

**DISTRICT OF COLUMBIA
WATER AND SEWER AUTHORITY
(DC Water)**



"SERVING THE PUBLIC - PROTECTING THE ENVIRONMENT"

**PROJECT DESIGN MANUAL
VOLUME 1 – PROJECT MANAGEMENT**

February 2018

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AUTHORIZATION FORM

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ACRONYMS AND ABBREVIATIONS

AACEI	American Association of Cost Engineers, International
A/E	Architect/Engineer
ASCE	American Society of Civil Engineers
Authority	District of Columbia Water and Sewer Authority
BOA	Basic Ordering Agreement
BPPB	Blue Plains Project Branch
CDR	Concept Design Report
CTC	Conformed to Contract
CAD	Computer-aided Design
CFR	Concept Finalization Report, or, Code of Federal Regulations
CIP	Capital Improvement Program
CM	Construction Manager/Management
CPM	Critical Path Method
CSI	Construction Specifications Institute
CSO	Combined Sewer Overflow
D&F	Determination and Findings
DC Water	District of Columbia Water and Sewer Authority
DCCR	DC Clean Rivers Project DC Water
DCMR	District of Columbia Municipal Regulations
DCRA	(District) Department of Consumer and Regulatory Affairs
DDCS	(DC Water) Department of Distribution and Conveyance Systems
DOEE	Department of Energy and Environment
DDOT	District Department of Transportation
DETS	(DC Water) Department of Engineering and Technical Services
DMS	(DC Water) Department of Maintenance Services
DP	Design Package
DPW	(District) Department of Public Works
DSEC	(DC Water) Department of Security
DSS	(DC Water) Department of Sewer Services
DWE	(DC Water) Department of Wastewater Engineering
DWG	AutoCAD Drawing (files)
DWS	(DC Water) Department of Water Services
DWT	(DC Water) Department of Wastewater Treatment
EA	Environmental Assessment
ENR	Engineering News Record
EPA	(United States) Environmental Protection Agency
EMIS	Engineering Management Information System
EPMC	Engineering Program Management Consultant
EQ&SS	Environmental Quality and Sewerage Services
ESDC	Engineering Services During Construction
FAC MGT	Facility Management
FFCDI	Futrell Fire Consult & Design, Inc.
FS	Fact Sheet
GIS	Geographical Information System
HAZOP	Hazard and Operability
HVAC	Heating, Ventilation, and Air Conditioning
IBC	International Building Code

I/O	Input/Output
IT	Information Technology
LAM	(DC Water) DWS Linear Asset Management Branch
MBE/WBE	Minority Business Enterprise/Woman Business Enterprise
MOA	Memorandum of Agreement
MOPO	Maintenance of Plant Operations
MOU	Memorandum of Understanding
N/A	Not Applicable
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NTP	Notice to Proceed
O&M	Operation and Maintenance
OCFO	Office of the Chief Financial Officer
OMAP	Operations and Maintenance Assistance Project
OPCC	Opinion of Probable Construction Cost
ORM	(DC Water) Office of Risk Management
P&ID	Process and Instrumentation Diagrams
PAF	Project Action Form
PCS	Process Control System
PDE	Project Design Engineer
pdf	Portable Document Format
PDM	Project Design Manual
PM	Project Manager
PgM	Program Manager
PMB	Program Management Branch
POST	Process Objectives and System Training
PQP	Project Quality Plan
PWP	Project Work Plan
QA/QC	Quality Assurance/Quality Control
ROCIP	Rolling Owner Controlled Insurance Program
SOP	Standard Operating Procedures
SMP	Standard Maintenance Plan
SOW	Scope of Work
SPCC	Spill Prevention Control and Countermeasure
TBD	to be determined
TIC	(DC Water) Technical Information Center
UFA	Urban Forestry Administration
USACE	U.S. Army Corps of Engineers
VE	Value Engineering
WBS	Work Breakdown Structure
WMATA	Washington Metropolitan Area Transit Authority
WQWS	Water Quality Water Service
WTPM	Wastewater Treatment Program Manager

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PROJECT DESIGN MANUAL

VOLUME 1 – PROJECT MANAGEMENT

1 INTRODUCTION

1.1 PROJECT DESIGN MANUAL PURPOSE

The Project Design Manual (PDM) is the primary guide reference for managing and preparing the design of projects that comprise the Capital Improvement Program (CIP) of the District of Columbia Water and Sewer Authority (DC Water). The PDM is referenced as required criteria in the Standard Scope of Work (SOW) exhibit(s) of the DC Water Professional Services Agreement. It presents design criteria, standards, procedures, and management methods to be used for all designs of facilities and linear infrastructure encompassed in the program. The goal is to ensure a consistent design approach among different projects and different Project Design Engineers (PDEs), which conforms to DC Water standards, and where multiple projects comprise a system, that designs are integrated among different outside PDEs and DC Water design staff.

1.2 AUDIENCE

The PDM shall be shared by the Department of Engineering and Technical Services (DETS) and the Department of Wastewater Engineering (DWE) with all parties involved with design, administration, and management of DC Water CIP projects including new or modified facilities or linear infrastructure. The PDM shall also be available for use by the DC Clean Rivers Project (DCCR), as applicable. The manual shall be followed by all such parties, including program managers (PgMs), project managers (PMs), PDEs, subconsultant design firms, and District of Columbia Agencies [District Department of Transportation (DDOT), Department of Energy and Environment (DOEE), or others as applicable], private developers, Engineers-of-Record, and DC Water in-house design staff.

1.3 ORGANIZATION OF THE PROJECT DESIGN MANUAL

The PDM is organized in three volumes:

- **Volume 1 - Project Management** – This volume describes the overall design management approach, procedures and requirements, relevant reference documents, and construction procurement for the administration, management, and execution of Professional Services Agreements for Facilities and Linear Infrastructure projects.
- **Volume 2 - Facilities Design** – provides design guidelines to be used by engineers responsible for design of *facilities* at the Blue Plains Advanced Wastewater Treatment Plant and offsite water pumping stations, sewage pumping stations and storage structures.
- **Volume 3 - Infrastructure Design** – provides guidelines to be used by engineers responsible for design of underground *linear infrastructure* (water and sewer pipelines) projects.

The scope of Volume 1 is further defined here to highlight the administrative, management, and common design requirements of projects within the CIP.

- **Section 1 - Introduction.** This section describes the purpose of the PDM and the organization of the Project Management Volume 1.

- **Section 2 – Existing DC Water Information Records.** This section identifies existing records of information on constructed facilities and infrastructure that are available for planning, design and construction.
- **Section 3 – Guidance Documents.** This section identifies DC Water’s various companion but separate documents, memoranda, etc., that provide guidance on policies, procedures, standards, and requirements for managing design projects.
- **Section 4 – Planning Approach.** This section presents guidance for formulating, scoping, and budgeting for planned design projects.
- **Section 5 – Design Project Administration.** This section addresses extensive detailed requirements for the management and administration of design agreements, from procurement of design through advertisement for construction procurement and services of the PDE during construction.
- **Section 6 – Design Requirements.** This section includes specific requirements for the PDE management and execution of design projects, including requirements which are typically common to both facilities and infrastructure design projects.
- **Section 7 – Construction Procurement.** This section presents DC Water’s requirements for construction procurement, and administration from the Advertisement/Bidding phase through post-bidding phases to the Construction Notice to Proceed (NTP).

1.4 CHANGES

The PDM is a working document, which may be modified over time. All users of the PDM are encouraged to submit recommended changes that will improve its usefulness to all PDEs. Please submit any suggestions for improvement to DC Water, DETS Supervisor, Specifications and Standards. PDM updates, upon approval, shall be distributed to PDEs who are under contract at the date of issue. Therefore, PDE agreements and all supplemental agreements, must clearly address the applicability of DC Water design standards updates which may be issued during the design phase.

1.5 DEFINITIONS

Agreement - term used by DC Water for a contractual agreement between DC Water and a professional Consultant for program management services, design services, or engineering services during construction (ESDC).

Change Management (DETS Water and Sewer Design only) – a DETS process that applies to any change, major or minor, in scope, cost or schedule to a project. The intent is to identify not only the direct impact to cost or scope but the potential cost a change in design will impact the construction and assess impacts during the design or planning phase.

Concept Design Report (CDR) – The written characterization, definition, explanation, and formulation of an idea for a design. Upon identification of a need, the DETS Planning Branch or DWE Program Management Branch (PMB) will prepare or will engage a PgM or a design consultant to prepare a CDR to define the nature and scope of a desired design project, and identify qualifying parameters and criteria including but not limited to, such aspects as purpose, location requirements, permitting requirements, a

project budget, size, capacity, constraints, operating requirements, and interface requirements with existing facilities or infrastructure.

Concept Finalization Report (CFR) – Upon procurement of an Agreement for professional design services, the PDE’s first phase of work is to build on the CDR to verify all existing conditions, project requirements, constraints, design criteria, and construction cost budget, and prepare a Draft CFR to serve as a proposed basis for finalizing the design concept, and prepare a Preliminary Design package that forms the basis to prepare the design scope of work. The Draft CFR, accompanied by Preliminary Design drawings, is submitted to DC Water for approval, and any subsequent changes in design criteria directed by DC Water or exceptions taken during the Design Lock-in or recommendations from a Value Engineering (VE) study that is/are approved by DC Water shall be documented in a Final CFR.

Consultant – term used by DC Water, as distinguished from the term ‘Contractor’, for a person or firm performing professional services under an Agreement with DC Water.

Contract – term used by DC Water when referring to a construction contract between DC Water and a construction Contractor.

Contractor – term used by DC Water, as distinguished from the term ‘Consultant’, for a construction firm under contract

Design Lock-In – Upon completion of any required VE workshop (if applicable), and when DC Water, the PgM, and the PDE have agreed upon issues raised in reviews, and upon approval or acceptance of a CFR and Preliminary Design by DC Water, the design approach is considered and designated as ‘Locked-In’ as the basis for completing the detailed design, with the intent to avoid subsequent approach or criteria changes unless approved or directed otherwise by DC Water.

DC Water Engineering Division– refers to the overall DC Water Engineering group, comprised of DETS, DWE, Clean Rivers, and Permit Operations, all of which are responsible for design and administration of construction of DC Water facilities and infrastructure.

DETS – DC Water Department of Engineering and Technical Services (DETS) provides general direction and management of the CIP for DC Water linear infrastructure, including responsibility for planning, coordinating procurement and oversight of design, construction management, and program management consultants. In cooperation with DC Water management, DETS oversees consultant and construction contractor compliance with established Fair Share Objectives for participation by Minority and Women owned Businesses in DC Water construction contracts. Additionally, DETS coordinates procurement of construction contractors, authorizes change orders and progress payments, and issues completion certificates. DETS is also responsible for construction management (CM) of linear infrastructure, including the option to procure and manage CM consultants for support. DETS is responsible to conduct independent review of all work produced by PgMs, CMs, and PDEs under its purview.

DWE – DC Water Department of Wastewater Engineering (DWE) provides general direction and management of the CIP for DC Water facilities, including responsibility for coordinating procurement and oversight of design, construction management, and program management consultants. In cooperation with DC Water management, DWE oversees consultant and construction contractor compliance with established Fair Share Objectives for participation by Minority and Women owned Businesses in DC Water construction contracts. Additionally, DWE coordinates procurement of construction contractors, authorizes change orders and progress payments, and issues completion certificates. DWE is also responsible for CM of DC Water process facilities construction and renovations, including the option to procure and manage

CM consultants for support. DWE is responsible to conduct independent review of all work produced by PgMs, CMs, and PDEs under its purview.

Engineer of Record - The PDE firm or an individual licensed discipline design professional who is in responsible charge of a design, including under whose supervision a design was performed by others, and who goes on record as the responsible party by sealing the particular design drawings and specifications for which the Engineer of Record is responsible.

Facility/Facilities – as stated herein refers to new or modified treatment plant buildings and processes, water pumping stations, sewer pumping stations, related ancillary buildings, storage tanks, and other structures, at Blue Plains and throughout the DC Water service area.

Program Manager – a person or entity responsible for managing a group of related subprograms, projects, and related program activities managed in a coordinated way to achieve leveraged benefits more efficiently than by managing them individually. Programs may be managed on multiple levels, such as the owner level and consultant level, and for different types of functions, such as planning, design, or construction. DWE PgMs provide planning and PDE management and oversight. DETS PgMs support the Planning branch

Project – a temporary endeavor undertaken to create a specific product, service, or result. A project is differentiated from routine operational activity by having an established starting point, defined objectives, and a targeted end point for completion.

Project Manager – A person within an entity (e.g., DC Water, program management consultant, design consultant, etc.) who is assigned responsibility for overseeing, managing, controlling, and/or supervising the respective entity's involvement in a design project. Hence, a single project may involve multiple PMs, each acting on behalf of their respective employer. DC Water projects shall have a DC Water PM designated to perform DC Water oversight and management of a design agreement, either directly or with the assistance of a program management consultant.

Project Design Engineer (PDE) – The Prime Architect/Engineer (A/E) Firm or DETS' licensed design professional responsible for the design of a project. This could be either a DC Water in-house licensed engineer in charge of producing a design, or a licensed consulting engineering design firm under an agreement with DC Water to produce a design, or, under a Basic Ordering Agreement (BOA) to perform designs for multiple task orders which may be defined or selected during the time of the BOA.

Project Quality Plan (PQP) – The PQP is a designated part of the PDE's Project Work Plan (PWP), which details the processes and procedures to be used by the PDE during execution of the design agreement. The PQP shall conform to the requirements of DC Water's Quality Manual.

Project Work Plan (PWP) – The PWP is the PDE's plan for executing the work of the design agreement. It includes, but is not limited to, the staffing plan, roles, design schedule, tasks and budgets, production standards, communication protocols, coordination procedures, and the PQP.

Quality Manual – DC Water's Quality Manual document which stipulates required quality procedures and processes to be implemented by the PDE, and contents required to be included in the PDE's PQP.

Stage Gating (DETS Water and Sewer Projects only) –a verification process for DETS Water and Sewer CIP projects to ensure at designated critical design transition phase, the project is reassessed by management to determine whether the project/design should proceed to the next phase by way of a Stage Gate approval. The Stage Gate process is an independent process from the more specific project level

design phase submittals. The Stage Gate document is intended to capture the project information from concept (i.e., CDR) and any/all approved project changes throughout the project life-cycle in a single location to validate compliance with Engineering Division quality standards, and to develop lessons learned and implement necessary improvements to DETS Water and Sewer planning, design, and construction processes.

Supplemental Agreement – a supplement documenting a change agreed to by DC Water and a Consultant to be added to a professional services agreement as an amendment to change one or more of the scope of services, or budget, or schedule of the original agreement. Similar to a construction contract change order.

Task Order – a specific service task which may be only one of potential multiple tasks authorized independently or incrementally. Task Orders are normally contracted and administered with a BOA whereby individual tasks may be negotiated and authorized individually over the life of the BOA.

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2 EXISTING DC WATER INFORMATION RECORDS

2.1 BACKGROUND TECHNICAL INFORMATION

To supplement, support, and facilitate required field investigations of existing conditions, the PDE shall be aware that technical records and documents are maintained by DC Water and available at the Technical Information Center (TIC) at Blue Plains. TIC is the archival facility for engineering documents including contract files, drawings, as-built records, planning reports, studies, and various other types of records for DC Water facilities and utilities infrastructure. TIC is also the primary source of records information and drawings for the Advanced Wastewater Treatment Plant. Available records or documents can be obtained upon request through DC Water.

Additionally, DC Water maintains records for asset management on Maximo and geographical information system (GIS) systems. Together they comprise asset information such as water and sewer feature attributes, including references to the source information, and information to track the operations and maintenance of assets. The following is a list of resources available through GIS and TIC, however, not accessible outside of DC Water network:

Available on Both ArcMap via Citrix and GIS Viewer:

- Utility Layers (Water/Sewer, Active/Proposed/Inactive)
- Base Map Information
- Premise Information (including info about water services)
- Counter Maps (Water, Sewer)
- Aerial imagery
- Topography lines

Available on ArcMap via Citrix Only:

- CIP and DDOT project lines
- Field survey points
- GIS group's project lines (projects in GIS Department's queue)
- Tool for exporting base map layers from GIS to computer-aided design (CAD) for selected area
- Tool for exporting list of as-built job numbers in selected area
- Tool for exporting list of addresses in selected area

Available on GIS Viewer only:

- Numerous as-builts via hyperlink.
- Land records via hyperlink [Covenants, Easements, Memorandum of Agreement (MOA)/Memorandum of Understanding (MOU), and Quit Claim].
- Interactive elevation analysis (area above elevation).

Records at TIC:

- Various contract drawings
- Contract files
- Field books
- Shop manuals

- Reports on various types of DC Water infrastructure

2.1.1 Facilities Records

DC Water may be able to provide for review and copy of technical reference documents on existing facilities commensurate with the design SOW and depending on availability. The records listed below are typically available at the TIC, or on the DC Water Livelink system. Livelink is NOT available outside of DC Water except w/Citrix and an account.

- Surveying Reports, topographic maps, and other site information
- Geotechnical reports
- Engineering reports
- Facility Plan reports
- Contract drawings and Record drawings
- Construction specifications
- Operation and Maintenance (O&M) manuals
- National Pollutant Discharge Elimination System (NPDES) Permit
- Facility Operations reports
- Utility maps

2.1.2 Water and Sewer Records

DC Water maintains construction records of most water mains, sanitary sewers and storm sewers (some are combined) for the District of Columbia. A few storm sewers or culverts constructed by other agencies are not part of the public storm system maintained by DC Water; records for these may be found at the DC Department of Public Works (DPW). Records and information on the public water, sanitary, storm, and wastewater treatment plant systems available in the TIC include the following:

- As-built drawings (where available)
- Historic infrastructure material
- Historic topographic maps
- Planning, design and studies material
- Water and sewer counter maps
- Water notes
- Water, sewer, wastewater treatment facilities and pumping station records
- Sewer grade sheets
- Valve cards

3 SUPPLEMENTAL REQUIREMENTS AND GUIDANCE

While this design manual provides an overview of the management of design projects, additional document sources are available to ensure consistency of design and presentation from different design firms or groups. These documents serve a specific purpose in the management and design of a project, and variably address PDE responsibilities, DC Water project standards, and in some cases, affect the scope of the project. All PDEs shall be familiar with applicable project guidance documents. Documents and information specifically applicable to execution of Professional Services Agreements for projects designed under the CIP include:

- DETS Quality Manual
- CDR or Transition Document produced from planning for the project
- Background Technical Information on Existing Physical Conditions
- DC Water *Project Design Manual*, Volumes 1 through 3, as described in Section 1.3
- DC Water Standard Specifications, Supplemental Specifications, and Guideline Specifications

Additional information and procedures for use by PMs include the DC Water Procurement Manual and the Engineering Standard Operating Procedures (SOPs), located on the DC Water network but not accessible by parties outside of DC Water.

3.1 ENGINEERING STANDARD OPERATING PROCEDURES

DC Water Engineering Division has established a series of SOPs to serve as guidance to DC Water staff, and consultant program and construction managers. The SOPs document DC Water's established processes and procedures for procurement, administration, and management of CIP projects from project conception and planning through design and construction. All DC Water staff and consultant program and construction managers located at Blue Plains can access the SOPs through the DC Water network.

3.2 PROCUREMENT MANUAL

The Procurement Manual was issued by the General Manager of DC Water in 2009, and has been revised periodically as late as September 2015. It provides guidance to DC Water staff for compliance with the DC Water's Procurement Regulations in the acquisition of all goods and services, including Architect-Engineering (A-E) Services for DC Water. The Manual includes noted revisions and updates, and is available at https://www.dewater.com/sites/default/files/DCWater_Procurement_Manual.pdf. The manual includes section references to the procurement regulations which are Chapter 53 to Title 21 of the District of Columbia Municipal Regulations (DCMR) 21, Chapter 53.

3.3 QUALITY MANUAL

All projects within the CIP shall be planned and designed with regard for excellence in accordance with the Quality Policy adopted by the Chief Engineer and the DETS Director on January 29, 2013. The DETS Quality Manual provides guidance to PMs and PDEs in delivering projects that meet DC Water's standard for excellence. PM/PgM shall provide each PDE with an electronic version of the DETS Quality Manual during negotiation of the SOW with the PDE.

3.4 ENGINEERING DOCUMENTS INSTRUCTIONS

The Engineering Documents Instructions, posted on [Livelink](#), addresses a multitude of various detail requirements for preparing and completing the Project Manual, the PDEs Opinion of Probable Construction

Cost (OPCC) and estimated construction schedule, and selected pre-advertisement requirements. The document is subject to occasional updates and currently includes the following sections:

- | | |
|----------------------------------|--------------------------------------|
| 1. Introduction | 11. Construction Cost Opinion |
| 2. Modifications | 12. Construction Schedule |
| 3. Project Manual Divisions | 13. Pre-Bid Conference |
| 4. Section Numbers and Titles | 14. Insurances |
| 5. Specification Format | 15. Liquidated Damages |
| 6. Basic Guidelines | 16. Mobilization/Demobilization Cost |
| 7. Specification Changes | 17. Allowances Cost |
| 8. Submittals | 18. Bid Opening Date |
| 9. Advertisement Category | 19. Document Printing |
| 10. Drawing Cover Sheet Approval | 20. Addenda |

3.5 CONSTRUCTION SPECIFICATIONS LIBRARY

Construction bidding and contract documents for DC Water shall include a Project Manual and Construction Contract Drawings. The Project Manual shall include specifications for procurement and contracting requirements, general requirements, technical specifications, and appendices with forms, inserts, and standard details as needed. DETS maintains an electronic library of Specifications master documents on Livelink for access by DETS and DWE staff and consultant PgMs. Specifications documents shall be provided to the PDE at the concept design lock-in phase of the project. The master documents include the following:

- An instructions document for preparation and formatting of specifications.
- A formatted section template.
- A Bidding Form Matrix indicating which of the available procurement and contracting specification sections and forms are required for projects of various funding categories.
- Standard specifications adopted by DC Water for which editing is not allowed.
- Supplemental specifications which comprise DC Water approved interim modifications to the Standard specifications, and for which editing by the PDE is not allowed.
- Guideline specifications which may be used as is, or edited as needed by the PDE for the specific project, rendering them as Project-Specific specifications.
- Standard Project Manual Appendices items including Forms, Inserts, and Standard Detail Drawings (for Water and Sewer).

The Project Manual for each project may include any of each type of DC Water specifications. Specifications needed for any project which are not included in DC Water's specifications library shall be developed and provided by the PDE. In some cases, DC Water may have some draft guideline specifications available upon request for reference or use by the PDE. For more detail on DC Water Construction Specifications, see Section 6 of this volume.

3.6 CAD MANUAL

The DETS CAD Manual is a stand-alone document which prescribes drafting standards requirements for all computer-based designs to conform to DC Water's standards for drawing presentation and format, file naming, and layering conventions. The CAD Manual contains numerous Appendices with examples of drawing standards, sample standard drawings, and DC Water Standard Details adopted for consistency in

design and quality of constructed projects and manufactured products. Standard Details may in the future be compiled in separate volumes.

3.7 OTHER GUIDANCE DOCUMENTS

3.7.1 DC Water Engineering Workflow Charts

There are several comprehensive processes used in managing a project, which include layers of sequential activities and involve multiple parties, departments, PgMs, and consultants. Process workflow charts, which detail the steps involved and the parties associated with the various steps, are posted on Livelink as 'Procurement Process Flowcharts'. They include the following:

- A/E, Design, Program Management, Construction Management, and BOA Agreement Award Process
- A/E, Supplemental Agreement (SA) Process
- A/E, Task Order Process
- Construction Contract Award Process
- Construction Change Order Process

Additional workflow charts available from DETS/DWE include the following:

- Revising Standard Documents – Standard Specifications Revision Process
- DETS (W&S) and DWE (Facilities) Design and Construction Workflow
- Design Review Processes
 - DC Water Consultant Design Review Process
 - DETS In-House Design Workflow
- Design Comment Resolution Workflow

3.7.2 Concept Design Report

For many projects, the scope and major parameters for each design agreement are described in a separate CDR, sometimes referred to as the Initial Concept Report, which is prepared by the PgM for DWE. For DETS, the DETS Planning Branch prepares a planning-to-design 'Transition Document'. A CDR or Transition Document contains specific guidance for facilities, major equipment, and/or infrastructure to be included in the design. The limits and interfaces of the scope of design are defined. They may identify standard specifications that are available and specifications that shall be developed by the PDE. The PM shall provide all relevant planning documents and DC Water design standards to the PDE during negotiation of the scope of services. .

3.7.3 Additional Documents Related to Design Project Management

Various DC Water departments have developed additional documents separate from the PDM, which are applicable to management and execution of CIP design projects. The PM/PgM shall identify which documents are to be provided to the PDE for information and requirements applicable for any particular design. Table 1-3-1 lists the forms found on Livelink which are used for administration of design projects. Additionally, various separate guidance and requirements documents include, but are not limited to, those listed in Table 1-3-2. Always verify the latest version of any separate form or document before using them.

Table 1-3-1. Administrative Forms for Design Projects, on Livelink

Admin Form No.	File Name
1001	ADM – MEM – Allowance Request
1002	ADM – DESIGN – Reserved (Not Used)
1003	ADM – DESIGN – IFB Number Request
1004	ADM – DESIGN – Reserved (Not Used)
1005	ADM – DESIGN – Reserved (Not Used)
1006	ADM – DESIGN – Reserved (Not Used)
1007	ADM – DESIGN – Bidding Form Matrix
1008	ADM – DESIGN – Infrastructure Docs Release form
1009	ADM – DESIGN – Advertisement Category Request (temporarily suspended)
1010	ADM – DESIGN – Meeting Attendance
1011	ADM – DESIGN – Meeting Notes
1012	ADM – DESIGN – InsRev – FRM – ROCIP Manual Input Sheet
1013	ADM – DESIGN – InsRev – Article 25 Insurances Review - Master
1014	ADM – DESIGN – Liquidated Damages Calculations
1015	ADM – DESIGN – Design Submittal Distribution List
1016	ADM – DESIGN – Claim Review – Spec Claim Review
1017	ADM – DESIGN – Specifications Master Template
1018	ADM – PREADVERTISEMENT –Project Schedule Calculation (From Advertisement to Construction NTP)
1019	ADM – PREADVERTISEMENT – Liquidated Damages Determination Request
1020	ADM – PREADVERTISEMENT – Pre-Advertisement Checklist
	Reserved (Not Used)
1022	ADM – PREADVERTISEMENT – Pre-Advertisement Certification
1024	ADM – PREADVERTISEMENT or LD-Cover Sheet Routing Slip
1025	ADM – ADDENDUM CERTIFICATION – ADD00

Table 1-3-2. Separate Guidance Related to Design Project Management

Document Name*	Department Location
*Asset Classification Guidance and Template	DETS, DWE, DCCR Livelink
*Blue Plains Site Maps (Logistics)	DWE BPPB WASAWIDE
*CAD Manual	DETS Survey Under revision
*Commissioning Management Plan (PDM Volume 2)	DWE Livelink
Construction Operations Manual (TBD)	DETS CM, DWE CM Under Revision
Design Submittal Distribution List Template (Blue Plains, Water and Sewer, and Clean Rivers Projects)	DWE, DETS, DCCR Livelink
DETS/DWE Process Workflow Charts (procurement, design reviews, comments resolution)	DETS and DWE Livelink
*Engineering Documents Instructions	DETS Std and Specs. Livelink
Engineering SOPs (for DC Water Engr & PgMs)	DETS, DWE, DCCR Eng. SOP SharePoint
Fire Protection Plan Review Procedures (for Buildings \geq \$500k, with sprinklers or fire alarms)	Office of Risk Management/Alliant Risk Control
*DC Water Specifications (Standard, Supplemental, or Guideline) and Specifications Template	DETS Std. and Spec. Livelink
*Network Connectivity & Contractor Supplement	IT DC Water IT Department
Contract Award (Brown Folder) Checklists	DETS Livelink
Permitting Plan Template	DETS Interagency Planning & Permitting Livelink
Pre-Advertisement Checklist	DETS Quality Livelink
Pre-Advertisement Certification	DETS Program Services Livelink
Procurement Manual	DC Water Procurement dcwater.com
Procurement Regulations	DC Water Procurement dcwater.com
Professional Services Agreement Standard Documents	DETS, DWE, CR Livelink Under Revision
*Quality Manual	DETS Quality Livelink
*Project Quality Plan (PQP) Checklist	DETS Quality Livelink
ROCIP IV Insurance Review Process	Office of Risk Management
ROCIP Procedures Policy Memo (needs update)	DETS Program Services Livelink
ROCIP Project Data Sheet	DETS Program Services Livelink
*Security Features in Plant Design Projects	DC Water Department of Security
*Spare Parts Policy	DETS, DMS TBD
Stage Gate Checklist	DETS Quality Livelink
*Standard Details – Facilities (presently in CAD Manual & PDM Vol. 2)	DETS, DWE Livelink
*Submittal Acceptance Checklist	DETS and DWE Livelink
*Sustainability Memo (per DC Green Bldg. Act)	General Manager's Office, Feb 2012

Document Name*	Department Location
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Notes:

Department = DC Water Document Content Owner.

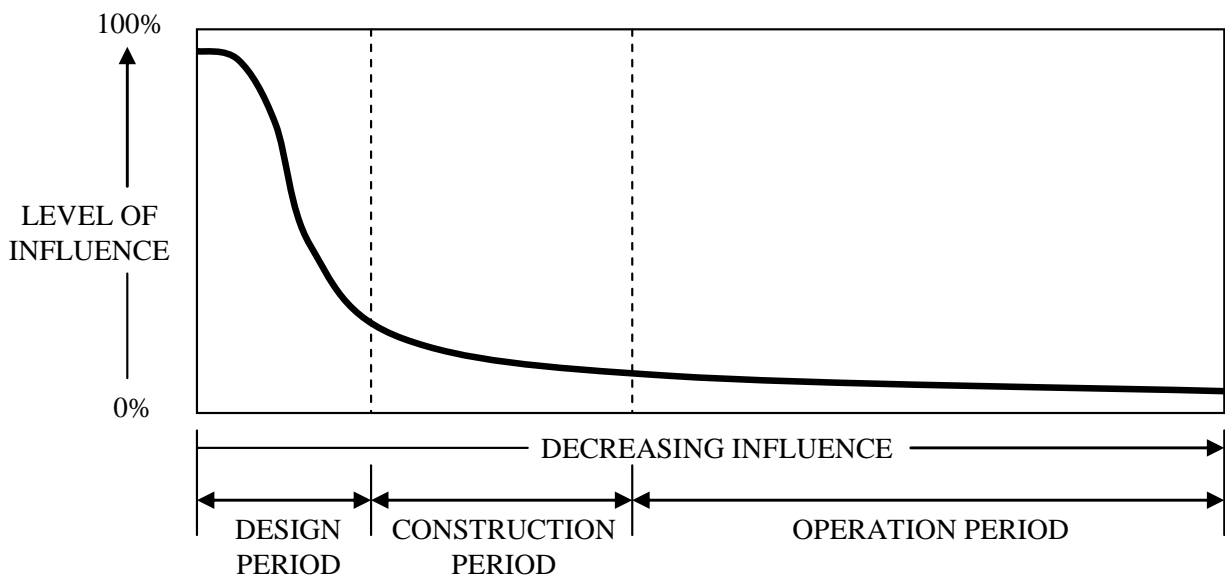
Location = Location of Document.

* Documents noted with an ‘*’ are to be provided by the PM to the PDE, depending on project scope.

4 PLANNING APPROACH

This section presents the policies and procedures to be used in managing, directing, and coordinating those entities in the project organization engaged in the management of the project throughout the design period. Procedures cover aspects of the relationships among DC Water, the PgMs, the PDEs, and other consultants, including routing and formal communications, coordination of interfaces among design agreements, and management and review actions.

The quality and total lifecycle cost of a project are greatly influenced in the early stages of a design. There is considerable benefit to ensuring that particular attention is paid by all the stakeholders early in the design process. Decisions made in the conceptual and preliminary phases have a profound effect not only on cost but also on quality. Figure 2-1 demonstrates this effect. This figure has been reproduced from the American Society of Civil Engineers (ASCE) Manual of Professional Practice titled *Quality in the Constructed Project*.



Source: Adapted from *Quality in the Constructed Project*, ASCE, 1990.

Figure 1-4-1. Opportunity to Influence Project Quality and Cost

The design planning process starts with the identification and characterization of a need or a problem, and then through analysis and planning, to formulate possible solutions. DC Water normally tasks a program management consultant to perform the analysis and prepare an initial design concept, documented in a CDR, or as explained later, in a Transition Document. Upon procuring a PDE, the approach to administering and managing a CIP design project, from the design NTP to completion of bidding and construction contract documents is structured to provide input from all parties to the design process at an early stage to take advantage of the concept of enhancing design quality. Following the NTP, the PDE begins the concept finalization phase, in which the PDE has an opportunity to evaluate the concept design prepared by a PgM or by others and make suggestions for improvement. Any proposals for improvement

or recommended changes are submitted to DC Water for discussion where they may be accepted, modified or rejected with reasons for the rejection. The design is then carried to a preliminary level of completion, testing the criteria and parameters included in the CDR. An O&M review is conducted, and sometimes a concurrent VE study is performed. The VE workshop is required for federally funded wastewater construction projects with a value of \$10 million or more. At this point, the design concept has had input from several departments within DC Water including Safety, Security, Information Technology (IT), Procurement, Facilities and operations and maintenance departments, plus the PgM that prepared the original concept, the design engineer, the O&M reviewer, and the VE Team.

At the completion of these reviews and the PDE's CFR and Preliminary Design, the design is "locked-in." The process of locking-in the design concept discourages major changes thereafter during the detailed design phase. Locking-in the design concept permits the design engineer to prepare the design in accordance with the schedule and budget. Substantial changes to the concept late in design creates schedule slippage, design change orders, claims, and a design product which has generally not been thought through to the same extent as if the concept was tested in the preliminary phase. Thus, a major change to the design concept late in the design phase introduces added risk of construction change orders, claims, and delays. The design submittals shown are as defined in the DC Water Professional Service Agreement. Approved deviations to the CFR are to be documented throughout the entire design, and incorporated in a revised CFR, which shall be submitted with each design phase submittal.

4.1 FACILITIES AND INFRASTRUCTURE PLANNING

It is DC Water's responsibility to ensure that the water and sewer systems have the capacity and capability to provide service as required for the benefit of the public's health, safety and welfare. To fulfill this responsibility, significant ongoing improvement and rehabilitation work are necessary on many parts of the water distribution, wastewater collection, combined sewer overflow (CSO) controls, and wastewater treatment systems. Therefore, DC Water maintains facilities and infrastructure plans to identify and define projects needed to provide and maintain the required assets in good condition throughout DC Water's service area. Any projects thus identified and planned are organized and managed through the use of a CIP Financial Plan to implement design and construction of additions, repairs and upgrades to DC Water's facilities and infrastructure.

The DC Water CIP is a ten-year plan, reviewed and updated annually, that identifies capital projects and equipment purchases, provides a planning schedule and identifies options for financing the plan. The DC Water CIP provides links between Engineering (DETS and DWE) and Finance [Office of the Chief Financial Officer (OCFO)] to provide a comprehensive and strategic plan with budgets and projected disbursements. During the annual review of the proposed CIP, DETS and DWE closely coordinate the development with operations of various departments, including but not limited to, Department of Wastewater Treatment (DWT), Department of Water Services (DWS), Department of Distribution and Conveyance Systems (DDCS), and Department of Sewer Services (DSS).

4.2 RISK MANAGEMENT

Identifying the need and planning for a project should include consideration of potential risks. While potential risks are typically identified and characterized in more detail during a project design phase, the planning phase should address any known, suspected, or anticipated risks that may occur during construction or operation, and also any risks if a planned project is not executed. Refer to Section 5 of this volume for more detail.

4.3 PROJECT DEFINITION - CONCEPT DESIGN REPORT

As CIP projects are approved, DC Water may direct a design program management consultant or sometimes engage an outside consultant to formulate possible solutions and define a proposed concept in a CDR. Then, upon assignment or procurement of a PDE, DC Water PM shall convene a Design Initiation Meeting to include various DC Water departments and representatives to review the design concept with the PDE prior to starting design. Refer to Section 6 of this volume for more detail.

A PDE is typically procured to prepare a CFR/Preliminary Design. The PDE shall conduct field investigations, evaluate the concept design, make suggestions for improvement, and identify the most feasible design alternative after considering all practical alternatives. The Concept Finalization/Preliminary Design submittal should include a Design Memorandum and Basis for Design along with preliminary design drawings, and provide sufficient detail for VE (as applicable).

4.4 SCOPE OF DESIGN SERVICES

The comprehensive SOW for design agreements are comprised of multiple documents as shown below, which have a hierarchal relationship. Exhibits C-1, C-2, and C-3 are DC Water standard documents which address standard SOW requirements for different types of projects. The Exhibit D document is prepared by the PM uniquely for the subject project. For projects of the type which typically involve National Environmental Policy Act (NEPA) classification or Environmental Assessments (EA) but the status is not yet known, assume an EA is required. The SOW for all facility projects shall include preparation of a Commissioning Plan. The applicable SOW exhibits will be incorporated in the professional services agreement for a project. The agreement and SOW exhibits will make reference to selected SOW requirements in the PDM.

- Professional Service Agreement, Exhibit C-1 Standard Scope of Work for Facilities Design
- Professional Service Agreement, Exhibit C-2 Standard Scope of Work for Linear Infrastructure Design
- Professional Service Agreement, Exhibit C-3 Standard Scope of Work for NEPA Related Design
- Professional Service Agreement, Attachment 1 Task Order/Work Authorization Process
- Professional Service Agreement, Exhibit D, Project Specific Scope of Work
- DC Water PDM, Volumes 1, 2, and 3, as applicable, depending on type of project.
- Engineering Design Services During Construction (ESDC) included in Exhibits C-1, C-2, & C-3.

4.5 PROJECT CONTROLS

DC Water maintains a detailed program schedule, which includes budgets as well, for the implementation of the projects contained in the CIP. This tool forms the basis for issuing bonds for capital improvements to the facilities and infrastructure and, as such, all program participants must be cognizant of the need to conform to each individual project schedule and budget. The design planning approach presented herein is intended to encourage the delivery of quality design products, consistent with achieving individual project and subproject schedules and budgets.

4.5.1 Budget/Schedule/Change Management

A design agreement shall have a funding budget established during negotiations, and a detailed design schedule shall be included in the PDE's PWP as one of the first agreement deliverables. Throughout the duration of performing a design agreement, the PM shall frequently monitor and track design effort costs against the budget, and the progress of completing tasks in accordance with the design schedule. The PM

shall also periodically estimate the remaining costs and time to complete the design, and identify potential conflicts or variances which jeopardize the ability to stay on budget and on schedule. If the project begins to run over cost projections or behind schedule, the PM shall communicate with the PDEs to prepare a recovery plan to bring the project back in compliance with the agreement budget and schedule. Such a recovery plan shall constitute an ‘internal’ change, i.e., not an agreement change, but the changes for recovery shall be reflected in a revised design schedule submittal.

On occasions whereby DC Water directs, or whereby DC Water and the PDE agree to make a change in scope, schedule, or fee, the PM shall prepare a Supplemental Agreement for execution by both parties, to formalize any change in a design agreement. Sometimes a change in the SOW involve only additional services, which may also affect the schedule and design fee. Supplemental Agreements shall be approved by DC Water through the same ‘Brown folder’ process as initial agreements in the procurement process; however, refer to the delegation of authority approval thresholds for the Chief Engineer prior to preparing the SA Brown Folder

4.5.2 Project Management Plan

Upon consideration of all the facets of project planning addressed in this Section 4. It is recommended the planning PM develop a project management plan to document the considerations, decisions, and projections for a project, for which said project management plan can subsequently be transitioned to a design phase PM for continuity and further development for concept finalization and design. Following is a brief sample outline for a project management plan:

- Project Overview – Objective, approach, list of requirements, list of stakeholders
- Project Scope – Scope definition, verification, and change control
- Project Time – Activity definition, sequencing and duration, schedule and schedule control
- Project Cost – Resources planning, cost estimate, budget and cost control
- Project Quality – quality planning, quality control and quality assurance assignments
- Project Personnel – Organizational structure and team development
- Project Communications – Correspondence protocols, paper, electronic, document control, information distribution, reporting, and administration
- Project Risks – risk identification, analysis, mitigation, monitoring, and control
- Project Procurement – Procurement planning, solicitation, and administration
- Project Closeout – Contract closeout requirements

5 DESIGN PROJECT ADMINISTRATION

To ensure effective coordination of the activities of all parties involved in the projects which comprise the DC Water CIP, administrative procedures have been established for certain critical areas. Specific requirements are included in: (a) the PDE Professional Services Agreement with DC Water; (b) this manual for establishing the PWP; and (c) the Submittal Acceptance Checklist (for DWE, Facility projects; and DETS, Linear infrastructure projects). This section also describes schedule status reporting, document control and handling, compliance with regulatory requirements, and procedures for invoicing

In accordance with the DC Water Professional Service Agreement, Exhibit C (C-1, C-2, or C-3), all PDE agreements have requirements for furnishing monthly progress reports, invoices, and other agreement administration responsibilities. The monthly reports include schedule updates and narrative descriptions of the status of each agreement element which the PM uses to monitor comparison of actual progress against the PDEs work plan and detail design schedule.

The Submittal Acceptance Checklist is a tool to be used by the PM/PgM to confirm that each design submittal is complete prior to distribution to DC Water staff for review. The checklist outlines a three-step verification process for the PDE and PM/PgM to ensure the design deliverable is acceptable.

5.1 DESIGN PROCUREMENT

DETS and DWE will determine if and when professional design services are needed and if so, will initiate procurement thereof. Procurement shall be in accordance with DC Water Procurement Manual and any specific guidance or procedures established by DC Water for engineering procurement. For reference, see the procurement process flowcharts referenced in Section 3 of this volume.

5.2 PROJECT WORK PLAN

A PWP is required within 21 calendar days of NTP to identify the SOW, schedule, budget, and organization chart required by the PDE agreement. It provides a road map to the project team and enables the DETS and DWE Managers and their designated representatives to monitor the progress of the design activities, expenditures, and schedule for completion of work to meet project expectations. The PWP is used as a guide throughout the term of the project and modified as necessary to reflect changes. The dynamic nature of the projects may require recurring changes to the PWP and updates are forwarded to the team. The PWP shall contain the following details:

- A copy each of the: (a) executed agreement; (b) Task Order if applicable; (c) approved CDR or Transition Document; and (d) Design Submittal Distribution List prepared by DETS/DWE PM that identifies the key stakeholders.
- Design team organization, identification of subconsultants and key technical and project management personnel, plus resumes as requested.
- Description of tasks and subtasks to be performed and associated costs. This breakdown shall be used as the basis for measuring progress, and preparation and approval of Consultant invoicing.
- Detailed cost loaded P6 Design Schedule, as explained hereinafter under Design Schedule.
- A Cash Flow Schedule for the professional services, based on the cost breakdown and schedule requirements described above.

- Additional miscellaneous provisions for multiple types of meetings, review times for documents submitted for approval or comments, etc., as referenced later in this Section.

DC Water shall review the draft PWP and submit any review comments as needed to the PDE. No payments shall be made prior to approval of the Work Plan.

5.3 DESIGN SCHEDULE

The PDE shall prepare a detailed Primavera P6 Design Schedule with a work breakdown structure (WBS) and scheduled start and finish dates for the design activities and project deliverables. The design schedule shall conform to the Design Schedule Template and the sample Design Schedule per R300 Detailed Project Design P6 Schedule Guideline. Design Schedules shall include all required meetings and time allowances for submittal reviews and documentation of meeting minutes in accordance with the times stipulated in Section 6. The Design Schedule is a component of the PDE's Work Plan, and shall be updated and submitted for review with each design phase submittal.

5.4 COMMUNICATION, MONITORING, AND COORDINATION

The PM/PgM is responsible for monitoring and coordinating the work of the PDEs. This activity includes both the technical and programmatic aspects of the project. As coordinator, the PM/PgM is the focal point of all direction and guidance given to the PDE. In instances where the PDE has questions or issues to be resolved, the PM shall coordinate with various entities as necessary and provide direction and information to the PDE. Entities with whom coordination may be needed include the CM, Operations and Maintenance Assistance Project (OMAP), other PDEs, other PMs, and DC Water departments. Depending on the location and scope of the project, the following DC Water Departments may be involved: Wastewater Engineering, Engineering and Technical Services, Clean Rivers, Wastewater Treatment, Facilities, Maintenance Services, Distribution and Conveyance Services, Water Services, Sewer Services, Procurement, Facilities, Safety, Security, and IT. In addition to resolving questions or issues from the PDE, the PM shall also be responsible to obtain input from DC Water Departments, as appropriate and provide direction and information to the PDE.

The performance of the PDE shall be monitored monthly through a comparison of actual progress against the PDE's work plan that is required under the PDE's Agreement with DC Water.

The primary mechanism for monitoring the technical aspects of design is a structured review process. The Design Submittal Distribution List found in Livelink is a template to be used by each PM to identify the number of deliverables in Exhibit D Project Specific Scope of Work and stakeholders that shall provide the necessary reviews for a given project (See Engineering SOP 3005). The template is comprehensive and the intention is that the PM should edit the template as appropriate for each project. The PM is responsible for coordinating these reviews. Specific PM/PgM responsibilities for each design submittal include:

- Identify the necessary reviewers, editing the Design Submittal Distribution List and obtain approval from the Manager, Program Management Branch for Blue Plains projects or the DETS Design Manager;
- Complete the Submittal Acceptance Checklist to ensure the deliverable is acceptable and ready for stakeholder review;
- Prepare a transmittal form listing the items included in the deliverable and distribute per the media preference stated in the Design Submittal Distribution List for the stakeholder;

- Email the stakeholders a link to access the deliverable in DC Water's web-based document/project management system (currently CM14) and include/attach a copy of the transmittal form and the Excel Design Review Comment Spreadsheet;
- Obtain comments from reviewers, confirming that they are clear, consistent, and timely and consolidate all the reviewer's comments in the Design Review Comment spreadsheet;
- Save the consolidated Design Review Comment spreadsheet in CM14 in the respective design phase and notify the PDE;
- Obtain responses from the PDE to each comment and updating the consolidated Design Review Comments spreadsheet with the responses;
- Forward the consolidated Design Review Comment spreadsheet with the subsequent deliverable to the stakeholders and work with the reviewers to close their comments accordingly (refer to Engineering SOP 3070);

DC Water discipline reviewers receive a copy of each submittal and it is DC Water's prerogative to provide reviews to the level they deemed practical and appropriate. In addition, the PgM may provide necessary discipline reviews for each submittal as well as interdisciplinary reviews and shall provide information to the PDE regarding required interfaces with other projects in design and under construction. If DC Water plans for a project to be eligible to receive federal grant funding, the U.S. Army Corps of Engineers (USACE), on behalf of the U.S. Environmental Protection Agency (EPA), shall be provided with the Pre-Final submittal for review and comment.

PDEs shall submit all technical documents to the PM. The PM shall review these documents to ensure that they are complete and adequate for review purposes at each level of submittal before initiating its review or supplying copies to the other parties for their review. Submittals that are incomplete or deemed inadequate for review shall be returned to the PDE without being reviewed. An explanation for the return shall accompany the returned documents. The PDE shall, within seven calendar days of receipt of a submittal that has been returned without being reviewed, submit to the PM a recovery plan indicating when the completed documents will be resubmitted and how the PDE will make up the schedule delay caused by the inadequate submittal. When establishing the recovery schedule, the PDE shall not shorten the review periods previously set in the work plan and schedule. Reviews of accepted submittal packages shall be conducted concurrently by the multiple parties to expedite the design process.

All reviews shall be completed and comments provided to the PDE within 30 calendar days of receipt of the review submission. This 30-day review and comment period may be reduced depending upon the extent and nature of a particular review, but in no case, shall it be less than two weeks following receipt of the review submission. Any reduction in time to less than 30 calendar days shall be requested in writing at least 45 calendar days before the receipt of the review documents. The PM shall review all such requests and shall respond in writing within 15 days with any adjusted review schedule. Refer to Engineering SOP 3070 Design Comments, Escalation, and Resolution for additional details.

The 30-day review commitment is based on timely and complete submittals for review. Because of the large number of submittals being received, reviews shall be scheduled closely. Late or incomplete review packages will delay the review process. It is the PDE's responsibility to meet the schedule and to make up lost time resulting from delays created by the PDE in the review process.

The PM reviews shall focus on the conformance of the design with the conceptual design report, the technical and procedural requirements and standards established for the project, and compliance with permit and mitigation requirements. DETS or DWE managers shall participate in reviews on the same schedule as other members of the team, at their discretion.

5.5 MEETINGS

The PDE shall plan, schedule, and conduct all meetings required throughout the design, except the PGM's Quality Manager shall conduct the quality audit meetings. The PDE shall prepare and distribute agenda and meeting minutes for all meetings. Agenda shall be distributed by email to all expected attendees at least four (4) working days prior to each meeting. Provide a draft copy of the minutes to DC Water within five (5) calendar days after each meeting. Upload final minutes into Contract Manager within five (5) calendar days after receipt of comments. Meetings shall consist of the following:

5.5.1 Progress, Coordination, and Workshop Meetings

Conduct design progress review meetings at least monthly, and attend other meetings necessary with DC Water staff and other DC Water consultants, for design coordination, and O&M requirements, as well as meetings with regulatory agencies as required, to get approval of design concepts and final construction plans and specifications.

The PDE is required to prepare an agenda and meeting minutes for all meetings. The agenda shall be distributed via e-mail to all expected attendees at least four (4) working days prior to each meeting. A draft copy of the minutes to DC Water shall be provided within five (5) calendar days of the receipt of comments. The final minutes shall be issued in Adobe Acrobat (pdf) format.

The PDE shall transcribe all decisions/actions from Design Workshop minutes to the Consolidated Design Review Spreadsheet to track that all comments/actions have been adjudicated.

5.5.2 Milestone Meetings

Kickoff Workshop – A design kickoff meeting to discuss concept design, design standards, administrative procedures, work plan with schedule requirements, submittal requirements, planned design meetings, permit acquisition and the cost-loaded schedule.

Risk Workshop – Refer to Sections 5 and 6.

Concept Finalization Report, Preliminary Design, and VE – Meetings with DC Water, its representative(s), and VE team, as applicable, to present Draft CFR and Preliminary Design. Meet with the VE team following the VE Study to receive and discuss VE recommendations.

Subsequent Design Phase Submittals – Meetings after receiving design review comments on each design review submittal, to discuss review comments on each submittal phase, with DC Water and its representative(s).

5.5.3 Audit Meetings

Assist DC Water and its representatives in conducting audits of quality activities to verify compliance with the PQP. Audits shall be performed after the PDE has completed their internal inter-disciplinary reviews and two (2) weeks prior to the Intermediate and Pre-Final Design submittal or at the discretion of DC Water as detailed in the Agreement SOW.

5.6 DOCUMENT MANAGEMENT

The document control and records management program provides a system for the identification, appraisal, disposition, storage, distribution, and turnover of project documentation. Consultant shall use Oracle

Primavera Contract Manager®, a web-based data management application, for electronic submittal of all documents required by the Agreement, unless directed otherwise by DC Water. The *Contract Manager*® site is owned and operated by DC Water, and the version used shall be as directed by DC Water. Consultant is responsible for its internet connectivity, the functionality of its computer systems, and use of software as recommended by Oracle for *Contract Manager*®. DC Water will accept no liabilities arising from Consultant's use of *Contract Manager* including, but not limited to: slow response time, down time periods, connectivity problems, or loss of information on Consultant's equipment. Under no circumstances shall the usage of the *Contract Manager* be grounds for a time extension or cost adjustment to the Agreement.

Consultant will be allocated two (2) user accounts upon receipt and approval of a "Contract Manager User Account Request Form" signed by each user requesting access, and shall notify DC Water immediately of any users to have access revoked. Subconsultants and vendors will not have direct access to *Contract Manager* unless authorized by DC Water.

Consultant shall attend a meeting either at DC Water or as presented online, as directed by DC Water, within fifteen (15) days after NTP, for an overview of user access, website navigation, uploading documents, review processing, and correspondence requirements. Consultant is responsible for training its staff in the use of *Contract Manager*. All costs related to using the system shall be considered part of Consultant's overhead; a separate added cost shall not be allowed.

DC Water will allow access for submittal of documents including but not limited to: work plan, quality plan, meeting minutes, progress reports, project schedules, submittals, drawings, specifications, memoranda, QC/QA documents, invoices, and correspondence. Consultant is solely responsible for the validity of information placed in *Contract Manager*, including data from its subconsultants and vendors.

Hard copies of all required documents shall be provided in accordance with the Agreement. In the event of a discrepancy between electronic versions and paper documents, the paper documents shall govern.

All Data entered into *Contract Manager* shall be the sole property of DC Water. DC Water's acceptance of documents submitted via *Contract Manager* shall not relieve Consultant from responsibility for any variation from the requirements of this Agreement.

If the Contract Manager version is upgraded during the Contract Time, consultant will not be required to upgrade its system unless directed by DC Water. Any upgrades shall be at no additional cost to DC Water.

5.7 CHANGE MANAGEMENT

The design of facilities and infrastructure shall conform to the requirements and guidelines outlined in all applicable volumes of the PDM.

However, the design criteria presented in these volumes include minimum requirements and should not preclude independent and innovative thinking by the design engineer.

Proposed deviations from the design criteria that are demonstrated to be in the interest of a better design shall be brought to the attention of DC Water. Any exceptions or modifications shall be proposed before the Final CFR stage of the design submittal process. Calculations and documentation shall be provided in sufficient detail to allow evaluation of the proposed exception or modification. Descriptions of alternatives, advantages, calculations, economic analysis, if required, and cost information should be included. The final decision on any changes shall be made by DC Water.

5.8 RISK MANAGEMENT

The PM/PgM will schedule a Risk Management Workshop to be conducted by the PDE within 45 days of NTP, with appropriate client stakeholders familiar with the facility or linear infrastructure, to identify and discuss potential risks associated with the construction and operation of the proposed project. The PM shall review and distribute as appropriate documentation provided by the PDE to demonstrate compliance with requirements for risk management, including identification of potential risks and plans for mitigation thereof for the design project. Requirements are briefly explained in Section 6. Also, see Hazard and Operability (HAZOP) Study in Section 6 for additional information on identification of potential risks.

5.9 REGULATORY PERMITTING

For any proposed construction or modification of DC Water facilities or infrastructure, applicable regulatory and permitting requirements shall be identified during the negotiating phase for design. The Professional Service Agreement Exhibit D, Project Specific Scope of Work shall specify which permits are required for a project and the responsibilities of the consultant, of DC Water, and possibly of third parties in preparing permit applications. DC Water facility projects are subject to requirements of, but not limited to, the International Building Code (IBC), the DC Construction Codes Supplement, the District of Columbia Municipal Regulations (DCMR), and federal regulations concerning the U.S. EPA Clean Water Act, Safe Drinking Water Act, Clean Air Act, and the NPDES discharge permit. It is the responsibility of each PM and where applicable, each PDE, to become familiar with and fully address all regulatory and permitting requirements for each design project. However, responsibility for preparing and submitting permit applications, and acquiring approvals, may be shared among DC Water, the PDE, and the PgM, depending on the type and scope of a project. Different permitting roles for facility projects and linear infrastructure projects are addressed in Section 6.

Construction of facilities within the CIP requires environmental review and regulatory approval from various governmental agencies at the federal and District levels. Additionally, particularly for facilities construction, note that the IBC includes requirements for ‘Special Inspections’ to be performed for various systems during construction. For facility projects, when completing the DCRA Building Permit application, the estimated cost of work may exclude the cost of construction for associated process equipment when determining the permit fee by DCRA.

DETS Interagency Planning and Permitting Section will assist to identify the permits required for the proposed linear infrastructure construction in accordance with local, state and federal regulations. The PM/PgM shall coordinate with the PDE and the DETS Interagency Planning and Permit Section to facilitate the preparation of a formal Permitting Plan, using the DETS Permitting Plan document which includes an extensive listing of various regulatory agencies and various potentially required permits. The Permits Group will coordinate with the appropriate regulatory agencies to determine which permits may be required, and develop applicable permit documents based on the proposed construction documents.

The Permitting Plan document may be used for linear infrastructure projects to formally track the progress and status of all permit applications and permit issuances, including periodic updates to record dates of permit application submittals, permit issuances, permit expirations, and identification of responsible parties and consulting parties.

The PM shall be prepared to make presentations at public meetings and regulatory agency hearings in coordination with DETS/DWE and DC Water Public Affairs Office.

5.10 DESIGN PHASES

The following subparagraphs outline the intermittent design phases normally required for a design project. Upon completion of each phase, the PM/PgM will receive a progress submittal design package (DP) for review. Specific detailed design requirements for each design phase are addressed in Section 6 of this Volume, and additional detail design requirements are stated in PDM Volumes 2 and 3 as applicable.

5.10.1 Concept Design Report

In most cases, and particularly for Facility projects at Blue Plains, the PgM shall provide the PDE with a CDR prepared either by or for DC Water. For linear infrastructure projects, DETS Planning prepares a Transition Document to transfer project planning decisions to a design group or PDE. In each case, these documents are the starting point and basis for the PDE's design work. Refer to Section 6 of this volume for more details.

5.10.2 Concept Finalization Report, Preliminary Design, and Design Lock-In

5.10.2.1 *Concept Finalization Report*

The PM/PgM shall provide the PDE with the CDR prepared by others, and all information and data available from DC Water relevant to the design and construction work for the project. The PDE shall prepare the Draft CFR and a Preliminary Design based on and to be submitted with the Draft CFR. The Draft CFR shall document clear design objectives, design criteria, control narratives, all assumptions, permitting requirements, all available studies, site investigations, modeling, technical memoranda, operating data, and previous contract documents, as-built drawings, and other drawings. The Draft CFR shall also establish the proposed basis of design for the project, reasoning and justification for choice of utility location technique(s), identify any additional field verifications needed, and contain the Preliminary Design drawings for the project. Refer to Section 6 of this volume for more details.

The vast majority of material and equipment to be procured for construction under the CIP shall be by competitive open bidding as part of the construction contract bid. However, some engineered equipment and materials will be procured using other procurement options. There are a variety of reasons for the other options such as standardizing equipment to enable more cost-effective maintenance and reduce the amount of spare parts or to compare performance, cost and desirability of equipment from various vendors and pre-qualify or pre-select equipment prior to issuing the construction bid documents. As part of the preparation of the CFR the PDE shall review the need to use an alternative procurement method for any material or equipment and recommend any equipment for alternative procurement, if appropriate. DC Water and the PM will consider the PDE's recommendation and a decision will be made as part of the design lock-in process. DC Water's Procurement Manual addresses sole source procurement and DC Water Engineering SOPs describe pre-selection of equipment.

5.10.2.2 *Design Memoranda and Basis for Design*

Verify the PDE has prepared and included design memoranda and basis for design items detailed in Section 6. For facility projects, review and distribute the memoranda and preliminary layouts for each of the process systems and most of the support systems. For linear infrastructure projects, verify the inclusion of design memoranda, technical memoranda, or environmental assessments (EA), as necessary, to define and describe the pipeline alignment and structure location, rehabilitation concept and method, geotechnical plan, public information plan, traffic plan, etc. for the project. Also, verify each Draft CFR includes not

only the Preliminary Design, but also a concise summary of all memoranda appended to the report. The Draft CFR will be used for VE studies where applicable.

5.10.2.3 *Design Lock-in*

After resolution of all review and VE comments (as applicable) on the Draft CFR and Preliminary Design, written acceptance and authorization by DETS/DWE/CR Director shall constitute “Design Lock-in.” Any subsequent changes to the design should only be made when directed by DC Water, or if proposed by the PDE with submitted justification and approved by DETS/DWE/CR Director. All approved changes shall be documented in a revised CFR updated with tracked changes and resubmitted with each subsequent design phase submittal. Refer to Engineering SOP 3100 Design Lock-in for further details.

5.10.3 **Intermediate Design**

This phase shall incorporate review comments and approved responses from the Concept Finalization Review and VE Workshop (as applicable). Drawings at this level of submission are intended to depict the complete facility or linear infrastructure systems including the assets. The drawings and design calculations shall be sufficiently complete for thorough analysis of the designs of each component system, and be consistent with requirements of the PDM Volumes 1, 2 and 3 as applicable.

5.10.4 **Pre-Final Design Submittal**

Certain projects may require additional selected information and reviews and possibly meetings with DC Water staff during the pre-final design phase to address various other considerations associated with design, construction, and operation of the proposed project, including:

- Commissioning Plan [See Section 6] *
- Control Strategy Narrative and Workshop *
- HAZOP Study [See Section 6] *
- Maintenance of Plant Operations (MOPO) Analysis *
- O&M Manual [See Section 6] *
- Operations Training requirements *
- Bid-ability **
- Constructability **
- Risk Based Bid Allowance Workshop**
- Coordination with Related Designs **
- Test Shut Plan and Asset Verification from DWS (for Linear Infrastructure projects only)
- Lessons Learned **
- PDE’s OPCC **
- PDE’s Estimated Construction Schedule **
- Sole Sourcing Equipment **
- Verify Rolling Owner Controlled Insurance Program (ROCIP) status for construction **

* applies to Facility projects only

** applies to Facility and Linear Infrastructure projects

The Pre-final design should include resolutions and incorporation of the Intermediate Design comments, and completion of interdisciplinary reviews, before the submittal is made. The submittal shall be distributed to the stakeholders identified in the Design Submittal Distribution List. The Pre-Final should be complete

in all respects and ready for bidding with the exception of final revisions resulting from the Pre-Final review comments. For water linear infrastructure projects, test shuts should be coordinated with DWS linear asset management (LAM) branch.

Responses to all comments on Pre-Final Design shall be written and reviewed by DC Water and its representative(s) to resolve and close out any outstanding issues. Document the resolutions prior to the Back Check Submittal.

5.10.5 Back Check Submittal

The PDE shall submit a Consolidated Design Review Comment Spreadsheet demonstrating that all comments received and design workshop actions/decisions have been resolved and approved. The resolution of comments from all reviews, including those of the PM/PgM, DC Water, the USACE, and other regulatory agencies shall be including in this submittal. This submittal shall be considered bid-ready (but not sealed) and all quality assurance and quality control reviews by the PDE shall be complete. All items submitted in the pre-final design submittal shall be included in the Back Check Submittal. If there were no changes made to any design document, then that should be noted.

5.10.6 Final Design/Final Bid Documents

Neither DC Water nor EPA should have a need to review the documents at this time, as Final Design documents are to be complete in all respects, including resolution and close out of all comments made by the DC Water, EPA/USACE and other regulatory agencies, and shall be signed and sealed as described in Section 6 of this volume. After the PM and DC Water have confirmed that responses to all comments have been incorporated into the design documents, the PDE shall be directed to produce Final Bid Documents to be used to advertise for bids and distributed to bidders for the construction contract.

5.10.7 Conformed Documents

After completion of bidding, DC Water shall advise the PDE to prepare and submit within 30 calendar days after the bid opening a pre-determined number of hard copy and electronic sets of the “Conformed to Contract” Documents consisting of the Contract Drawings and Project Manuals, annotated electronically to include all addenda issued during the bidding phase.

5.11 VALUE ENGINEERING

Value Engineering (VE) is defined as an intensive and systematic study and evaluation of a project design by a team of experienced design professionals to identify and eliminate any cost not needed to achieve necessary project function, performance and reliability for the life of the project. The VE effort shall be managed by the PM/PgM.

All Facility projects having an estimated construction value of \$10 million or more and intended to be eligible for EPA grant funding shall be studied for a VE analysis. VE study method shall conform to the EPA required study criteria. The VE workshop shall be scheduled by the PM/PgM to occur after the Draft CFR and Preliminary Design are completed. The VE study teams shall generally consist of five to six technical specialists representing a variety of disciplines and shall be led by a VE team coordinator who is a Certified Value Specialist. The PM/PgM shall review and approve staff assignments for the studies and shall participate in the brainstorming sessions. Additionally, projects of any size, regardless of funding sources, may optionally be studied for VE on a case by case basis as determined by DETS/DWE/CR Director, and not necessarily subject to EPA study criteria.

The fee for the VE study is grant eligible under EPA funded projects. The additional engineering fee for any significant redesign to implement accepted VE recommendations is grant eligible when approved by the EPA Regional Administrator prior to the redesign.

Following the workshop, the VE team makes a presentation to DC Water and the PDE. Each recommendation is presented and opportunity is given to question the VE team regarding the analysis and development of the recommendations. The results and all backup calculations, forms, and supporting data are compiled in a written report. Fifteen copies of the report are forwarded to the PM/PgM within 30 calendar days after the completion of the VE workshop.

DC Water, the PM, and the PDE shall thoroughly evaluate all of the VE recommendations and decide whether to accept or reject each recommendation. The VE team coordinator shall then issue the final VE report. It summarizes the results of the study, analyses of the recommendations, shows accepted ideas and those rejected, with justifications, net savings, and other significant information.

5.12 DESIGN REVIEWS

Several milestone technical submittals are associated with each design agreement. The requirements for the type and number of various submittals are stipulated in the Professional Service Agreement for Design Services and specific requirements are included in Section 6 herein, and also in Volume 2, Facilities Design (by discipline) and Volume 3, Linear Infrastructure Design.

5.12.1 Design Review Documents

The following five (5) milestone design package (DP submittals are required for each design project:

- CFR and Preliminary Design
- Intermediate Design
- Pre-Final Design
- Back Check Set
- Final, Bid Ready

The requirements for the various submittals are documented in each design Agreement or Task Order. The technical content requirements are also tabulated in PDM Volumes 2 and 3 as applicable. In the event of any discrepancies, the design Agreement or Task Order shall take precedence. Note that in some cases, the design manual lists more specific detail of required contents of submittals. The PDE is responsible for performing internal Quality Assurance/Quality Control (QA/QC) activities per the approved PQP. Any related documentation of these activities may be the subject of Quality Audits performed by or on behalf of DC Water.

DPs submitted for review shall be accompanied by the Submittal Acceptance Checklist, initiated by the PDE. The form is referenced in Section 3, Guidance Documents. Upon receipt of the DP and the Submittal Acceptance Checklist, the PM/PgM determine if the submittal meets the requirements for distribution to DC Water and will complete the checklist. An appropriate response to address comments from previous submittals is required to be annotated on the review design review comment spreadsheet and returned with each subsequent design submittal.

For each submittal package, the PDE is responsible for preparing a complete, detailed bill of quantities and an OPCC. The degree of detail and the level of precision, as evidenced by a contingency factor, should be commensurate with the level of completion of the design. The OPCC should be accompanied by quotes from manufacturers and suppliers, obtained during the design process, for equipment and manufactured products.

5.12.2 Submittal Acceptance Requirements

The PDE and the PM/PgM are required to complete and submit the Submittal Acceptance Checklist prior to each design review submission and indicate by initialing each applicable line on the checklist that each item is provided with an electronic version, uploaded to DC Water's web-based project/data management application (currently CM14), that is submitted seven (7) days (or as agreed to between the PDE and PM/PgM) prior to the hard copy submittal –only after the PDE receives a hard copy of the Submittal Acceptance Checklist from the PM/PgM confirming the acceptability of the submission should production of the required hardcopies proceed. The hard copy submittal is the agreement submittal date.

If the PM/PgM determines that the submittal is not acceptable, the PDE shall be advised that the submittal may not be distributed to DC Water for review and the PDE shall submit a recovery plan identifying when the complete submittal will be available. Upon agreement on a revised schedule for the submittal, the PM shall advise DC Water of the new submission date and review period.

5.12.3 Design Submittal Distribution List

The PM/PgM shall contact the reviewers designated for each project and prepare a Design Submittal Distribution List which documents the reviewers' selections for distribution of design review submittal documents as designated in the media preference identified in the list.

The PM/PgM shall also maintain the distribution list to document the various distributions, and acknowledgements of receipt of documents distributed for review.

The PM/PgM for each design project shall contact various DC Water Departments as needed to determine the full complement of reviewers desired for each aspect of the design, and to determine the number and type of review sets to be provided by the PDE. The PM/PgM should distribute the Design Submittal Distribution List to departments as needed to solicit names of reviewers as designated by each department manager. The completed Design Submittal Distribution List shall be maintained by the PM/PgM to document the distribution of DP submittals for reviews and copy stored in DC Water's web-based project/data management application (currently CM14) for each the design phase.

5.12.4 Third Party Reviews

At completion of pre-final design, the design drawings and specifications shall be submitted to select third party reviewers when required. These may include the USACE on behalf of U.S. EPA, the named professional fire protection engineer consultant on behalf of DC Water's property insurance carrier, and any of various District of Columbia agencies reviewing documents for permit approvals.

5.13 PRE-ADVERTISEMENT REQUIREMENTS

Before a project can be authorized for issuance of an invitation to bid, there are a number of pre-advertisement prerequisites which shall be addressed and approved. DETS Program Services will provide a Pre-Advertisement Checklist for each project as a general guide for the PM/PgM to maintain throughout the design phase to ensure required documents and approvals have been prepared/provided. One of the critical pre-advertisement prerequisites is the Pre-Advertisement Certification Approval form, which is prepared by the PM/PgM for approval sign-offs by multiple Engineering managers, CM, USACE, and Operations Director(s). Refer to Engineering SOP 4040 for the Pre-Advertisement Certification approvals requirements.

5.14 INVOICING

Invoices shall be prepared using the standard format established by DC Water. Invoices are required monthly unless agreed otherwise by the DC Water PM, shall correspond to the same period as the monthly progress report so that earned value by task can be compared to the invoiced amounts. The PM/PgM reviews the PDE invoices for DETS/DWE and DETS Program Services and coordinates a final review and payment with the DC Water Office of the Chief Financial Officer (OCFO). Prompt payment is DC Water's goal. It is a management objective to pay all invoices within thirty (30) calendar days of receipt by DC Water. DETS Program Services A/E Invoicing Procedures and Checklist located in Livelink provide instructions for preparing and submitting invoices.

6 DESIGN REQUIREMENTS

6.1 PROFESSIONAL REQUIREMENTS

Designs shall be developed by or under the direct supervision of design professionals licensed in the District of Columbia, who are knowledgeable in the requirements of the discipline involved. Additionally, property and topographic surveys required for designs shall be performed by land surveyors licensed in the District of Columbia. Exceptions are that surveys and designs for construction in Virginia or Maryland shall be prepared by professionals licensed in those respective jurisdictions. To avoid potential conflicts of interest (DC Water Procurement Manual, Para. 1.6) a Consultant who prepares a CDR for a DC Water CIP project cannot also provide services to prepare the CFR and the detail design for a project.

All final drawings, specifications, calculations, OPCC's, studies, and reports issued for a project shall be sealed and signed by the licensed surveyor, architect, or professional engineer in the respective discipline who is responsible for their preparation. All final documents prepared and submitted to DC Water shall be approved and signed by a professional who is licensed in the District, or jurisdictions noted above when applicable, and authorized by the PDE firm or subconsultant firm as applicable, to sign the final design documents.

Documents prepared by a subconsultant for either the PM or PDE shall be signed by representatives of both firms. The PM shall not sign documents prepared by PDEs under contract agreement. Seals shall be affixed on each drawing in a set of contract drawings and on the signature pages of design agreements, specifications, calculations, OPCCs, studies, and reports.

Documents prepared by DC Water shall be approved and signed by a DC Water approved signatory licensed in the District of Columbia.

6.2 DESIGN INITIATION MEETING

Within 5 calendar days of the NTP, the PM/PgM shall schedule a Design Initiation Meeting for attendance by the PDE's key project staff and DC Water's project stakeholders. The purpose of the meeting is to review all the basic project considerations including scope of services, project goals, and DC Water requirements and administrative procedures. The PDE shall be given copies of DC Water technical design requirements and all other pertinent and applicable DC Water guidance documents. It shall be made clear how design lock-in will be achieved and documented

- Reference SOP for design kick-off meeting.
- For concept design, goal of project, goal of design needs to be distributed and agreed to by user group and engineering group
- For detailed design, concept design lock-in report (or however lock-in details are documented) needs to be distributed and agreed to by user group and engineering group.
- The technical design requirements (guideline specs, design manual, current codes, other DC Water guideline documents) should be presented as part of the kick-off.

6.3 PROJECT WORK PLAN

Prepare and submit a PWP within 21 calendar days after the date of the NTP. The PWP shall provide a baseline of design task information to enable DC Water to monitor the progress of the design activities, expenditures, and schedule for completion of work to meet the project deadlines. The PWP shall contain the following:

- A copy of the executed Agreement and Task Order if applicable.
- A copy of the approved CDR or transition document.
- A copy of the Design Submittal Distribution List prepared by the DC Water PM that identifies key stakeholders.
- Design team organization, identification of subconsultants and key technical and project management personnel, plus resumes as requested.
- Description of tasks and subtasks to be performed and associated costs. This breakdown shall be used as the basis for measuring progress, and preparation and approval of Consultant invoicing.
- A cost loaded schedule, prepared in latest Primavera software used by DC Water, which identifies tasks for all services covered by this Agreement and clearly indicates the critical path activities required for completion of services. Critical path items shall include obtaining permits necessary for the completion of the project. The schedule shall be updated monthly, or as directed by DC Water and submitted with the Consultant's monthly progress report, and at the attainment of all milestones, to reflect actual progress against the original baseline, and earned value. The schedule shall allow 30 calendar days for review by DC Water of each deliverable. The schedule shall be submitted via Contract Manager in Primavera native format and hard copies shall be provided if requested by DC Water.
- A Cash Flow Schedule for the professional services, based on the cost breakdown and schedule requirements noted above.

The PDE shall acknowledge the PDE requirements associated with project administration as stated in Section 5, and include such activities as appropriate in the PWP. Within 10 calendar days after receipt of review comments, submit the PWP in Contract Manager and submit three (3) hard copies of the PWP, finalized in accordance with DC Water review comments. No payments shall be made prior to approval of the PWP.

6.4 DESIGN AND CONSTRUCTION SCHEDULES

6.4.1 Detailed Design Schedule

The PDE shall prepare and maintain a detailed, cost loaded, Primavera based Design Schedule to identify tasks for all services covered by the Professional Service Agreement that clearly indicates the critical path activities required for completion of services. The design schedule shall conform to the DC Water Design Schedule Template which is available on Livelink, and shall be provided to the PDE. The Design Schedule is a component of the PDE's Work Plan, and shall be updated and submitted with each monthly progress report. The schedule shall include at least the following details:

- Work breakdown structure (WBS) by design phase.
- Tasks that are cost loaded with the budgeted cost associate for the respective project schedule tasks/milestones.
- Major components of the design identified for each design phase.
- List and identify all design-related tasks and subtasks.
- Identification of meetings including kickoff, progress, coordination, workshops, milestone meetings, and audits.
- Logical relationship among the various project phases.
- Logical and dependent relationships among activities.
- Scheduled start and finish dates and milestones for design activities and deliverables.
- Allowance of 30 calendar days for review and comment of each deliverable.
- Obtaining permits necessary for the completion of the project

- Estimated activity durations to meet milestone dates including original (scheduled) duration, remaining duration, and percent complete.

To reflect actual progress against the original baseline, and earned value, activity descriptions shall be in sufficient detail to enable an independent evaluator (DETS, DWE, or the PM) to assess the planned progress of design in relation to the design schedules and, subsequently, to periodically determine the progress status of individual tasks.

The schedule shall contain typical major discipline activities anticipated during each of the several required design phases and include submittals, reviews, and major milestones. Activity durations should be planned such that the report or deliverable required at the end of each phase meets agreement deliverable dates. The entire project, including submittal review periods, shall be planned to fall within the overall agreement duration.

The schedule shall be accompanied by a progress forecast based on scheduled activities. The schedule may be cost-loaded at the activity level, or a separate table, such as a spreadsheet, may be used. The value ascribed to each activity should be proportional to the amount of effort or product (for example, status of completion of drawings or specifications) associated with that activity. The subtotal value of individual activities during a phase shall total the percent complete payment amount expected at the end of each phase. The sum of the values of phase payments shall total 100 percent. The earned value derived from the progress-status schedule and the cost-loaded schedule shall be evaluated by the PM and coordinated with approval of the PDE's monthly invoice. The progress and completion status shall be reported monthly by the prime consultant and include the status for each major subconsultant.

6.4.2 Construction Schedule

The PDE shall prepare and include a preliminary critical path method (CPM) construction schedule with the Intermediate Design Submittal in Primavera P6 latest edition, illustrating how the major components of construction can be sequenced. An updated detailed estimated construction schedule shall also be prepared and submitted with each subsequent DP.

6.5 PROJECT QUALITY PLAN

DC Water has a DETS Quality Manual (posted on Livelink) which includes the Quality Policy and requirements to ensure appropriate Quality Assurance and Quality Control activities for design agreements. Attachment A of the DETS Quality Manual outlines requirements for a PQP. A detailed PQP shall be prepared and submitted, for approval, within 21 calendar days after the NTP. The PQP shall conform to requirements of the DC Water Quality Manual, shall demonstrate how quality will be achieved on the project/program, and shall describe how records will be generated and managed. An Outline Project Quality Plan for PDE Consultants and a PQP Checklist are available on Livelink and is provided as guidance and indicates the type of information required and the typical level of detail to be provided in a PQP.

The PDE/PgM shall submit a PQP for each design project or program management Agreement. Services provided by sub consultants shall be addressed in the PQPs. The PQP shall be periodically reviewed and used for conducting quality audits of the Consultant's and subconsultants' activities to verify documented compliance with the PQP. The PQP shall be submitted with the PWP to be jointly reviewed and approved.

6.6 FIELD INVESTIGATIONS AND SURVEYS

6.6.1 Topographic and Bathymetric Base Plans

For requirements of topographic surveys and base plans, and bathymetric base plans if needed, see PDM Volume 2, Facilities Design.

6.6.2 Water and Sewer Pipeline Designs

For field survey requirements for water and sewer pipeline designs, see PDM Volume 3, Linear Infrastructure Design.

6.6.3 Lead and Asbestos Survey

For requirements pertaining to asbestos and lead paint surveys, see PDM Volume 2, Facilities Design.

6.7 RISK MANAGEMENT

The PDE shall address risk management for each design project. Risk management effort shall begin with preparation of a Risk Register to compile a listing of all perceived potential risks that could possibly affect the project during design, construction, operation, and maintenance. The Risk Register shall be initiated during the concept finalization phase, updated continuously the risk(s) and associated mitigating measures incorporated, as applicable, in the subsequent submittal, and included with each design phase submittal. There is no limit to the types of potential risks that can be identified, and can include for example, but not limited to, people, decisions, non-performance, equipment deficiencies or malfunctions, process weaknesses, bidding documents issues, construction problems, weather impacts, scope changes, costs, operator mistakes. “What if” and “What can go wrong?” questions should be asked to help identify potential risks. Also, see HAZOP Study later in this Section 6 for additional information on identification of potential risks.

Within 45 days of the NTP, the PDE shall conduct a Risk Management Workshop with appropriate client stakeholders familiar with the facilities or infrastructure, to first identify any additional potential risks. The workshop activity shall include discussion and evaluation to build consensus on the perceived likelihood of each risk event happening, including qualitative and quantitative assessments in accordance with DC Water risk register guidance. The workshop shall also include evaluation and building consensus on the potential severity of consequences associated with each risk event. Consequences of risk events may be categorized such as, for example: health and safety, schedule delay, contract/legal, financial, process impairment or failure, permit violation, external affairs, or others as may be considered. Then the identified consequences are assigned a relative severity score such as low (1), moderate (2), or extreme (3). The above evaluation factors should be added to the risk register in a matrix form to tabulate overall risk scores and result in a calculated ranking list of all the identified risks.

Identify possible remedies to mitigate each risk. Then, with consensus on the proposed mitigation, re-evaluate the risks with proposed mitigation measures. Assign each mitigation measure to a PDE team member to be responsible for verifying and reporting that the risk and mitigation are addressed. Expand the risk register to indicate the ‘owner’ of each proposed mitigation, the mitigated risk evaluation, and a status column to indicate the status of each mitigation item. The PDE shall review and track progress of all risk mitigation plans and conduct quarterly review meetings with DC Water, until all assigned items are indicated ‘closed’. This activity may extend into and during construction.

For project related risks that were identified in the planning and design phases that could not be mitigated, the Allowance Approval Request is completed and approved by DC Water Chief Engineer –this is separate from the “Necessary and Prudent Allowance” which is a standard bid allowance, as an additional Bid Allowance for “Additional Work” of *potential foreseen issues* with supporting justification and explanation. The Bid Allowance for the risk mitigation of potential foreseen project related issues are typically categorized by discipline, is a percentage of the PDE OPCC per discipline, and for items that cannot be fully quantified but the approximate costs are based on lessons learned and management experience. An Engineering SOP for the Bid Allowance is pending, however, a sample and guidance of the requirements and outline can be provided by DWE (Reference IFB 150030 Raw Wastewater Pump Station No. 2 Upgrades).

Identification of and addressing possible mitigation of potential risks is also related to HAZOP studies. See HAZOP Study later in this Section 6.

6.8 REGULATORY PERMITTING

DC Water facilities projects are subject to requirements of, but not limited to, the IBC, the DC Construction Codes Supplement, the DCMR, and federal regulations concerning the U.S. EPA Clean Water Act, Safe Drinking Water Act, Clean Air Act, and the NPDES discharge permit. PDEs shall become familiar with and fully address all regulatory and permitting requirements for each design project. However, responsibility for preparing and submitting permit applications, and acquiring approvals, may be shared among DC Water, the PDE, and the PgM, depending on the type and scope of a project. Most DC Water CIP projects are categorized as either facilities projects, or linear infrastructure projects. General roles for permitting activities are:

Permitting Activity	Facilities Projects (on & off Blue Plains site)	Linear Infrastructure (off of Blue Plains site)
1. Prepare required permit documents	PDE	PDE
2. Prepare and submit permit applications	PDE	DC Water
3. Pay the permitting fees	DC Water	DC Water
4. Pick up the permit	PDE (& submit to DC Water)	DC Water

Facility designs involving the production of, or change in air emissions may be subject to requirements for air quality permits in compliance with DC Regulations and Federal Clean Air Act and Clean Air Act Amendments, which are enforced by DDOE Air Permitting and Enforcement Branch. Air permits may include two types: an air permit to construct, and a Title V operating permit. See PDM Volume 2, for the Screening Chart for Air Quality Permit Determination, and additional information.

PDE staff may occasionally be needed to provide testimony at regulatory agency public hearings.

6.8.1 Facilities Designs

DC Water facilities shall be designed to operate in conformance with regulatory standards for air, water, and noise. Construction of facilities within the CIP requires environmental review and regulatory approval

from various governmental agencies at the federal and District levels. All facilities projects involving land-disturbing activities or major substantial improvement activities shall require a building permit.

For each project, the following shall be performed in accordance with the project schedule:

- Verify which permits are required for the project.
- Identify specific requirements for permit applications to achieve permit and regulatory approvals.
- Incorporate considerations related to permit requirements into the design process and documents.
- Complete permit application forms and contribute information as applicable including design criteria and data, written narrative descriptions, and construction plans and specifications.
- Upon approval of the building permit application, pay the filing fee for the building permit fee.
- Respond to all technical questions pertaining to regulatory approvals and participate in technical review meetings with the agencies if deemed necessary by DC Water.

The PDE is responsible for the timely completion of all design work, so that regulatory approvals can be obtained in accordance with the PDE's SOW schedule. In coordination with DETS/DWE and DC Water Public Affairs Office, PDE staff may occasionally be needed to provide testimony at regulatory agency public hearings.

Facility designs involving new or resulting changes in air emissions may be subject to requirements for air quality permits in compliance with DC Regulations and Federal Clean Air Act and Clean Air Act Amendments, which are enforced by DDOE Air Permitting and Enforcement Branch. Air permits may include two types: an air permit to construct, and a Title V operating permit. The PDE shall consult the DC Water air permit contact to review project components and determine which if any permits or types of analyses are required. See also Design Manual Volume 2, for the Screening Chart for Air Quality Permit Determination, and additional information.

6.8.2 Linear Infrastructure Designs

Permits for linear infrastructure construction will be coordinated with the DETS Interagency Planning and Permitting (Permits Group) in accordance with local, state and federal regulations. The PM and the PDE shall coordinate with the DETS Permits Group to facilitate the preparation of a formal Permitting Plan, using the DETS Permitting Plan document which includes an extensive listing of various regulatory agencies and various potentially required permits. The Permits Group will coordinate with the appropriate regulatory agencies to determine which permits may be required, and develop applicable permit documents based on the proposed construction documents.

The Permitting Plan document shall also be used to formally track the progress and status of all permit applications and permit issuances, including periodic updates to record dates of permit application submittals, permit issuances, permit expirations, and identification of responsible parties and consulting parties.

Linear Infrastructure designs may typically require coordination with the National Park Service property map; the Architect of the Capitol; the DC Functional Classification Street Map; Truck routing map; and Washington Metropolitan Area Transit Authority (WMATA). Potentially required permits for approval of infrastructure design may include the following:

- DCRA Building Permit Application
- National Park Service Special Use Permit
- Erosion and Sedimentation Control Permit

- DDOT Traffic Control Plan
- DDOT Public Construction/Excavation Permit

6.8.2.1 *Permits During Construction*

Bidding and contract documents prepared by the PDE shall address permits required to be obtained by the construction contractor. The Contractor is required to obtain all permits required for the work, except any obtained by DC Water as listed above. Permits obtained by the Contractor shall be approved by DC Water prior to the start of construction, and may include, but are not limited to:

- DDOT Traffic Control Plan
- DDOT Steel Plate Permit
- DDOT Rotating Steel Plate Permit
- DDOT Urban Forestry Administration (UFA) Public Space Tree Permit
- DC Water Fire Hydrant Use Permit
- DDOT Occupancy Permit
- After Hours Permit
- Raze permit from DCRA
- Spill Prevention Control and Countermeasure (SPCC) Plan, if required by the DDOE

Additionally, the Contractor shall obtain the necessary transport, handling and delivery permits and approvals, complete and in compliance with established local haul routes and requirements of the District of Columbia. The Contractor shall also determine the size limitations on all roads, bridges, underpasses, etc. over which the equipment and materials will be moved during construction. Where such limits are exceeded, the Contractor shall be responsible for any and all permits and fees.

6.9 DESIGN PHASES

6.9.1 Concept Design Report

For facilities projects, the PDE shall be provided a CDR prepared by others. For linear infrastructure projects, DETS Planning shall prepare and provide a Transition Document to transfer project planning decisions to a design group or PDE. In each case, these documents shall be the starting point for the design work, and depending on the project complexity, the CDR will typically contain:

- Assumptions and Constraints
- Project Description, Maps, and Layouts
- Process Schematic and/or Site Configurations, as applicable
- Project Justification
- Technology Review and Screening, as applicable
- Process Selection, as applicable
- Project Objectives
- Project Design Criteria and Intent
- Recommendations for Geotechnical, Site Utilities, and Hazardous Material Investigations
- Planning Level Cost Estimates for Design and Construction

- Overall Budget
- High Level Project Risks
- Preliminary List of Key Stakeholders
- Supplementary Information to Support the Concept Design

The following subparagraphs outline the various incremental design phases, and the associated requirements normally required for each phase of a design project. Additionally, PDM Volumes 2 and 3 include more detailed design submittal requirements for various disciplines and each of the following design phases. Upon completion of each design phase, the PDE shall submit a progress DP for review.

6.9.2 Concept Finalization Report, Preliminary Design, and Design Lock-In

Field Verification

Prior to the Draft CFR and Preliminary Design Report and at each level of design, inspect field conditions to verify the constructability of the proposed facilities or linear infrastructure design and incorporate any necessary improvements resulting from the field inspections into the Draft CFR and preliminary design report and contract drawings and specifications, to mitigate potential disputes over changed site conditions during construction. Take photographs as necessary to document conditions.

6.9.2.1 Concept Finalization

Based on the CDR, develop a Draft CFR/Preliminary Design and submit in accordance with the approved schedule for review by DC Water. Collect and review all information and data available from DC Water relevant to the design and construction work for the project, including operations data, previous reports and studies, contract documents, as-built and other drawings, field verification of basis for integration with existing equipment, structures, electrical systems, Process Control System (PCS), etc., and any other information needed for design. The report shall include detailed design criteria, establish the basis of design for the project, control narratives, reasoning and justification for choice of utility location technique(s), and contain preliminary design drawings for the project. In addition, meet with relevant permitting agencies to identify permitting requirements and include the requirements in the Draft CFR and Preliminary Design.

The Draft CFR, accompanied by Preliminary Design drawings, is submitted to DC Water for approval, and any subsequent changes in design criteria directed by DC Water or exceptions taken during the Design Lock-in or recommendations from a Value Engineering (VE) study that is/are approved by DC Water shall be documented in a Final CFR. The PDE shall seal and sign the Final CFR in accordance with DCMR Title 17, Chapter 15, Section 1516 and submit as part of the “Design Lock-in.”

For Facility design projects only, the Final CFR shall be updated and resubmitted without the seal and sign, as necessary, with each level of design submission to document in track change all approved deviations.

6.9.2.2 *Design Memoranda and Basis for Design*

Plant and Facility Designs

Produce a series of design memoranda, including preliminary layouts, for each of the process systems and the major support systems. Design memoranda shall define the basic assumptions governing the unit sizes for the equipment in question, and shall include supporting calculations, manufacturer's literature, outline specifications, manufacturers initial quotations on cost and delivery times, control strategies for the equipment, and other information such as power requirements, weight, need for cooling water etc. Include the basis for design for each discipline applicable to the project, including but not limited to geotechnical; civil, hydraulic; process; structural; architectural; mechanical; heating, ventilation, and air conditioning (HVAC); electrical; and, instrumentation and control. List all design criteria, parameters, and applicable national codes and specifications. Discuss all interfaces with existing operations and maintenance, noting required process, access or equipment shut downs and their effects. Memoranda shall include basic equipment layouts and flow diagrams to establish the final basis for design of the selected processes and required equipment components. In addition, the memoranda shall become the basis for coordinating all design disciplines for work required in support of each system. The memoranda shall be appended to the Final Concept Finalization/ Preliminary Design Report and a concise summary shall be provided within the Report prior to submittal for VE (as applicable) and DC Water reviews.

Linear Infrastructure Projects

Produce a series of design memoranda, technical memoranda, or environmental assessments (EA), as necessary, to define and describe the pipeline layout and structure location, rehabilitation concept and method, geotechnical plan, public information plan, traffic plan, etc. for the project. The memoranda shall be appended to the Draft CFR and Preliminary Design and a concise summary shall be provided within the Report prior to submittal for DC Water reviews.

6.9.2.3 *Preliminary Design*

Preliminary Design drawings and specifications shall include the following items, as applicable, and shall be in sufficient detail for VE review. At a minimum, provide the following documents, as applicable:

- Asbestos and lead paint survey report for the project area*
- Assessment of energy savings provisions of selected options*
- Catalog data on all proposed new equipment and list of recommended spare parts*
- Draft input/output (I/O) list*
- Electrical riser diagram*
- Estimate of additional O&M labor hours*
- Evaluation of Greenhouse Gas and other potential air emission issues*
- General arrangement of new equipment with the new and modified structures and major piping*
- Hydraulic profiles*
- Instrumentation and control philosophy*
- Operating strategies for the Process and Instrumentation Diagrams (P&IDs)*
- Preliminary design calculations, including lighting and electrical*
- Process and instrumentation diagrams (P&IDs)*
- Process flow diagrams*
- Schematic diagrams*
- OPCC in CSI format (within Cost Engineers guidelines for Preliminary Design)**

- Outline of technical specifications for all major structural, mechanical and electrical components, with Construction Specification Institute (CSI) or DC Water section numbers. Indicate which sections are DC Water specification.**
- Piping diagrams**
- Preliminary construction schedule showing major construction phases and estimated durations**
- Results of survey, location of pipelines, manholes, valves, structures, other appurtenances, and access roads**
- Site plan**

* Applicable for Facility projects only

**Applicable for Linear Infrastructure projects and Facility projects

Prepare and submit written responses to all review comments on the Preliminary Design. Meet with DC Water and its representative(s) to review comments and responses, and resolve any outstanding issues. Resolution of comments shall be documented on the listing of comments and responses or appended to it.

6.9.2.4 Design Lock-in

After resolution of all review and VE comments (as applicable) on the Draft CFR and Preliminary Design, written acceptance and authorization by DC Water shall constitute “Design Lock-in” to negotiate the design scope of work and to proceed to the subsequent design phase of the project. Any changes to the Final CFR should only be made when directed by DC Water, or if proposed by the PDE with submitted justification and approved by DETS/DWE/CR Director. All approved changes to the Final CFR throughout the entire design for Facility projects shall be documented in an updated Revised CFR and resubmitted with each subsequent design phase submittal. Revisions shall be in “**bold**” font and “strikeout” notation, or indicated as “tracked changes.”

6.9.3 Intermediate Design

Comments and approved responses from the Concept Finalization Review and VE Workshop (as applicable) shall be incorporated. Drawings for this submittal shall depict the complete facility or linear infrastructure systems. The drawings and design calculations shall be sufficiently complete for thorough analysis of the designs of each component system.

Prepare Intermediate Design Documents consistent with requirements of the PDM Volumes 1, 2, and 3 as applicable. Submit the following in sufficient detail to allow for thorough analysis, as applicable, of all structural, site, pipe alignment, architectural, instrumentation, process, control, mechanical, HVAC, odor control, plumbing, and electrical systems design:

Applicable for Facility projects only:

- All equipment schedules, even if not yet complete, in DC Water approved format, on ‘G’ drawings and on a separate Excel file (Asset Template located in Livelink Appendix A Forms). Use DC Water standard nomenclature to list for all required equipment: equipment tag identification, equipment description, locations, and process and system names. In the Asset Classification Table, include a blank column for Asset Number for subsequent input from DC Water.
- Catalog data on all proposed new equipment, updated with new data for the Intermediate Design submittal.
- Documentation of provisions for compliance with fire protection and life safety requirements.
- Outline of Commissioning Plan, and commissioning forms for the Project Manual.

- Preliminary sequence of construction for maintenance of facility operations during construction.

Applicable for Linear Infrastructure projects only:

- Copies of counter maps and as-built records organized by location to facilitate review of design submittal. These documents shall be returned to the PDE with the comments to the submittal.
- Coordinate with DWS Linear Asset Management (LAM) Branch to identify small diameter water main assets and test shut project boundary.

Applicable for Facilities projects and Linear Infrastructure projects:

- Completed and signed PDE internal Quality Review Checklist and any other quality control/quality assurance documentation required by the PQP.
- Consolidated Design Review Comment Spreadsheet with all comments received, written responses, and design workshop actions/decisions.
- Design calculations, updated for the electronic Intermediate Design submittal.
- Drawings:
 - Illustrate the complete complement of facilities included in the project (both rehabilitated and new), including all dimensions, abbreviations, nomenclature, legends, general notes, and discipline related notes.
 - Include set cover sheet, location plans, access roads and routes, and drawing index.
 - Include as applicable, soil erosion and sediment control details, utility locations, manhole, structure, valve and appurtenance locations,
 - Prepare drawings in AutoCAD 2017 or later format. Comply with DC Water CAD standards. Use of overlay drawings is prohibited.
 - Provide a flash drive containing both AutoCAD and full-size portable document format (pdf) format.
- Preliminary construction schedule, indicating basic critical path sequencing. The schedule shall include the sequencing of construction operations as applicable for maintaining existing facilities, linear infrastructure test shuts, or plant operations during construction.
- Preliminary Schedule of Prices.
- Project Manual including complete Table of Contents; all applicable DC Water procurement and contracting documents and forms (General Conditions, Bid Documents, bid forms, EPA or DC Government requirements, etc.); Divisions 00 and 01; and technical specifications for all major civil, architectural, structural, mechanical, plumbing, HVAC, electrical and instrumentation components. Include project title on applicable bid forms. Technical specifications shall describe in detail the required types and quality of materials, equipment, and systems; the quality of workmanship; the methods of fabrication, installation and erection; the test and code requirements; and other information required for proper completion of the work. Use DC Water specifications wherever applicable, and prepare additional specifications as needed in DC Water and CSI format, using DC Water's format template. Submit any proposed changes of DC Water Guideline specifications for approval in tracked changes. Do not change or duplicate DC Water standard specification section numbers. Specifications shall also include: any known permit requirements, listing of permits to be acquired, sections for materials not in DC Water Standard Specifications, and DDOT Traffic Control requirements as applicable.
- Updated bill of quantities and updated OPCC in CSI format, based on the progress of the design.
- Summary of any deviations from the Final CFR.

Respond to all comments on Intermediate Design in writing within ten (10) business days after receipt of the consolidated comments from the PM/PgM. Meet with DC Water and its representative(s) to review comments and responses. Resolve any outstanding issues and document the resolutions.

6.9.4 Pre-Final Design

In addition to the required submittal items noted on the next page, certain projects may require additional information and possibly meetings with DC Water staff to address various other considerations associated with design, construction, and operation of the proposed project, including:

For Facility projects only:

- Commissioning Plan [See Section 6]
- Control Strategy Narrative
- HAZOP Study [See Section 6]
- MOPO Analysis
- O&M Manual [See Section 6]
- Operations Training requirements

For Facilities projects and Linear Infrastructure projects:

- Bid-ability
- Constructability
- Coordination with Related Designs
- Test Shut Verification from DWS (Water Linear Infrastructure project only)
- Lessons Learned
- PDE's OPCC
- PDE's Estimated Construction Schedule
- Sole Sourcing Equipment
- Risk Based Bid Allowance Workshop
- Verify ROCIP coverage for construction

The Pre-Final Design submittal shall be represented by the PDE as being final and complete and contain complete design documents by the PDE. The comments from the Intermediate Design reviews shall be resolved and incorporated. The PDE interdisciplinary reviews should be completed before the submittal is made. The drawings and specifications shall be ready for bidding, with the exception of any changes to the documents that may be required by comments made during review of this submittal. For water linear infrastructure projects, test shuts should be coordinated with DWS Linear Asset Management (LAM) Branch.

This submittal will be distributed to the stakeholders and reviewers identified in the Design Submittal Distribution List. The Pre-Final Design should be complete in all respects with the exception of final revisions resulting from the review comments.

The submittal shall include the following items, as applicable, plus other items as applicable listed in PDM Volumes 2 and 3:

- A detailed OPCC, in CSI format, including subtotals for each technical specification division and explanation of the derivation of costs.
- A critical path method (CPM) construction schedule illustrating how the major components of construction can be sequenced.
- Complete design calculations.
- Complete Project Manual with DC Water cover and title pages, table of contents, all front-end documents, technical specifications, schedule of prices, measurement and payment sections, and pertinent appendices.
- Catalog data on all proposed new equipment. Submit new notebook with catalog cuts of all equipment to be used in the project, whether previously submitted or not. This notebook shall replace any and all notebooks submitted previously.
- Revised Final Concept Finalization /Preliminary Design Report, noting all changes.
- Equipment Schedules/Identification Tables in DC Water approved form, on 'G' drawings, and a separate Excel file of a completed DC Water Asset Classification Template.
- Arc-flash study and electrical coordination study (if applicable).
- Pre-Final Commissioning Plan (if applicable).
- PDE internal Quality Review Checklist and any other quality control/quality assurance documentation required by the PQP.
- Traffic Control Requirements.
- Sequence of Construction requirements.
- Consolidated Design Review Comment Spreadsheet with all comments received and design workshop actions/decisions
- Submittal Register

Respond to all comments on Pre-Final Design in writing within ten (10) business days after receipt of the consolidated comments from the PM/PgM. Meet with DC Water and its representative(s) to review comments and responses, and resolve any outstanding issues. Document the resolutions prior to Back Check Submittal.

6.9.5 Back Check Submittal

The PDE shall submit a Consolidated Design Review Comment Spreadsheet demonstrating that all comments received and design workshop actions/decisions have been resolved and approved. The Back Check Submittal is a 'pencils down' submittal with no new comments unless a new item (e.g., specification, drawing, equipment, control strategy, etc.) has been introduced which was not included in the prior submittals, or if an item is discovered missing. The resolution of comments from all reviews, including those of the PM, DC Water, the USACE, and other regulatory agencies shall be included in this submittal. This submittal shall be considered bid-ready (but not sealed) and all quality assurance and quality control reviews by the PDE shall be complete. All items submitted in the pre-final design submittal shall be included in the Back Check Submittal. If there were no changes made to any design document, then that should be noted.

6.9.6 Final Design/Bid Documents and Conformed Documents

Neither DC Water nor EPA should have a need to review the documents at this time, UNLESS there were comments generated with the Back check submittal. Final Design documents are to be complete in all respects, shall have addressed and incorporated all comments made by the DC Water, EPA/USACE and other regulatory agencies on the previous submittal, and shall be signed and sealed as described in Section 6. Submit the drawing cover sheet for DC Water approval signatures. After the PM and DC Water have

confirmed that responses to all comments have been incorporated into the design documents, the PDE shall be directed to produce final Bid Documents to be used to advertise for bids and distributed to bidders for the construction contract.

6.9.6.1 Contract Drawings

- Develop and prepare in AutoCAD 2017 or later format.
- Provide flash drive of both AutoCAD and full-size pdf format.
- Comply with the CADD standards as stated in the DC Water CAD Manual
- Use of overlay drawings is prohibited.
- Upon completion of the bidding period, deliver complete AutoCAD drawing (DWG) Files on a flash drive, conformed to include all addenda issued during the bid period. Submit all support files used and necessary such as: shape, fonts, symbols and lisp files; also, submit files specifying scale and plot data for all files.

6.9.6.2 Project Manual (Procurement and Contracting Requirements, General Requirements, and Technical Specifications)

- Table of Contents, and all applicable DC Water specification sections in Divisions 00 and 01.
- Project information on applicable bid forms.
- Schedule of Prices with appropriate bid items per Section 00 40 10, and formatted per DC Water guidance and seal and sign by a licensed professional engineer.
- Equipment and System Commissioning specification, if applicable, including commissioning appendices forms.
- Technical specifications based on DC Water Standard, Supplemental, or Guideline specifications wherever applicable, and additional technical specifications as needed in DC Water modified CSI format.
- Bidder Submittal Packets, bound separately from Project Manuals. (with Final Bid Documents only)

6.9.6.3 Conformed to Contract (CTC) Documents

After completion of bidding, DC Water shall advise the PDE to prepare and submit within 30 calendar days after the bid opening a pre-determined number of hard copy and electronic sets of the “Conformed to Contract” (CTC) Documents consisting of the Contract Drawings and Project Manuals, annotated electronically to include all addenda issued during the bidding phase.

6.10 DESIGN WORKSHOPS

The PDE shall schedule and conduct all required workshop meetings with DC Water staff as needed for each design. Each workshop shall generally focus on one or more related topics or disciplines to discuss plans, options, or alternatives for the design and receive input, concurrence, guidance, or direction from DC Water stakeholders. The PDE shall take minutes of each workshop meeting and submit a record for documentation and confirmation of decisions and direction. Minutes should be entered in Contract Manager and comments and resolutions related to technical design issues should be added to the design review comment spreadsheet.

6.11 SOFTWARE REQUIREMENTS

DC Water appreciates design methods which employ proven software. The PDE shall submit a list of computer programs proposed to be used for design and analysis to DC Water prior to use of the programs. The submittal should include a description of the methods for documenting inputs, the use of the software, and methods for verifying custom or non-industry standard programs to be used for design and analysis. Proposed software shall be reviewed and accepted by DETS/DWE/DCCR as part of the PDE design SOW prior to being used for the design agreement. Software that is not fully operational, or which is provided for demonstration purposes, or which is not licensed to the user, shall not be used for DC Water design projects. In addition, the use of any software which has been shown to produce unreliable results shall be prohibited.

6.11.1 CAD Requirements

DC Water has selected Autodesk AutoCAD software to facilitate design, construction, and maintenance of DC Water's facilities and is currently using AutoCAD 2017/Civil 3D. All designs are to be CAD-based. CAD is to be used as a visual and informational tool in the construction, start-up, and operational phases of the project.

The primary objectives of CAD system use are to:

- Ensure design consistency among all design firms working on the project.
- Develop coordinate-based plans which can be assembled into composite drawing files as needed for site layout control and management.
- Provide flexibility in the event that economic, governmental, or construction-related conditions require DETS to repackage construction documents after PDEs have completed their designs.
- Provide CAD-based documents that can be incorporated into plant and facility electronic operations and maintenance systems.
- Provide the DETS with CAD-based documents that are suitable for use on future capital projects.

DC Water will supply the project design and drafting standards, standard details, symbols, and standard naming conventions to the design engineers, who shall use these tools to produce the final design on their design project. All PDEs shall use the drawing standards established for the project including drawing formats, standard symbols, details, layering and naming conventions. If adjustments or additions to the standards are needed, they shall first be approved and implemented by DC Water for all PDEs to use.

Monitoring of PDE conformance with project standards is the responsibility of the PM under the direction of DETS/DWE. Design reviews will be accomplished at milestones in the design process and shall include the review of hard copy documents at each submittal and electronic drawing files at only certain submittals, as defined in the DC Water CAD Manual.

6.11.2 Other Software

Other software programs that are generally used or acceptable to DC Water for analysis and design may include, but not be limited to, the following:

- BioWin (EnviroSim) Wastewater Process Simulation
- Fathom (Applied Flow Technology - Incompressible Pipe Flow Analysis and System Modeling)
- (Oracle) Primavera P6 Professional Project Management
- (Oracle) Primavera Contract Management (not design, but for document management)

- Paladin Power Engineering Software
- InfoWorks Integrated Catchment Modeling (ICM)
- InfoMaster – Asset Integrity Management and Capital Planning Software
- WaterGEMS – Water Distribution Analysis and Design Software

6.12 DEVIATIONS

Designs for new construction or modification of existing construction shall conform to the requirements and guidelines outlined in all applicable volumes of the PDM. However, the design criteria presented in these volumes include minimum requirements and should not preclude independent and innovative thinking by the engineer.

Proposed deviations from the design criteria that are demonstrated to be in the interest of a better design shall be brought to the attention of DC Water for consideration and/or approval. Any recommended exceptions or modifications should be proposed during the concept finalization phase of the design process unless it is due to a situation or condition that only becomes evident as design progresses. Calculations and documentation shall be provided in sufficient detail to allow evaluation of any proposed exception or modification. Descriptions of alternatives, advantages, calculations, economic analysis, if required, and cost information should be included. Proposed deviations shall be submitted through the PM or PgM to DETS/DWE/CR Director shall review for acceptance. The final approval decision on any changes shall be made by the Director.

6.13 CALCULATIONS

This section includes the general requirements on calculations. Specific requirements for various disciplines, if any, are included in the respective sections of other volumes of the PDM. All calculations shall include a cover sheet with DP identification and the name, registration number and signature of the discipline engineer.

6.13.1 Calculation Sheets and Format

All calculations are to be uploaded to Contract Manager and also presented on 8 1/2 - by 11-inch or 11- by 17-inch foldout sheets punched with three holes, bound in a standard-size, three-ring, loose-leaf notebook. Calculations shall be clear, neat, orderly, in a logical sequence, legible, complete and detailed commensurate with the design stage submittal. Note all assumptions and technical references on the calculations. Show all significant calculations; scratch paper work is not acceptable. Cross-reference calculations in such a manner that allows each element of design to be readily identified. Provide an index listing with the location of each set of design calculations.

All calculations shall have the following format:

- Purpose
- Data and References
- Assumptions
- Conclusions
- Calculation
- Attachments - include any information that cannot be obtained easily at a later date, such as:
 - Referenced graphs and tables used in design or analysis
 - Telephone conversation logs
 - Letters and memoranda

- Catalog information and manufacturer's data

6.13.2 Computer Calculations

Calculations performed by computer shall be organized, titled on the first page, sufficiently identified on input forms and output data, and numbered such that all data can be collated. If not readily apparent, the consultant shall provide any necessary documentation to explain the input, method of analysis, and output employed by the software.

6.13.3 Calculation Standards and Checking

Perform calculations using currently accepted methods of analysis and design except for methods specifically indicated in other parts of this volume.

Include references to all supporting documentation, including codes, texts, reports and handbook data, listing all assumptions used in the design.

Validate all assumptions prior to proceeding with the final design. All coefficients such as load factors, impact factors and factors of safety shall be listed.

Attach calculations to each of the required design progress submittals.

After the final design is approved, forward one record set of the certified calculations, including all revisions and corrections. The final calculation sheets shall be capable of producing second-generation photocopies that are legible in every respect.

Provide documentation of in-house checking procedure for checking all design calculations per the PQP. The person performing the quality check should be identified and their qualifications provided in the PWP. The checking procedure shall comply with the requirements of DETS' Quality Manual.

6.14 GEOTECHNICAL INVESTIGATIONS

Perform geotechnical engineering investigations as required for the design and cost-effective construction of the project. The general scope of geotechnical investigation shall include review of existing data, preparation of an exploratory program, field soil borings, laboratory analyses, preparation of recommendations and submittal of a detailed geotechnical investigation and design report for review by DC Water. For more detail geotechnical requirements, see PDM Volume 2 for facility designs, and PDM Volume 3 for linear infrastructure designs.

6.15 HAZOP STUDY

Facility design projects involving unit operations or unit processes, whether being added or being changed from existing, shall include a formal HAZOP Study in order to identify potential hazards or risks inherent in a design, operation, or process that may adversely affect the safety of personnel, the functioning of critical equipment, or the efficiency of operational performance. The HAZOP may be one component of an overall Process Hazard Analysis or Process Safety Management program. The HAZOP technique is qualitative, aiming to stimulate the imagination of participants to identify potential hazards and operability problems. The consequences of possible faults and breakdowns shall be considered, and all apparent associated deficiencies shall be documented and reported. The PDE shall work to eliminate hazards or mitigate possible effects, by design changes or by establishing appropriate operating procedures.

The HAZOP study team shall be experienced and multi-disciplinary, with expertise in engineering and process operations, and experience and knowledge specific to the processes being studied, and at least one member shall be knowledgeable in the HAZOP methodology. A typical HAZOP team may include:

- HAZOP Chairman, a person with experience facilitating HAZOP workshops
- HAZOP Technical Secretary, a designated person to document the findings of the workshop
- Project Manager (DC Water PM and design PM, if not the same person)
- Lead Mechanical Engineer on the design
- Lead Electrical Engineer on the design
- Lead Instrumentation and Control Engineer on the design and DC Water I&C engineer
- Representative of Operational Staff
- Safety Representative (DC Water or professional safety consultant)
- DC Water's Engineer(s) of appropriate discipline(s)
- Specialist Contractor or Supplier (optional)

6.15.1 HAZOP Methodology

The PDE shall perform the HAZOP study commensurate with the complexity of the process, and is normally conducted during multiple meetings. It is recommended the HAZOP study be undertaken after completion of the process layout, hydraulic grade, piping and instrumentation diagrams (P&IDs) and control descriptions for the project, but not later than at the 60% design stage. The HAZOP study is not intended as a design study, but rather a critique of the design as it stands with respect to its ability to meet its design intent in a safe and efficient manner. It may also take into consideration materials of construction and plant layout. The HAZOP study is intended to identify potential hazards but not to quantify the frequency or probability of occurrence of identified hazards. A recommended standard reference for detailed HAZOP study procedures is BS IEC 61882 *Hazard and Operability Studies (HAZOP studies) - Application Guide*, latest edition, published by the British Standards Institution, which also contains references to standards for risk analysis, reliability analysis, fault-tree analysis, and formal design review. A sample HAZOP SOW is provided in Table 1-6-1.

Table 1-6-1. Sample HAZOP Scope of Work

<p>1. Preparation for HAZOP</p> <p>1.1. Assemble drawings and data: P&IDs, flow charts, hydraulic grade lines and operating procedures or instructions.</p> <p>1.2. Assess the potential number of nodes to be examined.</p> <p>1.3. Subdivide the HAZOP: Determine an optimum number of smaller sections that can be studied in a work day. Selected section boundaries should generally not include too many physical or 'operational' connections.</p> <p>1.4. Select Study Team: The HAZOP Chairman shall identify the disciplines and levels of expertise needed for the study team, which shall include engineers, operations staff, and others as deemed appropriate. (see list above). The team size shall preferably not exceed ten members, but shall allow for specialist input as appropriate.</p>
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1.5. Select dates and locations: The HAZOP Chairman shall coordinate with the relevant PM to schedule mutually convenient dates and location(s) for each session.

1.6. Numbering system for components: Chairman shall establish a numbering system by which each node, guideword, deviation and recommendation can be uniquely identified, preferably in accordance with DC Water's existing process and asset classification nomenclature and consistent with the drawings and asset lists. The selected numbering system shall be clearly marked up on the drawings or P&IDs that form the key reference documents for the study.

1.7. Compile two lists of keywords: The study is based on using two types of keywords deemed likely relevant to each unit process and sub-component of the design: 'guide words' describing parameters defining process conditions or design intentions; e.g., 'flow'; and 'deviation words' describing possible deviations of the process parameter or design intention referred to by the guide word; e.g., 'less'. Additional keywords may need to be added in the course of the meeting.

2. Conduct HAZOP

2.1. Conduct the HAZOP study to include meetings over multiple working days. Use the drawings and operating descriptions to systematically examine each element of an installation, referred to as 'nodes' (such as each section of pipework and each unit process in the plant facility). Also analyze control descriptions for all processes.

2.2. Hazards Analysis: Analyze node for any operation that could possibly cause a catastrophic release of toxic, flammable, or explosive chemicals, flood, spill or any action that could result in injury to personnel.

- Properties of, and hazards presented by chemicals used or produced in the process;
- Precautions necessary to prevent exposure, including engineering controls, administrative controls, and personal protective equipment;
- Control measures to be taken if physical contact or airborne exposure occurs;
- Any special or unique hazards.
- Safety systems and their functions.

2.3. Operability Analysis for each operating phase: Analyze node for any operation inside the design envelope that could cause or possibly lead to a violation of environmental, health or safety regulations, or impede maintenance of critical equipment.

- Initial startup
- Normal operations
- Temporary operations
- Emergency shutdown including conditions which require emergency shutdown, and assignments of responsibility to qualified operators to ensure safe and timely shutdown

- Emergency operations
- Normal shutdown
- Startup following a turnaround, or after an emergency shutdown
- Operating at maximum and minimum design limits
- Consequences of deviation
- Steps required to correct or avoid the deviation

2.4. Systematically examine scenarios using the “guide words” and “deviation words” to determine possible consequences of an event on the safe operation of the node or downstream systems. For each guide word relevant to the node being studied, consider a deviation word and identify all possible causes of that deviation occurrence. Assess the consequences of each deviation from a planned event or action, along with any existing or needed mitigation measures. If an event can result in an unsafe or otherwise undesirable situation and the current mitigation measures are deemed inadequate by the team, or where information is lacking, make a recommendation for some remedial action or information update. For example, “High” + “Flow” may have consequences like flooding, or spilling to the environment or a failure of a compliance parameter. Identify these scenarios and recommend corrective measures (either design changes or change in operation procedures) to resolve the unsafe condition for each node assessed.

3. Document HAZOP Findings

- 3.1. Document the HAZOP study findings in an organized report, listing major recommendations and all analyses of each node. The report shall serve as a basis for design changes and for developing SOPs for plant control.
- 3.2. Establish a system to promptly address the team's findings and recommendations and assure that the recommendations are resolved in a timely manner. Document corrective actions to be taken, and a schedule for timely completion of the actions. Communicate the actions and schedule to operating, maintenance, and other staff who may be affected by the recommendations or actions.
- 3.3. Develop written operating recommendations suitable for use by DC Water to provide clear SOPs for safely conducting activities consistent with the results of the hazards analysis, process safety information, and addressing all the operating phases noted above.

6.16 COMMISSIONING PLAN

DC Water defines commissioning as a planned, documented and managed approach to the design, installation, start-up, validation, and turnover of systems, sub-systems and equipment to assure that they meet the performance requirements of its components, the design intent of the project, and training and asset integration requirements of DC Water. Construction and renovation facility projects which include equipment assets to be operated and maintained need to include commissioning procedures according to

prescribed protocols for service manual documentation, asset classification, factory or service representative inspections and approvals, testing, O&M training, operational demonstrations, and start-up activities. DC Water typically has multiple concurrent projects either in design or construction, which requires coordinated planning and management to minimize conflicts and maximize the effectiveness of the start-up and commissioning activities of these multiple contracts. Beyond activities for final completion of construction and renovation contracts, commissioning activities are important for meeting expanded operational commitments, and managing all equipment assets and integrating new assets into the plant’s asset management system. For requirements during design, refer to the latest edition of the *DC Water Commissioning Management Plan*. It addresses commissioning protocols through all stages of projects – planning, design, construction, and operations. Key commissioning topics by phase are shown below.

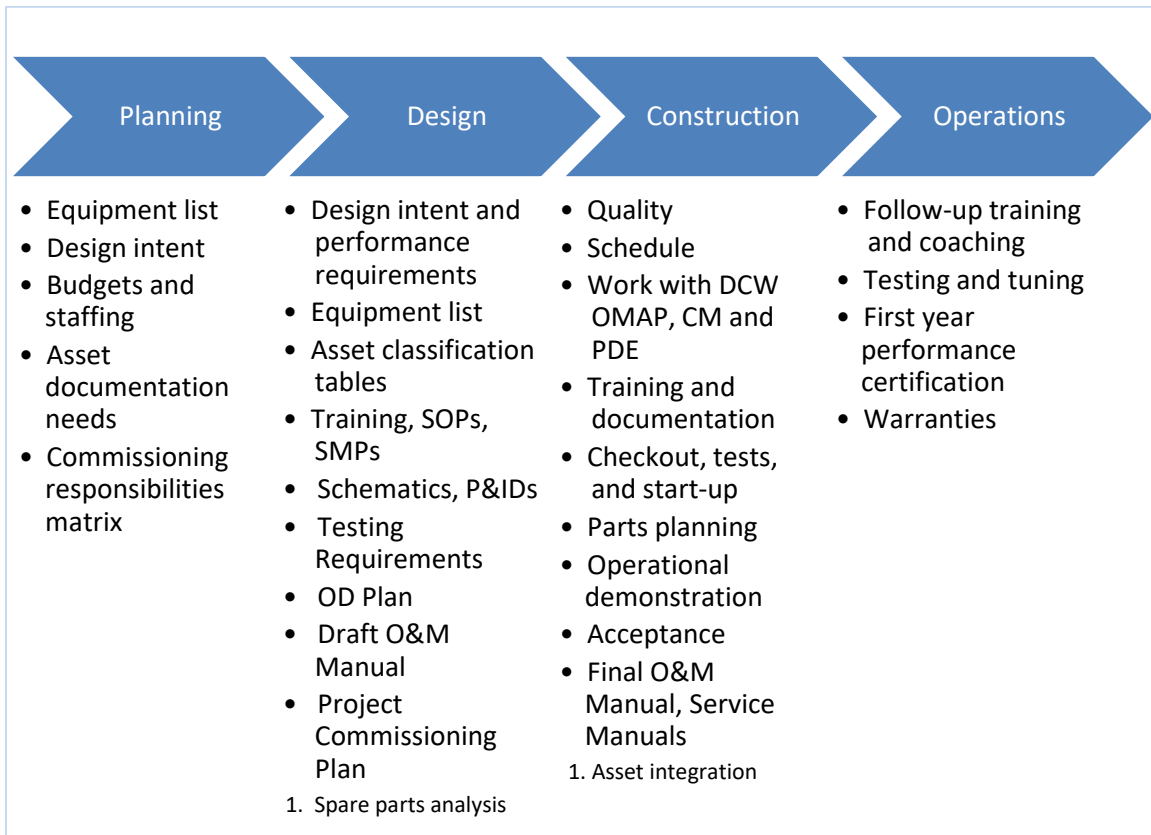


Figure 1-6-1. Commissioning Phases

For the design phase, the PDE is required to develop a Project Commissioning Plan during pre-final design phase. The Commissioning Management Plan includes an Appendix C which is a guide for the PDE for development of the Project Commissioning Plan. This plan includes asset integration, training, contractor deliverables, and requirements for equipment and system checkout, performance testing, and operational demonstration. Information developed for the plan shall be incorporated into the construction contract documents. The intent is that the plan, developed by the PDE, shall be clearly translated into unambiguous requirements for inclusion into the contract documents that will be tendered and bid. Any commissioning tasks to be prepared, performed, or delivered by the construction contractor shall be clearly identified in the

construction contract documents. Specifically, specification 01 91 00 includes the construction contractor's commissioning requirements.

The PDE's Project Commissioning Plan shall also include or address a draft O&M Manual, to be developed by the PDE during design, with enough detail to be used for Process Objectives and System Training (POST). POST training is used to brief O&M staff on an overview of process objectives and systems to be provided under a new capital project. The draft O&M Manual along with preliminary service manuals, shall be used to develop System and Duty Station Training, and preparing the Standard Operating Procedure (SOP) for DCCS/DWS facilities. The service manuals provided by the construction contractor's equipment vendors form the source documents to develop lesson plans for O&M training sessions. Training is delivered by the vendor to plant O&M trade personnel. The service manuals are also used to develop standard procedures and develop Duty Station Training modules. The elements of the O&M Training and Documentation Plan are also included in the Commissioning Management Plan.

6.17 OPERATION AND MAINTENANCE

Wastewater treatment plants, pumping station facilities, and storage reservoir/tanks shall take into consideration features that increase the flexibility, reliability, efficiency, safety, and ease of O&M that meets the design intent and provides satisfactory service over the long term. Therefore, early and continuous interface with and input from the Operations and Maintenance staff from planning through construction, startup, and operation of a facility is important and vital to the success of the DC Water facility projects. As a project team member, the PDE is responsible for the following items for each facility project:

- Obtain O&M related input for the facility design from DC Water Operations and the PgM through design guidelines, orientation and review meetings, and site visits.
- Obtain O&M related input from other similar facilities as applicable and when required.
- Consult equipment manufacturers for technical information to address O&M related issues.
- Prepare the following specification sections for each project design:
 - 01 75 00 Operational Demonstration.
 - 01 75 20 Service Manuals, including Appendix A, listing ALL of the service manuals required for the project including submittal levels and specification section references.
 - 01 79 00 Operation & Maintenance Training. Include Appendix A, with the titles of the training classes, intended audiences, hours for each session, and specification references.

Prepare an O&M Manual for the unit process or system, if none exists, or update the existing process O&M Manual.

For additional information regarding O&M requirements and details for designed facilities, see the PDM, Volume 2, Section 10 – Operation and Maintenance.

6.18 CONSTRUCTION SPECIFICATIONS

Bidding and Contract documents prepared by the PDE shall include a Project Manual containing a table of contents organized per CSI MasterFormat 50 divisions of work format, generally as follows:

- Front matter -Cover, Title Page, Table of Contents
- Division 00 - Procurement and Contracting Requirements
- Division 01 - General Requirements

- Divisions 02-49 - Technical Specifications
- Appendices - Forms; Inserts; Standard Details, Emergency Response Plan

The procurement, contracting, and general requirements will consist of DC Water standard documents, edited only as need for specific projects. The technical specifications will follow recommended formats in accordance with DC Water standards which are based on CSI MasterFormat publications.

6.18.1 Specifications Sources

DC Water maintains an electronic library of Specifications master documents on Livelink which include the following:

- Instructions for preparation and formatting of specifications.
- A formatted section template.
- A Bidding Form Matrix indicating which of the available procurement and contracting specification sections and forms are required for projects of various funding categories.
- Standard specifications adopted by DC Water for which editing is not allowed.
- Supplemental specifications which comprise DC Water approved interim modifications to the Standard specifications, and for which editing by the PDE is not allowed.
- Guideline specifications which may be used as is, or edited as needed by the PDE for the specific project, rendering them as Project-Specific specifications.
- Project Manual Appendices items including Forms, Inserts, and Standard Detail Drawings (for Water and Sewer).

6.18.2 Preparation of Specifications

As part of the concept finalization submittal for a project, the PDE will develop the specifications outline index. For subsequent progress design submittals, the PDE will prepare and submit draft specifications in accordance with the PDE agreement, the PDM requirements, and DC Water specifications instructions.

The Project Manual for each project may include any of each of the above-listed types of DC Water specifications. Specifications needed for any project which are not included in the specifications library shall be developed and provided by the PDE. It is important for the PDE to follow the DC Water instructions in preparing the Project Manual for a project. Only the latest electronic document files should be used for preparing specifications.

DC Water will provide the required information (e.g., liquidated damages, insurance requirements, and schedule constraints) for completing front end documents. Applicable bid forms shall include the name of the project and the DC Water invitation for bid number.

6.18.3 Specifications Submittals

All specifications submittals shall include electronic files in Microsoft Word document format and a consolidated Adobe Acrobat (pdf) format of the specifications uploaded to Contract Manager, plus any required hard copy review sets. See the Design Submittal Distribution List and PDE design SOW for requirements of specifications submittals for various design phases. All submittals prior to the final submittal shall indicate tracked changes. The specifications instructions address requirements for printing and binding of hard copies. At final printing, the PDE shall also prepare and submit complete Bidders Submittal Packets; see Section 7 for requirements.

6.19 COST ESTIMATING

The PDE shall prepare and submit an Opinion of Probable Construction Cost (OPCC) with each design phase submittal. Each OPCC shall contain detailed information commensurate with the design phase, and include supporting documentation. For additional guidance, see the documents referenced in Section 3, and also ASTM E 1804, *Performing and Reporting Cost Analysis During the Design Phase of a Project*, and AACE International 56R *Cost Estimating Classification System – As Applied for the Building and General Construction Industries*. Comply with the following general requirements:

- Verify in advance the acceptability by DC Water of any specific construction cost estimating software proposed to be used.
- Prepare and organize WBS for each construction package based on the CSI format for divisions of work and sections of the specifications.
- Prepare the OPCC based on a detailed quantity takeoff by design disciplines using the most current construction package documents and drawings, and associated cost data for each element in the quantity takeoff, with appropriate backup materials.
- Identify costs for materials and equipment to be furnished and installed. Include for review, copies of quotations received for project-specific engineered products, process mechanical equipment, instrumentation, and electrical equipment.
- Identify and include construction equipment costs, including operating costs.
- Estimate labor costs based on identified crews, crew production rates, and the latest prevailing wage rates applicable for the project location, such as Davis-Bacon wage rates or the DC Living Wage Act rates.
- Include a basic CPM construction schedule with each OPCC, to provide documentation for the estimated duration of construction. If the correct estimating software is used, the information can be downloaded directly into P6 if the PDE completes the Linkage. The schedule should be completed in P6.
- Recommend cost allowances as needed for incomplete design items, and pre-selected work items, and include them in the OPCC for each progress submittal. Indicate the cost allowance items in accordance with the CSI divisions and sections. Provide backup calculations or quotes for the determination of cost allowances.
- Identify and apply appropriate Contractor's business factors, including office overhead costs, field overhead costs, bonds and insurance costs, and anticipated profit margins.
- Apply appropriate adjustments based on the Engineering News Record (ENR) Construction Cost Index or the Building Cost Index, based on the type of project, for Washington, DC. Indicate the ENR cost index used for preparing each OPCC.
- Recommend a contingency factor for each submittal based on the unforeseen project related issues and the complexity of construction, and the basis for the contingency percentage, for each of the stages of progress submittals.

- Escalate the OPCC to the estimated mid-point of construction. The interest rate for escalation is subject to approval by the PM and DC Water.
- Provide breakdowns of the OPCC in the Schedule of Prices format and also in a trade category format, for consideration as to whether the project can meet Minority Business Enterprise/Woman Business Enterprise (MBE/WBE) goals.
- Submit the OPCC to the PM for review at each stage of design submittal. The PM shall review each OPCC submittal for completeness and comparison with the project budget, make each OPCC available for DC Water review, forward review comments to the PDE within approximately 30 calendar days, and, if necessary, schedule a review meeting to discuss any issues. Reconcile all outstanding issues with the PM before the OPCC is finalized. The PDE shall incorporate or otherwise resolve all review comments, and submit a revised OPCC.
- At the pre-final/back-check design submittal phase, a final review of the OPCC will be completed by the PM/PgM. The PDE shall submit a Schedule of Prices (Section 00 40 10) with all bid items including risk based bid allowances and associated cost that match the total depicted on the final OPCC sealed by a Professional Engineer licensed in the District of Columbia including the PDE's estimated mobilization and demobilization costs. DC Water will review the Schedule of Prices for approval, or for DC Water's determination of mobilization and demobilization costs. The PDE shall insert the mobilization and demobilization cost approved or determined by DC Water in the Schedule of Prices in the Project Manual before release by DC Water for advertisement for bids.

6.20 DESIGN PROGRESS REVIEWS

The PDE shall be responsible to consolidate and track all written comments on a single spreadsheet including drawing comments for each submittal phase. The Design Review Comment Template can be found on Livelink. The intent is to track if multiple reviewers had comments on the same drawing sheet and/or specification and that their comments were appropriately addressed and closed by reviewing comments on a single spreadsheet. The DETS/DWE PM is responsible to consolidate all comments and the PDE is responsible for providing a response to each comment. The PDE shall identify whether comments were addressed/resolved in the Review Workshop. The PDE action/responses are due ten (10) business days after receipt of comments; however, Review Workshop decisions may alter the initial action/response. The reviewer needs to verify that the response is sufficient and incorporated into the subsequent phase documents before indicating the issue is closed. The consultant shall transcribe all decisions/actions from Design Workshop minutes to the Consolidated Design Review Comment Spreadsheet to track that all comments/actions have been adjudicated.

7 CONSTRUCTION PROCUREMENT

7.1 PRE-ADVERTISEMENT CERTIFICATION

Before a project can be advertised for bidding, the PM/PgM shall confirm the completion all the pre-advertisement pre-requisites as applicable for the project, and as listed on the Pre-Advertisement Checklist available on Livelink, and review the checklist with DETS Program Services. One of the pre-requisites is to obtain the signed Pre-Advertisement Certification Approval (refer to Engineering SOP 4040) and from DETS' or DWE's approval of the electronic final submittal before printing the hard copies and providing the set number of electronic bidding documents on a flash drive.

7.2 ADVERTISEMENT PROCESS

Upon obtaining all required signatures on the Pre-Advertisement Certification, the PM shall provide the signed Pre-Advertisement Certification, a request for advertisement, and a copy of the Invitation to Bid (Section 00 10 00), to DETS Program Services by noon on Wednesday before the Sunday of advertisement. DETS Program Services shall then prepare and forward a memo, with the Invitation to Bid attached, to Procurement requesting advertisement in certain publications. Advertisements are published in newspapers on Sundays, and also posted on www.DCwater.com by Procurement. DC Water Procurement Manual requires advertisements to be publicized for a minimum of 30 calendar days before bid opening; however, advertisements for EPA grant eligible Design Bid Build projects shall be for a minimum of 45 calendar days.

7.3 BIDDING DOCUMENTS

The PM/PgM shall notify DETS Program Services, when the final bid-ready documents are posted by the PDE on Contract Manager. DETS Program Services enters these documents into the Engineering Management Information System (EMIS) to facilitate bid analysis and generate reports needed for inclusion in the "Brown Folder." By Friday before the advertisement, the PDE shall deliver copies of the printed bidding documents to DETS or DWE PM/PgM, for in-house distribution, in quantities as stipulated in the PDE's Agreement. Documents for in-house distribution shall include the Project Manual, the Drawings, the PDE's final OPCC, and the Schedule of Prices.

7.4 BIDDER'S SUBMITTAL PACKETS

At the printing of Final Bid Documents, the PDE shall also prepare and submit complete Bidders Submittal Packets, separate from the Project Manual, to include duplicate copies of all forms, documents, and items required to be submitted by each Bidder. These packets are provided along with the bid documents when distributed to prospective bidders. Refer to the Engineering SOP 4000 Series for additional information. Each packet shall be bound in a manner to allow easy removal and replacement or insertion of completed documents. Each packet shall include the following:

- DC Water Bidder's Submittal Packet cover sheet.
- Section 00 40 00 – Bid Form
- Section 00 40 10 – Schedule of Prices
- Section 00 40 20 – Bid Bond Form
- Section 00 40 25 – Bid Document Checklist
- Additional items as required and specified in Section 00 20 00 – Instructions to Bidders and as listed on the Bid Document Checklist

7.5 BIDDING PHASE

7.5.1 Pre-Bid Conference

The decision on whether to conduct a pre-bid conference is normally made by DC Water during the design phase of a project. The Project Manual shall stipulate whether or not the conference will be held, and, if so, whether attendance is mandatory or not. Sections 00 10 00, Invitation to Bid; 00 20 00, Instructions to Bidders; and 00 25 13, Pre-Bid Conference shall all be coordinated during the design phase to carefully address the date, time, location, and an agenda for the meeting, and the procedure and contact information for registering attendees for the meeting.

7.5.2 Bidder Inquiries

The Instructions to Bidders stipulates that Bidders' inquiries shall be made by written request and shall reach DC Water by 2:00 p.m. at least ten (10) calendar days prior to the date for receipt of Bids. Bidders' questions are submitted by email to DETS-Construction.Bid.Inquiry@dcwater.com. This group email goes to DETS Program Services who then forwards the questions to the PM to be addressed. Some inquiries may not require responses, but if warranted, responses shall be answered by addendum.

7.5.3 Addenda Process

The process for preparing and issuing addenda is similar to the advertisement process. The PDE prepares the draft addendum and works with the PM to ensure proper format. DETS Program Services needs an Addendum Certification signed by DETS or DWE managers before preparing a memo to Procurement requesting distribution of the addendum to plan holders. Procurement will distribute electronic copies to plan holders. DC Water's Instructions to Bidders states that Addenda shall be issued no later than five (5) calendar days prior to the date and time for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

7.5.4 Bid Opening and Bid Evaluations

Bid openings are normally scheduled on Wednesdays at 2:00 pm in a location to be designated at Blue Plains. Following the bid opening, DC Water Procurement and DETS Program Services shall collect the bid proposals, enter the information in EMIS, and then evaluate the bid proposals for responsiveness, and also coordinate evaluation of the bid proposals.

DC Water procurement regulations define a responsive bid as one which conforms in all material respects to the solicitation/invitation. For each project, the evaluator should verify whether the bid specifications address DC Water's option to waive 'informalities' or other. In the event an apparent low bid is judged to be not responsive, it is recommended that DC Water legal counsel be consulted to identify potential remedies or whether to evaluate the next apparent low bid. The time required to evaluate the bids depends on the number of bids received, the complexity of the Schedule of Prices, and other factors as may be involved. For projects with EPA funding and/or MBE/WBE requirements, bid proposals shall include documentation of the Bidders' MBE/WBE outreach efforts. Upon completion of the responsiveness evaluation, copies of the apparent responsive low bidder package are provided to the PM/PgM to use in preparing the fact sheet and "brown folder."

Upon determination of a responsive apparent low bid, it shall be forwarded to the PDE, or others as may be directed, to evaluate the Bidder for responsibility. DC Water procurement regulations define responsible offeror as one who has the capability in all respects to perform fully the contract requirements, and the

integrity and reliability which will assure good faith performance. In the event that a responsive apparent low bid was offered by a Bidder deemed not responsible, consult DC Water counsel to identify potential remedies or whether to evaluate another bidder. Bidder responsibility is documented in the Determination and Findings (D&F) document, which shall also be signed off by the Program Services Manager, DETS or DWE Director, Chief Engineer, Director of Procurement, and the General Manager, and subsequently included in the “brown folder.”

7.5.5 Fact Sheet Process and Requirements

The Fact Sheet (FS) is the document presented to the Board of Directors’ to obtain approval of any contract (AE Agreement or Construction Contract) over \$1,000,000 or any change to a contract over \$500,000. A contract shall be approved by the Board before it can be executed and before a NTP can be issued. Fact Sheet information, forms, and instructions are posted on Livelink and in the Engineering SOPs, including the FS Calendar, FS Certification, FS Instructions, FS Master documents (templates), and FS Style Guide. The FS Calendar includes specific deadlines for submitting to Program Services a draft FS, FS summary, and FS certification, plus dates for FS review meetings by DETS or DWE. Subsequently, the FS shall be handled by Program Services to be put on the agenda for the Environmental Quality and Sewerage Services (EQ&SS)/Water Quality Water Service (WQWS) Committee meeting. Upon Committee recommendation, the FA shall be put on the full Board agenda. Board approval is documented in a Board Resolution, which resolution shall be included in the “Brown folder.” For Construction contracts only, the PM/PgM shall jointly submit the draft D&F with the draft FS for the Director’s review prior to the FS meeting with DETS Program Services.

7.5.6 Construction Brown Folder

“Brown Folders” contain the instrument documentation for each construction contract and construction contract change order. A Brown Folder Checklist is posted on Livelink, which stipulates the contents and assemblage of brown folders for each type of instrument. Livelink also contains a number of standard documents related to Construction brown folders. For construction contracts, the PM can and should begin Brown Folder preparation as soon as the apparent low bidder is identified. All DETS or DWE approvals can be performed prior to the Board approval. Upon Board approval, required only for projects over \$1,000,000 or change orders over \$500,000, DETS or DWE shall obtain approvals from Finance, Procurement, and the General Manager.

Construction contracts shall be executed within 90 calendar days after bid opening. However, if an executed contract cannot be issued within 90 calendar days, the Procurement director must be notified as soon as practical to assess the situation and to request an extension of the acceptance period from the apparent low bidder.

7.6 CONFORMED-TO-CONTRACT (CTC) DOCUMENTS

Within 30 calendar days after the bidding period, the PDE shall provide DC Water with half-size and full-size print sets of CTC Drawings, and bound sets of CTC Project Manuals in quantities stipulated in the design agreement. CTC documents shall be Drawings and Specifications that are modified and amended to include and indicate the changes described in all addenda issued during the bidding period. The PDE shall also provide flash drive copies of the CTC documents, with each type of file designated in accordance with DC Water CAD Standards naming convention. CTC documents are prepared for DC Water’s benefit only and not intended to be provided to the construction contractor.

7.7 TRANSFER OF DOCUMENTS

The PM/PgM shall contact all necessary stakeholders to schedule a Transfer of Documents Meeting, to coordinate and transfer all project related instructions, files and documents to the Construction Manager (CM) so that the CM can fully manage the construction project. At a minimum, the attendees should include: the DETS or DWE Manager or their designated representative, the CM, the PgM, and the A/E (PDE) Firm. The PgM and the PDE shall discuss with the CM the ongoing process of the project up through Construction Procurement, discuss design criteria, specifications and all other aspects of the design, hand over all drawings and other necessary documentation to the CM, and answer any and all questions raised by the CM. The Engineering SOPs include a sample meeting agenda.

7.8 CONSTRUCTION NOTICE TO PROCEED

The purpose of the NTP letter is to establish start and completion dates and provide direction to the Contractor to begin work. The NTP serves as formal notice to all parties that the construction contract work period has begun and that work shall commence, as per the contract documents.

NTP may be issued after the approval of the contract package, and verification that bonding requirements, insurance requirements, and other contract stipulations are met, including subcontractor agreement approvals. The CM shall set a date for the NTP after conferring with the Director and the Contractor. The CM shall prepare the NTP for signature by the DETS or DWE director, and shall indicate the construction start date, the number of calendar days in the Contract, and the Contract completion date. The date of the pre-construction meeting, if required, shall also be included. The document shall be reviewed and initialed by the originator and reviewers (Construction Manager and Director). The office of the DETS Director or DWE Director shall deliver the NTP to the Contractor with copies to the originator and reviewers.

7.9 ENGINEERING SERVICES DURING CONSTRUCTION

Refer to the Professional Service Agreement documents including Exhibits C-1, C-2, and C-3 for provisions and requirements regarding engineering services during construction (ESDC).

Appendix A

DC Water Departments involved with CIP Projects

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DC Water Departments involved with CIP Projects

- DC Clean Rivers Project DC Water (DCCR)
- Department of Engineering and Technical Services (DETS)
 - DETS Planning
 - DETS Design
 - DETS Water and Sewer Construction
 - DETS Program Services
 - DETS Quality Management
 - DETS Specifications and Standards
 - DETS Interagency Planning and Permitting
- Department of Distribution and Conveyance Services (DDCS)
- Department of Water Services (DWS)
- Department of Sewer Services (DSS)
- Wastewater Treatment (WWT)
 - Department of Maintenance Services (DMS)
 - Department of Wastewater Treatment (DWT)
 - Department of Process Engineering (DPE)
 - Department of Clean Water Quality and Technology
 - Department of Resource Recovery
- Department of Wastewater Engineering (DWE)
 - DWE Blue Plains Construction (aka Blue Plains Project Branch) (BPPB)
 - DWE Program Management Branch (DWE-PMB)

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