Section 1 - Introduction

I. Purpose – The purpose of this document is to present information to Professional Services Firms for the design, preparation of construction documents and contract administration and inspection services more efficiently while satisfying the needs and desires of HRSD. The term "FIRM" is used throughout this document to refer to the firm or individual providing professional consulting services for the design, contract administration, and inspection of HRSD facilities. HRSD expects the FIRM to bring its experience, expertise, and enthusiasm to projects while recognizing the culture and desires of HRSD. The FIRM must carefully review the information contained in this document, raise questions where appropriate, and deliver projects that incorporate HRSD standards as laid out in this document. HRSD must be specifically advised, in writing, of any case when these standards that make up this document have not been incorporated in the final plans, specifications, and Bid Documents or are contrary to other federal, state, or local requirements.

II. Expectations, Outcomes, and Sustainability – For an Engineered Construction Project to be successful, a number of outcomes are required. These outcomes include meeting project quality, schedule, and cost objectives. Projects must meet all regulatory, environmental, safety, and other needs of HRSD and the citizens we serve. Each project results in the delivery of infrastructure assets to HRSD. These assets must provide the required level of service within an acceptable level of risk at the lowest life-cycle cost. As such, FIRMs should consider the full life cycle of assets when planning, designing, and constructing HRSD projects. Life cycle cost accounting should include capital, operating, maintenance, rehabilitation, and decommissioning costs of the asset. FIRMs should compare asset alternatives based on Net Present Value (NPV) per anticipated years of service (NPV/anticipated years of service). HRSD strives to deliver projects sustainably. To be consistent and develop a common understanding of what sustainability means, FIRMs shall utilize the Institute for Sustainable Infrastructure (ISI) Envision checklist when evaluating and designing projects. The Envision checklist will assist the project team in identifying and engaging stakeholders, identifying project risks and opportunities, and evaluating the project from multiple perspectives. Because project adjustments can be most economically incorporated early in a project's life, the first use of the Envision checklist should occur sometime between the start of preliminary engineering and the start of project design. The primary goal of utilizing ISI Envision is to plan, design, and construct better infrastructure projects for HRSD, our ratepayers, and our local partners; not to receive accreditation or an award. In some instances, pursuing project accreditation and award may be justified. Better infrastructure projects are the result of evaluating the project from economic, social, and environmental perspectives (the triple bottom line or TBL) and evaluating project alternatives and project components based on their life cycle costs. For certain small, fast-track or

specialized projects, use of the Envision Checklist may not be required. Elimination of this requirement should be discussed and approved by the HRSD Project Manager.

III. Project Management – FIRMs are typically hired to provide both design and construction support services throughout the life of a project. HRSD has limited internal inspection staff; thus, we largely rely on the FIRMs to manage projects from start to finish. The "cradle to the grave" approach has served HRSD well over the years to assure continuity throughout the project. HRSD has the expectation that FIRMs have the capability to effectively manage the design and oversee the construction efforts. HRSD's standards provide specific expectations and information for all aspects of project management. The FIRMs are expected to provide knowledgeable and experienced staff to manage projects. FIRMs act as an extension of HRSD's Engineering Division and must use best practices when managing all aspects of projects, including technical, interpersonal, and professional responsibilities.

IV. Project Delivery Methods – As a political subdivision of the Commonwealth of Virginia, HRSD follows the requirements of the Virginia Public Procurement Act. In addition, HRSD has developed the HRSD Procurement Policy to more specifically define our efforts to meet specific procurement related matters. Engineered construction projects are typically delivered using a Design-Bid-Build method; however, HRSD has the authority to use alternative forms of project delivery if certain procedures and requirements are followed. Alternative (or Collaborative) delivery methods including Construction Management, Job Ordering Contracting, and Design-Build are evaluated on a case-by-case basis and must be approved by HRSD Commission for each project prior to starting an Alternative Delivery method.

These Design and Construction Standards were first developed when the traditional Design-Bid-Build project delivery was the recognized means of accomplishing HRSD's capital program. Although HRSD has adopted forms of alternate or collaborative project delivery, these Standards are still primarily to provide FIRMs guidance on preparation of Bid Documents for Design-Bid-Build project delivery and to provide expectations for the FIRM throughout the life of these delivered projects. Sections of these Standards may be appropriate for Design-Build (DB) project delivery and Construction Management (CM) project delivery with permission from the responsible HRSD Project Manager. FIRMs must exercise caution when using these Standards and providing or referencing these Standards for DB and CM project delivery to properly balance between prescriptive, performance, and preference elements.

V. Distribution - This document is incorporated by reference into all HRSD Professional Services Agreements for the design and construction of HRSD facilities. This document is posted on the HRSD website at www.hrsd.com.

VI. Preparation of Design Documents – HRSD employs numerous FIRMs for technical assistance in the preparation of design documents. Each of these FIRMs bring unique expertise to the design effort. These differences result in new ideas and methods for both the design and implementation of HRSD's Capital Improvement Program. Although HRSD has some specific preferences for certain aspects of the design, much of the procedures, details and technical information required for the project should be determined by the FIRM. The following information is an overview of some of the general requirements required by HRSD for the preparation of design documents.

A. General Requirements

1. Vertical construction projects (pump stations, pressure reducing stations, treatment plants, wet weather storage tanks, and administrative buildings) are to be designed in a 3-D CADD format as approved by HRSD Project Manager, which can be viewed and reviewed by HRSD staff with non-licensed viewer software packages and are compatible with BIM use. HRSD may additionally request that these 3-D models support both virtual reality (VR) and augmented reality (AR) for design reviews. The FIRM shall incorporate approved changes proposed by the Contractor during submittal reviews and Change Proposals to confirm that alternate equipment, materials, and changes from the FIRM's developed Bid Documents will not create further conflicts. The final 3-D design files are also to be delivered to HRSD in their native software format unless otherwise requested.

2. Total project cost estimates should be provided, listing design, construction, land acquisition, wetlands mitigation, and all other anticipated project costs. Costs should also include necessary contingencies, and these contingencies should be clearly defined. Along with each developed and published project or construction cost estimate by the FIRM, the ENR Construction Index of the month during which the estimate was prepared shall be documented in the footnote of the published cost estimate.

B. Study and Preliminary Engineering Report (PER)

1. Studies and PERs should clearly state the purpose, goals, and assumptions used in preparation of the document.

2. The PER should include an Executive Summary at the beginning of the document. The Executive Summary should include a brief overview of the project, recommendations, all project costs (design, construction, property acquisition, etc.), and schedule to implement

the work. The Executive Summary should be limited to approximately five (5) pages and should include a cost summary for the project in accordance with the Standards. The PER should consider alternatives for the various systems, processes, and equipment to be included in the final design. Materials of construction for the significant items of construction should also be included. A thoughtful method of comparing various alternatives is needed with specific recommendations.

3. Large amounts of data or other technical information should be included in an appendix with a summary of the information included in the text of the document.

4. Studies and PERs must be provided in an electronic PDF format for ease of use by HRSD. Paper copies may also be required, and their quantity is project-specific.

5. Specific requirements for the technical aspects of the study or PER will be included in the Professional Services Agreement.

6. PERs should be prepared in compliance with the Commonwealth's Sewage Collection and Treatment (SCAT) Regulations.

7. Depending on the type of project, HRSD has an expectation and process for incorporating architectural features and landscaping into site rehabilitation and both new and rehabilitation of vertical projects (pumping stations, pressure reducing stations, wet weather storage tanks, administration buildings, and certain treatment plant facilities). Specifics regarding these architectural guidelines and HRSD's Architectural Review Committee's role in the PER and Design phases are included in Section 2 – Architectural and Landscaping Design and Review Process.

8. Section 8 - PER, Design, and Construction Submittal Requirements details the minimum required table of contents chapters.

C. Project Manual (Contract Requirements, Technical Specifications, and Construction Drawings)

1. The FIRM should prepare the Project Manual in accordance with this document and all state and local regulatory requirements. The Project Manual should generally be organized as follows:

a. Volume 1: Construction Contract Requirements and Technical Specifications

b. Volume 2: Construction Drawings

c. Volume 3: Other documents as required

2. The documents used for regulatory approval and for construction bidding must be sealed and signed by a Professional Engineer or Architect licensed in the Commonwealth of Virginia.

3. The type of media and method used for the distribution of the Project Manual shall be agreed upon by HRSD and the FIRM prior to finalization of the design documents.

4. Specific requirements for the technical aspects of the Project Manual are described further in this document and will be included in the Professional Services Agreement.

5. Project and construction cost estimates during plan development shall be as described in Section 5 of the Standards.

VII. Common Historical Issues in the Design and Construction Phase - HRSD has routinely encountered a number of recurring issues in both the design and construction phases of projects. Some of these relate to HRSD preferences that may differ from the FIRM's or industry's normal practices. These are summarized below by design and construction phase.

A. Design Phase

1. Specification sections were included in the Bid Documents that are not applicable to the specific project.

2. Plans and specifications were not well coordinated.

3. The general intent is that existing HRSD drawings are to be reviewed, and all pertinent information from existing drawings should be included on the current project drawings so that these drawings represent the complete picture of the HRSD facility in the areas covered.

4. Suggested sequences of construction to ensure maintenance of plant operations (MOPO) and maintenance of service (MOS) for pipelines and pump stations were not prepared or carefully considered.

5. Technical specifications were not coordinated with HRSD standard front-end documents. Do not repeat in the technical specifications items that are covered in the front-end documents.

6. A consistent format (font, page numbering, paragraph numbering, etc.) was not used throughout the technical specifications.

7. Existing field conditions were not verified at the final design stage, resulting in conflicts.

8. Locations of piping and appurtenances, such as air release valves and isolation valves in busy intersections, need to be considered for maintenance and operation access.

9. Access for sampling or maintenance of equipment needs to be considered at treatment plants, pump stations, covered tanks, and other facilities.

10. Lack of consideration for how the project will negatively impact the public (noise, odors, vibration, access, etc.)

11. Easements, both temporary and permanent, and other property needs are not identified early enough in the project lifecycle, which causes the property acquisition timeline to become the critical path. Refer to Section 9 – Real Estate Acquisition and Plat Guidelines for the typical timeline.

B. Construction Phase

1. FIRMs were not carefully checking that Contractor submittals were in full compliance with the Bid Documents and HRSD Standards, and that the approved products and materials do not result in conflicts with other aspects of the physical space or other aspects of the Contract Documents.

2. FIRM not coordinating a list of submittals to be reviewed by HRSD prior to the start of construction.

3. FIRM not allowing HRSD to review all “or equal” equipment submissions by the Contractor prior to approval.

4. Field personnel (FIRM’s representative) did not have a copy of and were not familiar with the plans, specifications, and approved shop drawings/submittals.

5. Field personnel did not check materials received against approved shop drawings/submittals.

6. Field personnel used personal experience, not plans and specifications, when considering changes, answering questions, etc.

7. Field personnel relied on Locality / VDOT or other agency inspectors for contract item compliance when the Locality or VDOT was administering the construction contract that included impacts on HRSD facilities.

8. Field personnel relied on Contractor's record drawing keeping and failed to monitor progress and field changes closely. Field personnel should keep their own record of drawing information and frequently review the Contractor's record drawings.

9. FIRM failed to prepare independent cost estimates for use in verifying/negotiating changes with Contractor.

10. Field personnel were unaware of special features for the project. Design personnel should brief field personnel on special features and participate in startup to ensure compliance with the specifications.

11. Field and design personnel did not receive copies of all change documents, i.e., addenda, change orders, field orders, work change directives, etc.

12. Consideration was not given to final site restoration, including work best performed by certified landscape contractors.

13. Field personnel were not monitoring, documenting, or enforcing when the Contractor was outside of rights of way and easements that they were limited to work within.

14. Field personnel were not monitoring, documenting, or enforcing when the Contractor was violating locality maintenance of traffic restrictions.

VIII. Use of Autonomous Vehicles (AVs) – Due to potential issues with the use of prohibited airspace, privacy concerns, the changing regulatory environment, and the risk of injury and damages that could result from the use of AVs, HRSD requires that the use of AVs must comply with all relevant regulations, insurance requirements and policies. The use of AVs should be limited to circumstances when the AV provides HRSD with a financial, safety, or functionality benefit over

other reasonably available options. When the use of the AV involves a Consultant, Contractor, or other individual, written permission from the HRSD Chief Engineer and the HRSD General Manager will be required. The request submitted must clearly state the need and benefit afforded by using the AV, the name of the individual controlling the AV, and insurance coverages. The request should include the Remote Pilot Certification number of the responsible individuals controlling the UAS (Unmanned Aircraft Systems) and should note that they will fully meet all federal, state, and local regulations relating to the use of AVs.

End of Section