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Section 1
Introduction

1.1 Purpose and Overview

The *Design Management Manual* addresses guidance for delivering design services on Metropolitan Nashville and Davidson County (Metro) Water Services' (MWS) Clean Water Nashville Overflow Abatement Program (Program) projects.

The *Design Management Manual* supports a systematic approach for planning and executing projects to ensure that the design and construction work products conform to MWS' requirements. This management approach is discussed in the *Program Management Plan*, Volume I. This *Program Management Plan* references processes involved with managing the design's development and documentation to a level suitable for construction procurement and design maintenance during construction. This *Design Management Manual* provides clarification to the Designer about their responsibility to regularly report the design progress, including schedule, cost, and technical issues in order to provide an early elevation of issues to the Program for resolution.

In 2023, Metro Finance Procurement Division, on behalf of MWS, is soliciting proposals for three sets of pre-qualified engineering firms that Clean Water Nashville (CWN) may utilize for design services. In general, the Small Business Enterprise list (IDIQ SBE Designers) is anticipated to be used for sewer rehabilitation and small conveyance projects. The other two lists (IDIQ Facility Designers and IDIQ Linear Designers) may be utilized by CWN for design projects with design fees up to $7.5 million. Projects not identified for IDIQ Facility Designers, IDIQ Linear Designers, or IDIQ SBE Designers will be open to all qualified, registered firms through a traditional Metro engineering services proposal process. These are expected to include very large or complex project scopes.

From the scope described in a Project Summary and provided by the Program Management Consultant (described in *Program Management Plan*, Volume I, Section 7) and the services required by the specific contract with MWS, the Designer will prepare preliminary and final designs and contract documents and will provide engineering support during construction as required in the Scope of Work. Regular performance overviews of the design process will ensure that the design satisfies the Program's processes and quality, schedule, budget, and cost objectives. This overview is continuous and is in addition to typical design review milestones (concept, preliminary, detail design, biddable documents). The technical design solution may be subject to design value engineering, constructability, and possibly a special peer type review as deemed necessary by the Program Management Team.

This *Design Management Manual* is part of the Program's overall management approach, shall be used in conjunction with other Program requirements, and is available to the selected Designers. The standards and protocols defined in the following sections form the basis of the Program's Design Management System and shall be applied to all Program design activities in accordance with the scope of the contract documents.

Furthermore, guidance documents and other design standards supplementing this *Design Management Manual* are available in the appendices. The *Design Management Manual* and the supporting guidance documents are included in the *Program Management Plan*, Volume III, and are available to Designers and the public on the Program website (www.cleanwaternashville.org). Of the numerous appendices provided with this *Design Management Manual*, the primary design guidance documents associated with the project types are as follows:

- Guidance for Design - Equalization Facilities and Pump Stations (Appendix A)
- Guidance for Design - Conveyance Pipelines (Appendix B)
- Guidance for Design - Wastewater Collection System Rehabilitation (Appendix C)

1.2 Intended Audience

This *Design Management Manual* has been developed primarily for the following:

- Program Management Team (MWS Program Management Staff, Program Management Consultant, and Construction Management Consultant)
- Other MWS Divisions
- Designers and their contracted sub-consultants
- Construction Manager-at-Risk (CMAR) (project-specific contractor)

The *Design Management Manual*'s overall objective is to ensure that all project participants use common terminologies, practices, procedures, forms/formats, systems, and project management tools and have a common understanding about the Program's objectives and requirements.

1.3 Quality

Quality is extremely important for all aspects of the Program, particularly for the design and construction of facilities and system improvements. The Designer is directly responsible for the quality of the design work, including work completed by their sub-consultants, to ensure that both the design and the constructed project meet MWS' and Consent Decree requirements. The Designer must certify adherence to the Program *Quality Management Plan*'s quality requirements in writing and provide a copy of its corporate quality program upon request. The Designer's Quality Program shall address all aspects of the guidelines included as an appendix to the Program's *Quality Management Plan* in Volume III of the *Program Management Plan*. This Program *Quality Management Plan* is available on the Program website.

1.4 Safety

Safety is the first priority of Program-related activities. Designers shall design the facilities and improvements for the safety of the MWS employees performing operations and maintenance activities and any public uses of these facilities. All Designers and design sub-consultants shall support MWS' safety objectives during design, through the construction phase, and in the products delivered. Designers, sub-consultants, and subcontractors must adhere to all Occupational Safety and Health Administration (OSHA) and Tennessee Occupational Safety and Health Administration (TOSHA) requirements. When Program or Designer staff is required to perform field activities, safety plans incorporating Best Management Practices for the risks shall be utilized.

Section 2

Roles and Responsibilities

This section briefly summarizes the roles and responsibilities of the principal parties implementing the design phase and design services during construction.

2.1 Metro Water Services

The general roles and responsibilities for MWS (Engineering and other supporting Divisions) are as follows.

- Manage the Designer procurement process through its interface with the Metro Finance Procurement Division. This includes the use of pre-qualified engineering firms (IDIQ Facility Designers, IDIQ Linear Designers, or IDIQ SBE Designers), as well as individual procurements for large or complex projects.
- Manage the rehabilitation contractor procurement process (when using the pre-qualified list of contractors established via contractor Indefinite Delivery Indefinite Quality contracts) through its interface with the Metro Finance Procurement Division
- Approve additional or revised design standards, when required during the Program
- Interface with regulatory authorities regarding project implementation
- Provide primary interface with Metro Council Members, the general public, and the media
- Acquire land and easements as recommended
- Acquire permits as recommended
- Approve the design documents following recommendation from the Program Management Consultant
- Make payments for services

2.2 Program Management Team

The general roles and responsibilities for the other members of the Program Management Team (Program Management Consultant and Construction Management Consultant) are as follows:

- Prepare Project Summaries for defining design scope
- Monitor the consistent application of Program design procedures and requirements, as outlined in the *Design Management Manual* and the *Program Management Plan*
- Manage the project design scope and cost
- Assist MWS in the procurement of the Designers and contractors
- Provide limited rehabilitation or special design, value engineering, peer review, and risk management services consistent with Program Management Consultant procedures contained in *Program Management Plan* and the *Design Management Manual*
- Review systematically design, sustainability, and constructability
- Update design guidelines, standards, and Program manuals, consistent with the Controlled Document Revision Procedure in the *Program Management Plan*, Volume II

- Track and manage design progress against the baseline *Master Program Budget and Schedule Report*
- Coordinate submittals and interface with authorities when obtaining project level permits and approvals
- Process and provide limited reviews of contractor submittals, shop drawings, and Requests for Information (RFI) according to procedures contained in the *Construction Management Plan*
- Review contractor submittals, shop drawings, and Requests for Information (RFI) for rehabilitation and some small conveyance projects
- Engage appropriately the support of Designer's for resolution of construction issues.
- Conduct project review/coordination meetings between MWS, the Program Management Team, and the Designer
- Assure that proper documentation is maintained by all parties during implementation of design and construction project phases
- Report design and construction progress
- Closeout the construction (Construction Management Consultant) and the project (Program Management Consultant's Project Manager)

2.3 Designer

In all cases, the Designer's ultimate responsibilities are defined by the Scope of Work and contract for each project. The Designer's general role and responsibilities include the following tasks:

- Adhere to latest version of design criteria, standards, and regulations
- Maintain responsibility for sub-consultants' performances
- Obtain data required during design (survey, geotechnical, rights-of-way, environmental, etc.)
- Submit a detailed design schedule to meet Program delivery requirements
- Produce *Preliminary* and *Final Design Reports* and calculations, cost estimates, drawings, and specifications
- Identify and prepare permit applications for necessary approvals
- Identify additional land and all easement (temporary and permanent easements and rights-of-entry) acquisition needs required for construction, operation, and maintenance. Prepare legal descriptions/maps/exhibits and all other documentation for acquisition.
- Participate in value engineering, constructability, and special review sessions as required
- Incorporate sustainability principles into the design, where applicable
- Produce biddable stamped drawings and contract documents for the procurement stage
- Provide design modifications and clarifications to the Program Management Team during regulatory reviews and bidding, if requested
- Produce construction drawings and documents for the "For Construction" stage if requested
- Provide design intent and clarifications to the Construction Manager during construction through the review of submittals, shop drawings, and RFIs
- Utilize PMIS and other software tools in execution of the work
- Incorporate safety into design and be responsible for the safety of design employees and that of the respective sub-consultants when working on-site

- Adhere to established quality requirements

Section 3

Design Process

3.1 Overview

A successful design phase is important to the achievement of individual project goals and to the Program as a whole. It has been shown that a systematic approach and standardized processes produce consistent, high-quality design products and projects. This *Design Management Manual* assumes a design-bid-build project delivery method. CWNOAP projects may also include alternative delivery projects, although these rely on the Designer's scope of work to define the design process.

3.2 Project Summary

The Program Management Team prepares a Project Summary in order to procure design services and initiate the first stage of the design process. The individual project information developed for the *Corrective Action Plan/Engineering Report* (CAP/ER) or *Long Term Control Plan* (LTCP), including addenda and updates. provides the basis for the Project Summary. Further scope concepts and additional available project-specific information are also incorporated to allow the development of a definitive scope in the Request for Proposal. The Project Summary is the basis for the Scope of Work issued to a Designer through the procurement process. The Project Summary includes a listing of project-specific risks that the Designer will consider in its concept development for each project.

3.3 Design Management

3.3.1 Program Management Information System

The Program Management Team has established a secure internet-based Program Management Information System (PMIS) to support Program activities across all team members and organizations. The PMIS provides a single Program-level collaboration platform with these key design activity functions:

- Document control, sharing, and distribution
- Meeting minutes capture
- Schedule progress tracking
- Contract, invoice, and amendment management
- Process tracking (submittals, RFIs, RFCs, issues, etc.)
- Status reporting

The Designer shall interact with PMIS across the functions noted and those further detailed by the Project Manager. The Designer's basic functions within PMIS are to upload deliverables and meeting minutes and to retrieve CWNOAP comments. The Designers do not directly access the CWNOAP's standard documents and drawing details. These are provided to them by the Project Manager. PMIS training will be scheduled with design staff at the Design Kick-off Meeting. PMIS is not intended for document development by the Designer and their team.

3.3.2 Designer's Quality Review Process

The Designer's quality review must be a continuous process throughout all design phases. The Designer is responsible for adhering to the elements described in the *Project Quality Plan Checklist* for each project for quality assurance and quality control. Deliverables must be reviewed before submitting them to the Project Manager. Information on the *Project Quality Plan Checklist* is provided in Appendix A of the Program's *Quality Management Plan* in the *Program Management Plan*, Volume III.

3.4 Design Stages

Although the required design stages and deliverables may vary by project, typical design stages are illustrated in **Figure 3-1**. In particular, rehabilitation or small conveyance projects typically will not have each stage. Additional information regarding the content of each deliverable is defined in the Designer's Scope of Work.

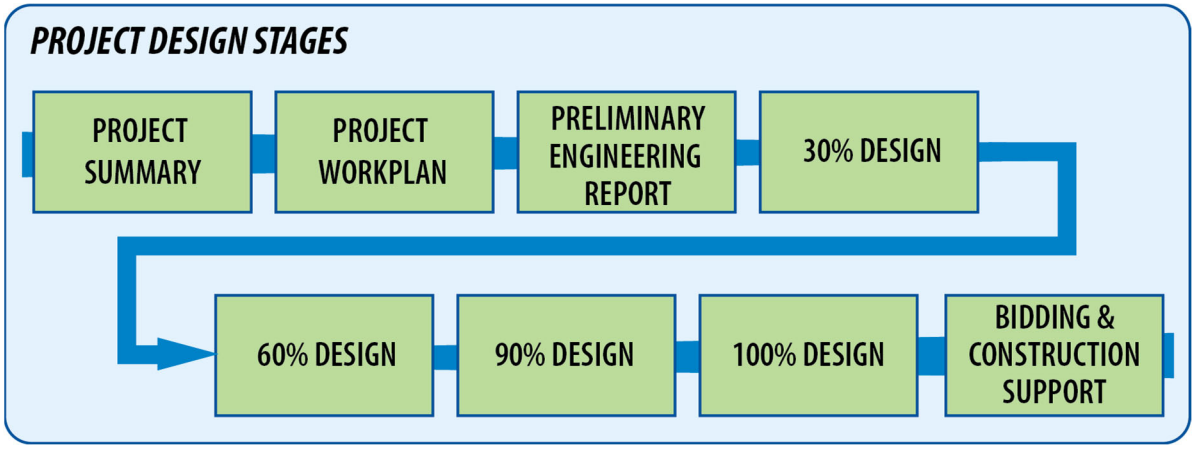

Figure 3-1 Project Design Stages

The Project Summary will be developed by the Program staff to define the project design goals, background, available resources, and various parameters. The following subsections describe examples of the content that may be required of each Designer-performed design stage. The specific requirements for each deliverable are delineated in the Designer's Scope of Work.

3.4.1 *Project Work Plan*

The Designer may be required to produce a *Project Work Plan* that defines how, upon project commencement, services will be executed and how compliance with contractual obligations will be achieved. The Project Manager reviews the Designer's *Project Work Plan* for compliance with the contract, adherence to this *Design Management Manual*, management of quality processes, interfaces with other stakeholder activities, and alignment with the Program's objectives. This review will be conducted according to the Project Work Plan Review Procedure in the *Program Management Plan*, Volume II.

The *Project Work Plan* should be used by the Designer as its baseline control of the design's progress. Requirements for the *Project Work Plan* are defined in the Designer's Scope of Work and may include the following elements:

- Designer's Scope of Work
- Designer's detailed schedule/key milestone list
- Design budget
- Sub-consultant contracting plan
- Designer's deliverable list
- Designer's discipline leads and coordination plan
- Designer's Project Safety Plan
- Designer's Project Quality Plan Checklist
- List of key issues and approach

When included in the project's Scope of Work, Designers may be allowed to use a *Project Work Plan Checklist*, which includes the *Project Quality Plan Checklist* in lieu of fully developed, detailed *Project Work Plan*. The *Project Work Plan Checklist* is generally used for rehabilitation and small conveyance projects by SBE Designers. A *Project Work Plan* will not be required for the limited or special projects designed by the PMC design team.

To help manage the project, kick-off meetings that are initiated and led by the Project Manager are to be held with the Designer, MWS, and the Program Management Team. Standard Program documents for meeting agendas, minutes, Designer input, etc., are to be utilized.

3.4.2 *Preliminary Engineering Report*

When required, the Designer's *Preliminary Engineering Report* is the study of a project/element/route commencing design to prove the approach meets the intended abatement goal, is functional and constructible, and complies with the baseline scope and schedule. This report may consider design options and associated advantages and disadvantages as well as require site-specific project computer modeling, high-level calculations, routing analysis, sizing reviews, workshops, and meetings with relevant authorities. The Program's Planning and Technical Support Team may be required to verify the design solution with system modeling, but site and project elements, such as hydraulic computations development and analysis, are the Designer's responsibility.

The *Preliminary Engineering Report* may incorporate the following:

- The basis of design that has been formulated to achieve the prescribed scope and objectives as delineated in the Project Summary
- Project description
- Site plan
- Geotechnical, archaeological and/or environmental findings
- Hydraulic profile
- Alternatives with cost
- Survey data
- Quantity list
- Process & Instrumentation Diagrams for process projects

- Preliminary specifications listing
- Preliminary design plan sheet listing
- Pertinent information for required property acquisition, major easements, and major permits
- Outstanding issues list

The comprehensive nature of this early document also allows the Project Manager to analyze the risk issues provided in the Project Summary and identify additional risks. The Designer will assist the Project Manager in deciding what risk strategies must be addressed in the design documents. The Project Manager reviews the document in accordance with the Design Deliverable Review Procedure included in the *Program Management Plan*, Volume II, and makes recommendations regarding acceptability to MWS. The Designer will be expected to resolve all comments arising in this review. This review process will be followed with each deliverable discussed in this section.

3.4.3 30% Design Submittal

MWS must approve the prior stage deliverable before each Designer can start the next stage of design. The 30% Design Submittal should show sufficient element detail to fully describe the scope, allow detailed pricing on high-cost items, and describe the impacts to the baseline Master Schedule.

Although the requirements of this deliverable are described in the Designer's Scope of Work, the following elements may be expected in the 30% Design Submittal deliverable:

- Data acquisition (survey, geotechnical, environmental, etc.) completed during this stage
- Preliminary design calculations for major features
- Drawings depicting the overall layout for major features, alignment, profiles, typical sections, and major dimensions
- Identification of Standard Details to be used as well as review of these details for applicability to the project
- For pipeline projects, a site review that includes walking the proposed pre-staked alignment's major issue areas
- All layout plans (with certain details missing), dimensions, sections, etc., to describe the completed works
- Completed Table of Contents for specifications
- Commencement of Program Standard Specifications reviews
- Identification of items requiring deviation or supplementation from the standards and supporting rationale. Construction cost estimates for facilities and pipelines.
- Identification of preliminary land and easement acquisition needs
- A listing of all required permits
- Identification of major utility relocation requirements
- Initial project construction duration

As described in the Designer's Scope of Work, the 30% Design Submittal is typically not required for rehabilitation projects.

3.4.4 60% Design Submittal

The 60% Design Submittal continues the design process. The finished intent of the project presentation on design documents is substantially met, the construction scope is described, and the baseline Master Schedule and cost impacts are known with a reasonable degree of certainty. As described in the Designer's Scope of Work, the 60% Design Submittal is typically not required for rehabilitation projects.

Although the requirements of this deliverable are described in the Designer's Scope of Work, the following elements may be expected in the 60% Design Submittal deliverable:

- All facility or pipeline drawings and drawing views and sections are started. Any needed modifications to Standard Specifications are identified.
- All site drawings, process flow diagrams, process instrumentation and design drawings, drawing views and sections, and project-specific specifications are in advanced stages of completion. Standard Details are included on drawings and project-specific details are available for review.
- Pipeline projects have fully developed mainline plans (schematics and on aerials) and profiles with easements indicated with sufficient detail to begin easement acquisitions.
- Design calculations are essentially complete.
- Quantities for each bid item for rehabilitation projects, including assumed quantities based on the Designer's knowledge of past similar work.
- Full specifications sections are prepared although some details and tables may be incomplete.
- Initial plans for utility relocations, traffic maintenance, sediment and erosion control, and permanent stormwater management are developed.
- Permit application documents are developed.
- Construction cost estimates and the quantity list are refined.
- Construction duration for schedule is refined.
- All major design related issues should be essentially resolved at this stage.

3.4.5 90% and 100% Design Submittals

The 90% Design Submittal should represent the Designer's complete design, pending final Program review. The scope is fully met and described, and the baseline construction schedule and cost impacts are known with a high degree of certainty. All drawings and specifications, cost estimates, QA/QC reviews, third party checking, *Design Reports* (including *Design Calculation Reports*) are complete.

The 90% Design Submittal should represent the completed design pending only the incorporation of final review comments from MWS. The Designer shall be ready to sign and seal documents at the 90% stage for regulatory submittals and bidding. At the 100% stage, the bid documents must be signed and sealed by a registered professional who is licensed to practice in Tennessee. The sealant shall be a registered Professional Engineer or other applicable licensee and practicing within their area of expertise.

The Designer, through its own internal quality control checks, is to review the documents for compliance with respect to the following:

- The design must achieve MWS' requirements.

- The final design accurately reflects the preliminary design or there is documentation to support approved changes.
- The format must conform to required standards.
- Information must be clear and concise.
- The design must incorporate all approved comments/recommendations made by MWS and/or Program Management Consultant technical team.

At this point, the Project Manager prepares a *Risk Assessment Report* and identifies how risk issues were addressed in the final design. In order to complete the report, the Project Manager utilizes the Designer-prepared verification of its handling of risk issues in the contract documents.

3.4.6 Value Engineering

Formal value engineering sessions may be required as part of the 60% Design Submittal review. When required, value engineering reviews will be identified in the Project Summary and included in the design contract requirements. MWS may also elect to add value engineering reviews as the design progresses. If not included in the original design contract, MWS and the Designer will discuss the terms of the addition and the design contract will be adjusted, if necessary.

The objective of the value engineering session, if required, is to evaluate affordability and maximize value while minimizing design cost requirements consistent with performance, reliability, and maintainability standards. Value engineering sessions will be conducted by and consist of off-project senior technical specialists experienced in similar type work and conform to the *Value Engineering Job Plan* as endorsed by the U.S. Environmental Protection Agency.

The Designer, in responding to issues raised in value engineering recommendations, will provide any necessary comparative exercises, including, but not limited to, measurements and production of quantities and estimates for alternative construction methods and portions of the Quantities Lists.

3.5 Bidding, Award and Construction

After MWS accepts the final design, funding is secured by MWS, and MWS and/or the Metro Finance Procurement Division bids the work and awards a contract. Selected conveyance and rehabilitation projects may be bid by MWS using pre-qualified contractors established under two sets of Indefinite Delivery Indefinite Quantity (IDIQ) contracts awarded in Spring 2021 by the Metro Finance Procurement Division. Refer to Procedure CT.12. Request for Quotation Management in Volume II of the *Program Management Plan* for details about that process for rehabilitation projects using the pre-qualified rehabilitation construction IDIQ contracts. The pipeline construction IDIQ contracts are administered by MWS Engineering but may be utilized for Clean Water Nashville projects.

The Designer creates, if requested, the “For Construction” documents consisting of the procurement package documents with new or revised documents issued in amendments. The Designer issues this “For Construction” set of plans and specifications for use by the Construction Management and Program Management staff showing where all language has been added, deleted, or modified. The Designer also advises the Program Management Consultant about any deviations and upgrades to the Bid quantities list (caused by any amendments) for contract documentation purposes. The contractor is provided only with the “As-bid” plans and specifications and the amendments. These “For Construction” documents are typically not prepared for rehabilitation projects or projects with few technical changes issued via amendments during bidding.

During bidding and construction, the Designer, as established in their scope and contract, will:

- Prepare bidding question responses, bidding amendments, and document modifications as requested and required by each procurement process
- Participate in pre-construction meeting and present the technical aspects of the work
- Participate in construction progress meetings
- Respond to Requests for Information from the construction contractor
- Review – in compliance with the contractual time or contractor schedule durations:
  - Shop drawings
  - Contractor submittals
  - Equipment data
  - Vendor/contractor project construction designs
  - Claims and variations, where they may have potential impact on the design
- Prepare or assist with Requests for Change with the Construction Manager
- Prepare record drawings for conveyance, pump station, equalization tanks, and facility projects, incorporating as-constructed or building information modeling (BIM) information provided by the Construction Manager from the contractor

For rehabilitation projects and/or small conveyance projects, the Designer typically has limited involvement in the above-listed functions, as defined in their scope. The Program Management Consultant in conjunction with the Construction Manager may perform most of these tasks.

The turnaround time for all Designer bidding support services must comply with the MWS procurement schedule requirements. The turnaround time for all Designer construction support services must be timely so as not to delay construction progress. Critical areas where Designer response in accelerated time frames is warranted include:

- Bidding questions. Acknowledgements of receipt should be transmitted to the Project Manager within 24 hours with initial responses transmitted within 48 hours.
- Amendment preparation of technical responses with draft responses should occur within 48 hours of closing date for bidder questions, and final responses should occur within 24 hours after Project Manager's review comments.
- Responses to construction RFIs should be posted to PMIS within 7 to 14 calendar days depending on the complexity and number of issues contained in the RFIs. The goal is RFI turnaround within 4 business days.
- For shop drawings and other initial submittals, reviews should be completed and responses posted to PMIS within 14 to 30 calendar days depending on the complexity and number of disciplines contained in each submittal. The goal is submittal return within 10 business days.
- Responses to re-submittals should be posted to PMIS within 7 to 21 calendar days depending on the time needed to review the original submittal and the number of issues that mandated the re-submittal.

Section 4

Design Review Process

4.1 Overview

The design deliverable review is a continuous process throughout the design and is implemented at stated deliverable milestones. The objective is to establish a robust, standard, and consistent process to ensure the quality of deliverables, reduce risk to delivery, and set delivery expectations.

For each design review, design documents are reviewed by the Program Management Team for the following:

- Conformance to scope of services, basis of design, standard drawings, performance technical provisions, and other project requirements
- Conformance to documented owner and stakeholder requirements and industry standards
- Adequacy, clarity, and ease of interpretation
- Interface compatibility
- Errors and discrepancies
- Coordination with related design elements
- Cost effectiveness
- Design progress, scope growth, schedule deviations, and changes
- Incorporation of previous design review comments
- Constructability
- Durability, sustainability, and low impact design
- Operability
- Safety

4.2 Program Management Consultant Design Review Process

The Program Management Consultant has developed a technical review process that incorporates technical reviews, recommendations of acceptability to MWS, and submittal approvals by MWS. The design review procedure flow chart in **Figure 4-1** schematically describes the process. The design deliverables being reviewed, according to Program Management Consultant procedures included in the *Program Management Plan*, Volume II, include the *Project Work Plan*, *Design Reports*, drawings, schematics, cost estimates, technical specifications, quality certifications, or similar Designer-provided documents. **Detailed checks are the responsibility of the Designer and should be conducted prior to deliverable submittal to the Program Management Team. Sufficient time, planning, and budget shall be allocated for this task by the Designer, including engagement of design team sub-consultants.**

Reviews commence at the end of each design stage milestone as defined in the Designer's Scope of Work.

The review protocol shall be the same for each stage and milestone although individual review team briefings may vary if deviations are specifically approved by the Design Manager. Depending on the

project's complexity, the technical review duration, including comments, workshop(s), responses to comments, and approval will be defined in the contract or agreed to with the Designer's initial schedule. The Designer can typically assume a minimum of 14 days to a maximum of 30 days in the design schedule for this review activity as stated in the scope unless otherwise discussed and agreed. -

Design Deliverable Review Procedure

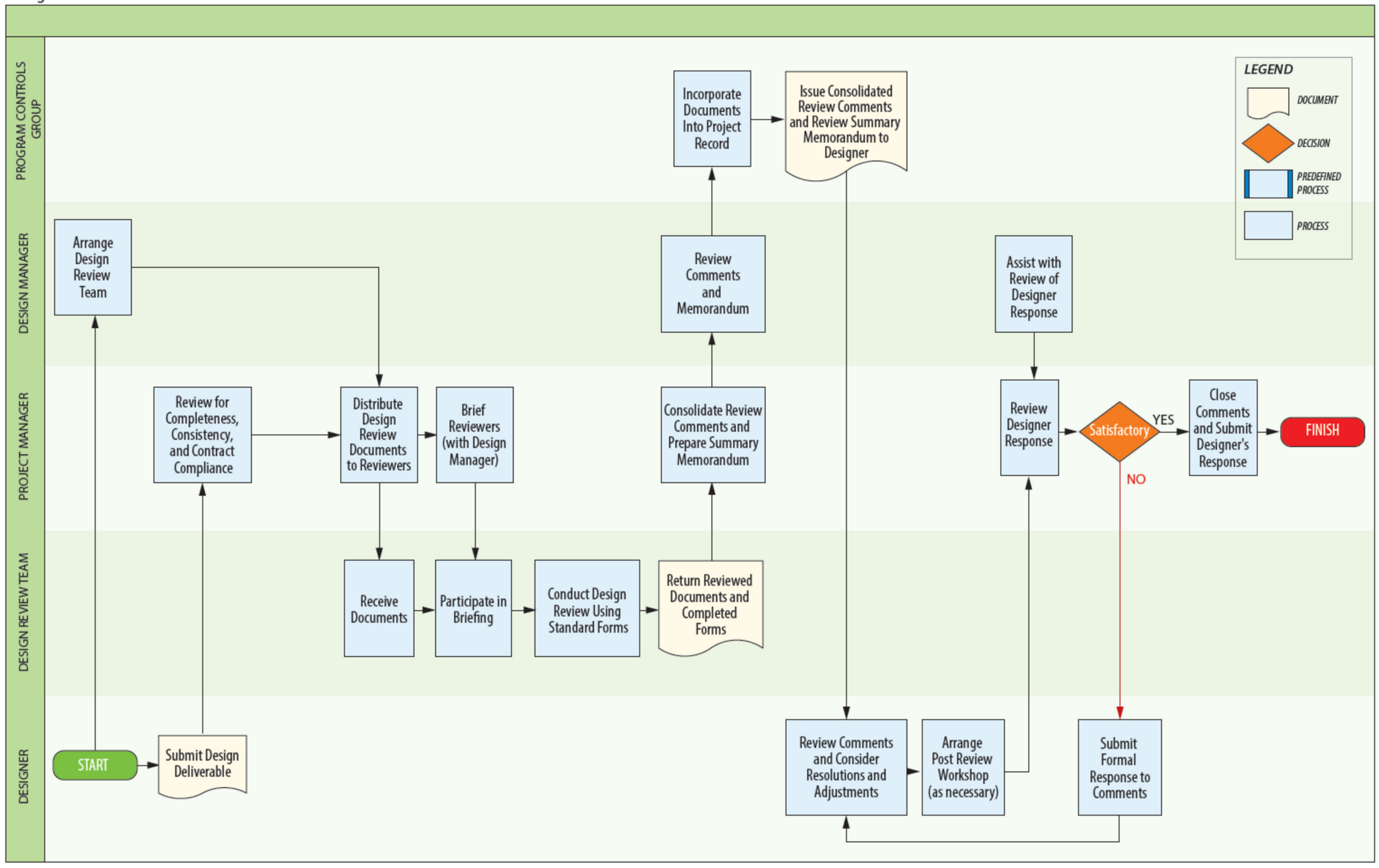

Figure 4-1 Design Review Process

Section 5

Design Specifications

5.1 Overview

A select and limited number of Standard Specifications are provided for use by Designers on Program projects. These Standard Specifications cover the key major material and contractual needs consistently encountered in typical Program projects. The number of Standard Specifications may be expanded as the Program matures. These sections reside in PMIS and are provided to Designers in MS Word format by the Project Manager. The list of Standard Specifications is provided in Appendix F. The Program has implemented and will require that the Designer will use the 48 division based Construction Specifications Institute (CSI) MasterFormat 2004 system format during the Program as the basis for specifications. The format specification list from CSI can be found at www.constructionnotebook.com/ipin2/CSIDivisions.asp.

5.2 Development and Modifications

Although the Designer is the responsible professional for the project specifications and shall seal the 100% documents, the available Standard Specifications sections shall be used as needed for each individual project as determined by the Designer. The Designer shall provide supplemental project-specific specifications for project aspects not addressed by the Standard Specifications. Should the Designer encounter unique project aspects not adequately addressed by the Standard Specifications, the Designer may make project-specific specification section modifications to address these conditions; however, any proposed modification shall be presented to the Project Manager for review. The Designer is allowed and expected to modify the Standard Specifications for project naming/numbering insertions, deletion of instructions to the Designer, and typical project-specific modifications such as Bid Item numbering.

Project-specific modifications to Standard Specifications presented by the Designer will be reviewed by the Program Management Team to assess the need to adjust the Standard Specifications. These modifications may include the following categories:

- Corrections Level – Changes to correct minor irregularities (incorrect standard references, typographical or numbering errors, etc.)
- Enhancement Level – Changes based on prior experience to enhance the sections

Following review of the potential modifications, the Program Management Team will accept, reject, modify, or hold for future consideration the suggested Standard Specification changes.

Section 6

Design Details

6.1 Overview

Key standard design details have been developed for use by Designers on the Program's projects. These limited details are intended to address assets to be designed consistently across all projects. A listing of current Program Standard Details available for the Designer can be found in Appendix G.

6.2 Standard Detail Development

Although the Designer is the responsible professional for the project details and shall seal the 100% documents, the available Standard Details shall be used as needed for each project as determined by the Designer. The Designer will likely encounter several project aspects not addressed by the limited Standard Details listed in this *Design Management Manual,* MWS details, or in the available Program details library. The Designer shall provide supplemental project-specific details for project aspects not addressed by the Standard Details. Should the Designer encounter project aspects not adequately addressed by the Standard Details, the Designer may make project-specific detail modifications to address these conditions; however, any proposed modification shall be presented to the Project Manager for review. The Designer is allowed and expected to modify the Standard Details for project naming/numbering insertions.

Project-specific modifications to Standard Details presented by the Designer will be reviewed by the Program Management Team to assess the need to adjust the Standard Details. These modifications may include the following categories:

- Corrections Level – Changes to correct minor irregularities (incorrect standard references, typographical or numbering errors, etc.)
- Enhancement Level – Changes based on prior experience to enhance the details

Following review of the potential modifications, the Program Management Team will accept, reject, modify, or hold for future consideration the suggested Standard Details changes.

Section 7

Survey Requirements

7.1 Overview

Program requirements have been established to standardize survey and mapping data collected from the field for planning, designing, and producing record drawings. Since multiple Designers and surveyors may produce work products requiring this data, it is important to maintain consistency between projects and work products in order to allow surveys to be coordinated for spatially intersecting and future projects. Because survey deliverables may be used for future planning, all survey data may be merged into a central geographical information system (GIS) survey database that necessitates very close attention to horizontal and vertical control and adherence to the specified datum requirements.

Appendix H defines the specifics and common requirements for a typical Program survey in regard to datum and expected coordination. Individual Designer Scopes of Work may clearly define the limits and requirements for surveys associated with each design contract. Survey elements, not specifically delineated within these requirements, shall be performed in accordance with the Tennessee Board of Examiners for Land Surveyor's Standards of Practice, current version as applicable.

7.2 Firm Quality Program

The Designer's survey consultant shall maintain a quality program while performing all services on individual projects. The quality program must ensure that the surveyor's services for the Program conform to this *Design Management Manual*'s requirements and with Tennessee's survey requirements as well as applicable portions of the Designer's quality approach. The surveyor shall provide certification of adherence to the Program and, upon request, provide a copy of its quality program.

Section 8

Geotechnical Requirements

8.1 Overview

The Program's geotechnical requirements presented in Appendix I have been established to standardize geotechnical data collection, analysis, and reporting. It is extremely important to maintain consistency from project to project and for the geotechnical information to consistently be of a high quality. It is generally expected that a sub-consultant will be performing the services for the Designer.

Geotechnical consultants are to consider the project information, requirements, and the Designer's instructions in conjunction with knowledge about local subsurface conditions in developing the geotechnical scope of services. The Designer shall inquire of MWS, research, and provide any recoverable existing geotechnical data to plan the geotechnical investigation program and use the available data to the maximum degree possible to verify, reduce, and supplement the exploratory efforts and reports undertaken for the project. Field exploration is generally expected to include test borings, but test pits or geophysical testing methods may be considered in lieu of or in addition to borings depending on project and site specifics.

With input from the geotechnical consultant, the Designer shall develop a field and laboratory testing program sufficient to provide data upon which to base its professional site evaluation. If conditions are encountered that justify increasing or revising the contracted scope of services, the geotechnical consultant shall contact their contractual oversight manager (Designer) to discuss the proposed scope modification and the justification thereof. In no case should the geotechnical consultant execute tasks or services beyond their contracted scope without prior direction from the Designer. If the Designer assesses that the conditions encountered will impact the critical path schedule of the project or are outside the project's scope and budget, Designer shall contact the Project Manager to discuss the proposed schedule and/or scope modification and provide the justification thereof.

The geotechnical consultant, geotechnical consultant's laboratories and subcontractors shall adhere to applicable local, state, and federal laws; codes and regulations for the services being provided; and industry performance standards. General technical requirements for the geotechnical consultant's firm and for the personnel, laboratories, and subcontractors performing work for the project are presented in detail in Appendix I.

8.2 Services

Geotechnical services typically include preliminary or design level geotechnical explorations. The scope for geotechnical services is typically issued by the Designer although it is possible that MWS will issue a separate proposal request and procurement in special circumstances. The responsibility for geotechnical services will be identified in the Designer's Scope of Work.

The Designer should provide project information to be used by the prospective geotechnical consultant to evaluate the project's geotechnical aspects. Such information is project-specific and may include:

- Previous geotechnical information for the site if readily available
- Background information, including project description, site location, site access, etc.
- Anticipated structure descriptions
- Anticipated structural loads, elevations, and settlement criteria
- Planned grade changes
- Pavement thickness design criteria (traffic loads, design life, etc.)
- Other pertinent information

8.3 Firm Quality Program

If a geotechnical consultant is utilized by the Designer, the consultant shall maintain a quality program while performing all services on projects. The quality program must ensure that the services performed conform to this *Design Management Manual*'s guidance and to the Designer's quality approach. The geotechnical consultant shall provide certification of adherence to the Program and, upon request, provide a copy of its quality program.

Section 9

Easement, Land, and Permit Requirements

9.1 Overview

Acquiring real property, easements, and various building and environmental permits involves planning and coordination with Metropolitan Nashville and Davidson County, the State of Tennessee, federal agencies, and other entities or regulators. To expedite the project construction phase, permit applications need to be completed and permits acquired by the conclusion of the design phase to the extent possible.

Real property acquisitions and easements or rights-of-entry must be available before construction starts. Therefore, the descriptions of the required additional real estate and easements must be completed promptly by the Designer. The Program Management Team has generally identified the real property necessary for the planned projects and initiated the acquisition process. Property acquired or undergoing acquisition will be identified in the Project Summary.

9.2 Easements and Land

9.2.1 General

Easement and land acquisitions are a critical Program Management Team responsibility for reducing the risk of delays in project delivery. The Program has a standard process to track easement or land requirements for each project. The resources supporting the MWS' Properties section of the Engineering Division perform property research (including Designer-generated information), appraise property values, review appraised reports, prepare legislative documents, contact property owners, negotiate with property owners, coordinate agreements and property closings, and prepare final recordable documents. The Program Management Team, as requested, may assist MWS in these activities.

Typically, land acquisition tasks will occur prior to the design phase for facilities, but some land and easement acquisition will be initiated during design with the goal of having all land and easements acquired prior to bidding for construction. All easement and land acquisition activities will be tracked in PMIS by project via submittals in the Designer Submittal Business Process and the Real Estate Acquisition Log.

9.2.2 Project Summary – Easement/Land Review

The Project Summary provided to the Designer may include an Easement and Land Acquisition list that identifies, to the extent possible, any potential properties for which easements of high risk will need to be acquired or for which property is being or has been purchased outright by MWS and the Metro Public Properties Division of the General Services Department. The Project Summary may also include a proposed schedule for initiating or concluding the acquisition process. It is expected the schedule will be refined and updated by the Project Manager as the design and final alignments advance through the project development phases based upon Designer and MWS acquisition data.

9.2.3 Preliminary Engineering Study

The Designer shall review the Project Summary relative to anticipated easement acquisitions and any land actions taken by MWS prior to initiating the design process. The *Preliminary Engineering Report* (see Section 3.4.2) should include the Designer's understanding of the easement and land acquisition project requirements and any updates to the plan based on other design factors (proposed alignment, needed land acquisition, etc.). The Designer should also note any immediate concerns or suggested changes in the schedule for easement or land acquisitions.

9.2.4 Easement/Land Negotiations

MWS, or the Program Management Team if requested for resource supplementation, will initiate contact, secure appraisals, and begin negotiations with property owners after approval by MWS and Metro Council. Each proposed agreement will be documented in writing, and the Designer will be updated as to the status of these negotiations. The Designer shall include special instructions in the contract documents advising potential construction bidders, and most importantly the successful bidder, about all requirements agreed to as part of the easement and/or land acquisition process.

9.2.5 Property Records

The Project Manager, with support as needed from the Real Estate Coordinator, will oversee the preparation of all documentation required to acquire the easement or documents for the additional real property acquisition identified during design. MWS or the Metro Public Properties Division of the General Services Department will record the executed documents in the Davidson County Register of Deeds office or with the appropriate authority if outside of Davidson County. The Designer will be the primary document originator and provide aid to MWS in the preparation of the easement or land descriptions, easement form insertions, plats, and supportive mapping following MWS' guidelines. All supporting documentation will be tracked in PMIS via the Designer Submittal Business Process and/or the Real Estate Acquisition Log.

9.3 Permits

This section describes the role of the Project Manager, Designer, and contractor in acquiring various building, construction, and environmental permits from Metropolitan Nashville and Davidson County, the State of Tennessee, federal agencies, and other regulators and entities.

The Designer is responsible for the following items:

- Providing a comprehensive assessment of the permits required for a project, based on field observations and experience
- Compilation of documentation needed for permit applications required before construction starts
- Preparation of the permit applications
- Support for the Program Management Team when obtaining and tracking permit approval
- Submittal of all permit documentation via the Designer Submittal Business Process

The contractor is responsible for obtaining all final permits where their name and/or signature and/or bonds and specific insurance is required and all local excavation and roadway closure permits.

To expedite the project's construction phase, permit applications need to be completed as early as practical in the design phase. While the Designer will be provided with a preliminary list of potential

permits in the Project Summary, the Designer is expected to further define this list as the design develops.

The Designer, in collaboration with the Project Manager or others as designated, will contact various state, federal, local, and other resource agencies and entities to verify the requirements particular to a given permit/permission. The type of impacts that a project may generate and the project location will determine which federal, state, and/or local requirements apply. The Program's Permit Coordinator is available as a resource when needed.

Permits and their requirements are subject to change as rules, regulations, and policies change. It is the Designer's responsibility to understand the current compliance requirements of permit rules, regulations, and policies.

Not all permits will apply to all projects. Typical rehabilitation projects without any pipe replacement, with limited areas of disturbance, and with no excavation in waterways or waterbodies may require no permits for project approval and bidding. Additional permit information is provided in Appendix J.

Most facility projects, rehabilitation projects with extensive pipe replacement, and conveyance projects will require, at a minimum, the following four permits/activities:

- Tennessee Department of Environment and Conservation's National Pollutant Discharge Elimination System's Permit for Construction Stormwater
- Metro Grading Permit
- TDEC's Wastewater Plans Review and Approval
- NDOT-approved Traffic Control Plan for public roadway closures

In addition to the four above-listed permits, facility-type projects will require a Metro Building permit. The Designer will make pre-construction application for the Building Permit and the Grading Permit and resolve issues so the contractor can obtain the final construction permit. Along with the Grading Permit application, all applicable state, federal, local, and other permits must be submitted to obtain Metro's Grading Permit.

Examples of required applicable permits are the following - from the state of Tennessee (ARAP, Section 401, Tennessee Department of Transportation, etc.), the federal government (Section 10, Section 404, etc.), Metro (floodplain variance, *Erosion Prevention and Sediment Control Plan*, stormwater criteria, etc.), and other permits (railroad crossings, electrical and gas utilities permits, etc.).

The Program, in order to facilitate rehabilitation construction and reduce risk, may apply for an annual CWNOAP-wide TDEC ARAP permit for projects that may construct point repairs or rehabilitate sewer services in or crossing wet weather conveyances and USGS delineated "blue line" streams. The application may include a protocol to provide protection to the environment and water courses. The previously-granted permits have included such a protocol. The permit does allow for excavation in dry streams and addresses excavation, if required, in wetted streams with reporting requirements.

Section 10

Estimating Procedures and Guidelines

This section and Appendix K establish the processes, protocols, and methods to be used by each project Designer to prepare intermediate and final Opinions of Probable Construction Cost (OPCC).

This document provides guidance to the Designer for creating OPCCs and thereby ensuring consistency and uniformity in the estimate layouts, generation frequencies, manner of review, and proposed estimating software acceptable to the Program. This will ensure that project OPCCs are developed on a consistent basis allowing cost comparisons to Program baselines. This information supplements the Program Management Consultant estimating approach defined in the *Program Management Plan*, Volume I, Section 5, and Volume III, Estimating Guidelines. Typically, the OPCC for rehabilitation projects with standard work items is developed by the Program using quantities developed by the Designer.

The accuracy of OPCCs is of the utmost importance because they confirm the inclusion of design issues as identified in the *Project Work Plan*, form the basis for funding commitments, and allow for managing project scope throughout the life of individual projects. When developing OPCCs for each project, the Designer must ensure that the estimated work falls within the start and finish dates of the applicable project construction schedule.

Additional cost estimating process objectives are to:

- Establish a performance baseline
- Create a benchmark as a basis for change control
- Establish OPPCs at design completion for analyzing contractor bids
- Develop a database for typical costs of common work items encountered in the Program

More detailed information and Program guidance regarding project cost estimating for the Designer can be found in Appendix K.

Section 11

Sustainable Development and Landscape

Over the past several years, sustainability and "green" initiatives have become critical issues for action plans and improvements within and for Metropolitan Nashville and Davidson County. In 2009, a Green Ribbon Committee developed a comprehensive document entitled *Together Making Nashville Green.* This document establishes 16 goals and 71 recommendations and notes the importance of having green and sustainable elements in the constructed environment to improve air and water quality. It is available online at www.nashville.gov/sustainability/docs/grc/grc_report_090701.pdf.

Detailed information and specific Program guidelines regarding sustainable development and landscaping for the Program, consistent with the 2009 document, can be found in Appendix L. These specific guidelines will aid the Designer integrating sustainable elements while developing the design documents outlined in the project scope.

Additionally, the Designer is expected to be familiar with and incorporate additional guidance from Metro's Urban Forestry Program Manager, regarding tree canopy maintenance and clearing on public lands.

Section 12

CADD – Drawing Classification and Referencing

This section and Appendix D introduce and describe the drafting guidelines to be used by the Designer for computer-aided design and drafting (CADD) standards thereby ensuring clarity, consistency, and uniformity in the Program drawings and exhibits. These guidelines are based on the American Institute of Architects' CADD Standards and are designed to be flexible enough to accommodate periodic CADD improvements and updates. The procedures and standards may be periodically updated as required to comply with the current version of CADD software standards.

If 3D modeling is used, a *Building Information Modeling (BIM) Execution Plan* must be developed. The purpose of the plan is to identify and document the BIM's goals and uses; develop the information content, parties responsible, grouping, and schedule for information exchange among parties; and define the infrastructure required to support the developed BIM processes. If an alternative form of construction delivery is used, the Designer's *BIM Execution Plan* must be done in conjunction with the contractor.

Tables of layers, plotter settings, standard text and dimension styles, file naming structure, and a drawing standard file are included in Appendix D as guidelines; however, the Designer is expected to adhere to these guidelines whenever the Designer's Scope of Work requires that AutoCAD files be submitted electronically as a deliverable. Sample Plans of typical projects key sheets can be found in Appendix E.

This section, the Appendices, and the electronic files provided to the Designer at the project's initiation provide the appropriate CADD related layer guidelines, drawings templates, symbols, and title blocks. This material is supplied to ensure conformance to the standards.

While CADD guidance is provided, it is expected that the Designer will employ capable, experienced CADD personnel to ensure quality services in this area.