

# Maintenance Management Plan

CDOT Contract Number: C 0704-241




## Record of Revisions

Revision number	Date issued	Pages affected	Comments
A	3/19/2018	All	Draft
0	4/02/2018	All	For Initial Submission
1	05/07/2018		Address QRD Comments
2	10/30/2018	Appendix A-1-3	Bridge maint. plan
3	01/04/2019	3, 39	Org chart revision; MS4 compliance
4	01/28/2019	29	WQF inspection revision
5	05/01/2019		Annual update
6	05/06/2020		Annual update
7	3/19/2021	Appendix A-1-18	Inclusion of tunnel maintenance items
8	3/24/2021	Appendix A-1-18	Adding tunnel maintenance items
9	5/19/2021	Appendix A-1-18	Establishing baseline tunnel maintenance items
10	5/20/2021	Appendix A-1-18	Revisions to tunnel maintenance items
11	11/11/2021	Appendix A-1-18	Revisions to tunnel maintenance items. Refer to Aconex Doc # C70-Jorg-OPM-MAN-000001 for supplemental information.
12	12/13/2021	Appendix A-1-18	Revisions to tunnel maintenance items. Refer to Aconex Doc # C70-Jorg-OPM-MAN-000001 for supplemental information.
13	6/30/2021	All	Update for Substantial Completion
14	9/19/2022	4, 7, 43, 63, 82, 86, 87	Comments addressed
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16	12/13/3022	All	Comments addressed and additional info added
17	06/30/2023	All	Comments Addressed and Reformatted
18	7/20/2023	All	Addressed CDOT's comments

## Deliverable Certification

As per Schedule 8, Section 6.7.3 Document and Data Approval, I Umang Khatiwada as the originator of this deliverable certify this deliverable to be complete and meets the requirements of the Project Agreement.

<u>Umang Khatiwada</u>	 <u>Umang Khatiwada (Jul 20, 2023 16:03 MDT)</u>	<u>Jul 20, 2023</u>
Printed Name of Originator	Signature of Originator	Date

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## 1. Maintenance Management Plan Contents

The Central 70 (C70) Maintenance Management Plan (MMP) describes the KMP's technical approach to ensuring the maintenance obligations described in the Project Agreement (PA) are met. These obligations are specifically called out in Schedule 11 for the general maintenance activities during both the Construction and Operating Periods and for Handback activities in Schedule 12 covering the last 70 months of the Operating Period. Other areas of the PA that effect Project maintenance activities include but are not limited to are:

- Schedule 6 Performance Mechanism
- Schedule 10 Design and Construction Requirements Section 8 Drainage, and Section 14 Landscaping and Aesthetics
- Schedule 14 Strategic Communications, and
- Schedule 17 Environmental Requirements

The initial draft of the MMP was prepared and submitted with the Proposal prior to implementation of the PA. A revised MMP was prepared, submitted, and accepted prior to issuance of NTP2 in 2018. In keeping with the requirement for updates of the MMP as well as other plans, annual revisions have been made as documented in the Record of Revisions page. This update to the MMP focuses on tasks and activities that are necessary to meet the maintenance performance requirements during the Operating Period.

This MMP is part of the overall Project Management Plan (PMP) that includes the Developer's managerial approach, strategy, and quality procedures to design, build, operate, maintain and handback the Project according to the Project Agreement requirements. Key functions of the technical approach designed to achieve performance and project goal include:

- Assemble a qualified team.
- Train the team members to competently perform their jobs.
- Proficiently execute the MMP to meet performance objectives.
- Monitor MMP performance.
- Self-monitor and report accomplishments, compliance, progress, challenges, and important project data
- Improve the MMP performance based on our experience during implementation.

Previous versions of the MMP have addressed requirements for maintenance during the Construction Period. This update addresses maintenance activities during the initial Operating Period beginning at Substantial Completion through the first anniversary of Operating Period. If significant changes in the performance and execution of maintenance obligation are required sooner than the one-year anniversary, the MMP will be updated within 30 days after the execution of the change order or contractual modification.

Roy Jorgensen Associates, Inc. (RJA, O&M Contractor) will continue to be responsible for all O&M work activities except for the non-civil ITS and ETS systems and the performance of the Renewal Work Program. The plans for these functions are provided separately. Organization of the remainder of this document follows the requirements for MMP contents listed in Schedule 11, Subsection 5.2.



## 2. Organizational Structure

O&M Work will be performed during the Operating Period with a combination of KMP O&M staff and key subcontractors reporting directly to the O&M Contractor. KMP's staff will handle management and administrative aspects of the Project and provide coordination and communication with the Enterprises, their appointed support contractors, and other stakeholders such as the City of Denver and other local government agencies. The O&M Contractor will provide all resources for carrying out the operations and maintenance activities identified in Appendix A-2 of Schedule 11 of the PA except for those elements dealing with the functions as described in the previous subsection. The overall scope of Project O&M activities includes service patrols, CTMS operations, routine asset maintenance, snow and ice removal, incident response, periodic asset inspections, development of annual and special work plans, materials storage, and quality management of the O&M operations.

### 2.1. O&M Organization

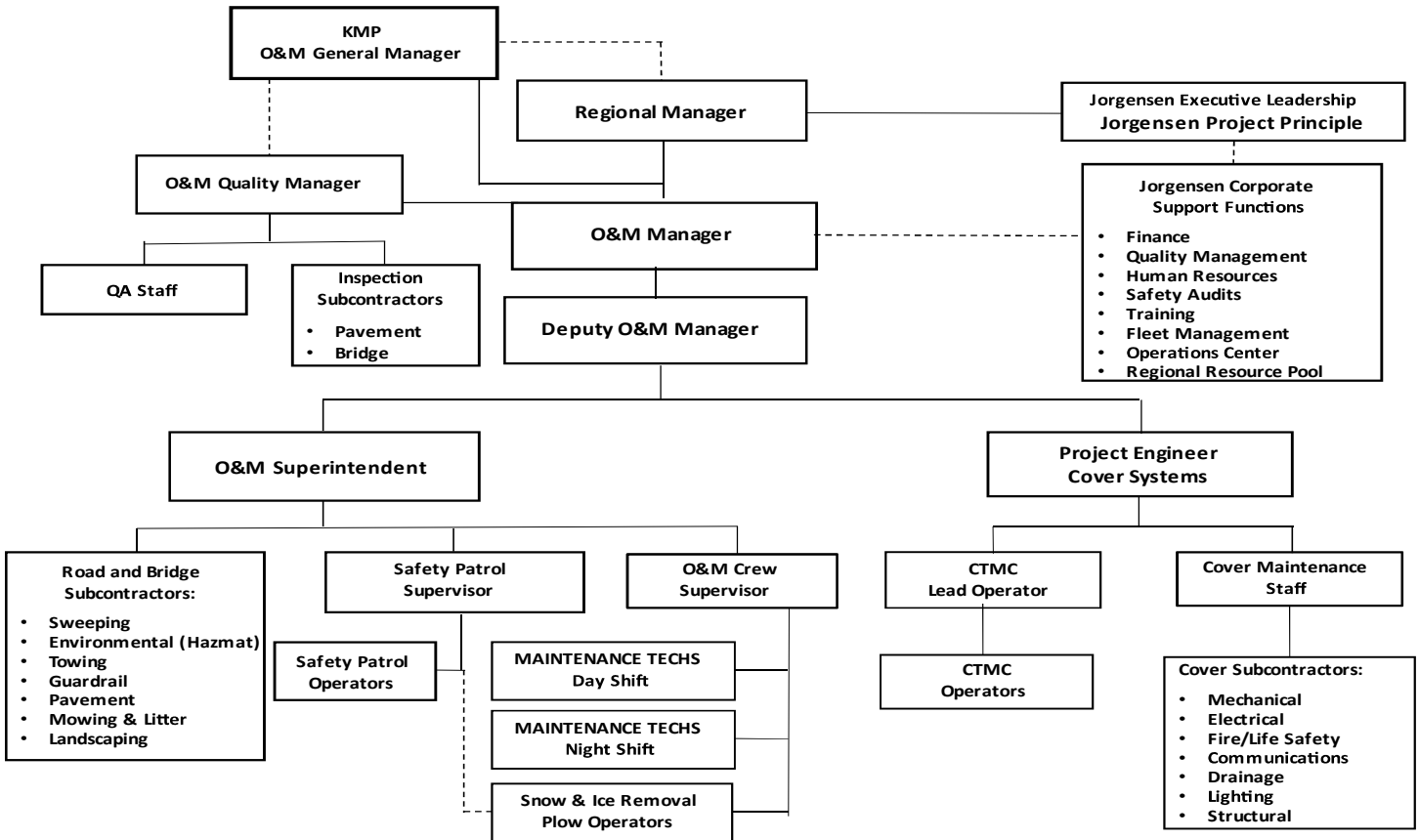
The organization and staffing of the O&M function is an integral part of the C70 Project. The PMP contains the overall Project organization and shows the inclusion and placement of the O&M function within the Developer's operations during the Operating Period.

For the Operating Period, the O&M organization has been modified to respond to several specific requirements identified in the PA and reflected in the other individual functional plans that accompany the MMP. It includes the addition of staff at both the management and technician levels as well as realignment of several reporting responsibilities. A graphic presentation of this structure is provided in Figure 1, O&M Operating Period Organization Structure. Staffing of the organizations is described in the following subsection.

### 2.2. Staffing Plan

The O&M staffing plan is based on the organization provided above. The staff includes managers, engineers, supervisors, and technicians as well as subcontractors who will work as a cohesive team to meet the requirements and challenges of the operation and maintenance work within the Project. In addition to those among the on-site staff, additional personnel will be available to support the project, either on a continuous part-time basis or at specific intervals when required. Roles and responsibilities for the personnel identified in the O&M organization structure are provided below and presented by specific functional areas such as management, supervision, technical and support.

Figure 1: KMP's O&M Organization Structure



### 2.3. KMP O&M General Manager

Although the KMP O&M General Manager is not part of the O&M contractor's staff, they provide oversight and coordination of the O&M work through the Developer to the Client and other stakeholders. This involves regular interface with O&M managers through periodic meetings, electronic communications and receipt and review of periodic and special reports and other documents. This position assumes all technical coordination of the Developer's activities during the Operating Period and reports directly to the KMP Project Manager. KMP O&M General Manager is the primary liaison with Enterprise. For any environmental issues, the Environmental Manager as described in the O&M ECWP liaises between KMP and the Enterprise.

### 2.4. O&M Contractor Executive Leadership

Overall responsibility for leadership, direction, and execution of Jorgensen's O&M work rests with its executive leadership. For this Project, Executive Leadership is provided by the Infrastructure Services Division Vice President for Operations and the Division's Western Regional Manager. These two positions provide guidance and direction for work planning, resource utilization, and budgeting. They are responsible for the development and implementation of an effective O&M program with sufficient resources, in compliance with Project requirements, while ensuring a safe working environment as well as customer safety. They communicate and interface with Developer management to ensure key functional changes to the O&M program are implemented where warranted.

- **Division Vice President for Operations** – This position is the top technical position within the Infrastructure Services Division. Responsibilities include the overall organization, planning, execution, and oversight of the project from inception to final completion. The VP for Operations will interface with both the Client and Developer as needed to discuss issues or concerns regarding the Project and develop any required mitigation efforts. They will also direct and monitor Project O&M work activities and resource utilization to ensure that work is carried out safely, effectively, and meets Project Performance Requirements.
- **Regional Manager** – Jorgensen's Regional Manager has overall performance and financial responsibility for the O&M project. As such, this includes oversight and direction of quality management activities. He periodically reviews quality management reports and data and provides guidance and direction to the O&M Quality Manager regarding quality processes and procedures. The Regional Manager is also part of the quality management review team that performs quarterly reviews of the project.

### 2.5. O&M Manager

The O&M Manager is Key Personnel per Schedule 27 and is responsible for all operations and maintenance activities within the scope of services of the O&M Contractor. This position oversees all on-site O&M staff and activities except for quality management QA functions and the O&M Quality Manager. All other project staff report to the O&M Manager through the chain of command shown on the O&M Organization Chart. The duties of the O&M Manager include:

- Ensuring that the O&M Work is delivered in a safe and efficient manner, and in compliance with the contract requirements.
- Ensuring that all resources necessary to execute the O&M work are available.

- Ensuring that all O&M project personnel meet the qualifications necessary for their position.
- Coordinating applicable contractual interfaces with KMP and Enterprise.
- Ensuring that all O&M project personnel are properly trained to perform their duties.
- Ensuring that all subcontractors and vendors used by the O&M Contractor are qualified and certified as necessary to render their services in compliance with the PA.
- Ensuring that the O&M Work is delivered in accordance with this Operating Period MMP, OMP and their subplans.
- Serving as coordinator for O&M Contractors role in the transition of O&M Work from the Construction Period to the Operating Period, and in the transition of O&M Work at Handback.
- Ensuring open and accurate communication with the Department and other stakeholders. Communicate with the Department and other stakeholders through the appropriate KMP channels and personnel.
- Ensuring proper development and implementation of proper ESB and other hiring programs to maximize recruitment and utilization efforts. Coordinates with other Project stakeholders regarding this effort.
- Oversees any customization and revisions to the MMIS (JAMMS) necessary to provide for effective planning, organizing, directing, and controlling Project O&M work.

## 2.6. O&M Deputy Manger

The O&M Deputy Manager is responsible for the functions and activities relating to the operations and maintenance fieldwork. He oversees periodic and routine maintenance work activities as well as operational activities such as Service Patrols and quality control activities. He will assist the O&M Manager with the development of the annual maintenance work program and budget as well as detailing short term work programs necessary to execute maintenance work on a weekly and monthly basis.

The Deputy Manager, in coordination with the O&M Field Superintendent, will maintain and oversee the operation and maintenance of the project’s maintenance management system (JAMMS) that supports planning, scheduling, and control of budgeted resources. This effort also includes the following activities that provide input to the JAMMS and allows for effective management of maintenance work on a day-to-day basis.

- Identification of maintenance needs through periodic inspections of various types of assets or specific locations.
- Development of in-house performance standards and quantity standards.
- Preparation of periodic work schedules and crew assignments.
- Collection of data on status of work activities.
- Review and analysis of planned versus actual accomplishments; and
- Adjustments to resources based on field inspections and performance indicators.

The Deputy Manager, in coordination with other Project staff, is responsible for preparing specified planning documents such as this MMP, and periodic reports for presentation to the Client and other stakeholders. They will also assist with the identification of O&M staff training needs and arranging of appropriate training sessions or programs.

## 2.7. Quality Manager

This position has overall responsibility for the development, implementation and updating of the OMQMP as well as the quality management system and processes that relate to each area within the system. It requires a full-time on-site individual who is responsible for addressing all quality and compliance issues. This includes performance and oversight of quality assurance activities; preparation and review of noncompliance reporting and documentation; and carry out data analysis on the results of QA and QC inspection activities. The position is also responsible for training and ensuring that staff are trained in all quality processes and procedures. The Quality Manager reports to the Regional Manager.

## 2.8. Project Engineer Cover Systems

The Project Engineer position was created to address the need for overseeing the development and implementation of O&M program for the Cover systems. This began during the third year of the Construction Period since there was a need to take over O&M of one bore of the Cover during this time. The Project Engineer coordinates with the sub-contractors to organize programs and procedures for addressing the requirements for numerous inspections of each of the Cover systems; performing periodic tests of various systems components; and participate in procuring specialty subcontractors as required to perform repairs to the systems whenever there is a defect or failure of a component. The Project Engineer also coordinates and oversees the activities at the CTMC in relation to real-time monitoring of Cover Operations.

## 2.9. O&M Superintendent

The O&M Superintendent's primary responsibility is facilitating the execution of the road and bridge maintenance work. The position coordinates and oversees the in-house maintenance crews and subcontractors as well as activities such as snow and ice control and safety patrol operations. The position supports the O&M Manager to ensure that annual work plans, and periodic work schedules of maintenance crews and subcontractors are focused on the proper areas to ensure achievement of the target performance values. Specific responsibilities and tasks assigned to the Superintendent include:

- Executing the daily/bi-weekly/monthly plans to achieve target performance goals.
- Inspecting work sites for safety compliance and work quality
- Ensuring the quality, quantity, and responsiveness of the subcontractor's work efforts
- Coordinating with other functional managers
- Planning and scheduling in-house crew assignments.
- Monitoring maintenance crew safety and efficiency
- Identifying equipment and materials needs and specifications and facilitating equipment procurement, materials inventory, and spare parts.
- Verifying that Department safety, quality, and environmental compliance procedures are followed.

The Superintendent is also involved in the operational activities inclusive of the project (ex: snow and ice control, incident response, and the Courtesy Patrol service). These responsibilities include:

- Organizing and directing maintenance crews and subcontractors to respond to incidents in coordination with the appropriate Supervisors.
- Preparation and distribution of a weekly 24/7 on-call schedule
- Preparing a Snow and Ice Event Plan for each event as required

- Overseeing procedures and activities for each snow and ice event
- Supporting traffic operation activities such as detour set up, flagging, and closures for maintenance work.
- Performing or assigning quality control inspections and consistency reviews on operations and maintenance activities

## 2.10. O&M Supervisor

For the O&M function of this Project the Supervisor is a working highway maintenance technician that supervises multiple or individual maintenance field crews. They will have experience with all routine highway operations and maintenance activities and may have an MOT certification like Traffic Control Supervisor (TCS) Certification. Responsibilities will include the mustering and organization of field crews to specific locations along the roadway for the purpose of performing one or more assigned maintenance activities. The Supervisor ensures that the crew(s) is carrying out the maintenance work in a safe and efficient manner and that all established procedures for safety, environment and workmanship are being followed. They are responsible for ensuring that crew members are qualified to perform the work assigned. They will perform Quality Control and other inspections as assigned by the O&M Superintendent or O&M Deputy Manager.

## 2.11. Maintenance Technicians

Maintenance technicians are the in-house personnel that execute the daily operational and maintenance work needs within the project limits. There are four levels of Maintenance Technician that are employed for both maintenance field work and specific operational activities such as CTMC Operations, Courtesy Patrols, and snowplow operators. Table 2 summarizes the qualifications required for each of the maintenance technician levels. These four levels align very closely with the State of Colorado’s Transportation Maintenance positions, Levels I – IV. CTMC Operations is carried out by CTMC Operators with 24/7 coverage working from CTMC CDOT GOLDEN 425 Corporate Cir, Golden, CO 80401.

Table 2: O&M Maintenance Technician Responsibilities and Qualifications

Position	Responsibilities	Experience and Qualifications
<b>Maintenance Technician IV</b>		
Advanced technical knowledge of highway asset repair and skilled in mechanical, electrical, or other Assigned to a skilled crew responsible for increasingly difficult maintenance work requiring in-depth knowledge of local standards and specifications. Performs as Crew Leader or specific functional support for larger work	<p>Set and review productivity goals based on benchmarks from the industry, other KMP projects and past project performance.</p> <p>Be knowledgeable with various parts of roadway, bridge, drainage structures and other road assets and correct work methods for various activities required to maintain and repair highway infrastructure.</p>	<p>High School Diploma or GED required; college preferred, but not required.</p> <p>5-10 years’ experience in maintenance or construction field</p> <p>Speak, read, write, and comprehend English.</p> <p>Maintain company standards for background checks (e.g., criminal record, driving record, controlled substance/drug testing)</p>

<p>activities such as bridge deck replacement or paving activities.</p>	<p>Ability to set up standard and advanced MOT like TCS Certification for road and bridge work.</p> <p>Train and mentor junior maintenance technicians in the most effective work methods and techniques.</p> <p>Know the current standards and specifications required for each highway infrastructure repair.</p> <p>Plan and schedule work crews for field work and oversee work activities. Full knowledge of JAMMS functionality.</p>	<p>Knowledge of local driving rules and regulations</p> <p>Carry out relatively complex arithmetic functions.</p> <p>Ability to read construction plans and drawings.</p> <p>Ability to use smart phone and tablet applications</p>
<b>Maintenance Technician III</b>		
<p>Advanced technical and skilled ability with maintaining road and bridge assets. Typically assigned to a small to medium maintenance crew responsible for increasingly difficult maintenance work requiring knowledge of local standards and specifications.</p>	<p>Be familiar with various parts of roadway, bridge, drainage structures and other road assets and correct work methods for various activities required to maintain and repair highway infrastructure.</p> <p>Setting up of standard MOT like TCS Certification for road or bridge work.</p> <p>Support training of maintenance technicians in the most effective work methods and techniques.</p> <p>Know the current standards and specifications required for each highway infrastructure repair.</p> <p>Familiarization with JAMMS operation and data input.</p>	<p>High School Diploma or GED preferred, but not required.</p> <p>Minimum of five years of experience in a similar position.</p> <p>Speak, read, write, and comprehend English.</p> <p>Maintain company standards for background checks (e.g., criminal record, driving record, controlled substance/drug testing)</p> <p>Perform work using manual and power tools.</p> <p>Knowledge of local driving rules and regulations</p> <p>Carry out simple arithmetic functions and read plans and drawings.</p> <p>Ability to use smart phone and tablet applications.</p>
<b>Maintenance Technician II</b>		

<p>Intermediate level role. Requires minimal previous experience in roadway and bridge maintenance or roadway operations. Assignments are routine and repetitive, requiring brief instructions usually involving lifting, carrying, manual loading and unloading.</p>	<p>Perform a variety of general maintenance tasks and follow verbal and written instructions.</p> <p>Follow instructions and specifications to determine work activities.</p> <p>Work independently without close supervision.</p>	<p>High School Diploma or GED preferred, but not required.</p> <p>Speak and comprehend English.</p> <p>Maintain company standards for background checks (e.g., criminal record, driving record, controlled substance/drug testing)</p> <p>Knowledge of local driving rules and regulations</p> <p>Carry out simple arithmetic functions.</p> <p>Ability to use smart phone and applications</p>
<b>Maintenance Technician I</b>		
<p>Entry level position. Does not require previous experience in maintenance. Assignments are routine and repetitive, requiring instructions in how to perform tasks. Usually involves lifting, carrying, manual loading and unloading. Use of hand and small power tools.</p>	<p>Perform a variety of general maintenance tasks and follow verbal and written instructions.</p> <p>Follow instructions and specifications to determine work activities.</p>	<p>High School Diploma or GED preferred, but not required.</p> <p>Maintain company standards for background checks (i.e., criminal record, driving record, controlled substance/drug testing)</p> <p>Be able to speak and understand verbal instructions in English.</p> <p>Knowledge of local driving rules and regulations</p> <p>Ability to lift 40 pounds.</p>

## 2.12. Jorgensen Corporate Support Functions

Project support from the O&M Contractor’s corporate organization provides guidance, training, oversight, and additional physical resources to the project on an as-needed basis. The O&M organization chart identifies the specific types of functional support that is available to the Project. Physical resources in the forms of labor and equipment may be acquired from the Contractor’s other projects or Regional Offices. Table 3 summarizes the various types of support available.



Table 3: O&M Project Support Functions

Support Function	Responsibilities
<p><b>Finance and Accounting</b></p>	<p>Finance and accounting activities are a centralized function. This function follows typical business procedures such as payroll, expense payments, accounts payable, accounts receivable, project budgeting, purchasing and management of other direct costs associated with the project. This function works directly with the project to resolve problems with billing and payments to both the Client as well and Project subcontractor and consultants who perform assigned work under established subcontract agreements</p>
<p><b>Quality Management</b></p>	<p>The Corporate quality management function provides oversight as well as additional resources to the project. This is coordinated through the Regional Manager who is responsible for overall Project Quality Management. Through the Executive Leadership and in coordination with corporate quality managers, periodic reviews are performed on project operations and specific activities needing closer review or possibly corrective action.</p>
<p><b>Human Resource</b></p>	<p>Directs and supports recruitment and Project staffing. Develops and implements policies and programs for staff development and training. Ensures that hiring practices and standards are maintained. Provides guidance and support to project staff regarding HR issues. Coordinates special HR programs such as SBE and DEB.</p>

<p><b>Regional Safety Manager</b></p>	<p>Coordinates with the Project Health and Safety Officer on safety aspects of all O&amp;M activities during the Construction and Operating periods. Oversees traffic safety issues and coordinates with the Maintenance Supervisor and Operations Supervisor to ensure proper procedures for traffic control (MOT) set-ups and traffic control during emergencies and severe weather events. Facilitates work site safety for training, equipment operations, drug testing, OSHA and State safety compliance, and MOT certification testing.</p>
<p><b>Regional Training Manager</b></p>	<p>Establishes project training goals and develops individual training programs for project staff. Facilitates key training courses and ensures compliance with certification and training contract requirements. Responds to requests for training from O&amp;M Manager or Executive Leadership.</p>
<p><b>Fleet Management</b></p>	<p>Administers Corporate Equipment Management Program. Specifies and coordinates equipment purchases and transfers among projects. Monitors equipment health and utilization.</p>
<p><b>Operations Center</b></p>	<p>Provides 24/7 communications capabilities for Project services. Coordinates between customer requests and project services and work activities. Supports JAMMS data input and output. Performs integrity checks on project data.</p>
<p><b>IT</b></p>	<p>Implements the technical solution for the project communication program including procurement of IT devices, hardware and software management, monitoring, and tracking of utilization.</p>
<p><b>MMS Program Management</b></p>	<p>Responsible for the implementation and general management of the maintenance management system. Trouble shoots program errors and oversees revisions and upgrades to JAMMS.</p>

<b>Regional Resource Pool</b>	Labor and equipment can be provided from other projects through a regional resource pool controlled by the Regional Manager. Additional resources can be provided for scheduled specific work activities or for general maintenance operations when local staffing falls below existing requirements.
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### 2.13. O&M Personnel Contact List

Because the O&M project work requires vigilance and operational readiness 24/7 365 days per year, there is a need to keep communications open between O&M staff and other stakeholders as well as the public. Communications from the public is handled via telephone and website connectivity and is described in the O&M Operations Management Plan. Contact with O&M staff within the Project is facilitated through a contact list maintained by the O&M Deputy Manager. This list identifies O&M staff by project position, name, telephone number, and corporate email address. It is reviewed and updated monthly or anytime information regarding the position changes. A copy of the current O&M contact list is provided in Appendix D and updated in SharePoint.

### 3. Qualification and Training of O&M Staff

Due to the nature of the work required for this project and the need to ensure safe, effective, and timely responses to all work activities, highly trained and experienced managers and technical staff are required. Personnel are selected and assigned to positions based on their knowledge, skills, and abilities.

Management personnel must be competent and strong leaders, capable of properly interpreting the contract documents and thoroughly experienced in the type of work being performed. They must have full authority to receive requests and instructions from Client and Developer personnel and be able to execute directives and negotiate work requirements that solve problems. The training of the O&M staff continues during the Operating Period and will continue through the Project Term. The qualifications and training requirements for O&M project managers are provided in Table 4.

Table 4: Manager Qualifications and Training

Position/Title	Position Qualifications	Education Requirements	Training Requirements
<b>*O&amp;M Manager</b>	Minimum 10 years of experience on major highway infrastructure projects of similar size and scope to the Central 70 Project. Experience in the management and development of Project deliverables including O&M technical approach that ensures compliance and quality	University Degree in engineering discipline	Minimum of 30 hours annually
<b>O&amp;M Deputy Manager</b>	Minimum 10 years of experience on major highway infrastructure projects of similar size and scope to the Central 70 Project. Experience in the management and	University Degree in engineering or	Minimum of 30 hours annually

	development of Project deliverables including O&M technical approach that ensures compliance and quality	science discipline	
<b>Project Engineer</b>	5 years of experience in highway maintenance and/or construction industry. Provide field experience to evaluate Project compliance criteria and design functional maintenance programs.	University Degree in Civil or Mechanical Engineering	Minimum of 20 hours annually
<b>O&amp;M Superintendent and Supervisor</b>	Minimum 5-year experience in highway Maintenance, construction, and/or similar industry	Minimum High school diploma or equivalent	Minimum of 30 hours annually

All individuals assigned to the Project will be qualified to perform their work functions based on previous work experience, education, training, certifications, and technical skills. This requirement applies to both project managers and technical and administrative personnel. Training is used to ensure that individuals understand the Contractor’s corporate operations as well as project specific work requirements. Training of project staff began during the mobilization period and has continued through the Construction Period. This effort will continue through the Operating Period. The core training program for employees coming onto the project includes seven categories:

- **Introductory Training:** New employee orientation to company policies and procedures and introductory safety training.
- **Environmental Health and Safety (EH&S) Training:** Safety-focused training modules designed to educate and train employees in correct safety practices for their job responsibilities.
- **O&M Maintenance Training:** Job-specific training modules to educate employees in correct processes and procedures for their job responsibilities.
- **Information Technology Training:** Training modules for specific technologies (universal and proprietary) used for O&M work.
- **Administrative Training:** Training for administrators and office positions, including mentorship and support to develop the tools necessary for success in all aspects of their jobs.
- **Management and Supervisor Training:** Training modules for managers and supervisors on leadership techniques and management methodologies.
- **Communication Training:** Training modules for key managers to develop skills for effective communication with clients and employees.

All project personnel are expected to attend orientation and safety courses prior to performing any Work. Topics include project safety, project organization, contract scope, project objectives, policies and procedures, communication protocols, reporting requirements, and the requirements and restrictions of the Project Agreement. New employees also receive training in policies and procedures, O&M requirements, work-time reporting, dress codes, and use of resources. Focused training is performed initially but continues throughout the project term to increase work efficiencies, personal development, and continuously improve the delivery and execution of the O&M program.

Over 100 specific courses in these seven key training categories are available in the Contractor’s O&M training library. The most effective training delivery occurs through a combination of classroom training supplemented with on-the-job training. Classroom training teaches fundamentals of specific topics, and on-the-job training develops technical skills for practical use.

### 3.1. Training/Qualifications Updates

Refresher and update training courses are used for basic operational practices and retraining where deemed necessary by management to increase a worker’s qualifications to perform their work function. O&M personnel are trained by three methods:

- **Off-the-Shelf Courses:** Self-scheduled, programmed learning courses and scheduled short courses or seminars on specific topics such as ATSSA and OSHA as described in the O&M Safety Plan.
- **Customized Courses:** Developed specifically for O&M activities. Instructed by certified (or otherwise qualified) O&M personnel. We offer these courses in classrooms or offices or in the field.
- **On-the-Job (OJT) Training and Exercises:** Individuals or groups participate in drills and practice job skills in real-time. Qualified O&M personnel direct OJT sessions.

Training staff hold regular training update meetings including monthly training calendar reviews and quarterly reviews of training needs and progress to date. This ensures the training for all new employees matches the training for current employees.

### 3.2. O&M Training/Qualification Curriculum

Table 5 provides a summary of the immediately available training courses list for the Operating Period. The training matrix is not all inclusive but provides a minimum level of training required for O&M positions throughout all personnel categories.

Table 5: Required Training and Certifications Matrix

Category	Series	Course	Position	Credit Hrs.
<b>Initial Training*</b> <b>Environmental Health &amp; Safety**</b>	<b>NEO</b> <b>HAZMAT</b>	New Employee Orientation Express (NEO Express)	All	<b>1.0</b>
		New Employee Safety Orientation Live (NESO)	All	<b>1.5</b>
		Diversity for Employee	All	<b>1.0</b>
<b>Environmental Health &amp; Safety**</b>	<b>HAZMAT</b>	OSHA Global Harmonizing Standard (GHS)	All	<b>1.0</b>
		Hazardous Materials Communications Program HazCOMM	PM/Supervisors	<b>1.0</b>
		HAZMAT Awareness and Spill Response	All Field Personnel	<b>2.0</b>

	<b>OSHA</b>	OSHA 10-Hour	Crew Leaders /Supervisors/PM	<b>10.0</b>
		Personal Protective Equipment	Field Personnel	<b>1.0</b>
	<b>CPR/First Aid</b>	CPR/First Aid	Crew Leaders /Supervisors/PM	<b>4.0</b>
	<b>Environmental</b>	Hot Weather/Cold Weather Safety	Field Personnel	<b>2.0</b>
		Working Safely Outdoors	Field Personnel	<b>1.0</b>
	<b>Emergency Management</b>	Emergency Action Plan	All	<b>1.0</b>
		NIMS: ICS100, IS 200	Field Personnel	<b>3.0</b>
		NIMS: IS700, IS800 Incident Management	Supervisors/PM	<b>3.0</b>
	<b>Project Safety</b>	Project Safety Overview	All	<b>3.0</b>
	<b>Operations &amp; Maintenance</b>	<b>MOT &amp; Operating in Traffic Zones</b>	Traffic Incident Management (TIM)	Field Personnel
Traffic Control Technician (TCT)			Field Personnel	<b>8.0</b>
Traffic Control Supervisor (TCS)			Supervisors/PM	<b>16.0</b>
Flaggers in the Work Zone			Field Personnel	<b>4.0</b>
<b>Maintenance Activities</b>		Crash Barrier Systems	Crew Leaders/Supervisors/PM	<b>Varies</b>
		Winter Weather Operations	Field Personnel	<b>4.0</b>
<b>Tools &amp; Equipment Operations</b>		Smith Driving	ALL	<b>3.5</b>
		TMA Operations and Safety	Sponsored Operators	<b>2.0</b>
		Hand and Power Tools	Field Personnel	<b>1.0</b>
<b>Information Technology</b>		<b>JAMMS</b>	DWR Process	Admin, Crew Ldrs, Supervisors, PM
	JAMMS Mobile		Admin, Crew Leaders, Supervisors, PM	<b>4.0</b>

		JAMMS Desktop	Admin, Supervisors, PMs	4.0
<b>Management &amp; Supervision</b>	<b>HR</b>	Corrective Counseling/Write Ups	Admin, Supervisors, PMs	2.0
		Employment Law for Supervisors	Admin, Supervisors, PMs	1.0
		HR Basics	Admin, Supervisors, PMs	2.0
	<b>TPC</b>	Third Party Claims for Project Managers	PMs	2.0
	<b>QMS</b>	Quality Management System Overview	Supervisors/PM	2.0
<b>Leadership</b>	<b>Leadership Basics</b>	A Purpose Driven Team	Supervisors/PM	2.0

\*Coordinates the initial training phase for O&M personnel with this training.

\*\*See Operations Management Plan and Environmental Compliance Work Plan” for further discussion on the environmental compliance and mitigation training program (ECMTP) for O&M personnel. See “Safety Management Plan” for further discussion on safety training for O&M personnel.

## 4. Work Hours and Work Locations

Work schedules vary by workload, client requests, location, and emergency conditions. O&M responsibilities for the Central 70 Project are 24/7. Recognizing this, KMP employs a team that understands the variability of work hours and expectations of a 24/7 operation. The staff is structured to manage the diverse work schedules that are necessary to assist with emergency situations and on-call activities, as well as both daytime and night-time maintenance operations. During the Operating Period, O&M resources are located primarily at 4375 N Havana Street Denver, Colorado, 80239 (Maintenance Yard) however, other locations may be identified and maintained if there is a need to temporarily relocate specific resources to locations that are closer to the required work. CTMC Operations are carried out from CDOT CTMC Golden, 425 C Corporate Circle, Golden, Colorado, 80401. There is 24/7 coverage from CTMC Operators.

There are no refueling facilities at the Havana Street Yard. For equipment refueling, pickup trucks and smaller vehicles are refueled at the local gas station on Havana Street across from the O&M Yard. Larger trucks and other large equipment are refueled using Card Stand locations along the I-70 corridor; one at North Pecos Street and one at Peoria and East 39th Ave.

## 5. Experience and Qualifications for Inspection Personnel

Operational and maintenance performance is verified through an inspection program of roadways, bridges, and cover infrastructure assets as well as various operational activities. There are no specific experiences and qualifications set out in Appendices A-1 and A-2 of Schedule 11 for personnel assigned to perform inspections of the various elements except for structures having a length more than 20 feet. However, RJA carries out inspections of any element of the project following the best industry standards

or practices. Pertaining to qualifications and experience requirements for FHWA Safety Inspection for In-Service Bridges, specific experience and training are required to adequately perform the annual pavement inspection listed in Subsection 8.4 of Schedule 11.

Table 6 below summarizes the experience and qualifications required for bridge and pavement inspection personnel and maintenance personnel performing safety and other types of inspections, and cover inspections. Additionally, Project internal policy requires annual training of O&M personnel for numerous functions and activities. These are identified in Table 5 of the previous subsection.

Table 6: O&M Bridge and Pavement Field Inspection Personnel (Experience and Qualifications)

Experience/Job Responsibilities	Professional/Academic Qualifications
<b>BRIDGE INSPECTION ENGINEER</b>	
<p>Supports the project in fulfilling the requirements of the bridge inspection program.</p> <p>Provides day to day management of the bridge inspection teams.</p> <p>Ensures certification for bridge inspection training.</p> <p>Ensures bridge inspection team members maintain training requirements.</p> <p>plans, schedules, and prepares information for the field inspection of bridges.</p> <p>Performs QC/QA reviews of bridge inspection reports</p>	<p>Reviews and approves bridge inspection reports.</p> <p>Signs and processes bridge inspection reports</p> <p>Assists with special inspections.</p> <p>Registered professional engineer.</p> <p>BSCE minimum</p> <p>Completed the FHWA approved bridge inspection training course.</p> <p>Completed ten years of bridge inspection experience</p>
<b>BRIDGE INSPECTOR II</b>	
<p>Supports the Bridge Inspection Engineer in fulfilling the requirements of the bridge inspection program.</p> <p>Provides direction to the bridge inspection teams.</p> <p>plans, schedules, and prepares information for the field inspection of bridges.</p> <p>Coordinates with railroad companies for bridge inspections over/under railroads</p> <p>Performs bridge inspections.</p> <p>Performs QC reviews of bridge inspection reports.</p> <p>Signs and processes bridge inspection reports</p> <p>Ensures the general safety of the bridge site.</p>	<p>Completed the FHWA approved bridge inspection training course or completed five years of bridge inspection experience.</p> <p>Completed the FHWA approved bridge inspection training course.</p> <p>Completed the FHWA approved bridge inspection training course or Certified as a Level III or IV Bridge Safety Inspector for National Institute for Certification in Engineering Technologies (NICET)</p>



<p>Verify all safety procedures and the proper use of access equipment are followed.</p>	<p>Completed the FHWA approved bridge inspection training course OR completed a bachelor's degree in engineering from an Accreditation Board for Engineering and Technology (ABET) accredited establishment.</p> <p>Completed the National Council of Examiners for Engineering and Surveying (NCEES) fundamentals of the engineering licensing examination.</p> <p>Completed the FHWA approved bridge inspection training course.</p> <p>Completed two years of bridge inspection experience OR completed an associate degree in engineering from an ABET accredited establishment.</p> <p>Completed four years of bridge inspection experience</p>
<b>BRIDGE INSPECTOR I</b>	
<p>Supports the Bridge Inspector III in fulfilling the requirements of the bridge inspection program.</p> <p>Provides direction for the bridge inspections.</p> <p>plans, schedules, and prepares information for the field inspection of bridges.</p> <p>Performs bridge inspections.</p> <p>Performs QC reviews of bridge inspection reports.</p> <p>Signs and processes bridge inspection reports</p> <p>Ensures the general safety of the bridge site.</p> <p>Verify that all safety procedures and the proper use of access equipment are followed.</p> <p>Registered professional engineer/BSCE.</p> <p>Completed the FHWA approved bridge inspection training course or completed five years of bridge inspection experience.</p>	<p>Completed the FHWA approved bridge inspection training course or completed a bachelor's degree in engineering from an Accreditation Board for Engineering and Technology (ABET) accredited establishment.</p> <p>Completed the National Council of Examiners for Engineering and Surveying (NCEES) fundamentals of the engineering licensing examination.</p> <p>Completed the FHWA approved bridge inspection training course.</p> <p>Completed two years of bridge inspection experience.</p>

<p>Completed the FHWA approved bridge inspection training course or Certified as a Level III or IV Bridge Safety Inspector for National Institute for Certification in Engineering Technologies (NICET)</p>	<p>OR have the following qualifications:</p> <p>Completed an associate degree in engineering from an ABET accredited establishment.</p> <p>Completed the FHWA approved bridge inspection training course.</p> <p>Completed four years of bridge inspection experience</p>
<p><b>ROADWAY INSPECTION</b></p>	
<p>Has extensive knowledge on the condition assessment of a wide variety of roadway features (e.g., pavements, drainage appurtenances, safety hardware (e.g., guardrail), traffic appurtenances (e.g., signs, pavement markings)</p> <p>Supports the O&amp;M Manager in fulfilling the requirements of the roadway inspection program.</p> <p>Provides day to day management of the roadway inspection teams.</p> <p>Can utilize various systems for inspection reporting, Microsoft product suite, JAMMS.</p>	<p>Has completed internal organization training on specific inspection prior to</p> <p>Has a high school diploma or higher.</p> <p>Completes annual training hours requirements.</p> <p>Has completed TIMS training and plans, schedules, and prepares information for the field inspection of roadways.</p> <p>Has completed project safety training.</p>
<p><b>COVER INSPECTION</b></p>	
<p>Has extensive knowledge on the functioning, inspections, preventative maintenance, reactive maintenance, and other functions of the Tunnel including but not limited to Mechanical Electrical and Plumbing.</p> <p>Supports the O&amp;M Manager in fulfilling the requirements of the Cover inspection program.</p> <p>Can utilize various systems for inspection reporting, Microsoft product suite, JAMMS.</p>	<p>Working Knowledge of ASHTO, ASTM and FHWA standards and Manuals.</p> <p>FHWA Specifications for National Tunnel Inventory (STNI)</p> <p>FHWA Tunnel, Operations, Maintenance, Inspection, Evaluation (TOMIE)</p>

## 6. Safety Plan

Safety is of utmost importance to KMP and as such, safety programs involving training, enforcement and oversight are key components of the O&M Safety Plan. The primary components of the plan are described in a separate document as Appendix 5.2.4.A Safety Plan, which is a subpart of this Maintenance Management Plan and which KMP will utilize for all O&M functions.

The Developers' O&M Manager is responsible for consistent implementation and success of the Safety Plan. The O&M Contractors' Regional Safety Manager is responsible for overseeing all safety-related inspections, investigations, and reviews during the Operating Period. The Safety Plan provides details on all Project safety requirements as well as additional requirements imposed by the O&M and ITS Contractors. Below are some specific areas of focus that will help minimize the occurrence of personal injury on the job and to help alleviate public safety concerns.

- Ensure that all equipment used by KMP, and its subcontractors is maintained in a safe and efficient manner in accordance with State, Local and Federal law, safety organizations, and regulations and guidelines pertaining to the providing of the required services. Follow all safety requirements outlined in the National Electric Safety Code (NESC), the Occupational Safety and Health Administration (OSHA), and any Standards or practices for safe installation or maintenance of required equipment per the Concession Agreement.
- Provide for the safety of Project personnel through the provision of safety equipment to include procedures for the protection of employees and the public throughout the areas within the Project limits after construction.
- Develop and implement focused safety action programs that support KMP's vision of fostering an accident preventive, caring culture.

Additional activities that KMP considers prudent practices relative to the health and safety of its employees are described in the Safety Plan or the Operations Plan. All new and updated MSDS forms, OSHA, NESC or other updates and similar documents will be incorporated into the appropriate appendices of these Plans.

## 7. O&M Quality Management Plan

As part of the C70 Project Agreement, (Subsection 5.4 Schedule 11) KMP has developed and is implementing a comprehensive O&M Quality Management Plan (OMQMP). The primary function of the OMQMP is to establish a system that ensures O&M work is being carried out in line with Project requirements and accepted industry practice. The OMQMP is attached to this MMP as Appendix 5.2.4 B O&M Quality Management Plan.

The OMQMP establishes KMP's self-monitoring process to oversee and manage the performance of O&M Work during the Operating Period. The PA also requires that the OMQMP provide the means to evaluate O&M work performance with respect to the Performance Requirements (Schedule 11 Appendix A-2) for the Operating Period. KMP will follow the procedures and reporting requirements of the OMQMP and submit these results according to the requirements of Schedule 6. Additionally, the PA requires a comprehensive quality assurance system to be implemented to validate the information, accuracy, and

results of the self-monitoring process within the O&M function. This serves as the basis for identifying noncompliance events and non-authorized lane closures. Processes and procedures detailed in the OMQMP are summarized below.

## 7.1. Quality Organization and Staffing

The individuals responsible for quality management functions will have sufficient authority, access to work areas, and organizational freedom to identify quality problems, verify implementation of solutions, and ensure that further processing, delivery, or installation is controlled until proper disposition of a deficient condition has occurred. Quality verification functions will report to project higher management (Regional Manager) so that sufficient authority and organizational freedom to ensure appropriate action is taken to resolve quality issues through various means such as additional training, revision of work methods and procedures, and organizational restructuring. An organizational staffing plan for quality management functions as well as position descriptions is provided in the OMQMP and aligns with the overall organization and staffing plan in this MMP.

## 7.2. Revisions

The OMQMP is a living document and will be updated as necessary to reflect changes in scope, plan, and technical approach. At minimum, annual updates will be made to incorporate any such changes and such revisions will be distributed in accordance with the Project's Document Control Procedure. All revisions must be reviewed and approved by the O&M Contractors Quality Manager, designated KMP management, and Enterprise before going into effect.

## 7.3. O&M Limits After Construction

The drawings in Appendix E of this MMP present the O&M Limits After Construction (Operating Period). They will be the basic graphical reference to the physical limits of O&M work activity for the period beginning the first day after Substantial Completion. The drawings will be updated as required during the Operating Period to reflect any adjustments to the limits of maintenance responsibilities as determined among the stakeholders. Where necessary, the physical limits are identified onsite using appropriate physical markings and/or signage. Mainline limits are identified with signage at the Project's beginning and end points.

## 7.4. Location and Layout of Maintenance and Storage Facilities

For the maintenance facility and equipment storage during the Operating Period, the existing Maintenance Yard will serve as the primary maintenance facility housing O&M staff, office equipment, maintenance fleet and other equipment, materials, tools, and spare parts for roadway and bridge assets as well and the Cover. The proximity of the site to the Project limits is conducive to cost effective and efficient O&M services. The current yard provides ample staging area for KMP's resources required for the O&M activities. The parcel is approximately 6.5 acres, which includes a 140 ft. by 60 ft. material storage building and a 100 ft. by 45 ft. shop/warehouse and office building. Figure 7 is an ariel photo of the property showing locations of facilities as well as location with respect to the I-70 roadway and Havana Street.

Figure 7: Aerial View of O&M Contractor Facility



Modifications and improvements to the site are anticipated prior to the beginning of the Operating period. This will include the following:

1. Addition of another office module close to the existing office and Warehouse building. This will provide office space and working areas for addition project staff that are identified in the Organization and Staffing Plan. The plan is to have office space for project management and supervision activity and separate working space (current module) for maintenance technicians and subcontractor personnel as needed.)
2. Construction of a building on a site located on the south most portion of the property. This building would be large enough to house spare parts that are required to be available for Cover systems. Any available additional space would be used for housing equipment spare parts that are needed for fleet equipment such as snowplows and other heavy equipment.

One location where O&M staffing and resources are located will facilitate ensuring all necessary maintenance equipment and materials are readily available. JAMMS has the capability to manage the spare parts inventory levels, materials, as well as vehicle and equipment utilization. Procedures for ensuring that maintenance equipment and materials are readily available are summarized below.

## 7.5. Communications and Coordination with Department for Scheduling Repairs and Closures

Open communication and transparency in the O&M program facilitate mutual trust, confidence, and information exchange with the Department as well as other entities and agencies with interest in the Project. There are several processes and procedures that are used to communicate and coordinate O&M activities with the Department and other stakeholders. Many of these were established at the beginning of the Project and revised or added during the Construction Period.

The Department has identified areas requiring coordination by specifying communication protocols, work documentation, informational reports and meetings that must be implemented by the Developer. Most are required throughout the Project Term. Some requirements focus only on the Construction Period or the Operating Period. Communications and Coordination activities described in this subsection of the MMP address the requirements for the Operating Period. Some operations and maintenance activities that surface periodically will typically be addressed on an informal and direct basis between the appropriate staff from the Department and the Developer. Coordination with other entities is described in subsection 5.2.1.h.

KMP's Project Manager is the direct contact and interface between KMP and the Department's designated personnel for all maintenance-related Project responsibilities. This responsibility is typically delegated to either the KMP Technical Manager or the O&M Manager. Additionally, at the discretion of the Project Manager, key O&M staff and maintenance subcontractors are directed to provide additional information and/or attend meetings with the Department.

The main operations and maintenance activities requiring coordination between the Department and the Concessionaire are as follows:

### 7.5.1. Reports and Other Documents

- Provision of an Operations Management Plan and Maintenance Management Plan including major subplans for Safety, Quality Management, Courtesy Patrol, Snow and Ice Removal, Incident Response, Emergency Management, and Communications. Each of these plans contains information regarding communication and coordination with the Department and others concerning the specific functional area. Additionally, the Developer's Transportation Management Plan and Project Management Plan contain information regarding communication and coordination for other functional areas that are not specific to O&M activities but may have impact for certain situations.
- Periodic reports that contain a wide variety of information as specified by the Department. Significant among these documents are the following:
  - Weekly O&M Operations and Maintenance Report that provides a three-week look ahead for all planned O&M activities.
  - A two-month work schedule in Gantt chart format identifying planned cyclical routine maintenance work for the period This information would typically be included in the O&M Monthly Report.

- An annual work plan that lays out the overall O&M program for a one-year period based on anniversary date of Substantial Completion.
- Reports of asset inspection results such as pavement, guardrail, signs, and bridges. The biannual NBIS bridge inspection reports are the only documents that require specific information and formatting.
- Reports required for emergency response and disaster relief based on State and Federal emergency management requirements.
- Accident report summaries and TIM documentation as required.
- Non-compliance and Non-Permitted Closure reports documenting each event.

### 7.5.2. Meetings

- Weekly with Department representatives to discuss and coordinate O&M activities for the next week. Topics include the previous week’s maintenance activities, planned maintenance for the next three weeks activities, future lane closures, incidents/emergencies, construction or renewal activities, assessment of Non-Compliance Points, O&M violations, and other pertinent information.
- Emergency Meetings to discuss specific O&M related issues as required or occurs.
- TIM (Traffic Incident Management) meetings
- Winter Weather Event Response Report in the Monthly O&M Report
- Fire Life Safety Meetings
- ITS/tolling Task Force Meetings
- Meetings with local agencies, as required.
- Meetings with the Enterprise Boards as required to provide information on O&M activities.
- Traffic Operations quarterly meetings. This meeting will be included as part of the monthly O&M meeting in the months of March, June, September, and December of each year.
- Annual meeting with Department to discuss O&M ESB goals.

### 7.5.3. Reviews, Inspections, Services, and Approvals

- Coordination with Department regarding work that would impact utilities.
- Flexible and rigid pavement monitoring coordination including annual pavement inspection.
- Approval for use of experimental products or items not on approved products list
- Approval for lane closures according to the process of Exhibit II
- Development of protocols that address requirements for Incident Scene Clearance
- Inspections of specified assets and provision of results to Department (e.g., attenuator, guardrail, lighting, signs)
- Periodic bridge inspection and provision of NBIS data
- Annual review of O&M performance requirements

To facilitate coordination and understanding of ongoing O&M activities, KMP provides the Department access to the O&M Contractor's MMIS (JAMMS) for a status on all O&M work activities, lane closures, inspections, and resource availability.

#### 7.5.4. Emergency Events

Emergency events require special attention to coordination, communications, inspections, and reporting. Depending on the magnitude of the emergency there are different levels of coordination, communication and post event inspection and reporting. For example, requirements will differ between a localized emergency such as a sink hole and a broader geographic emergency such as a tornado event. These functions are detailed in the Operations Management Plan, Incident Response Plan and Communication Plan.

### 7.6. Procedure for Coordination of O&M Activities with other Entities

At the beginning of the C70 Project KMP prepared plans defining the approach to development and implementation of managing the overall Project, particularly during the Construction Period. A number of these documents addressed the need for, and processes required for coordination with the numerous entities involved in the Project. Documents that directly addressed these requirements regarding O&M functions were the Construction Period Communications Plan, this MMP, and the OMP. Most of the processes identified in these plans were put in place during the Construction Period and are still relevant for O&M during the Operating Period.

The main principals used for coordination, interfacing, and building strong positive relationships with other entities that work on or are impacted by the Project are:

- Well defined and effective channels of communication
- Building and maintaining a strong framework for seamless customer interface
- Maintaining consistency in coordination and communication
- Well defined organizational responsibilities within the O&M function

In similar fashion to the Construction Period, KMP will again reach out to local agencies and all entities who are involved with Project activities to reaffirm or reestablish lines of communication prior to the start of the Operating Period and continue during the Operating Period. This will include:

- **Operating Period Kick Off Meetings** - These meetings will occur prior to Substantial Completion with the goal to provide all local agencies and other stakeholders with an introduction to the O&M team, explain the types of activities that will be performed during the Operating Period as well as Project general background information, contact information, and answer any questions or concerns.
- **Project Overview** - Preparation of white papers, information bulletins, and presentations of the O&M function including goals and services. These documents will be distributed at the kick-off meeting, posted on the Project website, and sent to organizations via email upon request.
- **Monthly Work Schedule Impacts** - On a monthly basis, agencies that will be impacted by maintenance activities scheduled on the corridor will be notified of the upcoming potential impacts via email or through direct communications such as teleconference or scheduled meetings to discuss specific activities.



- **Utility Excavations** – reference Colorado revised statute Title 9, Article 1.5.
- Based on the scope of the Project and the requirements set forth in the PA, KMP will reestablish on and coordinate with the following entities beginning at the Operating Period:
- CDOT Offices are not directly involved with C70 Project development or operation such as:
  - CDOT Office of Emergency Management
  - CDOT Public Relations
  - CDOT Region 1
  - CDOT Transportation System Management and Operations (TSM&O)
  - Others as required
- City of Aurora
- City and County of Denver
- Colorado Motor Carriers Association
- Colorado State Patrol (CSP)
- Denver Council of Regional Governments (DRCOG)
- Denver Emergency Management
- Denver Fire Department
- Denver Police Department (DPD)
- Federal Highway Administration (FHWA)
- Mobility Transportation & Service
- Regional Transportation District
- Local Utility Companies
- State Highway Patrol

### 7.6.1. Contact Lists

To facilitate communication with entities that are involved in supporting the Project or are supported by the Project, a contact list has been developed showing detailed contact information for individuals or specific functions that require contact for communication and coordination during O&M activities. The basic contact list is provided as Appendix D. Table 8 is a contact list containing information for contact with personnel in the KMP Project office and the C 70 O M office.

Any CDOT CTMC communication pertaining to potential corridor deficiencies may be directed to RJA CTMC Hotline Number 303-512-5861.

Table 8: O&M Office 4375 Havana Street, Denver, CO. 80239

<b>Khatiwada, Umang</b>	O&M Manager	<b>303.483.3929</b>	<a href="mailto:Umang_Khatiwada@royjorgensen.com">Umang_Khatiwada@royjorgensen.com</a>
<b>Jarvis, John</b>	Quality Manager	720.284.2333	<a href="mailto:John_jarvis@royjorgensen.com">John_jarvis@royjorgensen.com</a>
<b>Sentell, Matthew</b>	Maintenance Superintendent	720.392.5888	<a href="mailto:matthew_sentell@royjorgensen.com">matthew_sentell@royjorgensen.com</a>
<b>Fleming, Alex</b>	Project Engineer (Cover)	214.679.7157	<a href="mailto:Alex_Fleming@royjorgensen.com">Alex_Fleming@royjorgensen.com</a>

These lists are distributed to project personnel at the outset of the Operating Period and will be updated periodically by the KMP Communications Manager. The lists will be continually updated on the C70 Project Website for review and download. Additional contact lists specifically for emergency/disaster events are provided in the Emergency Management Plan.

### 7.7. Special Coordination Requirements

Various types of utilities are present along the Project right-of-way. These entities require close coordination to ensure there is no disruption to their services. There are also five locations where railroad tracks intersect the Project right-of-way requiring coordination of maintenance activities on the roadways that pass either over or under the railroad ROW.

Various types of utilities are present along the Project right-of-way. These entities require close coordination to ensure there is no disruption to their services. There are also five locations where railroad tracks intersect the Project right-of-way requiring coordination of maintenance activities on the roadways that pass either over or under the railroad ROW.

**Utility Coordination:** Any ongoing O&M work that requires excavation needs to call 811 and coordinate any work with the utility owner if necessary. Other utility work in CDOT ROW will be done the CDOT permit office and coordinate with KMP.

**Railroad Coordination:** There are five railroad crossings along the corridor. We anticipate coordination efforts with these agencies for the purpose of repairs and maintenance by the railroads and O&M work that affects or infringes on the railroad ROW. The coordination will be achieved through CDOT Railroad Manager to the Railroad.



For example, inspection and maintenance work activities associated bridge and substructure maintenance will require the use of access equipment. This equipment has the potential to encroach on the railroad access area. Prior to initiating work, a Contractor’s Right of Entry (CROE) form will be completed and

submitted. All O&M work will be performed in accordance with the requirements detailed in the RRA between the individual railroad and the Department.

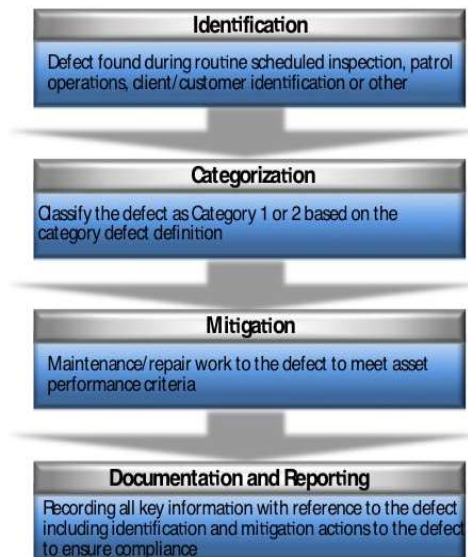
In case of general coordination required for significant maintenance activities affecting the adjacent property owners, a stakeholders coordination meeting will be organized. CDOT Railroad Manager will super head these coordination meetings.

## 7.8. Approach to Identification and Recording of O&M Defects

Identification of O&M defects requires an agreement or definition of what constitutes a defect. The Department has defined what it considers a defect by listing O&M Performance Requirements for the maintenance and operational Elements that are within the Project Limits. These requirements for the Operating Period are identified in Schedule 11, Appendix A-2. These criteria are also in Appendix I of this MMP. Figure 9 on the next page illustrates the identification and management process for dealing with O&M defects.

Maintenance deficiencies are categorized based on the condition of the asset, which will determine appropriate maintenance work based on category severity. The Department has defined two deficiency categories as Category 1 and Category 2 which has been defined in the Project Agreement

Figure 9: Deficiencies Management



The O&M staff are trained in the practice and methodology of asset inspection, including the identification of deficiencies based on the Performance Requirement in Appendices of Schedule 11. Since this was done at the outset of the Project for identification of defects during the Construction Period, it is not a new concept and is easily adapted for the same type of training necessary for the Operating Period. Our staff identifies operational deficiencies with two programs -- systems notification and inspections. Courtesy Patrols can identify safety-related deficiencies (asset damage, debris, pavement failures) effectively. Supervisors are also required to perform patrolling of the corridor periodically to identify any type of defect that may have occurred since the preceding inspection. The periodic inspection program that is

programmed on an annual basis identifies in detail the asset conditions and their anticipated deterioration rates. Safety inspection activities and schedules are described in both Subsection 5.2.1. k of this MMP and in the Safety Plan (Appendix 5.2.4 A). Figure 10 below illustrates this process.

Figure 10: Asset Inspection Process



## 7.9. Procedure for Responding to Category Defects

Categorizing the defects (Category 1 and Category 2) identifies the severity and element deficiency, which initiates the priority level and associated response. The priority level establishes when and what corrective action will take place. Once a defect is identified and prioritized, a plan for corrective action is established. The repair or replacement activity will be scheduled about priority level, resource availability and the amount of time allowed to complete the repair. At a minimum it must meet the response time and condition criteria established by the Performance Requirements in Appendix A-2 of Schedule 11. These requirements also define the Defect Remedy period, which is the period beginning when the defect is identified to the time it needs to be corrected. Identification of defects or noncompliance events by Project staff are the most common occurrence. O&M staff are responsible for identification of defects or investigating defects identified by other stakeholders and the public and logging them into JAMMS as Service Requests. The process for identification and response to category defects is as follows:

- Work needs are identified and entered in the JAMMS system by way of a Service Request. If it is identified as a Category 1 defect, the O&M Superintendent is notified immediately for development of a plan to resolve the defect. For Category 2 defects, Service Request will be entered in JAMMS and reviewed during the weekly scheduling meeting.
- The work need goes into JAMMS's master work backlog where it is prioritized by the O&M Manager in collaboration with other O&M staff based on the category level, associated performance requirement, resource availability and other work already planned.
- The priority is verified by the Maintenance Superintendent or Project Engineer and a Work Order is established in JAMMS specifying the work requirements, resource needs and scheduled.
- Work is performed and inspected for Quality Control. All work performed on safety assets is also automatically designated to have a Quality Assurance check.

As part of the scheduling process, defects in JAMMS are prioritized in the weekly schedule to ensure we meet the compliance deadline. In addition, JAMMS has an alert function that will automatically issue email alerts of pending deadlines, so defect remedy time frames are met. A compliance report is also accessible in JAMMS to quickly review and confirm compliances.

Each work need and associated response will have an individual Work Order record that accounts for all work activities performed. This information is entered into JAMMS with the minimum required to be the start and end dates of the mitigation work; labor, equipment, and material usage; engineering and photographic documentation; and QC and QA checklists. A comprehensive report of each event can be accessed in real-time from JAMMS by O&M Project staff, Contractor support personnel and management as well as KMP Project staff and Department Project Staff.

## 7.10. Procedure for Monitoring and Maintaining the Condition and Performance of the Project to Meet the PA Requirements

In addition to the Performance Requirements in Appendices A-1, and A-2 of Schedule 11, KMP will follow Department, AASHTO, FHWA, and other relevant manuals, guidelines, specifications, and standards to ensure quality O&M management and performance in carrying out O&M activities. The O&M staff performs periodic reviews of available technical documentation to ensure that the latest versions of these references are up to date.

Maintenance performance and asset condition is verified through our inspection, monitoring, and quality program as described in Appendix B “O&M Quality Management Plan.” The following procedures are utilized for monitoring and maintaining the condition and performance of the project.

- Identify Performance Requirements for each Element (Ref. Appendices A-1 and A-1 Schedule 11)
- Identify asset inventory quantities (Updated inventory provided for start of Operating Period).
- Develop an inspection process to monitor, review and validate performance – The inspection process will review the asset conditions to verify performance. These procedures are described in the following subsection.
- Define O&M work program and schedule work activities and frequency – See Section 5.2.2 of this MMP.
- Implement the quality management system to confirm product and service quality- See OMQMP Appendix B to this MMP for the quality management program and specific procedures for monitoring work activities and performance compliance.
- Adjust work schedule, work execution, and inspection methodologies – Based on inspection findings, and OMQMP results revise the work plan, work schedules, and inspection reviews to achieve performance.

## 7.11. Inspection Procedures and Objectives

The major goal of the inspection program is to periodically determine the condition of all Project assets and to reflect those findings in periodic Routine Maintenance Work Programs and Schedules as well as the Annual Renewal Work Schedule during the Operating Period. The inspection plan is based on PA requirements and the need to preserve assets in the state of good repair for as long as possible until there is a need for major renewal or replacement. The plan incorporates the following objectives:

- Verify the continuing safety for users.
- Prioritize deficiencies requiring immediate and urgent attention if the potential to create a danger to users exists. (i.e., Category 1 deficiencies)
- Identify Category 2 deficiencies for repair or replacement.

- Respond to reports or complaints received from customer groups by inspecting reported defects.
- Determine the effect of accidents or emergency events on assets.
- Monitor the effects of extreme weather conditions on assets.
- Collect data to monitor performance of the Project assets and to establish priorities for future O&M Work

## 7.12. Summary of Inspection Program

Appendices A-1 and A-2 of Schedule 11 identify elements that require periodic inspections. Figure 10 identifies provides a sample of the types of inspections, their frequency, and equipment required. The frequencies listed in this table will be updated as needed to account for ageing assets and increased levels of asset deterioration. The inspection verification will be tracked in JAMMS and the required reports will be stored in Aconex. Routine patrolling of the system will primarily be utilized to identify Category 1 and Category 2 deficiencies, so these will be identified and scheduled for immediate action. Additional inspections are programmed to occur periodically to establish asset condition levels and track asset deterioration.

As stipulated in Appendices A-1 and A-2 of Schedule 11, and included in the Example Inspection Program Table above, Performance Requirements for several Elements are based on specified standard testing methods used for the inspections. The following listing identifies the Elements and testing method required.

- **Element 1.2 “Pavement”**: Ride Quality measured according to ASTM E-1926 using equipment meeting AASHTO M-328 and operated in accordance with AASHTO R-57 using equipment verified and operators certified according to AASHTO R-56
- **Element 2.1 “Storm Sewer Systems”**: Rate condition according to CDOT Level of Service Manual and measurement of several defects (e.g., settlement, cracking, spalling)
- **Element 3 “Structures”**: Inspections and measurements as required by the National Bridge Inspection Standards, CDOT Pontis Bridge Inspection Coding Guide, and FHWA/AASHTO Inspection Manuals (e.g., foundation settlement, rotational movement of girders)
- **Element 3.9 “Load Ratings”**: Ratings according to the AASHTO Manual for Bridge Evaluation
- **Element 4.1 “Pavement Markings”**: Retroreflectivity measured according to AASHTO TP111
- **Element 6 “Signs”**: Retroreflectivity measured according to the MUTCD requirements for Signs (This requires application of ASTM E1709 procedures using Retroreflectometer)
- **Element 15.3 “(Snow) Plowing Material Application”**: All unit’s operations and time requirements measured by AVL monitoring systems.
- **Element 16.1 “Courtesy Patrol”**: Location and time requirements measured by AVL systems.

## 7.13. Procedures for Traffic Control and Management During Periods of Closure

Work zone traffic control is needed for many maintenance activities, renewal efforts, and regular operational needs. During the Construction Period, maintenance of traffic for work zone traffic control was managed by the construction contractor since most closures were for construction related activities. During the Operating Period, the O&M Contractor will be responsible for the management of the traffic control for their own closures required for all O&M work. Closures for renewal work are addressed in the Operating Period Transportation Plan and the Renewal Work Plan. Closures for incidents are described in the Incident Response Plan.

KMP employs work zone traffic control applications like those defined by the Department's standard O&M activities. The detailed procedures planning and implementing lane closures are described in the Transportation Management Plan and comply with PA requirements identified in Section 2 of Schedule 10. While these requirements were originally meant for the Construction Period, they are also applicable to the Operating Period.

KMP along with the O&M Contractor has created MOT strategies and processes for the Operating Period based on the initial efforts and lessons learned during the Construction Period and focused on minimizing impacts to roadways under Project control as follows:

- Combining multiple O&M work activities and events into single closures to minimize closure times and reduce traffic congestion.
- Identifying potentially impacted businesses and major civic events to provide communication with these organizations as necessary.
- Issuing early and definitive notices to the affected parties and public
- Coordinating with the Denver Traffic Management Center to minimize problems with traffic flow through the affected area.
- Facilitating public media outreach and coordination with CTMC and the Department's Traffic Web Portal ([www.cotrip.org](http://www.cotrip.org))
- Minimizing long term ramp closures
- Limiting major traffic switches
- Reducing neighborhood impacts, and
- Expediting business access and local traffic signing and access

## 7.14. MOT/Lane Closure Procedures

Proven MOT/lane closure methods are employed to minimize negative traffic operational impacts on the public and neighboring businesses. These methods are procedures that have been adopted by numerous highway departments and follow MUTCD guidelines for lane closures. The O&M Manager reviews the impacts of all proposed lane closures to ensure compliance with the PA technical provisions. Lane closure requests are submitted to the Department 10 days or 1 week minimum prior to the requested closure (except in cases of unforeseen emergencies, which allow for shorter notice time). The lane closure procedure is explained in Exhibit II herewith.

Scheduling closures during holidays and special events is avoided because of the amplified impact on the traveling public. Local and federal holidays are blackout dates when Department approvals for lane closures are required. Traffic operations restrictions are also considered during special events (e.g., the National Western Stock Show, Cinco De Mayo).

KMP will work closely with the O&M Contractor to plan road closures in advance by reviewing upcoming events and other operational issues and activities. KMP will communicate the time, location, and duration of closures weekly to the Department via Aconex and provide information to the CTMC for notices on the DMS message boards. KMP uses the following guidelines when considering requests for closures at work zones:

- **Holiday Hours:** Unless otherwise stipulated, holiday hours will begin at 7 pm the day before the holiday date, and end at 5 am the day following the holiday date. The closure blackout period is 34 hours.
- **Permissions:** Unless the Department or Federal agency directs otherwise, closures for incident management are allowable without exception
- **Exclusions:** In consultation with the Department, KMP can permit closures for work zones if anticipated traffic volumes are significantly less than those during similar non-holiday periods

### 7.14.1. Lane Closure Tracking

Lane closures are tracked in JAMMS using Service Requests (SRs) and Work Orders (WOs). Additional information regarding the use of JAMMS for managing and documenting lane closures is provided in Subsection 5.2.1.g above. The beginning and ending of each closure are part of the Daily Work Report verifying compliance with the requirements. The basic procedure for documenting lane closures is as follows:

- A Service Request (SR) and Work Order (WO) are entered into JAMMS.
- The Work Order is assigned and denoted as requiring MOT/closure needs.
- The Daily Work Report (DWR) tracks times allocated to the beginning and ending of the closure.
- A summary of all closures for the previous month are reported in the monthly report, which includes dates and durations.

## 8. Procedures for Investigation and Response Complaints or Reports of O&M Defects or Non-Compliance Events

Complaints or reports of O&M defects or noncompliance events are received from numerous sources including the Department and other stakeholders as well as the general public. Most of the Department complaints or reports are communicated directly to the O&M Project staff either through telephone calls or emails sent to the O&M Manager or other staff who are responsible for specific O&M functions. Information is also received during the weekly O&M Task Force meetings from Department personnel, KMP staff or the Construction Contractor. Other sources of complaints or requests come from other stakeholders such as businesses along the corridor or the traveling public.

Complaints and reports of O&M defects or noncompliance events are classified as maintenance service requests that are managed according to specific procedures that have been developed for such a purpose. Information from all sources flows into the service request system regardless of its origin. This includes O&M defects and maintenance needs identified by O&M staff.



## 8.1. Complaints and Reports from Project Entities

Complaints and reports of O&M defects or noncompliance coming from sources within the project are noted by the receiving project staff and discussed with the originator in order to get as much information as possible before having the information entered on a Service Request in the JAMMS. Each entry includes the customer's name, contact information, time and date of request or entry, location of defect, condition or circumstance, and photographs.

The procedure for investigating, determining appropriate response, tracking work activities and close out is the same for all complaints and reports of defects. This is discussed in Subsection 5.2.1.m.iii below.

## 8.2. Complaints and Service Requests from Customers Outside the Project

The O&M Contractor has established a call line for the purpose of receiving comments, complaints and other information about O&M defects or operational problems relative to the C 70 Project. In addition to the project staff who are available during normal working hours, designated supervisors take turns serving in an on-call capacity. Additionally, the call line is available 24/7 365 and is staffed during normal working hours in real time. After normal working hours, the mailbox is periodically monitored after working hours. All calls are received in the Contractor's Operations Center specifically designed for receiving, documenting, coordinating information regarding Service Requests. All customer comments or service requests are documented and tracked in JAMMS. JAMMS can sort reports based on location, date, and activity. A specific individual in the Ops Center is assigned to the C 70 project for this purpose. They take the information from the customer, open the Service Request, and record all documentation, and communicate the information to the appropriate requirements to the O&M Project staff. Customer service roles and responsibilities are defined and clearly documented to the Ops Staff who received periodic training in customer relations, project activities, and JAMMS operation. Key elements for our customer service process include:

- Management commitment
- Clear explanations of the work
- Project staff accessibility
- Prompt and courteous customer response
- Personalized response whenever possible
- Simple and clear customer communications
- Objectivity and flexibility in determining proper resolution of request or complaint, and
- Uniform, consistent, and accessible documentation

Ops Center activities are subject to periodic review, quality control and data integrity checks.

## 8.3. Investigation and Response Procedures

Investigation and response to each Service Request begins with a review of all the information logged into the Service Request record. The procedure for investigating and responding to complaints and reports of O&M defects or noncompliance events is as follows:

- Service Request containing request and information is forwarded to O&M staff for investigation.

- Designated O&M staff person reviews Service Request and does field investigation to determine required action and response. The required action is based on examination of asset condition and location. Damaged assets are rated according to function and can be safety related, preservation requirement or aesthetic.
- Assign a number and a priority level to the request based on the nature of the complaint.
- Response to customer is made within 48 hours with status and pending action updates if the request cannot be resolved immediately.
- Establish a follow-up schedule for requests unresolved within one working day. Relay follow-up schedule to the customer and note in the Customer Service Request
- Add the final resolution date to the Customer Service Request

Reporting of Customer Service Requests is provided to the Department monthly or on an as required basis. This information is also available directly through JAMMS and can be accessed via the JAMMS web portal at any time to review individual data the Maintenance Accomplish Report by maintenance function.

## 9. Work Plans and Schedules for Routine Maintenance Activities and Renewal Work During the Operating Period

The work planning and scheduling process includes two key components:

- Work Needs Identification - Work needs are generated through periodic asset inspections such as daily and weekly patrols and annual asset focused inspections, and identification of defects by O&M staff as well as other stakeholders on an ongoing basis.
- Work Planning and Scheduling - Annual and monthly work plans generated from the work needs identification process and from known long term preventative maintenance needs related to asset renewal. A monthly rolling work schedule is generated by the annual work plan and from that, a bi-weekly work schedule is prepared showing specific O&M work activities to be accomplished during that time frame.

This subsection of the MMP describes the process for developing a maintenance work plan and schedule for the initial year of the Operating Period as well as the maintenance activities involved in implementing that work plan. During the Construction Period, the Baseline Asset Condition Inspection provided the foundation for the development of the initial work plan and schedule. The resulting Baseline Asset Condition Report is included in this MMP as Appendix E. A similar approach is taken at the beginning of the Operating Period by conducting an overall inspection of the Project assets, particularly the newly completed construction to identify maintenance requirements other issues such as asset maintainability that would a continuing routing maintenance effort. The 5.2.1.k.ii Summary of Inspection Program identified provides the foundation for this work during the Operating Period. Also note that the routine maintenance program and renewal program are designed to work in tandem to maximize life cycles and extend the life of assets as much as possible.

There are three basic stages in the development of a comprehensive maintenance work plan and associated work schedule. The following is a list of steps required to formulate a maintenance work program.

1. Work Plan Inputs- How the work needs are generated.
  - a. O&M contractual requirements.

- i. Asset specific inspections - Inspection performed to verify the asset condition and define asset work needs.
    - ii. Specified cyclic activities - Contract required cyclical work activities.
  - b. Project specific inputs - Work needs generated by project specific needs.
    - i. Client driven - Expectation of the client in the performance of specific work activities.
    - ii. Customer driven - Customer specific service requests.
  - c. Work backlog - Work identified by the continuous evaluation of asset condition.
    - i. Asset inspection.
    - ii. Condition assessment compared to a specific standard (Performance Requirements, other specifications, etc.).
  - d. Establish a baseline - Estimated work needs based on work history experience.
    - i. Historical annual accomplishments on similar types of activities on other projects.
2. Analysis - Review and assessment of the inputs to detail the work program.
    - a. Define what activities generate most of the work.
    - b. Identify individual work activities and break-down frequency and volume of individual work activity.
    - c. Execution of the work activity analysis and risk allocation.
      - i. In-house analysis to define the following resource needs: man hours, equipment/materials, and production rates.
      - ii. Subcontractor analysis to define unit cost/activity, production rate, and associated risk of outsourcing.
  3. Outputs - Generated from the work plan and execution of the work plan.
    - a. Annual work plan and schedule indicating volume of work and required resources.
    - b. Detailed monthly work schedule (OC and project's input) by location of work, schedule, work quantities, resource levels (personnel, material, and equipment)
    - c. Production rates to identify work efficiencies.
    - d. Reconciliation of proposed work plan against performed work plan including Planned vs actual accomplishments, planned vs actual costs, planned vs actual resources consumed, and schedule deviations.

Each work activity will generate its own detailed work plan that is periodically revised and updated based on results of inspections and the age considerations of the asset.

## 9.1. Work Plan Development for Individual Assets

This programming process is performed for each work activity required to address asset maintenance and preservation and will generate the overall comprehensive work plan and schedule for the O&M portion of the Project. The process was implemented prior to start of the Construction Period and will continue throughout the Operating Period with revisions as needed to adjust for baseline asset conditions, results of asset condition inspection, and programmed renewal activities. The following identifies Additional details relative to the generating a maintenance work program along with the types of work activities and associated work methods are provided below.

## 9.2. Procedures for the Performance of Routine Maintenance Activities

Subsections describing the maintenance work performed on system assets to ensure asset performance compliance are provided below. The descriptions are organized by the Element categories listed in Schedule 11 Appendix A-2 and work methods are subject to change. Refer to Appendix A-1 of Schedule 11 for performance targets not specified in this MMP. An example of a routine maintenance work program and schedule is provided in Subsection 5.2.2.

### 9.3. Pavement

This section briefly describes routine maintenance activities for managing obstructions and debris on the travel lanes and addressing pavement deficiencies.

#### 9.3.1.1. Obstruction and Debris (on pavement surface)

Remediation activities for obstructions and debris are typically quick and require little supplemental equipment or specialty support. Courtesy Patrols and O&M maintenance crews monitor the corridor daily. The Courtesy Patrols supplemented by the maintenance crews will swiftly remove debris and roadkill to avoid hazards on the travel lanes and shoulders. We use MOT traffic control when necessary.

##### 9.3.1.1.1. Pavement (structure)

This section discusses routine pavement work to repair pavement deficiencies. The measures help ensure pavement meets the performance criteria. This approach uses a systematic method for determining O&M Work Plans for pavement. We have organized the plan first by location—shoulder, mainline, or ramp—and second by pavement type. Potential deficiencies include depressions, pavement shoving, concrete spalls, poor joint sealant, potholes, and edge raveling. The repair measures described below apply to both asphalt and concrete pavement.

- **Low Shoulder Maintenance:** Heavy equipment operation performed by O&M technicians. The technicians use motor graders, dump trucks, bobcats, and backhoes as needed to add fill to restore shoulder elevations to the performance criteria. Technicians survey the site as necessary to verify compliance. We install erosion control measures such as sod or seed to preserve the roadside stability in vegetated areas.
- **High Shoulder Maintenance:** Similar procedures and equipment for Low Shoulder Maintenance. Technicians will correct high shoulders by removing excessive materials and re-establishing grade and drainage paths. When possible, any material removed to correct high shoulders is added to correct low shoulders.

O&M field staff monitors mainline pavement conditions for pavement deficiencies. We perform all routine maintenance on the pavement; significant pavement repairs are part of the renewal work. Routine pavement maintenance includes:

- **Pothole Repairs:** Use of cold patch asphalt from the Department’s material producer list or plant-approved products to fill potholes and drop-offs. Courtesy Patrols monitor their respective routes to ensure timely emergency repair completion within the specifications of the asset performance criteria and the emergency repair guidelines.

- **Skim Patching/Minor Mill and Overlays:** Used for small areas, usually less than 100 sq. ft., by experienced operators using rollers, packers, milling attachments, and supplemental equipment when necessary.
- **Crack Sealing/Crumb Rubber Sealing/Spray Patching:** Asphaltic tar or crumb rubber sealant techniques in deficient areas. Typically used in the spring or summer.
- **Incident Damage:** Repair pavement damage caused by traffic accidents, fuel fire, and hazardous liquids, various methods will apply based on the pavement condition.

Application of routine maintenance activities to pavement to eliminate punch-outs, corner breaks, spalls, excessive cracking, and misalignments. Trained technician’s complete minor repairs. For significant repair or reconstruction renewal work would be involved. Maintenance crews complete the following pavement maintenance activities:

- **Emergency Spall Repairs:** Routine maintenance crews use cold patch asphalt to fill potholes and drop-offs. We use cyclic seasonal mobile operations for asphalt patching.
- **Permanent Spall partial and Full-Depth Repairs:** Partial depth and full-depth concrete repairs. These typically require closures and require cleaning the spalled areas and reinforcing steel, new concrete, and surface finishing. We complete partial depth repairs, as needed, throughout the year.
- **Crack Sealing:** Concrete crack sealing measures are the preferred preventive technique for avoiding full depth slab repairs. We complete these measures during the spring and summer to reduce premature slab failures due to storm water and debris infiltration into sub-base surfaces.
- **Pressure Grouting:** Functionally depressed pavement slabs often result from failures in the base course and are corrected with pressure grouting techniques.
- **Asphalt Pavement Potholes and Rigid pavement Patching (CRC punch-outs):** Routinely repaired by full time in-house equipment crews as part of their daily work assignment. Immediate response capabilities are typically 0.25 tons or less.
- **Broken Rigid Concrete:** Temporary repairs, which typically include asphalt or fast-cure rigid concrete. Permanent repairs, either partial depth or full depth, are used with MOT when necessary.

### 9.3.2. Drainage Systems

The corridors proximity to major water features and the intensity of area rainfalls necessitates an effective drainage system to accommodate potential water loads. Peak loads must flow smoothly with minimal flooding. Sweeping maintenance procedures to clear the system are discussed in “Sweeping and Cleaning.”

The methods described below are effective countermeasures for the drainage systems required to be maintained. KMP will adhere to Permanent Water Quality (PWQ) control measures where applicable and comply with the conditions of the current version of the Department’s MS4 Permit by performing the activities listed below within the O&M Limits and in accordance with the Performance and Measurement Criteria. Refer to the section titled “Summary of Inspection Program” of this MMP for details regarding inspection frequencies associated with these activities. The following requirements will be fulfilled as part of the MS4 permit plan.

- Litter and debris will be removed from the roadway, roadside, wetlands, and water quality ponds to limit debris accumulation at the drains and downstream stormwater sewer systems.
- Sweeping cycles will be performed with mechanical sweepers attached with vacuums to limit sediment accumulation at the drains and downstream stormwater sewer systems. Sweeping cycles are also performed, as needed and upon the completion of snow and ice removal services to remove excess granular material.
- Drains, ditches, and forebays will be inspected for debris and sediment buildup affecting drainage performance and removed as necessary.
- Roadside embankments and vegetation will be maintained to reduce the impacts of erosion.
- Herbicide application will use the minimum quantities needed to meet the Performance and Measurement Criteria.
- Specific maintenance plans for each water quality facilities are being developed and reviewed by CDOT

### 9.3.3. Drainage Structures and Barrier Wall Inlets

A wide range of preventive measures is included in the routine and preventive maintenance Work Plan. The methods described below are effective countermeasures.

- **Spot Aquatic Herbicide Applications:** Herbicide applications effectively reduce invasive species and nuisance vegetation. When appropriate, O&M crews apply herbicides in accordance with Integrated Noxious Weed Management Plan with surfactant and dye to drainage components.
- **Manual ingress/Egress Clean-Outs:** Maintenance crews perform routine preventive maintenance on drainage structures, including manually clearing debris, vegetation, sedimentation, and other accumulation from the inlets and outlets of drainage structures. In many cases, these simple manual methods allow the drainage system to flow as intended.

Inspection of existing drainage features on the roadway for maintenance needs and repair as needed to ensure proper function. Possible repairs include:

### 9.3.4. Drainage Structures and Barrier Wall Inlets

A wide range of preventive measures is included in the routine and preventive maintenance Work Plan. The methods described below are effective countermeasures.

- **Spot Aquatic Herbicide Applications:** Herbicide applications effectively reduce invasive species and nuisance vegetation. When appropriate, O&M crews apply herbicides in accordance with Integrated Noxious Weed Management Plan with surfactant and dye to drainage components.

- **Manual Ingress/Egress Clean-Outs:** Maintenance crews perform routine preventive maintenance on drainage structures, including manually clearing debris, vegetation, sedimentation, and other accumulation from the inlets and outlets of drainage structures. In many cases, these simple manual methods allow the drainage system to flow as intended.

Inspection of existing drainage features on the roadway for maintenance needs and repair as needed to ensure proper function. Possible repairs include:

- **Pipe Desilting/Pressure Blasting/Vac-Con Operations:** Piping systems with excessive build-up and sedimentation require non-destructive hydro-blasting and vac-con desilting.
- **Concrete Repairs:** Repair of infiltrations, joint damage, and minor deficiencies with concrete joint collars, using simple excavation when necessary. Third party accidents and vehicular traffic are common causes of damage to concrete structures, box inlets, drop inlets, curbs, and gutters.

### 9.3.5. Water Quality Features

The project corridor is receiving additions of ponds and vaults to its drainage system, and maintenance post-construction is important to ensure these new elements are functioning properly. The following maintenance activities or inspections occur (at minimum) at intervals specified in the Summary of Inspection Program subsection of this MMP:

- **Extended Detention Basins**
  - Trash racks and outlet structure grates are inspected for litter and debris accumulation and disposed of as required.
  - Hardware is inspected to ensure it is secure and functional.
  - Orifice holes are cleared to ensure continued flow.
  - Sediment is removed from the Extended Detention Basin (EDB) prior to reaching the lowest orifice hole and before the forebay outlet pipe is blocked, and sediment is disposed of offsite.
  - Slopes are evaluated to determine erosion control needs.
  - Slopes are reseeded as necessary to prevent erosion.
- **Proprietary Structures**
  - Accumulation chambers are routinely inspected for sediment and oil accumulation and disposed of as required.
  - Chambers are inspected immediately after a known or suspected hazardous substance spill (in accordance with the Incident Response Plan and the Incident Management Plan).
  - These structures will be added to the project at the following locations:
    - One structure at the I-70 eastbound on ramp from Brighton Blvd
    - One structure near the pond at East 42nd Ave and Crown Blvd
  - Additional inspection/maintenance requirements may be needed based on final design and construction completion. A review of as built drawings will provide needed information.

## 9.4. Structures

Routine structure maintenance is essential to preserving the facility and protecting the traveling public. In conjunction with the Federal Highway Administration National Bridge Inventory (FHWA NBI) biennial inspections, the O&M Work Plan includes a proactive process to avoid the possibility of significant structural deficiencies. All bridges and culverts with a centerline length of 20 ft. or more are defined as a structure with a deck, superstructure, and substructure components. The Project also includes overhead sign structures and DMS units in this category and requires specific inspection and maintenance activities. A list of structures required to be maintained by the Developer is provided in Appendix F.

KMP performs routine maintenance for bridge deck, superstructure, and substructure components and culverts. The most critical goal of the program is to reduce structural deficiencies and failures. The O&M bridge maintenance program has three categories -- preventive maintenance, periodic maintenance, and other routine maintenance. Preventive maintenance reduces the deterioration of the components and increases lifespan. Periodic maintenance includes repairs for components with significant deterioration that are no longer functioning as designed. We typically use additional maintenance activities to correct structural impacts due to unforeseen events.

### 9.4.1. Routine Maintenance Activities for Structures

Key maintenance tasks to ensure that structures comply with NBIS requirements and key performance, and asset standards include:

- **Mechanical Sweeping on Bridges:** Extensive mechanical sweeping operations are a first step in keeping bridge drainage structures clear of debris and are essential for achieving asset performance criteria. We schedule mechanical sweeping during off-peak hours (typically at night) as a mobile maintenance operation. Mobile vacuum sweepers remove debris, and MOT trucks with attenuators protect the mobile operation. Debris is disposed according to approved methods. We sweep roadway features bordering drainage structures, barrier walls, bridge abutments, curb edges, traffic islands, medians, in these operations.
- **Herbicide on Bridges:** We use herbicide applications in bridge and structure maintenance, and focus applications on slope pavement joints, substructure joints, drainage canals, and other locations where spot application can be effective.
- **Joint Cleaning:** Water and debris accumulation in the seam, preventing the joint from compressing properly, is a common cause of joint deficiencies. This accelerates deterioration of the joint material, causing it to become ineffective and leading to additional deficiencies (such as spalling) in surrounding concrete. Preventing premature joint failure includes a two-part approach: 1) reducing the number of debris threatening the joint using mechanical sweeping, and 2) removing the debris already in the joint using pressure washing or compressed air.
- **Pressure Washing Structure Components:** Debris accumulation in superstructures and substructures can also lead to premature component failures; bridge seats and bearings are most vulnerable. Our maintenance program is also a two-part process: 1) control vegetation with herbicide, and 2) use pressure washing or compressed air to remove existing buildup.
- **Manual Drainage Cleaning:** Effective drainage to clear corrosive chemicals and standing water from bridges helps protect both travelers and bridge components. Routine maintenance work includes a variety of manual cleaning tasks on drains, scuppers, inlets, and other drainage features linked to the structure.



- **Sign Maintenance:** Maintenance crews clean sign panels to ensure visibility and message readability.

Key areas or specific items of structures that require inspection and assessment include:

- **Prestressed Girders:** Ends of prestressed girders where they meet the integral diaphragms; check for cracking in the web and spalling of the bottom flange.
- **Integral Diaphragms:** Face of integral diaphragm (abutment and pier) where girder meet diaphragm; check for cracking in the diaphragm around the girders.
- **Pier columns:** inspect for damage (a result of vehicular impact)
- **Elastomeric bearings:**
  - Keep area clean around the bearing, very important for expansion bearings.
  - Inspect the stainless-steel sliding surface for pitting or damage.
  - Check for excessive distortion, if the side of the bearing is sloped more than 45 degrees, it may require resetting.
  - Check for damage to bearing/sole plates.
  - Check for bent or broken anchor bolts.
- **Decks:**
  - Check concrete deck for spalling, delamination, and cracking.
  - Exposed and corroded reinforcing steel.
  - Condition of deck overlay.
- **Steel girders:**
  - Moderate to severe corrosion.
  - Cracking of steel components or section loss.
  - Extensive corrosion or section loss of bolt heads.
  - Extensive distortions of cross frames or diaphragms.
  - Impact damage to girders.
- **Bridge Railing:**
  - Collision Damage.
  - Check condition and alignment of cover plate over expansion joints.
  - Extensive spalling or cracking of concrete.
  - Exposed and corroded reinforcing steel.

### 9.4.2. Maintenance Requirements Resulting from Emergencies

Damage from severe weather events and accidents requires a special response to mitigate or repair the asset. The following activities include:

- **Identification:** Dispatch responder(s) to secure the area and identify the damage through special inspections.
- **Mobilization:** Mobilize maintenance crews, specialty bridge contractors, emergency bridge inspectors, and bridge engineering design firm (if needed)

- **Corrective Measures:** Secure the site and mitigate potential hazards to motorists, clear debris field, and begin repairs.
- **Post Assessment:** Review to confirm that the repair is safe and secure. Perform QC and QA activities as required.

## 9.5. Roadway Markings

System striping materials include thermoplastic, preformed tape, and paint. Reflective pavement markings help delineate safe traffic lanes and offer good retro-reflectivity in darkness. Object markers and delineators also offer better visibility of potential hazards.

The maintenance of roadway markings along the Central 70 Corridor facility is a challenge, especially during the winter months. Poor markings often elicit public complaints. Therefore, priority on meeting the performance criteria for roadway markings is necessary:

- **Long Line Striping:** These are usually thermoplastic applications for asphalt pavement and preformed tape for rigid pavement and bridges (paint striping is adequate for severe deficiencies or fast response.) Long line or mainline striping is assessed annually for effectiveness. Short sections of striping are mechanically or chemically repaired as needed.
- **Ramp Striping, Words, Symbols, and Gore/Bridge Hatching:** Equipment for thermoplastic, paint, and preformed tape applications are available. These applications are typically scheduled two to three times annually and focus on ramps, gore areas, and bridge approaches. Crews perform symbol installations (8 in. to 24 in.), arrows and messages, and standard (less than 4 in.) solid and skip line maintenance.

Several delineator systems are used on the Project, including barrier wall delineators, vertical-adhered, and u-channel mounted reflectors. Most delineators are located at interchanges, horizontal curves, bridges, and entrance/exit ramp gores (except for barrier-wall bridge delineators). Maintenance crews carry a full inventory of the systems and replace damaged and poorly reflective delineators as needed.

Maintenance crews service barrier wall delineators, using epoxy systems for anchoring. Drainage, bridge, and other hazard object markers typically offer good reflectivity, but often become bent and incur damaged posts. During routine maintenance, O&M maintenance teams correct object marker, delineator, and attenuator deficiencies as they are identified.

## 9.6. Guardrails, Barriers, and Impact Attenuators

Timely guardrail and attenuator repairs are critical to ensure the safety of the motoring public, but the variety of materials needed for each system, plus the changing specifications, can present challenges. Repaired safety appurtenances must meet the current specifications for crash worthiness based on the AASHTO Manual for Assessing Safety Hardware (MASH) to ensure safety. We maintain adequate inventories at the maintenance yard and explicit directions on the proper repair of safety appurtenances. Our regular repair measures for guardrail maintenance include:

- **Blocks:** Deficiencies identified in this process include loose blocks, excessive cracking, wear/breakage, misalignments, and deterioration. Remedies include block replacements (steel, block, and poly), re-alignment, and hardware tightening.
- **Posts:** Deficiencies include misalignments, excessive racking/wear/breakage, deterioration, and spacing. Remedies include post replacements (steel, concrete, wood), re-alignments, and hardware tightening.

- **Rail:** Deficiencies include improper splicing, third party damages, improper rail types, misalignments, and improper height (requiring post adjustments). Remedies include rail replacement and re-alignment.
- **Hardware:** Deficiencies include improperly installed hardware and linkages. Remedies include tightening and replacement.
- **Reflectors:** Deficiencies include poor reflectivity and cracked or missing reflectors. The remedy is usually cleaning or replacement.

Meeting the exact specifications during installation is critical. There will be the use of proprietary components which must be carried in the spare parts inventory. Common deficiencies include mismatched parts, loose cables, loose hardware, incorrect spacing, incorrect breakaway post systems, and height installation issues. Correcting these systems is usually an extensive effort requiring the re-installation of individual components.

## 9.7. Signs

Maintenance technicians follow the technical plan for maintenance of both small and large signs. Sign work trucks are equipped with high intensity strobe beacons, pole racks, and power inverters for equipment operations.

Daily patrols and maintenance crews help determine sign maintenance needs using:

- Annual sign inspections to review sign structures for hardware, panel, and post deficiencies.
- Annual retro-reflectivity inspections to review panels for compliance and to identify cleaning and replacement needs.
- Daily programs to identify leaning, missing, or defaced signs.
- Reports to identify signs damaged in traffic accidents.
- Third party reports.

For signs mounted at heights above 10 feet, O&M technicians perform these inspections using bucket trucks. Closures or mobile operations with traffic mounted attenuator devices may be required, depending on the location and type of deficiency, to ensure safety during maintenance.

Crews are assigned to ensure the timely completion of maintenance deficiencies on traffic signs and delineation systems:

- **Regulatory Signs:** Maintenance trucks that are in continuous use in the field are stocked with safety signs (and related hardware and tools) including ‘stop’, ‘do-not-enter’, ‘yield,’ and ‘wrong-way.’ Traffic crews repair downed signs within hours of discovery, and their efforts are continuous. Other (MUTCD) regulatory signs, such as speed limits and ‘no parking,’ are in the panel inventories located at the maintenance yard.
- **Warning Signs/Guide Signs/Other:** Through measures like those for performance on regulatory signs, we repair all other signs on the system. Crews carry solvents for panel cleaning, removal of graffiti, and removal of stickers and decals.
- **Graffiti Removal:** For signs vandalized with graffiti, maintenance includes washing, chemical removal, and panel replacement.
- **Overhead Panel Replacements:** Maintenance crews overlay and replace panels to correct excessive cracking of reflective sheeting and poor reflectivity.

- **Structural Members Maintenance:** Structural members are periodically for damage, excessive corrosion, cracked welds, loose hardware, and un-safe conditions. Damage from third party incidents or major weather events are addressed as soon as possible depending on the location and severity of the damage.

Courtesy Patrols, Supervisors, and maintenance crews identify damaged and out-of-specification signs and enter the information into JAMMS for inclusion in the work program. Active mobility, good equipment, and properly equipped trucks enable sign crew efficiency. Downed/damaged regulatory signs are prioritized for repair or replacement. Large sign and small sign maintenance require different work methods and equipment. Large multi-post signs are assembled in the shop and installed onsite. Sign maintenance program effectiveness depends on expedited panel and material procurement. Hundreds of sign types with a wide range of hardware, bases, poles, panels, and installation configurations are available. Work trucks also carry a large variety of components needed to ensure quick response and efficient installation.

## 9.8. Traffic Signals

Signal maintenance includes identifying and understanding the scope of signal work required on the Project. Knowing the locations and characteristic load control centers for every system is critical to properly diagnose and maintain the system’s operability, because it enables technicians to better document and explain any defect identified in the asset.

The typical process for identifying necessary maintenance work includes several activities. O&M supervisors and crew leaders run scheduled routes to identify deficiencies and outages and enter these into the routine maintenance repair cycles. Traffic incidents, customer requests, and third parties can help identify deficiencies. The three maintenance activities for traffic signal assets are:

- **Inspection of Traffic Signals:** Inspections by O&M maintenance technicians is carried out weekly. Also, Supervisors patrolling any time look at traffic lights to ensure they are functioning properly.
- **Notification of CCD and Department of defect:** O&M makes notification to Department and CCD when defect is identified.
- **Maintaining Issue Log:** O&M Project office maintains log of defects found and notifications made.

Necessary equipment resources include:

- Pickup truck
- Bucket trucks, high and low reach for closer look at possible defects

## 9.9. Lighting

During the Operating Period (other than lighting beneath the Cover) Xcel Energy is responsible for electrical and operational features with the exclusion of temporary lighting. KMP is responsible for providing inspection and reporting. Lighting outages and lighting structures damage are reported to Xcel and to the Department. A log is kept by the O&M Project office that documents types of defect issues, date and time defect was identified, and information regarding the reporting to Xcel and the Department.

## 9.10. Fences and Walls

Proactive maintenance Work Plans for fences and barrier walls include preventive measures for reducing vegetative growth in joints, removing drainage obstructions, and crack sealing measures. Additional routine maintenance work will be required for excessively cracked or damaged wall sections and, in some instances, involve new concrete installations.

Maintenance associated with fences includes:

- **Routine Repairs:** Routine fence maintenance includes replacing sections of damaged or deteriorated fence fabric, resetting footings, and realigning fence posts. The daily patrol, maintenance crews, and third parties identify these deficiencies. The surrounding area is secured, and the maintenance crew performs initial mitigation and/or routine maintenance.
- **Terrestrial Herbicide Application:** Invasive species and weeds can affect the base of fence fabric. Eradicating these plants is critical and the preventive maintenance plan includes herbicides.
- **Accident Damage Repair:** Traffic accidents can easily damage chain link fences within the ROW. Fence post replacement, post foot replacement, and fence fabric re-splicing are typical repairs. The repair process is the same as described for routine maintenance repairs.

Concrete barrier wall maintenance includes:

- **Mechanical Sweeping:** Debris accumulation affects drainage structures and drop inlets and impedes storm water run-off. Accumulated debris also leads to nuisance vegetation. The maintenance plan includes frequent mechanical sweeping to remove accumulations. KMP ensures all sweeping activities comply with the Denver Regional Council of Governments (DRCOG) PM-10 air quality requirements. This is accomplished by 1) using sweepers to remove sand and grit as soon as possible, 2) reducing air-borne dust during operations through equipment selection, and 3) cleaning and replacing air filters as required.
- **Terrestrial Herbicide Application:** Invasive species and weeds can proliferate in barrier wall joints, impede surface runoff, and harm the integrity of the structure and joint. Preventive maintenance includes herbicide application.
- **Concrete Joint and Structure Repairs:** In isolated incidents (for example, when a third-party cause damage), crews mitigate the site and install steel tie-ins, form, and pour new structures, and install new joints as needed. Preventive measures for crack failures and misalignments include joint sealing and partial concrete patches.
- **Drainage Inlet Cleaning:** Barrier wall drainage inlets require periodic cleaning. Maintenance measures include surface debris removal by the Courtesy Patrol. Specialty Subcontractors clear inlets with measures such as Vac-con for pipe de-silting and hydro blasting.

Routine maintenance for walls includes:

- **Graffiti Removal:** Hydro-blasting, solvents, power washing, and paint matching.
- **Nuisance/Excessive Vegetation Removal:** Spot herbicide applications to help eliminate noxious vegetation growing around joints and other visible areas in accordance with Integrated Noxious Weed Management Plan.

- **Concrete/Damage Repair:** Specialty concrete subcontractors repair third party damage. Preventive measures such as joint sealing and partial repairs help maintain the long-term integrity of these roadside features.

## 9.11. Roadsafe

Routine roadside management focuses on grooming grassy areas and controlling weeds through mechanical and chemical applications. Roadside maintenance also includes removing safety hazards within the clear zone along the road. This is typically done by the Courtesy Patrol. Routine efforts involving other clean up and vegetation control include:

- **Mowing and Litter Removal:** The approach to mowing and litter control involves dividing roadway sections into sub-areas based on mowing requirements, turf conditions, and customer needs. Each area's acreage is determined and categorized by large machine, small machine, slope, and litter removal. Each area has a prescribed number of cycles to meet the minimum and maximum height performance requirement per Schedule 11 requirements. Traditional mowing methods are used to perform all mowing functions. A manual litter crew picks litter from the ROW, large machine operations follow, then small operations and weed eating-crews finish. ROW litter typically is disposed of at the appropriate local landfill location or taken back to the maintenance yard for disposal later.

The mowing operation, in addition to the standard mainline ROW, is responsible for ramps, arterial supplemental roadway limits, fenced-in retention ponds, wet ditches and outfalls, mitigation areas, in-fields, and other designated areas. When necessary, areas flooded by heavy rainfall in the spring receive herbicide to ensure proper vegetative control. Mowed areas, including ponds and detention basins, are inspected after the mowing operation to ensure that drainage inlet and outlet structures are free of obstructions.

- **Vegetation Management Methodologies:** Strong turf conditions for native grasses are essential for roadside erosion control, which helps protect shoulder and slope areas. In conjunction with front slope and shoulder repair work, long term maintenance can benefit from sodding. Diseased and bare turf is reestablished as part of this effort. Hydroseeding is most effective during the spring and summer due to frequent rainfall and sunlight. Sodding can be effective in any season except the winter.
- **Landscaping Maintenance:** Landscape maintenance for the C70 Corridor landscape plots includes:
  - **Mulching:** Used rarely and only for fertilization and noxious weed control.
  - **Pruning, Shearing, Tree Trimming:** Guidelines for trimming flowering bushes and other plantings. Usually completed manually, assisted by bucket truck, if needed.
  - **Manual Weeding, Spot Herbicide:** Weed control improves aesthetic appearance and improves beneficial plant growth. Crews use spot herbicide in accordance with Integrated Noxious Weed Management Plan for problem areas and manual weed control where areas are less congested.

- **Tree and Brush Trimming:** Brush and trees are trimmed as necessary along with clearing dead trees and brushing from the greenery areas in the ROW. Severe weather events can cause high tree fall rates. Maintenance technicians are trained for quick response and rapid tree removal. Certified arborists are also used when large trees or specific landscaping requirements are called for.

## 9.12. Earthworks and Embankment

Earthwork maintenance for a large acreage of shoulders, front slopes, ditches, berms, and back slopes is required within portions of Project ROW. Washouts on un-established turf are the cause of front slope maintenance needs. Heavy equipment maintenance crews consisting of trained equipment operators and skilled maintenance technicians complete these routine activities. Deficiencies are normally located at headwalls, side drains, drainage structures, or slopes with continuous and heavy water flow. Like shoulder repair, the operation adds, or re-uses fill as necessary to re-compact the existing grade elevation, so we can add new turf or seed. Slope stabilization treatments may be required where drainage runoff from bridge abutments is present.

## 9.13. Graffiti

In general, summer months are typically the time when most graffiti appear. Patrols travel the roadway daily and are usually the first to identify and remove easily accessible graffiti. We schedule lift equipment and maintenance crews to remove graffiti in difficult locations. We expect traffic signs, barrier walls, and retaining walls to be common targets. Graffiti removal and abatement procedures include:

- **Spot Detergent Cleaning:** Graffiti is removed on non-penetrating surfaces with household detergents and water when possible.
- **Solvent Cleaning:** Mild solvents and commercial cleaners are used for stubborn graffiti on surfaces such as traffic signs and galvanized metal. Mitigation efforts are used to ensure these cleaners do not enter the storm water drainage system.
- **Anti-Graffiti Coatings:** For repeated graffiti in difficult locations, a bonding material with non-volatile anti-graffiti coating is applied to the surface. Appropriately selected products are from the Department's qualified products list.
- **Murals:** The murals and local art throughout the Project cannot rely solely on repainting as the primary solution. A lifecycle analysis for the specific asset is conducted to determine the appropriate application and product selection for anti-graffiti coating.

## 9.14. Incident Response

Incident response activities include:

- Responding to incidents and assisting in traffic control, clean up and repair of damaged assets.
- Oversee and manage the mitigation and clean-up of hazardous spills on the roadway.
- Evaluate damage to roadway and bridge assets that have been damaged in incident.

The incident responses follow the processes and procedures defined in the Incident Response Plan. Evaluation of damage to roadway and bridge assets is described earlier under the Structures Subsection of this Section of the MMP. Activities involved in the incident response and hazardous spills clean-up are described in the Incident Response Plan of the OMP and in the Emergency Management Plan.

## 9.15. Maintenance Yard

Maintenance yard work activities include:

- **Cleaning the yard of unwanted debris and equipment:** Maintenance crews are assigned to periodically patrol and clean the grounds within the yard of any trash, unwanted left-over materials, and other debris. This material is hauled to a waste center.
- **Organizing spare parts and stored materials:** Maintenance crews are tasked with organizing spare parts and other stored materials with the yard and storage building and taking a periodic inventory to reconcile counts with inventory values in the JAMMS.
- **Inspecting for any environmental contamination:** Inspections are performed periodically to determine if there is any environmental contamination from items such as herbicides, leaking batteries or other containers used for storing hazardous materials.

## 9.16. Snow and Ice Removal

Activities required to perform snow and ice removal are detailed in the Snow and Ice Control Plan that forms part of the Operations Management Plan.

## 9.17. Courtesy Patrol

Courtesy Patrol operations and activities are detailed in the Courtesy Patrol Service Plan which is a subplan of the Operations Management Plan. Also, activities dealing with incident management are found in the Incident Management Plan which is Part of this MMP.

## 9.18. Sweeping and Cleaning

Mechanical sweeping methods are effective for clearing dirt, debris, and sediment to remove these impurities that are adjacent to drainage systems. Vacuum sweeping focuses on areas bordering bridges, barrier walls, abutment walls, and shoulder/valley gutters. The sweeping operation also helps maintain a professional appearance for the Project.

Mechanical sweeping is routine and uses mobile operations. A vacuum mechanical sweeper truck(s) leads the mobile operation. Truck Mounted Attenuator (TMA) units follow the mechanical sweeper(s) at prescribed distances. Warning arrow boards are at the rear of the operation to alert nearby traffic.

### 9.18.1. Curb Edging and Sweeping

Edging and sweeping curb and gutter structures help prevent excessive siltation, debris, and vegetation from entering the stormwater system. Manual weed-eaters and blowers can be very effective for this. Most of these systems are located and connected to slope drains near exit and entrance ramps.

- **Manual Ingress/Egress Clean-outs:** O&M in-house crews perform routine preventive maintenance such as manually cleaning debris, vegetation, sedimentation, and other accumulations from the inlet and outlets of drainage structures. Often, these simple manual methods are sufficient to allow the drainage system to flow as intended.

## 9.19. Cover

The Tunnel Systems Preventive Maintenance and Inspection Plan provided as an Exhibit I to this MMP summarizes the preventive maintenance and cyclic inspections associated with the cover/tunnel systems.



Details of associated inspection and maintenance activities are provided as separate documents in the tunnel systems O&M/User/Reference Manuals.

- **Pump Station:** CTMC Operators will monitor pump station status using DYNAC. Those statuses include:
  - Pump running status.
  - Well water levels.
  - Intrusion Alarms
  - Camera

Notifications of the status changes will be sent out following Jorgensen Alarm Response Document saved in the Client Shared Point (RJA Alarm Summary).

Included in this alarm summary list is “Lead Pump 1\* start” with RJA’s response listed as mobilizing adequate personnel to the pump station. The cyclic inspections associated with the pump stations are included in Exhibit I.

In case of a flash flood warning as predicted by National Weather Service, RJA will mobilize an on-call person to monitor pump station: physical pump status and wet wells level at periodic intervals.

## 9.20. ITS and ETCS Equipment

The roadway and bridge O&M function is not responsible for ITS and ETCS equipment and therefore does not perform maintenance on these systems. However, the civil infrastructure part of the systems will be maintained as per the requirement of Schedule 11. For information and details regarding the operation and maintenance of this equipment, see the respective Plans for those functions.

Annual Report per the Project Agreement as outlined in Schedule 11, Section 13.2.1, and submitted every year provides the schedule for the Annual Maintenance Plan.

## 10. Denver Water Utilities

KMP is not responsible for maintenance of the waterline running parallel to Columbine St but is responsible for the maintenance of the waterline’s hangars and support hardware. KMP will provide traffic control which may require two nights of closures and inspections for each directional bore (anticipated duration for the removal and installation of fireboard at the waterline, inspection time, time for MOT setup and teardown for permitted multi-lane closures in both bores, and other operational considerations). These inspections occur at NBI-required frequencies while the Columbine St structure is a bridge or part of the cover, and KMP will communicate associated inspection or maintenance schedules with Denver Water to allow the utility owner an opportunity to perform their own inspections during these scheduled closures. KMP’s inspection reports or maintenance logs will note whether Denver Water participated in the utilities’ inspection at the available time. KMP will provide the Denver Water Inspector a man-lift or similar equipment and lighting to facilitate the water line inspection. Developer shall provide traffic control on I-70 for any repairs of the Columbine waterline, as necessary. DWD shall provide traffic control on top of the Cover superstructure for any repairs of the Columbine waterline, as necessary.

The inspection program provides essential feedback for KMP’s Annual Routine Maintenance Schedule and Annual Renewal Work Schedule. The inspections identify the nature and scope of the needs, and the Schedules provide the formal mechanism to accomplish the work. The following provides an example of the feedback based on our bridge inspection program.

**Process:** Bridge maintenance is an essential element for extending the service life of structures. Maintenance and preservation activities assist in protecting the structural and operational performance of bridge structures and in minimizing future repair costs.

Each bridge will be inspected at least once every two years as required by FHWA. Bridge inspectors enter the bridge inspection findings and recommendations into JAMMS.

The bridge inspectors recommend maintenance and preservation/renewal activities for each bridge. The activities are prioritized as high, medium, or low and are classified as routine maintenance, signing, safety features or preservation/renewal activities, as described in the following:

- **Routine Maintenance:** Prioritized maintenance activities completed by the KMP maintenance staff every spring and fall. Routine maintenance is performed semi-annually, so bridge inspectors only recommend routine maintenance items that need attention.
- **Signing:** Indicates inadequate or misplaced signage on the structure, such as object markers, load posting signs or vertical clearance signs, to be replaced by the KMP maintenance staff.
- **Safety Features:** Indicates issues regarding transition elements, approach guardrail, attenuation, parapets, and any other safety items to be addressed by the KMP maintenance staff.
- **Preservation:** Bridge needs outside of the scope of routine/responsive maintenance. The needs are addressed in the Renewal Work Program.

Examples of routine bridge maintenance activities include the following:

- Remove debris from drains.
- Remove debris from around bearings.
- Sweep deck.
- Remove weeds and seal slope protection joints.
- Overlay approach slab settlement.
- Patch structural potholes
- Remove debris from expansion joints.
- Seal relief/backwall joints
- Remove large vegetation debris and vegetation growth from channel.
- Remove debris from culvert barrels and inlets/outlets.
- Remove loose concrete from structures over traffic lanes.
- Remove graffiti.
- Repair chain link fence

Examples of Preservation and Renewal Work include:

- Apply deck overlay treatment.
- Repair spalls/delamination/potholed areas
- Clean and seal parapets
- Replace deck.

- Replace parapets.
- Repair parapets
- Replace approach slab.
- Replace expansion joints.
- Remove and close expansion joints.
- Repair settlement/ride
- Apply healer/sealer on the deck and parapets.
- Extend drainpipes below superstructure.
- Remove and patch all loose concrete from structures.

For the complete list of O&M Work Activities refer to Appendix D of the OMQMP.

## 11. Approach to Life Cycle Assumptions and Renewal Work During the Operating Period

Appendix G Renewal Work Plan provides KMP's approach to life cycle assumptions and Renewal Work. Included in the Renewal Work Plan is a table detailing the approach that indicates the timing and extent of Renewal Work expenditures throughout the Term. This approach is based on:

- Estimated Useful Life and Residual Life
- Handback Requirements
- Level of Routine Maintenance
- Optimization of costs for Renewal Work

Assumptions are based on the Baseline Asset Condition Report using local knowledge and experience along with elemental review both with designers, specialist consultants, construction, and O&M Contractors. These assumptions take into consideration:

- Design life of each element
- Current wear and tear of New and Existing Infrastructure utilizing the Baseline Asset Condition Report
- Performance level of the asset for the User
- Data collated from at each work stage (Construction and Operations) assessed against the Department's performance requirements.

The result is a comprehensive production of the project specific life cycle analysis.

For greater clarity, KMP estimates the Useful Life of each Element using the replacement cycle based on assumptions including initial cost, projected maintenance cost, reliability, and obsolescence. We analyzed the design and predicted performance for each element is analyzed and the replacement model is populated with design inputs and assumptions and compared using baseline, aggressive, and conservative alternatives where applicable. Design and performance requirements from the Schedule, traffic predictions, pavement design inputs, and multiple replacement strategies are also included in the analysis. The result was an estimate for replacement life for the life cycle cost analysis.

An example of this analysis is provide using pavement:

- Analyze pavement functional and structural performance using Pavement-ME software.
- Results from the analysis are used to predict pavement replacement requirements for each combination of initial construction alternative and intervention strategies.
- Ride quality (IRI) is emphasized because it is anticipated to be a key renewal work requirements during the Operating Period.

During the Operating Period, KMP will be actively monitoring the assets through daily patrols, weekly maintenance reporting and specialist consultant annual engineering reviews. We will use the predicted Useful Life as a guide for scheduling inspections to determine actual replacement needs based on performance requirements. KMP uses experienced staff to look at each element of the asset and create renewal schedules to prevent performance reductions. Elements are monitored, and conditions reported to confirm better performance or highlight reduced performance. With this condition assessment information, KMP adjusts the life cycle (renewal) schedule. The same process occurs each year to ensure the Handback process meets the Department's requirements.

The Renewal Work Schedule will guide Renewal Work, and we will update it annually. We will also submit a written report of the preceding calendar year's Renewal Work on Renewal Work Schedule Elements. The report will describe each Element by location, work performed, dates work started and ended, and the total cost of all Renewal Work performed.

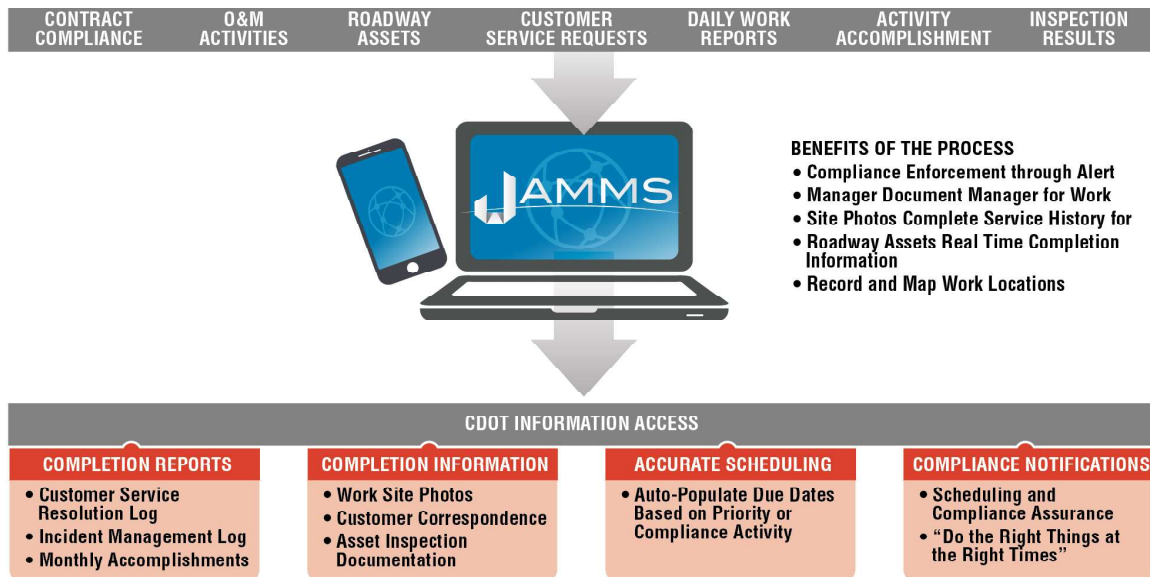
## 12. Procedure for Record Keeping According to Developer's OMQMP

Document management is critical to controlling information and ensuring compliance with maintenance requirements. The Maintenance Management and Information System (JAMMS) is used to inventory, track, and record maintenance and inspection work for the O&M portions of the Project. JAMMS is used to:

- Manage required O&M assets including inventory, inspection, and condition assessment.
- Track all O&M maintenance work and operational activities.
- Use the Department's maintenance codes to track O&M costs, compliance, equipment and material inventory levels, quality management, scheduling, and reporting.
- Store all data relative to Customer Service Requests.
- Track resources used on Project work activities.
- Store technical information about assets and maintenance repair techniques.

JAMMS includes real-time tracking of O&M data through a mobile device application. Figure 12 below depicts the key functions of the system:

Figure 12: JAMMS System Functionality



All required O&M documentation including submittals, reports, inspections, and manuals are stored in JAMMS. They are:

- Legible, readily identifiable, and retrievable.
- Include records of changes to processes and old versions of documents.
- Maintained in accordance with the information and procedures within the Schedules.

### 13. Document Management Procedures

Prior to NTP-2 JAMMS was populated with the following information:

- Department maintenance activity codes to identify and describe work activities and the measurement units for the code
- Roadway segments by roadway identification code and route name
- Equipment, materials, and personnel

By the end of the Construction Period JAMMS will contain over three years' worth of data on maintenance work and operational activities. This information can be used to evaluate procedures and processes to improve maintenance and operational planning, work methods, and scheduling moving into the Operating Period.

When the post-operating period commences, the following document management procedures will be implemented:

- **Identify and Record Source in JAMMS:** Occurs immediately.
- **Define Priority Level:** This automatically associates schedule priority metrics to the Work action and occurs when the request information is entered into JAMMS.
- **Schedule Work:** Based on the priority level of the request and the Schedule requirements for response time.

- **Issue Work:** Issue a Work Order to crews using appropriate Department codes.
- **Work Documentation:** Record completed work volumes, times, locations, and resources real-time through a mobile application immediately following completion.
- **Quality Review:** If applicable, complete additional quality checks of completed work to verify compliance and quality. Reviewers can use the mobile application for these reviews.
- **Customer Contact:** When applicable, issue a prompt call back for customer requests.

All records and user actions in JAMMS are automatically time stamped. Work records cannot be deleted from the system and are available to those who have various levels of permission to access the system. Any transmittals to and from the Department will be carried out via Aconex.

## 14. Procedure for Tracking O&M Defects, Performance Compliance and Corrections

The Project MMIS (JAMMS) provides the capability for documenting and tracking O&M defects and noncompliance events and reporting information related to defects recorded by maintenance staff, including monitoring of repair status and due dates to meet cure period requirements, and achieved response and completion times. KMP will utilize JAMMS to monitor O&M defects, noncompliance events and non-permitted lane closures, including classifying remedies as temporary or permanent. The classification of a remedy as temporary or permanent will be included in the notification provided to the Department as that condition will have a bearing on whether it is considered a CAT 1 or CAT 2 condition.

The Monthly O&M Report to the Department will contain a summary of O&M existing and unresolved noncompliance events and non-permitted lane closures, including details of each occurrence and planned efforts to mitigate or resolve each issue. Items specific to O&M are included in this report such as commencement time, duration, and details of the cure actions.

Additional information and details for tracking O&M activities relative to defects, performance compliance and corrections are provided in Subsections 5.2.1.i and 5.2.1.j of this MMP and more specifically in the OMQMP, Appendix D of this document.

## 15. Procedure for Maintaining Spare Parts and Material Inventory Levels

The availability of various types of construction materials and spare parts is essential for providing an effective and efficient response to O&M work requirements. During the Construction Period the types of materials and spare parts were determined based on the anticipated maintenance requirements from the baseline condition inspection, asset inventory and O&M responsibilities in relation to the construction program. A plan was developed to estimate, and the manager required materials and spare parts for the Construction Period. This plan will continue into the Operating Period.

The O&M Contractor will continue to use its JAMMS MMIS to document and manage spare parts and materials items that are stored in the maintenance compound at Havana Street. It is the primary data-tracking tool for materials usage and inventory levels. The system documents component description, inventory level requirements, supplier source, history of usage and location. RJA does the count of

inventory periodically. Additionally, Client Access SharePoint has the Cover Systems Spare Part List and other elements spare list.

## 15.1. Materials/Spare Part Categories and Levels

There are four basic categories of materials and spare parts that will be stored and managed for use with O &M maintenance activities during the Operating Period. They are as follows:

- **Bulk Materials:** This includes both solid and liquid materials used maintenance work activities (e.g., stone, dirt, sand, oil dry) and those used specifically for snow and ice control (e.g., anti-icing products, sodium chloride[liquid])
- **Road and bridge assets spare parts and components:** Roadway and bridge assets such as guardrails, attenuators, railing, signs, and other assets require numerous parts to be available to replace broken and damaged assets.
- **Cover Systems Spare Parts:** Operational readiness of the Cover EMP systems is critical to uninterrupted traffic flow through the Cover. This required stocking of several spare parts deemed critical their continuous operation. These spare parts will be stored in a warehouse, specifically constructed for this purpose. (Currently parts that have already been procured by the Construction Contractor are being stored in an off-site warehouse)
- **Equipment Spare Parts:** These items are required for repair and replacement of parts on O&M equipment used on the project (e.g., trucks, loaders, trailers, portable message boards)

## 15.2. Spare Parts Reporting Metrics

Some inventory levels (such as Cover spare parts) are dictated by PA requirements, others are at the discretion of the Developer. For minimum levels of items not specified in the PA, the O&M contractor, in consultation with the Developer and the Department will set inventory levels based on experience and usage metrics accumulated over several years of experience on the Project.

During the Construction Period materials suppliers are identified and placed under subcontract to supply various items, bulk materials, and components. Most of the suppliers have proven reliable in terms of quality and delivery of their products. The O&M Contractor continues to reevaluate inventory needs and identify additional suppliers that can provide the service and products that meet Project requirements. O&M staff are supported in this effort through the ability to access data stored in JAMMS as well as rely on several national accounts established by the O&M Contractor.

- **Materials Suppliers:** Qualified suppliers, contact information, available services and/or products, product costs.
- **Materials Inventory:** Descriptions, numeric designations, inventory levels, re-order points, expected lead times, costs, and suppliers.
- **Usage History:** Usage history across variable time frames, individual assets, asset elements, whole system assets, and by O&M crew type and/or Work performed.

## 15.3. Qualified Products List

The PA requires that products used on the Project be approved by the Department. This ensures use of materials and parts that meet certain specifications and other conditions necessary to withstand use in the highway environment.

- Items that have been preapproved by the Department and that are on their Qualified Produces List

- Items that are not on the QPL require approval for use through defined procedure that includes documentation, testing and application of other standards.

## 16. Description of MMIS and It’s Functionality

The Jorgensen Asset Maintenance Management System (JAMMS) is an MMIS that helps optimize roadway management with comprehensive online database tools. JAMMS is a proven system – it is currently used more than 40 operations and maintenance (O&M) contracts in the US and Puerto Rico and Kenya. JAMMS helps maximize production through a proactive maintenance approach, allowing O&M managers to control all aspects of roadway maintenance including schedules, work status, asset service history, and inspection service details. Work completion documentation and photographs provide transparency and actionable information. Parts of the JAMMS have already been described in previous subsections of this MMP. They include Subsections 5.2.1 h, i, and m. A summary of the overall functionality of the System is as follows:

JAMMS is used to:

- Program, schedule, manage, and report all aspects of O&M Work.
- Receive automated work activity alerts.
- Make quick and informed decisions by looking at specific data and documentation.
- Access and update weekly Work Orders, annual Work Plans, work status, completion documentation, inspection details, and asset service history by using text, photos, and GPS data in real-time using mobile devices.
- Provide ongoing, detailed communication among O&M staff and other stakeholders for efficiency and transparency.

JAMMS features include:

- Definition and customization of project parameters and data capture and storage.
- Detailed reports based on filtering data on operations, management, schedules, finances, training, assets, and resources.
- Customization of user access and privileges.
- Daily management of all aspects of the O&M activities.
- Ability to customize settings and notifications.

### 16.1. Alerts

JAMMS includes a customizable alert system to automatically send emails to designated managers and supervisors to alert them of pending obligations. The alert system is used to ensure compliance with contractual response times and the expectations of our clients. Alerts can be triggered by several key JAMMS events, including but not limited to:

- New priority 1 service requests
- Work order status changes
- Compliance activities with deadlines
- One-day turnaround work orders
- Low inventory levels



## 16.2. Document Manager

JAMMS can attach all O&M documentation and photographs to easily prepare work completion information for asset inspections, incident management, and O&M activities.

## 16.3. Quality Management

Service Requests are central to the features of JAMMS. After entering a Service Requests, the user can create appropriate Work Orders, and make assignments to in-house staff or Subcontractors. The system handles many quality management functions, including:

- Documentation of maintenance work and operational activities
- Documentation of Customer Service Requests
- Provision of QC and QA requirements and documentation of inspection activities
- Compiling noncompliance information and summarizing compliance information
- Documentation of work accomplishments
- Documentation and compilation of Accident Summary Reports
- Provision of Incident Management logs and reports

## 16.4. JAMMS Asset Manager

All O&M assets receive a unique asset ID. The system then tracks GPS locations, maps, photographs, service life data, inspection data, cost details, and repairs for each asset ID. With this data, the system assembles actionable reports on stock levels, reorder quantities and dates, and service life milestones.

For vehicles and equipment, the system can also track and present data on usage hours, rental rates, operational costs, mileage, fuel use, and repair and maintenance needs.

## 16.5. JAMMS Ad Hoc Reporting

JAMMS includes report templates for performance-based asset maintenance work and can also create custom reports. Standard JAMMS reports include:

- **Client:** Project progress and compliance for Aconex reporting
- **Operation:** Tracking and reviewing work
- **Management:** Project management details to aid operational decisions
- **Asset Management:** Service history and cost summary by individual asset
- **Invoicing:** Invoice and service history details
- **Financial:** Budget tracking data
- **Timesheets:** Personnel times and activities on a daily basis
- **Training:** Tracking of personnel training received and certifications
- **HCM:** Personnel data

## 16.6. Monthly and Yearly Reports

The monthly O&M work report is a detailed derivation of our annual plan and includes data on the previous month's completed maintenance work and plans for the next month. JAMMS maintains these reports real-time and uses the Department's maintenance activity definitions and location descriptions

(including GPS coordinates). We develop the estimated monthly work schedules before the beginning of the operational year. We consider O&M needs, growing seasons, travel seasons, and specific customer needs when planning the work program. Key components of these reports include:

- Customer Service Logs
- Environmental Management System data
- Incident Management Logs
- Risk management and risk registers, outlining possible risks to O&M activity completion and risk mitigation measures.
- Summary of inventory and materials used.
- Open work orders 'on hold for materials and associated costs
- Performance based on scope of services to evaluate requirements vs. performance.
- Work order details and cost report
- Asset service history
- Training activities including safety, MOT, herbicide, equipment operation training, provided on a six-month basis.
- Compliance activity report
- Quality Control summary
- Financial Year Reconciliation - budget and variances on both monthly and O&M work-to-date basis.

## 17. Transition of Maintenance Activities from the Department/Local Agency to Developer

The transition of maintenance activities from the Department/local agencies to KMP took place during the period between NTP1 and NTP2 at the beginning of the Construction Period. The Developer has now been performing the O&M activities during the Construction Period for over three years. At Substantial Completion, activities will now transition from O&M during construction to O&M activities during the Operating Period. Activities to prepare for this transition are like those during the initial Project implementation except that is within the overall control of the Developer. The activities include:

- Prepare Plans for Operating Period and other necessary documentation prior to Substantial Completion.
- Perform inspection of completed construction.
- Establish O&M Limits after construction completion.
- Set O&M Performance Requirements for Operating Period Year 1
- Revise protocols and procedures with external agencies to ensure effective communication and coordination for operations activities such as emergency response, fire/life safety activities and local government functions.

These efforts will begin 180 days before Substantial Completion and should be completed by that date.

## 18. Maintenance and Service Manuals

In addition to this MMP and the other Project Plans, there are service and repair manuals and other documentation required for specific elements of the Project. Specifically, the Cover and ITS systems require extensive documentation needed to operate and trouble shoot components with these systems.

During the Construction Period this information has been gathered and cataloged. These documents will be included as part of the maintenance of the specific elements attached to specific Service Requests. The functional areas where documentation is required include:

- Cover (electrical, mechanical, and plumbing systems.)
- ITS, (Cameras, DMS boards, etc.)
- Cover Fire Suppression System
- Guard rail and attenuator systems
- Heavy equipment repair and operations
- Systems software (for Cover systems)

All documents are available for element service activities and include preventive maintenance schedules (Exhibit I), testing and diagnostic procedures, trouble-shooting techniques, suggested corrective measures, the location and availability of support services, point to point component wiring schematics and logic signal flows, and assembly and disassembly drawings, including exploded view drawings (Client Access SharePoint).

## 19. Description of all Elements and Inventory Facilities, Systems, and Equipment Maintained

KMP has the responsibility for performing O&M Work on the roadway assets within the O&M Limits After Construction per PA Schedule 11. An initial inventory was performed during the early phase of the Construction Period. The inventory process involved field counts of various assets during the Baseline Asset Condition assessment as well as take-offs from as-built drawings provided by the Department. While construction took place during the past three years, the inventory was updated annually to reflect assets added during the construction. The asset inventory serves as the basis for the calculations for the projected annual O&M Work Program. This inventory is provided in the previous Annual Work Plan included with the 2021 version of the MMP. It contains estimated values for 63 individual physical assets found within the Project O&M Limits.

For the Operating Period a review of this inventory will be carried out during the 90-day period prior to Substantial Completion to update the values and identify any additional assets that may have been added during the final phase of the construction effort. The inventory data will be stored in JAMMS and included in the Year 1 Annual Work Plan for the Operating Period. Additionally, these data can be accessed from Client Access SharePoint. Elements are categorized into routine, preventive, and operational maintenance. For example, is an operational activity way markings categories are routine and preventive maintenance; Incident Response and Snow and Ice control are operational activities. Typically, routine, and preventive maintenance inventories are quantified units based on the system design, age, and condition. Operational activities need estimates of quantities, resources, and the number of operational events per unit of time. The level of maintenance and summary of maintenance work is identified in Subsection 5.2.2.a, EXAMPLE MONTHLY ROUTINE MAINTENANCE SCHEDULE and Subsection 5.5.2.b EXAMPLE ANNUAL ROUTINE MAINTENANCE SCHEDULE.

All elements are subdivided into routine and preventive maintenance categories with specific performance measures based on the assets within that element. Unplanned activities within maintenance services are anticipated based on local experience and prevailing conditions within the Project O&M limits. The values for these activities are dynamic and updated whenever there is a change to the asset

inventory, O&M limits or operating procedures that require responsibility on the part of the O&M Contractor.

## 20. List of Maintained Element’s Major System and the Equipment Manufactures/Vendors

A table of the major systems within specific Elements is under development during the construction of the south bore of the Cover and will be available prior to substantial completion. System identification is further divided into major components that need special attention and oversight. Therefore, there is a need to provide information on the manufacturers, suppliers, and vendors for these components to be able to contact or communicate with them in case of problems with a component or complete system. A template for this can be found in Table 13 provided below.

Table 13: Major Systems with Specific Elements

Equipment	Mfg/Vendor	Contact Name	Address	Phone Number(s)	Website Address	e-mail Address
<b>Ventilation Fans</b>	Fan Mfg Name	Name	Address	(555) 555-5555	www.FanMfgName.com	Name@FanMfgName.com
<b>Fire Detection and Alarm System</b>	FDAS Vendor Name	Name	Address	(555) 555-5555	www.FDASMfgName.com	Name@FDASMfgName.com

## 21. List of Unplanned but Anticipated Maintenance Services for All Road Elements

Unexpected events that result in a need for maintenance repairs are inevitable, are anticipated and procedures/protocols are documented about the application of specific work activities to mitigate these unplanned events. The types of events that are anticipated are described below:

- Traffic Accidents:** Vehicular accidents, especially those involving heavy vehicles, can cause significant damage to a wide variety of highway assets (e.g., guardrail, crash cushions, traffic signs, pavements, pier supports). In some cases, a rapid repair response is essential to the safety of the traveling public and to the mobility of the traffic service. For example, if an accident destroys a significant portion of a guardrail run, the roadside barrier will not be able to sustain a second impact without repair. In addition to safety, timely repair avoids liability exposure.
- Natural Disasters:** Including floods, tornados, and more. Every element of the highway facility can be at risk of damage, and some lengthy segments of the facility may become unusable.
- Geotechnical Events:** The structural soundness of the highway facility is only as good as the materials providing support. Roadway embankments, pavement subgrades, and bridge piers/abutments, all depend on the geotechnical stability of the underlying foundation. Compounding the consequences of a geotechnical failure is the lack of warning inherent to these failures. A frequently reported national news item, for example, is the sudden development of a sink hole that develops beneath the pavement.

- **Asset Rapid Deterioration:** Every highway asset has a service life and will fail at some point. KMP designed our asset management strategy to detect impending failure and proactively correct the problem. We are prepared to react quickly to the unexpected failure of an asset.
- **Haz/Mat Incidents:** These incidents are unique and initial response can be complex, however we are prepared to respond rapidly. The incident responses follow the processes and procedures defined in the Incident Response Plan, Appendix B of OMP.
- **Human Activity:** The most obvious example is vandalism (e.g., damage to the right-of-way fencing). Less likely, for example, would be the use of explosive devices. See Appendix B of OMP for details.

Examples of necessary maintenance work resulting from these events may include Guardrail replacement, sign replacement, pavement repairs, concrete repair, pavement marking installation, earthwork repairs, fence repair, Erosion repair, drainage structure clean out, turf re-establishment, re-stabilization of concrete structures.

## 22. Repair Procedures for Repairs that are Anticipated

The approach to executing the required maintenance repair work includes the use of the maintenance management system (JAMMS), self-monitoring, quality control and quality assurance program, and structured management reviews. Appendix B, OMQMP describes the QC and QA process and the use of JAMMS to support this process.

O&M technical and management plans address the complexities of the repair strategies depending on Project design. Relying on operational history from many projects, new repair strategies based on lessons learned.

Specifically, for routine maintenance repairs, (which means they are known to be required and therefore planned) JAMMS tracks repair needs by specific roadway location and develops work programs tailored to these specific location deficiencies. These are systematically evaluated against past maintenance repair methods and operational work plans, gauging their results, providing the ability to make changes to the repair techniques for improved future performance. If the repair requires a detailed procedure this will be included as part of the Work Order stored in JAMMS.

KMP uses repair procedures based on CDOT Manual of Maintenance Procedure and CDOT Plant Maintenance Field Manual (2017). These procedures are subject to change based on new technology that addresses the use of more modern materials and equipment.

## 23. O&M Activities necessary to Comply with other Schedules

The requirements for O&M work activities to comply with the Project Agreement Schedules include:

- Schedule 17, Environmental Requirements
- Schedule 10, Section 8, Drainage
- Schedule 10, Section 14, Landscaping & Aesthetics
- Schedule 10, Design and Construction Requirements

The processes and procedures detailed in this MMP, its subplans and other referenced documents are consistent with the activities, processes, and procedures described in the other project plans that address the requirements of the Schedules referenced above. In most cases the O&M activities developed to perform the work requirements for the elements and assets identified in this MMP considering the requirements of these other Schedules.

## 24. Inspection Plan and Inspection Forms

The Baseline Asset Condition Inspection Plan included inspection forms and checklists utilized to document the condition of existing and new assets. Additionally, the OMQMP includes the QC and QA checklists used for quality management activities. Specific forms and checklists associated with the NBIS bridge inspection program are nationally used and well documented. Copies of all forms and checklists are stored in JAMMS and are available for review at any time. Daily Patrol checklist is available in the Client Access SharePoint.

## 25. How Best Management Practices will be Applied

Application of best management practices involves the continuous review and analysis of general industry practices, applied research, and use of new technology to solve problems of performance effectiveness and efficiency in the transportation O&M industry. The O&M Contractor has numerous projects throughout the USA and overseas where specifications and performance requirements vary. The process of technology assessment allows for Contractor staff to investigate new and improved management techniques and technical practice to provide continuous improvement of the O&M function of the C70 Project.

Once an idea or process is selected for application on the Project, the O&M Manager will provide the Department with information, in the form of a summary proposal for review and approval to move forward with the process. The information will be communicated via Aconex. Functional areas where these activities present themselves include use of new materials (not currently on the QPL); approach to snow and ice removal using alternate techniques and materials; use of new equipment (such as drones) to perform various types of inspections.

The best management practices also include training or educating employees of the new Cover management practices that is being carried out in different projects. Periodically, employees are sent to trainings, conferences and any other such programs to learn new techniques and ideas. Management Practice is always evolving; such training helps to adhere to the ongoing trends and provide the best product and services to the client.

## 26. Schedules and Associated Plans for Routine Maintenance and Renewal Work

Schedules for O&M work plans and schedules are developed by the O&M staff in collaboration with the O&M Contractor's corporate leadership and support staff. They are designed to provide information about the level of work required to maintain each asset at the expected and specified level of service. These plans depend on the Project Performance Requirements applied to each Element and each asset associated with that Element; the inventory of assets and the resources available to perform the work. The resulting plans are provided for specific time periods as required by the PA as well as practical

application of the maintenance management process. The following subsections provide a description of the required plans and schedules that address the implementation of maintenance and renewal activities over time.

### 26.1. Example Monthly Routine Maintenance Schedule

The monthly routine maintenance schedule is taken from the Annual Maintenance Work Plan, which is addressed in in the next subsection (5.2.2.b).The monthly schedule provides the anticipated monthly routine maintenance activities for a three-month rolling period, A more detailed schedule showing anticipated timing, durations, frequency of tasks, and traffic management arrangements and reporting requirements is developed to manage and supervise work activities is also prepared based on current inspections, condition assessments, and observations of local condition at that point in time. The schedule is subject to change as the condition of the network changes. Additionally, revisions to the inventory levels will be finalized as design and construction work is completed. The inventory list is available in the Client Access SharePoint. An example of a monthly schedule is provided in Appendix H-a.

**Note:** Specific routine maintenance schedules for the Cover systems are provided in the Cover Maintenance Management Plan (Exhibit I).

### 26.2. Example Annual Routine Maintenance Schedule

On multiyear projects with large inventories and varying levels of maintenance and operations requirements, Annual Work Programs and Budgets are developed along with preliminary work schedules for all routine or planned maintenance and operations. This strategy is a requirement for the C 70 Project and requires that information be included as to type of O&M work performed, anticipated timing, durations, frequency of each task, resources required, traffic management requirements, and documentation.

An Annual Routine Maintenance Plan and Schedule is being developed for Year 1 of the Operating Period. This plan will be available as an appendix to this MMP after it has been completed and approved by the O&M Contractor's Executive Leadership. The Annual Routine Maintenance Plan and Schedule will be placed in Appendix H.b of this MMP 90 days prior to Project Substantial Completion.

**Note:** Specific routine maintenance schedules for the Cover systems are provided in the Cover Maintenance Management Plan (Exhibit I).

### 26.3. Example Annual Renewal Work Schedule

The Renewal Work Schedule is included as Appendix, H Renewal Work Plan. It will be prepared and submitted to the Department for Acceptance no later than 90 Calendar Days before the Substantial Completion date for Year 1 of the Operating Period and 60 Days before the end of each subsequent year of the Operating Period. The Renewal Work Schedule for the following year is consistent with the Five-Year Renewal Work Schedule and will be based on the asset condition, the applicable General Requirements, and the work necessary to meet or exceed the applicable Targets.

## 26.4. Example Five-Year Renewal Work Schedule

The Five-Year Renewal Work Schedule is part of the Annual Renewal Work Plan and is submitted together with Annual Renewal Work Schedule. The Five-Year Schedule will include:

- The estimated Residual Life of each Residual Element and the proposed strategy and activities that will be carried out to meet the Handback Requirements
- The performance of the Renewal Elements, including any instances where a Renewal Element has not achieved its originally intended Useful Life
- A description of any Routine Maintenance required to ensure that each Element of the Project continues to comply with the applicable General Requirements and meet or exceed the applicable Targets.
- A description of the type of Renewal Work anticipated to be performed at the end of the Element's Residual Life
- A schedule of anticipated planned maintenance needed to perform the Renewal Work including the nature, timing, and duration of any associated Closures.

The Five-Year Renewal Work Schedule be included with the Final Renewal Work Plan after review and discussion and acceptance by the Department.

## 27. Updated O&M Performance Requirements for the Operating Period

The current version of the O&M Performance Requirements is included as Appendix I of the 2021 MMP. This version is under review by the Developer and will be discussed with the Department. Any revisions or modifications to the current 2021 version will be included in the 2022 version and attached to this MMP at least 90 days before Substantial Completion. It will be provided as Appendix I of the MMP.

## 28. Current Accepted Actual Useful Life for Each Renewal Element

The actual Useful Life of each Renewal Element will be consistent with the Baseline Requirements Table and the Renewal Work Plan. Updates to the Useful Life Baseline Requirements Table will be submitted for acceptance no later than 90 Calendar Days before the Substantial Completion date and 60 days before the anniversary date of each contract year. Updates will reflect Good Industry Practice and specific attributes of the final plan set. See Appendix G for more details on the Renewal Plan.



## 29. Schedule of Appendices

- A. Safety Plan
- B. Quality Management Plan
- C. O&M Limits After Construction Drawing
- D. Contact Lists
- E. Baseline Asset Condition Report
- F. List of Structures Requiring Inspection and Maintenance
- G. Renewal Work Plan and Schedule
- H. Monthly and Annual Work Plan and Schedule
- I. O&M Performance Requirements

Exhibit I – Cover Maintenance Management Plan

Exhibit II – Lane Closure Procedure

Exhibit III – Landscape Management Plan

Exhibit IIII – ITM

Exhibit V – RJA Alarm Summary

Exhibit VI – Cover Spare Parts List

Exhibit VII – ISO 27001

Exhibit I - Cover Maintenance Management Plan  
Attachment 1, Appendix A-1-18 Cover Maintenance Management Plan

Tunnel Systems Preventive Maintenance and Inspection Plan																			
ID#	Cover MEP System	Ref Manual	Element/Component	Task	Daily	Weekly	Monthly	Every 2 Months	Quarterly	Semi-Annually	Yearly	Every 2 Years	Every 3 Years	Every 5 Years	Every 6 Years	Every 15 Years	Every 20 Years		
C01	CCMS	SCADA Head End OM Manual	Dell EMC PowerEdge Servers - Storage and RAID subsystems	Update drivers and firmware on controllers, hard drives, backplanes and other devices. Perform routine Check Consistency operations Inspect cabling for signs of wear and damage and ensure good connections. Review logs for indications of problems. "The inspection prevents operational interruptions and machine breakdowns. The measure to increase performance and pump efficiency are decided for each application. They can include such things as impeller trimming, wear part control and replacement, control of zinc anodes and control of the stator."			X												
D01	Drainage	Non Clog Centrifugal Pumps O&M Manual - C70-KIE-PUM-MAN-000001	Small Pumps	"The overhaul lengthens the operating lifetime of the product. It includes the replacement of key components and the measures that are taken during an inspection."									X						
D02	Drainage	Non Clog Centrifugal Pumps O&M Manual - C70-KIE-PUM-MAN-000001	Small Pumps	"The inspection prevents operational interruptions and machine breakdowns. The measure to increase performance and pump efficiency are decided for each application. They can include such things as impeller trimming, wear part control and replacement, control of zinc anodes and control of the stator."													X		
D03	Drainage	Non Clog Centrifugal Pumps O&M Manual - C70-KIE-PUM-MAN-000001	Medium Pumps	"The overhaul lengthens the operating lifetime of the product. It includes the replacement of key components and the measures that are taken during an inspection."										X					
D04	Drainage	Non Clog Centrifugal Pumps O&M Manual - C70-KIE-PUM-MAN-000001	Medium Pumps	"The inspection prevents operational interruptions and machine breakdowns. The measure to increase performance and pump efficiency are decided for each application. They can include such things as impeller trimming, wear part control and replacement, control of zinc anodes and control of the stator."													X		
D05	Drainage	Non Clog Centrifugal Pumps O&M Manual - C70-KIE-PUM-MAN-000001	Large Pumps	To secure a long operating lifetime for the product. It includes the replacement of key components and the measures that are taken during an inspection."										X					
D06	Drainage	Non Clog Centrifugal Pumps O&M Manual - C70-KIE-PUM-MAN-000001	Large Pumps	"The overhaul lengthens the operating lifetime of the product. It includes the replacement of key components and the measures that are taken during an inspection."													X		
D07	Drainage	St. Andrews - Standby Power & ATS OM Manual	Diesel Engine Maintenance Schedule	various typical engine checks and services (refer to Table 5-1 Maintenance Schedule). Clean the enclosure. Inspect the transfer switch contacts. Maintain transfer switch lubrication. Check all cable connections & retighten them. Exercising of back-up generators under load where used as essential and Emergency sources, monthly.	X	X	X			X	X	X							
D08	Drainage	St. Andrews - Standby Power & ATS OM Manual	Automatic Transfer Switch	various typical engine checks and services (refer to Table 5-1 Maintenance Schedule). Generator misc services per Installation, Service, and Maintenance Manual (refer to Table 11. Alternator Service Schedule)						X									
D09	Drainage	REF 18.12 of Appendix A-2 (Schedule 11)	Pump Station Back-Up Power Generator	Inspect: Backflow Prevention Assemblies - Reduced pressure, reduced-pressure detectors.			X												
D10	Fire and Life Safety	NFPA 25 - Valves, Valve Components, and Trim (refer to Table 13.1.1.2)	Backflow Preventor	Test: Backflow Prevention Assemblies.		X													
D11	Fire and Life Safety	NFPA 25 - Valves, Valve Components, and Trim (refer to Table 13.1.1.2)	Backflow Preventor	Inspect: Interior backflow prevention assemblies. Inspect: Pumps water level set points; HOA set to Auto at PLC and MCC							X								
D12	Fire and Life Safety	NFPA 25 - Valves, Valve Components, and Trim (refer to Table 13.1.1.2)	Backflow Preventor	Replace air filter (more frequently depending on conditions). Keep UPS free of dust and moisture.				X											
D13	Drainage	CAR 32	Pump Station PLC	Inspect UPS display for voltage outputs for early problem detection. -Examine the interior and exterior of the MCC for moisture, oil, or other foreign material. Eliminate all foreign material and clean the MCC. -clean the interior and exterior of the MCC with a vacuum cleaner. Check the enclosure for damage that might reduce electrical clearances. -Examine the finish of the enclosure. Touch up the paint if necessary. Replace any badly corroded or damaged enclosure parts.							X								
E01	Electrical	Diesel Engine Driven Generator O&M Manual - C70-SECO-SYC-PMP-000007	Diesel Engine Maintenance Schedule	Perform maintenance of bus and incoming line lug connections. (annually, or more frequently if indicated by service conditions and established maintenance policy).	X	X	X				X	X							
E02	Electrical	Diesel Engine Driven Generator O&M Manual - C70-SECO-SYC-PMP-000007	P7 Alternator	Perform maintenance on control units (annually, or more frequently if indicated by service conditions and established maintenance policy).						X	X			X					
E03	Electrical	SECO Cover Systems - Low Voltage Transformer O&M Manual - C70-SECO-SYC-PMP-000001	Dry-Tye Transformers - 1000 Volts and Below	Perform maintenance of the switchboard includes cleaning, lubrication, and exercising component parts. The interval between maintenance checks can vary depending upon the amount of usage and environmental conditions of each installation. The maximum recommended inspection interval is one year."								X							
E04	Electrical	SECO Cover Systems - Uninterruptable Power Supply O&M - C70-SECO-SYC-PMP-000010	Air Filter and Dust Control	"Exercise the operating mechanism at least once a year to ensure proper operation." Periodic cleaning and lubrication of the switch. "Exercise circuit breakers at least once a year..."				X											
E05	Electrical	SECO Cover Systems - Uninterruptable Power Supply O&M - C70-SECO-SYC-PMP-000010	Battery	"Periodically exercise the switch to ensure proper operation. This period should not exceed one year."															
E06	Electrical	SECO Cover Systems - Motor Control Center O&M Manual - C70-SECO-SYC-PMP-000005	Motor Control Center	Level IV Preventive Maintenance (see Table 7 (p. 369) for details but consists of visual inspections and measuring resistance.															
E07	Electrical	SECO Cover Systems - Motor Control Center O&M Manual - C70-SECO-SYC-PMP-000005	Bus	"Inspect the SPD periodically to maintain reliable system performance and continued transient voltage surge suppression."															
E08	Electrical	SECO Cover Systems - Motor Control Center O&M Manual - C70-SECO-SYC-PMP-000005	Control Units	"...Level II preventive maintenance..." (Table 5 (p. 788) consists of visual inspections and operational checks)															
E09	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	QED-2 Switchboards	"...Level III preventive maintenance..." (Table 6 (p. 789) consists of visual inspections and operational checks)															
E10	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Automatic Transfer Switches							X									
E11	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Fusible Switches								X								
E12	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Low-Voltage Power/Insulated Case Circuit Breaker												X				
E13	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Surge Protection Device																
E14	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Circuit Breaker																
E15	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Circuit Breaker										X						

Exhibit I - Cover Maintenance Management Plan  
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Tunnel Systems Preventive Maintenance and Inspection Plan					Daily	Weekly	Monthly	Every 2 Months	Quarterly	Semi-Annually	Yearly	Every 2 Years	Every 3 Years	Every 5 Years	Every 6 Years	Every 15 Years	Every 20 Years
ID#	Cover MEP System	Ref Manual	Element/Component	Task													
E16	Electrical	SECO Cover Systems - Switchboard O&M Manual - C70-SECO-SYC-PMP-000009	Circuit Breaker	Level IV Preventive Maintenance (see Table 7 (p. 790) for details but consists of visual inspections and measuring resistance.										X			
E17	Electrical	SECO Cover Top - Medium Voltage Switch - O&M Manual - C70-SECO-SYC-PMP-000003	Switchgear	Routine Switchgear Testing (REF 18.12 of Appendix A-2) Inspect all exposed surfaces for evidence of tampering, battered metal, gouges, etc. Dents or deformities should be repaired at once. Scratched or weathered paint or protective coatings should be touched up promptly.					X								
E18	Electrical	SECO Cover Systems - Medium Voltage Transformer O&M	Cabinet Exterior	Inspect the terminal compartment interior and all operating equipment. Check all gauges and controls for proper operation. Repair or replace damaged or defective equipment. Inspect drain cocks, plugs, fuse mountings, and switches. Look for evidence of insulating liquid see page around tank-wall gaskets, seals, etc.							X						
E19	Electrical	SECO Cover Systems - Medium Voltage Transformer O&M	Cabinet Interior	Repairs if a severe electrical short circuit has occurred. Test the ground fault protection system (if furnished) in accordance with the manufacturer's instructions.							X						
E20	Electrical	SECO Cover Systems - Panelboards O&M Manual - C70-SECO-SYC-PMP-000002															
E21	Electrical	Motor Control Center O&M C70-SACS-PUM-MAN-000003	Motor Control Center	Inspect to assess serviceability and ensure proper function. "Check for any accumulation of dust or dirt on the terminations or vents. Inspect insulators, terminals, terminal boards for tracking (discharge), breaks, cracks, or burns. Check terminal quality and connections, including taps, for tightness. Inspect ground connections and ground contact surfaces."							X						
E22	Electrical	Pump Station Mini Power Centers C70-SACS-PUM-MAN-000004	transformer	Generator misc services per Installation, Service, and Maintenance Manual (refer to Table 11. Alternator Service Schedule)					X	X							
E24	Electrical	Generator & ATS O&M C70-SACS-PUM-MAN-000001	P7 Alternator	Clean the enclosure: Deenergize all sources, then brush and vacuum away any excessive dust accumulation. Remove moisture with a clean cloth.					X					X			
E25	Electrical	Generator & ATS O&M C70-SACS-PUM-MAN-000001	Automatic Transfer Switches	Inspect the transfer switch contacts. Deenergize all sources, then remove the transfer switch barriers and check the contact condition. Replace contacts when pitted or worn excessively. Reinstall the barriers carefully.							X						
E26	Electrical	Generator & ATS O&M C70-SACS-PUM-MAN-000001	Automatic Transfer Switches	Maintain transfer switch lubrication. Under normal operating conditions no further lubricating is required. Renew factory lubrication if the transfer switch is subjected to severe dust, abnormal operating conditions, or if the TS coil is replaced. Order lubrication kit 920836.							X						
E27	Electrical	Generator & ATS O&M C70-SACS-PUM-MAN-000001	Automatic Transfer Switches	Check all cable connections & retighten them. Torque to values shown on the transfer switch label.							X						
E28	Electrical	Generator & ATS O&M C70-SACS-PUM-MAN-000001	Automatic Transfer Switches	Perform routine inspections, maintenance, and testing after any severe electrical short circuit, ground fault, or environmental event (e.g., flooding) to determine the operational status of the transformer.							X						
E29	Electrical	SECO Cover Systems - Low Voltage Transformer O&M Manual	Dry-Tye Transformers - 1000 Volts and Below	Check all electrical contacts with a calibrated torque wrench. Verify proper spacing. Refer to the manufacturer's specifications for torque values. Check all external hardware for tightness. Use a low resistance ohmmeter to measure contact resistance. An infrared scanning device may be used to look for abnormal temperatures at transformer contacts for energized units. Insulation resistance checks may create a capacitive charge on a winding. On larger transformers (>500 kVA): Measure the winding resistances and record for future reference. Check for proper values of resistance between the system ground lug (or point) and the transformer enclosure, core, frame and clamps. Perform a turns ratio test on all taps and on the full winding voltages for each phase. Significant changes may indicate a loss of winding continuity. Inspect the sound isolation pads for signs of physical deterioration. Inspect all coil cooling ducts for any accumulation of dust, dirt or other obstructions.													
E30	Electrical	SECO Cover Systems - Low Voltage Transformer O&M Manual C70-SECO-SYC-PMP-000001	Dry-Tye Transformers - 1000 Volts and Below	Ensure terminals are in good working condition for the proper operation of transformers. Exercising of back-up generators under load where used as essential and Emergency sources, monthly.							X						
E31	Electrical	REF 18.12 of Appendix A-2 (Schedule 11)	Cover Back-Up Power Generator	Load testing of UPS systems where used as essential and Emergency source, monthly.			X										
E32	Electrical	REF 18.12 of Appendix A-2 (Schedule 11)	Uninterruptable Power Supply (UPS)	Monitoring and Testing of individual battery cell condition, annually.			X										
E33	Electrical	REF 18.12 of Appendix A-2 (Schedule 11)	Uninterruptable Power Supply (UPS)	The fall of potential method shall be used to test the resistance to earth of all grounding electrode systems serving electrical services, lightning protection and alternate energy sources, every 5 years.							X						
E34	Electrical	REF 18.14 of Appendix A-2 (Schedule 11)	Electrical Systems, Ground & Lightning Protection	"Under normal conditions, properly applied switches require maintenance only for verification of environmental conditions and that the correct enclosure type for those conditions is being used."							X						
F001	Fire and Life Safety	SACS - Enclosed Switches & Circuit Breakers OM - C70-SACS-PUM-MAN-000002	FFFS Pump Station	Visual inspection and manual operation of Connections, Safety Switch, and Operating Mechanism. (table titled "Safety Switches - Inspection and Maintenance Schedule Template).							X						
F002	Fire and Life Safety	SACS - Enclosed Switches & Circuit Breakers OM - C70-SACS-PUM-MAN-000002	Safety Switches	Testing detectors.							X						
F003	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Testing the control panel.							X						
F004	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Simulating alarm.							X						
F005	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Simulating trouble.							X						
F006	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Check the sensitivity of each detector.						X							
F007	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Check that all appropriate detectors are armed.						X							
F008	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924							X							

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<b>Tunnel Systems Preventive Maintenance and Inspection Plan</b>																	
ID#	Cover MEP System	Ref Manual	Element/Component	Task	Daily	Weekly	Monthly	Every 2 Months	Quarterly	Semi-Annually	Yearly	Every 2 Years	Every 3 Years	Every 5 Years	Every 6 Years	Every 15 Years	Every 20 Years
F009	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Activate a detector or alarm-initiating device.						X							
F010	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	To test for Go-No Go operation, use Test Gas, PIN 315-282747, following the instructions on the label.						X							
F011	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Check that the detector LED lights and the proper indication is given at the Control Panel.						X							
F012	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Verify that an alarm can be acknowledged and that the System can be silenced and reset.						X							
F013	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Verify the time and date setting of the System clock.						X							
F014	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Operating System, Model FC92x / FT924	Check that the output logic functions - the controls - work in accordance with customer specifications.							X						
F015	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Check pressure gauges(s) on cylinder valve(s). If the pressure is 10% below the pressure required for the temperature of the cylinder at the time of inspection, the cylinder must be serviced by an authorized Siemens distributor.		X											
F016	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Check for physical damage or missing parts from the SINORIX Fire Extinguishing System hardware.		X											
F017	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Check the discharge nozzles for orientation and tightness.		X											
F018	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Check for obstructions that would interfere with nozzle discharge pattern or mechanical operation of they system.		X											
F019	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Check that all tamper seals are intact and secure.		X											
F020	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Repeat weekly inspection.						X							
F021	Fire and Life Safety	Clean-Air Agent Fire Extinguishing System O&M C70-MB12-ARC-MAN-000002	Sinorix 227 Fire Extinguishing System	Check agent quantity and pressure of refillable containers.						X							
F025	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Manual stations	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)						X							
F026	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Non-restorable heat detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)						X							
F027	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Restorable heat detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)						X							
F028	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	SIGA2 heat detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)						X							
F029	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Smoke detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F030	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	SIGA2 heat detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F031	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	SIGA2 smoke and heat detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F032	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	CO sensors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F033	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	CO sensors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)											X		
F034	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	SIGA2 smoke, heat, and CO detectors	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F035	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Waterflow switches and alarms	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)						X							
F036	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	All initiating device circuits	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F037	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Remote annunciators	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F038	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Notification appliances	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F039	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Panel LEDs and trouble buzzer	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F040	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Panel trouble signals	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)							X						
F041	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	LCD clock	Testing Interval is "Each visit"													
F042	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Supervisory signal initiating devices	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)						X							
F043	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Auxiliary system off-premises fire alarm signal transmission	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)					X								
F044	Fire and Life Safety	Linear Heat Detection O&M C70-SECO-SYC-SHD-000005	Remote system off-premises waterflow signal transmission	Testing and Preventive Maintenance (refer to Ch. 8 for Test Procedure)				X									
F045	Fire and Life Safety	Deluge Local Control Panel OM Manual	West FCC Room Deluge Push-button Panel	Every 6 to 12 months, the panel's mechanical and electrical components should be checked for proper working condition. The following are suggested checks to perform. The panel should only be tested in conjunction with Operations to ensure that the SCADA system has the system on a bypass to prevent un-intended activation of the Deluge Sprinkler System: <ul style="list-style-type: none"> <li>o Check panel door seal and conduit entry seals for any water leaks.</li> <li>o Check wires for breaks along the wires, especially those across the door hinge.</li> <li>o Check bare copper wires for any oxidation or tarnishing.</li> <li>o Check screw terminations have not loosened due to temperature or vibration, confirm screw terminals meet expected Torque specifications.</li> <li>o Check that under illuminated pushbuttons there is no water.</li> <li>o Check that each button and light are operational.</li> </ul>							X	X					

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ID#	Cover MEP System	Ref Manual	Element/Component	Task												
F052	Fire and Life Safety	NFPA 25 Aero - Fire Sprinkler O&M	Sprinkler Systems (refer to Table 5.1.1.2)	Inspect: Hanger/braces/supports. Hydraulic design information sign. Information signs. Pipe and fittings.						X						
F053	Fire and Life Safety	C70-AAASC-SYC-MAN-000001	Sprinkler Systems (refer to Table 5.1.1.2)	Visual inspection of Waterflow devices to verify that they are free of physical damage.				X								
F056	Fire and Life Safety	Aero - Fire Sprinkler O&M C70-AAASC-SYC-MAN-000001	Sprinkler Systems (refer to Table 5.1.1.2)	Test: Sprinklers (extra-high or greater temperature solder type). Sprinklers (harsh environments)										X		
F059	Fire and Life Safety	NFPA 25	Standpipe and Hose Systems (refer to Table 6.1.1.2)	Inspect: Fire Hose Valve (FHV) Cabinet. Hydraulic design information sign.						X						
F060	Fire and Life Safety	NFPA 25	Standpipe and Hose Systems (refer to Table 6.1.1.2)	Test: flow test. Hydrostatic test.										X		
F061	Fire and Life Safety	Aero - Fire Sprinkler O&M C70-AAASC-SYC-MAN-000001	Private Fire Service Mains (refer to Table 7.1.1.2)	Inspect: Hose houses.				X								
F063	Fire and Life Safety	NFPA 25	Private Fire Service Mains (refer to Table 7.1.1.2)	Inspect: Hydrants (dry barrel and wall). Hydrants (wet barrel). Mainline strainers. Pipe and fittings (exposed). Test: Hydrants (flow).						X						
F064	Fire and Life Safety	Aero - Fire Sprinkler O&M C70-AAASC-SYC-MAN-000001	Private Fire Service Mains (refer to Table 7.1.1.2)	Test: Piping (exposed and underground (flow test))										X		
F068	Fire and Life Safety	NFPA 25 Section 4.1.2.5	Deluge valve enclosure	Valve enclosures for ... deluge valves... subject to freezing shall be inspected daily during cold weather to verify a minimum temperature of 40°F (4°C). -Valve enclosures equipped with low-temperature alarms shall be allowed to be inspected weekly. -Low-temperature alarms, if installed in valve enclosures, shall be inspected annually at the beginning of the heating season to verify that they are free of physical damage.		X										
F069	Fire and Life Safety	Aero - Fire Sprinkler O&M C70-AAASC-SYC-MAN-000001	Valves, Valve Components, and Trim (refer to Table 13.1.1.2)	Inspect: Locked/supervised control valves. Check (PB-400-DN) the fans inside the amplifiers bi-annually to ensure they are free of dust and debris that may have made its way through into the rack rooms. This will prevent possible fan failure.			X									
F075	Fire and Life Safety	SECO Cover Systems - VA-PA O&M Manual Heat Trace O&M Manual	amplifier fans	Visual inspection and function check. Refer to Installation and Maintenance Log on the manufacturer's O&M manual.					X							
F076	Fire and Life Safety	C70-KIE-SYC-PMP-000013	Heat Trace	Frequent visual inspections are recommended to be initially performed for corrosion resistant coated sprinklers, after the installation has been completed, to verify the integrity of the corrosion resistant coating.						X						
F077	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M	Fire Sprinklers	Thereafter, annual inspections per NFPA 25 should suffice; however, instead of inspecting from the floor level, a random sampling of close-up visual inspections should be made, so as to better determine the exact sprinkler condition and the long term integrity of the corrosion resistant coating, as it may be affected by the corrosive conditions present.						X						
F078	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO Series EC-11 and EC-14 Extended Coverage Upright and Pendant Sprinklers	Frequent visual inspections are recommended to be initially performed for corrosion resistant coated sprinklers, after the installation has been completed, to verify the integrity of the corrosion resistant coating.						X						
F079	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO Model SW-20 and SW-24, 11.2 K-factor, Extended Coverage Ordinary Hazard (ECOH) Horizontal Sidewall Sprinklers	Thereafter, annual inspections per NFPA 25 should suffice; however, instead of inspecting from the floor level, a random sampling of close-up visual inspections should be made, so as to better determine the exact sprinkler condition and the long term integrity of the corrosion resistant coating as it may be affected by the corrosive conditions present.						X						
F080	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO Model SW-20 and SW-24, 11.2 K-factor, Extended Coverage Ordinary Hazard (ECOH) Horizontal Sidewall Sprinklers	Inspect the interior of the valve and all components for corrosion, damage, and wear at least every five (5) years. Replace any components found to be corroded, damaged, or worn.							X					
F081	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Reliable Model G Check Valve	Cleaning of internal components/Part Replacement										X		
F082	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Bermad Model 400Y Deluge Valve 4", 6"	Visual Inspection										X		
F083	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Bermad Model 400Y Deluge Valve 4", 6"	Trip Test						X						
F084	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Bermad Model 400Y Deluge Valve 4", 6"	Lubricate						X						
F085	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Bermad Model 400Y Deluge Valve 4", 6"	Open and Close Valve						X						
F086	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Nibco GD4865-4N Butterfly Valve 4", 6"	Internal Inspection				X								
F087	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Nibco GD4865-4N Butterfly Valve 4", 6"	Internal Inspection										X		
F088	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Reliable Model G Check Valve 6", 10"	Visual Inspection												
F089	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Reliable Model G Check Valve 6", 10"	Visual Inspection												
F090	Fire and Life Safety	C70-AAASC-SYC-MAN-000001	CLA-VAL Model 33ATD Air Vacuum, 2"	Visual Inspection			X									

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F091	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Potter Roemer 4065-500 Hose Valve (angle), 2 1/2"	Visual Inspection				X								
F092	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Potter Roemer 4065-500 Hose Valve (angle), 2 1/2"	Open and Close Valve								X				
F093	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Potter Roemer 5922 Stortz Connection, 5"	Visual Interior Inspection						X						
F095	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Potter Roemer 5795-05 Open Snoots, 2 1/2"	Visual Interior Inspection						X						
F097	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Potter Roemer 5033 3 Way Clapper Type, 6 x 2 1/2 x 2 1/2 x 2 1/2	Visual Interior Inspection						X						
F099	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Main Drains, 2"	Main Drain Test (see NFPA 25)				X								
F100	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Appollo 75-104,5,6,7,8-01 Locking Ball Valve, 3/4", 1", 1 1/4", 1 1/2", 2"	Cleaning of internal components									X			
F101	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Appollo 75-104,5,6,7,8-01 Locking Ball Valve, 3/4", 1", 1 1/4", 1 1/2", 2"	Part Replacement										X		
F102	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Appollo 75-104,5,6,7,8-01 Locking Ball Valve, 3/4", 1", 1 1/4", 1 1/2", 2"	Visual Inspection			X									
F103	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Appollo 75-104,5,6,7,8-01 Locking Ball Valve, 3/4", 1", 1 1/4", 1 1/2", 2"	Trip Test						X						
F104	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Appollo 75-104,5,6,7,8-01 Locking Ball Valve, 3/4", 1", 1 1/4", 1 1/2", 2"	Internal Diaphragm Inspection									X			
F105	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Bermad 400Y-Trim Gauges	Recalibration or replacement										X		
F106	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	Bermad 400Y-Trim Gauges	Visual Inspection			X									
F107	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO TYS237 Open Pendant, 11.2K	Representative sample testing/ Replacement												X
F108	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO TYS237 Open Pendant, 11.2K	Visual from ground						X						
F109	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO TYS332-SW-20 Open Sidewall, 11.2K	Representative sample testing/ Replacement												X
F110	Fire and Life Safety	Cover Deluge and Standpipe Systems O&M C70-AAASC-SYC-MAN-000001	TYCO TYS332-SW-20 Open Sidewall, 11.2K	Visual from ground						X						
F111	Fire and Life Safety	Tunnel Voice Alarm System	ABF-260 Horn	Regular cleaning of this protection grid might be required in order to avoid deterioration of the acoustical performance of the ABF260. The required cleaning interval is depending on the environmental classification with respect to dust deposit. Although the ABF-260 is designed to withstand jet cleaning equipment, such as may be used in tunnel cleaning operations, it is advised to avoid spraying a high pressure/high rate water flow directly into the horn mouth.							X					
F112	Fire and Life Safety	Tunnel Voice Alarm System	VA/PA Fans	Check (PB-400-DN) the fans inside the amplifiers bi-annually to ensure they are free of dust and debris that may have made its way through into the rack rooms. This will prevent possible fan failure.					X							
F113	Fire and Life Safety	Deluge Local Control Panel OM Manual	CDOT Building Deluge Push-button Panel	Every 6 to 12 months, the panel's mechanical and electrical components should be checked for proper working condition. The following are suggested checks to perform. The panel should only be tested in conjunction with Operations to ensure that the SCADA system has the system on a bypass to prevent un-intended activation of the Deluge Sprinkler System: o Check panel door seal and conduit entry seals for any water leaks. o Check wires for breaks along the wires, especially those across the door hinge. o Check bare copper wires for any oxidation or tarnishing. o Check screw terminations have not loosened due to temperature or vibration, confirm screw terminals meet expected Torque specifications. o Check that under illuminated pushbuttons there is no water. o Check that each button and light are operational.					X	X						
F114	Fire and Life Safety	REF 18.15 of Appendix A-2 (Schedule 11)	Ventilation System	Life Safety preventative maintenance performed and reported bi-annually.					X							
F115	Fire and Life Safety	REF 18.15 of Appendix A-2 (Schedule 11)	Ventilation System	Life safety components of the tunnel ventilation system tested annually.						X						
F116	Fire and Life Safety	REF 18.15 of Appendix A-2 (Schedule 11)	Ventilation System	Verification of OCC activation and separately, local activation of tunnel ventilation life safety response, annually.						X						
I01	ITS and Communications	REF 18.11 of Appendix A-2 (Schedule 11)	2-way Radio	Operational tests using 2-way radio equipment and frequencies to match outside agencies served, weekly.		X										
I03	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Structure	Inspect the mounting structure for corrosion, loose bolts, and overall stability.						X						
I04	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Structure	Check the connections of the earth ground wires, if accessible						X						
I05	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Earth Ground Resistance	Ensure earth ground readings meet local and national codes.						X						
I06	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Display Cabinet	Check for water stains and other signs of water intrusion in the display cabinet.						X						

Exhibit I - Cover Maintenance Management Plan  
Attachment 1, Appendix A-1-18 Cover Maintenance Management Plan

Tunnel Systems Preventive Maintenance and Inspection Plan				Daily	Weekly	Monthly	Every 2 Months	Quarterly	Semi-Annually	Yearly	Every 2 Years	Every 3 Years	Every 5 Years	Every 6 Years	Every 15 Years	Every 20 Years	
ID#	Cover MEP System	Ref Manual	Element/Component	Task													
07	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Display Cabinet	Seal any leaks that have developed with a silicone sealant or another suitable sealer.						X							
08	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Display Cabinet	Repair any door gaskets that have tears or missing pieces.						X							
09	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Display Cabinet	Check the drainage holes in the bottom of the cabinet for obstructions.						X							
10	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Display Cabinet	Remove any debris that has collected in the display cabinet.						X							
11	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Temperature and Light Sensors	Clear away any obstructions to air flow around the temperature and light sensors.						X							
12	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Temperature and Light Sensors	Clean the windows if they are dirty.						X							
13	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Ventilation Fans	Verify all fans work by pushing the test button until the fans turn on.						X							
14	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Ventilation Fans	Open the intake fan assembly and clean any dirt and debris off the fan blades. Spin the fan blades with a pen or pencil to ensure the bearings are free and the fan is balanced.						X							
15	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Filters	Check and clean the filters. If the filter has an excess of dirt and dust, check the filters more frequently.						X							
16	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Vanguard® Field Controller	Ensure all connectors are secure and the cables are not damaged in any way.						X							
17	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Vanguard® Field Controller	Check the Vanguard® Field Controller operation. Refer to DD3021059 in Appendix B.						X							
20	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	LED and Electronic Circuitry	Test LED and electronic circuitry at intervals determined by customer requirements. Daktronics recommends performing the tests at least monthly. Perform tests on the DMS to check for hardware problems and incorrect variable settings.				X									
21	ITS and Communications	SECO Cover Systems O&M Manual for LUS SMVMS	Vanguard® Field Controller P1248	Ensure all connectors are secure and that the cables are not damaged. Test functionality by checking the VFC operation. Fill out one copy of the maintenance checklist for each VFC						X							
22	ITS and Communications	SECO Cover Systems - Cellular, AM/FM Rebroadcast & Two Way Radio O&M Manual - C70-SECO-SYC-PMP-000020	MARK-IIID AM SIGNAL CONDITIONER M3D-AM2B-4RU	"mandatory to maintain the cooling system always in good working condition and clean their air filters twice a year or more often if the equipment room ambience is not clean."					X								
23	ITS and Communications	SECO Cover Systems - Cellular, AM/FM Rebroadcast & Two Way Radio O&M Manual - C70-SECO-SYC-PMP-000020	MARK-IIID FM SIGNAL CONDITIONER M3D-FM2B-4RU	"mandatory to maintain the cooling system always in good working condition and clean their air filters twice a year or more often if the equipment room ambience is not clean."					X								
24	ITS and Communications	SECO Cover Systems - Cellular, AM/FM Rebroadcast & Two Way Radio O&M Manual - C70-SECO-SYC-PMP-000020	AM/FM RF POWER AMPLIFIER RFA-2AMFM-6R19	"mandatory to maintain the cooling system always in good working condition and clean their air filters twice a year or more often if the equipment room ambience is not clean."					X								
25	ITS and Communications	SECO Cover Systems - Cellular, AM/FM Rebroadcast & Two Way Radio O&M Manual - C70-SECO-SYC-PMP-000020	warranty	"Owner agrees to keep a record log onsite for performed annual and 5 year inspections required by section 510 of the 2018 Denver Fire Code as part of the Radio Maintenance Plan."						X			X				
26	ITS and Communications	SECO Cover Systems - CCTV/VMS/Qognify O&M Manual - C70-SECO-SYC-PMP-000013	AXIS Device Manager	Firmware upgrades													
27	ITS and Communications	Tunnel Telephone System & Service Bldg O&M Manual C70-SECO-ELC-SHD-000018; C70-SECO-SYC-ML-000031	Model 277-001 Telephone	general cleaning only.						X							
28	ITS and Communications	Ramp Meter O&M Manual C70-SECO-SYC-PMP-000032	cabinet components	Filter replacement. Cabinet cleaning, Mechanical Inspection						X							
L01	Lighting	SECO Cover Systems - Lighting Control Systems O&M Manual - C70-SECO-SYC-PMP-000004	Tunnel Lighting Addressable Control System (TLACS)	Verify if there is no major alarm like NWC or Zone failure.	X												
L02	Lighting	SECO Cover Systems - Lighting Control Systems O&M Manual - C70-SECO-SYC-PMP-000004	Tunnel Lighting Addressable Control System (TLACS)	Verify NWC Date and Time. Backup SCADA data log.			X										
L03	Lighting	SECO Cover Systems - Lighting Control Systems O&M Manual - C70-SECO-SYC-PMP-000004	Tunnel Lighting Addressable Control System (TLACS)	NWC storage card report handling. Verify UPS battery. Backup CMS database and NWC reports. Prepare LPC alarm report for the next tunnel maintenance. Backup SCADA configuration. Wash Luminance Photometer window and fill windshield washer tank if installed. Wash Illuminance Photometer window. Lamp replacement (recommend change to "On Demand.")					X								
L04	Lighting	SECO Cover Systems - Lighting Control Systems O&M Manual - C70-SECO-SYC-PMP-000004	Tunnel Lighting Addressable Control System (TLACS)	UPS shutdown test. Verify Luminance Photometer alignment. Clean up filter cabinet.						X							
M01	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Air flow - check for obstructions (dirt, rags, etc) in the inlet or outlet ductwork.			X										
M02	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Screens, VIVs, and other air flow accessories - Remove dirt, which causes resistance to air flow and decreases volume of air supplied.					X								
M03	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Rotor - Inspect rotor blades for dust or dirt accumulation which can unbalance fan. Wrap bearings tightly with plastic film and clean with steam, water jet, compressed air or wire brush. Be careful not to damage aluminum blades while cleaning. Make sure rotor is centered to prevent blades from striking housing, and rotating in proper direction.					X								
M04	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Hardware - Check all foundation bolts, rotor hubs, set screws, rotor locking bolts and bearing locking collars					X								
M05	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Surface Coatings - Check condition of surface coatings and paints. Repainting interior and exterior parts of fan and ductwork extends service life. Select paint able to withstand operating temperatures and conditions.					X								
M06	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Shaft - Check shaft for proper alignment; shaft must not be cocked on bearings. Misalignment can cause overheating, worn dust seals, bearing failure and unbalanced condition.					X								
M07	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Vibration - Excessive vibration must not be permitted. See Appendix C, "Troubleshooting" for possible causes. Table 3 (Allowable vibration at fan operating frequency) lists safe vibration levels.			X										

Exhibit I - Cover Maintenance Management Plan  
Attachment 1, Appendix A-1-18 Cover Maintenance Management Plan

Tunnel Systems Preventive Maintenance and Inspection Plan																		
ID#	Cover MEP System	Ref Manual	Element/Component	Task	Daily	Weekly	Monthly	Every 2 Months	Quarterly	Semi-Annually	Yearly	Every 2 Years	Every 3 Years	Every 5 Years	Every 6 Years	Every 15 Years	Every 20 Years	
M08	Mechanical Ventilation	RK Mech - Jet Fan and Accessories - OM Manual C70-RKMECH-SYC-MAN-000001	Jet Fan Model APA 1250/ 578 Unidirectional	Bearings - Check all bearings or excessive temperature or chatter. High-speed fan bearings are designed to run hot (165 degrees). Do not replace a bearing simply because it feels hot. Check pillow block temperature with a pyrometer or contact thermometer.														
M09	Mechanical Ventilation	Air Quality Monitor System C70-RKMECH-SYC-MAN-000002	034E Wind Sensor	Inspect the sensor for proper operation per Section 3.0 (of user manual). Replacement of Wind Speed Sensor bearing in extremely adverse environments.							X							
M10	Mechanical Ventilation	Air Quality Monitor System C70-RKMECH-SYC-MAN-000002	034E Wind Sensor	Replacement of Wind Speed Sensor bearings.								X						
M11	Mechanical Ventilation	Air Quality Monitor System C70-RKMECH-SYC-MAN-000002	034E Wind Sensor	Recommended complete factory overhaul of sensor.									X					
M12	Mechanical Ventilation	Air Quality Monitor System C70-RKMECH-SYC-MAN-000002	VICONOX - CO, NO, NO2 & Visibility Monitor for Tunnels	Visual inspections, "clean the outer casing to remove any dirt build up."						X								
M13	Mechanical Ventilation	Air Quality Monitor System C70-RKMECH-SYC-MAN-000002	AIRFLOW MkII - Air Velocity and Direction Monitor for Tunnels	Checking for dirt buildup on the airflow sensors.						X								
M14	Mechanical Ventilation	Air Quality Monitor System C70-RKMECH-SYC-MAN-000002	Tunnel Sensors Combined Termination Unit - CTU	Regularly clean and inspect the device for: damage, fixing, lid closure, sealing, cleanliness.						X								

Complement to Attachement 1:

CAR - 35 Addition

- a) The drylines will be inspected to be fully drained at the same frequency of deluge cabinet valves inspections; monthly (November-May)
- b) The drylines will be inspected to be fully drained at the same frequency of main drain test inspections; quarterly (November-May)

Inspection to Fire Extinguishers

- a) The inspection of the fire extinguishers will follow Supplement A - Tunnel Systems Preventative Maintenance and Inspection Plan



## Supplement A – Tunnel Systems Preventative Maintenance and Inspection Plan

### **Summary**

Supplement A is the addition for inspection of fire extinguishers at Cover/Tunnel in the *Central 70 Project - Kiewit Meridiam Partners - Maintenance Management Plan R16* accepted with conditional approval. There is an ongoing annual certification or inspection of fire extinguishers in place. In addition to the annual inspection, per NFPA 10, monthly inspection of the fire extinguishers will be carried out. These inspections will pertain to the units located at:

1. Cover FDC Cabinets (7 in each bore, 14 total)
2. Cover Building (1 in the war room)
3. Pump Station (1 at equipment pad)

### **Inspection Schedule**

The inspection of these fire extinguishers will be carried out in a Monthly basis.

### **Documentation**

The inspections will be tracked through Service Request and Work Orders in JAMMS.

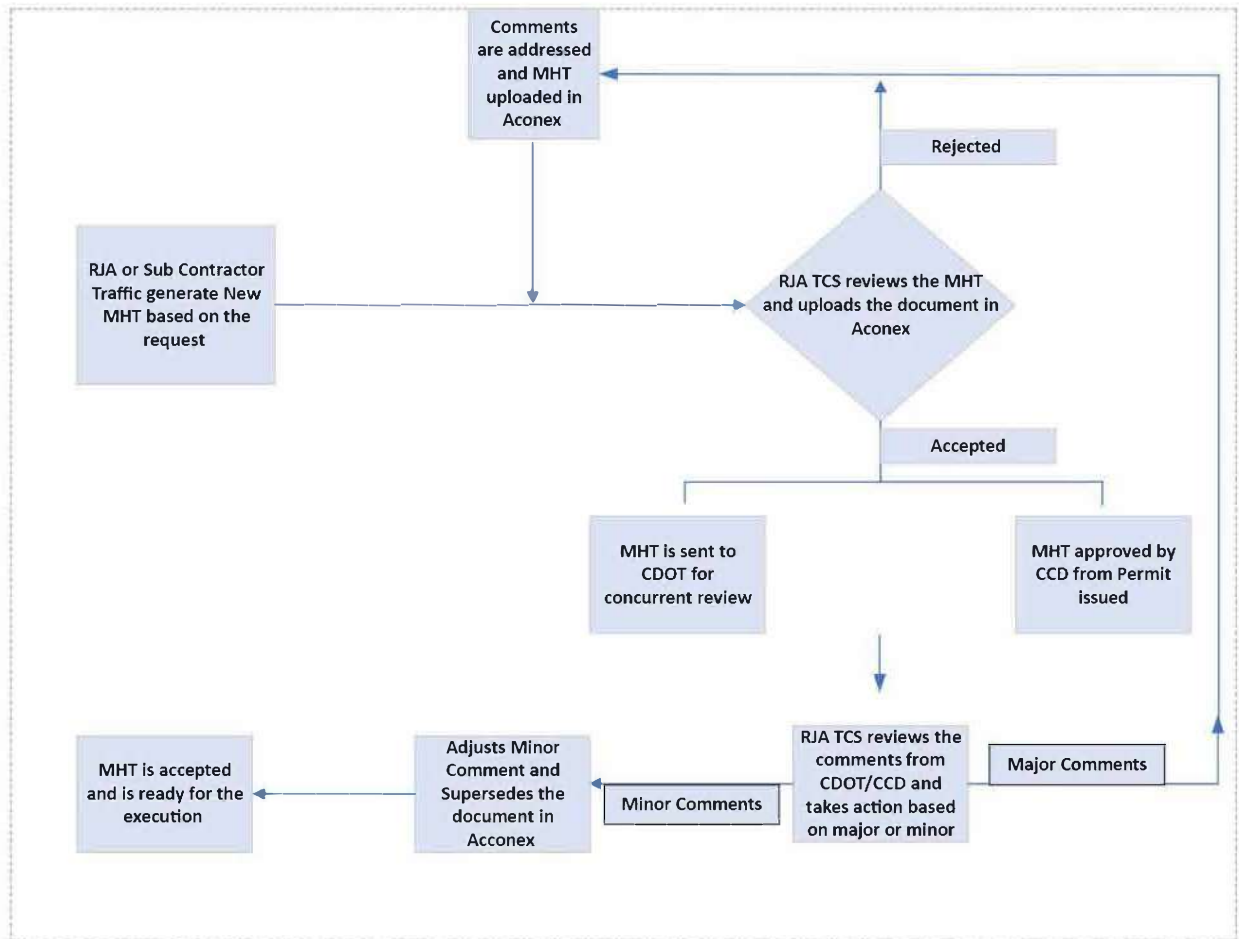
## Exhibit II Lane Closure Procedure

### Lane Closure Process

All lane closures will have a specific MHT or an approved (typical) MHT. Once a MHT has been established, a lane closure can be submitted. The submitted MHT will be sent to CDOT for approval required. RJA will apply for CCD permit as required for the approval of the lane closure. There is no cost associated with the permit (170E-CDOT-REF-0005429.10.9.06 IGA – CDOT and City and County of Denver). This concurrence, the closure limits, dates, and durations will be clearly defined on the Aconex submission to the department. Approvals to the department will be submitted 10 days prior to proposed implementation date. Lane closure request will include a detailed explanation of the need for closure with pictures of the site as needed for clarity.

Once the lane closure has been approved through Aconex, the O&M contractor will set the lane closure accordingly. Changes and cancellations will be submitted to the department daily or as applicable. Rescheduled closures will be on the next available day as approved by the department.

Figure 1 shows the workflow for lane closure procedures:



## **Emergency Lane Closures**

Certain lane closures will be deemed as Emergency Lane closures to protect safety and property of the traveling public. Emergency lane closures will also be needed to remedy CAT 1 defects. Emergency lane closures will be implemented with verbal approval of the department and/or CCD and documented through Aconex after the event. RJA will apply for CCD permit expeditiously as required and will be uploaded to Aconex.

## **Lane Closure Times and Durations**

Lane Closure will follow Region 1 Lane Closure Strategy on the project ROW.

## Exhibit III

### Landscape Maintenance Plan

The landscaping and vegetative areas will be maintained as per the requirements of Schedule 11 Appendix 2.

Mowing, litter pickup, irrigation system maintenance and operation, plant maintenance, pruning, insect, disease and pest control, fertilization, mulching, bed maintenance will be carried out as per the best industry practices and Schedule 11 requirements.

## Exhibit IV

### **Exhibit 1.1 – Additions to Underground Fire Suppression**

#### **Inspections for Tunnel Fire Suppression System supply lines**

Below you will find information from NFPA 25 – Standards for Inspections, Testing and Maintenance. This will relay the importance of checking all alarms during annual and quarterly inspections. There are inspections such as flushing and operation of sprinklers to be completed every 5 years. These are specifically important for when winter is set to start. Dener, CO is no stranger to cold temperatures. The entire fire system for the most part is exposed to the elements. It will be of great important to complete all inspections and testing prior to cold temperature settling in. Please follow the notes below to create a checklist that would best suite Central 70 in the maintenance period.

#### **NFPA 25 – Chapter 4 –**

**4.1.1** - Responsibility for inspection testing and maintenance impairment. The property owner or designated representative shall be responsible for the proper inspection, testing, maintenance, and impairment management of water-based fire protection systems in accordance with this standard.

**4.1.1.3** – Inspection, testing and maintenance shall be performed by qualified person.

**4.1.1.3.1** – Qualified personnel shall meet at least one of the following qualifications

(1) Meets the requirements and training for a given field acceptable to the authority having jurisdiction

(2) Is certified by a nationally recognized fire protection certification organization acceptable to the authority having jurisdiction.

(3) Is registered, licensed, or certified by a state or local authority to perform inspections, testing and maintenance of water – based fire protection systems.

**4.1.2** Freeze protection. The property owner or designated representative shall ensure that water filled piping is maintained at a minimum temperature of 40°F Unless an anti-freeze solution complying with Chapter 5 is utilized.

**4.1.2.4** – Where other approved means of freeze protection for water filled piping as described in 4.1.2.3 are utilized, they shall be inspected, tested, and maintained in accordance with this standard.

**4.1.2.5.2** – Low Temperature alarms, if installed in valve enclosures, shall be inspected annually toward the beginning of the heating season prior to onset of freezing conditions to verify that they are free of physical damage.

**4.1.4 Notification of System Shutting Down** – The property owner or designated representative shall notify the authority having jurisdiction, the fire department, if required, and the alarm receiving facility before testing or shutting down a system or its supply. (Call DFD, Fire Watch Permit)

## Exhibit IV

See Checklist Example Below for Heat Trace, Low Temperature Alarms, and Backflow heater verification:  
This should be a yearly inspection prior to the winter season on Central 70.

1. Place central Monitoring in Test	Call Central Monitoring
2. Verify Unit is powered on	On and off
3. Verify Unit is providing Heat	Turn up dials to produce heat
4. Return heat setting to 50°F	Back to required setting
5. Verify Alarm/ Status to Dynac	Verify by Power loss
6. Return Equipment to on	Verify alarm goes away
7. Heat Trace Testing Complete	

These records should be kept, digitally and archived for a minimum of 1 year. This test shall be completed during Jorgensen inspections prior to the cold weather seasons.

### **NFPA 25 – Chapter 7 – Private Fire Service Mains**

#### **7.1.1 Minimum Requirements**

7.1.1.1 – This chapter shall provide the minimum requirements for the routine inspection, testing, and maintenance of private fire service mains and their appurtenance installed in accordance with NFPA 24 or other approved installation standard.

7.1.2 - Common components and valves shall be inspected, tested, and maintain in accordance with Chapter 13.

7.1.3 – Obstruction investigations. The procedures outlined in Chapter 14 shall be followed where there is a need to conduct an obstruction investigation.

7.2.1 – General. Private fire service mains and thei appurtenance shall be inspected at the intervals specified in table 7.1.1.2 (Excel Attached)

#### **7.2.2.1 – Exposed Piping**

7.2.2.1.1 – Exposed Piping shall be inspected annually.

7.2.2.1.2 – Piping to be inspected for following conditions

1. Leaks

## Exhibit IV

2. Physical damage

3. Corrosion

4. Restraint methods

7.2.2.4 Dry Barrel and Wall Hydrants. Dry barrel and wall hydrants shall be inspected annually and after each operation for the following conditions

(1) Inaccessibility

(2) Presence of water or ice in barrel which could indicate a faulty drain, a leaky hydrant valve or high groundwater table

(3) Improper drainage from barrel

(4) Leaks in outlets or at top of hydrant

(5) Cracks in hydrant barrel

(6) Tightness of outlet caps

(7) Worn outlet threads

(8) Worn Hydrant operating nut

(9) availability of operating wrench

(10) Corrosion detrimental to hydrant integrity

7.2.2.6 Dry Hydrants shall be inspected at least quarterly and maintain as necessary to keep them in good operation condition.

7.2.2.6.3 The reflective material marking the hydrant and signage shall be inspected at least annually to verify that it is being maintenance in accordance with 8.4.7 of NFPA 1142

7.2.2.7 Monitor Nozzle. Monitor nozzles shall be inspected semiannually for following conditions

(1) Leaks

(2) Physical damage

(3) Corrosion

7.2.2.8 House Houses Hose houses shall be inspected quarterly for the following

(1) Inaccessibility

(2) Physical damage

(3) Missing equipment

## Exhibit IV

### **7.3 Testing**

7.3.1 Underground and exposed piping flow tests. Underground and exposed piping shall be flow tested at minimum 5-year intervals

7.3.1.1 any flow test results that indication deterioration of available water flow or pressure shall be investigated to the complete satisfaction of the authority having jurisdiction to ensure that the required flow and pressure are available for fire protection.

7.3.2 Hydrants shall be tested annually to ensure proper functioning.

7.3.2.1 Each hydrant shall be opened fully, and water flowed until all foreign material has cleared

7.3.2.2 After operation, dry barrel and wall hydrants shall be observed for proper drainage from the barrel

7.3.3.2 All monitor nozzles shall be oscillated and moved throughout their full range annually to ensure proper operability.

### **7.4 Maintenance**

7.4.1 General. All equipment shall be maintained in proper working condition, consistent with the manufacturer's recommendations.

#### **7.4.2 Hydrants**

7.4.2.1 Hydrants shall be lubricated annually to ensure that all stems, caps, plugs, and threads are in proper operating condition.

7.4.2.2 Hydrants shall be kept free of snow, ice, or other materials and protected against mechanical damage so that free access is ensured.

7.4.3 Monitor nozzles. Monitor nozzles shall be lubricated annually to ensure proper function.

7.5 Component Action requirements

### **Devices to confirm with Alarm to Dynac**

OS & Y Tamper switches from Columbine East and West Backflow Cabinets

OS & Y Tamper switches from Clayton East and West Backflow Cabinets

Backflow Heater Status

Backflow Low Temperature Alarms

Manhole tamper switches at Backflows

Heat Trace at West Drip Edge, WB Traffic, North Wall Behind Stainless Steel Panel



## Exhibit IV

### **10" Supply Line at Columbine West End of the Cover, North Abutment Wall**

For the 10" supply line at the west end of the cover, there are removable stainless-steel panels. At the bottom of these, there is an access door. The keys for this access door have been placed in the Jorgensen lock box in the CDOT Building.

The 10" supply line behind the door and panel is wrapped with insulation. While this isn't classified as "exposed" piping, this section of supply shall be treated as such. Maintain photos of the insulation throughout all annual or quarterly inspections. This will allow Jorgensen to track weather there are slow leaks coming through the supply line.

This will also allow you to access the heat trace. This is a device that would be tested and inspected under the guidelines of NFPA 25. Please see above for an example or obtain a copy of NFPA 25 for a full document. Heat trace shall be tested and inspected with the low temperature alarms prior to winter or cold season weather.

For information regarding the Heat Trace Controller, utilize C70-KIE-SYC-PMP-000013.

## Exhibit IV

<b>Inspection</b>	<b>Frequency</b>	<b>Reference</b>
Backflow Preventer	--	Chapter 13
Check valve	--	
Control Valve	--	
Fire Department Connection	--	
Fire Hose Valves	Quarterly	7.2.2.8
Hydrants (Dry Barrell & Wall)	Annually and after each operation	7.2.2.4
Mainline Strainers	Annually and after signifgant flow	7.2.2.3
Pipe and fittings	Annually	7.2.2.1
Supervisory Devices	Annually & Lubrication	Chapter 13
<b>Test</b>	<b>Frequency</b>	<b>Reference</b>
Backflow preventor	--	Chapter 13
Control valves	--	Chapter 13
Hydrants (Flow Test)	Annually	7.3.2, 7.2.2.6.5
Monitor Nozzles (Flow Test)	Annually	7.3.3
Piping (Exposed and Underground) (Flow Test)	5 Years	7.3.1
Valve Status	Annually	Chapter 13
Valve Suppervisory	Annually	Chapter 13
<b>Maintenance</b>	<b>Frequency</b>	<b>Reference</b>
Backflow Preventor	--	Chapter 13
Check valve	--	Chapter 13
Control Valve	--	Chapter 13
Dry Hydrant (Water supply and clearance)	--	7.2.2.6.1, 7.2.2.6.2
Hydrants and Fire Department Connections	Quarterly	7.4.2
Mainline Strainers	Annually and after each operation	7.2.2.3
Monitor Nozzles	Annually	7.4.3

## Exhibit V - RJA Alarm Summary

Pri	Type	Registry Name	Registry Description	Dynac Screen	Physical Location	Jorgensen Response Knowledge	Jorgensen JAMMS Asset	Jorgensen Response
3	Text Alarms	aidCameras/*	aidCamera-Congestion	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidCameras/*	AidCamera - Pedestrian	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidCameras/*	aidCamera - Slow Speed	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidCameras/*	AID Camera - Stopped	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidCameras/*	AID Camera - Wrong Way	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidZones/*	AID Zone - Congestion	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidZones/*	AID Zone - Pedestrian	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidZones/*	AID Zone - Slow Speed	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidZones/*	AID Zone - Stopped	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	aidZones/*	AID Zone - Wrong Way	Overview	Program for CCTV Cameras	good		Observe and Report
3	Text Alarms	ATS_PWR_AVAIL_EM	ATS Power Available - Emergency	Power Distribution	Clayton Equipment Yard	good		Observe and Report
3	Text Alarms	ATS_PWR_AVAIL_NORM	ATS Power Available - Normal	Power Distribution	Clayton Equipment Yard	good		Observe and Report
1	Text Alarms	ATS_SWITCH_EM	ATS Switch Emergency	Power Distribution	Clayton Equipment Yard	good		Operator verify (GEN, EM Lights), email, Field verify when returned to Utility Power
3	Text Alarms	ATS_SWITCH_NORM	ATS Switch Normal	Power Distribution	Clayton Equipment Yard	good		Observe and Report
1	Text Alarms	BRK_CTRL	Control Breaker	Power Distribution	Clayton Equipment Yard	good		Operator verify, email, Field verify when returned to Utility Power
2	Text Alarms	intrusion/INTR-CNC-RIO-11	Cabinet Doors - Intrusion	Overview Screen	CDOT Building/Basement	good		Observe and Report
2	Text Alarms	intrusion/INTR-CNC-RIO-13	Cabinet Doors - Intrusion	Overview Screen	CDOT Building/Lighting Control	good		Observe and Report
2	Text Alarms	intrusion/INTR-CNC-RIO-14	Cabinet Doors - Intrusion	Overview Screen	CDOT Building/Basement	good		Observe and Report
2	Text Alarms	intrusion/INTR-CNC-RIO-15	Cabinet Doors - Intrusion	Overview Screen	Emergency Generator	good		Observe and Report
2	Text Alarms	intrusion/INTR-CNC-RIO-16	Cabinet Doors - Intrusion	Overview Screen	CDOT Building/Operations	good		Observe and Report
2	Text Alarms	intrusion/INTR-EB-RIO-01	Cabinet Doors - Intrusion	Overview Screen	Cabinets on South Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-EB-RIO-02	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-EB-RIO-03	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-EB-RIO-04	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-EB-RIO-05	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ESWBD-01	Cabinet Doors - Intrusion	Electrical Screen	ATS - Emergency Switchboard Cabinet	good		Observe and Report
2	Text Alarms	intrusion/INTR-NSWBD-02	Cabinet Doors - Intrusion	Electrical Screen	ATS - Normal Switchboard Cabinet	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-01	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-02	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-03	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-04	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-05	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-06	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-ET-EB-07	Cabinet Doors - Intrusion	Overview Screen	Cabinets on Center Wall in Tunnel	good		Observe and Report
2	Text Alarms	intrusion/INTR-GENRM-01	Cabinet Doors - Intrusion	Overview Screen	Generator - Fire Extinguisher	good		Observe and Report
2	Text Alarms	intrusion/INTR-GENRM-02	Cabinet Doors - Intrusion	Overview Screen	Generator doors	good		Observe and Report
2	Text Alarms	intrusion/INTR-MESR-101	Cabinet Doors - Intrusion	Overview Screen	CDOT - Building	good		Observe and Report
2	Text Alarms	intrusion/INTR-NER-110-1	Cabinet Doors - Intrusion	Overview Screen	CDOT - Building	good		Observe and Report
2	Text Alarms	intrusion/INTR-OCR-113-2	Cabinet Doors - Intrusion	Overview Screen	CDOT - Building	good		Observe and Report
2	Text Alarms	intrusion/INTR-PLC-B	Cabinet Doors - Intrusion	Overview Screen	CDOT - Building	good		Observe and Report
2	Text Alarms	intrusion/INTR-EBFCC-01	Cabinet Doors - Intrusion	Overview Screen	EB FCC RIO	good		Observe and Report
2	Text Alarms	intrusion/INTR-WBFCC-01	Cabinet Doors - Intrusion	Overview Screen	WB FCC RIO	good		Observe and Report
2	Text Alarms	intrusion/INTR-STR-102	Cabinet Doors - Intrusion	Overview Screen	CDOT - Building	good		Observe and Report
2	Text Alarms	intrusion/INTR-UER-112-1	Cabinet Doors - Intrusion	Overview Screen	CDOT - Building	good		Observe and Report
2	Text Alarms	cameras/*	Cameras Bad	Overview Screen		good		Contact Camera Sub
1	Text Alarms	airQualitySystem/AQS-WB-02	CO - HI HI HI	CVS	Tunnel	good		Verify fan operation; manually start fan; O&R DFD will roll
1	Text Alarms	Template: template/FFFS_DELUGE_VALVE_CABHTR	DVC - Low Temp	FFFS	Deluge Cabinets	good		Field Verify; O&R
1	Text Alarms	FFFS/DVC-EB-01 THRU FFFS/DVC-EB-10, FFFS/DVC-WB-01 THRU FFFS/DVC-WB-10	DVControl - Fail to Close	FFFS	Deluge Cabinets	Command failed		Mobilize to close lower supply valve. Call Aero
1	Text Alarms	FFFS/DVC-EB-01 THRU FFFS/DVC-EB-10, FFFS/DVC-WB-01 THRU FFFS/DVC-WB-11	DVControl - Fail to Open	FFFS	Deluge Cabinets	Command failed		Mobilize to open supply valve. Call Aero Maintain Contact with DFD.
1	Text Alarms	facp/FACP-FIRST_RESPONSE	FACP - Fire Response Alarm	FACP	Fire Alarm Control Panel	good		Phone Call - Field Verify
2	Text Alarms	facp/FACP-FIRST_RESPONSE	FACP Fire Response Supervisory	FACP	Fire Alarm Control Panel	good		Phone Call/email - Field Verify

## Exhibit V - RJA Alarm Summary

3	Text Alarms	facp/FACP-FIRST_RESPONSE	FACP - Trouble	FACP	Fire Alarm Control Panel	good	Email - Field Verify
1	Text Alarms	facp/FIRE-EB-DETECTED	Fire - EB Detected	FACP	Fire Alarm Control Panel	good	Determine location, direct DFD Will show up on every screen in Dynac
1	Text Alarms	facp/FIRE-WB-DETECTED	Fire - WB Detected	FACP	Fire Alarm Control Panel	good	Determine location, direct DFD Will show up on every screen in Dynac
1	Text Alarms	fffs/FFFS-WB-SPFV	Flow Alarm WB - SPFV	FFFS / Overview	Deluge Cabinets	SPFV	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-01	Flow Alarm WB - Zone 1	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-02	Flow Alarm WB - Zone 2	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-03	Flow Alarm WB - Zone 3	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-04	Flow Alarm WB - Zone 4	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-05	Flow Alarm WB - Zone 5	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-06	Flow Alarm WB - Zone 6	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-07	Flow Alarm WB - Zone 7	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-08	Flow Alarm WB - Zone 8	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-09	Flow Alarm WB - Zone 9	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
1	Text Alarms	fffs/DVC-WB-10	Flow Alarm WB - Zone 10	FFFS / Overview	Deluge Cabinets	good	Coordinate with DFD
3	Text Alarms	template/GENERATOR	Generator - Fuel High	Power Distribution	Clayton Equipment Yard	good	Observe and Report
1	Text Alarms	template/GENERATOR	Generator - Fuel Leak	Power Distribution	Clayton Equipment Yard	good	Field verify
2	Text Alarms	template/GENERATOR	Generator - Fuel Low	Power Distribution	Clayton Equipment Yard	good	Initiate fuelling request
2	Text Alarms	template/GENERATOR	Generator - Trouble	Power Distribution	Clayton Equipment Yard	good	Field verify
1	Text Alarms	fffs/DVC-WB-01	Inlet Tamper - WB 01	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-02	Inlet Tamper - WB 02	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-03	Inlet Tamper - WB 03	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-04	Inlet Tamper - WB 04	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-05	Inlet Tamper - WB 05	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-06	Inlet Tamper - WB 06	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-07	Inlet Tamper - WB 07	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-08	Inlet Tamper - WB 08	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-09	Inlet Tamper - WB 09	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-10	Inlet Tamper - WB 10	Deluge FFFS	Tunnel	Lower valve	Physically verify valves position
1	Text Alarms	intrusion/INTR-ET-WB-02	Intruder - ET WB 02	Overview Page	Telephones on North & Center Wall in Tunnel	good	Communicate with user; O&R
1	Text Alarms	intrusion/INTR-ET-WB-03	Intruder - ET WB 03	Overview Page	Telephones on North & Center Wall in Tunnel	good	Communicate with user; O&R
1	Text Alarms	intrusion/INTR-ET-WB-04	Intruder - ET WB 04	Overview Page	Telephones on North & Center Wall in Tunnel	good	Communicate with user; O&R
1	Text Alarms	intrusion/INTR-ET-WB-05	Intruder - ET WB 05	Overview Page	Telephones on North & Center Wall in Tunnel	good	Communicate with user; O&R
1	Text Alarms	intrusion/INTR-ET-WB-06	Intruder - ET WB 06	Overview Page	Telephones on North & Center Wall in Tunnel	good	Communicate with user; O&R
1	Text Alarms	intrusion/INTR-ET-WB-07	Intruder - ET WB 07	Overview Page	Telephones on North & Center Wall in Tunnel	good	Communicate with user; O&R
1	Text Alarms	intrusion/INTR-WB-DVC-0102	Intruder - WB DVC 01 - 02	Overview Page	Cabinets on Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-DVC-0304	Intruder - WB DVC 03 - 04	Overview Page	Cabinets on Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-DVC-0506	Intruder - WB DVC 05 - 06	Overview Page	Cabinets on Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-DVC-0708	Intruder - WB DVC 07 - 08	Overview Page	Cabinets on Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-DVC-0910	Intruder - WB DVC 09 - 10	Overview Page	Cabinets on Center Wall in Tunnel	good	O&R or coordinate with DFD
3	Text Alarms	intrusion/INTR-WB-EE-01	Intruder - EE 01	Overview Page	Emergency Egress Door #1	Are cameras set to PTZ on both bores? YES	Observe and Report
3	Text Alarms	intrusion/INTR-WB-EE-02	Intruder - EE 02	Overview Page	Emergency Egress Door #2	Are cameras set to PTZ on both bores? YES	Observe and Report
3	Text Alarms	intrusion/INTR-WB-EE-03	Intruder EE 03	Overview Page	Emergency Egress Door #3	Are cameras set to PTZ on both bores? YES	Observe and Report
1	Text Alarms	intrusion/INTR-WB-FHVC-01	Intruder WB FHVC 01	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-FHVC-02	Intruder WB FHVC 02	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-FHVC-03	Intruder WB FHVC 03	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-FHVC-04	Intruder WB FHVC 04	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-FHVC-05	Intruder WB FHVC 05	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-FHVC-06	Intruder WB FHVC 06	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-FHVC-07	Intruder WB FHVC 07	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-RIO-06	Intruder RIO 06	Overview Page	North Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-RIO-07	Intruder RIO 07	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-RIO-08	Intruder RIO 08	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD

## Exhibit V - RJA Alarm Summary

1	Text Alarms	intrusion/INTR-WB-RIO-09	Intruder RIO 09	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	intrusion/INTR-WB-RIO-10	Intruder RIO 10	Overview Page	Center Wall in Tunnel	good	O&R or coordinate with DFD
1	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-09	Jet Fan - CtrIPwrUnavailable	CVS	East Portal Entry	From MCC	Verify switch position at MCC
3	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-10	Jet Fan - EM_RUN_CTRL	CVS	East Portal Entry	Fan in emergency run mode runs to failure	User input only; Observe and Report
2	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-11	Jet Fan - Fail to Start	CVS	East Portal Entry	good	Verify other fan turned on in place; Second attempt; O&R; report to RK
1	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-12	Jet Fan - Fail to Stop	CVS	East Portal Entry	good	Investigate at MCC and Field to verify condition; RK Mech
2	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-13	Jet Fan - Lock Out	CVS	East Portal Entry	good	Verify Fan on Switch Screen Tab; Reset alarms; RK Mech
2	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-14	Jet Fan - MCP Trip	CVS	East Portal Entry	good	Motor Control Panel Trip; breaker check; RK Mech
2	Text Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-15	Jet Fan - Unavailable	CVS	East Portal Entry	From Jet Fan Itself loss of LV (Control Circuits) Power Local fan or REO (6 or 1) Issue	Control at fan is unavailable; RK Mech or Kapsch
1	Text Alarms	faccp/LHD-WB-FZ-01	LHD - Zone 1 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-01	LHD - Zone 1 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-01	LHD - Zone 1 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-02	LHD - Zone 2 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-02	LHD - Zone 2 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-02	LHD - Zone 2 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-03	LHD - Zone 3 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-03	LHD - Zone 3 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-03	LHD - Zone 3 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-04	LHD - Zone 4 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-04	LHD - Zone 4 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-04	LHD - Zone 4 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-05	LHD - Zone 5 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-05	LHD - Zone 5 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-05	LHD - Zone 5 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-06	LHD - Zone 6 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-06	LHD - Zone 6 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-06	LHD - Zone 6 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-07	LHD - Zone 7 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-07	LHD - Zone 7 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-07	LHD - Zone 7 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-08	LHD - Zone 8 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-08	LHD - Zone 8 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-08	LHD - Zone 8 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-09	LHD - Zone 9 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-09	LHD - Zone 9 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-09	LHD - Zone 9 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-10	LHD - Zone 10 FL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-10	LHD - Zone 10 ML	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
1	Text Alarms	faccp/LHD-WB-FZ-10	LHD - Zone 10 SL	Overview FFFS	Tunnel	Good with aspect alarm	Coordinate with DFD
2	Text Alarms	lighting/LIGHT-EB	Lighting East bound LCAM	Lighting	East Portal Entry	good	Report to RJA
2	Text Alarms	lighting/LIGHT-WB	Lighting Westbound	Lighting	West Portal Entry	good	Report to RJA
1	Text Alarms	fffs/DVC-WB-01	Outlet Tamper - Zone 01	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-02	Outlet Tamper - Zone 02	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-03	Outlet Tamper - Zone 03	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-04	Outlet Tamper - Zone 04	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-05	Outlet Tamper - Zone 05	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-06	Outlet Tamper - Zone 06	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-07	Outlet Tamper - Zone 07	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-08	Outlet Tamper - Zone 08	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-09	Outlet Tamper - Zone 09	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	fffs/DVC-WB-10	Outlet Tamper - Zone 10	Overview FFFS	Deluge Cabinets	Top valve	Physically verify valves position
1	Text Alarms	ps/PS-SWWW-CGD-1	Pump Station - CGD - High - Stormwater Wet Well	Pump Station Overview	Pump Station -	Caustic Gas Detection	field verify call hazmat sub
2	Text Alarms	ps/PS-FFFS-CGD-2	Pump Station - Gas Level - High	Pump Station Overview	Pump Station -	good	field verify call hazmat sub
2	Text Alarms	ps/PS-FFFS-CGD-3	Pump Station - Gas Level - High High	Pump Station Overview	Pump Station -	good	field verify call hazmat sub
2	Text Alarms	ps/PS-FFFS-LI-2A, ps/PS-FFFS-LI-2B, ps/PS-FFFS-LI-3A	Pump Station - FFF - Level High	Pump Station Overview	Pump Station - Fixed Fire Fighting Suppression	good water level	Verify pumps are running; verify Holding tank level; field verify; contact pumping sub

## Exhibit V - RJA Alarm Summary

2	Text Alarms	ps/PS-FFFS-LI-2A, ps/PS-FFFS-LI-2B, ps/PS-FFFS-LI-3A	Pump Station - FFF - Level High High	Pump Station Overview	Pump Station - Fixed Fire Fighting Supression	good water level	Verify pumps are running; verify Holding tank level; field verify; contact pumping sub
2	Text Alarms	template/PS_FLD	Pump Station - FLD - Logic Disagreement		Pump Station - PLC	good PLC Disagreement	Verify warnings at Pump Station PLC
1	Text Alarms	template/PS_Generator	Pump Station - Generator Fail	Pump Station Overview	Pump Station - Generator	good	field verify
3	Text Alarms	template/PS_Generator	Pump Station - Generator High	Pump Station Overview	Pump Station - Generator	good	Observe and Report
3	Text Alarms	template/PS_Generator	Pump Station - Generator High High	Pump Station Overview	Pump Station - Generator	good	Observe and Report
2	Text Alarms	template/PS_Generator	Pump Station - Generator Low	Pump Station Overview	Pump Station - Generator	good	Initiate fueling request
2	Text Alarms	template/PS_Generator	Pump Station - Generator Low Low	Pump Station Overview	Pump Station - Generator	good	Verify fueling request
2	Text Alarms	ps/PS-FFFS-LI-2A, ps/PS-FFFS-LI-2B, ps/PS-FFFS-LI-3A	Pump Station - Well Level High High	Pump Station Overview	Pump Station - Generator	good	Verify pumps are running; verify Holding tank level; field verify; contact pumping sub
	Text Alarms	ps/PS-FFFS-LI-2	Pump Station - SWWW - Differential	Pump Station Overview	Pump Station - Storm Water Wet Well	good	Verify Holding tank level; field verify; contact pumping sub
	Text Alarms	ps/PS-SWWW-LI-1	Pump Station - FFFS - Differential	Pump Station Overview	Pump Station - FFFS Wet Well	good	Verify Holding tank level; field verify; contact pumping sub
2	Text Alarms	ps/PS-SWWW-CGD-1	Pump Station - SWWW - Gas Level High	Pump Station Overview	Pump Station - Storm Water Wet Well	good	Field Verify; contact sub
2	Text Alarms	ps/PS-SWWW-CGD-2	Pump Station - SWWW - Gas Level High High	Pump Station Overview	Pump Station - Storm Water Wet Well	good	Field Verify; contact sub
2	Text Alarms	ps/PS-SWWW-LI-1A, ps/PS-SWWW-LI-1B	Pump Station - SWWW - Level High	Pump Station Overview	Pump Station - Storm Water Wet Well	water level? Yes	Verify pumps are running; email; O&R
2	Text Alarms	ps/PS-SWWW-LI-1A, ps/PS-SWWW-LI-1B	Pump Station - SWWW - Level High High	Pump Station Overview	Pump Station - Storm Water Wet Well	water level? Yes	Verify pumps are running; email; field verify water levels
1	Text Alarms	radio/AM_SUMALM34	Radio AM Summary Alarm 34	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/FM_SUMALM12	Radio FM Summary Alarm 12	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/Z1_SUMALM56	Radio Zone 1 Summary Alarm 56	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/Z2_SUMALM78	Radio Zone 2 Summary Alarm 78	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-AMFM-ALRM	Two Way Radio AM FM Alarm	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-CCNC-DASALRM	Two Way Radio CCNC DAS Alarm	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-CELL-DASALRM	Two Way Radio Cellular DAS Alarm	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-DFD-RESALRM	Two Way Radio DFD RES Alarm	N/A	CDOT/Basement	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/FR-EB-FCC-COMMS	EB Portal FCC RM Fire Radio Transmitter Antenna Cut Comm Trouble	N/A	EB FCC FACP	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/FR-WB-FCC-COMMS	WB Portal FCC RM Fire Radio Transmitter Antenna Cut Comm Trouble	N/A	WB FCC FACP	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/FRADIO-TELRM-COMMS	Telecom RM Fire Radio Transmitter Antenna Cut Comm Trouble	N/A	CDOT Building	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-AMFM-TRBL	Two Way Radio AM FM Trouble	N/A	CDOT Building	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-CCNC-DASTRBL	Two Way Radio CCNC DAS Trouble	N/A	CDOT Building	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-CELL-DASTRBL	Two Way Radio Cellular DAS Trouble	N/A	CDOT Building	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	radio/TWR-DFD-RESTRBL	Two Way Radio DFD RES Trouble	N/A	CDOT Building	Radio Rebroadcast	Field Verify; contact sub
1	Text Alarms	system/servers/*	Server Idel		Telecom Room	Which mode each server is in	Verify ANY server is still active at top right of screen; contact Kapsch if not available
1	Text Alarms	system/servers/*	Server Offline		Telecom Room	Which mode each server is in	Verify ANY server is still active at top right of screen; contact Kapsch if not available
1	Text Alarms	fffs/FFFS-WB-SPIV-01	Standpipe Tamper - WB 01	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-02	Standpipe Tamper - WB 02	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-03	Standpipe Tamper - WB 03	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-04	Standpipe Tamper - WB 04	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-05	Standpipe Tamper - WB 05	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-06	Standpipe Tamper - WB 06	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-07	Standpipe Tamper - WB 07	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-08	Standpipe Tamper - WB 08	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-09	Standpipe Tamper - WB 09	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
1	Text Alarms	fffs/FFFS-WB-SPIV-10	Standpipe Tamper - WB 10	Overview FFFS	Tunnel	at roof	Contact AERO; Valve at roof; Need scissor lift
2	Communication Alarms / Loss	aid*/*	Comms - AID	Overview FFFS	Cameras / Traffic Vision Server	Communication errors? Yes	Contact sub
2	Communication Alarms / Loss	air*/*	Comms - Air	Overview FFFS	AQMS	Communication errors? Yes	Contact sub
2	Communication Alarms / Loss	audio */*	Comms - Audio	Overview FFFS	Public Address	Communication errors? Yes	Contact sub
2	Communication Alarms / Loss	breaker*/*	Comms - Breakers	Overview FFFS	Clayton Equipment Yard	Communication errors? Yes	Contact sub
2	Communication Alarms / Loss	cameras*/*	Comms - Cameras	Overview FFFS	Cameras	Communication errors? Yes	Contact sub

## Exhibit V - RJ Alarm Summary

2	Communication Alarms / Loss	channels*/*	Comms - Channels	Overview FFFS		Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	controllers */*	Comms - Controllers	Overview FFFS		Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	coverPower*/*	Comms - Cover Power	Overview FFFS	Room 113 CDOT	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	dte*/*	Comms - DTE	Overview FFFS	Signs in Tunnel	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	facp*/*	Comms - FACP	Overview FFFS	FCC room & CDOT Building	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	fffs*/*	Comms - FFFS	Overview FFFS	Tunnel Fire Equipment	Communication errors? Yes	Contact sub		
1	Communication Alarms / Loss	generator*/*	Comms - Generator	Overview FFFS	Clayton Equipment Yard	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	intrusion*/*	Comms - Intrusion	Overview FFFS	Door Contracts	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	network*/*	Comms - Network	Overview FFFS	SCADA CDOT Telecom	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	scanGroups*/*	Comms - Scan Groups	Overview FFFS		Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	signs*/*	Comms - Signs	Overview FFFS	LUS Override at Portals	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	ups*/*	Comm - UPS	Overview FFFS	Room 112 CDOT	Communication errors? Yes	Contact sub		
2	Communication Alarms / Loss	zones*/*	Comm - Zones	Overview FFFS	Fire Zones in Cover	Communication errors? Yes	Contact sub		
1	Aggregate Alarms	aspectControls/FIRE-EB-DETECTED/facp/FIRE-EB-DETECTED	Fire Detected - East Bound	CCTV	Tunnel	good	Coordinate with DFD		
1	Aggregate Alarms	aspectControls/FIRE-WB-DETECTED/facp/FIRE-WB-DETECTED	Fire Detected - West Bound	CCTV	Tunnel	good	Coordinate with DFD		
2	Aggregate Alarms	Controls/PS_FFF_Gas_Lvl_High_High/ps/PS-FFFS-CGD-2	Gas Level High High	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	good	Contact Cleaning Guys		
2	Aggregate Alarms	aspectControls/PS_FFF_Level_High/ps/PS-FFFS-LI-2A	Fixed Fire Fighting Side Level High @ 2A	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	water level or pump running?	FFFS water level; verify pumps are running; email; field verify		
2	Aggregate Alarms	aspectControls/PS_FFF_Level_High/ps/PS-FFFS-LI-2B	Fixed Fire Fighting Side Level High @ 2B	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	water level or pump running?	FFFS water level; verify pumps are running; email; field verify		
2	Aggregate Alarms	aspectControls/PS_FFF_Level_High/ps/PS-FFFS-LI-3A	Fixed Fire Fighting Side Level High @ 3A	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	water level or pump running?	Holding Tank water level; email; field verify		
2	Aggregate Alarms	aspectControls/PS_FFF_Level_High_High/ps/PS-FFFS-LI-2A	Fixed Fire Fighting Side Level High High @ 2A	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	water level or pump running?	FFFS water level; verify pumps are running; email; field verify		
2	Aggregate Alarms	aspectControls/PS_FFF_Level_High_High/ps/PS-FFFS-LI-2B	Fixed Fire Fighting Side Level High High @ 2B	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	water level or pump running?	FFFS water level; verify pumps are running; email; field verify		
2	Aggregate Alarms	aspectControls/PS_FFF_Level_High_High/ps/PS-FFFS-LI-3A	Fixed Fire Fighting Side Level High High @ 3A	Pump Station Overview	Pump Station Fixed Fire Fighting Well -	water level or pump running?	Holding Tank water level; email; field verify		
1	Aggregate Alarms	Controls/PS_WWW_Gas_Lvl_High_High/ps/PS-SWWW-CGD-1	Gas Level High High	Pump Station Overview	Pump Station - Storm Water Wet Well	good	Contact Cleaning Guys		
2	Aggregate Alarms	aspectControls/PS_WWW_Level_High/ps/PS-SWWW-LI-1A	Water Level High @ 1A	Pump Station Overview	Pump Station - Storm Water Wet Well	water level or pump running?	SWWW water level; verify pumps are running; field verify		
2	Aggregate Alarms	aspectControls/PS_WWW_Level_High/ps/PS-SWWW-LI-1B	Water Level High @ 1B	Pump Station Overview	Pump Station - Storm Water Wet Well	water level or pump running?	SWWW water level; verify pumps are running; field verify		
1	Aggregate Alarms	aspectControls/PS_WWW_Level_High/ps/PS-SWWW-LI-1A	Water Level High High @ 1A	Pump Station Overview	Pump Station - Storm Water Wet Well	water level or pump running?	SWWW water level; verify pumps are running; field verify		
1	Aggregate Alarms	aspectControls/PS_WWW_Level_High/ps/PS-SWWW-LI-1B	Water Level High High @ 1B	Pump Station Overview	Pump Station - Storm Water Wet Well	water level or pump running?	SWWW water level; verify pumps are running; field verify		
1	Aggregate Alarms	aspectControls/JF_cntIPwrUnavailable/jetfan/JF-EB-01	Jet Fan Power Unavailable	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Verify valves at MCC	1	Jet Fan - CtrlPwrUnavailable
3	Aggregate Alarms	aspectControls/JF_EM_RUN_CTRL/jetfan/JF-EB-01	Emergency Run Control	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	User input only; Observe and Report	3	Jet Fan - EM_RUN_CTRL
2	Aggregate Alarms	aspectControls/JF_FailToStart/jetfan/JF-EB-01	Jet Fan Fail to Start	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Second attempt; O&R; report to RK	2	Jet Fan - Fail to Start
2	Aggregate Alarms	aspectControls/JF-MCP_Trip/jetfan/JF-EB-01	Jet Fan MCP Trip	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Investigate at MCC and field to verify condition; RK Mech	1	Jet Fan - Fail to Stop
2	Aggregate Alarms	aspectControls/JF_OutBd_Vibration/jetfan/JF-EB-01	Jet Fan Outboard Vibration	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Verify Fan on Values Tab; RK Mech	2	Jet Fan - Lock Out
2	Aggregate Alarms	aspectControl/JF_InBd_Vibration/jetfan/JF-EB-01	Jet Fan Inboard Vibration	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Motor Control Panel Trip; breaker check; RK Mech	2	Jet Fan - MCP Trip
2	Aggregate Alarms	aspectControl/JF_PhaseA_Temp/jetfan/JF-EB-01	Jet Fan Phase A Temperature	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Verify Fan on Values Tab; RK Mech	2	Jet Fan - Unavailable
2	Aggregate Alarms	aspectControl/JF_PhaseB_Temp/jetfan/JF-EB-01	Jet Fan Phase B Temperature	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Verify Fan on Values Tab; RK Mech		
2	Aggregate Alarms	aspectControl/JF_PhaseC_Temp/jetfan/JF-EB-01	Jet Fan Phase C Temperature	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Verify Fan on Values Tab; RK Mech		
2	Aggregate Alarms	aspectControls/JF_Unavailable/jetfan/JF-EB-01	Jet Fan Unavailable	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Control at fan is unavailable; RK Mech or Kapsch		
1	Aggregate Alarms	aspectControls/JF_cntIPwrUnavailable/jetfan/JF-EB-02	Jet Fan Power Unavailable	Main overview, AQMS Page	West Portal Entry East Bound Traffic	good	Verify valves at MCC		









## Exhibit V - RJA Alarm Summary

2	Aggregate Alarms	aspectControls/JF_OutBd_Vibration/jetfan/JF-WB-05	Jet Fan Outboard Vibration	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Verify Fan on Values Tab; RK Mech
2	Aggregate Alarms	aspectControl/JF_InBd_Vibration/jetfan/JF-WB-05	Jet Fan Inboard Vibration	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Motor Control Panel Trip; breaker check; RK Mech
2	Aggregate Alarms	aspectControl/JF_PhaseA_Temp/jetfan/JF-WB-05	Jet Fan Phase A Temperature	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Verify Fan on Values Tab; RK Mech
2	Aggregate Alarms	aspectControl/JF_PhaseB_Temp/jetfan/JF-WB-05	Jet Fan Phase B Temperature	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Verify Fan on Values Tab; RK Mech
2	Aggregate Alarms	aspectControl/JF_PhaseC_Temp/jetfan/JF-WB-05	Jet Fan Phase C Temperature	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Verify Fan on Values Tab; RK Mech
2	Aggregate Alarms	aspectControls/JF_Unavailable/jetfan/JF-WB-05	Jet Fan Unavailable	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Control at fan is unavailable; RK Mech or Kapsch
1	Aggregate Alarms	aspectControls/JF_cntlPwrUnavailable/jetfan/JF-WB-06	Jet Fan Power Unavailable	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Verify valves at MCC
3	Aggregate Alarms	aspectControls/JF_EM_RUN_CTRL/jetfan/JF-WB-06	Emergency Run Control	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	User input only; Observe and Report
2	Aggregate Alarms	aspectControls/JF_FailToStart/jetfan/JF-WB-06	Jet Fan Fail to Start	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Second attempt; O&R; report to RK
2	Aggregate Alarms	aspectControls/JF-MCP_Trip/jetfan/JF-WB-06	Jet Fan MCP Trip	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Investigate at MCC and Field to verify condition; RK Mech
2	Aggregate Alarms	aspectControls/JF_OutBd_Vibration/jetfan/JF-WB-06	Jet Fan Outboard Vibration	Main overview, AQMS Page	East Portal Entry West Bound Traffic	good	Verify Fan on Values Tab; RK Mech



## Exhibit V - RJ Alarm Summary

1	Aggregate Alarms	aspectControls/LHD-WB-Z05-FL	Fire Detection WB Zone 5 - Fast Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z05-ML	Fire Detection WB Zone 5 - Middle Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z05-SL	Fire Detection WB Zone 5 - Slow Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z06-FL	Fire Detection WB Zone 6 - Fast Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z06-ML	Fire Detection WB Zone 6 - Middle Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z06-SL	Fire Detection WB Zone 6 - Slow Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z07-FL	Fire Detection WB Zone 7 - Fast Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z07-ML	Fire Detection WB Zone 7 - Middle Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z07-SL	Fire Detection WB Zone 7 - Slow Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z08-FL	Fire Detection WB Zone 8 - Fast Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z08-ML	Fire Detection WB Zone 8 - Middle Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z08-SL	Fire Detection WB Zone 8 - Slow Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z09-FL	Fire Detection WB Zone 9 - Fast Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z09-ML	Fire Detection WB Zone 9 - Middle Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z09-SL	Fire Detection WB Zone 9 - Slow Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z10-FL	Fire Detection WB Zone 10 - Fast Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z10-ML	Fire Detection WB Zone 10 - Middle Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
1	Aggregate Alarms	aspectControls/LHD-WB-Z10-SL	Fire Detection WB Zone 10 - Slow Lane	CCTV, Dynac	Fire Zones in Cover	good	Coordinate with DFD
2	Limit Alarms	aspects/AQS_AVG_CarbonMonoxide	AQS Average Carbon Monoxide	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	aspects/AQS_AVG_NitricOxide	AQS Average Nitric Oxide (Will be replaced by Temperature)	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	aspects/AQS_AVG_NO2	AQS Average NO2	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	airQualitySystem/AQS-EB-01	AQS EB 01 - Visability	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	airQualitySystem/AQS-EB-02	AQS EB 02 - Visability	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	airQualitySystem/AQS-WB-01	AQS WB 01 - Visability	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	airQualitySystem/AQS-WB-02	AQS WB 02 - Visability	CVS	AQMS Cover	good	Verify Fans are running; verify MODE; IF Mode 5 - call EMS; RK Mech
2	Limit Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-09	JF - Inboard Vibration	CVS	Jet Fans in Cover	good	Verify Fan on Values Tab; RK Mech
2	Limit Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-09	JF - Outboard Vibration	CVS	Jet Fans in Cover	good	Verify Fan on Values Tab; RK Mech
2	Limit Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-09	JF - Phase A Temperature	CVS	Jet Fans in Cover	good	Verify Fan on Values Tab; RK Mech
2	Limit Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-09	JF - Phase B Temperature	CVS	Jet Fans in Cover	good	Verify Fan on Values Tab; RK Mech
2	Limit Alarms	jetfan/JF-EB-01 thru jetfan/JF-EB-09 & jetfan/JF-WB-01 thru jetfan/JF-WB-09	JF - Phase C Temperature	CVS	Jet Fans in Cover	good	Verify Fan on Values Tab; RK Mech
4	Limit Alarms	points/STSTANA1	Limit alarm Training	CVS	Test	good	Only enabled during testing
	Text Alarms	2ndalarm/SecondaryAlarmAID	Secondary Alarm For the AID System	N/A	Tunnel		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel AID System Failure
	Text Alarms	2ndalarm/SecondaryAlarmCCTV	Secondary Alarm For the CCTV System	N/A	Tunnel		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel CCTV System Failure
	Text Alarms	2ndalarm/SecondaryAlarmDrainageLVL1	Secondary Alarm For the Drainage System Level 1	N/A	Pumpstation		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel Drainage System Failure
	Text Alarms	2ndalarm/SecondaryAlarmDrainageLVL2	Secondary Alarm For the Drainage System Level 2	N/A	Pumpstation		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel Drainage System Failure
	Text Alarms	2ndalarm/SecondaryAlarmDTE	Secondary Alarm For the Distance to Exit Signage	N/A	Tunnel		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel Distance to Exit LED Lighted Signs Failure
	Text Alarms	2ndalarm/SecondaryAlarmFDAS	Secondary Alarm for the Fire Detection Alarm System	N/A	Tunnel		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel Fire Alarm System Failure

## Exhibit V - RJA Alarm Summary

Text Alarms	2ndalarm/SecondaryAlarmJetfanEB	Secondary Alarm for Jetfan Ventilation System Eastbound	N/A	Tunnel	Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel Jet Fan Ventilation Failure	
Text Alarms	2ndalarm/SecondaryAlarmJetfanWB	Secondary Alarm for Jetfan Ventilation System Westbound	N/A	Tunnel		
Text Alarms	2ndalarm/SecondaryAlarmLighting	Secondary Alarm for the Lighting System	N/A	CDOT BUILDING (Lighting Control Room)		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel Lighting System Failure
Text Alarms	2ndalarm/SecondaryAlarmPA	Secondary alarm for the VA/PA System	N/A	CDOT BUILDING (IT comm Room)		Minimum Operational Threshold has been reached,
Text Alarms	2ndalarm/SecondaryAlarmPower	Secondary Alarm for the Electrical system (Normal/Emergency)	N/A	Emergency Generator and ATS		Minimum Operational Threshold has been reached,
Text Alarms	2ndalarm/SecondaryAlarmRRB	Secondary Alarm for the Radio Re-Broadcast system	N/A	CDOT BUILDING (IT comm Room)		Minimum Operational Threshold has been reached, follow Operator Procedures for Tunnel AM/FM Rebroadcast
Text Alarms	2ndalarm/SecondaryAlarmTWR	Secondary Alarm for the Two-Way Radio system	N/A	CDOT BUILDING (IT comm Room)		HAR Equipment Failure
Text Alarms	fffs/FFFS-EB-SPCV	Eastbound FCC Standpipe Check Valve (FCC Standpipe Isolation Valve CLOSED)	EB FCC Popup	EB FCC Room		Minimum Operational Threshold has been reached,
Text Alarms	fffs/FFFC-WB-SPCV	Westbound FCC Standpipe Check Valve (FCC Standpipe Isolation Valve CLOSED)	WB FCC Popup	WB FCC Room		
Text Alarms	fffs/FFFS-WB-SPFV	Westbound FCC Standpipe Fill Valve (FCC Standpipe Fill Valve OPEN)	WB FCC Popup	WB FCC Room		
Text Alarms	fffs/FFFS-WB-SPIFV	Westbound FCC Standpipe Isolation Valve (FCC Standpipe Isolation Valve CLOSED)	WB FCC Popup	WB FCC Room		
Text Alarms	fffs/FFFS-EB-SPMFV	Eastbound FCC Standpipe Manual Fill Valve (FCC Standpipe Manual Fill Valve OPEN)	EB FCC Popup	EB FCC Room		
Text Alarms	fffs/FFFS-WB-SPMFV	Westbound FCC Standpipe Manual Fill Valve (FCC Standpipe Manual Fill Valve OPEN)	WB FCC Popup	WB FCC Room		
Text Alarms	fffs/FFFS-WB-SPFV	Westbound FCC Standpipe Pressure Switch (Pressure Switch HIGH)	WB FCC Popup	WB FCC Room		

Exhibit VI

COVER EQUIPMENT LIST



Area	Manufacturer	Spare Parts	Contractor	Aconex Reference	Storage Requirements
		21 12 00 - Fire Suppression Standpipe			
		None		C70-KIE-SYC-MAN-000001	
		21 12 01 - Lower Roadway Fire Suppression Standpipe			
		None		C70-KIE-SYC-MAN-000001	
		21 13 26 - Deluge Fire Suppression Sprinkler Systems			
Cover FCC	Tyco	(24) Sprinkler Heads - TY5237 (Pendent) TY5332 - SW-20 (Wall)		C70-KIE-SYC-MAN-000001	EB & WB FCC Room
		21 22 00 - Clean Agent Fire Extinguishing Systems			
		(1) Smoke Detector Head			
		(1) Smoke Detector Base			
		(1) Pull Station	Maxwell / Integrity Fire	C70-MBI2-ARC-MAN-000002	CDOT Building
		(1) Horn			
		(1) Strobe			
		22 40 00 - Plumbing Fixtures			
	American Standard	(1) Diaphragm for flush valve	Maxwell / Palmer Mechanical	C70-MBI2-ARC-ML-000116	CDOT Building
		(1) Set batteries for sink sensor			
		23 34 00 - Exhaust Fans			
		None	Maxwell / Rogers and Sons	C70-MBI2-ARC-MAN-000001	CDOT Building
		23 34 23 - HVAC Power Ventilators			
		None	Maxwell / Rogers and Sons	C70-MBI2-ARC-MAN-000001	CDOT Building
		23 54 16 - Gas Fired Furnaces			
		(1) Filter	Maxwell / Rogers and Sons	C70-MBI2-ARC-MAN-000001	CDOT Building
		23 81 23 - Split System Air Conditioners			
		None	Maxwell / Rogers and Sons	C70-MBI2-ARC-MAN-000001	CDOT Building
		23 82 39 - Propeller Unit Heaters			
		None	Maxwell / Rogers and Sons	C70-MBI2-ARC-MAN-000001	CDOT Building
		23 85 85 - Jet Fan and Accessories			
Cover	Howden American	(1) Fan Motor	RK Mechanical	C70-RKMECH-SYC-MAN-000001	Yes
Cover	Howden American	(1) Impeller	RK Mechanical	C70-RKMECH-SYC-MAN-000001	Yes
Cover	Howden American	(2) Lifting Cradels	RK Mechanical	C70-RKMECH-SYC-MAN-000001	Yes
		23 85 86 - Air Quality Monitors			
Cover	Acoem Tunnel Sensors & Met One Instruments	None	RK Mechanical	C70-RKMECH-SYC-MAN-000004	N/A
		26 12 16 - Medium Voltage Transformers			
Clayton Equipment Yard	Eaton	None	Sturgeon	C70-SECO-SYC-PMP-000014	Yes

Acknowledged: \_\_\_\_\_

## Exhibit VI

26 13 13 - Medium Voltage Switch gear						
Clayton Equipment Yard		(1) 225A 3P Circuit Breaker	S&C Electric / Sturgeon	C70-SECO-SYC-PMP-000003	Yes	Picked up from Strugeon: 02/10/2023 Jorgensen Signature: _____
Clayton Equipment Yard		(1) 100A 3P Circuit Breaker	S&C Electric / Sturgeon	C70-SECO-SYC-PMP-000003	Yes	
Clayton Equipment Yard		(1) 800A 3P Circuit Breaker	S&C Electric / Sturgeon	C70-SECO-SYC-PMP-000003	Yes	
26 22 00 - Low Voltage Transformers						
Clayton Equipment Yard		None	None	C70-SECO-SYC-PMP-000001	N/A	
26 24 19 - Motor Control Centers						
CDOT Building	Schneider Electric	(2) 100 HP Softstarter for Model 6 MCC	Sturgeon	C70-SECO-SYC-PMP-000005	Yes	Picked up from Strugeon: 02/10/2023 Jorgensen Signature: _____
26 32 13 - Diesel Engine Driven Generator						
Clayton Equipment Yard	Cummins	(1) Preventative Maintenance Kit	Sturgeon	C70-SECO-SYC-PMP-000015	Yes	Preventative Maintenance kit from Cummins is no longer available. Jorgensen has a maintenance contract with Generator Source. Parts are available through Generator Source at time of maintenance window. No spare parts will be kept with Jorgensen.
26 33 53 - Status Uninterruptable Power Supplies						
CDOT Building	Vertiv	None	Sturgeon	C70-SECO-SYC-PMP-000010	N/A	
26 36 23 - Automatic Transfer Switches						
CDOT Building	Schneider Electric	None	Sturgeon	C70-SECO-SYC-PMP-000009	N/A	
26 55 40 - Cover Tunnel Lighting Luminaries						
	Holophane	(250 Ea.) Type T Luminaires		C70-SECO-SYC-PMP-000006	Temporary Fixtures in North bore, Type D	Delivered to Jorgensen
26 55 41 - Cover Tunnel Light Control System						
CDOT Building	Nyx Hemera	(24 Ea) Local Product Controller	Sturgeon	C70-SECO-SYC-PMP-000004	Inside of Spare Fixtures being provided	All in place within the additional temporary equipment installed, LCC-2 in Normal Electrical Room
CDOT Building	Nyx Hemera	(1) Power Supply	Sturgeon	C70-SECO-SYC-PMP-000004	Yes	
CDOT Building	Nyx Hemera	(1) Lighting Controller	Sturgeon	C70-SECO-SYC-PMP-000004	This panel currently controls temporary lighting. Will be left in place as a spare.	
CDOT Building	Nyx Hemera	(2) Surge Protection Device	Sturgeon	C70-SECO-SYC-PMP-000004	In spare fixtures	
CDOT Building	Nyx Hemera	(1) Luminance Photometer	Sturgeon	C70-SECO-SYC-PMP-000004	Redundant LCAMs are installed at Fillmore and Josephine	



## Exhibit VI

27 11 00 - Intrusion Detection System							
Cover	ADT	(1) Egress Door Contact	Sturgeon	C70-SECO-SYC-PMP-000023	Yes	Sturgeon to Deliver to Kiewit	
Cover	ADT	(2) Telephone Cabinet Contacts	Sturgeon	C70-SECO-SYC-PMP-000023	Yes		
Cover/CDOT/Clayton	ADT	(4) Equipment Door Contacts	Sturgeon	C70-SECO-SYC-PMP-000023	Yes		
27 12 00 - Fire Alarm and Detection System							
Cover	ADT	(1) SIGA-OSD Optical Smoke Detector	Sturgeon	C70-SECO-SYC-PMP-000033	Yes	Delivered to Jorgensen 02/10/2023 Jorgensen Signature: _____	
Cover	ADT	(1) SIGA-OSHD Multi Sensor Smoke/Heat Detector	Sturgeon	C70-SECO-SYC-PMP-000033	Yes		
Cover	ADT	(1) SIGA-SB4 Standard Detector Base W/ Ring	Sturgeon	C70-SECO-SYC-PMP-000033	Yes		
Cover	ADT	(1) SIGA-RB4 Relay Detector Base W/ Ring	Sturgeon	C70-SECO-SYC-PMP-000033	Yes		
Cover	ADT	(1) SIGA-278 Manual Station Double Action	Sturgeon	C70-SECO-SYC-PMP-000033	Yes		
Cover	ADT	(1) SIGA-MCT2 Monitor Module 2 Input UIO MT.	Sturgeon	C70-SECO-SYC-PMP-000033	Yes		
Cover	ADT	(1) G4AVWF Horn/ Strobe Wall Mt.	Sturgeon	C70-SECO-SYC-PMP-000033	Yes		
27 13 00 - Telephone System							
Cover/ CDOT/ CTMC	Mitel	(2) Mitel 6930 IP Phone	Sturgeon	C70-SECO-SYC-PMP-000031	In CDOT Bldg now	Pricing an additional phone because of replacement of north wall phone in 2021. Second phone is being repaired by Servitech.	
Cover/ CDOT/ CTMC	Gai- Tronics	(2) Gai-Tronics 227-001 Tough Phone	Sturgeon	C70-SECO-SYC-PMP-000031	Yes		
Cover/ CDOT/ CTMC	Raritan	(1) Raritan-2802 PDU	Sturgeon	C70-SECO-SYC-PMP-000031	Kapsch Cabinet in CDOT		
27 13 10 - Voice Alarm System							
CDOT & CTMC	Ford Audio	(1) 4 Zone Dante Mic Station	Sturgeon	C70-SECO-SYC-PMP-000016	Yes	Delivered to Jorgensen: Septemeber 2022 4 Zone Mic is at the CDOT Building End of line devices delivered in September Logic Controlled Relay is removed, no longer required because this is a network system	
CDOT & CTMC	Ford Audio	(1) Octradrive DSP - DN	Sturgeon	C70-SECO-SYC-PMP-000016	Yes		
CDOT & CTMC	Ford Audio	(1) 8 Channel Amplifier	Sturgeon	C70-SECO-SYC-PMP-000016	Yes		
CDOT & CTMC	Ford Audio	(1) Horn Speaker	Sturgeon	C70-SECO-SYC-PMP-000016	Yes		
CDOT & CTMC	Ford Audio	(1) End of Line Detection	Sturgeon	C70-SECO-SYC-PMP-000016	Yes		
CDOT & CTMC	Ford Audio	(1) Ambinet Noise Sensor	Sturgeon	C70-SECO-SYC-PMP-000016	Yes		
CDOT & CTMC	Ford Audio	(1) Flex Channel DSP	Sturgeon	C70-SECO-SYC-PMP-000016	Yes		
CDOT & CTMC	Ford Audio	(1) Logic Controlled Relay (Removed)	NO LONGER NEEDED	C70-SECO-SYC-PMP-000016	Yes		
27 14 00 - Cover Tunnel Two Way Radio System							
Cover/ CDOT/ FCC	DAS	None	Sturgeon	C70-SECO-SYC-PMP-000020	Yes	Delivered to Jorgensen: _____ Jorgensen Signature: _____	
27 22 00 - Tunnel CCTV & AID System							
CDOT Building	Surveillance One	(2) Axis Q62 Spare Kit	Sturgeon	C70-SECO-SYC-PMP-000013	Yes		
CDOT Building	Surveillance One	(1) Axis Q87 Spare Kit	Sturgeon	C70-SECO-SYC-PMP-000013	Yes		
27 24 00 - Wayfinding LED Signs							
Cover	DisplaySigns	The prices and parts list are provided in OM. These are not all spares. Sturgeon will provide 2 Complete Illuminated Signs as spares with the exception of the face plate. Face plates are unique to each location. Spare sign housing can also be utilized in Non Illuminated locations.	Sturgeon	C70-SECO-SYC-PMP-000022	Yes	Sturgeon to Order	

# Exhibit VI

## 27 25 01 - SCADA I/O

Cover	Dell	(8) 240 GB SSD SATA Mixed Use 6GPS 2.5" Hard Drive	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Dell	(1) Workstation, Precision 3431, 16GB, 256GB SSD, 1GB Nic Cards	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Ethernet Switch - FL Switch 40008T-25FP - 2891062	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Power Module - AXL F PWR 1H - 2688297	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Bus Coupler - Profinet Acl F BK PN - 2701815	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Safety Input Module - AXL F SSDI8/4 1F 2702263	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Safety Output Module - AXL LPSD08/3 1F - 2702171	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Safety Output Module - AXL AXL SSD08/3 1 F - 2702264	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) 4-20mA Analog inputs - AXL I4 I XC 1H - 2702007	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) RTD 8 Analog Inputs AXL F RTD8 1F 2688077	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(2) Coupling Relay PSR-PS20-1NO-1NC-24DC-SC - 2700356	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) Safety Input Module - AXL F SSD08-3 - 1190012	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) 10 Amp Circuit Breaker TMC81C 10 A - 2907566	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) 5 Amp Circuit Breaker TMC81C 5A - 2907562	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(1) 20 Amp Circuit Breaker TMC81C 20 A - 2907573	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(4) Terminal Block - UT 4-HESILA 250 (5X20) - 3046100	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(8) Terminal Block - UT 4-HESILED 24 (5X20) - 3046090	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(28) Terminal Block UT 4-L/HESILED 24 (5X20) 120KO - 3214366	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Phoenix	(6) Terminal Block UT 4-PE/L/HESILED 24 (5X20) 12 - 3214321	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Eaton	(1) Fuse Time Delay 1A BK/GMC-1-R	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Eaton	(40) Fuse Time Delay BK1/GMC-2-R	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Eaton	(4) Fuse Time Delay BK/MDL-12-R	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Eaton	(1) Fuse Time Delay BK/GMA-15-R	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes
Cover	Eaton	(2) Fuse Time Delay S506-12.5-R	Kapsch	C70-KAPSCH-SYC-ML-000001	Yes

All material in possession with Jorgensen: \_\_\_\_\_

Additional RIO delivered: 02/10/2023

Jorgensen Signature: \_\_\_\_\_

## 27 26 00 - Deluge Local Control

FCC Rooms & CDOT	Convergence	(2) Red illuminated Push Buttons	Convergence	C70-CC&E-SYC-MAN-000001	Yes
FCC Rooms & CDOT	Convergence	(1) Green illuminated Push Buttons	Convergence	C70-CC&E-SYC-MAN-000001	Yes
FCC Rooms & CDOT	Convergence	(1) Amber illuminated Push Buttons	Convergence	C70-CC&E-SYC-MAN-000001	Yes

Expected Delivery 03/17/2023

### **ISO 27001 – Operating Period Plan**

ISO 27001 Contractor/consultant will be engaged by KMP on an annual bases to provide a review to determine that the system is in accordance with ISO 27001. This will be in the form of an audit/report.

The following will be captured into a working plan where KMP and the Contractor/consultant will contribute to its ongoing development.

The Central 70 Cover Project utilizes a network of many different types of resources and devices. The network supports cameras, sensors, access control systems, and many other Life Safety Systems. These Security Mandates directly address security concerns and issues to prevent loss of money, resources and lives.

#### **Access Control:**

##### **Authorized Personnel;**

KMP - require both written authorization from Chief Financial Officer and O&M General Manager relating to any changes, updates or personnel undertaking this work on KMP's behalf.

CDOT – require approval through Aconex on matters relating to changes and updates.

##### **Authorized Software;**

KMP - require both written authorization from Chief Financial Officer and O&M General Manager relating to any software changes and/or updates.

CDOT - require approval through Aconex on matters relating to changes and updates.

##### **Authorized Equipment;**

KMP - require both written authorization from Chief Financial Officer and O&M General Manager relating to any equipment changes and/or updates.

CDOT - require approval through Aconex on matters relating to changes and updates.

#### **The Cover Network Vulnerabilities:**

- Unauthorized physical access to network resources or devices leading to unauthorized access to the network.
- Unhardened or unconfigured network resources or devices connected to the network.
- Making changes to the Production Network which impacts Life Safety Systems.
- Unknown or non-business-related Internet access.
- Network threats such as malware, viruses or ransomware, cannot be detected.
- Network Topology changes without approval or documentation.
- Loss of connectivity at remote locations such as the CTMC or Node Buildings.

#### **Security Mandates:**

- All network resources should be locked or secured in a way that prevents unauthorized access.
- All network resources will have their Ports disabled while not in use. No unmanaged network resources will be utilized in any portion of the Production Network.
- No changes will be made to the Production Network while Life Safety Systems are in use.
- Internet access will not be granted to Users, devices, or other resources.
- Unauthorized applications cannot or will not be installed within the Production environment.
- All topology changes made within the Production Environment will be approved, tracked and

documented.

- The Project will provide “remote hands and eyes” response to remote locations for network and device support.

### **Guidelines, Procedures, and Processes**

#### Physical Access:

Network Resources such as switches, routers, firewalls and Service Provider Equipment should be located where only authorized personnel have access to them.

Enforcement of the Physical Access Mandate prevents critical systems from being disconnected and also prevents unauthorized devices or Users from being connected to the network.

#### Unmanaged Network Resources:

No unmanaged network switches or similar network resources will be added to the Production Network.

All network resources will have their inactive network Ports disabled. All network resource default credentials will be changed.

Enforcement of the Unmanaged Network Resources Mandate prevents unauthorized access to the network. Unmanaged network switches do not utilize credentials or accounting which allows devices to connect and disconnect from the network without creating a record or logs of their actions. When switch ports are disabled no unauthorized Users or devices are allowed to connect to the switch.

#### Changes While Life Safety Systems are in Use:

Changes to the Production Network will not be made while Life Safety Systems are in use. This includes configuration changes on switches or devices, and physical changes to network resources or Life Safety end-point devices.

Enforcement of the Production Network Changes Mandate prevents issues and other critical failures within the Production Network which could cause Life Safety Systems to become unavailable or stop functions.

#### Unauthorized Internet Access:

The entirety of the Production Network design has been based upon the Internet being inaccessible. This means that normal day-to-day operations and Users do not utilize Internet access.

Enforcement of the Unauthorized Internet Access Mandate prevents cyber security issues and incidents from occurring.

#### Unauthorized Applications:

The network traffic and network communications within the Production Network cannot be inspected, analyzed, or blocked/prevented which means that all communications need to be authorized and approved. Unauthorized applications could have unknown qualities which negatively impact Life Safety Systems, or they could contain malicious payloads designed to prevent critical systems from functioning. Enforcement of the Unauthorized Internet Access Mandate prevents cyber security issues and incidents from occurring.

#### Topology Changes:

Due to the complexity of the Production Network all changes need to be Approved, Tracked, and Documented. This includes connecting new devices, changes to up-links between switches, or connecting new network switches or network resources.

Enforcement of the Topology Changes Mandate allows for changes within the environment to be accounted for before the changes are made. This includes presenting the changes for approval, tracking and scheduling the changes, and updating the supporting documentation based on the changes made.

Protocols will be developed to ensure physical secure access & egress is maintained.

Remote Hands and Eyes:

The Production Network connects to many locations outside of the Cover which require on-site troubleshooting. When an issue occurs at a remote location personnel will be provided for “remote hands and eyes” support.

Enforcement of the Remote Hands and Eyes Mandate allows Experts and Technology Contractors/Specialist to remotely support multiple locations. This saves time and resources so that critical systems can remain online without sending critical staff in to the field.