Performance Audit:
Department of Watershed Management
Capital Projects Contract Management

December 2020

City Auditor's Office

City of Atlanta

File #20.06

CITY OF ATLANTA
City Auditor's Office
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December 2020

Performance Audit:

DWM Capital Projects Contract Management

Why We Did This Audit

We undertook this audit to review controls over the management of capital projects in the Department of Watershed Management and to assess whether those controls were followed.

What We Recommended

To address minor gaps in controls and to update controls to reflect current practice, the Capital Projects Management Division should:

- Incorporate safety plan elements into the project management plan template.
- Regularly review and update the PDS.
- Incorporate supplemental guides in PDS.
- Add activity to process consultant invoices.
- Establish project cost threshold over which a value engineering workshop is required.
- Develop and document process to compare design costs to construction costs.
- Add an item to closeout checklists to ensure reporting requirements for grantors and bond covenants are addressed.
- Develop formal warranty inspection and post-occupancy evaluation procedures.
- Ensure backup manual processes document established workflows.
- Update Inspection Daily Report process in e-Builder to include safety issues.
- Update change document workflow in e-Builder to include routing step for review by the project controls team.

To consistently apply project management tools as described in the Project Delivery System, Watershed Management staff should:

- Follow procedures for developing and updating project management documents.
- Create and maintain technical review meeting summaries.
- Ensure all construction oversight documentation is maintained in e-Builder.
- Ensure that punch lists are generated.
- Maintain review comments and approvals of safety plans and related submittals.
- Consistently use pay application checklists.

To avoid future loss of access to systems, the Department of Watershed Management should:

- Procure any systems directly from vendors through the city's procurement process.

To maintain project documentation, Watershed Management staff should:

- Continue to upload remaining data from during the e-Builder outage to e-Builder.

For more information regarding this report, please use the "contact" link on our website at www.atlaudit.org

What We Found

The Department of Watershed Management has developed a mature PDS (project delivery system) to describe detailed policies and procedures that follow best practices for capital project management. This provides project teams with a framework for project management that addresses relevant risks. We found that Watershed Management has established controls that address most capital project risks. We identified minor gaps in controls over cost, schedule, reporting, safety, and quality management. We also noted portions of the PDS that no longer reflect current practice that should be updated.

While the PDS is a mature system of internal control following most industry best practices, controls must be actually implemented in order to have the desired effect on risks. We tested implementation of the controls detailed in the PDS and found that most key controls had been implemented, in e-Builder or otherwise, but that inconsistencies and opportunities for improvement remain. We reviewed project documentation in e-Builder for three sample projects: an active project, a complete project, and a project with a detailed design phase.

The e-Builder program management information solution contains an important suite of controls used by staff to manage projects. Watershed Management lost access to the system in January 2020 during the transition from an agreement between e-Builder, Inc. and the former program management team to an agreement directly between the city and e-Builder, Inc. The department did develop temporary backup controls to mitigate the effects of the lapse in access to e-Builder, though replacing automated with manual processes does introduce risk. The department also developed a detailed plan to migrate 2020 data into e-Builder after regaining access. Access to e-Builder was restored in August 2020, and we were able to confirm that staff has begun executing the plan to load 2020 project data into e-Builder.

Management Responses to Audit Recommendations

Summary of Management Responses		
Recommendation #1:	We recommend that the Project Delivery System administrator incorporate safety plan elements into the project management plan template.	
Response & Proposed Action:	Will include references to safety plan requirements in the Project Management Plan Outline template in the PDS.	**Agree**
Timeframe:	March 31, 2021	
Recommendation #2:	We recommend that the Project Delivery System administrator regularly review and update the Project Delivery System to ensure it more clearly reflects current practice using e-Builder forms and what legacy forms are used only as backup controls.	
Response & Proposed Action:	We will review all forms referenced in the PDS with respect to e-Builder forms and current practices and make appropriate modifications to the PDS. This will be performed annually.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #3:	We recommend that the Project Delivery System administrator incorporate supplemental guides by reference within the appropriate flowchart steps of the Project Delivery System, including the final version of the dashboard standard operating procedure in the recurring activity Update Project Summary Report.	
Response & Proposed Action:	Will finalize the Standard Operating Procedure Content Element Definitions/Development Project Summary Dashboard report, dated February 2017, and add it to the PDS with discussion and a reference link in the overview flowchart Recurring Activities: Update Project Summary Report.	**Agree**
Timeframe:	March 31, 2021	
Recommendation #4:	We recommend that the Project Delivery System administrator add a recurring activity for processing consultant invoices to the Project Delivery System design phase.	
Response & Proposed Action:	Will add recurring activities for consultant Process Payment Applications in the PDS at the appropriate flowchart design phase locations.	**Agree**
Timeframe:	March 31, 2021	
Recommendation #5:	We recommend that the Capital Projects Management Division establish a project cost threshold over which a value engineering workshop is required and require documentation for the reasons for waiving value engineering studies so required.	
Response & Proposed Action:	Will develop a Value Engineering guidance document/approval template for the PDS. It will be linked at appropriate flowchart locations.	**Agree**
Timeframe:	June 30, 2021	

Recommendation #6:	We recommend that the Capital Projects Management Division develop and document a process to compare design costs to construction costs during the documentation of lessons learned.	
Response & Proposed Action:	Will develop a report in e-Builder to capture and record design costs as a percentage of construction costs with verification as part of the Lessons Learned process.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #7:	We recommend that the Capital Projects Management Division add an item to the closeout checklists to ensure that reporting requirements for grantors and bond covenants are addressed during closeout.	
Response & Proposed Action:	Department of Finance/Office of Debt and DWM/Office of Financial Administration are jointly responsible for reporting on the grants and bond covenants requirements. Will modify the Project Closeout Checklist in the PDS to include the request for a verification of project compliance with grant requirements and the bond covenants in the memorandum for the final project closeout.	**Agree**
Timeframe:	March 31, 2021	
Recommendation #8:	We recommend that the Capital Projects Management Division develop formal warranty inspection and post-occupancy evaluation procedures to take place during the warranty period.	
Response & Proposed Action:	Will develop additional warranty inspection and post occupancy evaluation procedures and add it to the PDS under the Post-Construction Activities/Warranty Administration flowchart location.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #9:	We recommend that the Capital Projects Management Division ensure that backup manual processes document established workflows during e-Builder interruptions.	
Response & Proposed Action:	During the e-Builder outage we established several temporary procedures to manually continue project management activities outside of e-Builder. These documents will be reviewed, updated, and supplemented as needed and stored in the PDS for future reference.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #10:	We recommend that the e-Builder administrator update the Inspection Daily Report process in e-Builder to include a section for reporting safety issues.	
Response & Proposed Action:	The Daily Safety Inspection Checklist in the PDS is completed by the inspectors to document and track general site safety issues. The contract-provided Project Safety Officer prepares and transmits daily safety reports to DWM Construction Manager as required by City contract. Additionally, e-Builder already has a stand-alone Safety Violation Notice (SNV) Form. It will be added to the PDS with a link to the document under the flowchart stage: Construction/Monitor Safety Compliance.	**Agree**
Timeframe:	March 31, 2021	
Recommendation #11:	We recommend that the e-Builder administrator update the change document workflow in e-Builder to include a routing step for review of the contractor proposal by the project controls team.	

Response & Proposed Action:	Will assure the Change Document (CD) process in e-Builder and planned modifications to divide the CD process into three separate processes, include Project Controls review steps.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #12:	We recommend that Watershed Management staff follow procedures for developing project management plans, project risk registers, and project communications plans and maintain these documents in the project files in e-Builder.	
Response & Proposed Action:	Will develop an oversight process to monitor the extent project management procedures are being followed.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #13:	We recommend that Watershed Management staff follow procedures to update project management plans, project risk registers, and project schedules throughout projects and maintain these updated documents in the project files in eBuilder.	
Response & Proposed Action:	Will develop an oversight process to monitor the extent project management procedures are being followed.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #14:	We recommend that Watershed Management staff create technical review meeting summaries and maintain these documents in the project files in e-Builder.	
Response & Proposed Action:	Will develop an oversight process to monitor the extent project management procedures are being followed.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #15:	We recommend that Watershed Management staff ensure all construction oversight documentation, including preconstruction meeting agendas, checklists, testing forms, and submittal approvals, are maintained in the project files in eBuilder.	
Response & Proposed Action:	Will develop an oversight process to monitor the extent project management procedures are being followed.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #16:	We recommend that the Watershed Management staff ensure that city-issued punch lists are generated according to procedures described in the Project Delivery System to document the city's awareness of critical or incomplete items and completion dates of corrective actions.	
Response & Proposed Action:	Will develop an oversight process to monitor the extent project management procedures are being followed.	**Agree**
Timeframe:	June 30, 2021	
Recommendation #17:	We recommend that the Watershed Management staff maintain review comments on and approvals of safety plans and related submittals in the project files in e-Builder.	
Response & Proposed Action:	Will develop an oversight process to monitor the extent project management procedures are being followed.	**Agree**
Timeframe:	June 30, 2021`	
Recommendation #18:	We recommend that the Watershed Management staff consistently use pay application review checklists and maintain these documents in the project files in e-Builder.	
Response & Proposed Action:	The pay application checklists will be added to the Invoice Approval process as a linked reference document for consultation during reviews.	**Agree**

Timeframe:	June 30, 2021	
Recommendation #19:	We recommend that the Department of Watershed Management procure any systems directly from vendors through the city's usual procurement process, rather than issuing a task order for a contractor to procure systems.	
Response & Proposed Action:	On July 30, 2020, DWM issued an NTP for a contract with e-Builder, SP-S 1200145, e-Builder Software Support and Training Services. The initial term of the Contract was one year with up to four annual renewals. The first renewal was executed on October 31, 2020. The last year of the contract would expire on October 31, 2024, by which a new contract will be procured.	**Agree**
Timeframe:	Complete	
Recommendation #20:	We recommend that the Watershed Management staff continue to upload all remaining project data from during the eBuilder outage to e-Builder.	
Response & Proposed Action:	This is an ongoing effort expected to continue through the end of the 2020 calendar year.	**Agree**
Timeframe:	December 31, 2020	

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December 17, 2020

Honorable Mayor and Members of the City Council:

We undertook this audit to review controls over the management of capital projects in the Department of Watershed Management and to assess whether those controls were followed. This is the first in a series of capital projects contract management audits in various city departments following the conclusion of our eight-audit series on the Renew Atlanta and TSPLOST programs.

We found that the Department of Watershed Management has developed and implemented a mature project delivery system to describe detailed policies and procedures that align with best practices for capital project management. Our recommendations focus on addressing minor gaps in controls, updating controls to reflect current practice, and consistently using project management controls and tools as designed.

The Audit Committee has reviewed this report and is releasing it in accordance with Article 2, Chapter 6 of the City Charter. We sent the draft report to management on November 19, 2020, and received the final response December 11, 2020. We appreciate the courtesy and cooperation of city staff throughout the audit. The team for this project was Brandi D. Bell, Ijegayehu Jones, and Matthew Ervin.

Amanda Noble
City Auditor

Danielle Hampton
Chair, Audit Committee

DWM Capital Projects Contract Management

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List of Exhibits

Introduction

We undertook this audit to review controls over the management of capital projects in the Department of Watershed Management and to assess whether those controls were followed. This is the first in a series of capital projects contract management audits in various city departments following the conclusion of our eight-audit series on the Renew Atlanta and TSPLOST programs. The Department of Watershed Management's OES (Office of Engineering Services) is responsible for managing the department's capital improvement program, including design and construction projects to comply with the city's consent decrees.

Background

The Department of Watershed Management was formed in September 2002 to manage the City of Atlanta's drinking water, wastewater, and storm water systems. Pollution from stormwater and wastewater discharges led to two federal consent decrees in 1998 and 1999 that required the city to bring its CSOs (combined sewer overflows) and SSOs (sanitary sewer overflows) into compliance with the Clean Water Act and Georgia Water Quality Control Act. By 2009, the department had spent over $2 billion on capital projects and had reduced the volume of sewer spills by 97%.

After the completion of the CSO consent decree and the extension of the SSO consent decree to 2027, Watershed Management implemented a $1.27 billion capital improvement program to enhance water system efficiencies while ensuring the city maintains compliance with federal and state regulations. The program includes projects across five categories: water, wastewater, general support, CSO facilities, and stormwater. The CPMD (Capital Project Management Division) of the Office of Engineering Services is responsible for overall management of the capital improvement program and uses e-Builder as the program management information solution to store project documentation and track activity.

The Department of Watershed Management is Responsible for a $1.27 Billion Capital Program

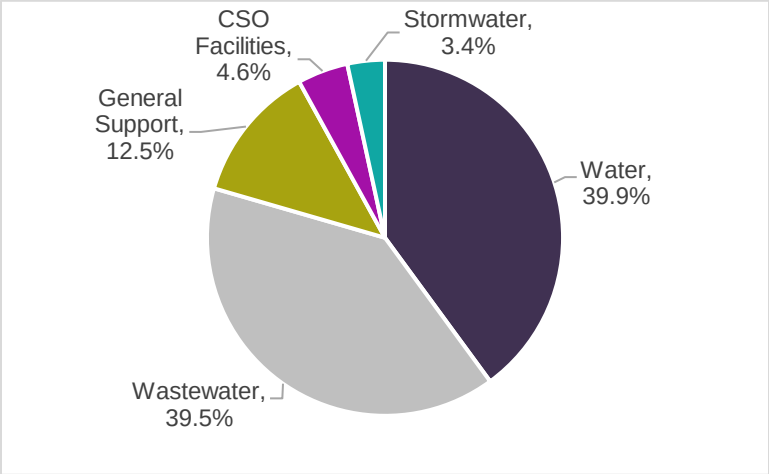
On September 24, 1998, a consent decree was entered in the U.S. District Court in the Northern District of Georgia to resolve alleged

Clean Water Act and Georgia Water Quality Control Act violations. The complainants alleged the city violated terms of NPDES (National Pollutant Discharge Elimination System) permits issued by the EPA (Environmental Protection Agency) at CSO control facilities and discharged untreated or partially treated wastewater into the Chattahoochee and South River and their tributaries. On July 29, 1999, a second consent decree was filed to resolve alleged violations of the Clean Water Act and the Georgia Water Quality Control Act that occurred at the City's wastewater treatment facilities and collection and transmission systems between 1993 and 1998. Work under the first consent decree, governing the combined sewer system, was completed in 2008. The court extended the completion time for the SSO consent decree to 2027.

In 2014, Watershed Management drafted a plan to evaluate water resource projects based on facility assessments conducted between 2011 and 2013. Watershed Management developed the plan to balance the department's capital investment needs for Clean Water Act compliance with the provision of safe drinking water for the Atlanta Metropolitan region. Following development of the plan, the department implemented a five-year (FY 2015 – 2019) CIP (Capital Improvement Program) to identify requirements to sustain, restore, and modernize the facilities and infrastructure that support various water systems in the Atlanta service area.

The capital program consists of consent decree and non-consent decree improvement projects intended to enhance system efficiency and reliability, renew or replace assets, and address regulatory requirements. The program contains five project categories: water, wastewater, general support, CSO facilities, and stormwater (see Exhibit 1). In November 2017, the CIP reported 82 projects across the different categories with a total estimated budget of just over $1.27 billion. The water supply program under the water system category represents the largest CIP project, with an estimated budget of nearly $342 million.

Exhibit 1: FY 2015-2019 CIP Composition by Program Categories

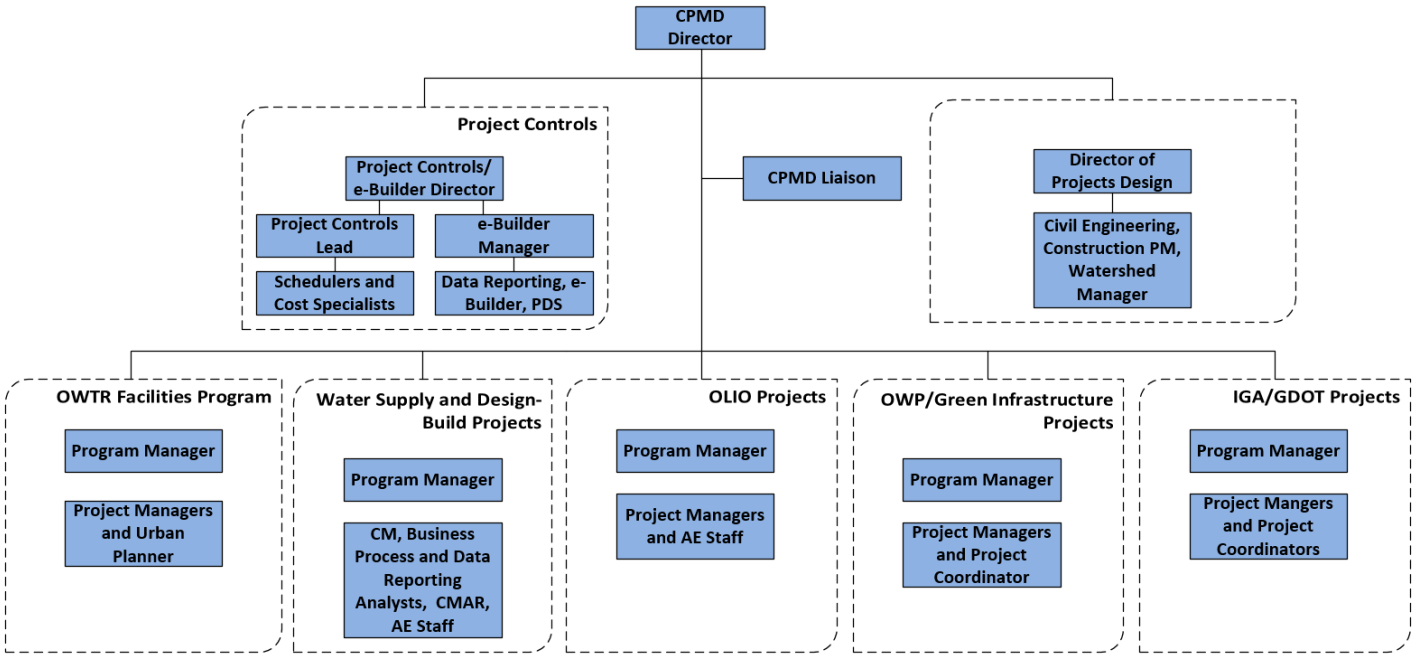


Source: Department of Watershed Management FY 2015-2019 Capital Improvement Program Plan

The Office of Engineering Services Manages the Capital Improvement Program

The CPMD (Capital Project Management Division) of the Office of Engineering Services is responsible for overall management of the capital improvement program. CPMD staff oversees design and construction of projects to ensure compliance with the city's consent decrees and administrative orders, as well as other improvements to the city's drinking water and wastewater systems. Staff responsibilities also include providing design and consultant/project management services to control construction costs and quality. Contracted services are provided on the Project Controls, Water Supply and Design Build Projects, and the OLIO (Office of Linear Infrastructure Operations) teams (see Exhibit 2).

Exhibit 2: DWM OES Capital Projects Management Division Organizational Chart

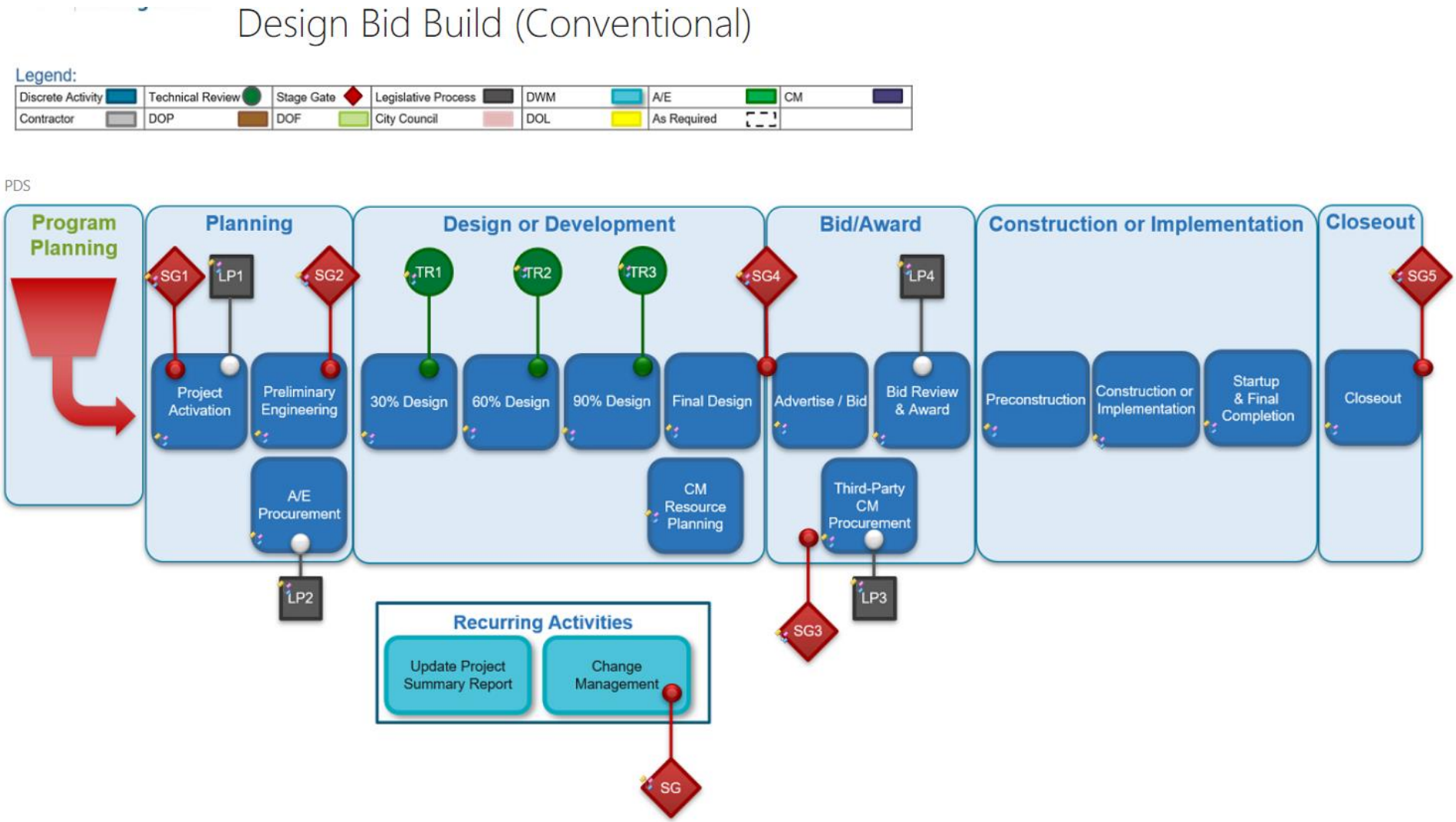


Source: Department of Watershed Management

The Capital Projects Management Division Has Developed a Project Delivery System to Manage Projects

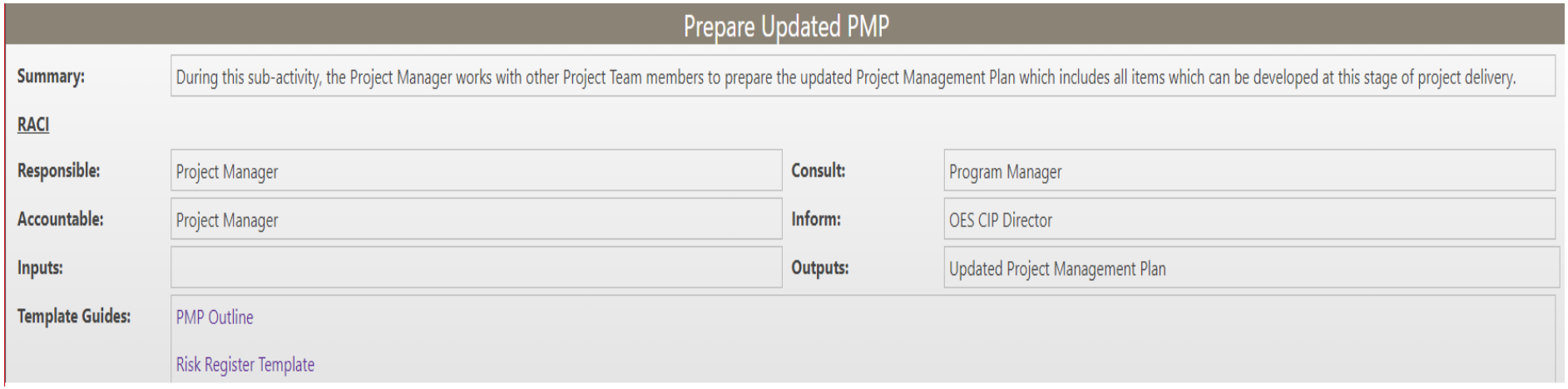
In 2016, the department implemented a cloud-based PDS portal that contains detailed procedures spanning the project lifecycle, from project activation to closeout (see Exhibit 3). The PDS includes five stage gates that require approval from an executive committee to proceed to the next phase of the project. Each phase of the project lifecycle is broken down into activities and sub-activities. Each activity and sub-activity includes a description of what actions must be taken, any necessary inputs or outputs, and links to any associated templates from the template guide library, a central location for all templates and documents linked in the PDS. Each step also includes a RACI designation, which identifies who is Responsible for an activity, who is Accountable for an activity, and who to Consult and Inform for the activity (see Exhibit 4).

Exhibit 3: Design Bid Build Project Delivery System Covers All Phases of Project Lifecycle



Source: DWM Project Delivery System

Exhibit 4: PDS Activities Designate RACI Roles and Link to Guidance



Prepare Updated PMP			
Summary:	During this sub-activity, the Project Manager works with other Project Team members to prepare the updated Project Management Plan which includes all items which can be developed at this stage of project delivery.		
RACI			
Responsible:	Project Manager	**Consult:**	Program Manager
Accountable:	Project Manager	**Inform:**	OES CIP Director
Inputs:		**Outputs:**	Updated Project Management Plan
Template Guides:	PMP Outline Risk Register Template		

Source: DWM Project Delivery System

The Capital Projects Management Division Uses e-Builder to Track Projects

In 2017, CPMD staff began using e-Builder as a web-based solution to track project data and related activities in a central location. The system enables communication among the owner, engineer, and contractor and facilitates timely processing and approval of contract documentation in coordination with the overall project schedule. The system contains hyperlinks to project documentation for review and also captures and reports user activity. CPMD extends e-Builder access to external service providers to transmit required documentation to the city for review and approval and to complete certain actions through workflow processes. Defined system roles appear to limit user access to certain project documentation. The system restricts deletions of project information from e-Builder.

The e-Builder home page shows a user any tasks, workflow steps, submittals, or other items requiring that user's attention or approval. The system contains several modules that staff uses for project management. The Projects module enables administrators to configure all project members to view vital project information, such as the project name, project number, oracle number, project controls member, contract manager, design manager, project manager, and project status. The project name within the project list is a hyperlink that reveals project details completed by the project manager upon activation.

The Documents module provides a central depository for project documentation. The system allows users to submit project data and documentation. The department uses a standard folder structure for each project, with nine main folders that contain various sub-folders. The sub-folders hold documents for review including contracts, start-up documentation, pay applications, change documents, contractor submittals, and closeout documents. For tracking purposes, the system also reports the upload date and the individual who uploaded documentation, as well as the user and time stamp for any subsequent modifications, downloads, or views.

The system also contains interactive project delivery schedules in the Schedule module. The schedule shows project tasks and the duration of each task, with start and finish dates. Users are also able to view schedule history data to identify user and timestamp information for completed tasks. The Cost module includes detailed project cost information such as line item budgets, forecasts, commitments, and actual costs. The module also links to the invoice approval process to

allow a user to view the approval workflow and any attachments uploaded to support payment applications.

The Forms and Processes modules contain workflow and static forms, which are customizable input screens used to record specific project data. Forms are created according to business processes and may be routed to various project team members or roles. Workflow forms can be routed to a number of different user roles, even across organizations for communication purposes. Static forms are mainly a "one-way" communication tool used to document and store project information. User and timestamp data for all reviews and approvals within a workflow are accessible for later review.

The e-Builder Reports module allows users to view reports on all aspects of accessible projects in e-Builder. System reports can provide an analysis of project data and can either be displayed, printed, emailed, exported, or saved. The module also includes certain dashboard reports that provide graphical depictions of program overview and performance, project statuses, and metrics.

Audit Objectives

This report addresses the following objectives:

- Is the design of the capital projects system of internal control consistent with industry best practices?
- Do key internal controls exist and have they been placed into operation? Were they used appropriately on a sample of projects?

Scope and Methodology

We conducted this audit in accordance with generally accepted government auditing standards. We reviewed the division's Project Delivery System for traditional design-bid-build capital projects but did not review the controls for design-build or construction-manager-at-risk projects. We tested for the implementation of key controls on two randomly selected projects, one active and one complete. Because neither of those two projects had a design phase, we also tested design phase controls on a third project known to have a design component. Due to the lapse in access to e-Builder experienced by the department, we did not test any project data from 2020. Most of our testing covered data from the year 2019, though some tests covered older data.

Our audit methods included:

- reviewing various sources of industry best practices to build a comprehensive capital projects best practice framework
- reviewing the Project Delivery System used by the department against identified best practices
- identifying key controls based on the review of the Project Delivery System and risk assessment techniques
- testing for the use of key controls on a sample of projects
- reviewing the department's plan for interim controls during the lapse in access to e-Builder

Generally accepted government auditing standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Findings and Analysis

Mature System of Internal Control Follows Capital Program Best Practices

The Department of Watershed Management has developed a mature PDS (project delivery system) to describe detailed policies and procedures that follow best practices for capital project management. This provides project teams with a framework for project management that addresses relevant risks. We found that Watershed Management has established controls that address most capital project risks. We identified minor gaps in controls over cost, schedule, reporting, safety, and quality management. We also noted portions of the PDS that no longer reflect current practice that should be updated. We recommend that the Project Delivery System administrator update the PDS to address these issues.

Project Delivery System Reduces Capital Project Risks

We reviewed the PDS procedures in comparison to best practices for capital project management throughout planning, design, execution and testing, and turnover, using a capital project procedural framework developed by PricewaterhouseCoopers (see Exhibit 5). We found that Watershed Management has established controls that address most risks associated with each phase and element, color-coded green in Exhibit 5. We identified minor gaps in controls over cost, schedule, reporting, safety, and quality management. The PDS addresses most best practices for these phases and elements, but due to these minor gaps they are color-coded yellow in Exhibit 5. Gray elements in Exhibit 5 were outside of our scope. We also noted portions of the PDS that no longer reflect current practice that should be updated. We recommend that the Project Delivery System administrator update the PDS to address these issues.

Our testing assessed controls across ten elements for each lifecycle phase: organization framework, procurement and contract management, scope and change management, cost and financial management, schedule management, systems and tools, risk and issue management, communication and reporting, quality management, and safety management.

Exhibit 5: Controls Exist for Most Project Elements and Lifecycle Phases

		Project Lifecycle					
		Planning	**Design**	**Execution**	**Testing**	**Turn-over**	**Operations/ Maintenance**
Project Elements	**Organization Framework**	Project resource plan, organization, roles and responsibilities		Mobilize and manage labor	Demobilization	Operations staff planning	Ongoing requirements/skills review
	Procurement and Contract Management	Contract strategy	Contractor qualification and evaluation	Contractor selection and negotiation	Contract compliance review	Trouble-shoot and punch list	Vendor qualification and selection
	Scope and Change Management	Project objectives and scope definition	Detailed project design and scope freeze	Change control		Owner acceptance	Asset change management
	Cost/Financial Management	Project estimate	Project cost baseline	Cost control		Final payment/retention release	Operations & maintenance budgeting
	Schedule Management	Project schedule requirements	Project schedule baseline	Schedule management		Completion checklist	Ongoing Maintenance Schedule
	Systems and Tools	Project systems strategy	Implement project systems	System support and maintenance		Transition to enterprise asset management	
	Risk and Issue Management	Risk and issue management planning	Risk and issue tracking and resolution			Confirm issue resolution	Ongoing issue management
	Communication and Reporting	Assess stakeholder requirements	Project status and regulatory filings	Project performance	Asset performance	Project close-out	Operations and financial reporting
	Quality Management	Quality plan	Specs. Compliance criteria	Quality assurance and control		Transition as-built specifications to operations	
	Safety Management	Safety plan Safety training program		Safety trend tracking and incident investigations		Commissioning interface plan	Operation safety program

Source: PwC Managing Capital Projects Through Controls, Processes, and Procedures; auditor review of DWM PDS

Planning Phase Controls Allow for Proactive Management of Costs and Schedules

The Project Delivery System describes controls to be used during the planning phase of a project in order to facilitate project management throughout the project's lifetime. An executive committee reviews the business case for a new project, which should ensure that only justified projects move forward. The project manager develops a PMP (project management plan), which provides a central location for key planning and project management information to be updated regularly for the rest of the project. While the PDS contains a PMP template, which should ensure that various elements are given due consideration during the planning of a project, that template does not currently include a section for safety and security management. We recommend that the Project Delivery System administrator incorporate safety plan elements into the project management plan template.

If a given project will require a detailed design phase, it first needs a preliminary engineering report. During this step, the project team can hold a risk management workshop, issue a communications plan, and review lessons learned from previous projects. The output of the risk management workshop is the risk management plan, which should be updated throughout the project. Once again, an executive committee must approve the work done to this point before allowing a project to move forward. This should ensure that the necessary baseline planning is complete.

We identified a few instances in the planning phase where the PDS does not reflect current practice. We recommend that the Project Delivery System administrator regularly review and update the PDS to ensure it reflects current practice. Additionally, the Office of Engineering Services staff directed us to several supplemental documents, such as a cost estimating guide and a scheduling guide, which are stored on the PDS site but not incorporated by reference into applicable flowchart steps. We recommend that the Project Delivery System administrator incorporate supplemental guides by reference within the appropriate flowchart steps of the PDS.

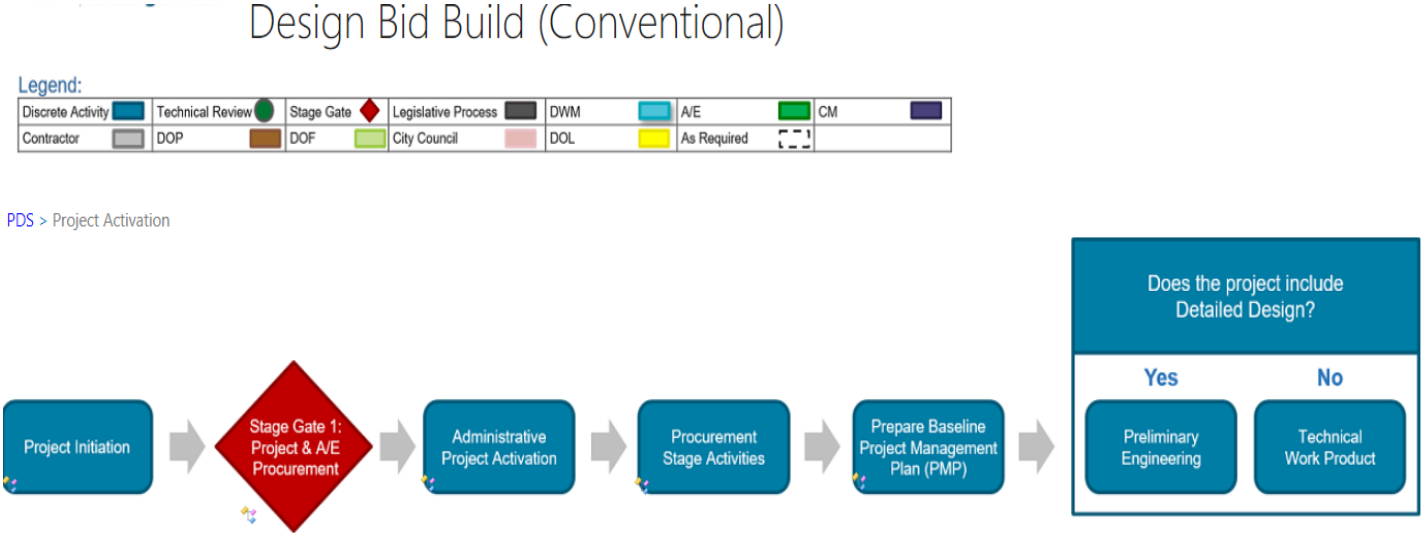
The planning phase of the PDS establishes baseline controls to proactively manage cost and schedule over the lifetime of a project. At the beginning of a new project, a project manager and project sponsor develop a business case, which provides justification for a proposed project and explains the need, scope, risks and high-level impacts to business functions. Next, the project manager recommends a project delivery method—traditional design-bid-build, design-build, or construction manager at risk—using guidance included in the PDS. At

this point, a project must pass through the first stage gate in order to proceed (see Exhibit 6). Stage Gate One requires the project manager to upload checklists and required documents to e-Builder for review by an executive committee, which approves the activation of the project and the proposed project delivery method. This should ensure that only projects with a justified business case move forward, at which point the project manager identifies the estimated cost, schedule, and resources for delivery of the new project. The project manager works with the e-Builder administrator to enter this baseline information into the system.

The development of a PMP (project management plan) is a key control in the planning phase (see Exhibit 6). The PDS includes a template for the baseline PMP which incorporates the business case, project team and stakeholders, a description of project scope, funding plan, schedule milestones, cost estimate, and any project assumptions. The project manager is responsible for preparing and updating the PMP over the lifetime of the project. Other elements are added to the plan during these updates, including communications, risk management, issue management, stakeholder engagement, quality control, permitting, and property acquisition. The project management plan template should ensure that all of these elements are given due consideration in the execution of a project.

Safety and security management is not explicitly included in the PMP template. Best practices suggest the PMP address safety and security measures to reduce possibilities of project delays resulting from potential injuries, safety incidents, and other hazards. Watershed Management does require contractors to submit a site-specific safety plan for review and approval. Watershed Management writes requirements for contractor safety team qualifications and the contractor's safety submittals are approved by the department's Office of Safety, Security, and Emergency Management, which is responsible for sending safety inspectors to project sites. Although these safety elements are addressed in the submittals, the project management plan could highlight project-specific safety elements earlier in the project lifecycle. To ensure risks of safety and security management are addressed, we recommend that the Project Delivery System administrator incorporate safety plan elements into the project management plan template.

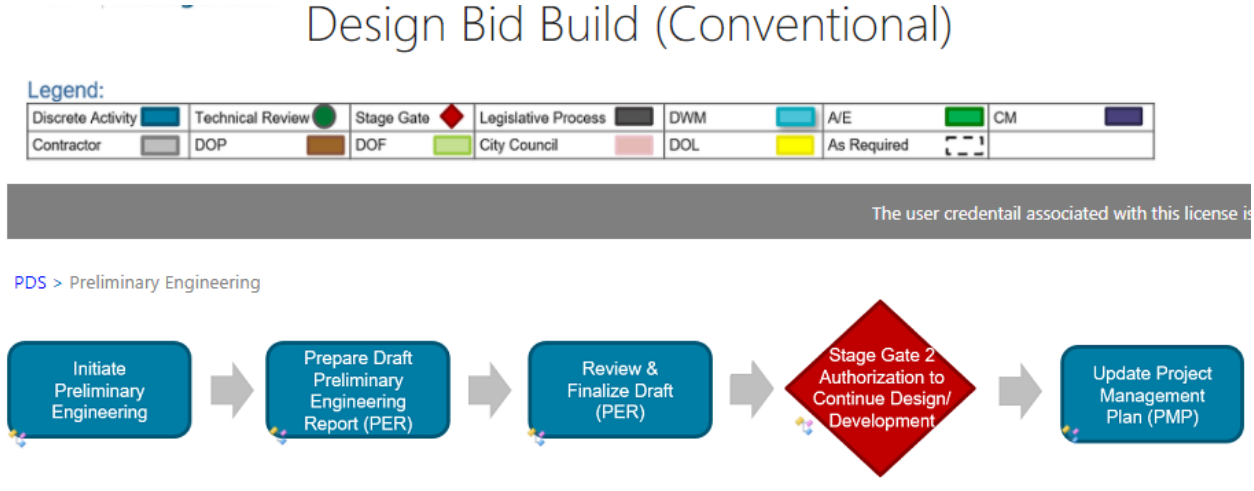
Exhibit 6: PDS Requires Development of a Baseline Project Management Plan Which is Updated Throughout the Lifetime of a Project



Source: DWM Project Delivery System

If a project requires a detailed design, it first needs a preliminary engineering report. As part of preliminary engineering, Watershed Management conducts a kickoff meeting with the project team (including any consultant team), reviews lessons learned from previous projects, issues a communications plan, and facilitates a risk management workshop (see Exhibit 7). The output of the risk management workshop is the risk management plan, which includes risk identification, risk analysis, and risk response planning, embodied in a formal risk register. This risk register will later be updated throughout design and construction.

Exhibit 7: PDS Requires Authorization to Proceed after Preliminary Engineering



Source: DWM Project Delivery System

Following the completion of the preliminary engineering report, a project must once again receive approval to proceed at Stage Gate

Two. Once again, an executive committee reviews a checklist and various documents, including the preliminary engineering report, project management plan, project delivery schedule, communications plan, and risk register. This should ensure that projects do not proceed to detailed design or construction without undergoing the necessary planning and risk management activities. At this point, the project manager also updates the PMP to reflect this additional information.

We identified a few instances in the planning phase of the PDS that do not reflect current practice. As part of the project activation stage, the PDS states the project manager is responsible for preparing a memo that summarizes procurement activities during project delivery that is to be reviewed by the Project Controls team. However, we were told the memo mentioned in the PDS has been replaced by the "Procurement Request Form", which is found in the PDS under a different stage ("A/E Procurement"). Watershed Management also told us the "Project Information Details Sheet" mentioned under the "e-Builder Project Creation" sub-activity has been replaced by the "New Project Setup Request Form"; but we could not locate the form within the PDS. We recommend that the Project Delivery System administrator regularly review and update the PDS to ensure it reflects current practice.

The Office of Engineering Services staff directed us to several supplemental documents, such as a cost estimating guide and a scheduling guide, which are stored on the PDS site but not referenced in applicable flowchart steps. We recommend that the Project Delivery System administrator incorporate supplemental guides by reference within the appropriate flowchart steps of the PDS.

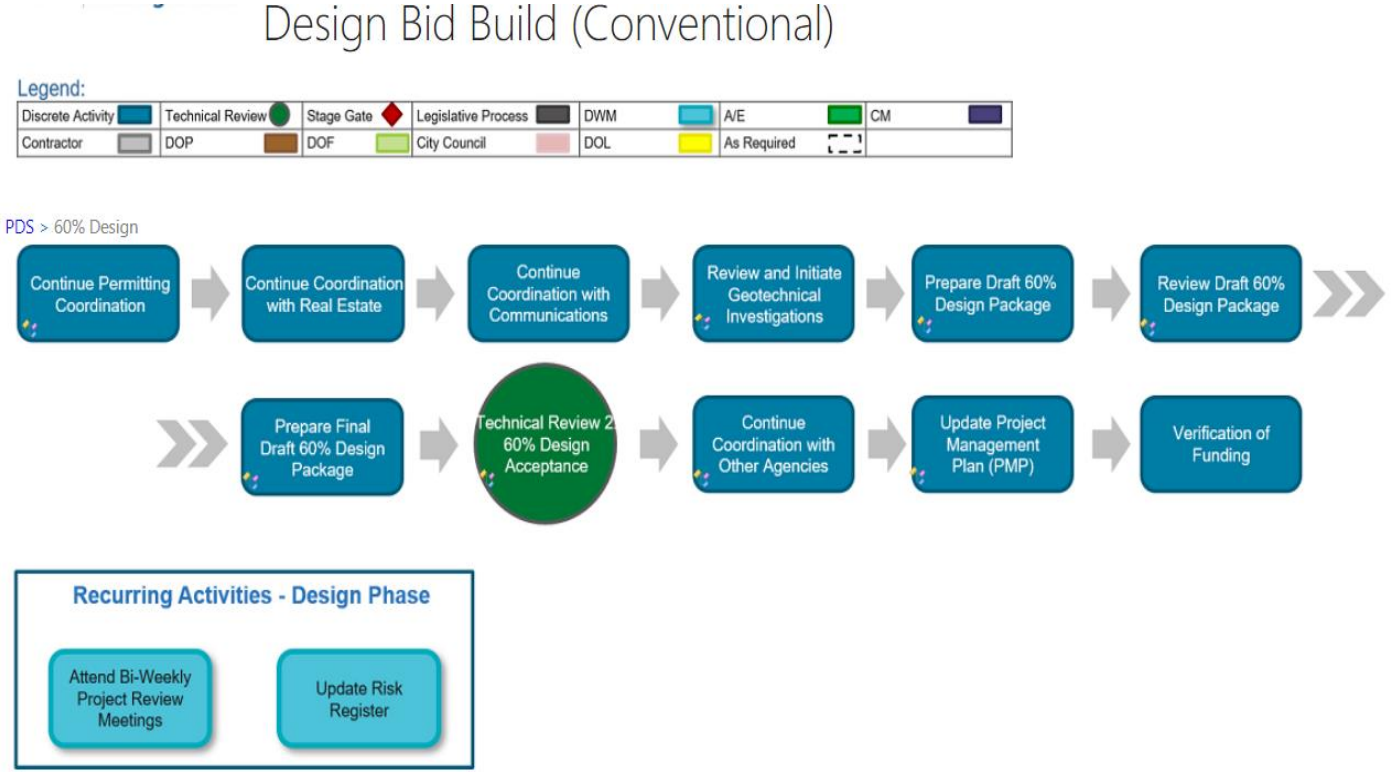
Design Phase Includes Guidance to Balance Quality, Cost, Schedule, and Scope

Design phase controls in the Project Delivery System are intended to ensure design submittals are complete and reviewed. Complete, well-reviewed plans during the design phase work to limit schedule delays and change orders during construction. The PDS calls for technical review of design submittals at several milestones. The PDS also provides guidance for balancing cost, schedule, and project needs during design, including required approvals for scope changes and a scope freeze once plans are 60% complete. The PDS template guide library contains guidance on the process for paying consultant invoices, but this guidance is not included in the PDS process flowcharts. We recommend that the Project Delivery System administrator add a recurring activity for processing consultant invoices to the PDS flowchart for design.

The department currently lacks detailed value engineering policies. Best practice recommends that capital project programs develop value engineering policies to ensure work is done in a cost-efficient manner. These policies would collectively ensure that high-cost projects are presumed to require value engineering unless project staff justify a decision to the contrary. While staff stated that value engineering workshops are typically held for projects estimated at $40–50 million or more, the department has not established in policy a cost threshold at which it is required. We recommend that the Capital Projects Management Division establish a project cost threshold over which a value engineering workshop is required and require documentation of the reasons for waiving value engineering studies so required.

A key objective of the PDS design phase is oversight to ensure design submittals are complete and reviewed, preventing schedule delays and change orders during construction. The design phase of the PDS describes three design review stages; the consultant submits design plans at 30%, 60%, and 90% completion (see Exhibit 3). A design services checklist showing that all required deliverables are included should accompany each submittal. Watershed Management staff then reviews the plans and returns any comments or concerns to the consultant for response. The consultant incorporates the review comments and prepares a final 30%, 60%, or 90% submittal package. At this point, a technical review committee, which includes members who are not part of the project design team, provides a detailed technical review of the plans (see Exhibit 8). Any comments provided by the technical review committee must be addressed in subsequent design submittals. This dual review by stakeholders both within and external to the project design team provides quality assurance of the design to prevent future construction change orders.

Exhibit 8: PDS Requires Dual Review of Design Plan Submittals for Quality Assurance



Source: DWM Project Delivery System

The PDS provides guidance for balancing cost, schedule, and project needs in design. The department's cost estimating guide directs the design team to develop a project scope definition package that identifies all features of the project scope and should ensure that the cost estimates include all project needs. Project managers compare the project budget to updated cost estimates at 30%, 60%, 90%, and final design, and the PDS reminds the project team to "design to budget." Project managers are responsible for reviewing and updating project schedules monthly throughout design, and a scheduling guide details how a schedule baseline should be established and updated. The scheduling guide also details the approvals required to change baseline schedules. Project managers also manage risk throughout design and update the risk register and project management plan at each design completion milestone. Once plans are 60% complete, all major design concepts should be frozen and future changes to scope should be avoided. The policy states that the project manager, program manager, and the project sponsor should review any scope change.

Another key focus of the PDS design phase is coordination between the project team and stakeholders. The department's procedures for design review include opportunities for key stakeholders to review plan submittals and participate in value engineering workshops. Watershed

Management established procedures to maintain regular communication regarding progress and any needed changes. Between 0% and 30% design completion, project managers should identify relevant guidelines and reporting requirements. Project managers are also expected to schedule regular status meetings with the architectural/engineering consultants and project team to discuss design activities, progress, and changes throughout the design phase. Throughout design, the public information officer is expected to coordinate communications among Watershed Management's communications office, other affected city departments, and the public.

The PDS establishes a process to review and approve consultant invoices. A consultant pay application checklist details the required supporting documentation and timesheets for billed quantities. An e-Builder workflow routes each invoice to be reviewed and approved by the design manager, project controls, project accounting, the program manager, the project manager, the OES deputy commissioner, the financial manager, and the commissioner's office. Any errors require the invoice to be revised and resubmitted. These controls, the consultant pay application review checklist and e-Builder invoice approval process workflow, are included in the PDS template guide library, but they are not included in the PDS process flowcharts (see Exhibit 8). We recommend that the Project Delivery System administrator add a recurring activity for processing consultant invoices to the PDS flowchart for design.

The department currently lacks detailed value engineering policies. Best practice recommends that capital project programs develop value engineering (VE) policies to ensure their work is done in a cost-efficient manner. These policies should include guidelines for when to apply VE based on project factors such as cost or complexity, requiring VE studies on projects with a cost estimate above a defined threshold, and documenting reasons for either waiving VE studies on projects above the set threshold or for rejecting VE recommendations. These policies would collectively ensure that high-cost projects are presumed to require value engineering unless project staff justifies a decision to the contrary.

Watershed Management's procedures call for VE workshops on projects whose cost, size, scope, and complexity warrant it, but do not provide detailed guidance on these factors. The department has not established a cost threshold at which VE is required and the decision to hold a value management workshop is left as a matter of judgment. With no cost threshold for when a VE study is necessary, there is no requirement for waivers for projects that do not receive VE studies. Staff stated that VE workshops are typically held for projects estimated $40-50 million and

above. To ensure that projects are completed in a cost-effective and efficient manner, we recommend that the Capital Projects Management Division establish a project cost threshold over which a value engineering workshop is required and require documentation of the reasons for waiving value engineering studies so required.

Construction Phase Controls are Partially Inconsistent with Current Practice

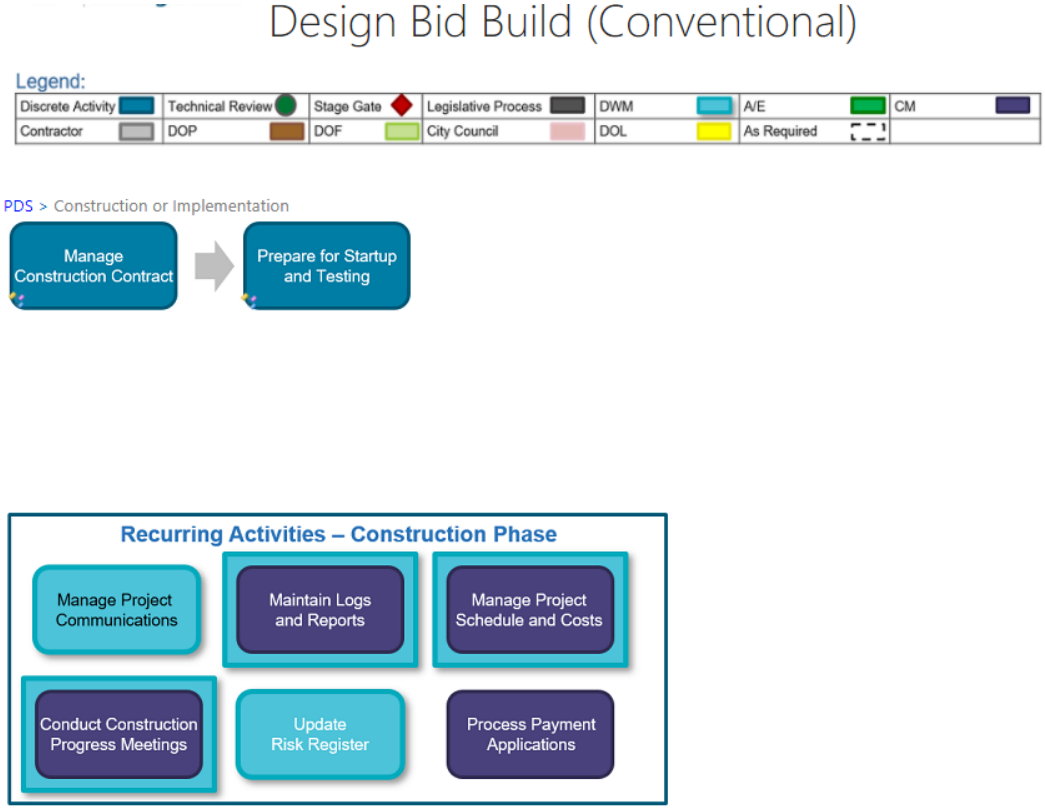
The construction phase of the PDS includes procedures for processing payment applications, approving work authorizations and change orders, and executing other recurring activities. In this phase, project authority transitions from the project manager to the construction manager. The PDS contains control activities intended to ensure construction activities are in accordance with contract requirements; however, these activities do not always agree to current practice. The PDS lists several forms for monitoring safety compliance and quality control, but in practice, these forms have been replaced by the Inspection Daily Report process in e-Builder. While the forms are maintained in the PDS in case of e-Builder service interruption, to avoid confusion, we recommend that the Project Delivery System administrator update the PDS to reflect more clearly what is current practice using e-Builder forms and what is a backup process using legacy forms. We also recommend that the e-Builder administrator update the Inspection Daily Report process in e-Builder to include a section for safety issues.

The PDS describes a recurring activity in which the project manager updates the project status in e-Builder to prepare a current Project Summary Report for each monthly CIP Status Update Meeting. The report color-codes project schedule and cost information according to defined variance thresholds in order to bring issues to the attention of project management and executive leadership. The department has a standard operating procedure that meets this best practice but does not include it by reference in the PDS. We recommend that the Project Delivery System administrator include by reference the dashboard standard operating procedure within the PDS under the recurring activity Update Project Summary Report.

The PDS includes detailed procedures to process applications for payment, approve work authorizations and change orders, and execute other recurring activities. Once a contractor has been engaged via the city's procurement process, preconstruction begins and project authority transitions from the project manager to the construction manager (see Exhibit 9). The construction manager initiates certain preconstruction activities, such as construction

training, construction team mobilization, permit compliance confirmation, conducting internal kickoff and preconstruction meetings, and review of contractor safety related submittals. Policies require the construction manager to review the contractor submitted mobilization plan to determine if contract requirements have been met and to approve the baseline schedule. Additionally, the project manager and construction manager collaborate to update the project management plan to include any new project management issues relevant to the construction phase of the project.

Exhibit 9: PDS Contains Guidance for Recurring Activities in Construction Phase



Source: DWM Project Delivery System

The PDS details control activities meant to ensure construction proceeds in accordance with contract requirements, but what the PDS describes does not always match current practice. Inspectors should be onsite daily while the contractor is working and should submit a daily report. The PDS lists several QA/QC forms, as well as safety and traffic monitoring forms. In practice, however, these various forms have been replaced by the Inspection Daily Report process in e-Builder. Watershed Management staff told us they kept the references to the old forms in case of e-Builder service interruption, but in order to avoid confusion, we recommend that the Project Delivery System administrator update the PDS to reflect more clearly what is current

practice using e-Builder forms and what is a backup process using legacy forms. We also recommend that the e-Builder administrator update the Inspection Daily Report process in e-Builder to include a section for safety issues.

In addition to daily monitoring by inspectors, the construction manager is responsible for administering the contract, identifying defective work, and recommending appropriate corrective action. The PDS includes templates of forms the construction manager completes in e-Builder to document the contractor's noncompliance with contract requirements. The contractor is responsible for development and submittal of a Health and Safety Plan for review and approval by the construction manager and the Watershed Management Office of Safety, Security, and Emergency Management.

The PDS contains a link to a standard operating procedure that outlines the process for documenting, reviewing, and approving changes to project scope and contracts. The PDS also includes templates of work authorization forms and graphical illustrations of e-Builder workflow approval processes for construction change orders and work authorizations.

The PDS includes a recurring process to ensure pay applications are properly supported, reviewed, and approved. The construction manager is responsible for determining if pay applications are in accordance with the Pay Application Review Process Checklist before the project manager verifies work reported for payment. There is also a graphical workflow of the invoice approval process within the PDS which shows the various layers of managerial review of the pay application.

The PDS requires the project team to hold progress meetings on a recurring basis to facilitate risk and issue tracking and resolution. These meetings give the project team a forum to monitor compliance with schedules and the requirements of the contract. The PDS includes a list of suggested agenda items such as a previous meeting summary, status update, material delivery and shortages, progress of schedule and causes of delays, status of change orders, and contractor payment issues. Progress meetings are intended to ensure a project stays on track and give team members the chance to intervene early if problems emerge. The project manager updates the risk register throughout construction as risks arise.

The PDS calls for the project manager to update the project status in e-Builder and to prepare a current Project Summary Report for monthly CIP Status Update meetings. This is a recurring, monthly

activity which occurs throughout all phases of the project lifecycle. These meetings, as described to us by department staff, include executive leadership and cover every active project. The Project Summary Report is a dashboard that shows current key information about a project's status, schedule, and cost. The report color-codes the information on project schedules and costs according to defined variance thresholds in order to bring issues to the attention of project management and executive leadership. Best practices suggest defined project cost and schedule variance thresholds that trigger escalation and reporting to leadership, and this dashboard follows that best practice, but is not described in detail in the PDS. The department has a Project Summary Report Dashboard Standard Operating Procedure in draft form to describe these polices but does not include it by reference in the PDS. We recommend Watershed Management staff complete the draft of the dashboard standard operating procedure and the Project Delivery System administrator include the final version by reference within the PDS under the recurring activity Update Project Summary Report.

Closeout Phase Controls Should Ensure That Work is Complete

The department's Project Delivery System describes procedures during the end of construction and throughout the closeout phase that aim to ensure that the work is complete and acceptable. The PDS calls for inspections at substantial and final completion to identify and address deficiencies in the completed work, as well as several tests to assess performance of new facilities.

Watershed Management's closeout procedures include steps to close out project funding sources. The template guide library holds a project closeout checklist used to ensure all closeout steps are completed, including performance evaluations, documentation of lessons learned, and e-Builder closeout. We also identified controls in the PDS to enable a smooth transition from construction to operations and maintenance.

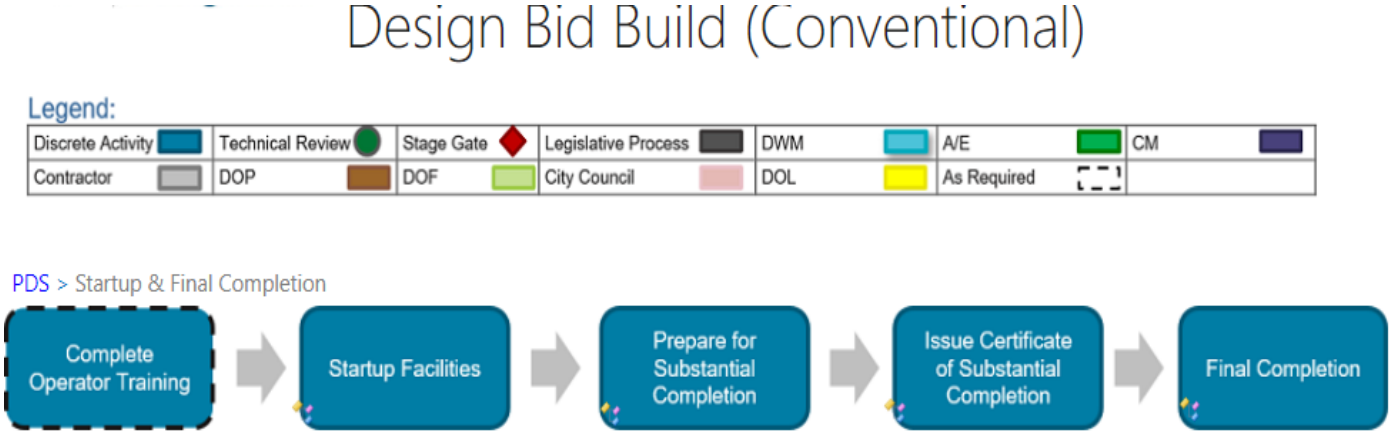
The department currently lacks clear procedures to address ongoing reporting requirements and post-occupancy evaluations. Capital project management agencies should confirm that all reporting requirements have been met and identify any ongoing reporting requirements, but we did not identify controls in the closeout phase to address this; we recommend the Capital Projects Management Division add an item to its closeout checklists and/or procedures. Additionally, the PDS states that for a warranty period of 12 months after construction, inspections may be conducted to identify errors in the completed work but did not include any formal procedures to ensure regular inspections or post-occupancy evaluations occur. We recommend that the Capital Projects Management Division develop

formal warranty inspection and post-occupancy evaluation procedures to take place during the warranty period.

The department's closeout procedures should ensure all work is acceptable and complete. Watershed Management's procedures include each form, checklist, and approval necessary to accept the contractor's work before project closeout. The final phase of construction includes startup testing to ensure that all facilities meet the performance standards in the contract. The construction manager should then compile a list of deficiencies to be added to a preliminary punch list, which must be completed to reach substantial completion.

Once the contractor has addressed the preliminary punch list items, the construction manager determines whether the project is substantially complete (see Exhibit 10). A project is substantially complete when the work has been sufficiently completed in accordance with the requirements of the contract documents for use in the intended purpose, deemed operational through the completion of the pre-operational checkout, functional test, and operational test, has all test documents with operations and maintenance manuals delivered, and has passed the 30-day acceptance test to prove that the identified portion of the work can reliably be utilized for the purpose for which it is intended. If a project is substantially complete, the construction manager prepares a Certificate of Substantial Completion and a final punch list of outstanding items to be completed by the contractor. Once the contractor claims to have addressed the final punch list items, the construction manager establishes the date of final completion, at which point the city can issue a Certificate of Final Completion.

Exhibit 10: PDS Requires Certification of Substantial Completion and of Final Completion



Source: DWM Project Delivery System

The PDS also includes steps to close out project funding and all project systems. Best practice dictates that allowances be adjusted by

change order to the actual amount paid at the completion of work, and that remaining encumbrances be closed out appropriately. Department procedure states that a final change order must be prepared to account for claims, changes, extra work, contract time adjustments, and finalize adjustments to allowances. The department also developed a final payment checklist to ensure all necessary steps and documentation have been completed prior to issuing the final payment to the contractor. The project manager and the Watershed Management financial analyst then confirm that all project cost centers and purchase orders are closed and remaining funds are returned to the proper sources.

The project manager uses a project closeout checklist to ensure that all project closeout steps have been taken. These steps include removing external users from e-Builder, updating schedules and statuses within e-Builder, performance evaluations, and documenting lessons learned. Although Watershed Management staff told us that they evaluate design costs at the beginning of a project and attempt to keep design costs below 8-10% of estimated construction cost, they do not currently review these costs in project closeout. In order to ensure design costs are appropriate, we recommend the Capital Projects Management Division develop and document a process to compare design costs to construction costs during the documentation of lessons learned.

Another key focus of the PDS during closeout is the project's transition from construction to operation. Watershed Management's procedures include steps at the end of construction to collect all as-built plans and agreement documents showing all changes made throughout construction to be archived in e-Builder and provided to end users. Final record drawings are created and stored in e-Builder and the department's asset management system, and technical manuals are passed on to operations and maintenance staff.

All closeout documentation is reviewed by an executive committee at Stage Gate Five. The committee uses a stage gate checklist to ensure all closeout actions and documentation are complete, then approves the project closeout.

The PDS lacks clear guidance on ongoing reporting requirements. Additional controls over reporting requirements and quality management could improve department procedures. Best practices for closeout of a capital project call for controls to ensure that all reporting requirements associated with grants and bond covenants are met and any ongoing reporting requirements are addressed. We could not identify controls within the department's PDS that ensure grant and bond reporting requirements are considered throughout the closeout

process. To ensure that reporting requirements for grantors and bond covenants are addressed during closeout, we recommend that the Capital Projects Management Division add an item to the closeout checklists and/or procedures in the PDS.

Watershed Management's closeout procedures do not include a formal post-occupancy evaluation process. Best practice is to implement post-occupancy evaluations to evaluate user satisfaction and effectiveness. The PDS describes a warranty period of one year, and staff stated that the facility is inspected throughout the 12-month period for deficiencies to be corrected by the contractor. However, there were no formal procedures in the PDS to ensure inspections are completed or to establish formal post-occupancy evaluations. To ensure that projects are meeting performance expectations and operating effectively after construction, we recommend that the Capital Projects Management Division develop formal warranty inspection and post-occupancy evaluation procedures to take place during the warranty period.

Project Controls Should Help to Manage Costs and Schedules

While the PDS is a mature system of internal control following most industry best practices, controls must be actually implemented in order to have the desired effect on risks. We tested implementation of the controls detailed in the PDS and found that most key controls had been implemented, in e-Builder or otherwise, but that inconsistencies and opportunities for improvement remain. We reviewed project documentation in e-Builder for three sample projects: an active project, a complete project, and a project with a detailed design phase. We only tested the design phase controls on the third sample project because the first two projects did not have traditional design phases. We recommend that staff consistently follow procedures described in the PDS for project management and documentation.

Staff Used e-Builder Project Management System to Provide Oversight

The e-Builder system provides an important tool for project oversight, allowing for a consolidated and organized document repository, a centralized location for external submittals, and automated review and approval workflows for various processes. We found that most key project management controls identified in our review of the PDS were implemented. Though some of the controls identified in the PDS were not yet implemented at the start of the projects we reviewed, we were able to locate evidence of functionally similar controls. There remains some room for consolidation and improvement. Various daily

responsibilities of field inspectors are not all represented in the e-Builder Inspection Daily Report process, approvals of safety submittals and other documents are not always recorded in the system, and document storage was not consistently applied across our sample projects.

Most project startup controls described in the PDS were implemented on our sample projects; however, there were some inconsistencies. We tested key controls identified under the planning phase in the PDS that relate to startup and project activation for the active and complete sample projects. We found that some key controls, such as baseline schedules and documented scopes of work, were implemented on our sample projects. Others, such as the project management plan, risk register, and communications plan, were only implemented on one of our sample projects. Our review included identifying whether the stage gate 1 & 2 checklists were approved through e-Builder processes and whether required documentation per the stage gate processes was provided.

We located baseline schedules with e-Builder submittal approvals and scope of work documentation for both projects. For the active project, we located a PEP (project execution plan) from 2018 that appeared to satisfy the requirements of the PMP template in the PDS. The PEP also included general information on a communication plan and project risk areas, with associated risk levels and planning factors. However, stage gate documentation (i.e., checklists, business case, preliminary engineering report, and date of risk management workshop) and related approvals for both projects could not be provided. Watershed Management staff told us that the active and complete sample projects had been activated in 2016 and the stage gate processes were not implemented until 2019.

We did not locate in e-Builder or receive for review a PMP, risk register, or project communications plan for the complete sample project. The PDS states the project manager is responsible for preparing the PMP and project risk register; the Office of Communications and Community Relations develops the project communications plan. DWM stated these documents were likely developed by the prior project management services team and not submitted to the CPMD for review. In order to consistently use project management tools, we recommend that Watershed Management staff follow processes stated in the PDS for developing the PMP, project risk register, and project communications plan and maintain these documents in the project files in e-Builder.

Ongoing project management controls are used to ensure project plans and schedules are routinely updated, but some documentation

is missing. Project managers are expected to regularly update the PMP, project schedule, and risk register during preliminary engineering, design, and throughout construction. In order to stay abreast of progress and changes on a project, department procedure also calls for regular progress meetings. A PO (purchase order) should be issued before a NTP (notice-to-proceed) can be issued to the contractor, and work should not begin until the NTP has been issued. We reviewed the active and complete sample for the appropriate timing of POs and NTPs, updates to project management plans, schedules, and risk registers during construction, and progress meetings.

In our testing, we found that POs were issued prior to NTPs for both projects. The POs for the active project were issued in February and April of 2018, and the NTP was not issued until May 2018; the PO for the complete project was issued on June 2nd, 2017, and the NTP was issued on June 6th, 2017. Both projects did not hold the first progress meetings until after the NTPs were issued. Both projects also had scheduled biweekly progress meetings. We also found that the PMP and risk register were updated during construction for the active project, but, as previously noted, we could not locate the original or updated PMP and risk register for the complete project. We recommend that Watershed Management staff consistently follow PDS procedures to update PMPs, risk registers, and schedules throughout projects and maintain these updated documents in the project files in e-Builder.

Most design oversight controls were implemented on our sample project; however, some documentation is missing. We tested key design oversight controls for one project. We reviewed project documentation for the use of design services checklists, review comment logs, and evidence of internal technical review meetings. We found that some technical review meeting summaries were not included in the files. Each of these controls should have been used at each design review milestone. We also checked for the completed Stage Gate 4 checklist with panel approval.

The project's task order only required design review at 60% and 100% completion because the pre-existing plans constituted 30% design plans. We identified the design services checklist completed at 60% review, but not for the 100% design submittal. We located a consolidated review comment log containing comments from various reviewers from both the 60% and 100% review stages. However, we could not find meeting summaries from the 60% and 100% design internal technical review meetings. The project manager stated that the notes and review comments from these meetings were added to the consolidated review comment log. The Stage Gate 4 Checklist was also completed and approved by 3 of the 4 panel members, with no response from the

fourth. To ensure review meetings and comments are documented, we recommend that Watershed Management staff consistently create technical review meeting summaries and upload them to e-Builder.

Construction oversight processes in e-Builder are not reflected in the PDS. We tested for a number of key construction oversight controls, and found that many were implemented, but that current practice does not always match what the PDS describes. We tested for the evidence of daily reporting by inspectors in a one-month period for each of the active and complete sample projects to identify whether city inspector reports were submitted daily in e-Builder. For each sample project, we determined that the inspectors consistently submitted reports. The sampled RFI (request for information) for the active project followed the workflow approval process in e-Builder, which included the Contract Manager, Project Manager, and Project Team review, with a response from the Contract Manager. We did not identify any RFIs for the complete project.

The PDS requires the Construction Manager to conduct a preconstruction meeting within ten days of issuance of the NTP (Notice to Proceed) letter to the contractor. The meeting is held to discuss specific project requirements and site procedures with the contractor and project team. The PDS contained a template of the agenda which is prepared to document the meeting and related details. We were able to locate an agenda in e-Builder that provided evidence of a preconstruction meeting occurring within ten days of the NTP for the active project. We were not able to locate any evidence of a preconstruction meeting for the complete project.

We were not able to locate evidence of material approvals for the active project in e-Builder; however, it was provided upon request. We were not able to locate startup and testing forms, a project closeout checklist, or a final completion letter for the complete project in e-Builder, but the department was able to locate and provide these documents at our request. We were also unable to locate a final payment checklist in e-Builder for the complete project; department staff could not locate a copy either. The department informed us that the checklist is used as a guide for closeout requirements and may not be attached to the payment application in e-Builder.

We could not locate a city-issued punch list for the complete project. Although the punch list items were written in the contractor's letter requesting a certificate of substantial completion, we could not confirm that this process included all the steps described in the PDS. We recommend that Watershed Management staff ensure all project documentation, including preconstruction meeting agendas, checklists,

testing forms, and approvals, are maintained in the project files in e-Builder. We also recommend that Watershed Management staff ensure a city-issued punch list is generated according to PDS procedures to document the city's awareness of critical or incomplete items and completion date of corrective actions. This should be completed prior to the issuance of a certificates of substantial and final completion.

We reviewed e-Builder for submittal of various quality control forms for the active and complete sample projects (i.e., "QA/QC Daily Report", "Manhole Inspection Report", "Open Cut Inspection Report", "Daily Erosion and Sediment Control Inspection Checklist", and "CMD Daily Reports"). We were unable to locate these forms in the project files for our sample projects, and, as noted previously, staff informed us these files are not currently in use. As noted above, we recommend that the Project Delivery System administrator update the PDS to reflect more clearly what is current practice using e-Builder forms and what is a backup process using legacy forms.

Safety inspection checklists described in the PDS are not currently in use. The PDS includes daily safety and traffic inspection checklists. We could not locate evidence of these checklists in e-Builder for review for either of the sample projects; traffic daily inspection checklists were not applicable to the scope of the complete project. When we requested completed daily safety or traffic inspection checklists, staff told us that these activities were incorporated into the inspectors' daily responsibility and a separate report is not completed. As noted previously, Watershed Management stated that the safety and traffic checklists are included in the PDS as backup controls if e-Builder's operations are interrupted. As stated above, we recommend that the e-Builder administrator update the Inspection Daily Report process in e-Builder to include a section for safety issues and that the Project Delivery System administrator update the PDS to reflect more clearly what is current practice using e-Builder forms and what is a backup process using legacy forms.

The PDS also includes procedures addressing safety management for project sites. The contractor is required to submit a Health and Safety Plan and other related documents in e-Builder for the construction manager to review and approve prior to the start of construction. In our testing, we determined that contractors submitted safety plans for review for both the active and complete sample projects, but we were unable to locate construction manager approvals.

For the active project, we found evidence of review of the initial safety submittal—the contractor responded to comments in a resubmittal request. The contractor also stated in an amendment to the safety plan

that the original plan had been previously approved. We also saw some evidence of review by the construction manager of the resubmittal in the e-Builder file history. However, we did not identify an explicit approval by the construction manager of the original or amended plan. For the complete project, the contractor submitted the safety plan marked "product data for information only" instead of for review and comment. The contractor also submitted the project safety coordinator's resume for review and comment; however, we could not confirm the construction manager's review of the resume submittal. We recommend that Watershed Management staff maintain review comments on and approvals of safety plans and related submittals in e-Builder.

Department Reviewed and Approved Payments and Changes to Work

The department used e-Builder to review and approve payments to consultants and contractors and to review and authorize work to be paid from contract allowances. When a consultant or contractor wishes to be paid by the city, they submit an invoice or application for payment in e-Builder, which is then automatically routed through a series of reviews and approvals. This process seems to function well to ensure that reviews and approvals are provided as required. The department has checklists to aid in the review process, but we were unable to locate completed checklists for any of the payments we reviewed. We recommend that staff consistently use pay application review checklists and maintain these documents in the project files in e-Builder.

Similarly, when a contractor requires a work authorization to use a contract allowance, or when a change order is necessary, there is a submittal process in e-Builder that allows for all the necessary reviews and approvals to take place. We reviewed two construction work authorizations and found that one went through the workflow in e-Builder. The other did not, and staff informed us that there was a problem with the workflow at that time. We did see that manual backup controls had been used, though it was not possible to confirm that non-signature reviews had taken place. We recommend that CPMD ensure that backup manual processes document established workflows during e-Builder interruptions. None of the three projects we reviewed had any design task order amendments, so we were unable to review the process for review and approval of a change to design scope.

Pay applications were reviewed and approved prior to payment. We sampled one consultant payment and one contractor payment from 2019 from the active project and one 2018 contractor payment from the complete project. We noted the e-Builder approval process slightly differed between the two projects as it was modified in 2019 to add

another layer of review. Neither of these projects had a traditional design phase, so we also sampled one 2019 consultant payment from the third sample project, which had a detailed design phase, to test a traditional design invoice. We found that all four payments included supporting documentation and that the payments were appropriately routed through the invoice approval process in e-Builder. We also found that all four payments were made within 45 days and reflected in e-Builder.

The architectural/engineering consultant for the active project only provided construction management services. A construction management invoice follows a different review process from a traditional design services invoice. The e-Builder invoice approval process for construction management services requires review by the contract manager, project controls, project accounting, the sectional manager, the project manager, the deputy commissioner, the financial manager, and the commissioner's office. The e-Builder invoice approval process for design services includes the same approvals, with the exception of the sectional manager, and requires additional approvals by the design manager and the program manager.

When a construction contractor submits a pay application, the construction manager reviews it in accordance with the contractor pay application review process checklist. The project manager then initials the checklist verifying requirements have been met and makes recommendations for the application to follow the workflow process in e-Builder for final approval. In the workflow process for the 2018 payment, the project manager first ensured the invoice reporting period of the application was appropriate (typically within 31 days) before the draft cover page was generated. The cover page was part of the pay application and included project details, cost information and required signatures. Once the invoice period was verified, the draft cover page was generated, and the contract manager reviews and approves the document.

After the final cover page was created, the contractor's project manager certified the request for payment. The pay application was then submitted to project controls and project accounting for review. Then, the application was routed to the contract manager, sectional manager, project manager, and deputy commissioner for review and approval, who each signed the cover page. The pay application package was compiled and routed to the department financial manager for approval. The commissioner then signed the cover page documenting review of the payment request and the payment application was emailed to project accounting for final processing. For the 2019

payment, the process included an additional review by the program director, prior to the deputy commissioner's review.

In our review, we found that all four payments followed their respective invoice approval processes in e-Builder and were approved by the proper staff. All four pay application packages also had supporting documentation. Both consultant invoice cover pages were signed by all parties listed; the cover pages for both construction contractor pay applications showed that required parties had reviewed and approved each payment in our sample. However, the commissioner's signature area on the cover page for the complete project payment was signed by a designee. For the active project's payment, the signature page did not include the commissioner's signature, but the executive assistant to the commissioner approved the payment request in e-Builder. We found that the invoice reporting periods for both contractor payments were within 31 days. All four invoices were paid within 45 days and marked paid within e-Builder.

We were unable to locate the consultant or contractor pay application review process checklists for any of the four payments. We recommend that Watershed Management staff use the pay application review checklists to ensure payment requirements are met and maintain these documents in the project files in e-Builder, as additional support with the payment application.

Controls identified in the PDS have mostly been implemented to ensure work authorizations are reviewed and approved. According to the change document workflow described in the PDS, the contract manager reviews the contractor-submitted proposal to assess pricing, staffing, and scheduling impact. The proposal is then routed to project controls and the project manager for a second review. Once the proposal is accepted, the city issues a work authorization for signature by the contractor. The work authorization form and supporting documentation are then submitted to the contract manager and project manager for review, who also sign the form.

We reviewed one work authorization approved in 2019 for the active sample project and one approved in 2018 for the complete sample project. We determined that the sampled work authorization package for the complete project was approved through the change document process in e-Builder, but that the process did not include a step to route the contractor proposal to the project controls team for review. The included work authorization form did not include signatures, but we identified the work authorization letter issued to the contractor was signed by the required parties. The work authorization selected for the active sample project was manually approved and the form included the

signatures of the contractor, contract manager, and the project manager. However, since the proposal was not routed through the e-Builder process, we were unable to identify any documentation of some reviews of the contractor submitted proposal. We were informed e-Builder encountered a brief issue concerning the workflow process, which prevented system routing for reviews and approvals. We recommend that the e-Builder administrator update the change document workflow in e-Builder to include a routing step for review of the contractor proposal by the project controls team. The Capital Projects Management Division should also ensure that backup manual processes document established workflows during e-Builder interruptions.

Eight-Month Lapse in e-Builder Access Weakened Controls

The e-Builder program management information solution contains an important suite of controls used by staff to manage projects. Watershed Management lost access to the system in January 2020 during the transition from an agreement between e-Builder, Inc. and the former program management team to an agreement directly between the city and e-Builder, Inc. The department did develop temporary backup controls to mitigate the effects of the lapse in access to e-Builder, though replacing automated with manual processes does introduce risk. The department also developed a detailed plan to migrate 2020 data into e-Builder after regaining access. Access to e-Builder was restored in August 2020, and we were able to confirm that staff has begun executing the plan to load 2020 project data into e-Builder. We recommend that staff continues to upload all remaining project data into e-Builder.

Agreement with Vendor was Held by Contractor Team Rather than by City

The e-Builder system was originally procured by the former program management services team, MWH/Khafra, JV. In 2015, the city issued a task order for MWH/Khafra, JV to implement a program management information system to electronically manage the Capital Improvement Plan program. MWH/Khafra, JV recommended and engaged e-Builder, Inc. to provide the system, including software, training, and technical support.

Several risks arise when the city procures a system like e-Builder indirectly, through a contractor, rather than contracting directly with the software vendor. Depending on the terms of a given agreement, the city may lose data stored in the system, may not own the data

stored in the system, or, as happened in January 2020, may experience an interruption in access to the system. The program management contract with MWH/Khafra, JV, originally executed in 2008, expired in 2017. Subsequently, the city needed to enter into a direct agreement with e-Builder, Inc.

In January 2020, Watershed Management and the chief procurement officer recommended that the city enter into a sole source agreement with e-Builder, Inc., to continue to provide e-Builder software, training, and support. Due to a lack of current agreement and therefore inability to pay an outstanding invoice, the vendor terminated the department's access to e-Builder in January 2020. Although City Council and the mayor approved the new agreement in January, access was not restored until August when the contract was executed and the outstanding invoice paid. During this period from January to August 2020, the department did not have access to automated workflows, dashboard generation, submittal processing, or other controls provided by the e-Builder software. In order to avoid similar situations in the future, we recommend that the department procure any systems directly from vendors through the city's usual procurement process, rather than issuing a task order for a contractor to procure systems.

Workaround Plan Likely Mitigated Effects of System Lapse

Staff developed a plan for backup manual controls to work around the lack of access to e-Builder during the period from January to August 2020. Project documentation was to be stored in OneDrive, SharePoint, or by project managers. Most procedures that required input, review, or approval from various parties, such as for review of design submittals, were to be conducted by email correspondence. Procedures regarding updates and dissemination of information to committees and executive management were to be carried out through monthly status update meetings and biweekly progress meetings. Still other procedures were to be managed directly by project managers or by the e-Builder administrator. Taken as a whole, these backup controls would not fully replace the automated controls in e-Builder, but they likely mitigated the effects of the lapse in access to the program management information system.

Staff have begun executing the plan to load data into e-Builder. The department also developed a plan to load project data from the lapse into e-Builder. The plan is a detailed guide that identifies the parties responsible for transferring and uploading various project documents, statuses, folders, and processes. It includes step-by-step instructions and screenshots of the e-Builder system to illustrate how each update should be accomplished. As of October 15, 2020, we saw clear evidence that staff had begun to execute the plan, including uploading invoices with backup documentation and design submittals from the period when they did not have access to e-Builder. We recommend that staff continue to upload all remaining project data into e-Builder.

Recommendations

In order to ensure safety and security risks are addressed, the Project Delivery System reflects current practice and avoids procedural confusion, and all relevant information is incorporated into the Project Delivery System, the Project Delivery System administrator should

1. Incorporate safety plan elements into the project management plan template.
2. Regularly review and update the Project Delivery System to ensure it more clearly reflects current practice using e-Builder forms and what legacy forms are used only as backup controls.
3. Incorporate supplemental guides by reference within the appropriate flowchart steps of the Project Delivery System, including the final version of the dashboard standard operating procedure in the recurring activity Update Project Summary Report.
4. Add a recurring activity for processing consultant invoices to the Project Delivery System design phase.

In order to ensure that projects are completed in a cost-effective and efficient manner, that design costs are appropriate, that reporting requirements for grantors and bond covenants are addressed during closeout, and that projects are meeting performance expectations and operating effectively after construction, the Capital Projects Management Division should

5. Establish a project cost threshold over which a value engineering workshop is required and require documentation for the reasons for waiving value engineering studies so required.
6. Develop and document a process to compare design costs to construction costs during the documentation of lessons learned.
7. Add an item to the closeout checklists to ensure that reporting requirements for grantors and bond covenants are addressed during closeout.
8. Develop formal warranty inspection and post-occupancy evaluation procedures to take place during the warranty period.
9. Ensure that backup manual processes document established workflows during e-Builder interruptions.

In order to ensure regular monitoring and recording of safety issues and that all required reviews are applied to change documents, the e-Builder administrator should

10. Update the Inspection Daily Report process in e-Builder to include a section for reporting safety issues.
11. Update the change document workflow in e-Builder to include a routing step for review of the contractor proposal by the project controls team.

In order to consistently apply project management tools according to the procedures described in the Project Delivery System, Watershed Management staff should

12. Follow procedures for developing project management plans, project risk registers, and project communications plans and maintain these documents in the project files in e-Builder.
13. Follow procedures to update project management plans, project risk registers, and project schedules throughout projects and maintain these updated documents in the project files in e-Builder.
14. Create technical review meeting summaries and maintain these documents in the project files in e-Builder.
15. Ensure all construction oversight documentation, including preconstruction meeting agendas, checklists, testing forms, and submittal approvals, are maintained in the project files in e-Builder
16. Ensure that city-issued punch lists are generated according to procedures described in the Project Delivery System to document the city's awareness of critical or incomplete items and completion dates of corrective actions.
17. Maintain review comments on and approvals of safety plans and related submittals in the project files in e-Builder.
18. Consistently use pay application review checklists and maintain these documents in the project files in e-Builder.

In order to avoid future situations similar to the recent loss of access to e-Builder, the Department of Watershed Management should

19. Procure any systems directly from vendors through the city's usual procurement process, rather than issuing a task order for a contractor to procure systems.

In order to continue to maintain all project documentation in one central location, Watershed Management staff should

20. Continue to upload all remaining project data from during the e-Builder outage to e-Builder.

Appendices

Appendix A: Management Review and Response to Audit Recommendations

Report # 20.06	Performance Audit: Department of Watershed Management—Capital Projects Contract Management	Date: December 2020

Recommendation 1: We recommend that the Project Delivery System administrator incorporate safety plan elements into the project management plan template.	
Proposed Action: Will include references to safety plan requirements in the Project Management Plan Outline template in the PDS.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** March 31, 2021
Recommendation 2: We recommend that the Project Delivery System administrator regularly review and update the Project Delivery System to ensure it more clearly reflects current practice using e-Builder forms and what legacy forms are used only as backup controls.	
Proposed Action: Will review all forms referenced in the PDS with respect to e-Builder forms and current practices and make appropriate modifications to the PDS. This will be performed annually.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** Jun 30, 2021
Recommendation 3: We recommend that the Project Delivery System administrator incorporate supplemental guides by reference within the appropriate flowchart steps of the Project Delivery System, including the final version of the dashboard standard operating procedure in the recurring activity Update Project Summary Report.	
Proposed Action: Will finalize the Standard Operating Procedure Content Element Definitions/Development Project Summary Dashboard report, dated February 2017, and add it to the PDS with discussion and a reference link in the overview flowchart Recurring Activities: Update Project Summary Report.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** March 31, 2021
Recommendation 4: We recommend that the Project Delivery System administrator add a recurring activity for processing consultant invoices to the Project Delivery System design phase.	

Proposed Action: Will add recurring activities for consultant Process Payment Applications in the PDS at the appropriate flowchart design phase locations.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** March 31, 2021
Recommendation 5: We recommend that the Capital Projects Management Division establish a project cost threshold over which a value engineering workshop is required and require documentation for the reasons for waiving value engineering studies so required.	
Proposed Action: Will develop a Value Engineering guidance document/approval template for the PDS. It will be linked at appropriate flowchart locations.	**Response:** Agree
Person Responsible: Ade Abon / PMST	**Implementation Date:** June 30, 2021
Recommendation 6: We recommend that the Capital Projects Management Division develop and document a process to compare design costs to construction costs during the documentation of lessons learned.	
Proposed Action: Will develop a report in e-Builder to capture and record design costs as a percentage of construction costs with verification as part of the Lessons Learned process.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** June 30, 2021
Recommendation 7: We recommend that the Capital Projects Management Division add an item to the closeout checklists to ensure that reporting requirements for grantors and bond covenants are addressed during closeout.	
Proposed Action: Department of Finance/Office of Debt and DWM/Office of Financial Administration are jointly responsible for reporting on the grants and bond covenants requirements. Will modify the Project Closeout Checklist in the PDS to include the request for a verification of project compliance with grant requirements and the bond covenants in the memorandum for the final project closeout.	**Response:** Agree
Person Responsible: Ade Abon / Lyonel Francois	**Implementation Date:** March 31, 2021
Recommendation 8:	

We recommend that the Capital Projects Management Division develop formal warranty inspection and post-occupancy evaluation procedures to take place during the warranty period.	
Proposed Action: Will develop additional warranty inspection and post occupancy evaluation procedures and add it to the PDS under the Post-Construction Activities/Warranty Administration flowchart location.	**Response:** Agree
Person Responsible: Lyonel Francois / John Tolbert (CMD)	**Implementation Date:** June 30, 2021
Recommendation 9: We recommend that the Capital Projects Management Division ensure that backup manual processes document established workflows during e-Builder interruptions.	
Proposed Action: During the e-Builder outage we established several temporary procedures to manually continue project management activities outside of e-Builder. These documents will be reviewed, updated, and supplemented as needed and stored in the PDS for future reference.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** June 30, 2021
Recommendation 10: We recommend that the e-Builder administrator update the Inspection Daily Report process in e-Builder to include a section for reporting safety issues.	
Proposed Action: The Daily Safety Inspection Checklist in the PDS is completed by the inspectors to document and track general site safety issues. The contract-provided Project Safety Officer prepares and transmits daily safety reports to DWM Construction Manager as required by City contract. Additionally, e-Builder already has a stand-alone Safety Violation Notice (SNV) Form. It will be added to the PDS with a link to the document under the flowchart stage: Construction/Monitor Safety Compliance.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** March 31, 2021
Recommendation 11: We recommend that the e-Builder administrator update the change document workflow in e-Builder to include a routing step for review of the contractor proposal by the project controls team.	
Proposed Action: Will assure the Change Document (CD) process in e-Builder and planned modifications to divide the CD process into three separate processes, include Project Controls review steps.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** June 30, 2021

Recommendation 12: We recommend that Watershed Management staff follow procedures for developing project management plans, project risk registers, and project communications plans and maintain these documents in the project files in e-Builder.	
Proposed Action: Will develop an oversight process to monitor the extent project management procedures are being followed.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** Jun 30, 2021
Recommendation 13: We recommend that Watershed Management staff follow procedures to update project management plans, project risk registers, and project schedules throughout projects and maintain these updated documents in the project files in eBuilder.	
Proposed Action: Will develop an oversight process to monitor the extent project management procedures are being followed.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** June 30, 2021
Recommendation 14: We recommend that Watershed Management staff create technical review meeting summaries and maintain these documents in the project files in e-Builder.	
Proposed Action: Will develop an oversight process to monitor the extent project management procedures are being followed.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** June 30, 2021
Recommendation 15: We recommend that Watershed Management staff ensure all construction oversight documentation, including preconstruction meeting agendas, checklists, testing forms, and submittal approvals, are maintained in the project files in eBuilder.	
Proposed Action: Will develop an oversight process to monitor the extent project management procedures are being followed.	**Response:** Agree
Person Responsible: Lyonel Francois / John Tolbert (CMD)	**Implementation Date:** June 30, 2021

Recommendation 16: We recommend that Watershed Management staff ensure that city-issued punch lists are generated according to procedures described in the Project Delivery System to document the city's awareness of critical or incomplete items and completion dates of corrective actions.	
Proposed Action: Will develop an oversight process to monitor the extent project management procedures are being followed.	**Response:** Agree
Person Responsible: Lyonel Francois / John Tolbert (CMD)	**Implementation Date:** June 30, 2021
Recommendation 17: We recommend that Watershed Management staff maintain review comments on and approvals of safety plans and related submittals in the project files in e-Builder.	
Proposed Action: Will develop an oversight process to monitor the extent project management procedures are being followed.	**Response:** Agree
Person Responsible: Lyonel Francois / John Tolbert (CMD)	**Implementation Date:** June 30, 2021
Recommendation 18: We recommend that Watershed Management staff consistently use pay application review checklists and maintain these documents in the project files in e-Builder.	
Proposed Action: The pay application checklists will be added to the Invoice Approval process as a linked reference document for consultation during reviews.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** June 30, 2021
Recommendation 19: We recommend that the Department of Watershed Management procure any systems directly from vendors through the city's usual procurement process, rather than issuing a task order for a contractor to procure systems.	
Proposed Action: On July 30, 2020, DWM issued an NTP for a contract with e-Builder, SP-S 1200145, e-Builder Software Support and Training Services. The initial term of the Contract was one year with up to four annual renewals. The first renewal was executed on October 31, 2020. The last year of the contract would expire on October 31, 2024, by which a new contract will be procured.	**Response:** Agree
Person Responsible: Robert Bocarro	**Implementation Date:** Complete

Recommendation 20: We recommend that Watershed Management staff continue to upload all remaining project data from during the eBuilder outage to e-Builder.	
Proposed Action: This is an ongoing effort expected to continue through the end of the 2020 calendar year.	**Response:** Agree
Person Responsible: Lyonel Francois / PMST	**Implementation Date:** December 31, 2020