



Kaiser Mead Groundwater Remediation Interim Action

Construction Quality Assurance Plan for Extraction, Treatment, and Discharge

Final

June 2020

Jacobs Construction Team



Kaiser Mead Groundwater Remediation Interim Action

Project No: KMCT2019.2300
Document Title: Construction Quality Assurance Plan for Extraction, Treatment, and Discharge
Document No.: PPS0227201702SPK
Revision: Final (Rev 2)
Date: June 2020
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Document History and Status

Revision	Date	Description	By	Review	Approved
A	2/28/2020	Pre-Final Design Review Draft	Project Team	Jay Dehner	Jay Dehner
0	4/3/2020	Final Design Version	Project Team	Jay Dehner	Jay Dehner
1	5/5/2020	Updated Final Design	Project Team	Jay Dehner	Jay Dehner
2	5/26/2020	Response to Ecology Comments	Project Team	Jay Dehner	Jay Dehner

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Acronyms and Abbreviations

Contractor	Jacobs Engineering Group Inc.
CQA	construction quality assurance
CQA Plan	<i>Construction Quality Assurance Plan</i>
CQC	construction quality control
Custodial Trust	Kaiser Mead Custodial Trust (Owner)
DBO	design-build-operate
DBM	Design/Build Manager
EC	electrocoagulation
EDR	Engineering Design Report
FCM	Field Construction Manager
GM	geomembrane
GCL	geosynthetic clay liner
HDPE	high-density polyethylene
HVAC	heating, ventilation, and air conditioning
Jacobs	Jacobs Engineering Group Inc. (Contractor)
Owner	Kaiser Mead Custodial Trust
QA	quality assurance
QC	quality control

1. Introduction

This *Construction Quality Assurance Plan* (CQA Plan) presents methods and procedures that will be implemented to provide construction quality control and assurance during construction of groundwater extraction, treatment, and discharge systems to support interim action groundwater remediation for the Kaiser Mead Custodial Trust (Custodial Trust). Specifically, this plan has been prepared to describe the quality control process and measures to be taken during the construction of conveyance systems, wetlands liner systems, the pre-fab building, and general earthwork.

The Custodial Trust is the Owner of the project and has hired Jacobs Engineering Group Inc. (Jacobs; Contractor) to construct and deliver the project under a design-build-operate (DBO) delivery format. Under this DBO format, Jacobs will lead the design development, serve as general contractor, perform startup and optimization of the extraction and treatment system, and operate the system for an initial period of 1 year, until long-term operations are assumed by the Custodial Trust, or their designees.

The objectives of project delivery under a DBO delivery format are to support a streamlined design development process, foster an integration of the design with construction of the remedy elements, and facilitate system performance optimization based on conditions encountered in the field. This format results in a focused design delivery that supports a phased procurement and delivery process under a streamlined delivery schedule as described in the *Remedial Design Work Plan, Kaiser Mead Groundwater Remediation Interim Action* (Jacobs, 2019). Jacobs will employ Subcontractors to complete specific elements of the work in accordance with the design documents included in the *Kaiser Mead Groundwater Remediation Interim Action Final (100%) Design Report for Extraction, Treatment, and Discharge Systems* (Jacobs, 2020; referred to herein as the Engineering Design Report, or EDR). The roles and responsibilities of each party are described in more detail in Section 2.

1.1 Purpose and Scope

The purpose of this plan is to identify procedures that will be used by Jacobs in collaboration with Subcontractors to guide quality control (QC) and quality assurance (QA) activities during construction and to obtain independent, documented confirmation that the standards of quality required by the design drawings and technical specifications presented in the EDR for the project have been met.

This plan provides the following:

- Identifies the organization, roles, and responsibilities of individuals who will be responsible for implementing the plan for the project during construction
- Summarizes the minimum qualifications of lead project participants from the Engineer's and Subcontractor's organizations
- Describes key activities that will take place and processes that will be used to meet quality standards, including frequency of inspections, performance audits, field testing, review and observation functions, sample sizes, sampling for laboratory testing, sampling and field testing procedures and equipment to be used, laboratory procedures to be used, calibration of field and laboratory testing equipment, QA/QC review of laboratory procedures, acceptance/rejection criteria that will be followed, and corrective measures to be used if deficiencies are found

Further specifications for testing and results, construction administration and management procedures, including documentation of construction quality assurance (CQA) activities by Jacobs and Subcontractors are described in the EDR.

1.2 Key Terms

Three related but independent processes will be used during construction to verify that the standards of quality (identified in the Contract Documents) are met. These processes are CQA, construction quality control (CQC), and construction administration and management. Definitions of these terms and

identification of the parties responsible for each process are as follows (additional information on these terms and how each process is implemented will be presented in a Construction Management Plan to be prepared by Jacobs in order to guide implementation of construction activities within the construction team:

- **Construction Quality Assurance:** Refers to a planned system of activities that provide assurance and documentation that a facility is constructed as specified in the design and that the materials used in the construction are manufactured according to specifications. CQA includes inspections, verifications, audits, and evaluations of materials and workmanship necessary to determine and document the quality of the constructed facility. For this project, the evaluation of materials and workmanship includes field sample collection, field verification testing, and laboratory analyses. CQA activities will be coordinated by Jacobs.
- **Construction Quality Control:** Refers to a planned system of actions used to directly monitor and control the quality of the construction project. CQCs are the coordinated measures undertaken by Subcontractors, including lower-tiered subcontractors to determine compliance with the requirements for workmanship and materials set forth in the plans and specifications. CQC includes inspections and testing to directly monitor the quality of all furnished, constructed, and installed components. Formal documentation of CQC efforts generally is not required, unless they occur concurrent with CQA documentation processes.
- **Construction Administration and Management:** Refers to those activities taken to control and administer the construction project, including conducting project meetings, monitoring project schedules, reviewing and acting on requests for payment, and coordinating changes to the EDR resulting from changed site conditions or the selection of alternative materials/equipment or methods of construction or installation. **This is a collaborative effort between Jacobs and its Subcontractors (and lower-tiered subcontractors).**

2. Organization, Roles, and Responsibilities

The major parties involved in the construction of this project are the Custodial Trust (Owner), Jacobs (Contractor), and Subcontractors. Jacobs is responsible for construction of the project per the design and will provide construction management services (inspection, CQA oversight, and technical support) and oversight of Subcontractors.

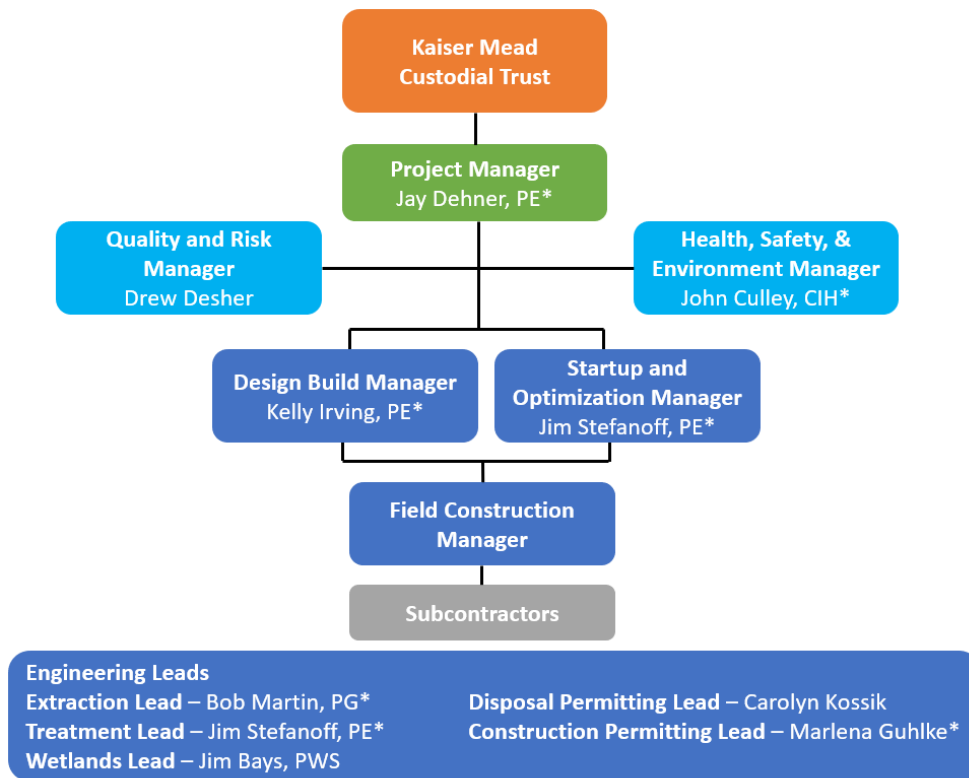
2.1 Project Organization

Key personnel associated with the overall project are identified, and the organization and relationship between them are presented in Figure 2-1. The lines of authority and responsibilities of each party are detailed in the following sections.

Lines of communication related to this project will generally flow as indicated in Figure 2-1 (the dashed lines indicate communication/coordination lines of communication and the solid lines indicate contract lines). The primary lines of communication and responsibility in the field will be between the Field Construction Manager (FCM) from Jacobs with Subcontractors' Superintendents and Foremen. The primary lines of communication and responsibility for office matters will be between the DBO Manager and the Project Manager (PM).

Although Figure 2-1 identifies formal lines of communication and responsibility, potential conflicts are encouraged to be resolved at the level where they occur by the individuals most knowledgeable with regard to the issues in question. For example, issues that can be readily resolved in the field should be handled by onsite personnel (for example, FCM and Subcontractors' superintendent).

Figure 2-1. Project Organization and Responsibilities



*Located In Spokane

2.2 Owner

The Owner is responsible for executing all administrative aspects of the contract with the Contractor. The Owner is represented by its technical representative, Scott Mason of Hydrometrics, for technical advice during construction of the project. The Owner has final authority for approval of the contract. All claims, any change orders, and all pay applications are the responsibility of the Contractor to develop and coordinate with the Owner. Note that Owner is responsible for execution of Special Inspection elements for the construction of the Electrocoagulation (EC) Building per International Building Code (IBC) requirements. This is outlined in more detail under Section 3 of the CQA Plan.

2.3 Contractor

Jacobs, Contractor, will perform construction management services, including inspection and QA/QC oversight as described in this plan, and in accordance with the contract with the Owner.

The Jacobs FCM will be the primary contact in the field, and will be responsible for inspection of Subcontractors' work and overseeing that the Subcontractors' CQA testing and inspections are done and satisfactory approved. The Jacobs FCM will also coordinate any Special Inspection requirements to be implemented by Owner for the project.

Additional technical support from the Jacobs Engineering team will assist the FCM and PM deliver the project. The PM will be responsible for maintaining communications with the Custodial Trust and providing continuity with the Engineering team; the FCM who will be responsible for construction administration and management in the field and will act as a liaison between the Owner and Subcontractors, and the Engineering team who will be responsible for handling design-related services at the direction of the PM.

For this project, Jacobs will be responsible for CQC and CQA. Specifically, the Contractor will be responsible for identification of Subcontractor's and their qualifications, review of any manufacturer's QA/QC plans, CQA documentation and certifications, and performing work in general accordance with the Contract Documents.

The Contractor is responsible for the development of the overall construction schedule and maintaining that schedule. The schedule is intended to provide a basis for the Contractor to manage progress and initiate corrective action, as necessary.

It is the responsibility of the Contractor to maintain and conduct all operations in a safe manner. Jacobs is responsible for creating a site-specific health and safety program for all employees and Subcontractors' personnel and will be responsible for conformance to the safety program requirements. Jacobs will also be required to designate a Safety Monitor for the project that is required to be present at all times during the construction work. This safety monitor may be the onsite FCM.

The specifications require that the Contractor identify a CQC System Manager for the project. It is conventional to also have this same person manage the CQA elements of the work to maintain an inherent level of continuity between these two different, but related quality controls. The CQA Manager will be responsible for ensuring that their plan, in collaboration with this plan, is being implemented and that coordination is occurring between the Contractor and Subcontractors to document CQC/CQA activities. The CQC/CQA manager will be the onsite FCM. Typical responsibilities are as follows:

- Carry out activities (including any CQA audits) to confirm that the Subcontractors' materials and workmanship meet the requirements of the Contract Documents and are being appropriately documented in accordance with this plan
- Identify, make arrangements for, oversee any CQA laboratory and field testing by certified testing laboratories, and oversee field testing and review test results
- Coordinate with the FCM in determining when satisfactory resolution of any defective/rejected work has been reached

2.3.1 Office/Technical Support Staff

2.3.1.1 Project Manager/Design/Build Manager

Jacobs office support staff will include the PM (Jay Dehner) and the Design/Build Manager (DBM, Kelly Irving) who will be responsible for administration of the construction contract in accordance with this plan and the Contract Documents, maintaining communications with the Owner, and providing continuity with the design team. The DBM will lead the construction team.

The DBM, together with the technical support staff at the DBM's direction and request, will have the responsibility to review submittals, interpret the project design, and assist with preparation of contract interpretation and clarification requests [also known as Requests for Information, Work Change Directives, Field Orders, and Change Orders]. All work impacting project price and schedule shall be coordinated and authorized first with the Custodial Trust for any changes to the overall contract, using the same change management process that was established during the design phase

The responsibilities of the DBM also will include, but will not be limited to, identifying the appropriate technical support staff to complete the requested submittal reviews, establishing schedules for reviews, and participating with selected technical staff in meetings requested by the Subcontractors. The DBM will be a licensed professional engineer who will oversee the construction project and will declare in writing that the construction was completed in accordance with the Contract Documents. This declaration, along with the record drawings, will be submitted to the Custodial Trust and Ecology at completion of the project.

2.3.2 Field Support Staff

2.3.2.1 Field Construction Manager (FCM)

The FCM will have overall responsibility for observing and documenting Subcontractors' construction of the project and CQA/CQC activities. These responsibilities will include review, coordination, interpretation, documentation, coordinating with the office support team, and observation activities necessary for the completion of the project. The FCM, with approval of the DBM, has the authority to issue defective/rejected work notifications to a Subcontractor if CQA test results, Subcontractor's submittals, and/or direct observations indicate that materials and work quality do not meet requirements of the Contract Documents.

The FCM is in charge of Jacobs' field contract administration operations; specifically, the FCM will participate in weekly progress meetings with Subcontractors and project management staff, prepares weekly meeting minutes and agendas, and act as a liaison between field staff and project staff. The liaison role is a key role of the FCM in which they are to help resolve any conflict before it occurs and identify favorable decisions and negotiations that are fair to the Owner and Contractor and at the same time equitable to the Subcontractor, where applicable. The FCM and DBM will coordinate routinely on key issues to maintain continuity between the office and field team.

Table 2-1 lists the project team members for the Owner and Jacobs, who will participate in project decisions during the construction. Table 2-2 identifies primary Subcontractors.

Table 2-1. Project Team Members

Name	Title	E-mail	Phone
Custodial Trust			
Dan Silver	Trust Administrator	danieljsilver@msn.com	360-754-9343
Scott Mason	Trust's Technical Representative, Hydrometrics	SMason@hydrometrics.com	406-257-4204
Steve Burchett	Trust's Local Representative, Budinger & Associates	sburchett@budingerinc.com	509-535-8841
Jacobs			
Jay Dehner/SPK	Project Manager	Jay.Dehner@jacobs.com	509-979-5733
Drew Desher	Quality and Risk Manager	Drew.Desher@jacobs.com	404-375-2080
Kelly Irving	Design/Build Manager	Kelly.Irving@jacobs.com	509-413-9591
Mike Heden	Field Construction Manager and CQA/CQC Manager	Mike.Heden@jacobs.com	509-953-7111
John Culley	Health and Safety Manager	John.Culley@jacobs.com	509-660-3367
Jim Stefanoff	Startup and Optimization Manager/Treatment Lead	Jim.Stefanoff@jacobs.com	509-981-5015
Bob Martin	Extraction Lead	Robert.Martin@jacobs.com	509-370-3866
Jim Bays	Wetlands Lead	Jim.Bays@jacobs.com	813-765-9286
Carolyn Kossik	Environmental Permitting Lead	Carolyn.Kossik@jacobs.com	425-453-5000 (ext. 25196)
Marlena Guhlke	Construction Permitting Lead	Marlena.Guhlke@jacobs.com	509-979-5934

Table 2-2. Subcontractor Project Team Members

Name	Responsibility	POC	Phone
Subcontractors			
Benthin & Associates	Surveying	Walt Dale	509-325-4529
H2O Well Services, Inc.	Wellfield	Tom Richardson	800-772-4901
Civil/Mechanical	TBD	TBD	TBD
EC Building	TBD	TBD	TBD
EC Treatment System	United Rentals	Douglas Herber <dherber@ur.com>	512-392-2660
Third-party Utility Locating	American Leak Detection	TBD	TBD
Laboratory Services	Test America, Inc.	TBD	TBD
Other Contacts			
Avista Company	Primary Electrical Service	TBD	TBD
Regulatory Agency Contacts			
Garin Schriever	Washington Department of Ecology Project Manager	gasc461@ECY.WA.GOV	360-407-6999

3. Construction Quality Assurance Activities

This section describes CQA activities that will take place and processes that will be used during primary construction elements. These activities and processes include review and observation, sampling and testing, the use of acceptance/rejection criteria, and the identification of corrective measures as they apply to the construction project. CQA activities associated with the primary construction components and the general site/civil components of the project are detailed in the Project Specifications and Drawings packages and include these components:

- Earthwork
- Concrete
- HDPE Geomembrane
- Geosynthetic Clay Liner
- High-density polyethylene (HDPE) Piping and Pumping
- Painting and Coating
- Metal Building System
- Heating, ventilation, and air conditioning (HVAC)
- Electrical

The FCM is responsible for ensuring that the Subcontractors perform all required tests, as identified in the final approved plans. The FCM will obtain all test results from the Subcontractors, update the Testing Plan and Log at a minimum of once a week, and maintain the records onsite in the project files.

The FCM shall ensure the performance of all tests specified or required by the project specifications and drawings to verify control measures are adequate to provide a product conforming to contract specifications. The FCM is responsible for ensuring that all construction-related tests are conducted. These tests include both operational testing and acceptance testing as appropriate. For all testing activities, the FCM shall:

- Verify that testing procedures comply with contract requirements.
- Verify that facilities and testing equipment are available and comply with testing standards.
- Check test instrument calibration data against certified standards.
- Verify that recording forms and the test identification control number system have been prepared.

All test results, both passing and failing, will be recorded on the Daily Report (Appendix A) for the day the results are obtained. Pertinent specifications, location where tests were taken, and the sequential control number identifying the test will be recorded. Test reports will be submitted to the DBM. As project-specific tasks are identified, the Testing Plan and Log will be amended to include monitoring tests and observations for those tasks.

Table A-1 (in Appendix A) presents a summary of these CQA activities, in addition to CQC and manufacturer's source testing for each component of the project (correlated to the Contract Document Specification sections) and the parties responsible for the testing.

3.1 Review and Observation

The review and observation function will involve review, observation, and recording of the Subcontractor's submittals and work methods to confirm that products and methods are meeting the intent and/or requirements of the specifications. These efforts will take place before, during, and after construction, as described in the following subsections.

3.1.1 Construction

Construction oversight will generally include but will not be limited to the following:

- Ensure that required submittals have been submitted for review.
- Review Subcontractors' submittals, samples, and supporting test reports, and verify that documentation required by the specifications has been received and is in compliance.
- Confirm that materials are consistent with requirements specified in the Contract Documents.
- Ensure that equipment does not damage stored or deployed geosynthetic materials.
- Ensure construction and maintenance of erosion control facilities.
- Record damage and repairs made to the compacted layers or geosynthetic materials, resulting from operation of equipment.
- Ensure all phases of the construction, document Subcontractors' compliance or noncompliance with the Contract Documents, and verify the correction of defective work.
- Review the Subcontractors' work progress schedules.
- Ensure that those individuals working on liner materials do not smoke, wear shoes that can damage the materials, or engage in other activities that can damage the materials.
- Ensure that lines and grades have been verified by the Contract prior to subsequent component construction.
- Ensure that the project piping, trenching, and grading work have been performed in general accordance with the project plans and specifications.
- Ensure performance compliance testing, performed by the Subcontractors' as part of overall CQC/CQA activities.
- Review quality testing results and reporting/transmitting information to the construction management team.
- Review construction record drawings for adequate documentation of the work and changes to the work.

Jacobs and its Subcontractors will meet all requirements set forth in the Contract Documents.

3.1.2 Post-Construction

Upon completion of the construction project, and concurrent with startup and commissioning processes (described in the Operations and Maintenance Plan), a post-construction inspection will be conducted by the FCM, DBM, PM, and selected discipline leads to check for proper system construction, hookup, and performance, as well as material and placement imperfections and identify those areas that require corrective action. The FCM and team will inspect for the following, including but not limited to:

- Proper system installation
- All hookups and functional components
- All controls and alarms, safety systems completed and functional.
- Proper commissioning and demonstration of operation for all pumping, meters, treatment components, electrical and instrumentation control systems (including proper training)
- Correctness of final grades and other dimensions
- Areas that have been disturbed or eroded by rainfall during construction or as a result of construction activities

- Damage to permanent structures in the vicinity of construction that may have resulted from construction activities
- Construction and adequacy of surface water and erosion control measures
- Surface restoration of disturbed areas

3.2 Sampling and Testing for CQC and CQA Activities

CQC and CQA testing, as required in the Contract Documents, will be performed for specified construction elements and will involve both field and laboratory testing activities. Field testing will be performed by the Subcontractor or by its specialty subcontractor (for example, liner supplier/installer), or by independent CQA testing performed by the Owner's representative. The Subcontractor will collect samples of the types, frequencies, and locations specified by Contract Documents and perform the specified tests. Quality control activities performed by the Subcontractor will primarily focus on liner systems, leak testing, and HDPE pipe welding. CQA verification testing will primarily be performed by Owner's independent Special Inspection testing firm. The drawings and specifications identify in detail these quality control tests and the parties responsible for sample collection, field (in-place) or laboratory testing, field observation and oversight, documentation, and review of test results. Additionally, Table A-1 (in Appendix A) summarizes each component of the project, required CQC/CQA, and manufacturer's source testing as well as the parties responsible for these tests. Jacobs is responsible to ensure required CQC/CQA testing is performed as required and to verify that the construction meets acceptance criteria.

3.3 Acceptance/Rejection Criteria

The criteria for acceptance or rejection of elements of work will be as stated in the Contract Documents. Regular checks will be made through field and laboratory testing to ensure that the Subcontractors' CQC/CQA procedures are sufficient.

Jacobs' FCM will notify the Subcontractor upon receipt of a failing CQA or CQC test result. A defective/rejected work notification will be issued if the deficiency in the test result is not acknowledged and corrected. Appendix B of this plan present the primary acceptance/rejection criteria for individual components of the work. These criteria, as well as other acceptance/rejection criteria, are described in the Contract Documents.

3.4 Corrective Measures

Corrective measures will be identified as necessary to bring the work to required quality standards and may include replacement of the work. When replacement of work is required, the area to be replaced will be defined and documented by the FCM, with input as appropriate by engineering discipline leads based on test results, visual analysis, and professional judgment. Acceptable corrective measures are detailed in Appendix B.

4. Project Meetings

Accurate and timely communication is required to avoid project-related conflicts and potential errors and omissions. The Owner, Jacobs, Subcontractors, and their respective employees and staff must have an established communication network. Establishing open lines of communication is essential for maintaining strong working relationships and producing quality work. The key elements of the communication plan for this project are listed in Table 4-1.

Table 4-1. Summary of Communications and Schedule

Type of Communication	Channel of Communication	Schedule
Communication with external stakeholders	Routine and as-needed call by Project Manager.	Weekly and as needed
Preconstruction meeting	Jacobs PM, Construction Manager, FCM, Owner, and Subcontractors should be present.	
Operational Readiness Review (ORR)	Meeting to discuss and review project team readiness and preparedness to begin construction. Complete prior to mobilization (conducted by Jacobs).	Prior to start
Daily Planning and Health & Safety meetings (Tailgate meeting)	Discussion of the work for that day and special equipment and hazard control measures or precautions that may be needed to execute the scheduled work in a safe manner.	Daily
Weekly progress meetings	Discussion of project activity progress and scope, schedule, budget status, change management, critical path items, and a 2-week look-ahead. Jacobs FCM, Owner, project personnel, and Subcontractors should be present.	Weekly, day TBD
Weekly Quality Control Meetings	Discussion and review of daily and weekly progress and team concurrence on weekly and project to-date quantities and change management conditions. This meeting facilitates efficient accrual reporting and invoicing. Attendees include Jacobs' FCM, Owner, project personnel, and Subcontractors.	Weekly, day TBD
Problem or work deficiency meetings	Special meetings may be held if problems or deficiencies are present or likely to occur. Participants are Jacobs' FCM, Owner, project personnel and Subcontractors, and any lower-tiered subcontractors involved in the problem or deficiency.	As needed

4.1 Owner Communications

The following communication guidelines should be adhered to throughout the project:

- The PM should be the primary contact with the Owner.
- In-person questions (if they occur) from the Owner, should be answered honestly and directly, but without speculation. If the answer is not known, tell the Owner that you do not know, will find the answer, and someone will respond quickly. Contact the PM immediately to update on conversation and unanswered questions.
- All stakeholder phone conversations must be documented. A copy of the phone memorandum should be routed to the PM, DBM, and any other project team members who could be affected.
- The PM will coordinate all formal Owner meetings.
- The PM must review all Owner correspondence before it is sent.

4.2 Internal Communications

The FCM or Field Team Leader (whichever is applicable) will communicate daily with the PM, and the PM will communicate with the Owner. Project issues will be communicated through the FCM, Field Team Leader, and PM. The project team will discuss and establish the project specific personnel and lines of communication at the kickoff meeting. The discussion will include the following:

- Communication procedures between the DBM, FCM, and other field staff
- Direct communication procedures between key parties for specific issues and situations
- Procedures and restrictions for secondary lines of communication within the project organization
- Procedures for information transfer and confirmation between the various parties
- Procedures for documentation of communications
- Format for meetings, reports, submittals, etc.
- Format for change(s) that may require quantification and management

Formal communication will be documented, and each party will receive a copy of such documentation (e.g., telephone memorandums, meeting notes). Copies will be routed to other parties if they should be aware of the situation (e.g., problem, change, or agreement).

Document control procedures will be established for items such as Subcontractor submittals, test results, and plan or specification revisions. All Subcontractor submittals will be entered into the Submittal Registers by the FCM/DBM or their designee upon receipt of the deliverable. At the time of entry, the PM or their designee will document who needs to perform a detailed review of the document and notify the appropriate team members. Team members will document the completion of their reviews by indicating the approval status (e.g., approved, revise/resubmit, or rejected) in the Register with the date the review was completed. These controls will include distribution and confirmation procedures to verify documents are appropriately dispatched and incorporated into the project. Whenever possible, documents indicating revisions in plans, specifications, or procedures will be distributed immediately and explained at routine or special project meetings.

5. References

Jacobs Engineering Group Inc. (Jacobs). 2019. *Remedial Design Work Plan, Kaiser Mead Groundwater Remediation Interim Action*. Prepared for Kaiser Mead Custodial Trust, Olympia, Washington. August.

Jacobs Engineering Group Inc. (Jacobs). 2020. *Kaiser Mead Groundwater Remediation Interim Action Final (100%) Design Report for Extraction, Treatment, and Discharge Systems*. Prepared for Kaiser Mead Custodial Trust, Olympia, Washington. April.

Appendix A
CQA/CQC Testing and Responsibility
Summary

Table A-1. KMCT Observation and Testing References^a

Section	Title	Paragraph	Implementation Responsibility		
			Jacobs	Subcontractor	Owner
01 31 13	Project Coordination	Page 1, Article 1.01 Page 3, Article 1.04	Primary	Secondary	
01 45 16.13	Subcontractor Quality Control	Page 3, Article 3.03 Page 8, Article 3.08 Page 9, Article 3.09	Verify	Primary	
01 45 33	Special Inspection, Observation, and Testing ^b	Page 3, Article 1.05	Verify	Secondary	Primary
01 64 00	Contractor- Furnished Products	Page 4, Article 3.02 Page 5, Article 3.03	Verify	Primary	
01 88 15	Anchorage and Bracing	Page 5, Article 1.06 Page 6, Article 3.02 Page 6, Article 3.03	Verify	Secondary	Primary
01 91 14	Equipment Testing and Facility Startup	All throughout	Verify	Primary	
03 30 10	Structural Reinforced Concrete	Page 9, Article 2.09 Page 13, Article 3.14	Verify	Secondary	Primary
09 90 00	Painting and Coating	Page 21, Article 3.10	Verify	Primary	
13 34 19	Metal Building Systems	Applicable Building Code: The 2015 International Building Code (IBC), as amended by the State of Washington and local agencies; refer to Drawing No. 000 – S – 001	Verify	Secondary	Primary
23 05 93	Testing, Adjusting, and Balancing for HVAC	Page 4, Article 3.03	Verify	Primary	
23 34 00	HVAC Fans	Page 11, Article 3.03	Verify	Primary	
26 08 00	Commissioning of Electrical systems	Page 4, Article 1.03 Page 5, Article 3.01	Verify	Primary	
26 20 00	Low-Voltage AC Induction Motors	Page 9, Article 2.17	Verify	Primary	
26 50 00	Lighting	Page 10, Article 3.05	Verify	Primary	
31 00 00	Earthwork	Page 15, Article 3.10	Verify	Primary (Other Earthworks)	Primary (Compaction)
33 05 13	Manholes	Page 7, Article 3.05	Verify	Primary	
33 47 13.01	Pond and Reservoir Liners HDPE Geomembrane	Page 7 Article 2.02 Page 9, Article 3.01 – 3.09	Verify	Primary	
33 47 13.07	Pond and Reservoir Liners Geosynthetic Clay	Page 5, Article 2.03 Page 8, Article 3.01 – 3.09	Verify	Primary	

40 27 00	Process Piping – General	Page 3, Articles 1.03 and 1.04 Page 7, Article 3.04 Page 8, Article 3.08 and 3.09 Page 9, Article 3.10 Page 10, Article 3.11	Verify	Primary	
40 90 00	Instrumentation and Control for Process Systems	Page 14, Article 1.05 Page 38, Article 3.03	Verify	Primary	

Notes:

^a Jacobs Subcontractors have primary responsibility for testing. Jacobs to verify accuracy and completeness.

^b Custodial Trust has primary responsibility for Special Inspections.

Appendix B
Observation and Acceptance/Rejection
Criteria

This appendix contains the observation and acceptance/rejection criteria for the Kaiser Mead Custodial Trust interim action groundwater remediation.

Earthwork

This section discusses the observation activities for general earthwork. As these tasks are not considered “specialized,” the discussion is brief. General earthwork activities for this project include, but are not limited to, the following activities:

- Clearing, Grubbing, and Stripping
- Asphalt Removal, Processing and Mixed Asphalt Fill
- Excavation
- Subgrade preparation
- Foundation Layer/Subgrade preparation for the liner system
- Compaction of embankment materials
- Construction of roadways and surfacing placement
- Imported material acceptance
- Construction of ditches
- Soil cover over liner

Observation Activities

The observation activities with respect to Earthwork include, but are not limited to, the following:

Clearing, Grubbing, and Stripping

- Verify clearing limits and staking.
- Observe clearing, removal, and proper disposal of trees, stumps, and roots.
- Observe topsoil removal and stockpiling; verify limits, location of stockpiles, and erosion protection of stockpiles are according to Subcontractor plans.

Asphalt Removal, Processing, and Mixed Asphalt Fill

- Verify limits of asphalt removal is consistent with drawings.
- Observe breakup and process the existing asphalt such that aggregated particles remain greater than 3 inches maximum dimension.
- Ensure that processed asphalt when mixed with Earthfill and used as Mixed Asphalt Fill given the materials are thoroughly mixed and the finished product contains no more than 25 percent asphalt (by weight), determined visually.

Excavation

- Verify excavation limits and utility locations.
- Ensure material excavated is stockpiled according to plans.
- Ensure all shoring sheeting, bracing, and sloping of excavations is consistent with design and Subcontractor plans.
- Ensure no excavations occurs within 5 feet of existing structures or newly completed structures without prior review by Engineer.
- Ensure excavations carried below grade lines are filled using the same fill material as specified and compact as required.

Subgrade Preparation

- Ensure that areas are free of soft surficial soils and proof-roll.
- Ensure that trash and foreign objects are removed before backfilling.
- Ensure that design grades are achieved in the field within the specified tolerances.
- Ensure that scarification and compaction (and moisture) requirements have been met.
- Ensure that surfaces are kept in a drained condition.
- Ensure the specification requirements for imported materials are met.
- Observe the type of equipment, number of passes, and moisture conditioning used in compaction and identify areas that have been poorly compacted or left uncompacted.
- Observe any visible material changes and check for the presence of hard soil clods and large stones.

Backfilling

- Ensure proper weather conditions (backfill and/or surface cannot be frozen) while placing fill.
- Ensure minimum 6 inches of fill beneath footings and structures prior to compaction.
- Ensure structural fill is no less than 8 inches thick prior to compaction.
- Ensure nonstructural fill is no less than 8 inches thick prior to compaction.
- Ensure equipment is not within 5 feet of walls of concrete structures without prior review by the Engineer.

Trench Backfill

- Ensure minimum width in trenches in which pipe is to be laid is 18 inches greater than outside diameter of pipe.
- Ensure that design grades are achieved in the field within the specified tolerances.
- Ensure backfill of the trench excavated below grade with pipe base material and compact to not less than 90 percent.
- Ensure proper health and safety conditions are met around trench.
- Ensure proper backfill and compaction over pipes.
- Ensure marking tape is placed at centerline for the length of the pipe.

Placing Geotextile and Soil cover

- Ensure geotextile separation between geocomposite liner and all other material.
- Ensure minimum of 2 feet overlap of geotextile at joints.
- Observe use of correct equipment to prevent puncture, tear, or displacement of geotextile and protect from damage.
- Ensure placement is done in accordance with plans and reference methods as indicated in Section 33 47 13.01B, Pond and Reservoir Liners HDPE and Section 33 47 13.07B Pond and Reservoir Liners Geosynthetic Clay.

Additional

- Ensure media are placed in accordance with submitted plan.
- Coordinate laboratory testing with a certified testing laboratory.
- Observe and document corrective measures.

Sampling and Testing

Sampling and testing frequencies for the prepared subgrade are detailed in Table B-1.

Acceptance/Rejection Criteria

Criteria for acceptance or rejection of prepared subgrade are described in the Contract Documents and in Table B-1. Corrective measures are described in Table B-2.

Table B-1. Sampling and Testing for Earthworks

Test	Method	Proposed Test Frequency	Acceptance Criteria/ Specification
Laboratory Compaction Testing	ASTM D1557	Minimum of two samples for each soil unit encountered.	Not applicable
Subgrade Testing	ASTM D6938	Beneath Structures: Minimum one test per every 10,000 square feet on every lift of subgrade, or one test per lift, whichever requires more tests. Wetland Berm Subgrades: Minimum one test per every 250 linear feet measured along berm centerline on every lift of subgrade, or one test per lift, whichever requires more tests.	Compact upper 12 inches to minimum of 95 percent of relative compaction as determined by ASTM D1557
Fill/Backfill	ASTM D1557	Embankment Fill: Minimum one test per every 250 linear feet measured along berm centerline each lift, or one test per lift, whichever requires more tests. Granular Fill and Earthfill: Minimum one test per every 10,000 square feet on every lift, or one test per lift, whichever requires more tests.	95 percent relative compaction as determined by ASTM D1557
Trench Backfill	ASTM D1557	Pipe Zone Fill and Pipe Bedding: One test for every 250 feet of backfill each lift; or one test per lift, whichever requires more tests. Earth Backfill above Pipe Zone: One test every 1,000 cubic yards.	95 percent relative compaction as determined by ASTM D1557

Subcontractor’s Responsibilities: Provide notification of materials onsite ready for testing; coordinate with materials testing subcontractor; issue results to DBM for review and approval.

DBM’s Responsibilities: Review certified test results and issue decision to the Subcontractor.

Table B-2. Corrective Measures for Earthworks

Condition	Corrective Measure
Slopes or elevations not as designed	Place additional soil to required grade, or remove, as applicable to conform to grades shown in Contract Document Drawings
Unsuitable subgrade	Subgrade will be corrected as appropriate based on condition causing issues. <i>See below for unsuitable condition corrective measures.</i>
Surface not adequate for placement of bottom liner system (holes, rocks, protrusions, etc.)	Remove and regrade to meet acceptability requirements and as specified in the Contract Documents
Soft, loose, or damaged areas	Recompact or remove unsuitable materials and replace as necessary
Moisture content too low	Sprinkle soil with water and mix uniformly prior to compacting
Moisture content too high	Aerate by rotovating, blading, discing, etc., prior to compacting
Areas below 95% relative compaction	Recompact as necessary
Depth of subgrade is less than 8 inches	Rebuild to achieve minimum thickness; add additional compaction effort to achieve full-depth compaction

Concrete

Refer to Specification Section 03 30 10, Structural Reinforced Concrete.

Observation Activities

The observation activities for concrete include, but are not limited to, the following:

- Ensure subgrade is prepared as specified.
- Verify rebar placement per shop drawings.
- Verify position of water stops, pipe and conduit sleeves, liner embedment are per drawings.
- Verify use of proper design mix.
- Observe testing of slump, air content, and making cylinders.
- Verify maintenance of specified curing techniques.
- Coordinating laboratory testing with a certified testing laboratory.
- Observing and documenting corrective measures.

Sampling and Testing

Sampling and testing frequencies for the prepared subgrade are detailed in Table B-3.

Acceptance/Rejection Criteria

Criteria for acceptance or rejection of prepared subgrade are described in the Contract Documents and in Tables B-3. Corrective measures are described in Table B-4.

Table B-3. Sampling and Testing for Concrete

Test	Method	Proposed Test Frequency	Acceptance Criteria/ Specification	Subcontractor's Responsibilities	DBM's Responsibilities
Slump Test	Field measurement	One per strength test	ASTM C143, C94	Notification of materials onsite ready for testing; coordination with materials testing sub; issue results to DBM for review and approval	Review certified test results and issue decision to the Subcontractor
Air Content	Field measurement	One per strength test	ASTM C231, C94	Notification of materials onsite ready for testing; coordination with materials testing sub; issue results to DBM for review and approval	Review certified test results and issue decision to the Subcontractor
Temperature	Field measurement	One per strength test	ASTM C1064	Notification of materials onsite ready for testing; coordination with materials testing sub; issue results to DBM for review and approval	Review certified test results and issue decision to the Subcontractor
Concrete Strength Test 28 day	Lab measurement	Collect three 6-inch-diameter cylinders per cement truck Break one specimen at 7 days, and two at 28 days <i>* When permitted 4-inch-diameter specimens are allowed</i>	Strength as listed in as ASTM C31/C31M and ASTM C39/C39M	Notification of materials onsite ready for testing; coordination with materials testing sub; issue results to DBM for review and approval	Review certified test results and issue decision to the Subcontractor

Table B-3. Sampling and Testing for Concrete

Test	Method	Proposed Test Frequency	Acceptance Criteria/ Specification	Subcontractor's Responsibilities	DBM's Responsibilities
Concrete Strength Test 56 days	Lab measurement	Collect five 6-in diameter cylinders per cement truck. Break one specimen at 7 days, and two at 28 days and 56 days <i>* when permitted 4-in diameter specimens are allowed</i>	Strength as listed in as ASTM C31/C31M and ASTM C39/C39M.	Notification of areas ready for testing; coordination with materials testing sub; issue results to DBM for review and approval	Review certified test results and issue decision to the Subcontractor
High Range Water Reducer (Superplasticizer) Admixture Segregation Test	Field measure				

Table B-4. Corrective Measures for Prepared Subgrade

Condition	Corrective Measure
7-day concrete strength test is less than 50 percent of specified 28-day strength	Extend period of moist curing by 7 additional days.

Geosynthetic Clay Liner and HDPE Geomembrane

Refer to Specification Section 33 47 13.01B, Pond and Reservoir Liners HDPE Geomembrane and Section 33 47 13.07B Pond and Reservoir Liners Geosynthetic Clay.

Observation Activities

During geomembrane and geosynthetic clay liner (GM/GCL) placement, responsibilities will include the following:

Prior to Placement

- Ensure that certificates have been received, and are acceptable, for each roll of material delivered to the site; rejecting any roll lacking proper numbering or certification.
- Ensure GCL test panel (no smaller than 25 square feet) is placed on similar foundation layer and either before or at same time as first GCL installation. Test panel will be visually inspected daily, and tested as necessary, to inform the time requirement for covering the liner materials.
- That the geomembrane and GCL rolls are stored and handled in a manner that preserves the integrity of the materials, and in accordance with manufacturers requirements.
- Ensure subgrade prepared as specified in Earthwork Section 31 00 00 Article 3.04 Subgrade Preparation, Paragraph E.
- Check that the installer has certified acceptance of the surface on which the GCL is to be placed.
- Ensure that environmental (weather and temperature) requirements are met.

Placement

- Ensure that panel deployment is following the approved panel layout plan.
- Ensure that GCL placement does not drag the panels over subgrade causing excessive combing or damage to the panel.
- Observe the geomembrane as it is deployed and record all panel defects and disposition of the defects (panel rejected, patch installed, extrudate placed over the defect).
- Ensure that a rub sheet is used during geomembrane panel deployment to prevent scuffing of the underlying GCL unless installer can demonstrate proper installation without damage to the underlying GCL.
- Ensure that equipment used does not damage the geomembrane or GCL, and is in accordance with manufacturer's recommendations.
- Ensure that the method used to deploy the sheet minimizes wrinkles and that the sheets are anchored to prevent movement by the wind.
- Ensure that geomembrane is temporarily anchored with sand bags.
- Marking the location of any defect requiring repairs and observing that all repairs are made in accordance with the project specifications.
- Ensure that minimum overlap dimensions for both GCL and geomembrane panels are provided prior to seaming panels.
- Verify boot manufacture fits pipe without excess material, folds, or wrinkles and is fitted, seamed, and tested in accordance with the plans and specifications, and in conformance with manufacturer's installation procedures.

Testing

- Ensure field seam testing for geomembrane are performed for all welds (both start-up checks and nondestructive and destructive production testing).
- Ensure that destruct samples are being collected by the installer at the prescribed frequency, and sent to a certified, independent testing laboratory for strength testing (shear and peel).
- Witness in-place moisture testing, if testing is necessary
- Note and record justification for reducing the frequency of destructive testing.

Additional

- Ensure that geomembrane anchorage is constructed as required by the project plans and specifications.
- Ensure that the geomembrane installer is maintaining accurate records of geomembrane placement and testing, including record drawings for liner installation as required per specifications.
- Ensure the geomembrane is covered with overlying materials within 10 calendar days or as otherwise defined by the results of the GCL test panel.
- Receive the completed Geomembrane Installer's Certification of Subsurface Acceptability for all lined areas.
- Ensure overlying material placement is completed in accordance with the specifications and the approved plan as referenced in 31 00 00 3.14 using equipment with limited maximum ground pressure and maintaining minimum thicknesses protecting the liner.

Sampling and Testing

Sampling and testing activities for the GM/GCL are detailed in Table B-5.

Acceptance/Rejection Criteria

Criteria for acceptance or rejection of GM/GCL material and installation are described in the Contract Documents and in Table B-6.

Table B-5. Sampling and Testing for GM/GCL

Test	Method	Proposed Test Frequency	Acceptance Criteria/ Specification	Subcontractor's Responsibilities	DBM's Responsibilities
GCL Roll Width	Field Measure	Random checks during delivery of materials	15 feet	Provide access to materials	Measure material dimensions in the field
GCL Roll Length	Field Measure	Random checks during delivery of materials	300 feet	Provide access to materials	Measure material dimensions in the field
GM Roll Width	Field Measure	Random checks during delivery of materials	23 feet	Provide access to materials	Measure material dimensions in the field
GM Roll Length	Field Measure	Random checks during delivery of materials	530 feet	Provide access to materials	Measure material dimensions in the field
Material Certs Cross-Check	Field Observe	Check each roll to make sure it is included in the lot and roll number provided in submittal	Listed on the approved lot and roll number cert list	Provide access to materials	Cross-check roll labels with bill of lading and material certs
Seam Testing					
Vacuum box test	ASTM D5641	Continuous, for all extrusion welds and any single wedge welded seams	All seams of this type, including all patches and cap strips; per specs and ASTM standard	Perform test	Witness and document test
Air channel pressure test	Not applicable	Continuous, for all double- wedge welded seams	27 psi for 5 minutes	Perform test	Witness and document test
High Voltage Spark Tests of Extrusion Welds		Minimum one Sample per 500 feet	No spark	Perform test	Witness and document test
Trial seams bonded seam strength in shear and peel adhesion tested by a field tensiometer	Field Tensiometer	One per welder per 4-hour work period; at least one per day	Shear: 2.0 lb/in-width/mil thickness, min. and FTB Peel: 1.2 lb/in-width/mil thickness, min. and FTB	Perform test	Witness and document test
Field CQA Testing (by Installer/Independent Testing Lab)					
Destructive bonded seam strength in shear and peel adhesion	ASTM D6392	Minimum of one sample per 40,000 square feet	Shear: 2.0 lb/in-width/mil thickness, min. and FTB Peel: 1.2 lb/in-width/mil thickness, min. and FTB	Cut destructive seam samples from completed work; perform peel and shear testing in the field; communicate results to DBM; provide destructive sample testing to independent lab for testing	Witness destructive sample collection and field testing; review lab results; and communicate results of review to Subcontractor.
Additional Sampling					

Table B-5. Sampling and Testing for GM/GCL

Test	Method	Proposed Test Frequency	Acceptance Criteria/ Specification	Subcontractor's Responsibilities	DBM's Responsibilities
In Place Moisture Content	ASTM D2216	Minimum of one sample per 40,000 square feet	Average moisture content should be 25 percent (as delivered to the site) and less than 50 percent during and after installation	Perform test	Witness and document test
Electrical Leak Detection Survey	ASTM D7007 and D7240	All liner surfaces, performed on bare liner after installation, and after initial lift placement	No leaks detected	Perform test	Witness and document test

Table B-6. Corrective Measures for GM/GCL

Condition	Corrective Measure
GM/GCL panel incorrectly positioned after unrolling (minor repositioning is acceptable)	If distance to reposition is likely to scuff GM/GCL, reroll panel and move, then unroll again.
Installed GM/GCL panels not seamed along geomembrane prior to precipitation	Pull back panel and inspect for moisture damage, replace damaged panels.
Edges of GM/GCL panel contaminated with dirt or debris prior to overlap	Verify that no stones or other debris migrates into GM/GCL overlap seams, fix/clean area as recommended by manufacturer.
Dislodging of Bentonite Coating	In areas where the bentonite coating has been scraped or dislodged, replace bentonite by supplementing with granular bentonite.
Material Wrinkles and Fishmouths	Wrinkles that cannot be pulled out manually should be (1) patched or (2) cut out and the area subsequently patched.
Equipment operated directly on GM/GCL panels	Verify equipment loads are acceptable. Inspect and replace GM/GCL panels if damaged.
Panel torn, damaged, or otherwise in noncompliance	Place patches with GM/GCL over the damaged area with the bentonite coating directly against the damaged area. Patches should extend a minimum 1 foot (300 millimeters) outward around the perimeter of the damage area and extrusion welded to the geomembrane.
Sheet tested or certified roll test results from manufacturer do not meet specification	Replace material.
Pinholes, scratches, or other flaws found in membrane	Repair area as specified in the Contract Documents or replace material as required.
Test sample fails trial seam test (start-up tests)	Have technician prepare another weld; welding of liner system not to commence until a passing test is obtained.
Seam fails nondestructive (air channel) test	Vacuum box as described in specs; make repairs as necessary.
Seam fails nondestructive (high voltage spark) test	Check for puncture or torn areas, make repairs as necessary.
Failed Moisture test	Allow bentonite portion to sun dry or mechanically dry to the proper moisture content. Take new samples 50 feet (15 meters) in either direction along the roll length. Remove and replace the entire 100-foot (30-meter) long-section of the roll between the new samples.
Electronic Leak Location Survey finds defect	Repair defect area per spec.

HDPE and Process Piping

Refer to Specification Sections 33 05 01.10, HDPE Pressure Pipe and Fittings; 40.27.00 Process Piping.

Observation Activities

During the installation of HDPE piping, responsibilities will include, but are not limited to, the following:

Prior to Installation

- Check that manufacturer certifications are received, and are acceptable, for the piping material delivered to the site.
- Ensure that piping is stacked per the manufacturers requirements, and not stacked excessively.
- Ensure piping to confirm that it is clean during installation.
- Ensure that piping is not abraded, nicked, or damaged in excess of the specification requirements during storage, handling, or construction.
- Ensure that holes in perforated pipe are of the specified size, drill pattern, and spacing, and that the perforations are clean and free of drilling residuals.
- Ensure that pipe diameters and wall thicknesses (Standard Dimension Ratio) are as specified for the specific applications.

Installation

- Ensure that pipe fusion machine facing knives provide smooth square butt ends that mate with no gaps in preparation for all butt fusion welds.
- Ensure that the fusion plate is at proper temperature prior to and during fusion and that no pressure is put on pipe during pipe softening and melting.
- Ensure that the welded bead is the proper size.
- Ensure that proper torques are applied to fasteners at flanged connections and that anti-seize lubricant is applied correctly.
- Ensure that piping fittings and appurtenances (valves, flow meters, camlock adapters, etc.) are installed per manufacturer's recommendations.
- Ensure that manufacturer's installation procedures are followed during installation of electro-fusion couplers (if required).
- Ensure that cleanouts are installed at the locations shown on the drawings.
- Ensure that manufacturer's minimum bending radius for pipes are followed.
- Witness pressure testing of solid wall pipe sections and verify that the installer follows procedures specified for pressure testing the pipe and noting pressures.

Hydrostatic Testing

- Witness HDPE pipeline hydrostatic testing, with test pressure being 150 percent of system operating pressure.
- Require notification 5 days in advanced of process piping pressure leakage testing.
- Witness hydrostatic test for pressure piping of 30 continuous minutes, including emptying and cleaning of pipe upon completion of test.
- Witness hydrostatic test for gravity piping, including both exfiltration and infiltration test.
- Ensure all tests results are recorded.

Additional

- Ensure that geomembrane is not damaged or stressed during installation of any piping.
- Ensure that there are uniform, minimum slopes for drainage, where required.
- Ensure that trenches backfilled according to specifications.
- Ensure the system startup of pumping and monitoring system and training for operating and maintaining the system.

Sampling and Testing

Sampling and testing activities for HDPE piping installation are detailed in Table B-7.

Acceptance/Rejection Criteria

Criteria for acceptance or rejection are specified in the Contract Documents, and in Table B-7. Corrective measures are listed in Table B-8.

Table B-7. Sampling and Testing for HDPE Piping

Test	Method	Proposed Test Frequency	Acceptance Criteria/ Specification	Subcontractor's Responsibilities	DBM's Responsibilities
Cleaning for piping	Visual	Prior to installation	Remove all cuttings, dirt, and debris	Conduct cleaning; notify Engineer before installation	Observe and confirm cleaning
Piping	Visual and measurement caliper	Before assembly and installation	Nicks, gouges, and cuts less than 10 percent of wall thickness are acceptable	Inspect	Observe and confirm inspection
Leak testing	Hydrostatic Testing	After each section of pipe is completed and after the entire system is installed	Per Contract Specifications	Supply calculations for test parameters; conduct test	Observe test and review results
Pipe slope	Visual and Survey	After each section of pipe is completed	Minimum slope requirements where applicable	Grade uniformly; survey control	Witness survey and/or measure with digital carpenter's level
Fastener torque	Visual Inspection	Spot check after demonstration by contractor of proper procedures	Manufacturer's requirements	Use torque wrench for fasteners	Witness torque wrench for readings
Pumping and Monitoring System Startup	Visual Inspection/ Witness of Facility Startup and Performance Demonstration	After system is installed and ready to place into service	All features of the pumping system and monitoring control system meet intended purpose, per specification	Provide a testing and startup representative(s)	Witness and confirm performance and startup activities
Training	Witness	Once as part of system coming online	Manufacturer's certification of compliance	Provide manufacturer representatives	Observe/witness training of Owner's personnel

Table B-8. Corrective Measures for HDPE Piping

Condition	Corrective Measure
Cuttings, dirt, grit or other foreign material emerges from end of pipe after cleaning	Continue cleaning until no material is seen to emerge from the pipe end
Damage to pipe exceeds specifications for any and all piping products	Ensure supplier replaces the damaged piece(s) or blends out and fills damaged section per manufacturer's written instructions
Pipe fails pressure test	Identify defective weld/pipe section and repair
Removal of nuts in stripped threads	Replace damaged fasteners and apply anti-seize compound
Inadequate pipe slope or sags in piping	Add additional soil material or regrade material under pipe and recompact
Pumping and monitoring system startup does not meet intended purpose or manufacturer's requirements	Replace/adjust system features to meet intended purpose

Manholes

Refer to Specification Sections 33 05 13, Manholes.

Observation Activities

During the installation of precast manholes and vaults, responsibilities will include, but are not limited to, the following:

Prior to Installation

- Check that delivered materials are acceptable and not damaged.
- Check that structural fill foundation has been properly placed and compacted.

Observation Activities

The observation activities for precast manholes and vaults include, but are not limited to, the following:

- Observe that sections to be joined are inspected and joints have been cleaned.
- Observe installation of gaskets in accordance with manufacturer's instructions and using primer furnished by manufacturer.
- Observe that first section is installed plumb and that completed manhole is rigid and watertight.

Testing

- Subject manholes to a hydrotest to confirm acceptable water tightness as detailed in Article 3.04 of Section 33 05 13.

Acceptance/Rejection Criteria

- Criteria for acceptance or rejection are specified in the Contract Documents (Article 3.04 of Section 33 05 13).

Painting and Coating

Refer to Specification Section 09 90 00, Painting and Coating.

Observation Activities

The observation activities for concrete include, but are not limited to, the following:

- Observe measuring of coating thickness specified in mils with a magnetic type, dry film thickness gauge, in accordance with SSPC PA 2. Check each coat for correct millage. Do not make measurement before a minimum of 8 hours after application of coating.
- Observe holiday detect coatings 20 mils thick or less, except zinc primer and galvanizing, with low-voltage wet sponge electrical holiday detector in accordance with NACE SP0188.
- Ensure proper color used for identification.
- Inspect surface and coating.

Acceptance/Rejection Criteria

After repaired and recoated areas have dried sufficiently, retest each repaired area.

Metal Building System

Refer to Specification Section 13 34 19, Metal Building System and Design Drawings Structural Statement of Special Instructions 1 and 2.

Observation Activities

The observation activities for concrete include, but are not limited to, the following:

- Work with Subcontractor to ensure all appropriate codes and laws are followed as referenced in design plans.
- Ensure materials below shallow foundations are adequate to achieve design bearing capacity.
- Ensure excavations are to proper depth and reached proper material.
- Ensure classification testing of compacted fill materials preformed.
- Verify use of proper materials, densities, and lift during compaction and fill.
- Ensure subgrade has been prepared properly.
- Ensure any change in material still meets prescribed code.
- Ensure building is erected in accordance with manufacturer's standards and instructions.
- Ensure all surfaces are free from damaged and painted according to design.

Acceptance/Rejection Criteria

Work with Subcontractor on all repairs.

HVAC

Refer to Division 23, Section 23 05 93, Testing and Adjusting and Balancing for HVAC; 23 07 00 HVAC Insulation; 23 31 13 Metal Ducts and Accessories; 23 34 00 HVAC Fans; 23 82 00 Terminal Heating and Cooling Units.

Observation Activities

The observation activities for HVAC include, but are not limited to, the following:

HVAC Testing

- Verify proper startup procedures have been completed on the system.
- Verify controls installation is complete and system is in stable operation under automatic control.
- Verify test instruments have been calibrated to a recognized standard and are within manufacturer's recommended calibration interval before beginning the Work.
- Witness measuring fan system performance in accordance with AMCA 203 and adjustments.
- Witness balancing log reports.
- Witness spot test if required to verify final results.

Additional

- Review factory tests on HVAC insulation.
- Ensure proper cleaning and startup procedures are followed.
- Ensure all functional test recommended by the manufacturer are performed.
- Witness HVAC insulation, metal ducts and accessories, fans are installed according to Specs and drawing.
- Observe and document corrective measures.

Acceptance/Rejection Criteria

Work with Subcontractor on all repairs.

Electrical

Refer to Division 26.

Observation Activities

The observation activities for HVAC include, but are not limited to, the following:

- Ensure proper cleaning and startup procedures are followed.
- Ensure functional and performance testing required by the design, or recommended by the manufacturer, are performed.
- Ensure electrical equipment/systems are installed and meet codes referenced in Drawings and Specs.
- Verify required documentation of installation and testing is received and complete.
- Observe and document corrective measures.

Acceptance/Rejection Criteria

Work with Subcontractor on all repairs.