

REQUEST FOR PROPOSALS



INSTALLATION OF MOORING
PILINGS, SITE PREPARATION,
UNLOADING, AND ASSEMBLY
FOR
THE CLEAR FORK OF THE
TRINITY RIVER AQUATIC TRASH
COLLECTOR SYSTEM

PROJECT: ENV 24-01: WATERWHEEL

DUE DATE: December 21, 2023

Submitted by:

Company Name

(print or type name of signatory)

Mailing Address

(signature)

City, State, Zip

Title

Telephone

Email



- **PROPOSAL ISSUE DATE:**
November 16, 2023
- **PROPOSAL ADVERTISEMENT DATES: STAR-TELEGRAM**
November 19, 2023
November 26, 2023
December 3, 2023
- **PRE-PROPOSAL CONFERENCE TIME, DATE, VIRTUAL LOCATION/INSTRUCTIONS:**
December 5, 2023 at 10:00 A.M. / 908 Monroe St – 7th Floor Conference Room
- **PROPOSAL DUE PRIOR TO:**
December 21, 2023 at 1:30 P.M.
- **TENTATIVE INTERVIEW DATES:**
January 10, 2024

Send Questions to:

Eric Mason
Environmental Senior Specialist, Land Quality Division of Environmental Services Department

EMAIL: eric.mason@fortworthtexas.gov

SOLICITATION/PROJECT NO: ENV 24-01: WATERWHEEL

HAND DELIVER ELECTRONIC COPIES TO:

City of Fort Worth Purchasing
Division, 200 Texas Street
Fort Worth, Texas 76102
1:30 P.M.

FORMAT: One original (1) electronic in PDF Format on USB.

Proposals will be accepted by: US Mail, Courier, FedEx or hand delivery at the address above;

Names of responsive firms will be opened publicly and read aloud at 2:00 PM Central Time in the City Council Chambers.

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1.0 REQUEST FOR PROPOSALS

1.1 PROJECT DESCRIPTION

Proposals are being accepted by the City of Fort Worth (City) for the furnishing of all labor, materials, services and equipment necessary for the installation of mooring pilings, site preparation, and the unloading, unpacking, and installation of one (1) “waterwheel” aquatic floatable trash interceptor/collector system located in the Clear Fork of the Trinity River. Refer to section 2.5 Scope of Work for a more detailed description. The engineer’s estimated costs for turn-key completion of this project is approximately \$614k.

*The usage of a “floatable barge” on the Trinity River to convey the necessary equipment to the worksite for the installation of any and all mooring pilings will be required per the current permit with the United States Army Corps of Engineers (USACE).

1.2 GENERAL REQUIREMENTS

Proposals (electronic copy on flash or thumb-drive) will be received at the **Purchasing Office**, City of Fort Worth, 200 Texas Street, Fort Worth, Texas 76102, until **1:30 p.m. Thursday, December 21, 2023** and will be opened and the proposer’s name will publicly read aloud approximately thirty minutes later in the Council Chambers.

The project name is **ENV 24-01: WATERWHEEL**

After evaluating the Proposals submitted, the City will select the Offeror that provides the Best Value to the City and enter into negotiations with that Offeror. The City may discuss with the selected Offeror options for a scope or time modification and any price change associated with such modification.

The offers will be valid for **one-hundred and twenty (120) calendar days**.

The Proposal Documents submitted in accordance with this Request for Proposal shall remain valid for one-hundred and twenty (120) days after the due date.

All Providers must comply with:

- Chapter 17, “Human Relations,” Article III, “Discrimination,” Division 3, “Employment Practices,” of the Code of the City of Fort Worth, prohibiting discrimination in employment practices.
- Fort Worth ordinance, 25-165-10-2021 Business Equity Ordinance.
- Chapter 2258 of the Texas Government Code, with respect to the payment of prevailing wage rates for public works contracts;
- The most recent revisions of applicable federal, state, and local laws, and the regulations established by the U.S. Environmental Protection Agency (EPA), the Texas Department of State Health Services (DSHS), the Occupational Health and Safety Administration (OSHA), the Texas Commission on Environmental Quality (TCEQ), the U.S. Department of Transportation (DOT), the Texas Department of Transportation (TXDOT), the City of Fort Worth, the Trinity River Authority of Texas, and any other entity that may have jurisdiction over work being performed.

Proposal documents, addenda, and specifications may be obtained from the City of Fort Worth Web site at <http://www.fortworthtexas.gov/purchasing/> in portable document format (PDF), or may be viewed at the

Environmental Quality Division office at 908 Monroe Street, 7th Floor, Fort Worth, Texas 76102, during normal business hours. Contact Eric Mason, at 817-392-8592 or email Eric.Mason@fortworthtexas.gov for assistance.

To ensure potential bidders are kept up to date of any new information pertinent to this project, all interested parties are requested to email **Expressions of Interest** in this procurement to the City Project Manager, Mr. Eric Mason. The email should include the company's name, contact person and that individual's email address and phone number. All Addenda will be distributed directly to those who have expressed an interest in the procurement and will also be posted in the City of Fort Worth's purchasing website at <http://fortworthtexas.gov/purchasing/>

1.3 PRE-PROPOSAL MEETING AND REGISTRATION OF INTENT

A pre-proposal meeting will be scheduled for:

Date: Tuesday, December 5, 2023

Time: 10:00 a.m.

Location: Environmental Services Department offices, located at 908 Monroe Street, 7th Floor Conference Room, Fort Worth, Texas 76102.

The pre-proposal conference will also be available simultaneously via web conference through Microsoft Teams. The web conference hyperlink is:

Microsoft Teams meeting

Join on your computer, mobile app or room device

[Click here to join the meeting](#)

Meeting ID: 299 673 137 815

Passcode: T6jLG4

The purpose of the meeting is to allow potential proposers to ask questions and request clarifications. The meeting is not mandatory, but is recommended.

1.4 INTERPRETATION OF RFP DOCUMENTS

All requests for an interpretation of the RFP must be made in writing and received by the Environmental Services Department, by fax or email (preferred), up until seven days prior to proposal opening. The person submitting the request will be responsible for its prompt delivery. No oral requests for interpretation will be answered.

Requests for interpretation of installation and construction activities must be submitted to:

Mr. Eric Mason, Senior Environmental Specialist
Environmental Services Department

eric.mason@fortworthtexas.gov

The City also will post addenda on its Purchasing website (<http://fortworthtexas.gov/purchasing/>). The City will not be responsible for any other explanations or interpretations.

1.5 CONFLICTS

Should there be conflicts between the proposal documents and the final executed contract document, the final contract shall take precedence.

1.6 HOW TO SUBMIT A PROPOSAL

Each Contractor must submit **one (1) electronic copy (PDF format on “flash” or “thumb-drive only”)** of their proposal to the City. All items to complete the submittal must be included within the proposal or the entire proposal may be considered non-responsive and rejected.

In case of ambiguity or lack of clarity, the City reserves the right to adopt the construction most advantageous to the City or to reject the proposal.

The project number must be clearly marked on the envelope and the statement **“PROPOSAL DOCUMENTS ENCLOSED, DELIVER TO PURCHASING DIVISION ONLY BEFORE 1:30 p.m. on Thursday, December 21, 2023”** placed in the lower left-hand corner of the envelope in which the documents are delivered. If the documents are placed in an envelope that is contained inside another envelope, the statement shall be placed on the outermost envelope.

Proposals must be submitted in a sealed envelope, addressed to the City of Fort Worth Purchasing Division, 200 Texas Street, Fort Worth, Texas 76102. **Proposals must be received by the Purchasing Division no later than 1:30 p.m. on Thursday, December 21, 2023.**

Late proposals will be returned. They will not be opened nor considered in the evaluation process. Proposals may be withdrawn at any time prior to the official opening.

NO FAXED OR PAPER PROPOSALS WILL BE ACCEPTED

The ideal contractor should have extensive experience in the installation of structures within a river, lake or coastal environment and succinctly convey this expertise in its proposal. Contractors are encouraged to keep their proposal brief and relevant to the specific work required. The proposal format is up to the proposer, but proposals must include the following items:

Work Proposal Required Content and Information

Cover Letter

Each proposal shall include a cover letter that includes the following:

- a. Any qualifying statements or comments regarding the contractor's proposal;
- b. The name, address, telephone number, and e-mail address of the contractor's contact person for the remainder of the selection process;
- c. Statement indicating the validity of the proposal for a minimum period of 120 calendar days subsequent to the proposal due date;
- d. The original signature of an individual with the authority to contractually bind the proposer and who may be contacted during the proposal evaluation period; and
- e. Acknowledgement of receipt of addendums, if any.

Statement of Qualifications

Each proposal shall include a statement of the contractor's qualifications that includes:

- a. A brief description of the contractor's company, including the year the company was established, the type of organization (partnership, corporation, etc.), and a listing of the proposed project personnel, including personnel experiences and resumes for ongoing response personnel. Emphasis should be given to highlighting work completed for comparable municipalities;
- b. A description of the contractor's experience with similar work, including names, current telephone numbers, and e-mail addresses of references for at least three existing and/or past clientele; and
- c. Copies of all appropriate certification forms and relevant licenses.
- d. Organizational Chart
- e. Project Timeline

Project Understanding and Approach

Each proposal shall include a statement detailing the contractor's understanding of, and planned approach to, the services contemplated in the Scope of Services section of this document. This statement shall include the following:

- a. A description of contractor's understanding of the Scope of Services and how contractor will approach work;

- b. A proposed staffing plan/organizational chart;
- c. Any other information that will assist the City in selecting the most qualified contractor.

1.7 SECURITY

BID SECURITY: Cashier's check or an acceptable bidder's bond payable to the City of Fort Worth, in an amount of five (5) percent of the bid submitted. The Bid Security must accompany the bid and is subject to forfeit in the event the successful bidder fails to execute the contract documents within ten (10) days after the contract has been awarded. The Bid Security shall be included in the envelope containing the bid proposal. Failure to submit the Bid Security will result in the proposal not being considered for this project. Bidder's bond will be returned if the City fails to award the contract within 120 calendar days of receipt of bids, unless the Bidder agrees to an extension. The surety must be licensed to do business in the state of Texas.

PAYMENT BOND AND PERFORMANCE BOND: For projects in excess of \$25,000, the successful bidder entering into a contract for the work will be required to give the City surety in a sum equal to the amount of the contract awarded. The form of the bond shall be as herein provided and the surety shall be acceptable to the City. All bonds furnished hereunder shall meet the requirements of Texas Government Code Section 2253, as amended.

In order for a surety to be acceptable to the City, the surety must:

- (1) hold a certificate of authority from the United States Secretary of the Treasury to qualify as a surety on obligations permitted or required under federal law; or
- (2) have obtained reinsurance for any liability in excess of \$100,000 from a reinsurer that is authorized and admitted as a reinsurer in the State of Texas and is the holder of a certificate of authority from the United States Secretary of the Treasury to qualify as a surety on obligations permitted or required under federal law. Satisfactory proof of any such reinsurance shall be provided to the City upon request. The City, in its sole discretion, will determine the adequacy of the proof required herein.

No sureties will be accepted by the City that are at the time in default or delinquent on any bonds or which are interested in any litigation against the City. Should any surety on the contract be determined unsatisfactory at any time by the City, notice will be given to the contractor to that effect and the contractor shall immediately provide a new surety satisfactory to the City.

If the total contract price is \$25,000 or less, payment to the contractor shall be made in one lump sum. Payment shall not be made for a period of 45 calendar days from the date the work has been completed and accepted by the City.

If the contract is in excess of \$25,000, a Payment Bond shall be executed, in the amount of the contract, solely for the protection of all claimants supplying labor and materials in the prosecution of the work.

If the contract amount is in excess of \$100,000, a Performance Bond shall also be provided, in the amount of the contract, conditioned on the faithful performance of the work in

accordance with the plans, specification, and contract documents. Said bond shall be solely for the protection of the City of Fort Worth.

1.8 OPENING OF PROPOSALS

The firm name for each proposal submitted will be read aloud at 2:00 p.m. on Thursday, December 21, 2023 in the Fort Worth City Council Chambers. All Proposals will be open for public inspection after project award, as provided by paragraph 1.9 below.

The Proposal Documents submitted in accordance with this RFP shall remain valid for **one-hundred and twenty (120) calendar days** after the due date.

1.9 TRADE SECRETS AND CONFIDENTIAL INFORMATION

All material submitted to the City becomes public property and is subject to the Texas Open Records Act upon receipt. However, the City will endeavor to protect from disclosure any information in the Proposals that is subject to the trade secrets exception of the Public Information Act under §552.110 of the Texas Government Code or the confidential information exception under §552.101 of the Texas Government Code. It is the responsibility of the Contractor to clearly mark as such any information they deem trade secret or confidential. The final decision as to what information must be disclosed, however, lies with the Texas Attorney General. Failure of a Contractor to identify trade secret and confidential information in its Proposal will result in all unmarked sections being deemed non-proprietary and available upon public request.

1.10 PROPOSAL EVALUATION CRITERIA

The City will not reimburse proposers for any expenses incurred in preparing and submitting a proposal, or for attendance at any interviews or meetings. If you should have questions regarding the RFP, please put them in writing by Thursday, December 14, 2023 and email to:

eric.mason@fortworthtexas.gov

Staff will respond directly to questions in writing but will issue, as quickly as possible, written addenda restating the question and providing the answer which will also be posted on the City's website. Other updates will also be posted on the website at <http://fortworthtexas.gov/purchasing/>. We suggest you check the website regularly for any addenda.

The City reserves the right to reject any or all submittals to this RFP if they do not meet the criteria and specifications outlined in this document or do not meet the best interests of the City.

Following receipt of the proposals, the Evaluation Committee members will review and score the submittals to determine which firm(s) are considered to be "responsive and qualified" to perform the solicited professional services.

If the Evaluation Committee finds more than one proposal to be satisfactory, an interview may be scheduled with the short-listed respondent(s). This interview may be conducted in-person or virtually on January 10, 2023 and will determine the top-ranked firm(s).

Short-listed firms invited to interview will receive a minimum of three (3) days' notice with the interview location, time and venue. Further inquiries should be directed to eric.mason@fortworthtexas.gov.

The City will award a contract to the proposer who provides services at the best value to the City. In determining the best value, the following criteria will be considered pursuant to Texas Local Government Code §252.043:

- a) Unit cost; this evaluation factor will be evaluated based on information provided in Sections 2.6, 2.7 and 2.8;
- b) reputation of the proposer and of the proposer's goods /services; this evaluation factor will be evaluated based on information provided in Sections 2.6, 2.7 and 2.8;
- c) quality of the proposer's goods or services;
- d) extent to which the goods or services meet the City's needs; this evaluation factor will be evaluated based on information provided in Sections 2.6, 2.7 and 2.8;
- e) proposer's past relationship with the City;
- f) impact on the ability of the City to comply with laws and rules relating to contracting with historically underutilized businesses and non-profit organizations employing persons with disabilities;
- g) project schedule and timeline (logistics); and
- h) total long-term cost to the City to acquire the bidder's goods or services.

The following is a summary of evaluation factors and the point value assigned to each. These weighted factors will be used in the evaluation of the individual proposals submitted. The City will select the most highly qualified provider responding to the request based on these criteria. The highest overall score will determine the City's first choice for the project award.

Factor	Points
1. Price	30
2. Contractor's Capabilities, Qualifications, Experience	25
3. Personnel's Capabilities, Qualifications, Experience	15
4. Subcontractor's Qualifications	15
5. Logistics & Deliverables	15
TOTAL	100

The City may conduct such investigations as deemed necessary to assist in the evaluation of any Proposals and to establish the responsibility, qualifications, and financial ability of the Provider, subcontractors, and other persons who are proposed to work on the project.

City Evaluation Process

- An Evaluation Committee consisting of representatives from various CITY departments and CITY consultants and partners may be appointed to review and evaluate RFP responses in accordance with this RFP. CITY reserves the right at its sole discretion to include additional representatives from other CITY departments and or other contractors.
- CITY reserves the right at its sole discretion to determine the process for proposal evaluation and may elect to accelerate and/or decelerate the evaluation process by combining, eliminating or expanding phases as it is deemed in the public interest to do so.
- The Evaluation Committee will review PROPOSER's references and criteria and may select PROPOSER candidates for onsite interviews.
- RFP responses that deviate substantially from the requirements of the RFP will be rejected.
- The CITY reserves the right to reject any or all proposals.
- Contract award will be by section or overall total whichever the CITY determines to be in the CITY's best interest.
- The CITY anticipates selecting PROPOSER that will be recommended to the CITY Council for award of a contract to provide the requested services to the CITY.

1.11 CONTRACT TIME

The successful Contractor will be awarded a standard contract relating to this particular project with an expected completion date of November 30, 2024 is anticipated.

1.12 NEGOTIATION OF THE CONTRACT

The City will meet with the successful Contractor and negotiate any final changes to the Contract and any exceptions identified in the Proposal Documents. The City is not obligated to accept any exceptions made by Contractor. After the negotiations, the City will make final changes to the Contract documents and issue the Contract Documents with Notice of Awards to the successful Contractor.

1.13 AWARD OF THE CONTRACT

The City will send a notice of award letter to the successful Provider. An electronic set of contract documents will be sent via secure email for execution by the successful provider. Upon receipt of the completed electronic contracts, the City will execute each set and issue each Provider with a letter entitled notice to proceed. This letter authorizes work to begin and invoices to be paid.

1.14 TAX EXEMPTION

The City of Fort Worth is exempt from federal excise and state sales tax; therefore, tax must not be included in this proposal.

1.15 RESERVATIONS

The City reserves the right to reject any or all Bids or Proposals and waive any or all formalities.

1.16 VENDOR COMPLIANCE TO STATE LAW

The 1985 Session of the Texas Legislature passed House Bill 620 relative to the award of contracts to non-resident bidders. This law provides that, in order to be awarded a contract as low bidder, non-resident bidders (out of state contractors whose corporate offices or principal place of business are outside of the State or Texas) bid projects for construction, improvements, supplies or services in Texas at an amount lower than the lowest Texas resident bidder by the same amount that a Texas resident bidder would be required to underbid a non-resident bidder in order to obtain a comparable contract in the State in which the non-resident’s principal place of business is located. The appropriate blanks in Section A must be filled out by all out-of-state or non-resident bidders in order for your bid to meet specifications. The failure of out-of-state or non-resident contractors to do so will automatically disqualify that bidder. Resident bidders must check the box in Section B.

A. Non-Resident vendors in _____ (give State), our principle place of business, are required to be _____ percent lower than resident bidders by State law. A copy of the Statute is attached.

Non-resident vendors in _____ (give State), our principle place of business, are not required to underbid resident bidders.

B. Our principle place of business or corporate office(s) is in the State of Texas.

Bidder:

Company Name

By: (Please Print)

Signature

Title (Please Print)

The failure of out of state or non-resident bidders to complete the forms may disqualify that bidder. Resident bidders must check the box in Section B.

1.17 CONTRACTOR’S RESPONSIBILITIES

Contractor is responsible for becoming familiar with the character, quality, quantity of work to be performed, materials and equipment required.

Contractor shall procure all permits and licenses, pay all charges, costs, and fees, and give all notices necessary and incident to the due and lawful prosecution of the work, unless otherwise specified in this Request for Proposals.

All costs associated with preparing a proposal in response to the solicitation shall be borne by the bidder.

The undersigned acknowledges the requirements of this section, and intends to comply with same in the execution of this project.

PROVIDER:

_____ BY: _____

Company Name (print or type name of signatory)

Address (Signature)

City, State, Zip Title (print or type)

Each provider including subcontractors shall NOT be listed on the Excluded Parties List System (www.epls.gov). Before proceeding on each project, the provider including subcontractors will have to certify they are NOT on the EPLS.

PROVIDER:

_____ BY: _____

Company Name

(print or type name of signatory)

Address

(Signature)

City, State, Zip

Title (print or type)

1.18 SUBCONTRACTORS

PROPOSERS may include subcontractors for any part of services offered. CITY reserves the right at its sole discretion to accept or reject any proposal that includes subcontractors. Upon award of a contract, CITY reserves the right to pre-approve use of any and all subcontractors.

1.19 BEST AND FINAL OFFER

The CITY at its sole discretion may elect to have PROPOSERS submitting proposals deemed most advantageous to the CITY may be requested to prepare a Best and Final Offer for consideration by the Evaluation Committee. Contract negotiations will then be based on submitted Best and Final Offers.

1.20 ERRORS AND OMISSIONS

The PROPOSER shall not be allowed to take advantage of any errors or omissions in this RFP. Where errors or omissions appear in this RFP, the PROPOSER shall promptly notify the CITY's Purchasing Division in writing of such error or omission it discovers. Any significant errors, omissions or inconsistencies in this RFP are to be reported no later than ten (10) days before time for the RFP response is to be submitted.

1.21 ASSIGNMENT

The PROPOSERS shall not assign its rights or duties under an award without the prior written consent of the CITY. Such consent shall not relieve the assignor of liability in the event of default by its assignee.

1.22 TERMINATION

If this award results in a contract, it shall remain in effect until contract expires, delivery and acceptance of products and/or performance of services ordered or terminated by the CITY or Contractor with a thirty (30) day written notice prior to cancellation. In the event of termination, the CITY reserves the right to award a contract to next lowest and best PROPOSER as it deems to be in the best interest of the CITY.

Further, the CITY may cancel this contract without expense to the CITY in the event that funds have not been appropriated for expenditures under this contract. The CITY will return any delivered but unpaid goods in normal condition to the PROPOSER or pay for the goods, at the CITY's sole direction.

1.23 TERMINATION, REMEDIES, AND CANCELLATION

Right to Assurance. Whenever the CITY has reason to question the PROPOSER's intent to perform, the CITY may demand that the PROPOSER(s) give written assurance of PROPOSER's intent to perform. In the event a demand is made, and no assurance is given within ten (10) calendar days, the CITY may treat this failure as an anticipatory repudiation of the contract.

1.24 CHANGE ORDERS

No oral statement of any person shall modify or otherwise change or affect the terms, conditions or specifications stated in the resulting contract. All change orders to the contract will be made in writing by the CITY's Environmental Services Department and signed by both parties. Change orders must be approved by CITY Council if dollar amount is over \$50,000.00.

1.25 VENUE

The agreement(s) will be governed and construed according to the laws of the State of Texas. The agreement(s) is (are) performable in Tarrant County, Texas. Venue shall lie exclusively in Tarrant County, Texas.

1.26 CONFLICT OF INTEREST

No public official shall have interest in this contract, in accordance with Vernon's Texas Codes Annotated, Local Government Code Title 5, Subtitled C., Chapter 171.

1.27 INSURANCE

For the duration of a contract resulting from this RFP, PROPOSER shall carry insurance in the types and amounts as specified in this RFP. Insurance coverage(s) required herein are intended to respond to occurrences which may arise from services and/or goods related to this proposal solicitation.

1.28 CONTRACT CONSTRAINTS AND CONDITIONS

All services shall be provided in accordance with applicable requirements and ordinances of the CITY, laws of the State of Texas, and applicable federal laws.

A fully executed contract shall be comprised of the following documents:

- I. Vendor Services Agreement
- II. This Request for Proposals, including all Attachments
- III. The Successful PROPOSERs written Proposal

1.29 INVOLVEMENT OF BUSINESS EQUITY DIVISION

- A. All proposers shall note that the Business Equity Ordinance No. 25165-10-2021 (replacing Ordinance No. 24534-11-2020, as codified in Chapter 20, Article X of the City's Code of Ordinances, as amended, and any relevant policy or guidance documents), was adopted to ensure the full and equitable participation of certified Minority – and Women-owned business enterprises (M/WBEs), (collectively, "Business Equity Firms") in City contracts for the procurement of goods and services where a contract's total dollar value is greater than \$100,000.00, as detailed below.
- The Business Equity Goal is **10%**.
- B. If a Proposer is certified as a Business Equity Firm, such Proposer can count its self-performance services towards meeting the Business Equity Goal(s) for the assigned NAICS commodity codes on their MBE or WBE certification. If such Proposer will not self-perform all of the work, it will be required to provide subcontracting opportunities with Business Equity Firms to meet the stated goal(s).
- C. Proposers **must** obtain a listing of certified Business Equity Firms from the City of Fort Worth's Department of Diversity and Inclusion (DVIN). The request for listings form can be found on the City's website at <https://www.fortworthtexas.gov/departments/diversity-inclusion/business-equity> or email DVIN_BEOffice@fortworthtexas.gov. The selected offeror acknowledges it will present Business Equity Firms currently certified by the North Central Texas Regional Certification Agency (NCTRCA) or Dallas/Fort Worth Minority Supplier Development Council (D/FW MSDC) and the Women's Business Council Southwest (WBCS) and accepted by the City of Fort Worth in order for the participation to be counted towards established goal(s).
- D. The firms must be located in the Marketplace, or meet the requirements of the City's Significant Business Presence which means a Person (1) which has its principal place of business located inside the Marketplace; (2) which has its principal place of business located outside the Marketplace but has been verified to be in existence for a minimum of 24 months and from which at least 20% of the business's workforce is based in the Marketplace; or (3) which has cumulative business receipts greater than \$1,000,000.00 for work done in the Marketplace since January 1, 2013.

- E. Proposers shall submit with their proposals a preliminary Business Equity Utilization Plan (“Plan”) to address how it will comply with the Business Equity Goal(s). At a minimum, the preliminary Plan must certify that the Proposer will comply with the requirements and present evidence of the Proposer’s past business diversity procurement practices. **Failure to submit a preliminary Plan may render a Proposer non-responsive and the Proposal may be rejected.**
- F. Business Equity Firms must be certified at the time the proposal is submitted, in order for the participation to be counted towards the established goal.
- G. Short-listed firms are required to submit the final Utilization Plan detailing efforts to comply with the Business Equity Goal(s). For additional information contact the DVIN at (817) 392-2674 or send email to DVIN_BEOffice@fortworthtexas.gov.

INSTRUCTIONS TO PROPOSERS ABOUT THE BUSINESS EQUITY GOAL

It is the policy of the City of Fort Worth to ensure the full and equitable utilization of Business Equity Firms when appropriate, in the procurement of all goods and services. When a Business Equity Goal is established for a proposal, it means that the City of Fort Worth believes that there are Business Equity Firms available that can provide goods or services requested by the proposal.

The Business Equity Goal for ENV 24-01: WATERWHEEL is 10%. This means that the City believes that there are available Business Equity Firms that can provide goods or services required by this proposal and therefore, **10% of** the Proposer’s awarded amount must be spent with a Business Equity Firm. All requirements and regulations stated in the City’s current Business Equity Ordinance #25165-10-2021 apply to this proposal.

Because a Business Equity Goal has been established for this proposal, in order for your proposal to be considered, a Proposer **must satisfy one (1) of the conditions below.**

A. Commit to Meet or Exceed the Business Equity Goal

Hire Business Equity Firm(s) to provide goods or services and spend at

Step 1: Obtain a listing of Business Equity Firms by completing the “Request for Listing of Certified Firms Form” located at the City of Fort Worth’s Business Equity Division website.

Step 2: Request proposals from Business Equity Firms to provide goods or services at least 10 calendar days before proposal opening.

Step 3: Submit the following two (2) forms:

- a. Utilization Plan
- b. Letter(s) of Intent

B. Prove a Good Faith Effort

Show attempt to hire Business Equity Firms to meet or exceed the goal, but was unsuccessful.

This can occur in two (2) ways:

1. Proposer proposes a smaller Goal

Step 1: Obtain a listing of Business Equity Firms by completing the “Request for Listing of Certified Firms Form” located at the City of Fort Worth’s Business Equity Division website.

Step 2: Request proposals from Business Equity Firms to provide goods or services at least 10 calendar days before proposal opening.

Step 3: Submit the following three (3) forms:

- a. Utilization Plan
- b. Letter(s) of Intent
- c. Good Faith Effort

2. Proposer proposes a 10% Goal

Step 1: Obtain a listing of Business Equity Firms by completing the “Request for Listing of Certified Firms Form” located at the City of Fort Worth’s Business Equity Division website.

Step 2: Request proposals from Business Equity Firms to provide goods or services at least 10 calendar days before proposal opening.

Step 3: If unsuccessful, submit Good Faith Effort Form. Please see

Ordinance §20- 370 (g) page for requirements of an acceptable Good Faith Effort.

C. Prove that the Proposer Can Perform the Service and Provide all Materials on the Project as the Prime Contractor

Proposer must show that the Proposer is providing all of the goods and services through their own company and that there are no goods or services provided by a third party or an affiliate. Proposer will not purchase any supplies or inventory from a third party.

Step 1: Must submit Prime Contract Waiver Form

D. Create a Joint Venture with a Business Equity Firm

At least one or both of the firms must be a Business Equity Firm.

Step 1: Must submit Joint Venture Form

VIOLATIONS AND SANCTIONS

1. Failure to comply with the City's Business Equity Ordinance will result in the proposal being considered "Non-Responsive."
2. Failure to submit the required Business Equity forms and documentation will result in the proposal being considered non-responsive and a "written warning" letter that may impact the Offeror's evaluation scoring on future City proposal opportunities for up to 12 months, refer to Ordinance §20-373 on VIOLATIONS AND SANCTIONS for continued offenses or failures to comply.

If you have any questions regarding Business Equity, contact Department of Diversity & Inclusion, Business Equity Division

Email: DVIN_BE@fortworthtexas.gov | Phone: 817-392-2674

1.30 CONTRACTOR'S RESPONSIBILITIES

Contractor is responsible for becoming familiar with the character, quality, quantity of work to be performed, materials

1.31 COOPERATIVE PURCHASING

Should other governmental entities decide to participate in this Contract, PROPOSERS shall indicate in their proposals whether they agree that all terms, conditions, specification, and pricing would apply.

If the successful PROPOSER agrees to extend the resulting Contract to other governmental entities, the following will apply: Governmental entities within utilizing Contracts with the CITY of Fort Worth will be eligible, but not obligated, to purchase material/services under this Contract(s) awarded as a result of this solicitation. All purchases by governmental entities other than the CITY of Fort Worth will be billed directly to that governmental entity and paid by that governmental entity. The CITY of Fort Worth will not be responsible for another governmental entity's debts. Each governmental entity will order its own material/services as needed.

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1.32 BILLING FOR SERVICES: PAYMENT

PROPOSER shall bill for services based on the Proposed Service Fees and Charges Schedule for actual services performed.

All payment terms shall be “Net 30 Days” unless specified in the proposal.

Progress billings are acceptable with Project Manager approval.

Service PROPOSER shall invoice no more frequently than monthly for services provided by sending all invoices electronically to our centralized Accounts Payable department invoice email address: supplierinvoices@fortworthtexas.gov. Please note, this email address is not monitored so please do not send correspondence to this email address. The sole purpose of the supplier invoices email address is to electronically receive supplier invoices.

Please include the following on the subject line of your e-mail: vendor name, invoice number, and PO number, separated by an underscore (ex: Example, Inc._123456_FW013-0000001234)

To ensure the system can successfully process your invoice in an expedient manner, please adhere to the following requirements:

- All invoices must be either a PDF or TIFF format.
- Image quality must be at least 300 DPI (dots per inch).
- Invoices must be sent as an attachment (i.e. no invoice in the body of the email).
- One invoice per attachment (includes PDFs). Multiple attachments per email is acceptable but each invoice must be a separate attachment.
- Note: All backup documentation to an invoice must be included in the same attachment as the actual invoice. Example: The invoice should be the page 1 and the backup documentation would be pages 2-10 in the same attachment. Do not send the backup documentation to an invoice as a separate attachment.
- Please do not send handwritten invoices or invoices that contain handwritten notes.
- Dot matrix invoice format is not accepted.
- The invoice must contain the following information:
 - Supplier Name and Address;
 - Remit to Supplier Name and Address, if different;
 - Applicable City Department business unit# (i.e. FW013)
 - Complete City of Fort Worth PO number (i.e. the PO number must contain all preceding zeros);
 - Invoice number;
 - Invoice date; and
- Invoices should be submitted after delivery of the goods or services.

******To prevent invoice processing delays, please do not send invoices by mail and email and please do not send the same invoice more than once by email to supplierinvoices@fortworthtexas.gov******

To check on the status of an invoice, please contact the City Department ordering the goods/services or the Central Accounts Payable Department by email at: ZZ_FIN_AccountsPayable@fortworthtexas.gov.

Successful PROPOSERS are encouraged to register for direct deposit Payments prior to providing goods and/or services using the forms posted on the CITY website at <http://www.fortworthtexas.gov/purchasing>.

1.33 CERTIFICATE OF INTERESTED PARTIES

The successful PROPOSER is required to complete online and notarize the Certificate of Interested Parties Form 1295 and the form must be submitted to the Purchasing contact listed in the solicitation before the purchase/contact will be presented to the CITY Council. The form may be completed at:

https://www.ethics.state.tx.us/whatsnew/elf_info_form1295.htm.

1.34 CHANGE IN COMPANY NAME OR OWNERSHIP

The Vendor shall notify the CITY's Purchasing Manager, in writing, of a company name, ownership, or address change for the purpose of maintaining updated CITY records. The president of the company or authorized official must sign the letter. A letter indicating changes in a company name or ownership must be accompanied with supporting legal documentation such as an updated W-9, documents filed with the state indicating such change, copy of the board of director's resolution approving the action, or an executed merger or acquisition agreement. Failure to do so may adversely impact future invoice payments.

1.35 PROPOSAL REQUIREMENTS/FORMAT

Proposals should adequately address all evaluation factors listed in Section 1.10 and include the following list of required items that will be used as part of the evaluation. Proposals should be prepared as simply as possible and provide a straightforward, concise description of the proposer's capabilities to satisfy the requirements of the RFP. Utmost attention should be given to accuracy, completeness, and clarity of content. All parts, pages, figures, or tables should be numbered and clearly labeled. Response information should be limited to pertinent information only. PROPOSER shall utilize the format below to submit their proposal. **PROPOSER'S proposal submission must include the following information, failure to provide all the information will deem the proposal non-responsive:**

- A completed and signed original Request for Proposals (RFP) Cover Sheet. The primary contact should be identified, together with both telephone and email contact information. The cover letter will not be included in the page count.
- Provide Firm's background, capabilities and experience of the project team members of the Firm who will actually be performing services described in this RFP. Outline high-level structure, history and ownership of the organization.
- Five (5) letters of reference, similar to the scope of services requested in this RFP.
- **Project Timeline describing major activities, deliveries, and milestones;**
- Organization chart with contact information for key personnel;
- Conflict of Interest Questionnaire, Attachment A;
- Any and all exceptions to the RFP must be listed on an item-by-item basis and cross-referenced. If there are no exceptions, the Firm must expressly state that no exceptions are taken.
- Any addendums sent out after the release of the proposal. Should there be any, the signed addendums will not be included in the page count.
- Scanned copy of all documents listed in Section 1.35 in a USB flash drive. Please note, only the items on the USB will be evaluated, therefore, all documents must be uploaded to the USB. The Bidder's Bond shall be the only document included in the Proposal Package that is not required to be within the electronic version submitted on the USB.

2.0 PROPOSAL DOCUMENTS

All Proposal Documents, including this checklist, must be completed in full and submitted in a sealed envelope, in the requested order, to be considered a responsive submittal.

2.1 PROPOSAL DOCUMENT CHECKLIST

All Proposal Documents, including this Checklist, must be completed in full and submitted in a sealed envelope, in the requested order, or the Proposal Package may be considered as a non-responsive submittal.

<u>Proposal Documents</u>	<u>Initial if Included</u>
1. PROPOSAL DOCUMENT CHECK LIST	_____
2. ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA	_____
3. MINORITY BUSINESS ENTERPRISES (MBE)	_____
4. PROPOSAL SUMMARY	_____
5. PROPOSAL OF PROVIDER	_____
6. LIST OF SUBCONTRACTORS	_____
7. INSURANCE CERTIFICATES	_____
8. LICENSES & CERTIFICATES	_____
9. LEGAL & COMPLIANCE HISTORY	_____
10. PERFORMANCE AND PAYMENT BONDS	_____
11. BID SECURITY	_____
12. PREVAILING WAGE RATE	_____
13. COMPLIANCE & WORKERS COMPENSATION	_____
14. STATEMENT OF RESIDENCY	_____
15. STATEMENT OF NONDISCRIMINATION	_____

I understand that all of these items will be reviewed, and any items not included may result in my proposal being considered non-responsive.

2.2 ACKNOWLEDGEMENT OF RECEIPT OF ADDENDA

Check if applicable _____

The undersigned acknowledges the receipt of the following addendum (a) to the Request for Proposal, and has attached all addenda following this page. (Add lines if necessary).

___ Addendum Number 1 _____
(Date received)

___ Addendum Number 2 _____
(Date received)

___ Addendum Number 3 _____
(Date received)

___ Addendum Number 4 _____
(Date received)

Check if applicable _____

The undersigned acknowledges the receipt of no addenda to the Request for Proposal.

PROVIDER:

Company Name

BY: _____
(print or type name of signatory)

Address

(Signature)

City, State, Zip

Title (print or type)

2.3 Business Equity Ordinance 25165-10-2021

Business Equity Division Provisions:

All Offerors shall note that it is the policy of the City of Fort Worth to ensure the full and equitable participation with the Business Equity Program in the procurement of goods and services. If the total dollar value of the contract is greater than \$100,000, then a Business Equity subcontracting goal may be applicable.

The undersigned acknowledges the City's Business Equity requirements has been established at 10% for this contract.

PROVIDER:

_____ BY: _____

Company Name (print or type name of signatory)

Address (Signature)

City, State, Zip Title (print or type)

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2.4 PROPOSAL SUMMARY

TO THE CITY OF FORT WORTH:

The undersigned hereby proposes to furnish the equipment, labor, materials, superintendence, and any other items or services necessary to perform the installation of mooring pilings, site preparation, and the installation of one "Waterwheel", aquatic floatable trash interceptor, in the Clear Fork of the Trinity River, Fort Worth, Tarrant County, Texas.

Contractor equipment and personnel are capable of performing each type of procedure listed in the scope of work (Section 2.5) either with in house resources or through subcontracts.

All Proposal Documents have been submitted in a sealed envelope.

Unit prices are provided within the Proposal Documents in Section 2.6.

Contractor shall begin work after coordination with City's respective Project Manager.

This Proposal Summary and the accompanying Proposal Documents are intended to be complete and will remain valid for one-hundred and twenty (120) days from the date of submittal.

PROVIDER:

(Company Name)

BY: _____
(print or type name of signatory)

(Address)

(Signature)

(City, State, Zip)

Title (print or type)

Phone)

(Email)

2.5 SCOPE OF WORK

Proposals are being accepted by the City of Fort Worth (City) for the furnishing of all labor, materials, services, and equipment necessary for the installation of mooring pilings, site preparation, and unloading, unpackaging, and installation of (1) “waterwheel” aquatic floatable trash collector system located in the Clear Fork of the Trinity River.

The successful vendor will be expected to coordinate delivery, construction activities, and support services with the manufacturer of the waterwheel, Clearwater Mills LLC, in order for the project to be completed within the timeframe projected. The City of Fort Worth is purchasing the waterwheel directly from Clearwater Mills LLC and this contract requires the successful vendor to coordinate with Clearwater Mills LLC in unloading, unpackaging, and assembling the waterwheel on site prior to final installation in the Clear Fork of the Trinity River. The engineer’s estimated costs for turn-key completion of this project is approximately \$614k.

Contact information for coordination of support activities with Clearwater Mills LLC is as follows:

Mr. John Kellett, President, Clearwater Mills, LLC
 4965 Mountain Road
 Pasadena, Maryland 21122
 (410) 952-6370
kellett.clearwatermills@gmail.com
www.clearwatermills.com

Bid Item No.	Bid Description
1	Install Waterwheel Trash Interceptor (provided by Clearwater Mills) and connection to mooring piles, tether foundation, and floating booms.
2	Install approximately 200’ of floating booms (provided by Clearwater Mills)
3	Supply and install Four (4) Helical Piles to secure floating booms
4	Supply and install three (3) Mooring Pilings to secure Waterwheel
5	Supply and install tether foundation and cables to Waterwheel System
6	Site Clearing
7	Sodding
8	Unclassified Excavation
9	Supply, install and maintain sediment controls including Turbidity Curtains
10	Supply and Install Waterway Safety Signage and Markers*
11	Crane service and rigging required to offload Waterwheel components from Clearwater Mills delivery vehicles onto TRWD staging area (riverbank) near shoreline. Crane capacity - Pontoons estimated weight is 25,000#/each.
12	Supply and install Waterwheel Promotional Signage on Unit Itself. Attached to Waterwheel.

The general shipping and assembly plan for Waterwheel Aquatic Trash Interceptor, according to Clearwater Mills, is as follows:

1. A crane will be required to provide offloading of barges, pontoons, conveyors, and other equipment from trucks to the river based on site access and distance to the river's edge;
2. The floating barge and dumpster barge (aggregate weight of approximately 20,000 #) will be delivered via tractor/trailer from Kentucky;
3. Offloading the floating barge and dumpster barge directly from the delivery vehicles into the river is ideal;
4. Other components will be delivered from Maryland in a 52' storage container (approximately 25,000 #);
5. Components are assembled after the floating platform is in the water;
6. Approximate assembly time is three (3) to four (4) weeks;
7. Solar panels and fabric cover delivered to site with Clearwater Mills crew;

The City expects all contractors submitting proposals to fully understand and comprehend applicable current laws, regulations, and standards and have a means to stay abreast of upcoming proposed and final changes to any applicable laws, regulations, or standards. All contractors submitting proposals shall perform work in accordance with Industry Standards and all applicable federal, state, and local requirements, laws, regulations, etc. Provider shall procure all permits and licenses, pay all charges, costs, and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

Failure to bid on any single item or procedure may be considered grounds for rejection of the proposal unless an alternative is clearly provided. In case of ambiguity or lack of clarity in the prices stated in the proposal, the City reserves the right to adopt the most advantageous construction thereof or to reject the proposal.

* Note:

1. The USACE Federal 404 Permit has been approved for this project;
2. The City of Fort Worth, Corridor Development Certificate (CDC), has been granted by the Floodplain Administrator; and
3. The City of Fort Worth, Floodplain Development Permit (file number FDP-21-00290) has been issued for the project.

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2.6 PRICE

Waterwheel Aquatic Trash Interceptor Bidder's Form

Bid Item No.	Bid Description	UO M	Bid Quantity	Bid Value (\$)	Engineer's Estimated Costs (\$)	Specification Section No.
1	Install Waterwheel Trash Interceptor	EA	1		78,000	Drawings
2	Install approximately 200' of floating booms provided by Clearwater Mills.	EA	1		9,500	Drawings
3	Supply and Install Helical Piles	EA	4		32,000	Drawings
4	Supply and Install Mooring Piles	EA	3		375,000	Drawings
5	Supply and Install Tether Foundation and Cables	EA	2		64,000	Drawings
6	Site Clearing	LS	1		5,000	Section 31 10 00
7	Sodding	SY	200		3,500	Section 32 92 13
8	Unclassified Excavation	CY	250		20,000	Section 31 23 16 & Drawings
9	Supply, Install and Maintain sediment controls including turbidity curtains	EA	1		15,000	Section 31 25 00 & Drawings
10	Supply and Install waterway safety signage and markers	EA	1		1,750	Section 01 58 13 & Drawings
11	Supply and Install promotional graphics on Waterwheel	EA	1	10,000	10,000	
12	TOTAL				613,750	

2.7 CONTRACTOR INFORMATION AND QUALIFICATIONS

Bidder shall submit the following items to demonstrate their qualifications and capabilities to fulfill and abide by the requirements listed herein. The documents listed below shall be included in this proposal submittal, in the same order and numbered as listed, following this page, bound within the response.

Failure to submit any of the following information may result in the proposal document being considered non-responsive.

2.7.1 Contractor Information

Provide **company information** including company name, address, telephone number(s), email address and FAX number(s) for the local office as well as the headquarters.

2.7.2 Contractor Qualifications

Provide a concise (12-page maximum) description of the company's qualifications to perform the required services as described in this RFP.

2.7.3. Personnel Qualifications

Provide a concise (1-page maximum) description for each strategic employee and of their individual qualifications to perform the required services as described in this RFP.

2.7.4 Web-based Customer Service

Explain any web-based customer service system that may be available reports, notifications, and invoices.

2.7.5 Company Licenses and Certifications

Provider shall procure all permits and licenses, pay all charges, costs, and, and give all notices necessary and incident to the due and lawful prosecution of the work. Provider should include copies of appropriate company licenses, certifications, and registrations and provide copies of individual licenses and certificates applicable to this project upon request from the City.

2.7.6 Documentation Examples

Include examples of the following document types:

- Final Closeout Report
- Invoices
- Warranty Information
- Operating Instructions
- Organization Chart

2.7.7 Project Timeline – Chronological Overview

- Tasks
- Activities
- Benchmarks/Milestones
- Dates
- Dependencies
- Durations

2.7.8 References

Bidder shall provide at least five **project references** similar in scope and size to that of this solicitation. Each project reference shall include the following information:

- Company's Name
- Name and Title of Contact
- Email, Phone, and Address of Contact
- Contract/Project Value
- Contract Date
- Brief Description of Service Provided

**INCLUDE ALL INFORMATION/DOCUMENTATION REQUIRED IN SECTION 2.7 FOLLOWING
THIS PAGE BOUND WITHIN THE PROPOSAL SUBMITTAL**

Remainder of page intentionally left blank

2.8 SUBCONTRACTOR

For each subcontractor to be used for services under this contract, provide the information requested in the Table 2.8.1 and 2.8.2 and include qualifications and capabilities (as detailed in Section 2.7 of this solicitation) pertinent to the services to be provided under the contract. Include a brief description of tasks that will be performed by the subcontractor.

Table 2.8.1: Subcontractor Information

Providers shall complete the following information and submit it with the Qualifications Documents to permit the City of Fort Worth to more fully evaluate the submittal's quality prior to awarding the contract.

Subcontractor's Name	Subcontractor's Address	Subcontractor's Telephone No.	Proposed Tasks on the Project

IF NECESSARY, PROVIDE MORE SHEETS TO DESCRIBE ADDITIONAL SUBCONTRACTORS.

INCLUDE A COPY OF THE SUBCONTRACTOR QUALIFICATIONS FOLLOWING THIS PAGE BOUND WITHIN THE PROPOSAL PACKAGE

2.9 BONDS

2.9.1 Bidder's Bond

Bid bond or "surety" in the amount of five percent (5%) of the maximum bid price shall be included with this bid package may be payable to the City of Fort Worth, Tarrant County, Texas.

2.9.2 Payment and Performance Bonds

Before beginning the work, the Contractor may be required to execute to the City of Fort Worth, a **payment bond** if the contract individual project is in excess of \$25,000, and a **performance bond** if the contract individual project is in excess of \$100,000. The payment bond is solely for the protection and use of payment bond beneficiaries who have a direct contractual relationship with the Contractor or subcontractor to supply labor or material; and in 100% the amount of the Contract. The performance bond is solely for the protection of the City of Fort Worth; in 100% the amount of the Contract; and conditioned on the faithful performance by Contractor of the work in accordance with the plans, specifications, and contract documents. Contractor must provide the payment and performance bonds, in the amounts and on the conditions required, within 14 calendar days after Notice of Award.

2.9.3 Requirements for Sureties

The bonds shall be issued by a corporate surety duly authorized and permitted to do business in the State of Texas that is of sufficient financial strength and solvency to the satisfaction of the City. The surety must meet all requirements of Article 7.19-1 of the Texas Insurance Code. All bonds furnished hereunder shall meet the requirements of Chapter 2253 of the Texas Government Code, as amended.

In addition, the surety must (1) hold a certificate of authority from the United States Secretary of the Treasury to qualify as a surety on obligations permitted or required under federal law; or (2) have obtained reinsurance for any liability in excess of \$100,000 from a reinsurer that is authorized and admitted as a reinsurer in the state of Texas and is the holder of a certificate of authority from the United States Secretary of the Treasury to qualify as a surety on obligations permitted or required under federal law. Satisfactory proof of any such reinsurance shall be provided to the City upon request. The City, in its sole discretion, will determine the adequacy of the proof required herein.

No sureties will be accepted by the City that are at the time in default or delinquent on any bonds or which are interested in any litigation against the City. Should any surety on the Contract be determined unsatisfactory at any time by the City, notice will be given to the Contractor to that effect and the Contractor shall immediately provide a new surety satisfactory to the City.

PERFORMANCE BOND

THE STATE OF TEXAS §
 § **KNOW ALL BY THESE PRESENTS:**
COUNTY OF TARRANT §

That we, _____, known as
“Principal” herein and _____, a corporate
surety(sureties, if more than one) duly authorized to do business in the State of Texas, known as
“Surety” herein (whether one or more), are held and firmly bound unto the City of Fort Worth, a
municipal corporation created pursuant to the laws of Texas, known as “City” herein, in the penal
sum of, _____ Dollars
(\$ _____), lawful money of the United States, to be paid in Fort Worth,
Tarrant County, Texas for the payment of which sum well and truly to be made, we bind
ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally,
firmly by these presents.

WHEREAS, the Principal has entered into a certain written contract with the City
awarded the ____ day of _____, 20____, which Contract is hereby referred to and
made a part hereof for all purposes as if fully set forth herein, to furnish all materials, equipment
labor and other accessories defined by law, in the prosecution of the Work, including any Change
Orders, as provided for in said Contract designated as Trinity River Waterwheel Initiative,
ENV23-01; Waterwheel.

NOW, THEREFORE, the condition of this obligation is such that if the said Principal
shall faithfully perform it obligations under the Contract and shall in all respects duly and
faithfully perform the Work, including Change Orders, under the Contract, according to the plans,
specifications, and contract documents therein referred to, and as well during any period of
extension of the Contract that may be granted on the part of the City, then this obligation shall be
and become null and void, otherwise to remain in full force and effect.

PROVIDED FURTHER, that if any legal action be filed on this Bond, venue shall lie in
Tarrant County, Texas or the United States District Court for the Northern District of Texas, Fort
Worth Division.

This bond is made and executed in compliance with the provisions of Chapter 2253 of the
Texas Government Code, as amended, and all liabilities on this bond shall be determined in

accordance with the provisions of said statute.

IN WITNESS WHEREOF, the Principal and the Surety have SIGNED and SEALED this instrument by duly authorized agents and officers on this the _____ day of _____, 20____.

PRINCIPAL:

By: _____

Signature

ATTEST:

Witness as to Principal:

Name and Title

Address: _____

SURETY: _____

BY: _____

Signature

Name and Title

Address: _____

Witness to Surety: _____

Telephone: _____

*Note: If signed by an officer of the Surety Company, there must be on file a certified extract from the by-laws showing that this person has authority to sign such obligation. If Surety's physical address is different from its mailing address, both must be provided. The date of the bond shall not be prior to the date the Contract is awarded.

PAYMENT BOND

THE STATE OF TEXAS §
 § **KNOW ALL BY THESE PRESENTS:**
COUNTY OF TARRANT §

That we, _____, known as
“Principal” herein, and _____, a
corporate surety (sureties), duly authorized to do business in the State of Texas, known as
“Surety” herein (whether one or more), are held and firmly bound unto the City of Fort Worth, a
municipal corporation created pursuant to the laws of the State of Texas, known as “City” herein,
in the penal sum of _____ Dollars
(\$_____), lawful money of the United States, to be paid in Fort Worth,
Tarrant County, Texas, for the payment of which sum well and truly be made, we bind ourselves,
our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these
presents:

WHEREAS, Principal has entered into a certain written Contract with City, awarded the
____ day of _____, 20____, which Contract is hereby referred to and

made a part hereof for all purposes as if fully set forth herein, to furnish all materials, equipment,
labor and other accessories as defined by law, in the prosecution of the Work as provided for in
said Contract and designated as Trinity River Waterwheel Initiative, ENV22-07; Waterwheel.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that if
Principal shall pay all monies owing to any (and all) payment bond beneficiary (as defined in
Chapter 2253 of the Texas Government Code, as amended) in the prosecution of the Work under
the Contract, then this obligation shall be and become null and void; otherwise to remain in full
force and effect.

This bond is made and executed in compliance with the provisions of Chapter 2253 of the
Texas Government Code, as amended, and all liabilities on this bond shall be determined in
accordance with the provisions of said statute.

IN WITNESS WHEREOF, the Principal and Surety have each SIGNED and SEALED this instrument by duly authorized agents and officers on this the _____ day of _____, 20____.

PRINCIPAL:

By: _____

Signature

ATTEST:

Witness as to Principal:

Name and Title

Address: _____

SURETY: _____

BY: _____

Signature

Name and Title

Address: _____

Witness to Surety: _____

Telephone: _____

***Note:** If signed by an officer of the Surety Company, there must be on file a certified extract from the by-laws showing that this person has authority to sign such obligation. If Surety's physical address is different from its mailing address, both must be provided. The date of the bond shall not be prior to the date the Contract is awarded.

2.10 INSURANCE

FOR PURPOSES OF THIS REQUEST FOR PROPOSAL, PLEASE ATTACH A COPY OF YOUR CURRENT INSURANCE CERTIFICATE(S) FOLLOWING THIS SECTION AND INCLUDED WITHIN THE PROPOSAL PACKAGE.

The successful Provider will be required by the contract to have insurance coverage as detailed below. Prior to commencing work, the Provider shall deliver to Fort Worth certificates documenting this coverage. The City may elect to have the Provider submit its entire policy for inspection.

Insurance coverage and limits:

Provider shall provide to the City certificate(s) of insurance documenting policies of the following coverage at minimum limits that are to be in effect prior to commencement of work on the contract:

1. **Commercial General Liability**

- **\$1,000,000 each occurrence**
- **\$2,000,000 aggregate**

2. **Automobile Liability**

- **\$1,000,000 each accident, or**
- **\$250,000 property damage / \$500,000 bodily injury per person per accident**

A commercial business auto policy shall provide coverage on “any auto,” defined as autos owned, hired and non-owned during the course of this project.

3. **Worker's Compensation**

- **Coverage A: statutory limits**
- **Coverage B: \$100,000 each accident
\$500,000 disease - policy limit
\$100,000 disease - each employee**

Waiver of Subrogation required.

4. **Professional Liability**

- **\$1,000,000 each occurrence**
- **\$2,000,000 aggregate**

Professional Liability Insurance shall be written on a project specific basis. The retroactive date shall be coincident with or prior to the date of this contract and the certificate of insurance shall state that the coverage is claims-made and the retroactive date. The insurance coverage shall be maintained for the duration of this contract and for five (5) years following completion of the contract (Tail Coverage). An annual certificate of insurance shall be submitted to the City for each year following completion of this contract.

5. **Environmental Impairment Liability and/or Pollution Liability**

- **\$4,000,000 per occurrence.**

EIL coverage(s) must be included in policies listed in items 1 and 4 above; or, such insurance shall be provided under a separate policy or policies. Liability for damage occurring while loading, unloading and

transporting materials collected under the contract project shall be included under the Automobile Liability insurance or other policy(s).

Certificates of insurance evidencing that the Provider has obtained all required insurance shall be delivered to the City prior to Provider proceeding with the contract.

1. Applicable policies shall be endorsed to name the City an Additional Insured thereon, as its interests may appear. The term City shall include its employees, officers, officials, agents, and volunteers as respects the contracted services.
2. Certificate(s) of insurance shall document that insurance coverage specified according to items in section (a) above are provided under applicable policies documented thereon.
3. Any failure on part of the City to request required insurance documentation shall not constitute a waiver of the insurance requirements.
4. A minimum of thirty (30) days' notice of cancellation or material change in coverage shall be provided to the City. A ten (10) days' notice shall be acceptable in the event of non-payment of premium. Such terms shall be endorsed onto Provider's insurance policies. Notice shall be sent to Eric Mason, City of Fort Worth – Environmental Services Department, 200 Texas Street, Fort Worth, Texas 76102.
5. Insurers for all policies must be authorized to do business in the state of Texas or be otherwise approved by the City; and, such insurers shall be acceptable to the City in terms of their financial strength and solvency.
6. Deductible limits, or self-insured retentions, affecting insurance required herein shall be acceptable to the City in its sole discretion; and, in lieu of traditional insurance, any alternative coverage maintained through insurance pools or risk retention groups must be also approved. Dedicated financial resources or letters of credit may also be acceptable to the City.
7. **Applicable policies shall each be endorsed with a waiver of subrogation in favor of the City as respects the contract.**
8. The City shall be entitled, upon its request and without incurring expense, to review the Provider's insurance policies including endorsements thereto and, at the City's discretion, the Provider may be required to provide proof of insurance premium payments.
9. The Commercial General Liability insurance policy shall have no exclusions by endorsements unless the City approves such exclusions.
10. The City shall not be responsible for the direct payment of any insurance premiums required by the contract. It is understood that insurance cost is an allowable component of Provider's overhead.
11. All insurance required in section (a) above, except for the Professional Liability insurance policy, shall be

written on an occurrence basis in order to be approved by the City.

12. Subcontractors to the Provider shall be required by the Provider to maintain the same or reasonably equivalent insurance coverage as required for the Provider. When subcontractors maintain insurance coverage, Provider shall provide City with documentation thereof on a certificate of insurance. Notwithstanding anything to the contrary contained herein, in the event a subcontractor's insurance coverage is canceled or terminated, such cancellation or termination shall not constitute a breach by Provider of the contract.

FOR PURPOSES OF EVALUATING THIS SUBMITTAL, PLEASE ATTACH A COPY OF YOUR CURRENT INSURANCE CERTIFICATE(S) FOLLOWING THIS PAGE WITHIN THE PROPOSAL PACKAGE.

2.11 PROVIDER'S LICENSES & CERTIFICATES

Provider shall procure all permits and licenses, pay all charges, costs, and fees, and give all notices necessary and incident to the due and lawful prosecution of the work.

Provider should provide a copy of the appropriate certifications, registrations, and licenses and related certificates (including Subcontractors) with their submittal including but not limited to:

Provider shall provide necessary company licenses and certifications required to complete the project such as (if applicable):

- current **Texas Sales/Use Tax Certificate**;
- current **Texas Secretary of State Business/Company Registration exhibiting Officers of Business/Company**; and
- current **Certificate of Good Standing** (Texas Secretary of States' office).

**ATTACH COPIES OF CURRENT APPLICABLE LICENSES AND CERTIFICATES
FOLLOWING THIS PAGE AND BOUND WITHIN THE PROPOSAL PACKAGE**

Remainder of page intentionally left blank

2.12 PROVIDER'S LEGAL AND COMPLIANCE HISTORY

Provider's legal and compliance history is a critical component of this Request for Proposal. Read this section with care and respond accordingly. Failure of the Provider to provide all the information requested and to certify the report, will result in the Provider's submittal being declared non-responsive.

Provider shall attach a written report of legal action brought against Provider, Provider's officers, Provider's employees, AND Provider's proposed subcontractors relating to the protection of the environment. The terms "legal action" and "relating to the protection of the environment" are defined below.

The report shall include all legal action brought within **five (5) years of the closing date of this Request for Proposal**. The report shall detail the substance, status, and outcome of such legal action. This includes without limitation the names of the agency and/or persons bringing the action, all relevant dates, and all fines, judgments, and/or settlements. Include the following information for each case at a minimum:

- Style of Case (X vs. Y)
- Cause Number
- Court
- Date of Disposition
- Settlement Information (as appropriate)
- Names / Addresses of all parties named
- Counsel List and phone numbers
- Judgment and Order of Judgment

"LEGAL ACTION" means: ANY enforcement action by the United States Environmental Protection Agency, the Occupational Safety and Health Administration, any other federal agency, the Texas Commission on Environmental Quality (including its predecessor agency the Texas Natural Resource Conservation Commission), the Texas Department of State Health Services (including its predecessor agency the Texas Department of Health), and any other state agency, commission or department, whether in Texas or elsewhere, when such enforcement action is a result of violations, real or alleged, of any laws, licenses, permits, judicial orders, or administrative orders, relating to the protection of the environment. In this context, enforcement action shall include without limitation, written warnings, notices of violation, consent orders or agreements, compliance orders, administrative hearings, civil litigation, and criminal prosecution. Legal action also means any civil litigation brought by any person relating to the protection of the environment.

"RELATING TO THE PROTECTION OF THE ENVIRONMENT" means: requirements pertaining to the manufacture, processing, distribution, use, handling, storage, transportation, reporting, records keeping, permitting, licensing, treatment, disposal, emission, discharge, spill, release, or threatened release of hazardous materials, hazardous substances, hazardous wastes, toxic substances, petroleum, industrial waste, solid waste, pollutants or contaminants into or onto the air, surface water, drinking water, groundwater, stormwater, publicly owned treatment works, or land.

THE REPORT SHALL BE SIGNED AND CERTIFIED by an authorized representative of the Provider, using the form on the following page. The top portion of the form is to be completed if a report of legal action is attached. The bottom portion of the form is to be completed if Provider has no legal action to report. **Make certain that the appropriate portion of the form is filled out and signed.**

AN AUTHORIZED REPRESENTATIVE OF THE PROVIDER shall mean:

- (1) if the Provider is a corporation: the president, secretary, or treasurer, or a vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation;
- (2) if the Provider is a partnership, a general partner; and
- (3) if the Provider is a sole proprietorship, the sole proprietor.

**INCLUDE A COPY OF THE REPORT OF LEGAL ACTION FOLLOWING THE CERTIFICATION PAGE
AND INCLUDED WITHIN THE PROPOSAL PACKAGE**

Remainder of page intentionally left blank

2.13 CERTIFICATION OF PROVIDER’S LEGAL AND COMPLIANCE HISTORY

Complete ONE of the Following Certifications:

Certification of Legal Action Report

I certify under penalty of law that the attached Legal Action Report detailing Provider's, Provider's officers, Provider's employees, and Provider's proposed subcontractors legal and compliance history relating to the protection of the environment was prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

PROVIDER:

Company Name

BY: _____
(print or type name of signatory)

(signature)

Title (print or type)

Date

Certification of NO Legal Action

I certify under penalty of law that the legal and compliance history of Provider, Provider's officers, Provider's employees, and Provider's proposed subcontractors was researched under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, I hereby certify that no legal action relating to the protection of the environment was brought against Provider, Provider's officers, Provider's employees, or Provider's proposed subcontractors within the preceding five years. To the best of my knowledge and belief, this statement is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

PROVIDER:

Company Name

BY: _____
(print or type name of signatory)

(signature)

Title (print or type)

Date

2.14 PREVAILING WAGE RATE

A Contractor selected for this project will be required to comply with TEXAS GOVERNMENT CODE, Chapter 2258, with respect to payment of Prevailing Wage Rates for public works contracts. The current wage scale for members of the Building and Construction trade may be found at:

<http://www.texoassociation.org/Chapter/wagerates.asp>.

A worker employed on a public work by or on behalf of the City of Fort Worth shall be paid not less than the general prevailing rate of per diem wages for work of a similar character in the locality in which the work is performed; and not less than the general prevailing rate of per diem wages for legal holiday and overtime work. A worker is employed on a public work if the worker is employed by a contractor or subcontractor in the execution of a contract for the public work with the City of Fort Worth.

The contractor who is awarded a public work contract, or a subcontractor of the contractor, shall pay not less than the prevailing wage rates to a worker employed by it in the execution of the contract. A contractor or subcontractor who violates this requirement shall pay to the City of Fort Worth, \$60 for each worker employed for each calendar day or part of the day that the worker is paid less than the wage rates stipulated in the contract.

This requirement does not prohibit the contractor or subcontractor from paying an employee an amount greater than the prevailing wage rate.

The undersigned acknowledges the requirements of Chapter 2258 of the Texas Government Code, and intends to comply with same in the execution of this project.

CONTRACTOR:

Company Name

Address

City, State, Zip

BY: _____
(print or type name of signatory)

(Signature)

Title (print or type)

2.15 WORKER'S COMPENSATION COMPLIANCE

CONTRACTOR COMPLIANCE WITH WORKER'S COMPENSATION LAW

Pursuant to Texas Labor Code Section 406.096(a), as amended, Contractor certifies that it provides worker's compensation insurance coverage for all of its employees employed on City Project, designated

"ENV 24.01: WATERWHEEL

Contractor further certifies that, pursuant to Texas Labor Code, Section 406.096(b), as amended, it will provide to City its subcontractor's certificates of compliance with worker's compensation coverage.

CONTRACTOR:

Company
(Please Print) By: _____

Address Signature: _____

City/State/Zip
(Please Print) Title: _____

THE STATE OF TEXAS §
§ KNOW ALL BY THESE PRESENT:
COUNTY OF TARRANT §

BEFORE ME, the undersigned authority, on this day personally appeared
_____, known to me to be the person whose name is subscribed to
the foregoing instrument, and acknowledged to me that he/she executed the same as the act and deed of
_____ for the purposes and consideration therein expressed and, in
the capacity, therein stated.

GIVEN UNDER MY HAND AND SEAL OF OFFICE this _____ day of _____, 20__

Notary Public in and for the State of Texas

2.16 NONDISCRIMINATION

All City contractors are required to comply with Chapter 17, "Human Relations," Article III, "Discrimination," Division 3, "Employment Practices," of the Code of the City of Fort Worth, prohibiting discrimination in employment practices. Proposer agrees that Proposer, its employees, officers, agents, contractors or subcontractors, have fully complied with all provisions of such Ordinance, and that no employee, participant, applicant, contractor or subcontractor has been discriminated against according to the terms of such Ordinance by Proposer, its employees, officers, agents, contractor or subcontractors herein.

PROPOSER:

Company Name

BY: _____
(Print or type name of signatory)

Address

(Signature)

City, State, Zip

Title (print or type)

Remainder of page intentionally left blank

ATTACHMENTS

ATTACHMENT A

CONFLICT OF INTEREST DISCLOSURE REQUIREMENT

Pursuant to Chapter 176 of the Local Government Code, any person or agent of a person who contracts or seeks to contract for the sale or purchase of property, goods, or services with a local governmental entity (i.e. The CITY of Fort Worth) must disclose in the Questionnaire Form CIQ ("Questionnaire") the person's affiliation or business relationship that might cause a conflict of interest with the local governmental entity. Bylaw, the Questionnaire must be filed with the Fort Worth CITY Secretary no later than seven days after the date the person begins contract discussions or negotiations with the CITY, or submits an application or response to a request for proposals or bids, correspondence, or another writing related to a potential agreement with the CITY. Updated Questionnaires must be filed in conformance with Chapter 176.

A copy of the Questionnaire Form is available at: <https://www.ethics.state.tx.us/data/forms/conflict/CIQ.pdf>

If you have any questions about compliance, please consult your own legal counsel. Compliance is the individual responsibility of each person or agent of a person who is subject to the filing requirement. An offense under Chapter 176 is a Class C misdemeanor.

NOTE: If you are not aware of a Conflict of Interest in any business relationship that you might have with the CITY, state Vendor name in the # 1, use N/A in each of the areas on the form. However, a signature is required in the #7 box in all cases.

ATTACHMENT B

BASIS OF DESIGN

1.0 Purpose and Scope

The purpose of this calculation is to provide piles to support the waterwheel powered trash interceptor mooring platforms to be installed on the Clear Fork and ~~West Fork~~ of the Trinity River in Fort Worth, Texas.

2.0 Summary of Results and Conclusions

The West Fork trash interceptor mooring platform is to be supported by three – 36 inch diameter piles. The Clear Fork interceptor mooring platform is to be supported by three – 30 inch diameter piles. See Section 7.0 for pile calculations. See Project Plans in Appendix 1.

The trash interceptor supplier provides calculations and specifications for design of the waterwheel, mooring platform, anchorage of the mooring platform to the mooring piles, log loader and associated support and anchorage of the floating booms. The pile locations are determined by the trash interceptor supplier and the City of Fort Worth.

3.0 References

- 3.1 Texas Department of Transportation (TXDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2014
- 3.2 AASHTO Standard Specifications for Highway Bridges, 17th Edition
- 3.3 AASHTO LRFD Bridge Design Specification – Publication Code LRFDUS-6
- 3.4 U.S. Army Corp of Engineers, Engineering and Design Criteria for Design and Construction Within the Limits of Existing Federal Projects, SWFP 1150-2-1
- 3.5 ASCE 7, 2010
- 3.6 ACI 318, 2014
- 3.7 AISC 14th Edition
- 3.8 International Building Code (IBC), 2015

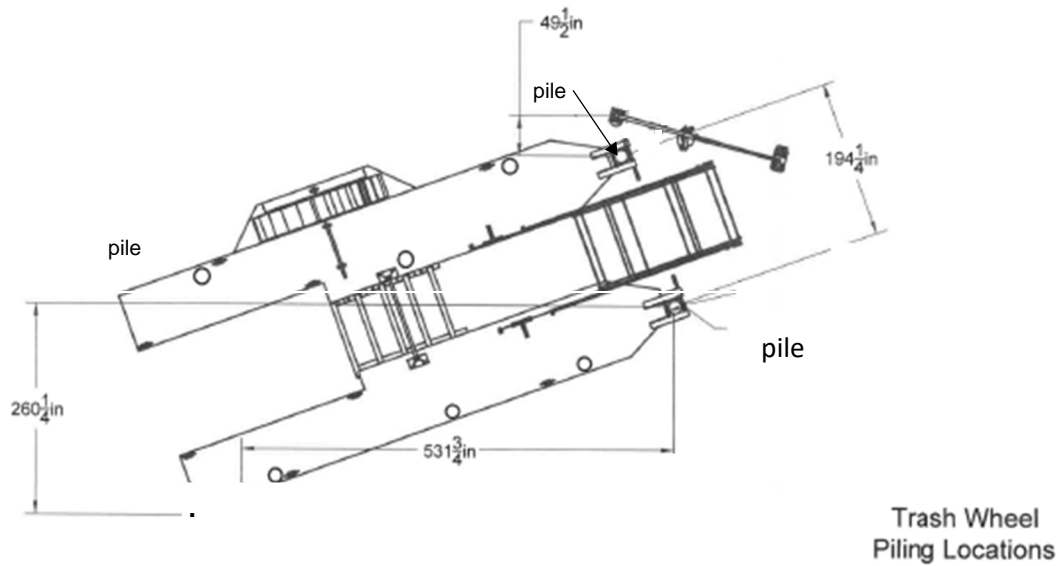
4.0 Assumptions

There are no assumptions that require justification in this calculation.

5.0 Design Inputs

5.1 Mooring platform parameters

Provided by Clearwater Mills, LLC



Pontoon Hull Sections 8' W x 52' L x 40" D

5.2 Hydrology parameters

See Hydrologic Analysis TSDN by RAMPP, Appendix 2.

Clear Fork

Average Water Velocity = 8.34 ft/s

Existing Grade (E.G.) elevation = 540.65 ft.

Mean High High Water (MHHW) elevation = 539.63 ft. Mean Low Water (MLW) elevation = 528.54 ft.

Minimum Channel elevation = 512.9 ft.

5.3 Geotechnical parameters

Geotechnical report by CMJ Engineering, Inc.

Report No. 2878-21-01 dated July 16, 2021

See Appendix 3

6.0 Methodology

This calculation analyzes the mooring platform piles for the loading conditions specified in ASCE 7 and AASHTO including:

- Stream Current – AASHTO LRFD Section 3.7.3
- Flood Loads – ASCE 7 Chapter 5
- Ice Loads – AASHTO ASD Section 3.18 and ASCE 7 Chapter 10
- Wave Loads – ASCE 7 Chapter 5
- Wind loads on the platform – AASHTO LRFD 3.8

The critical load combinations considered in this calculation are from the AASHTO Load Combinations and Load Factors table in Appendix 4.

- Service I: 1.0 (current + wave + boom + current on hull) + 0.3 wind
- Service IV: 1.0 (current + wave + boom + current on hull) + 0.7 wind
- Strength III: 1.0 (current on pile & hull + wave + boom) + 1.0 wind on platform resisted by 1 of 3 piles
- Strength III: 1.0 (current on pile & hull + wave + boom) + 1.4 wind/2 – wind on platform resisted by 2 of 3 piles
- Strength V: 1.0 (current + wave + boom + current on hull) + 0.4 wind
- Extreme Event: 1.0 (current on pile & hull + ice on pile & hull + wave + boom)

Loads are calculated for each trash interceptor location using the Excel spreadsheet. The pile is then designed using L-Pile software. The pile is evaluated for strength using the maximum Strength or Extreme Event level load combination and for deflection using the maximum Service level load combination.

CLEAR FORK TRINITY RIVER FORT WORTH, TEXAS
TRASH INTERCEPTOR MOORING PILE LOADING

	input		
	force on pile		
1. Clear Fork Stream Current Calculations			Flood zone AE
per AASHTO LRFD Section 3.7.3/ASD Section 3.18.1.1			
Steam Pressure			
<i>Regular Stream Current</i>			
Design Water Flow Velocity, V_{avg}	8.34	ft/sec	
Drag Coefficient, C_D or K	0.70	circular piles	
Avg. Current Pressure P_{avg}	48.69	psf	$K * V_{avg}^2$ Ref. 3.2 LRFD 3.7.3.1-1/ASD 3.1.1.1
Max Current Pressure, P_{max}	97.38	psf	$2 * P_{avg}$ Ref. 3.2 - 3.18.1.1
Pile Width/Diameter, d (ft)	2.50	30	
Exposed Pile Height above Mud Level, H_p (ft)	15.64	MLLW	mud level to MLLW water surface
Exposed Pile Height above Mud Level, H_p (ft)	26.73	MHHW	mud level to MHHW water surface
Current Flow Force, $F_{current}$		$H_p * d * \rho_{avg}$	
$F_{current}$ (kips)	1.90	MLLW	Triangular Pressure Load, P_{max}
$F_{current}$ (kips)	3.25	MHHW	Triangular Pressure Load, P_{max}
<i>Stream Current at 100 yr Design Flood</i>			
Extreme Current Flow, V_f	8.34	ft/sec	
Extreme 100 yr Flood above Mud Level (ft)	26.73		
Avg. Current Pressure P_{avg}	48.69	psf	
Max Current Pressure, P_{max}	97.38	psf	
100 yr Design Flood, $F_{current}$ (kips)	3.25		Triangular Pressure Load, P_{max}
2. Ice Load/Force Calculations			
<i>AASHTO 17th Ed. ASD Section 3.18.2.2 Dynamic Ice Force</i>			
Effective Ice Crushing Strength (p)	100.00	psi	AASHTO 3.18.2
Design Thickness of Ice in contact w/Pile (t_{ice})	1.50	in	ASCE 7 figure 10.4-2
Pile Diameter/Ice Thickness	20.00	d/t_{ice}	
Horizontal Crushing Ice Force on Pier (F_{ice})		$C_r * C_n * p * t * w$	ASD 3.18.2.2.1
Coefficient of Nose Inclination (C_n)	1.00		
Force Reduction Coefficient (C_r)	0.93	per AASHTO ASD Table 3.18.2.2.4 for d/t_{ice} value	
Longitudinal Force ($F_{ice, L}$)	4.19	kips	
Transverse Force ($F_{ice, T}$)	0.84	kips	no less than 20% of $F_{ice, L}$ per AASHTO 3.18.2.2.6
Horizontal Ice Force applied at water surface	4.27	kips	Resultant of Longitudinal & Transverse Forces
<i>USACOE Publication EM 1110-2-1612 October 2002 (Chapter 5-Ice Force on Structures) & AASHTO LRFD Procedure (Section 3.9.2)</i>			
p	14.40	ksf	AASHTO LRFD (100psi)
Ice Thickness (t_{ice})	1.50	in	ASCE 7 figure 10.4-2
Width of Structure $w=d$	30.00	in	Pile Diameter
Aspect Ratio t_{ice}/w	0.05		
Empirical Factor to account for Aspect Ratio	1.12		Eqn.3.9.2.2-3, $Ca=(St/w+1)^{0.5}$
Crushing Ice Failure $F_c = Ca * p * t * w$	5.03	kips	$F_{ice, L}$ Eqn.3.9.2.2-1
Transverse Force (acting simult. w/ $F_{ice, L}$)	1.01	kips	$F_{ice, T}$ Transverse Forces due to ice shifts taken as no less than 15% of Longitudinal Force 3.9.2.4.1 or 20% 3.9.4.2
Horizontal Ice Force applied at water surface	5.13	kips	F_{ice} Resultant of Longitudinal & Transverse Forces
Design Dynamic Ice Force	2.57	kips	$F_{ice}/pile$ Codes recommend reducing the dynamic ice force by 50% for piers in streams unlikely to encounter large size ice flows

3. Wave Load Calculations

Based on ASCE/SEI 7-10 Minimum Design Loads for Buildings & Other Structures, Ch. 5 Flood Levels

Computed Wave Height above 100-yr WSE	3.00	ft
Base Flood Elevation (BFE) For MHHW	0.00	
MHHW Depth above Mud Line, BFE-GS	26.73	ft
Local Still water Depth	17.37	ft
Breaking Wave Height	13.55	
Design Breaking Wave Height	13.55	ft
Density of Fresh Water, γ_w	62.40	pcf
Coefficient of Drag for Breaking Waves, C_d	1.75	
Pile Diameter, w	2.50	ft

Mud Level = 512.9'

$ds = 0.65 * (BFE - GS)$ Eq. 5.4-2 & 5.4-3
 $H_b = 0.78 * ds$, where ds = local water depth in ft. ASCE Eqn 5.4-1
 For Still Water at MHHW
 Fresh Water = 62.4 pcf; Saline Water = 62.9 pcf; Brackish Water = 63.9 pcf; Salt Water = 64.0 pcf
 1.75 for round piles; 2.25 for square piles or columns
 pile or column dia for circular sections; or 1.4 times the width of the pile for a square pile

Based on ASCE 7-10, Section 5.4.4.1 Breaking Wave Loads on Vertical Pilings & Columns

Net Horizontal Wave Force on Pile, $F_{wave} = 0.5 * \gamma_w * C_d * w * H_b^2$

MHHW Breaking Wave Height, H_b	13.55	ft
F_{wave} (per pile)	25.07	kips
100-YR WSE Breaking Wave Height, H_b	13.55	ft
F_{wave} (per pile)	25.07	kips

ASCE 7-10, Eq 5.4-4
 Water Surface at MHHW
 applied at MHHW Surface
 Water Surface at 100-YR WSE
 applied at 100-YR WSE

4. Wind Loading on Trash Collector (AASHTO LRFD Section 3.8)

Est. Area of Covered Wheel, A_w	275.00	sq. ft.
Dsgn Wind Velocity (Significant Wave) $V_{dz_extreme}$	100.00	MPH
Normal Design Wind Velocity, V_{dz_normal}	70.00	mph
Base Wind Velocity, V_b	100.00	mph
Base Wind Pressure, P_b	0.04	ksf
Design Wind Pressure on Wheel, P_d	0.04	0.0196
EXTREME Design Wind Load	11.00	
NORMAL Design Wind Load	5.39	

Platform Solar Panels Perp to Wind pontoons
 AASHTO 3.8.1.1 - same as P_b since less than 30 ft.
 above water surface
 Assume Normal Wind Max Wind Speeds (mph)
 Typical Wind Speeds (mph)
 AASHTO LRFD Section 3.8.1.2.1
 $P_d = P_b (V_{dz}/V_b)^2$ AASHTO LRFD Eqn 3.8.1.2.1-1
 $A_w * P_d W_{d_extreme}$ on Structure
 $A_w * P_d W_{d_normal}$ on Structure

5. Reaction to Piles Due to Current Pressure on Booms, Conveyor and Hull Connectors

E/W Transverse Distance between 2 Piles, L	50.00	ft
Assume between Straight Line & Boom, S	10.00	ft
E/W Distance to Max Sag Location, X	25.00	ft
Boom Thickness (equal to beam thickness), t	1.33	ft
Avg. Current Pressure, P_{avg}	25.20	psf
Distributed Load along Boom, q	33.52	lb/ft
Length of Beams between Hulls, L_{beam}	8.00	ft
N/S Longitudinal Reaction on Piles, F_{beam}	0.13	kip
E/W Component of Tension, $F_{boom, trans}$	0.79	kip
N/S Component of Tension, $F_{boom, long}$	0.63	kip
F_{boom}	1.01	kips per pile

$X = L/2$
 $q = P_{avg} * t$
 $F_{beam} = q * L_{beam} / 2$
 $F_{boom, trans} = (.75 * q * X^2) / S$
 $F_{boom, long} = .75 * q * X$
 sq. root of sum of squares

6. Hull Resistance Computations (Per US Naval Academy, USNA)

Ref. Yard Patrol Ch. 7- Resistance & Powering of Ships

Avg. Current Flow Rate against Hull	1 knot - 1.688	ft/sec
Speed of Water Flowing against Hull	8.34	ft/sec
Speed - to - Length Ratio, g	4.96	knots
Froude Number, Fn	0.81	k/ft^0.5
	0.40	per USNA

$L_s = 38$ ft Hull Length
 V_s / V_L_{hull}
 at low flow currents or speeds ($Fn < 0.2$, or $V/L^5 < 0.4$) $R_{current}$ dominates with up to 85% of a Hull's Tot

Total Hull Resistance Curve for a Navy Yard Patrol Craft

Per USNA, The Total Hull Resistance, $R_T = R_{current} + R_{wave} + R_{air}$
 where $R_{current} = R_{viscous}$ = friction and viscous effects of water acting on hull
 R_{wave} = wave making resistance
 R_{air} = Resistance that air provides to hull motion

Unit Weight of Water	63.20 lbm/ft ³	1009.60 kg/m ³
Unit Weight of Ice	57.20 lbm/ft ³	916.70 kg/m ³
Gravity, g	32.17 ft/s ²	9.61 m/s ²
Density of Water	1.96 lb-s ² /ft ⁴	102.90 kg-s ² /m ⁴
Density of Ice	1.78 lb-s ² /ft ⁵	93.50 kg-s ² /m ⁵
Effective HP @ 6 fps = 4 knots, EHP	20.00 HP	EHP = $R_T \cdot V_S / 550$ ft-lb/sec/HP
Total Hull Resistance R_T	1833.00 lbs	$R_T = EHP \cdot 550 / V_S$ is Total Hull Resistance
	$F_{Hull} = 1.80$ kips	V_S is ships speed in ft/sec

7. Ice Loading on Hull (Ice Force on Structures - Head on Collisions between a Ship and Ice Floe)

Ref. Ship Ice Interaction- Determination of Bow Forces and Hull Response Due to Head-On and Glancing Impacts between a Ship and an Ice Floe by Claude Daley, Richard Heyward, and Kej Riska for Ship Safety Northern Transport Canada Publication No. TP 121734E, Nov. 1996. Ocean Engineering Research Centre, Memorial University of Newfoundland, Canada

Maximum Normal Ice Force on Hull: $F_{n,max} = .766 \times K^{0.4} \sin^{0.2} \beta (MpgA_{wp})^{0.5} V = K^{0.4} \times \text{constant (N)}$ Max Bow Ice Force in a head-on collision with a Large Ice Feature

Where: Constant = $.766 \sin^{0.2} \beta (MpgA_{wp})^{0.5} V$

Ice Force is based on assuming that Ice Contact Pressure Model of the form: $Poc = C_1 A_c^{-0.5}$ A_c = Ice Contact Area and C_1 = Empirical constant

Vessel Speed or Stream Flow, V	1.00 ft/sec	SI Units	0.3 m/s	Total Weight	58.4 kips	Wt/pile (3)	19.47 kips
Total Weight of Structures & Equipment, W	58400.00 lbf		259763 N				
Mass of Vessel or Floating Platform, M = W/g	1815.36		27038.92995 kg				
Water Plane Area for Vessel, $A_{wp} = L \cdot W$	408.00		37.9 m ²				

Floating Platform Dimensions	Length (ft)	Width (ft)	Height (ft)	Volume (cu.ft)	$A_{wp} = L \times W$ (sq.ft)
Stern-Section	16	4.5	2.33	167.76	72.00
Mid-Section	19.3	6	2.33	269.81	115.80
Bow-Section	2.7	6	2.33	37.75	16.20
			Single Pontoon	475.32	204.00
			Total for 2 Pontoons	950.64	408.00

Hull Stem Angle to the Horizontal $20 \leq \beta \leq 40$

Assume β (deg) = 40 deg
 $\sin^{0.2}(\beta) = 0.92$
 Constant = 4791.89 lbf
 Constant SI = 6695.45 N
 Result = 4.79189 kip

Non-Dimensional Ice Strength $0.1 \leq K \leq 1$

$K = keq / (v_w A_c)$; $\tan(k) = t_{ice} / 2R$ R = Radius of Loaded Area

K	$K^{0.4}$	F = $K^{0.4} \times \text{Constant}$	$F_{iceh/pile}$	Reduction Factor
			4.79 kips	3
0.1	0.40		1.91	0.64
0.15	0.47		2.24	0.75
0.2	0.53		2.52	0.84
0.25	0.57		2.75	0.92
0.3	0.62		2.96	0.99
0.35	0.66		3.15	1.05
0.4	0.69		3.32	1.11
0.45	0.73		3.48	1.16
0.5	0.76		3.63	1.21
0.55	0.79		3.77	1.26
0.6	0.82		3.91	1.30
0.65	0.84		4.03	1.34

0.7	0.87	4.15	1.38
0.75	0.89	4.27	1.42
0.8	0.91	4.38	1.46
0.85	0.94	4.49	1.50
0.9	0.96	4.59	1.53
0.95	0.98	4.69	1.56
1	1	4.79	1.60

SUMMARY OF HORIZONTAL LATERAL FORCES ON PILES

1. WATER CURRENT FORCES		kip
Average MLLW F _{current}	1.90	
Average MHHW F _{current}	3.25	
100-YR WSE F _{current}	3.25	
2. ICE FORCE		
F _{ice}	4.27	
3. WAVE FORCE		
MHHW F _{wave}	25.07	
100-YR WSE F _{wave}	25.07	
4. WIND LOADING		
Normal F _{wind}	5.39	
Service I - Normal wind force F _{wind}	1.62	
Strength V - Normal wind force F _{wind}	2.16	
80 knots extreme F _{wind}	11.00	
Service IV - Extreme wind force F _{wind}	7.70	
Strength III - Extreme wind force F _{wind}	15.40	
5. WATER CURRENT PRESSURE ON BOOM AND HULL		
F _{boom}	1.01	
6. HULL RESISTANCE DUE TO CURRENT FORCE		
F _{hull}	1.80	
7. ICE LOADING ON HULL		
F _{ice_hull}	1.60	
SERVICE LOAD COMBINATIONS		kip
Typical service load: current loading only (pile, boom, hull) =	6.07	max @ MHHW, wind load on one pile
Typical service load: current loading only (pile, boom, hull) =	5.17	min @ MHHW, wind load on two piles
Service I: F _{current} +0.3F _{wind} +F _{wave} +F _{boom} +F _{hull} =	32.76	1 pile: assume full wind load
Service I: F _{current} +0.3F _{wind} /2+F _{wave} +F _{boom} +F _{hull} =	31.95	2 piles: assume wind on 2 piles
Service IV: F _{current} +0.7F _{wind} +F _{wave} +F _{boom} +F _{hull} =	38.84	1 pile: assume full wind load
Service IV: F _{current} +0.7F _{wind} /2+F _{wave} +F _{boom} +F _{hull} =	34.99	2 piles: assume wind on 2 piles
		design load - 2 of 3 piles resisting considered adequate conservatism - code allows all 3 to be used
STRENGTH LOAD COMBINATIONS		
Strength III: F _{current} +1.0F _{wind} +F _{wave} +F _{boom} +F _{hull} =	42.14	max @ 100-yr WSE, wind load on one pile
		max @ 100-yr WSE, wind load on two piles - design load - 2 of 3 piles resisting considered adequate conservatism
Strength III: F _{current} +1.4F _{wind} /2+F _{wave} +F _{boom} +F _{hull} =	38.84	
Strength V: F _{current} +0.4F _{wind} +F _{wave} +F _{boom} +F _{hull} =	33.29	max @ MHHW, wind on one pile
Strength V: F _{current} +0.4F _{wind} /2+F _{wave} +F _{boom} +F _{hull} =	32.22	max @ MHHW, wind on two piles

EXTREME EVENT II: F_ice+F_current+F_wave+F_boom+F_hull+F_ice_hull

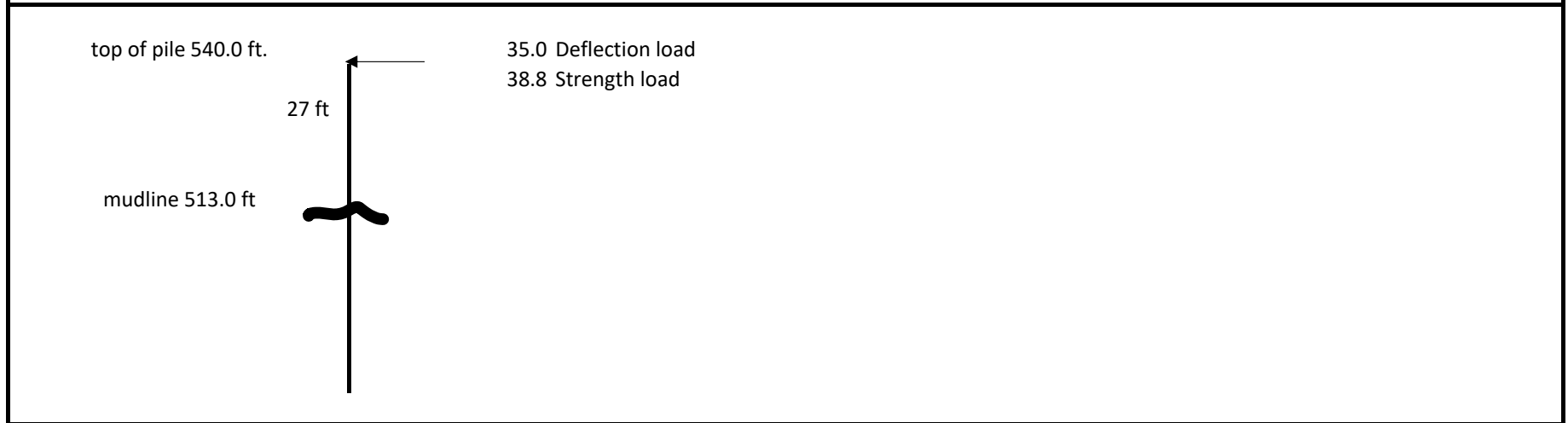
F_ice+F_current+F_wave+F_boom+F_hull+F_ice_hull =	35.31	max @ MHHW, hull ice on one pile only
F_ice+F_current+F_wave+F_boom+F_hull+F_ice_hull/2 =	34.06	max @ MHHW, hull ice load on two piles
F_ice+F_current+F_wave+F_boom+F_hull+F_ice_hull =	37.00	max @ 100-yr WSE, hull ice on one pile only
F_ice+F_current+F_wave+F_boom+F_hull+F_ice_hull/2 =	36.20	max @ 100-yr WSE, hull ice on two piles

CLEAR FORK MOORING PILE LOADING SUMMARY

Critical Load Conditions	Service IV (1)(4)	Service IV (2)(4)	Strength III (1)(3)	Strength III (2)(3)	Extreme II (1)(3)	Extreme II (2)(3)
Design WS Elev (ft.)	100 Yr. Elev 539.63	100 Yr. Elev 539.63	100 Yr. Elev 539.63	100 Yr. Elev 539.63	100 Yr. Elev 539.63	100 Yr. Elev 539.63
Connection Bracket Elev	540	540	540	540	540	540
Mudline elev	513	513	513	513	513	513
Total Applied Lateral Load (kips)	38.8	35.0	42.1	38.8	37.0	36.2
Assumed No. of Loaded Piles	1	2	1	2	1	2

NOTES

1. Assumes only one of three piles resists lateral wind or extreme hull ice loads.
2. Loads used for design assumes two of three piles resists lateral wind or extreme hull ice loads.
3. Pile capacity is based on maximum of Strength or Extreme loading conditions.
4. Pile deflection is evaluated based on Service loading conditions.



LPIle for Windows, Version 2019-11.008

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method

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Files Used for Analysis

Path to file locations:

\\enercon.sharepoint.com@SSL\DavWWWRoot/sites\NSG_NC\Clients\FWTH\FWTHFS\FWTHFS-00242\Calculations\Trash Wheel\LPILE\

Name of input data file:

New LPIle (USCS units) - Clear Fork.lp11d

Name of output report file:

New LPIle (USCS units) - Clear Fork.lp11o

Name of plot output file:

New LPIle (USCS units) - Clear Fork.lp11p

Name of runtime message file:

New LPIle (USCS units) - Clear Fork.lp11r

Date and Time of Analysis

Problem Title

Project Name: Fort Worth Trash Wheel
Job Number: FWTHFS-00242
Client: City of Fort Worth
Engineer: Sandeep Menon
Description: Clear Fork LPILE

Program Options and Settings

Computational Options:

- Conventional Analysis

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 300.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Input of side resistance moment along pile not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1

- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

 Pile Structural Properties and Geometry

Number of pile sections defined = 1
 Total length of pile = 46.000 ft
 Depth of ground surface below top of pile = 27.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	30.0000
2	46.000	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a steel pipe pile
 Length of section = 46.000000 ft
 Pile diameter = 30.000000 in
 Shear capacity of section = 0.0000 lbs

 Ground Slope and Pile Batter Angles

Ground Slope Angle = 0.000 degrees
 = 0.000 radians

Pile Batter Angle = 0.000 degrees
 = 0.000 radians

Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is soft clay, p-y criteria by Matlock, 1970

Distance from top of pile to top of layer	=	27.000000 ft
Distance from top of pile to bottom of layer	=	33.000000 ft
Effective unit weight at top of layer	=	125.000000 pcf
Effective unit weight at bottom of layer	=	125.000000 pcf
Undrained cohesion at top of layer	=	3.000000 psf
Undrained cohesion at bottom of layer	=	3.000000 psf
Epsilon-50 at top of layer	=	0.020000
Epsilon-50 at bottom of layer	=	0.020000

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer	=	33.000000 ft
Distance from top of pile to bottom of layer	=	40.000000 ft
Effective unit weight at top of layer	=	125.000000 pcf
Effective unit weight at bottom of layer	=	125.000000 pcf
Friction angle at top of layer	=	36.000000 deg.
Friction angle at bottom of layer	=	36.000000 deg.
Subgrade k at top of layer	=	120.000000 pci
Subgrade k at bottom of layer	=	120.000000 pci

Layer 3 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer	=	40.000000 ft
Distance from top of pile to bottom of layer	=	100.000000 ft
Effective unit weight at top of layer	=	140.000000 pcf
Effective unit weight at bottom of layer	=	140.000000 pcf
Uniaxial compressive strength at top of layer	=	275.000000 psi
Uniaxial compressive strength at bottom of layer	=	275.000000 psi
Initial modulus of rock at top of layer	=	100000. psi
Initial modulus of rock at bottom of layer	=	100000. psi
RQD of rock at top of layer	=	30.000000 %
RQD of rock at bottom of layer	=	30.000000 %
k _{rm} of rock at top of layer	=	0.0001000
k _{rm} of rock at bottom of layer	=	0.0001000

(Depth of the lowest soil layer extends 54.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer Layer Num.	Soil Type Name (p-y Curve Type)	Layer Depth ft	Effective Unit Wt. pcf	Undrained Cohesion psf	Angle of Friction deg.	Angle of psi	Uniaxial qu	RQD % krm	E50 or pci	kpy psi	Rock Mass Modulus
1	Soft Clay	27.0000 33.0000	125.0000 125.0000	3.0000 3.0000	-- --	-- --	-- --	0.02000 0.02000	-- --	-- --	
2	Sand (Reese, et al.)	33.0000 40.0000	125.0000 125.0000	-- --	36.0000 36.0000	-- --	-- --	-- --	120.0000 120.0000	-- --	
3	Weak Rock	40.0000 100.0000	140.0000 140.0000	-- --	-- --	275.0000 275.0000	30.0000 30.0000	1.00E-04 1.00E-04	-- --	100000. 100000.	

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load No.	Load Type	Condition 1	Condition 2	Axial Thrust Force, lbs	vs. Pile Length	Compute Top y	Run Analysis
1	1	V = 35000. lbs	M = 0.0000 in-lbs	0.0000000		No	Yes

V = shear force applied normal to pile axis

M = bending moment applied to pile head

y = lateral deflection normal to pile axis

S = pile slope relative to original pile batter angle

R = rotational stiffness applied to pile head

Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).

Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Steel Pipe Pile:

Length of Section = 46.000000 ft
 Outer Diameter of Pipe = 30.000000 in
 Pipe Wall Thickness = 1.000000 in
 Yield Stress of Pipe = 42.000000 ksi
 Elastic Modulus = 29000. ksi
 Cross-sectional Area = 91.106187 sq. in.
 Moment of Inertia = 9589. in^4
 Elastic Bending Stiffness = 278078859. kip-in^2
 Plastic Modulus, Z = 841.333333 in^3
 Plastic Moment Capacity = $F_y Z$ = 35336.in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = $F_y A_s$ = 3826.460 kips
 Nominal Axial Tensile Capacity = -3826.460 kips

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
-----	-----
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in ²	Depth to N Axis in	Max Total Stress ksi	Run Msg
-----	-----	-----	-----	-----	-----
0.00000205	570.5208744	278068998.	15.0000000	0.8835750	

0.00000410	1141.	278068998.	15.0000000	1.7671500
0.00000616	1712.	278068998.	15.0000000	2.6507250
0.00000821	2282.	278068998.	15.0000000	3.5343000
0.00001026	2853.	278068998.	15.0000000	4.4178750
0.00001231	3423.	278068998.	15.0000000	5.3014500
0.00001436	3994.	278068998.	15.0000000	6.1850250
0.00001641	4564.	278068998.	15.0000000	7.0686000
0.00001847	5135.	278068998.	15.0000000	7.9521751
0.00002052	5705.	278068998.	15.0000000	8.8357501
0.00002257	6276.	278068998.	15.0000000	9.7193251
0.00002462	6846.	278068998.	15.0000000	10.6029001
0.00002667	7417.	278068998.	15.0000000	11.4864751
0.00002872	7987.	278068998.	15.0000000	12.3700501
0.00003078	8558.	278068998.	15.0000000	13.2536251
0.00003283	9128.	278068998.	15.0000000	14.1372001
0.00003488	9699.	278068998.	15.0000000	15.0207751
0.00003693	10269.	278068998.	15.0000000	15.9043501
0.00003898	10840.	278068998.	15.0000000	16.7879251
0.00004103	11410.	278068998.	15.0000000	17.6715001
0.00004309	11981.	278068998.	15.0000000	18.5550751
0.00004514	12551.	278068998.	15.0000000	19.4386501
0.00004719	13122.	278068998.	15.0000000	20.3222251
0.00004924	13693.	278068998.	15.0000000	21.2058001
0.00005129	14263.	278068998.	15.0000000	22.0893751
0.00005334	14834.	278068998.	15.0000000	22.9729502
0.00005540	15404.	278068998.	15.0000000	23.8565252
0.00005745	15975.	278068998.	15.0000000	24.7401002
0.00005950	16545.	278068998.	15.0000000	25.6236752
0.00006155	17116.	278068998.	15.0000000	26.5072502
0.00006360	17686.	278068998.	15.0000000	27.3908252
0.00006566	18257.	278068998.	15.0000000	28.2744002
0.00006771	18827.	278068998.	15.0000000	29.1579752
0.00006976	19398.	278068998.	15.0000000	30.0415502
0.00007181	19968.	278068998.	15.0000000	30.9251252
0.00007386	20539.	278068998.	15.0000000	31.8087002
0.00007591	21109.	278068998.	15.0000000	32.6922752
0.00007797	21680.	278068998.	15.0000000	33.5758502
0.00008002	22250.	278068998.	15.0000000	34.4594252
0.00008412	23391.	278068998.	15.0000000	36.2265752
0.00008822	24532.	278068998.	15.0000000	37.9937253
0.00009233	25673.	278068998.	15.0000000	39.7608753
0.00009643	26814.	278068998.	15.0000000	41.5280253
0.0001005	27883.	277346208.	15.0000000	42.0000000 Y
0.0001046	28727.	274541066.	15.0000000	42.0000000 Y
0.0001087	29379.	270170377.	15.0000000	42.0000000 Y
0.0001128	29912.	265069954.	15.0000000	42.0000000 Y
0.0001169	30367.	259662382.	15.0000000	42.0000000 Y
0.0001211	30759.	254097829.	15.0000000	42.0000000 Y
0.0001252	31105.	248528090.	15.0000000	42.0000000 Y
0.0001293	31407.	242976448.	15.0000000	42.0000000 Y

0.0001334	31675.	237512289.	15.0000000	42.0000000	Y
0.0001375	31916.	232172354.	15.0000000	42.0000000	Y
0.0001416	32132.	226972188.	15.0000000	42.0000000	Y
0.0001457	32328.	221922349.	15.0000000	42.0000000	Y
0.0001498	32506.	217029601.	15.0000000	42.0000000	Y
0.0001539	32668.	212297800.	15.0000000	42.0000000	Y
0.0001580	32816.	207721450.	15.0000000	42.0000000	Y
0.0001621	32950.	203288588.	15.0000000	42.0000000	Y
0.0001662	33074.	199015198.	15.0000000	42.0000000	Y
0.0001703	33190.	194899466.	15.0000000	42.0000000	Y
0.0001744	33296.	190919599.	15.0000000	42.0000000	Y
0.0001785	33393.	187075068.	15.0000000	42.0000000	Y
0.0001826	33486.	183378943.	15.0000000	42.0000000	Y
0.0001867	33569.	179793525.	15.0000000	42.0000000	Y
0.0001908	33648.	176343549.	15.0000000	42.0000000	Y
0.0001949	33721.	173006719.	15.0000000	42.0000000	Y
0.0001990	33790.	169785863.	15.0000000	42.0000000	Y
0.0002031	33855.	166672259.	15.0000000	42.0000000	Y
0.0002072	33915.	163664816.	15.0000000	42.0000000	Y
0.0002113	33971.	160752539.	15.0000000	42.0000000	Y
0.0002154	34026.	157943956.	15.0000000	42.0000000	Y
0.0002195	34075.	155213986.	15.0000000	42.0000000	Y
0.0002236	34124.	152584198.	15.0000000	42.0000000	Y
0.0002277	34167.	150026441.	15.0000000	42.0000000	Y
0.0002318	34209.	147552941.	15.0000000	42.0000000	Y
0.0002359	34251.	145162665.	15.0000000	42.0000000	Y
0.0002401	34287.	142832021.	15.0000000	42.0000000	Y
0.0002442	34323.	140579718.	15.0000000	42.0000000	Y
0.0002606	34451.	132214942.	15.0000000	42.0000000	Y
0.0002770	34555.	124754172.	15.0000000	42.0000000	Y
0.0002934	34641.	118070499.	15.0000000	42.0000000	Y
0.0003098	34714.	112049349.	15.0000000	42.0000000	Y
0.0003262	34775.	106598138.	15.0000000	42.0000000	Y
0.0003426	34828.	101645833.	15.0000000	42.0000000	Y
0.0003591	34875.	97130998.	15.0000000	42.0000000	Y
0.0003755	34913.	92987214.	15.0000000	42.0000000	Y
0.0003919	34949.	89183219.	15.0000000	42.0000000	Y
0.0004083	34979.	85671744.	15.0000000	42.0000000	Y
0.0004247	35007.	82426751.	15.0000000	42.0000000	Y
0.0004411	35030.	79412129.	15.0000000	42.0000000	Y
0.0004575	35053.	76613804.	15.0000000	42.0000000	Y
0.0004739	35072.	73998719.	15.0000000	42.0000000	Y
0.0004904	35089.	71557089.	15.0000000	42.0000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Nominal

Load No.	Axial Thrust kips	Moment Capacity in-kips
1	0.00000000	35089.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

 Layering Correction Equivalent Depths of Soil & Rock Layers

Layer No.	Top of Layer Below Pile Head ft	Equivalent Top Depth Below Grnd Surf Above ft	Same Layer Type As Rock Layer	Layer is Rock or is Below lbs	F0 Integral for Layer lbs	F1 Integral for Layer
1	27.0000	0.00	N.A.	No	0.00	401.7144
2	33.0000	0.4824	No	No	401.7144	124977.
3	40.0000	13.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

 Computed Values of Pile Loading and Deflection
 for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 35000.0 lbs
 Applied moment at pile head = 0.0 in-lbs
 Axial thrust load on pile head = 0.0 lbs

Depth X feet	Deflect. y inches	Bending Moment in-lbs	Shear Force lbs	Slope S radians	Total Stress psi*	Total Stiffness lb-in^2	Bending p lb/inch	Soil Res. Es*H lb/inch	Soil Spr. Lat. Load lb/inch	Distrib.
0.00	5.5920	2.67E-04	35000.	-0.01638	4.18E-07	2.78E+11	0.00	0.00	0.00	
0.4600	5.5016	193200.	35000.	-0.01638	302.2236	2.78E+11	0.00	0.00	0.00	
0.9200	5.4111	386400.	35000.	-0.01638	604.4472	2.78E+11	0.00	0.00	0.00	
1.3800	5.3208	579600.	35000.	-0.01637	906.6709	2.78E+11	0.00	0.00	0.00	
1.8400	5.2304	772800.	35000.	-0.01635	1209.	2.78E+11	0.00	0.00	0.00	
2.3000	5.1402	966000.	35000.	-0.01634	1511.	2.78E+11	0.00	0.00	0.00	
2.7600	5.0501	1159200.	35000.	-0.01632	1813.	2.78E+11	0.00	0.00	0.00	
3.2200	4.9601	1352400.	35000.	-0.01629	2116.	2.78E+11	0.00	0.00	0.00	
3.6800	4.8702	1545600.	35000.	-0.01626	2418.	2.78E+11	0.00	0.00	0.00	
4.1400	4.7806	1738800.	35000.	-0.01623	2720.	2.78E+11	0.00	0.00	0.00	
4.6000	4.6911	1932000.	35000.	-0.01619	3022.	2.78E+11	0.00	0.00	0.00	
5.0600	4.6018	2125200.	35000.	-0.01615	3324.	2.78E+11	0.00	0.00	0.00	
5.5200	4.5127	2318400.	35000.	-0.01611	3627.	2.78E+11	0.00	0.00	0.00	
5.9800	4.4239	2511600.	35000.	-0.01606	3929.	2.78E+11	0.00	0.00	0.00	
6.4400	4.3354	2704800.	35000.	-0.01601	4231.	2.78E+11	0.00	0.00	0.00	
6.9000	4.2472	2898000.	35000.	-0.01595	4533.	2.78E+11	0.00	0.00	0.00	
7.3600	4.1593	3091200.	35000.	-0.01589	4836.	2.78E+11	0.00	0.00	0.00	
7.8200	4.0717	3284400.	35000.	-0.01583	5138.	2.78E+11	0.00	0.00	0.00	
8.2800	3.9845	3477600.	35000.	-0.01576	5440.	2.78E+11	0.00	0.00	0.00	
8.7400	3.8977	3670800.	35000.	-0.01569	5742.	2.78E+11	0.00	0.00	0.00	
9.2000	3.8113	3864000.	35000.	-0.01562	6044.	2.78E+11	0.00	0.00	0.00	
9.6600	3.7253	4057200.	35000.	-0.01554	6347.	2.78E+11	0.00	0.00	0.00	
10.1200	3.6397	4250400.	35000.	-0.01546	6649.	2.78E+11	0.00	0.00	0.00	
10.5800	3.5546	4443600.	35000.	-0.01537	6951.	2.78E+11	0.00	0.00	0.00	
11.0400	3.4700	4636800.	35000.	-0.01528	7253.	2.78E+11	0.00	0.00	0.00	
11.5000	3.3859	4830000.	35000.	-0.01519	7556.	2.78E+11	0.00	0.00	0.00	
11.9600	3.3024	5023200.	35000.	-0.01509	7858.	2.78E+11	0.00	0.00	0.00	
12.4200	3.2194	5216400.	35000.	-0.01499	8160.	2.78E+11	0.00	0.00	0.00	
12.8800	3.1369	5409600.	35000.	-0.01488	8462.	2.78E+11	0.00	0.00	0.00	
13.3400	3.0551	5602800.	35000.	-0.01477	8764.	2.78E+11	0.00	0.00	0.00	
13.8000	2.9738	5796000.	35000.	-0.01466	9067.	2.78E+11	0.00	0.00	0.00	
14.2600	2.8932	5989200.	35000.	-0.01454	9369.	2.78E+11	0.00	0.00	0.00	
14.7200	2.8133	6182400.	35000.	-0.01442	9671.	2.78E+11	0.00	0.00	0.00	
15.1800	2.7340	6375600.	35000.	-0.01430	9973.	2.78E+11	0.00	0.00	0.00	
15.6400	2.6555	6568800.	35000.	-0.01417	10276.	2.78E+11	0.00	0.00	0.00	
16.1000	2.5776	6762000.	35000.	-0.01404	10578.	2.78E+11	0.00	0.00	0.00	
16.5600	2.5005	6955200.	35000.	-0.01390	10880.	2.78E+11	0.00	0.00	0.00	
17.0200	2.4242	7148400.	35000.	-0.01376	11182.	2.78E+11	0.00	0.00	0.00	
17.4800	2.3486	7341600.	35000.	-0.01362	11484.	2.78E+11	0.00	0.00	0.00	
17.9400	2.2738	7534800.	35000.	-0.01347	11787.	2.78E+11	0.00	0.00	0.00	
18.4000	2.1999	7728000.	35000.	-0.01332	12089.	2.78E+11	0.00	0.00	0.00	
18.8600	2.1268	7921200.	35000.	-0.01316	12391.	2.78E+11	0.00	0.00	0.00	

19.3200	2.0546	8114400.	35000.	-0.01300	12693.	2.78E+11	0.00	0.00	0.00
19.7800	1.9833	8307600.	35000.	-0.01284	12996.	2.78E+11	0.00	0.00	0.00
20.2400	1.9129	8500800.	35000.	-0.01267	13298.	2.78E+11	0.00	0.00	0.00
20.7000	1.8434	8694000.	35000.	-0.01250	13600.	2.78E+11	0.00	0.00	0.00
21.1600	1.7748	8887200.	35000.	-0.01233	13902.	2.78E+11	0.00	0.00	0.00
21.6200	1.7073	9080400.	35000.	-0.01215	14205.	2.78E+11	0.00	0.00	0.00
22.0800	1.6407	9273600.	35000.	-0.01197	14507.	2.78E+11	0.00	0.00	0.00
22.5400	1.5752	9466800.	35000.	-0.01178	14809.	2.78E+11	0.00	0.00	0.00
23.0000	1.5107	9660000.	35000.	-0.01159	15111.	2.78E+11	0.00	0.00	0.00
23.4600	1.4472	9853200.	35000.	-0.01140	15413.	2.78E+11	0.00	0.00	0.00
23.9200	1.3848	1.00E+07	35000.	-0.01120	15716.	2.78E+11	0.00	0.00	0.00
24.3800	1.3236	1.02E+07	35000.	-0.01100	16018.	2.78E+11	0.00	0.00	0.00
24.8400	1.2634	1.04E+07	35000.	-0.01079	16320.	2.78E+11	0.00	0.00	0.00
25.3000	1.2044	1.06E+07	35000.	-0.01058	16622.	2.78E+11	0.00	0.00	0.00
25.7600	1.1466	1.08E+07	35000.	-0.01037	16925.	2.78E+11	0.00	0.00	0.00
26.2200	1.0899	1.10E+07	35000.	-0.01015	17227.	2.78E+11	0.00	0.00	0.00
26.6800	1.0345	1.12E+07	35000.	-0.00993	17529.	2.78E+11	0.00	0.00	0.00
27.1400	0.9802	1.14E+07	34993.	-0.00971	17831.	2.78E+11	-2.4031	13.5322	0.00
27.6000	0.9273	1.16E+07	34980.	-0.00948	18133.	2.78E+11	-2.3959	14.2626	0.00
28.0600	0.8756	1.18E+07	34967.	-0.00925	18435.	2.78E+11	-2.3505	14.8187	0.00
28.5200	0.8252	1.20E+07	34954.	-0.00901	18737.	2.78E+11	-2.3045	15.4162	0.00
28.9800	0.7761	1.22E+07	34942.	-0.00877	19039.	2.78E+11	-2.2578	16.0598	0.00
29.4400	0.7283	1.24E+07	34929.	-0.00853	19341.	2.78E+11	-2.2105	16.7545	0.00
29.9000	0.6819	1.26E+07	34917.	-0.00828	19642.	2.78E+11	-2.1626	17.5063	0.00
30.3600	0.6369	1.27E+07	34905.	-0.00803	19944.	2.78E+11	-2.1139	18.3222	0.00
30.8200	0.5932	1.29E+07	34894.	-0.00778	20245.	2.78E+11	-2.0644	19.2101	0.00
31.2800	0.5510	1.31E+07	34883.	-0.00752	20546.	2.78E+11	-2.0142	20.1792	0.00
31.7400	0.5102	1.33E+07	34872.	-0.00726	20847.	2.78E+11	-1.9633	21.2406	0.00
32.2000	0.4709	1.35E+07	34861.	-0.00699	21148.	2.78E+11	-1.9115	22.4072	0.00
32.6600	0.4331	1.37E+07	34851.	-0.00672	21449.	2.78E+11	-1.8589	23.6940	0.00
33.1200	0.3967	1.39E+07	34491.	-0.00644	21750.	2.78E+11	-128.3257	1786.	0.00
33.5800	0.3619	1.41E+07	33486.	-0.00617	22045.	2.78E+11	-235.7605	3596.	0.00
34.0400	0.3286	1.43E+07	31881.	-0.00589	22329.	2.78E+11	-345.8202	5809.	0.00
34.5000	0.2969	1.44E+07	29674.	-0.00560	22596.	2.78E+11	-454.0534	8441.	0.00
34.9600	0.2668	1.46E+07	26889.	-0.00531	22841.	2.78E+11	-554.8816	11480.	0.00
35.4200	0.2383	1.47E+07	23571.	-0.00502	23060.	2.78E+11	-647.2103	14992.	0.00
35.8800	0.2114	1.49E+07	19782.	-0.00473	23248.	2.78E+11	-725.6730	18949.	0.00
36.3400	0.1861	1.50E+07	15604.	-0.00443	23402.	2.78E+11	-788.1746	23376.	0.00
36.8000	0.1625	1.50E+07	11106.	-0.00413	23518.	2.78E+11	-841.4613	28588.	0.00
37.2600	0.1405	1.51E+07	6369.	-0.00383	23594.	2.78E+11	-874.7699	34371.	0.00
37.7200	0.1202	1.51E+07	1492.	-0.00353	23628.	2.78E+11	-892.2627	40992.	0.00
38.1800	0.1015	1.51E+07	-3445.	-0.00323	23619.	2.78E+11	-896.6846	48780.	0.00
38.6400	0.08444	1.51E+07	-8349.	-0.00294	23568.	2.78E+11	-880.1189	57534.	0.00
39.1000	0.06906	1.50E+07	-13106.	-0.00264	23475.	2.78E+11	-843.4556	67413.	0.00
39.5600	0.05533	1.49E+07	-17599.	-0.00234	23342.	2.78E+11	-784.4403	78256.	0.00
40.0200	0.04324	1.48E+07	-37710.	-0.00204	23171.	2.78E+11	-6502.	830115.	0.00
40.4800	0.03276	1.45E+07	-76662.	-0.00175	22691.	2.78E+11	-7612.	1282494.	0.00
40.9400	0.02388	1.40E+07	-121021.	-0.00147	21847.	2.78E+11	-8461.	1956025.	0.00
41.4000	0.01652	1.32E+07	-169265.	-0.00120	20601.	2.78E+11	-9019.	3013222.	0.00
41.8600	0.01061	1.21E+07	-219658.	-9.51E-04	18924.	2.78E+11	-9240.	4806703.	0.00

42.3200	0.00602	1.07E+07	-270089.	-7.24E-04	16807.	2.78E+11	-9033.	8275495.	0.00
42.7800	0.00262	9115605.	-317524.	-5.27E-04	14260.	2.78E+11	-8154.	1.72E+07	0.00
43.2400	2.07E-04	7238641.	-353170.	-3.65E-04	11323.	2.78E+11	-4761.	1.27E+08	0.00
43.7000	-0.00141	5216603.	-343147.	-2.41E-04	8160.	2.78E+11	8393.	3.29E+07	0.00
44.1600	-0.00245	3450300.	-291141.	-1.55E-04	5397.	2.78E+11	10450.	2.35E+07	0.00
44.6200	-0.00312	2002407.	-229302.	-1.01E-04	3132.	2.78E+11	11956.	2.12E+07	0.00
45.0800	-0.00357	918804.	-159733.	-7.19E-05	1437.	2.78E+11	13251.	2.05E+07	0.00
45.5400	-0.00391	238950.	-83225.	-6.04E-05	373.7905	2.78E+11	14470.	2.04E+07	0.00
46.0000	-0.00423	0.00	0.00	-5.80E-05	0.00	2.78E+11	15684.	1.02E+07	0.00

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 5.59201404 inches
 Computed slope at pile head = -0.01638488 radians
 Maximum bending moment = 15104253. inch-lbs
 Maximum shear force = -353170. lbs
 Depth of maximum bending moment = 37.72000000 feet below pile head
 Depth of maximum shear force = 43.24000000 feet below pile head
 Number of iterations = 34
 Number of zero deflection points = 1

 Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case No.	Load Type	Load 1	Load 2	Axial Pile-head Load lbs	Pile-head Deflection inches	Pile-head Rotation radians	Max Shear lbs	Max Moment in-lbs
1	V, lb	35000.	M, in-lb	0.00	0.00	5.5920	-0.01638	-353170. 1.51E+07

Maximum pile-head deflection = 5.5920140403 inches

Maximum pile-head rotation = -0.0163848801 radians = -0.938784 deg.

The analysis ended normally.

Pile Strength Check

		Clear Fork	
		30" DIA	
		30	
		1	
		29000	
		50	
		30	
		261	
		OK	
		28	
		841.33	
		42066.67	
		42066.67	
		40.60	
		COMPACT	
		0.90	
		37860.00	
		38.80	
		5.59	
		15104.25	
		353.17	
		43.24	
		0.00	
		137.66	
		30.00	
		91.11	
		1366.59	
		0.90	
		1229.93	
		0.40	
		0.26	
		0.47	
		OK	

AISC 14th Table 17-27 (Page 17-39) for HOLLOW CIRCLE
 AISC 14th Spec. F8.1 (Eq. F8-1)
 AISC 14th Spec. F8.1 (Eq. F8-1)
 AISC 14th Spec Table B4.1b Case 20 (In Flexure)
 AISC 14th Spec F8-2 does not apply for compact sections
 AISC 14th Spec F1

LPILE
 LPILE
 LPILE
 LPILE

AISC 14th Spec G6 (Eq. G6-1)
 AISC 14th Spec G1

Appendix 1
Platform Mooring Piles Plans

SHEET INDEX

- S101 - GENERAL NOTES
- S102 - WEST FORK SITE PLAN
- S103 - CLEAR FORK SITE PLAN
- S104 - WEST FORK / CLEAR FORK PROFILES
- S105 - STRUCTURAL & FOUNDATION DETAILS

GENERAL STRUCTURAL NOTES

1. FIELD SURVEY WAS NOT PERFORMED FOR THIS PROJECT. PLACEMENT OF PILES AND TETHER FOUNDATION BLOCKS ARE BASED ON THE DOWNSTREAM PILE CONTROL COORDINATES PROVIDED ON THE SITE PLANS.
2. ALL WORK IS ASSUMED TO BE NEW UNLESS OTHERWISE NOTED.
3. ALL MATERIALS AND WORKMANSHIP SHALL CONFORM TO THE MINIMUM STANDARDS OF THE 2015 INTERNATIONAL BUILDING CODE (IBC).
4. THE CONTRACTOR SHALL EXAMINE THE CONSTRUCTION DOCUMENTS AND NOTIFY THE ENGINEER OF RECORD OF ANY DISCREPANCIES PRIOR TO PROCEEDING WITH THE WORK.
5. THESE CONSTRUCTION DOCUMENTS REPRESENT THE FINISHED STRUCTURE AND DO NOT INDICATE THE METHOD OF CONSTRUCTION. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND PROCEDURES.
6. THESE CONSTRUCTION DOCUMENTS DO NOT INCLUDE NECESSARY PROVISIONS FOR CONSTRUCTION SAFETY. THESE DOCUMENTS AND ALL PHASES OF CONSTRUCTION ARE TO BE GOVERNED BY APPLICABLE PROVISIONS OF THE CURRENT OCCUPATIONAL SAFETY AND HEALTH ACT.
7. IN THE EVENT THAT CERTAIN FEATURES OF THE CONSTRUCTION FOR THE FOUNDATIONS ARE NOT FULLY SHOWN ON THE DRAWINGS OR CALLED FOR IN THE GENERAL NOTES, THEIR CONSTRUCTION SHALL BE OF THE SAME CHARACTER AS SHOWN FOR SIMILAR CONDITIONS.
8. THE CONTRACTOR SHALL HAVE A COPY OF THE PROJECT GEOTECHNICAL INVESTIGATION ON THE JOB SITE.
9. THESE CONSTRUCTION DOCUMENTS SHALL NOT BE MODIFIED WITHOUT PRIOR WRITTEN APPROVAL OF THE ENGINEER OF RECORD.
10. ALL DIMENSIONS ARE APPROXIMATE. CONTRACTOR MUST VERIFY ALL DIMENSIONS PRIOR TO CONSTRUCTION.
11. INSTALL TURBIDITY CURTAIN AS DIRCTED BY THE OWNER TO PROVIDE SEDIMENT CONTAINMENT WHILE CONSTRUCTION ACTIVITIES ARE OCCURRING. ALL APPLICABLE ORDINANCES AND CODES REGARDING EROSION AND SEDIMENT CONTROL SHOULD BE FOLLOWED.

STEEL PILES IN CONCRETE FILLED DRILLED SHAFTS

1. SHAFTS TO BE CONSTRUCTED IN ACCORDANCE WITH TXDOT ITEM 416.
2. AUGER CAST CONCRETE SHALL BE IN ACCORDANCE WITH TXDOT ITEM 421. CONCRETE SHALL HAVE A MINIMUM ULTIMATE COMPRESSIVE STRENGTH OF $f'_c = 4,000$ PSI AT 28 DAYS WITH A MAXIMUM WATER/CEMENT RATIO OF 0.45.
3. THE CONTRACTOR SHALL CAST TEST CYLINDERS TO CHECK THE COMPRESSIVE STRENGTH.
4. THE CONTRACTOR IS RESPONSIBLE FOR ALL TESTING AND DISPOSING OF USED, BROKEN TEST SPECIMENS, UNLESS SPECIFIED OTHERWISE. ALL REPORTS SHALL BE TURNED IN TO THE INSPECTOR WITHIN 48 HOURS.
5. CONCRETE COMPRESSIVE AND FLEXURAL STRENGTH TEST SAMPLES SHALL BE RANDOMLY TAKEN AT EVERY 1/3RD THE INTERVAL/VOLUME OF THE TOTAL POUR.
6. SHAFTS AND PILES SHALL BE PLACED WITH A MAXIMUM VERTICAL PLUMBNESS TOLERANCE OF 1 INCH PER 10 FEET OF LENGTH/DEPTH.
7. REFERENCE THE PROJECT GEOTECHNICAL REPORT BY CMJ ENGINEERING, INC. DATED 07/16/2021 FOR EXPECTED SOIL CONDITIONS AND TESTING REQUIREMENTS.
8. THE PROJECT GEOTECHNICAL ENGINEER IS TO BE ON SITE DURING DRILLING OF PILE SHAFTS TO VERIFY REQUIRED RESISTANCE IS ACHIEVED.
9. PILES ARE TO BE ASTM A252, GRADE 3 (MOD) ROUND PIPE, IN ACCORDANCE WITH TXDOT ITEM 407. PILES ARE TO BE COATED WITH AN IMMERSION COATING SYSTEM MEETING THE REQUIREMENTS OF NORSOK STANDARD M-501, TO BE APPROVED BY THE ENGINEER OF RECORD. APPLY TO FULL LENGTH OF PILE.
10. PILE LENGTHS SHOWN ON PLANS ARE ESTIMATED BASED ON GEOTECHNICAL EXPLORATION FOR ROCK DEPTH LOCATION. PILES ARE REQUIRED TO BE INSTALLED A MINIMUM 10' INTO ROCK. ADDITIONAL LENGTH MAY BE REQUIRED IF VARIATIONS FROM TEST BORING LOCATIONS ARE FOUND.

GENERAL STRUCTURAL NOTES (CONT.)

CONCRETE FOUNDATIONS (TETHER BLOCKS)

1. CONCRETE FOUNDATIONS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH TXDOT ITEM 420 AND 421.
2. CONCRETE FOR FOUNDATIONS SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 5,000 PSI AT 28 DAYS AND SHALL MEET THE REQUIREMENTS OF TYPE C CONCRETE AS STATED IN TXDOT ITEM 421.
3. ALL CONCRETE WORK SHALL COMPLY WITH IBC CHAPTER 19, ACI 318-14 AND THE LATEST EDITION OF THE ACI MANUAL OF CONCRETE PRACTICE.
4. ALL REINFORCING TO ASTM A615, GRADE 60.
5. REINFORCING IS TO BE LOCATED AS SHOWN ON THE PLANS AND HELD FIRMLY IN PLACE BEFORE AND DURING CONCRETE PLACEMENT USING BAR SUPPORTS THAT ARE ADEQUATE TO PREVENT DISPLACEMENT. BAR SUPPORTS IN CONTACT WITH SOIL OR SUBGRADE MUST BE APPROVED BY THE ENGINEER OF RECORD PRIOR TO USE.
6. REINFORCING BARS TO BE CLEAN OF RUST, GREASE OR OTHER MATERIAL LIKELY TO IMPAIR BOND.
7. VIBRATE ALL CONCRETE AS IT IS PLACED WITH A MECHANICAL VIBRATOR OPERATED BY EXPERIENCED PERSONNEL.
8. ALL CONCRETE SHALL BE WELL CONSOLIDATED AND THE MORTAR FLUSHED TO THE FORM SURFACES WITH IMMERSION TYPE VIBRATORS. VIBRATORS WHICH OPERATE BY ATTACHMENT TO FORMS OR REINFORCEMENT WILL NOT BE PERMITTED, EXCEPT ON STEEL FORMS. AT LEAST ONE (1) STAND-BY VIBRATOR SHALL BE PROVIDED FOR EMERGENCY USE IN ADDITION TO THOSE REQUIRED FOR PLACEMENT.
9. CONCRETE SHALL BE MAINTAINED IN A MOIST CONDITION FOR A MINIMUM OR 7 DAYS AFTER PLACEMENT OR CONCRETE SURFACES SHALL BE CURED WITH LIQUID MEMBRANE-FORMING CURING COMPOUND CONFORMING TO ASTM C309, TYPE 1, CLASS 1.
10. CONCRETE MIX DESIGN SHALL BE PREPARED BY THE CONCRETE SUPPLY PLANT. MIX DESIGN, INCLUDING CURRENT SUPPORTING DOCUMENTATION, SHALL BE SUBMITTED TO THE ENGINEER OF RECORD FOR REVIEW AND APPROVAL.
11. CONCRETE STRENGTH SHALL BE VERIFIED BY STANDARD CYLINDER TESTS (IN ACCORDANCE WITH IBC SECTION 1705.3) MADE BY AN APPROVED TESTING LABORATORY.

GRADING

1. RESTORE SOIL PROFILE TO THE ORIGINAL CONDITION FOLLOWING COMPLETION OF TETHER BLOCK CONSTRUCTION.

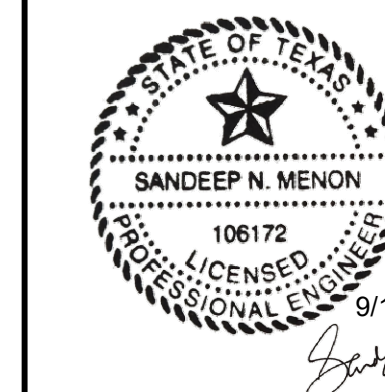


VICINITY MAP

DESIGN CRITERIA

- GOVERNING CODES:**
- AMERICAN SOCIETY OF CIVIL ENGINEERS, MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES (ASCE/SEI 7-10)
- FOR MOORING PILE DESIGN:**
- AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, 6 TH EDITION
- SITE CONDITIONS:**
- DESIGN WIND SPEED: 100 mph
 - MAXIMUM FLOW VELOCITY BASED ON 100 YEAR FLOOD FOR REVISED HEC-RAS MODEL (UPPER TRINITY RIVER CDC MODEL_TRASHWHEEL):
WEST FORK = 4.10 FT/S CLEAR FORK = 8.16 FT/S
- FOR TETHER FOUNDATION DESIGN:**
- 2015 INTERNATIONAL BUILDING CODE (IBC)
 - ACI 318-14 BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE
 - AISC 14TH EDITION - STEEL CONSTRUCTION MANUAL; SPECIFICATION FOR STRUCTURAL STEEL BUILDINGS (ANSI/AISC 360-10)

PROFESSIONAL ENGINEER



REV	DESCRIPTION	DRN	CHK	REV	APP	DATE
0	FOR PERMIT					9/19/22

ENERCON
FORT WORTH, TX

CITY OF FORT WORTH
FORT WORTH, TEXAS

TRINITY RIVER TRASH WHEEL
GENERAL NOTES

SIZE	DWG NO.	REV
D	FWTHS-00259-DWG-S101	0
SCALE	NONE	SHEET 1 of 1

SHEET NOTES

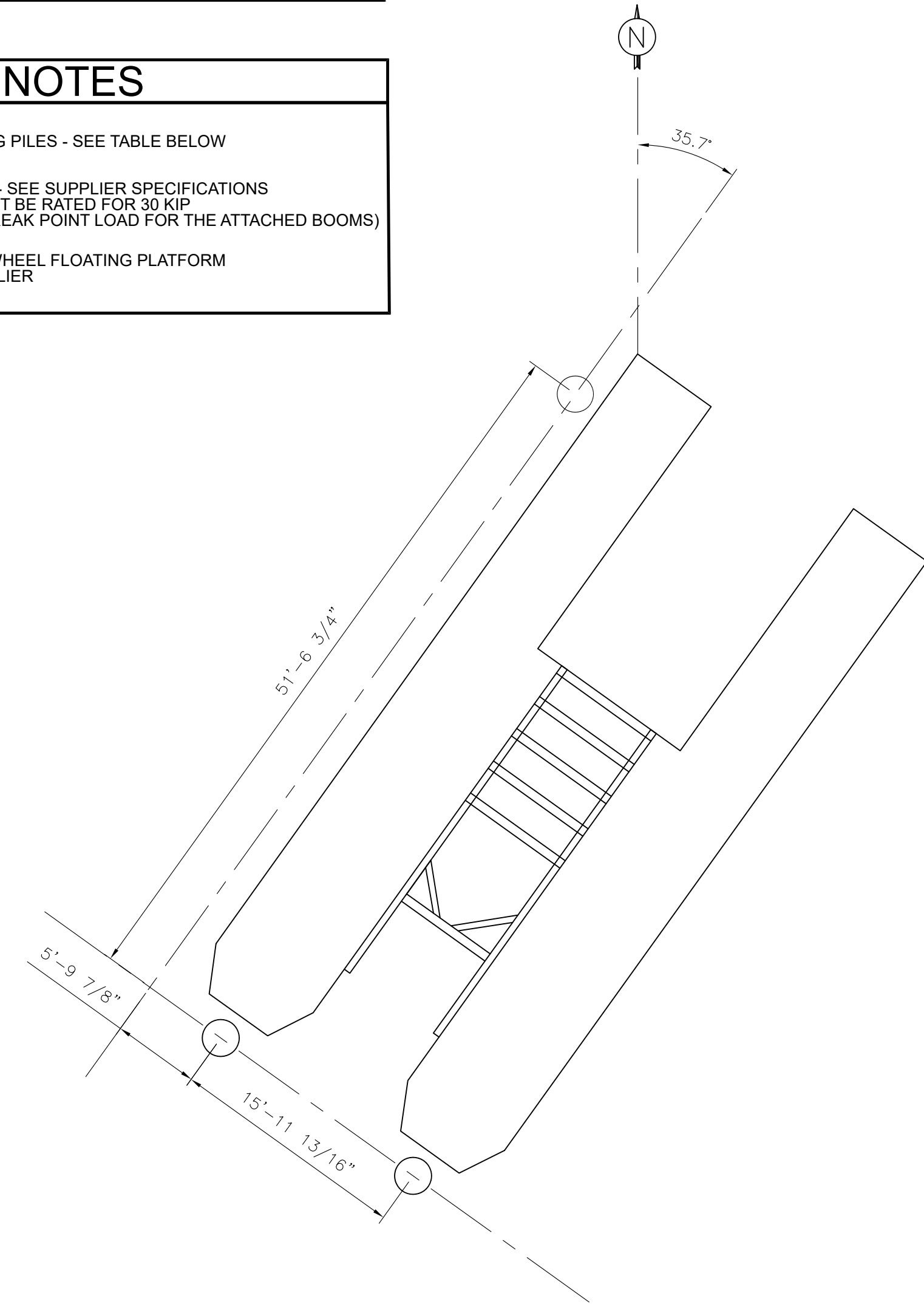
1. INSTALL PER GENERAL NOTES DRAWING FWTHS-00259-DWG-S101 AND TRASH WHEEL SUPPLIER SPECIFICATIONS.

KEY NOTES

1 MOORING PILES - SEE TABLE BELOW

2 HELICAL - SEE SUPPLIER SPECIFICATIONS AND MUST BE RATED FOR 30 KIP (SAFE BREAK POINT LOAD FOR THE ATTACHED BOOMS)

3 TRASH WHEEL FLOATING PLATFORM BY SUPPLIER

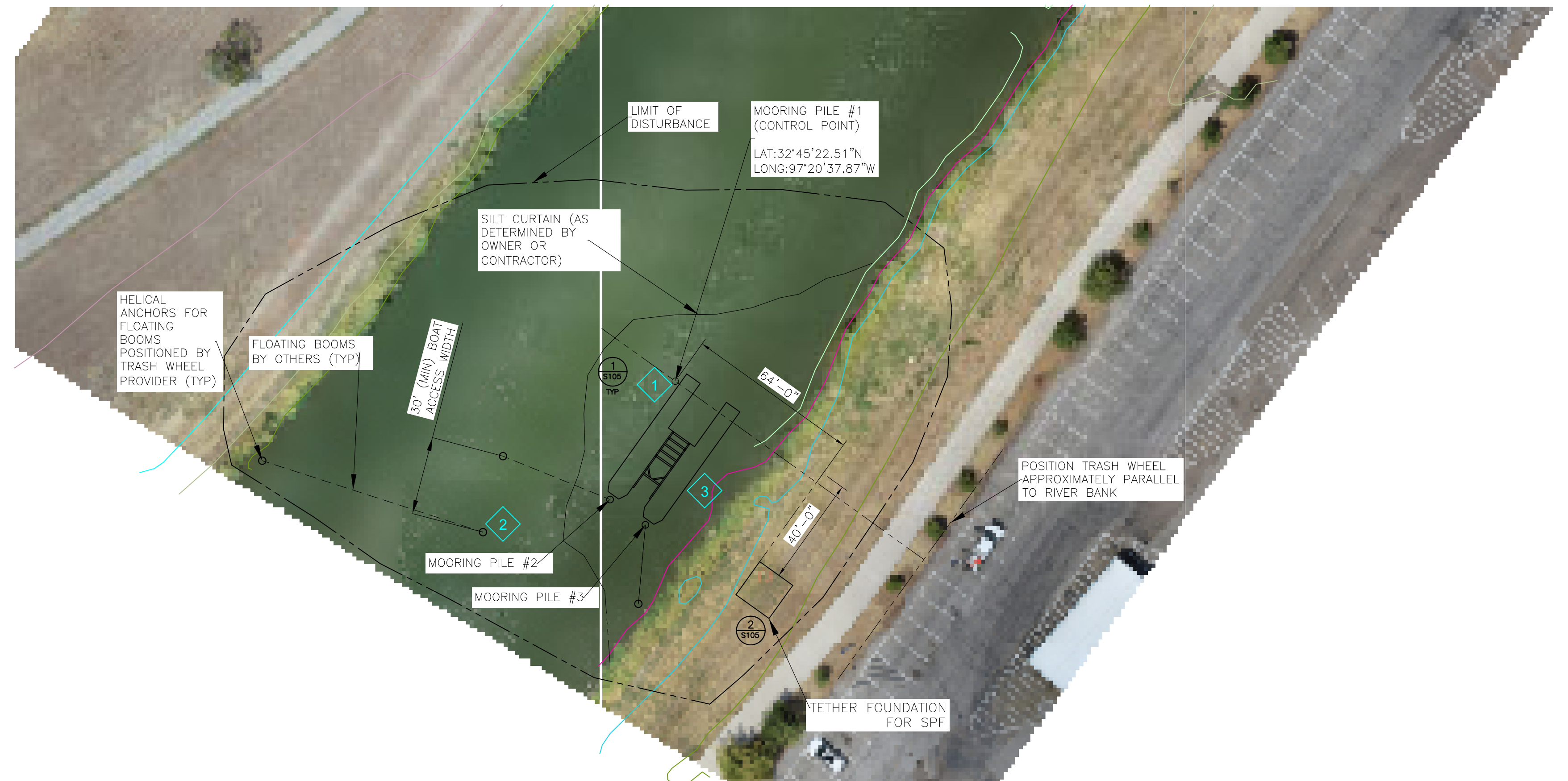


MOORING PILES
SCALE: 1/8" = 1'-0"

PILE #	DIAMETER inches	THICKNESS inches	ELEVATIONS (1) feet			TOTAL LENGTH (1) feet
			TOP	MUDLINE	BOTTOM	
CLEAR FORK #1	30	3/4	542	514.15	480	62
CLEAR FORK #2				514.37		
CLEAR FORK #3				515.48		

(1) elevations/lengths may vary based on field conditions

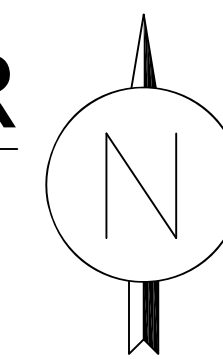
THE MUDLINE ELEVATION IS BASED ON THE PILE LOCATIONS POSITIONED IN THE PROJECT HEC-RAS UPPER TRINITY RIVER CDC MODEL. THE BOTTOM ELEVATION IS BASED ON THE LOCATION OF ROCK PROVIDED IN THE PROJECT GEOTECHNICAL REPORT. BOTTOM ELEVATION IS BASED ON A MINIMUM 10' EMBEDMENT INTO ROCK. THE TOTAL LENGTH WITH VARY BASED ON ACTUAL FIELD CONDITIONS AT THE LOCATIONS. PILES MUST BE EMBEDDED 10' (MIN) INTO ROCK. THESE ESTIMATES ARE PROVIDED FOR BIDDING PURPOSES.



PLAN
CLEAR FORK TRINITY RIVER

SCALE: 1/32" = 1'-0"

NO SURVEY WAS PERFORMED IN THE DEVELOPMENT OF THESE CONSTRUCTION DOCUMENTS. PLACEMENT OF THE TRASH WHEEL AND PILES IN THE PLAN ABOVE IS BASED ON AERIAL IMAGING FROM DRONE FOOTAGE TAKEN BY ENERCON. PILE #1 IS THE CONTROL POINT AND SHOULD BE PLACED AT THE COORDINATES SPECIFIED ABOVE. THE REMAINING TWO PILES SHALL BE INSTALLED BASED ON THE ANGLE AND DIMENSIONS PROVIDED IN THE MOORING PILE DETAIL. THE DIMENSIONS BETWEEN PILES MUST BE CONFIRMED WITH CLEARWATER MILLS MANUFACTURE DRAWINGS PRIOR TO INSTALLATION.



REV	DESCRIPTION	DRN	CHK	REV	APP	DATE
0	FOR PERMIT	TF	SM	BP		9/19/22

PROFESSIONAL ENGINEER

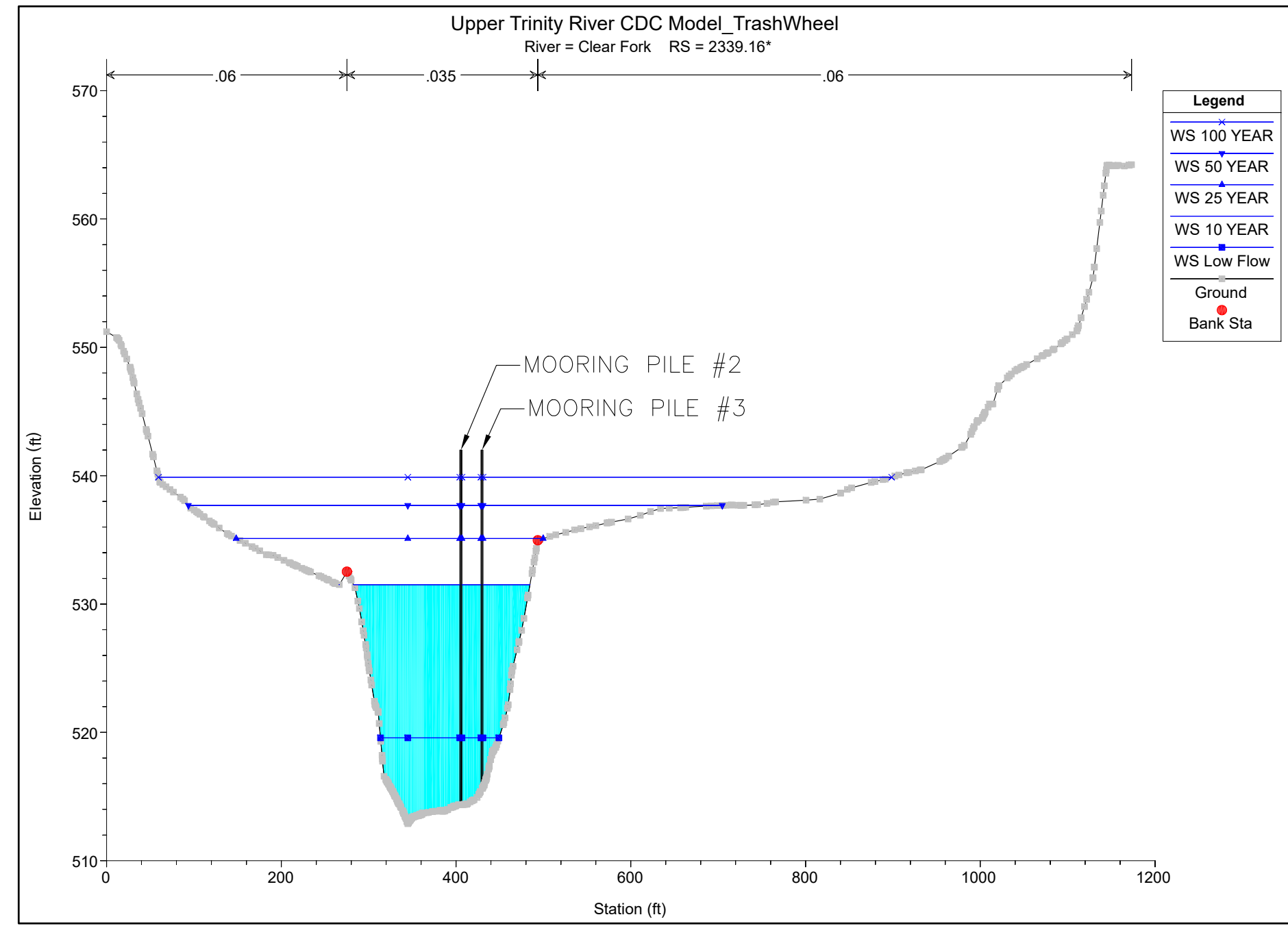
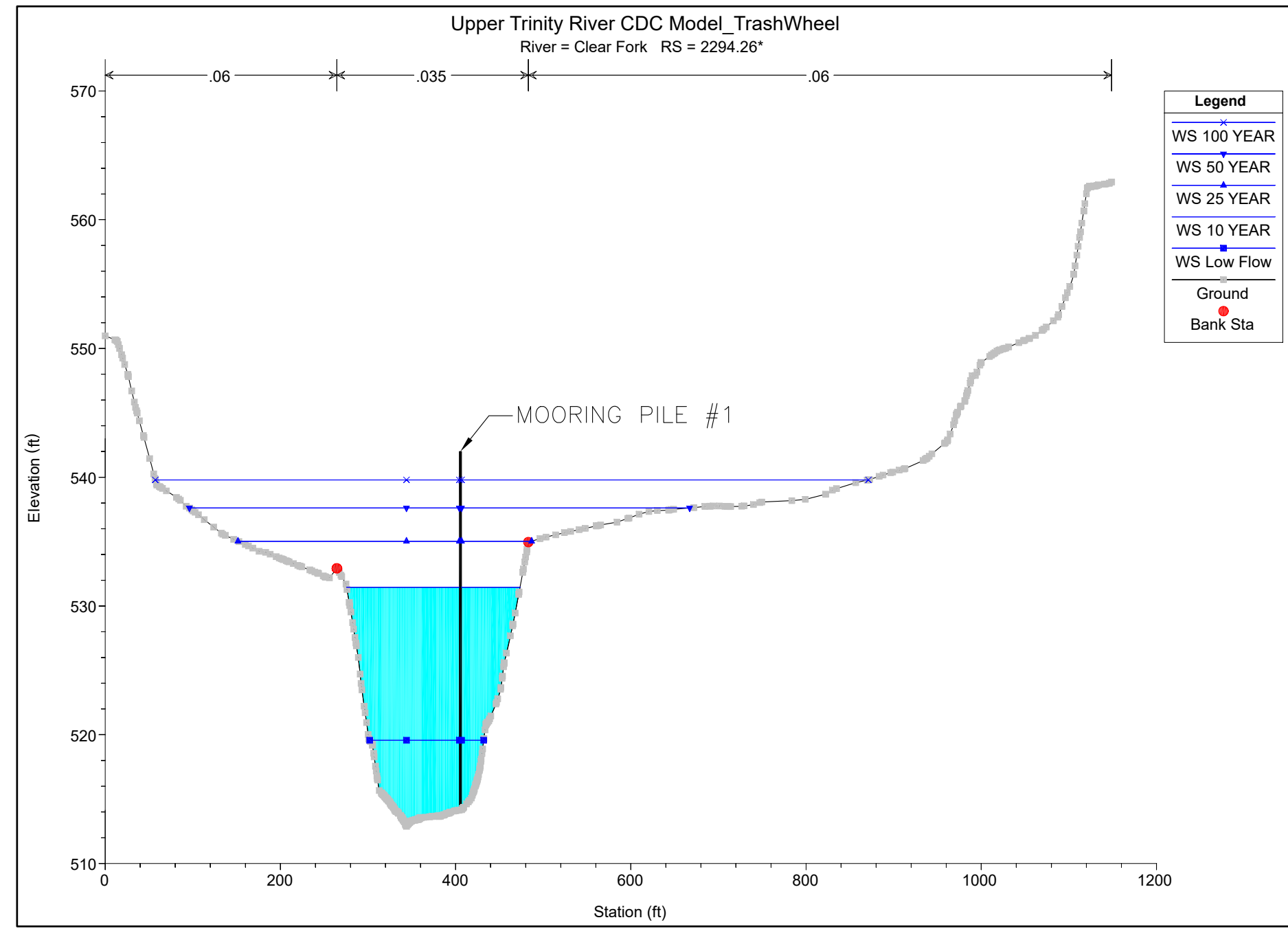
 SANDEEP N. MENON
 106172
 LICENSED PROFESSIONAL ENGINEER
 9/19/22

ENERCON
FORT WORTH, TX

CITY OF FORT WORTH
FORT WORTH, TEXAS

TRINITY RIVER TRASH WHEEL
CLEAR FORK SITE PLAN

SIZE DWG NO. D FWTHS-00259-DWG-S103 REV 0
 SCALE AS SHOWN SHEET 1 of 1



RIVER PROFILES
 SCALE: AS SHOWN

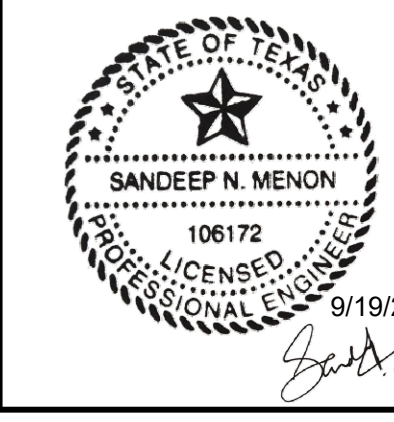
0	FOR PERMIT	TF	SM	BP	9/19/22
REV	DESCRIPTION	DRN	CHK	REV	APP

PROFESSIONAL ENGINEER

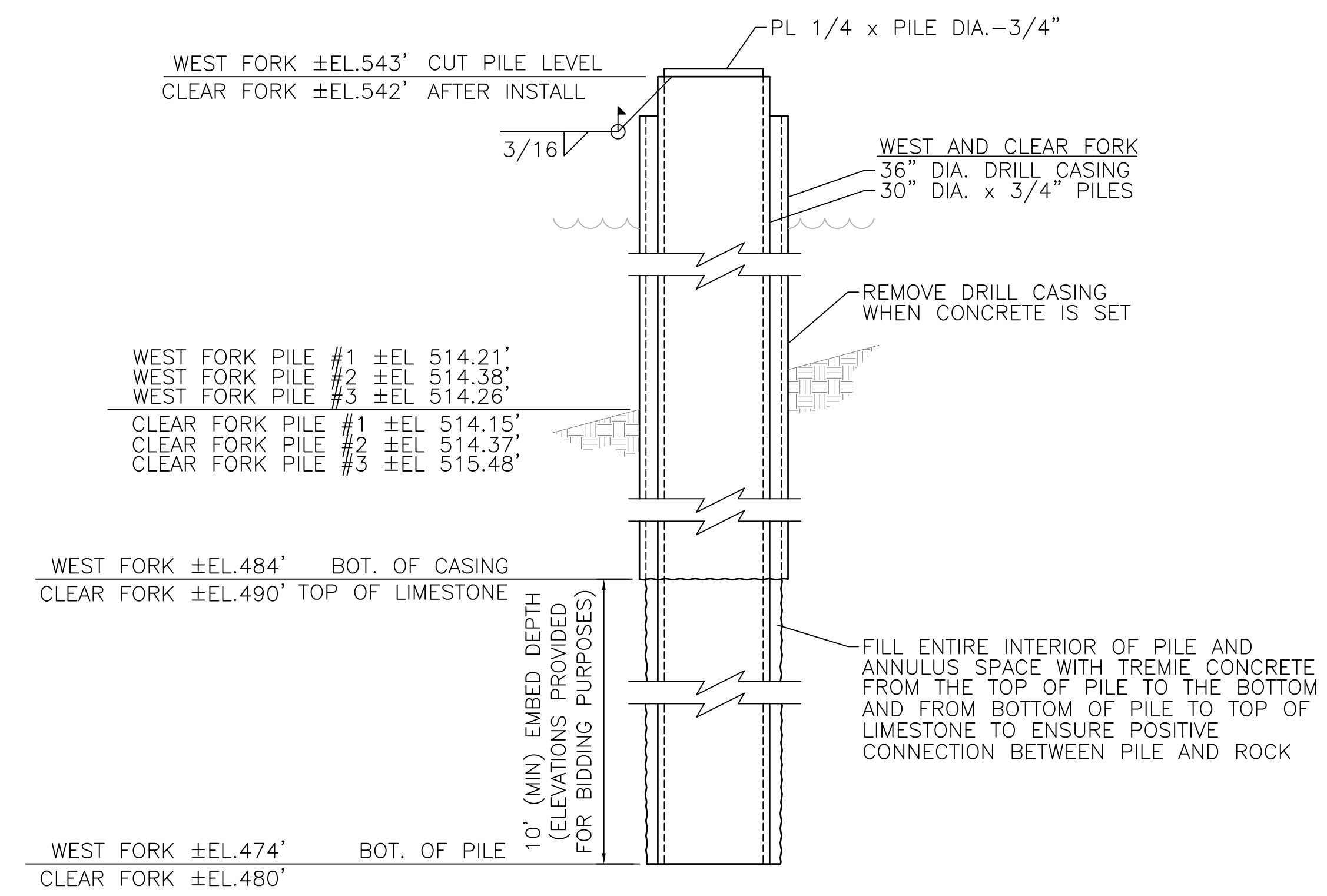


FORT WORTH, TX
 CITY OF FORT WORTH
 FORT WORTH, TEXAS

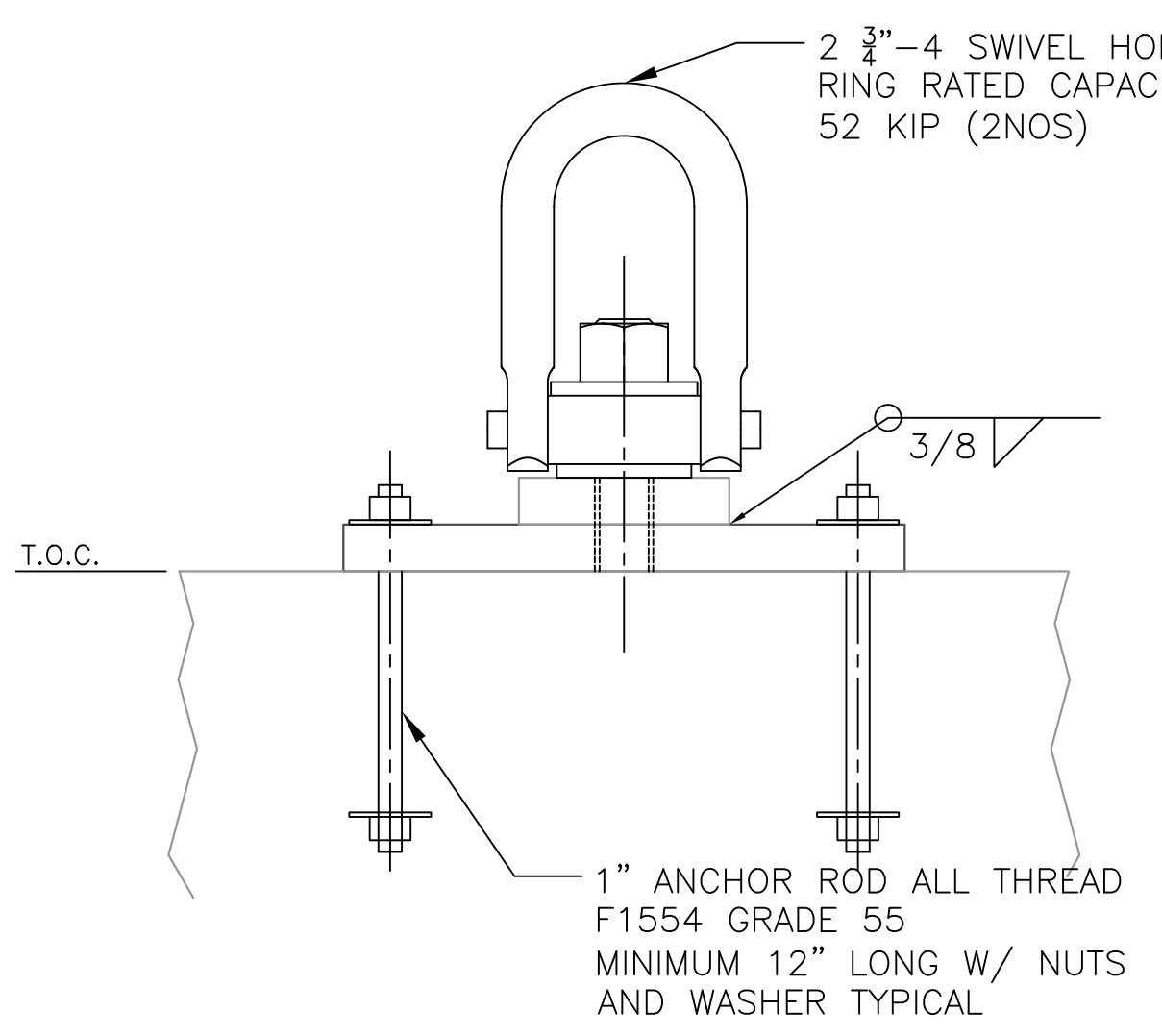
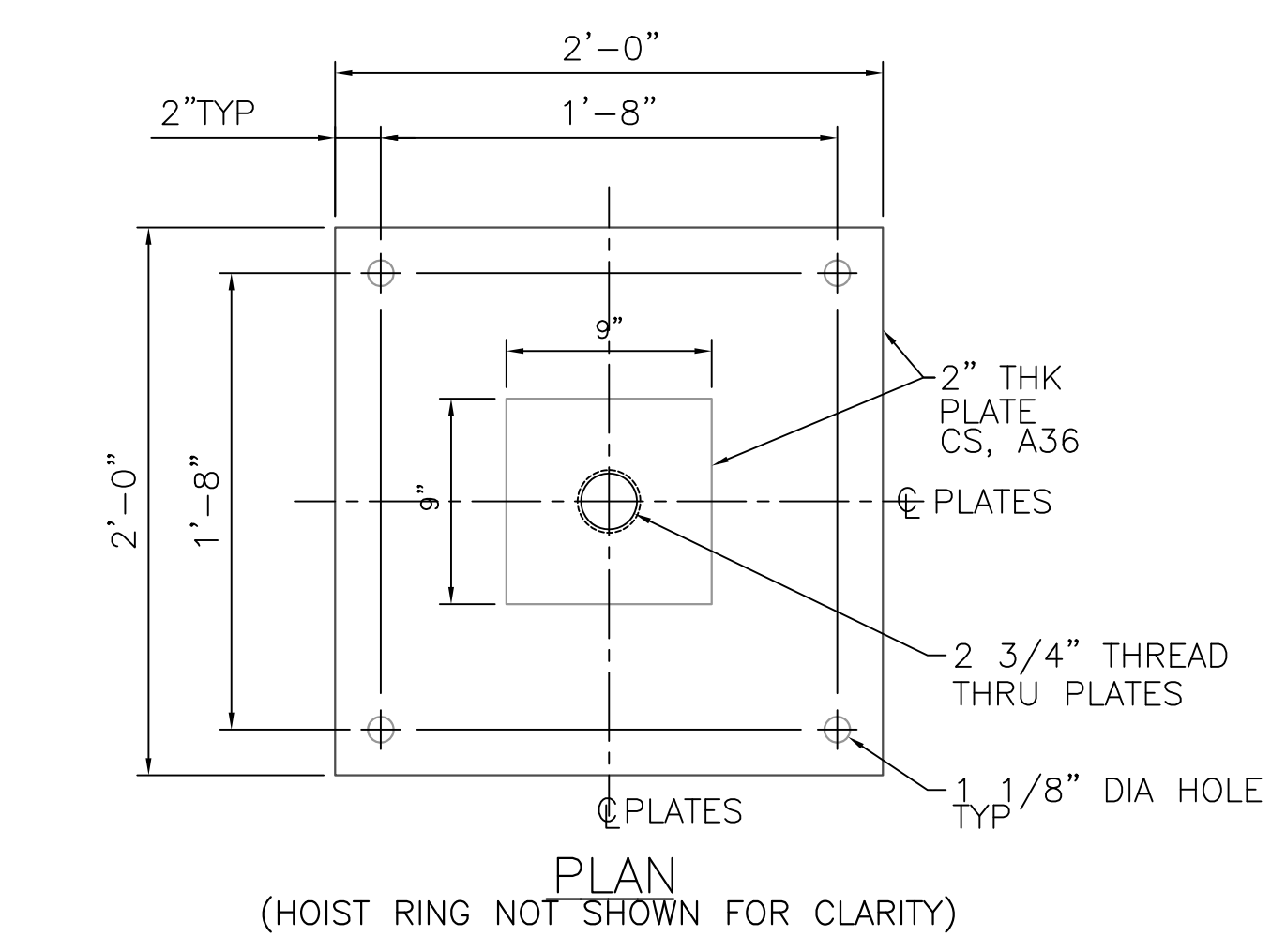
TRINITY RIVER TRASH WHEEL
 WEST FORK / CLEAR FORK PROFILES



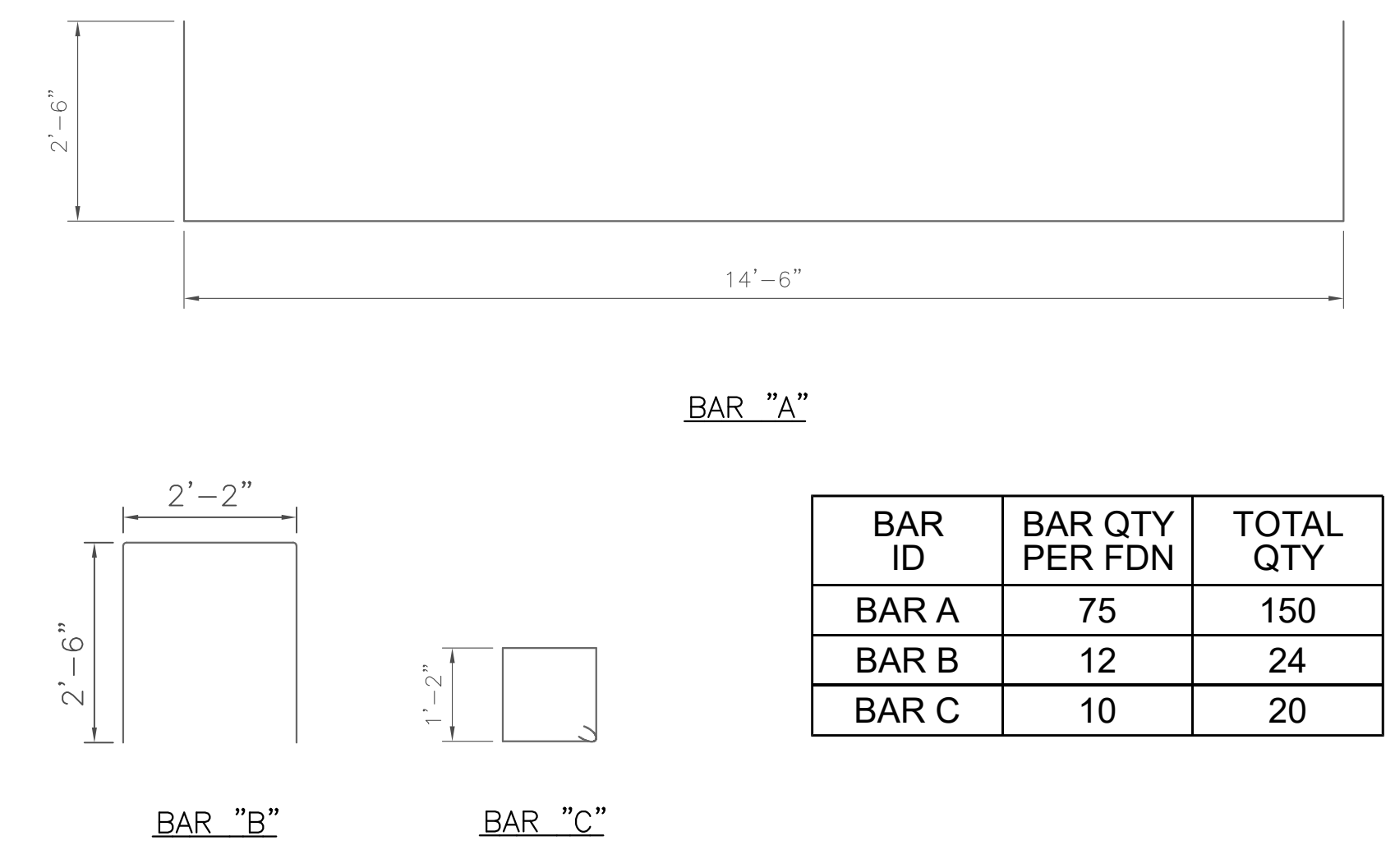
SIZE	DWG NO.	REV
D	FWTHS-00259-DWG-S104	0
SCALE AS SHOWN		SHEET 1 of 1



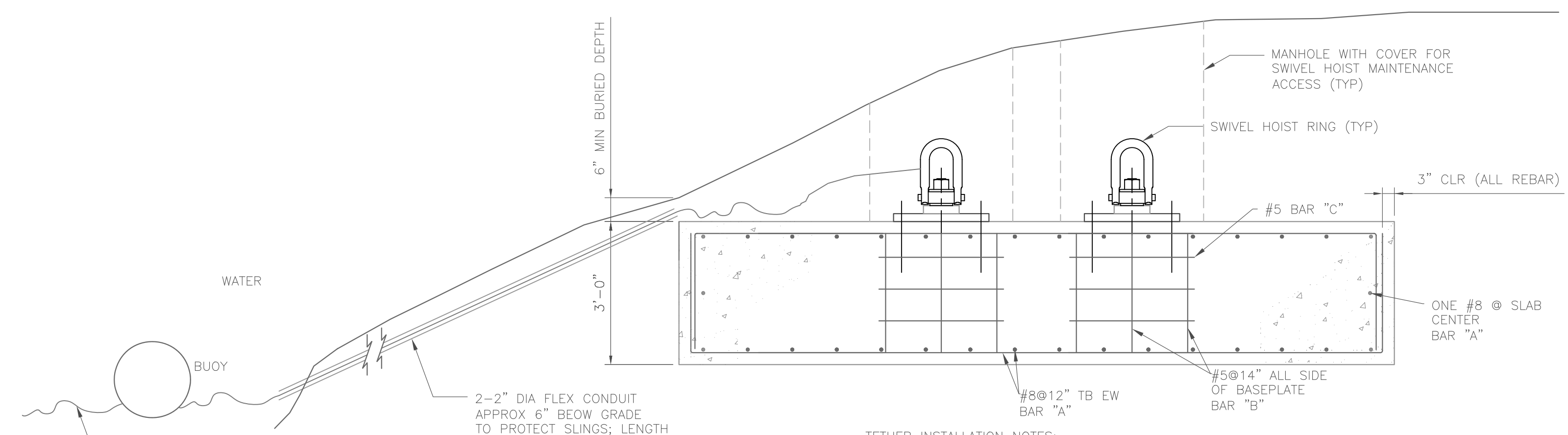
1 PILE CAP
S105 SCALE: N.T.S.



3 ANCHOR DETAIL
S105 SCALE: N.T.S.
NOTE: MAX 1" THICK GROUT SHALL BE USED TO ASSURE THE PLATE HAS AT LEAST 80% BEARING ON CONCRETE

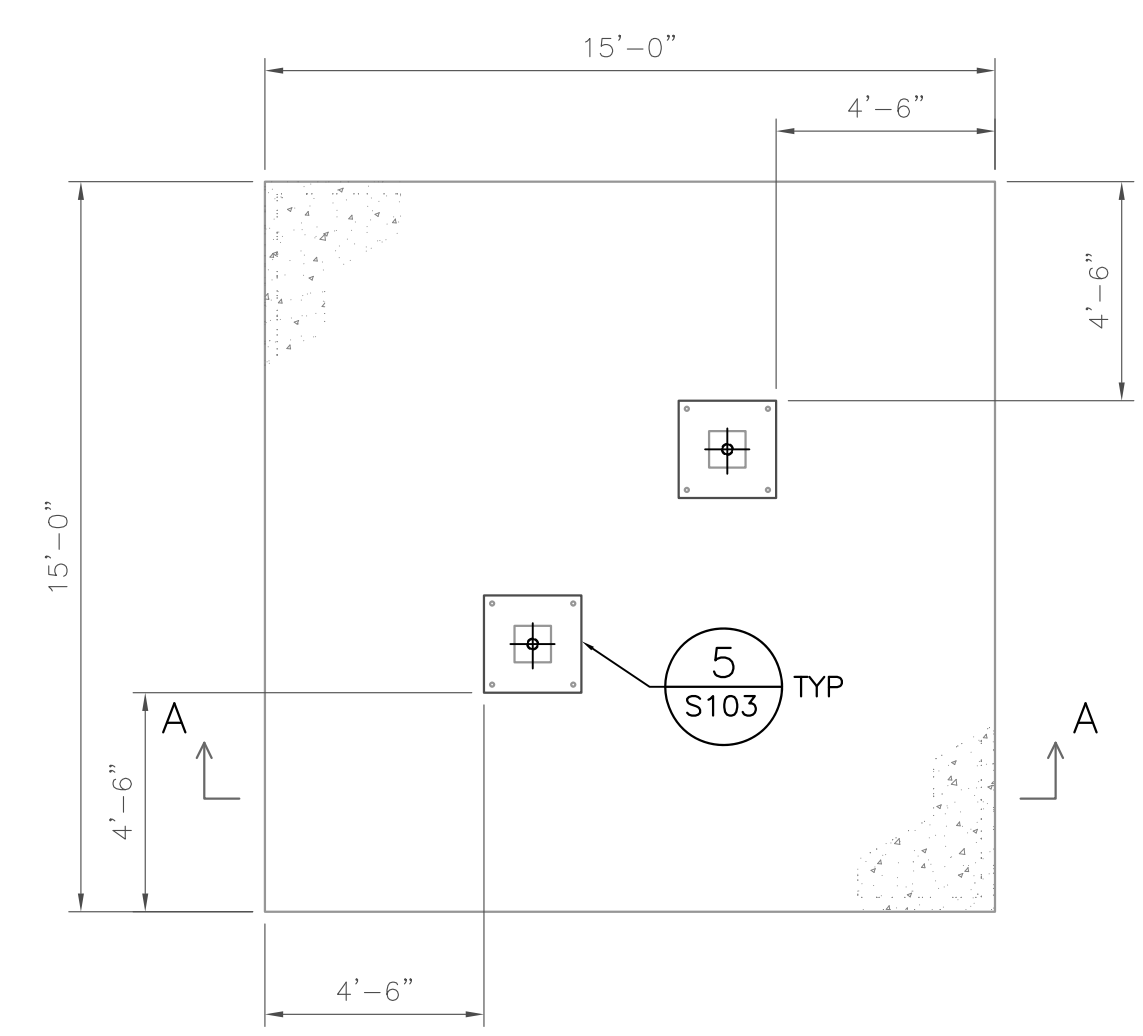


REBAR SCHEDULE
SCALE: 1/2" = 1'-0"

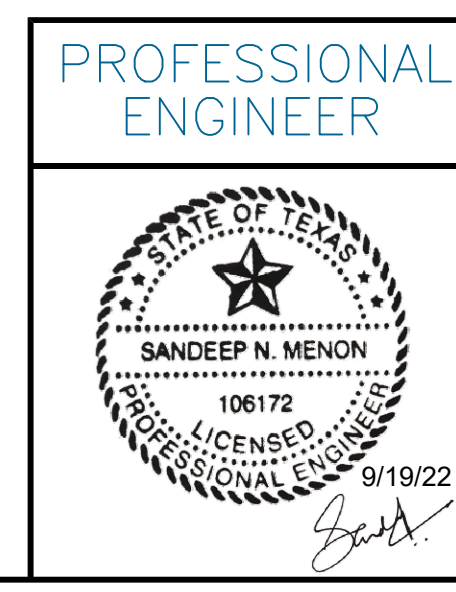


- TETHER INSTALLATION NOTES:
- TETHER SLING RATED CAPACITY 55 KIP
 - APPROXIMATE LENGTH = L1 + L2
WEST FORK = 225'
L1 = LENGTH FROM SWIVEL TO BUOY = 160'
L2 = LENGTH OF SLACK = 65'
CLEAR FORK = 150'
L1 = LENGTH FROM SWIVEL TO BUOY = 95'
L2 = LENGTH OF SLACK = 65'

TETHER FOUNDATION SECTION A-A
SCALE: 1/2" = 1'-0"



2 TETHER FOUNDATION PLAN
S105 SCALE: 1/4" = 1'-0"



REV	DESCRIPTION	DRN	CHK	REV	APP	DATE
0	FOR PERMIT	TF	SM	BP		9/19/22

PROFESSIONAL ENGINEER

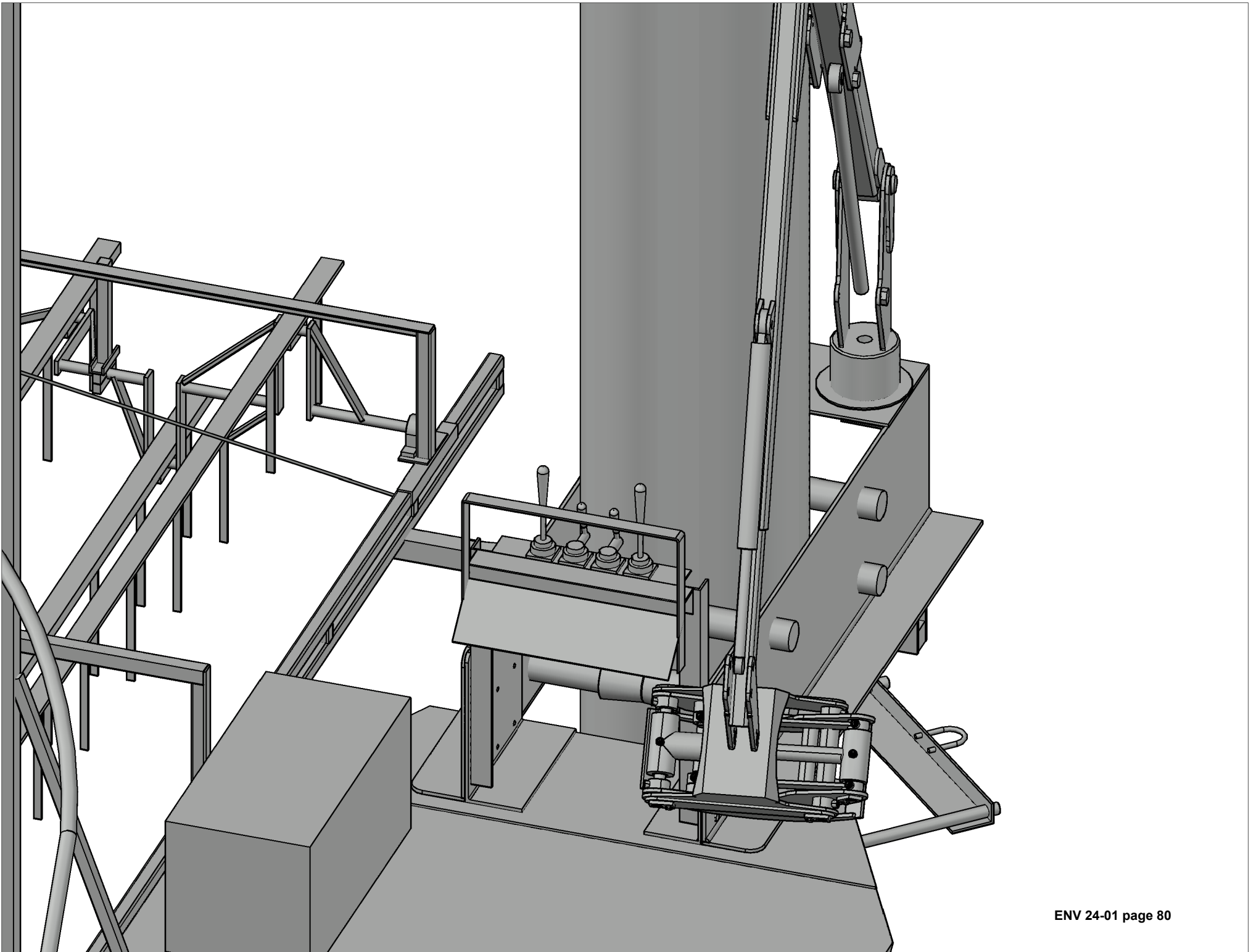
ENERCON
FORT WORTH, TX

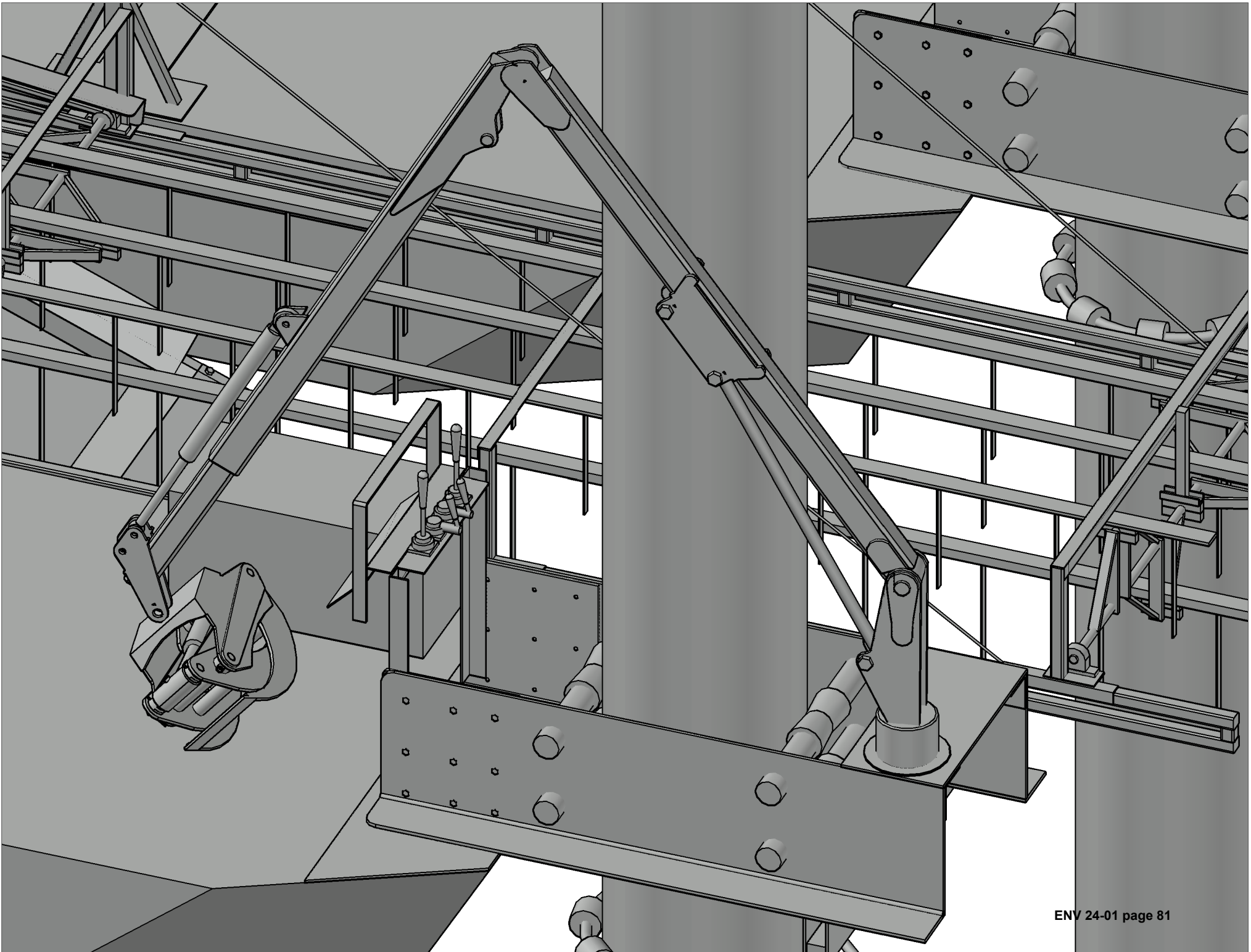
CITY OF FORT WORTH
FORT WORTH, TEXAS

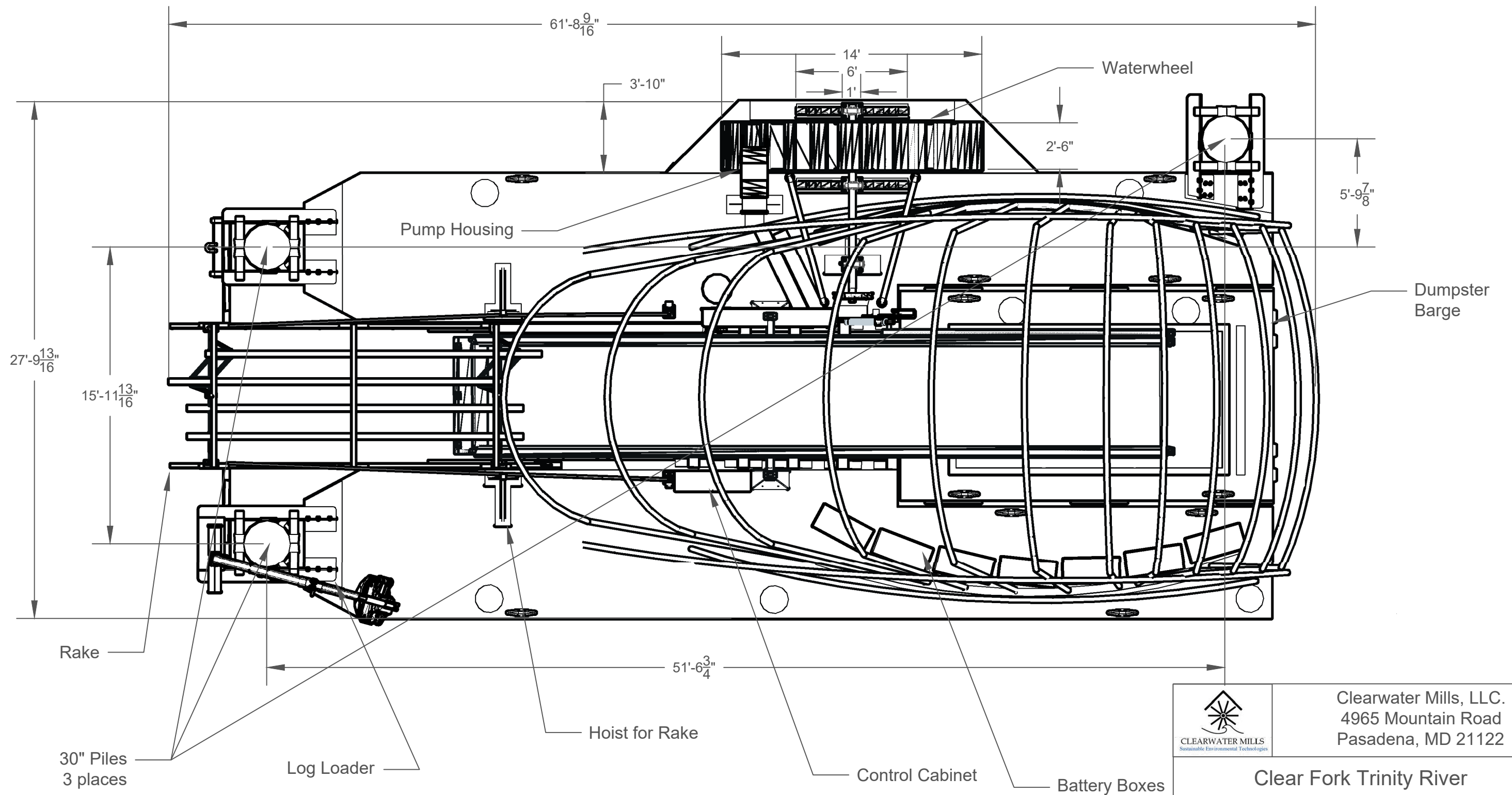
TRINITY RIVER TRASH WHEEL
STRUCTURAL & FOUNDATION DETAILS


SIZE DWG NO. D FWTHS-00259-DWG-S105 REV 0

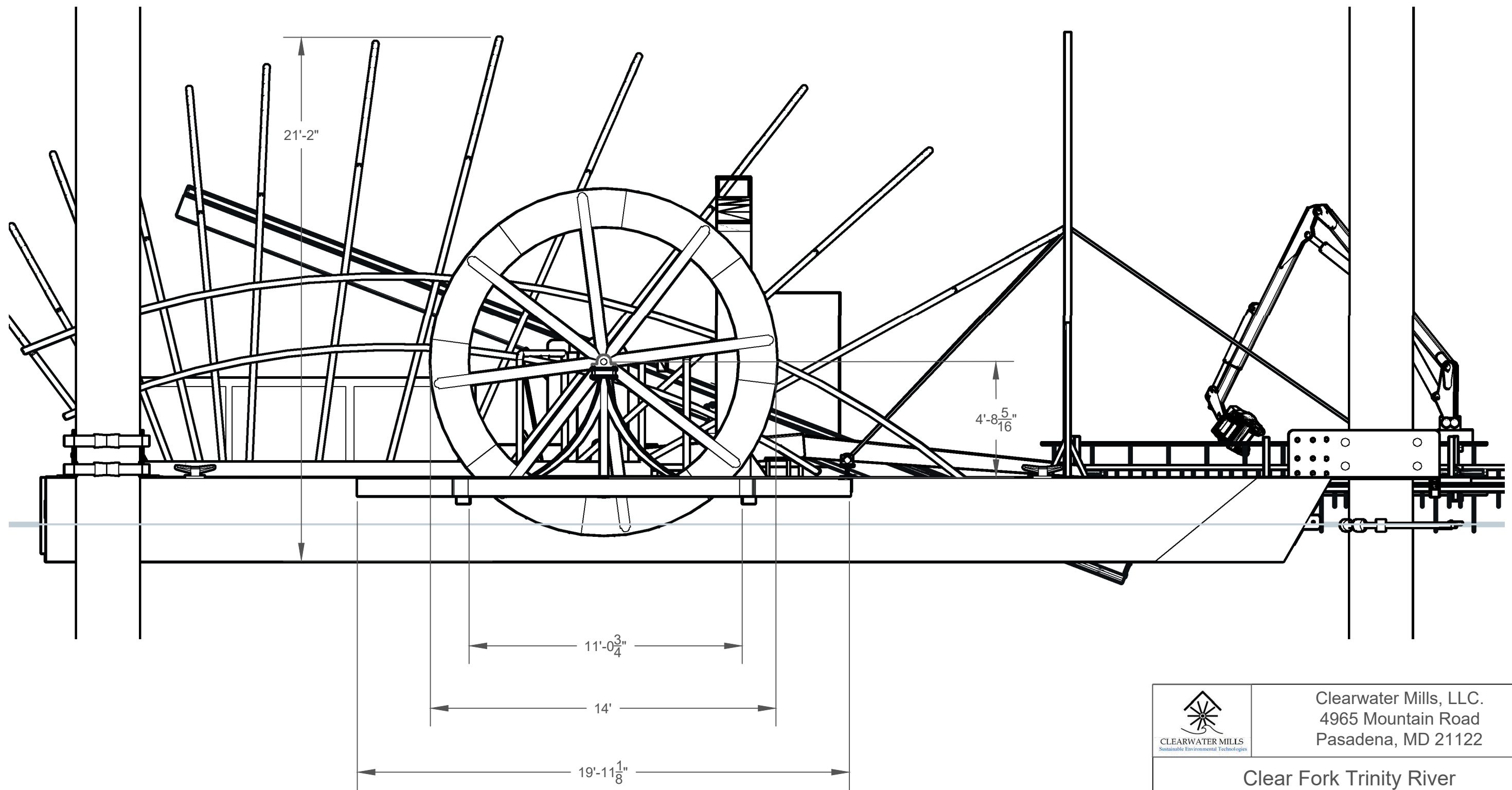
SCALE AS SHOWN SHEET 1 of 1







 CLEARWATER MILLS Sustainable Environmental Technologies	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122
	Clear Fork Trinity River Trash Wheel Plan View
Date 9/9/2022 3/16" = 1'	Page 1 of 19



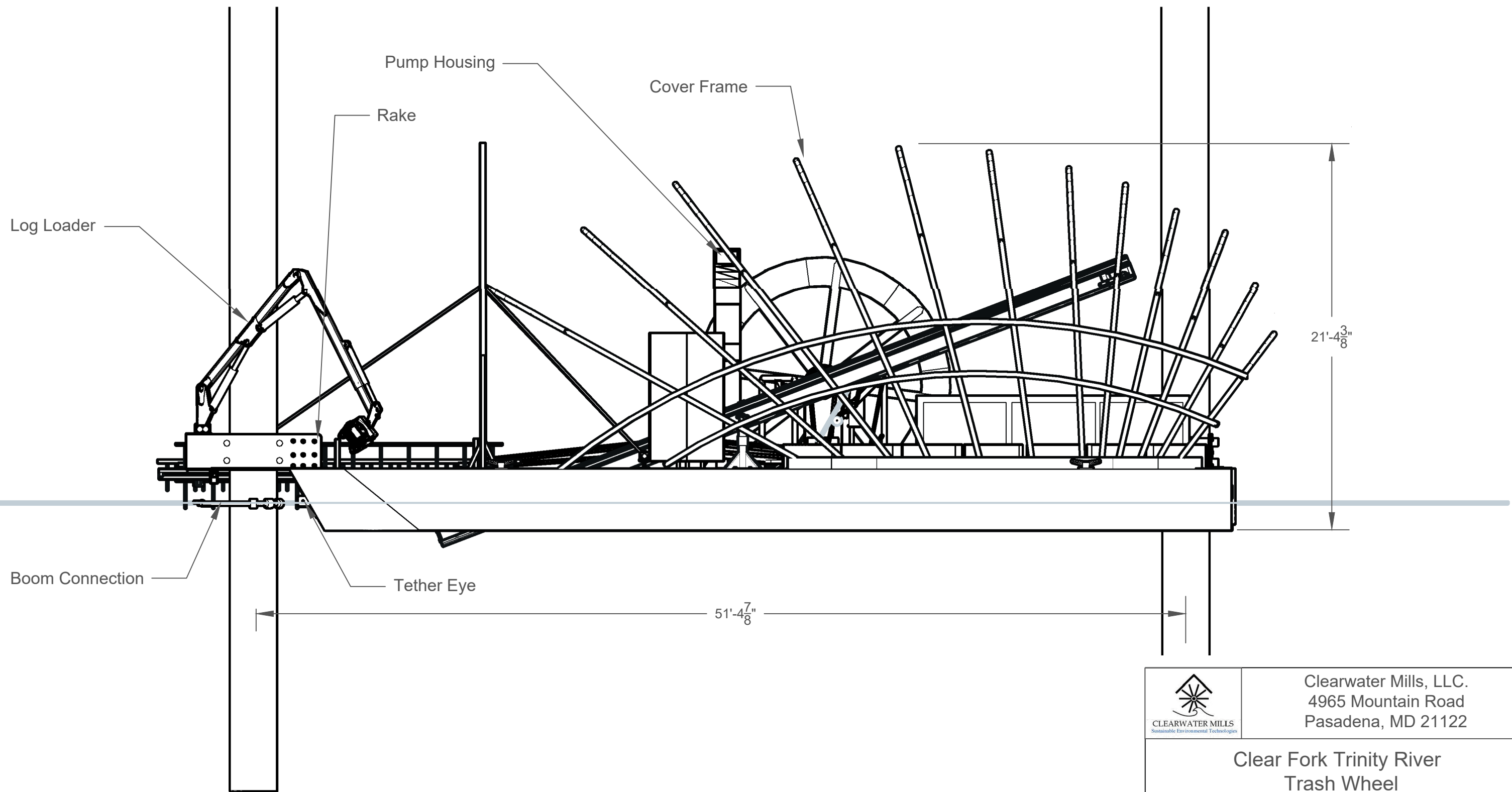
Clearwater Mills, LLC.
 4965 Mountain Road
 Pasadena, MD 21122

Clear Fork Trinity River
 Trash Wheel
 Elevation

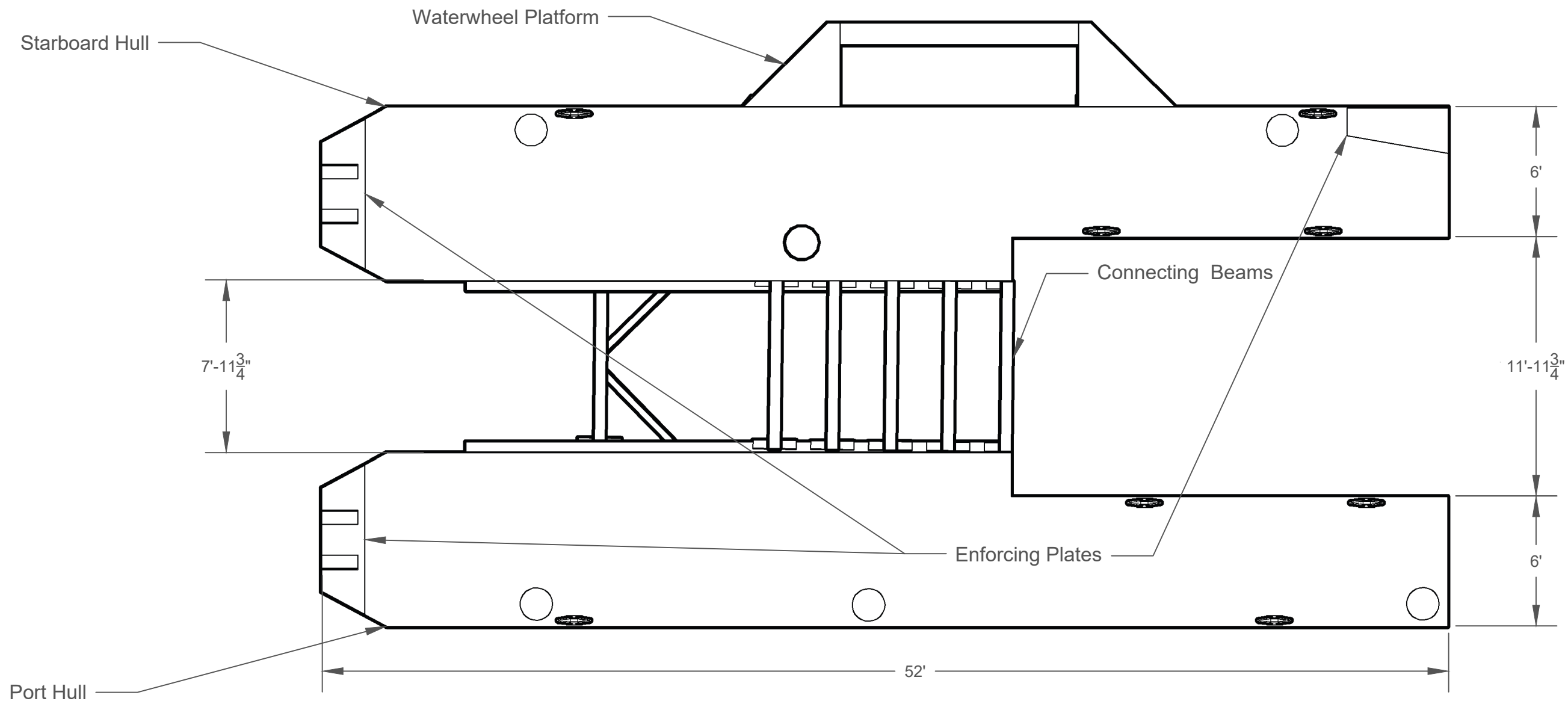
Date 9/9/2022

1/4" = 1'

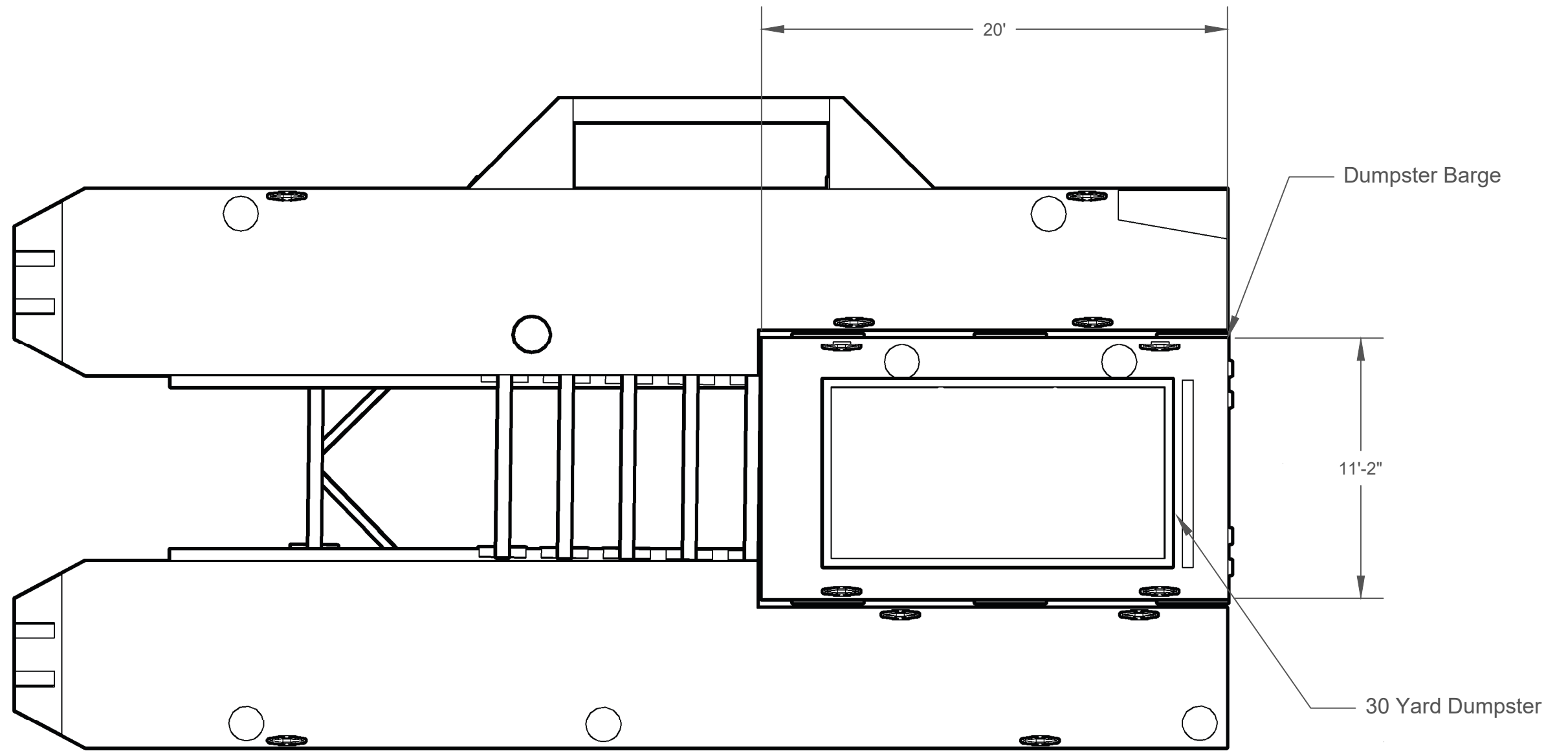
Page 2 of 19



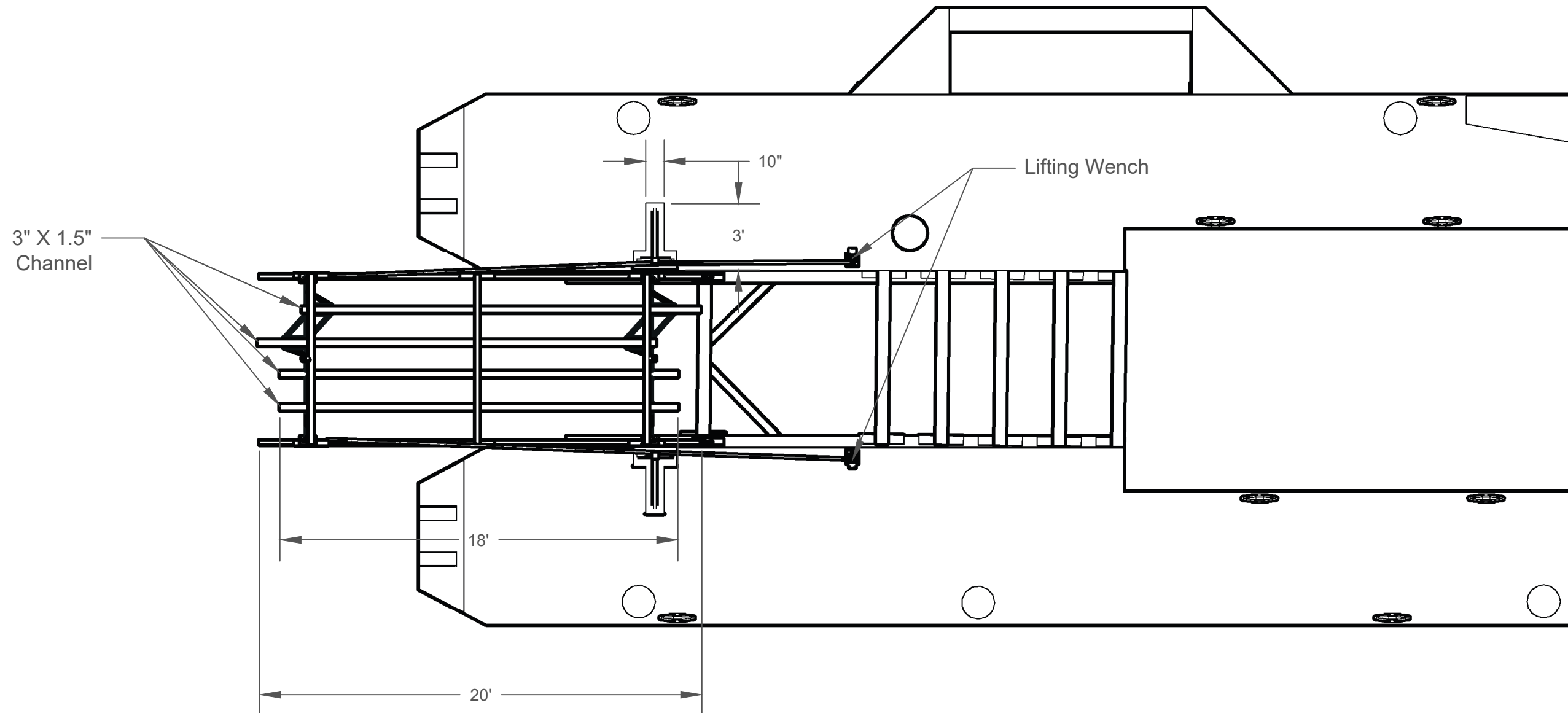
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Clear Fork Trinity River Trash Wheel Elevation		
Date 6/30/2022	3/16" = 1'	Page 3 of 19




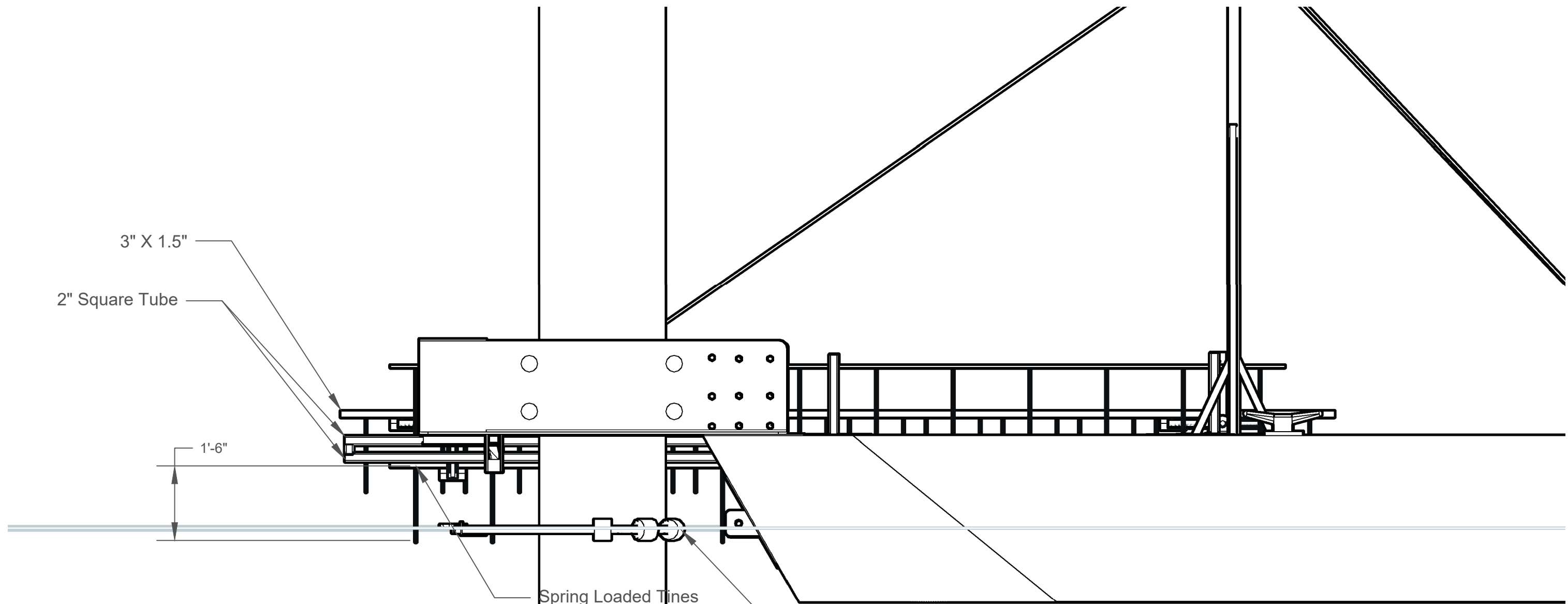
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<p>Clear Fork Trinity River Trash Wheel Hull Layout</p>		
<p>Date 6/30/2022</p>	<p>3/16" = 1'</p>	<p>Page 4 of 19</p>



 CLEARWATER MILLS <small>Sustainable Environmental Technologies</small>	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122	
Clear Fork Trinity River Trash Wheel Dumpster Barge		
Date 6/30/2022	3/16" = 1'	Page 5 of 19



 CLEARWATER MILLS <small>Sustainable Environmental Technologies</small>	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122
Clear Fork Trinity River Trash Wheel Rake	
Date 6/30/2022	3/16" = 1'
Page 6 of 19	



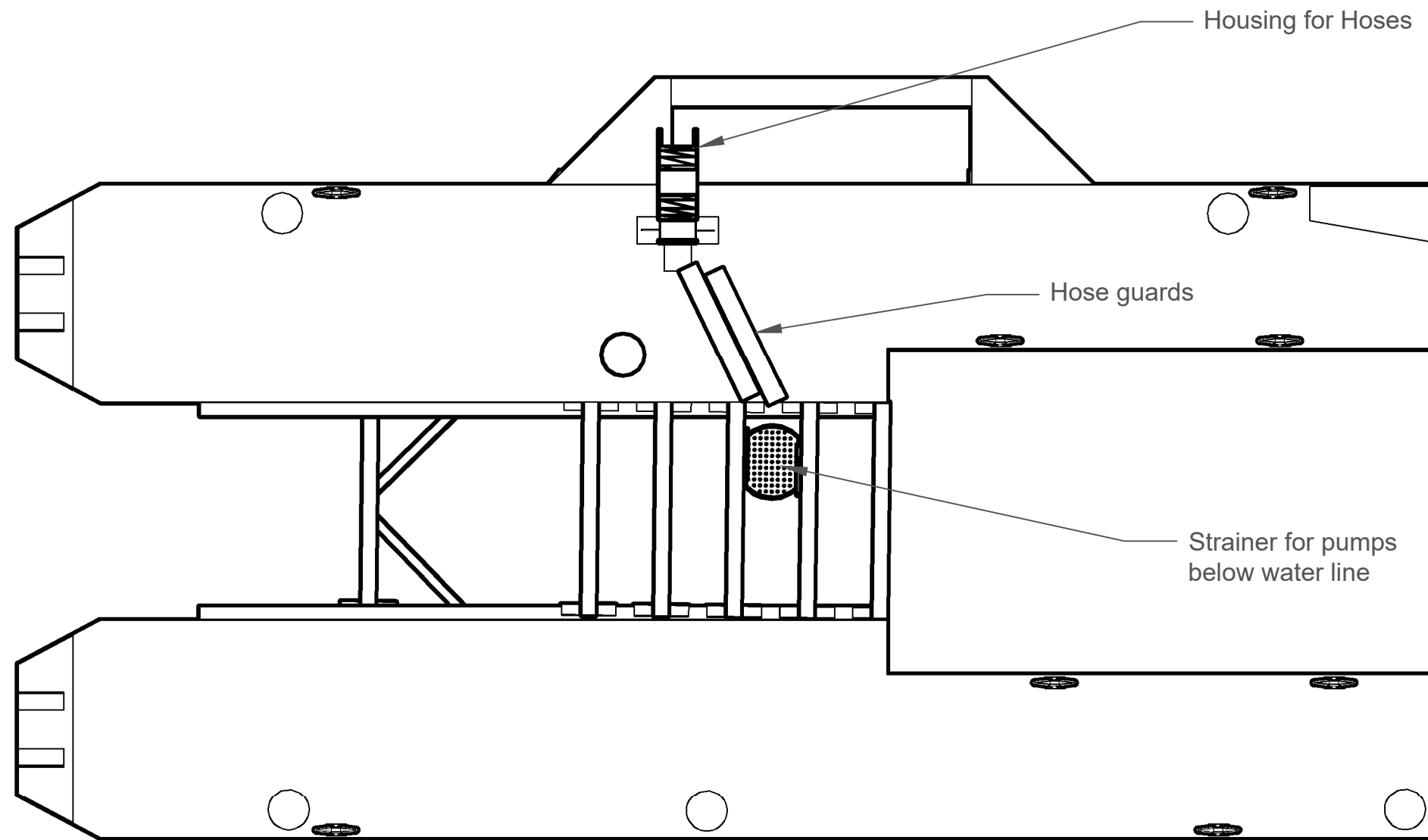
3" X 1.5"
2" Square Tube

1'-6"

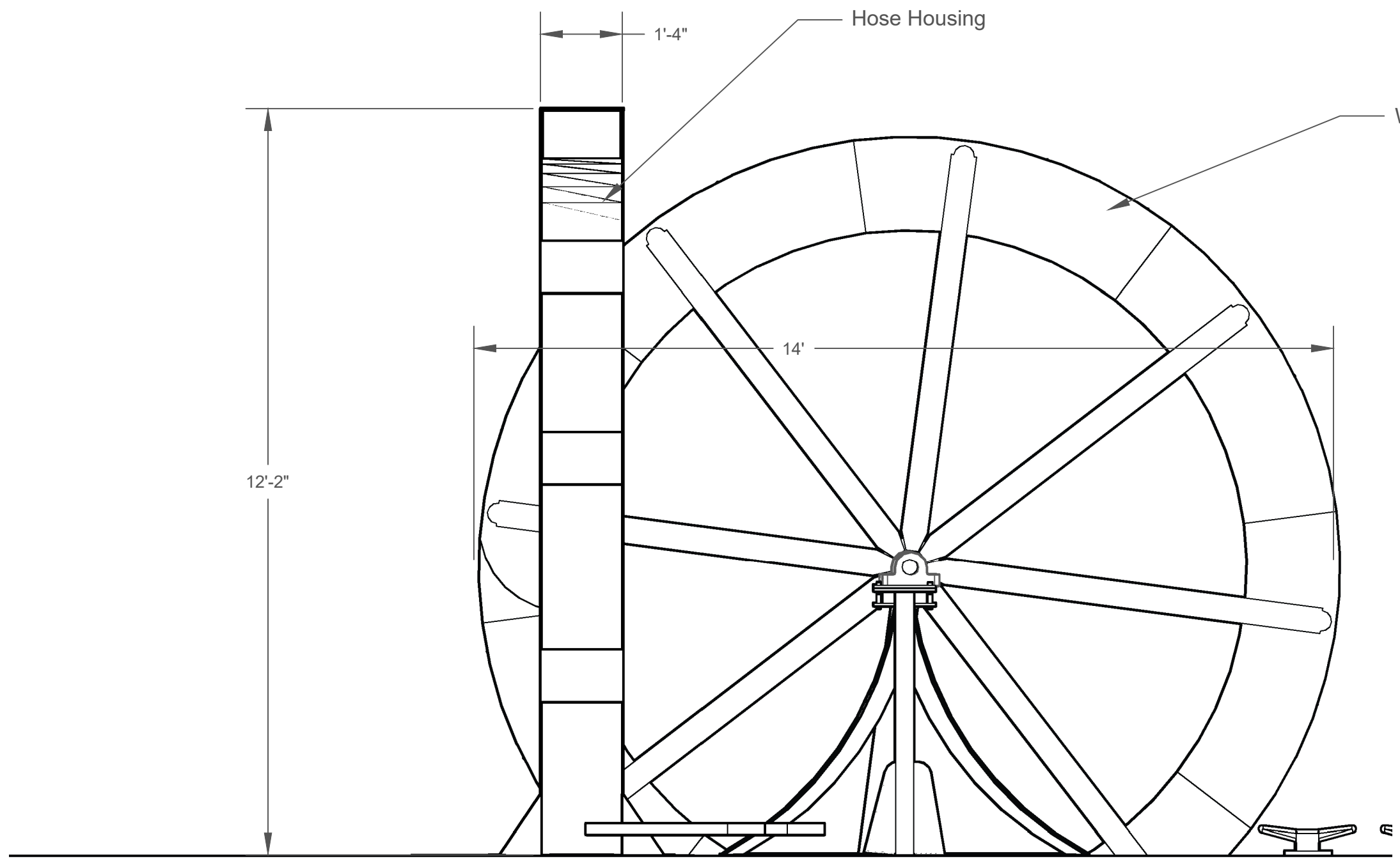
Spring Loaded Tines


Water Level

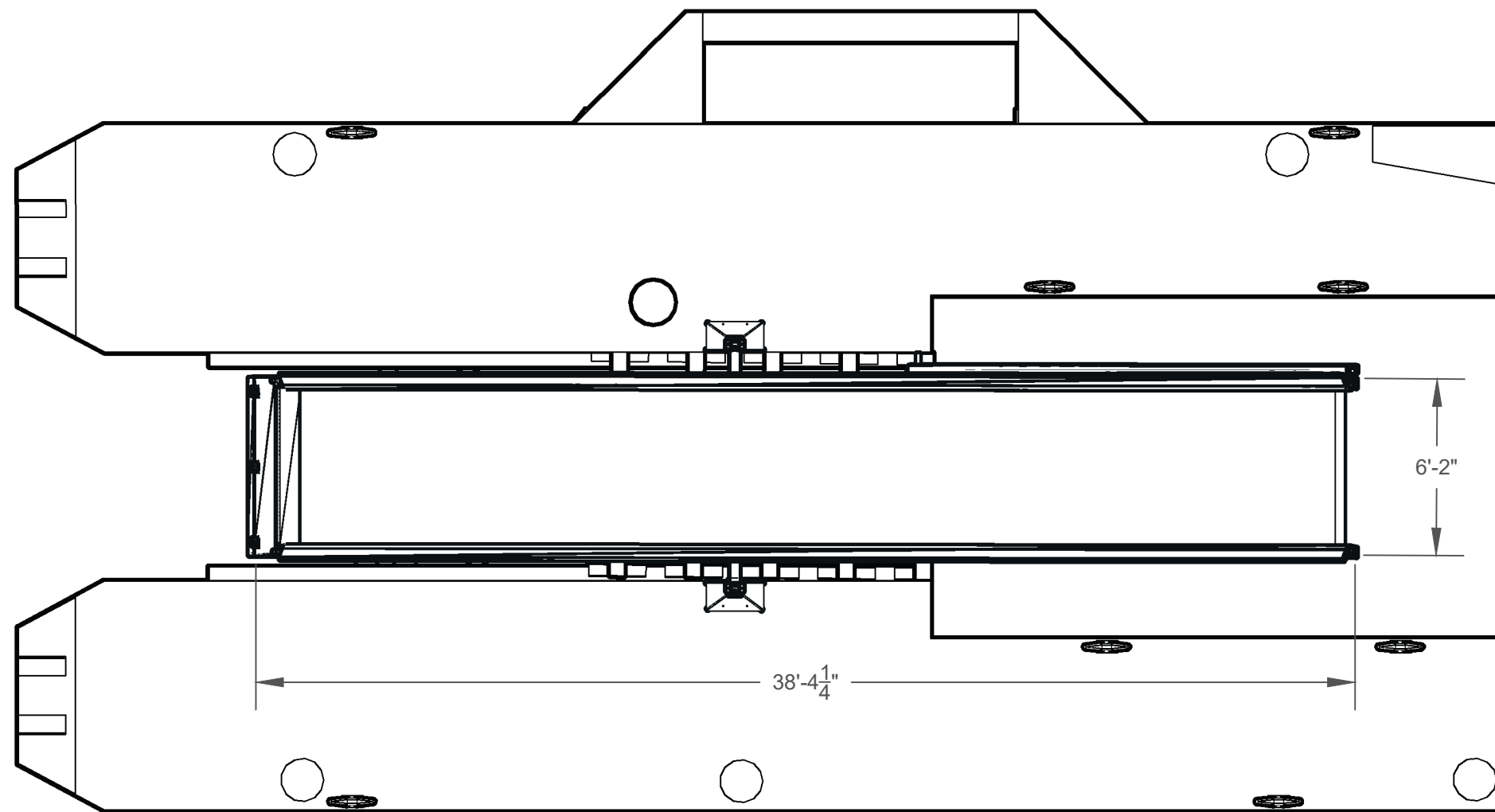
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	Clear Fork Trinity River Trash Wheel Rake	
Date 6/30/2022	1/2" = 1'	Page 7 of 19




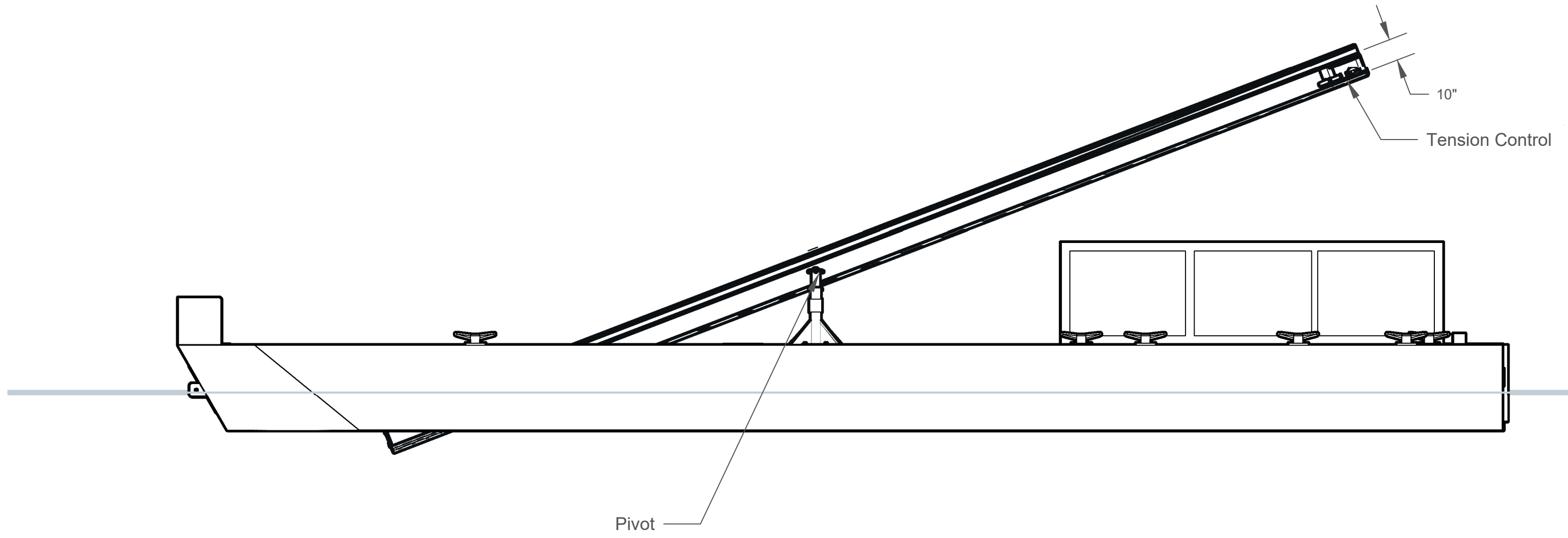
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<p>Clear Fork Trinity River Trash Wheel Pump System</p>		
<p>Date 6/30/2022</p>	<p>3/16" = 1'</p>	<p>Page 8 of 19</p>




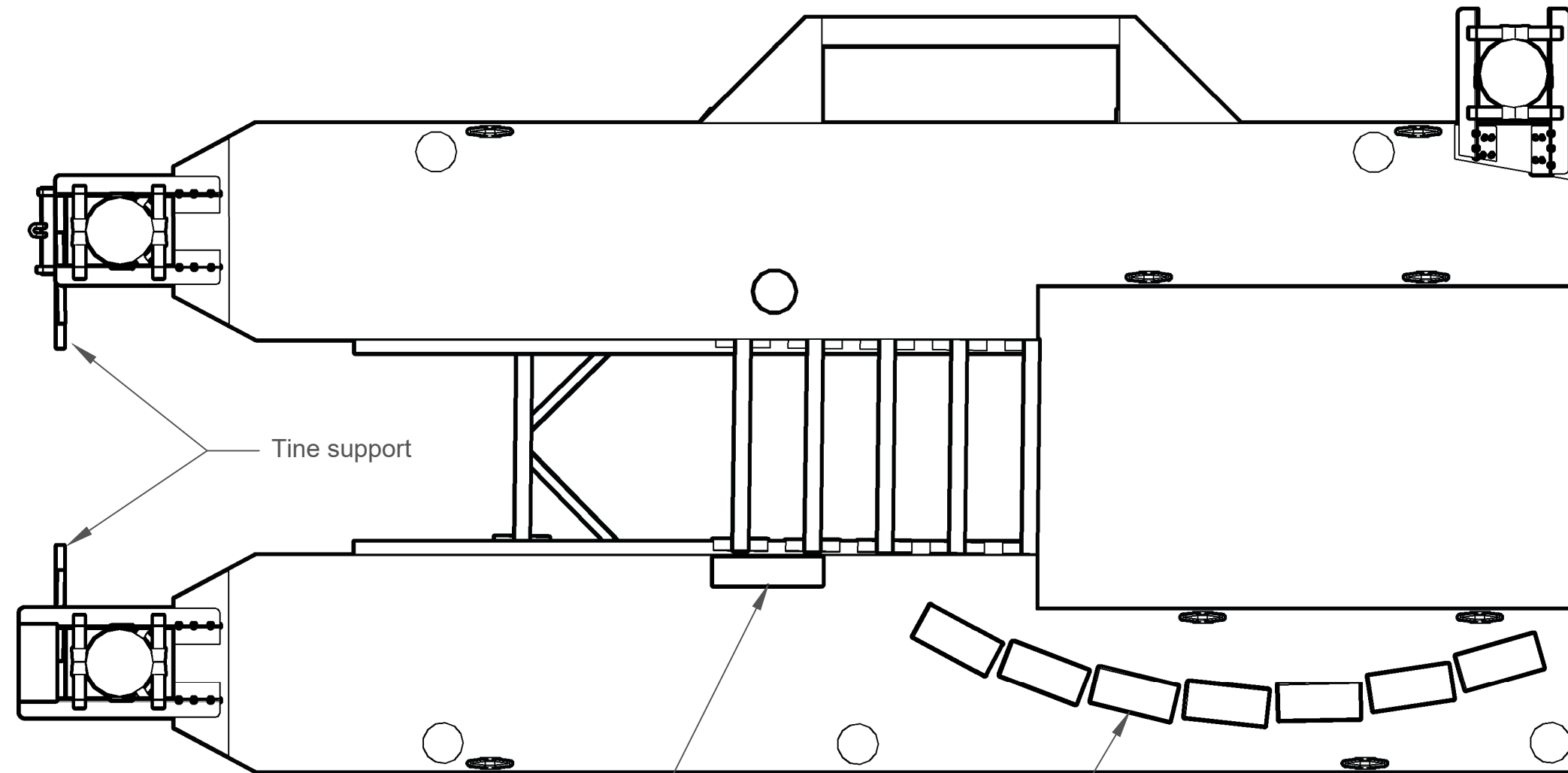
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Clear Fork Trinity River Trash Wheel Pump System		
Date 6/30/2022	1/2" = 1'	Page 9 of 19



 CLEARWATER MILLS <small>Sustainable Environmental Technologies</small>	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122	
Clear Fork Trinity River Trash Wheel Conveyor		
Date 6/30/2022	3/16" = 1'	Page 10 of 19



 <small>CLEARWATER MILLS</small> <small>Sustainable Environmental Technologies</small>	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122	
Clear Fork Trinity River Trash Wheel Conveyor		
Date 6/30/2022	1/4" = 1'	Page 11 of 19

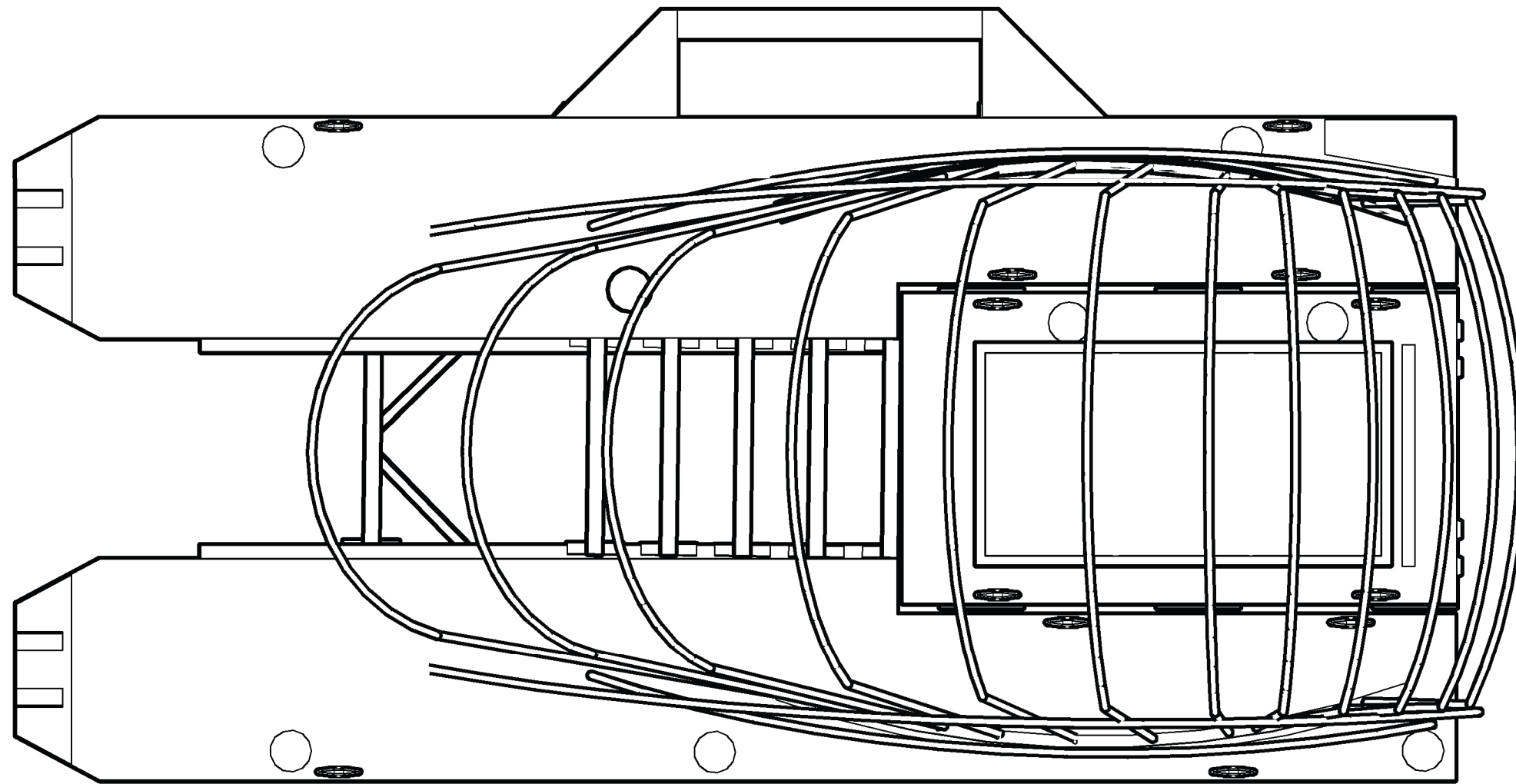



Tine support

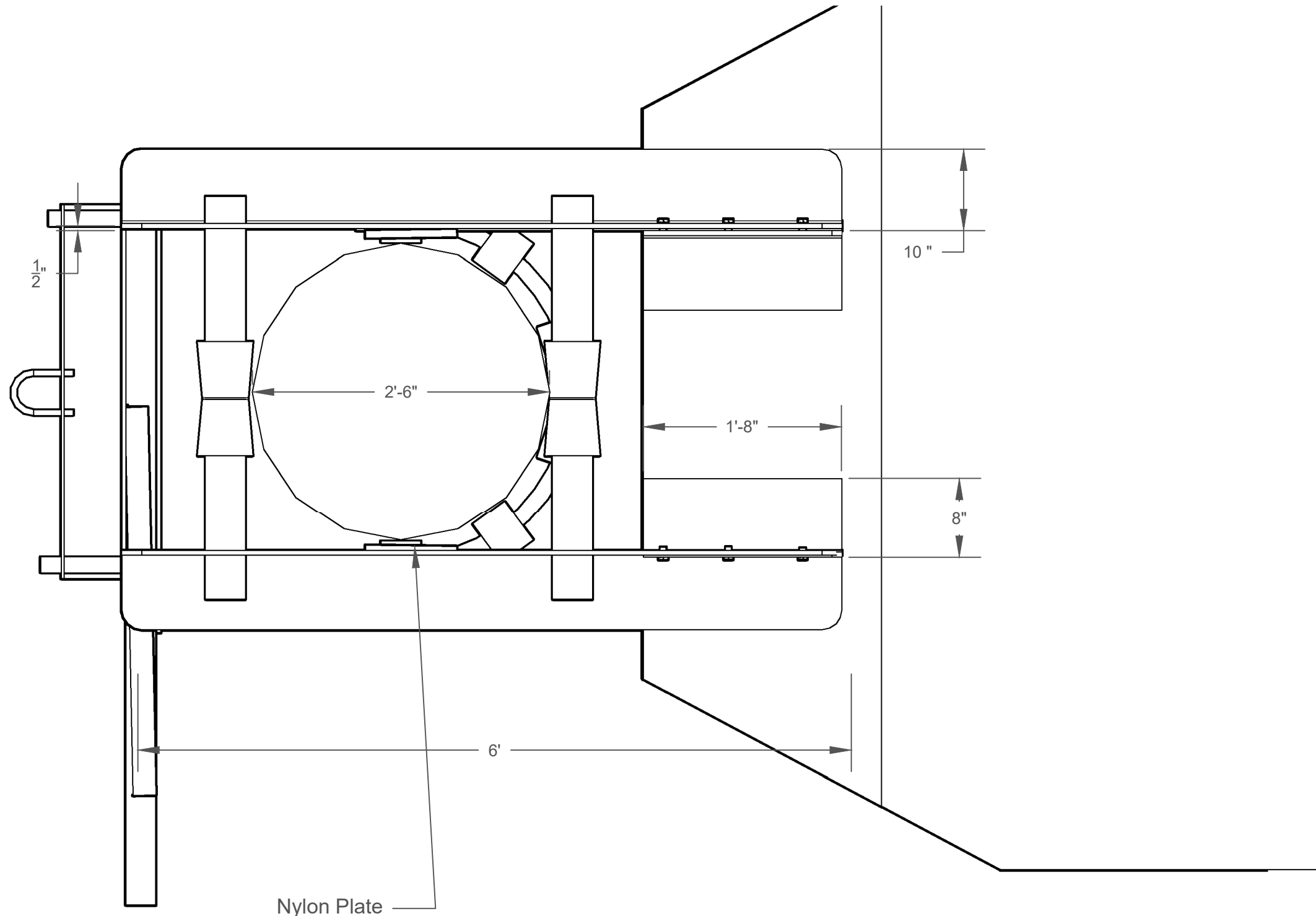
Control Cabinet

Battery Boxes

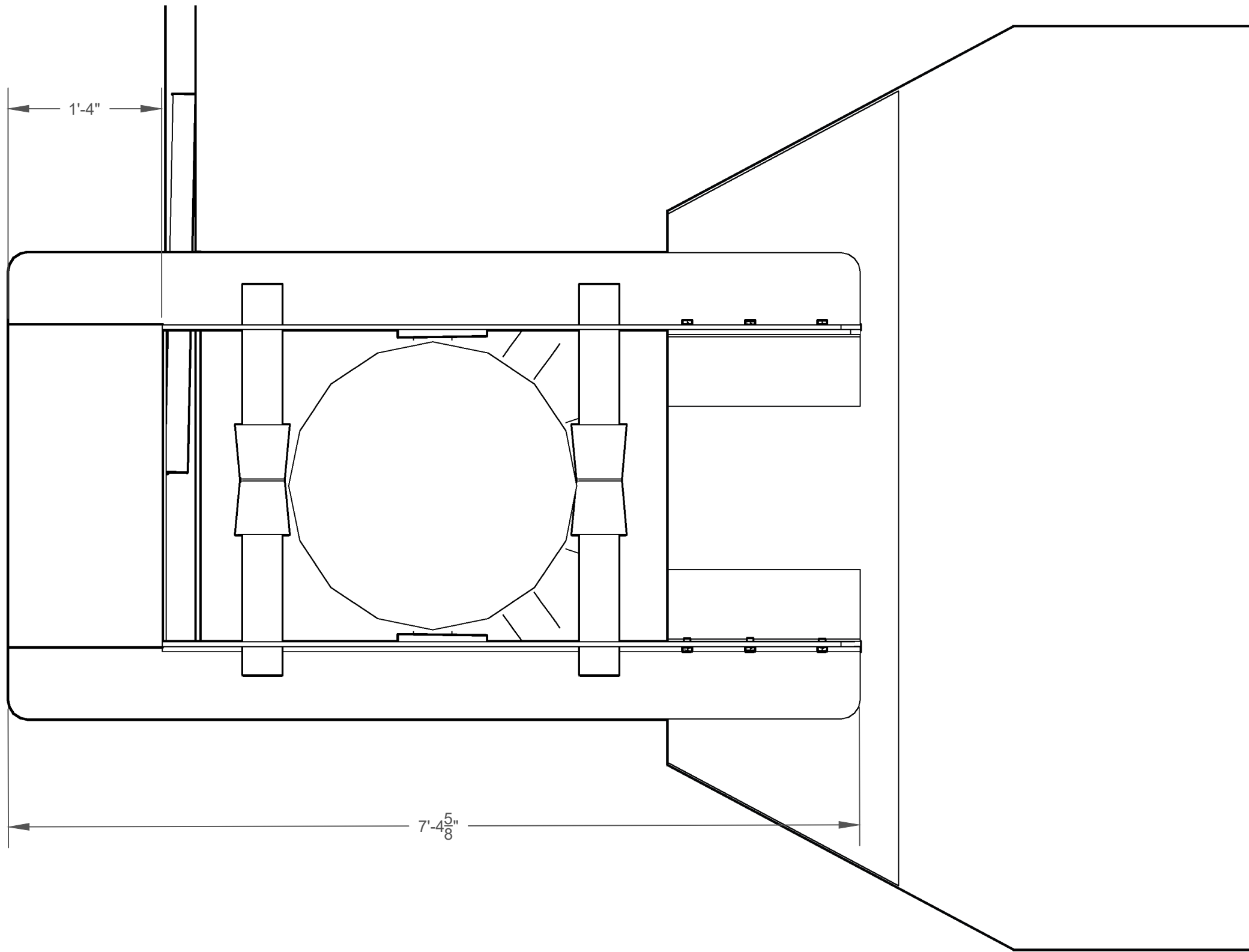
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<p>Clear Fork Trinity River Trash Wheel Electronics</p>		
<p>Date 6/30/2022</p>	<p>3/16" = 1'</p>	<p>Page 12 of 19</p>



 CLEARWATER MILLS <small>Sustainable Environmental Technologies</small>	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122	
Clear Fork Trinity River Trash Wheel Cover Frame		
Date 6/30/2022	3/16" = 1'	Page 13 of 19



	<p>Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122</p>	
<p>Clear Fork Trinity River Trash Wheel Starboard Piling Connection</p>		
<p>Date 6/30/2022</p>	<p>1" = 1'</p>	<p>Page 14 of 19</p>



	<p>Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122</p>	
<p>Clear Fork Trinity River Trash Wheel Port Piling Connection</p>		
<p>Date 6/30/2022</p>	<p>1" = 1'</p>	<p>Page 15 of 19</p>


Tine Support

Weld bead

4"

1'-10"

Boom Connection

 CLEARWATER MILLS Sustainable Environmental Technologies	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122	
Clear Fork Trinity River Trash Wheel Piling Connection		
Date 6/30/2022	1" = 1'	Page 16 of 19

7

6

5

4

3

2

1

1

REVISIONS				
ZONE	REV	DESCRIPTION	DATE	APPROVED

D

D

C

C

B

B

A

A

Helical Anchor

Small Boat Access

18 KIP Break Link

Buoy with $\frac{3}{8}$ " Proof Coil HDG Chain attached to Helical Anchor with 1" Eye Bolt

30" Mooring Piles

Clear Fork Trinity River

Contains proprietary information which can only be reproduced or used with written agreement with Clearwater Mills LLC. © US patent number 7,485,235



4965 Mountian Road
Pasadena, MD 21122

SIZE	DWG NO.	REV
	Page 17 of 19	
SCALE	SHEET	

Clear Fork Trinity River
Trash Wheel
Site Plan

7

6

5

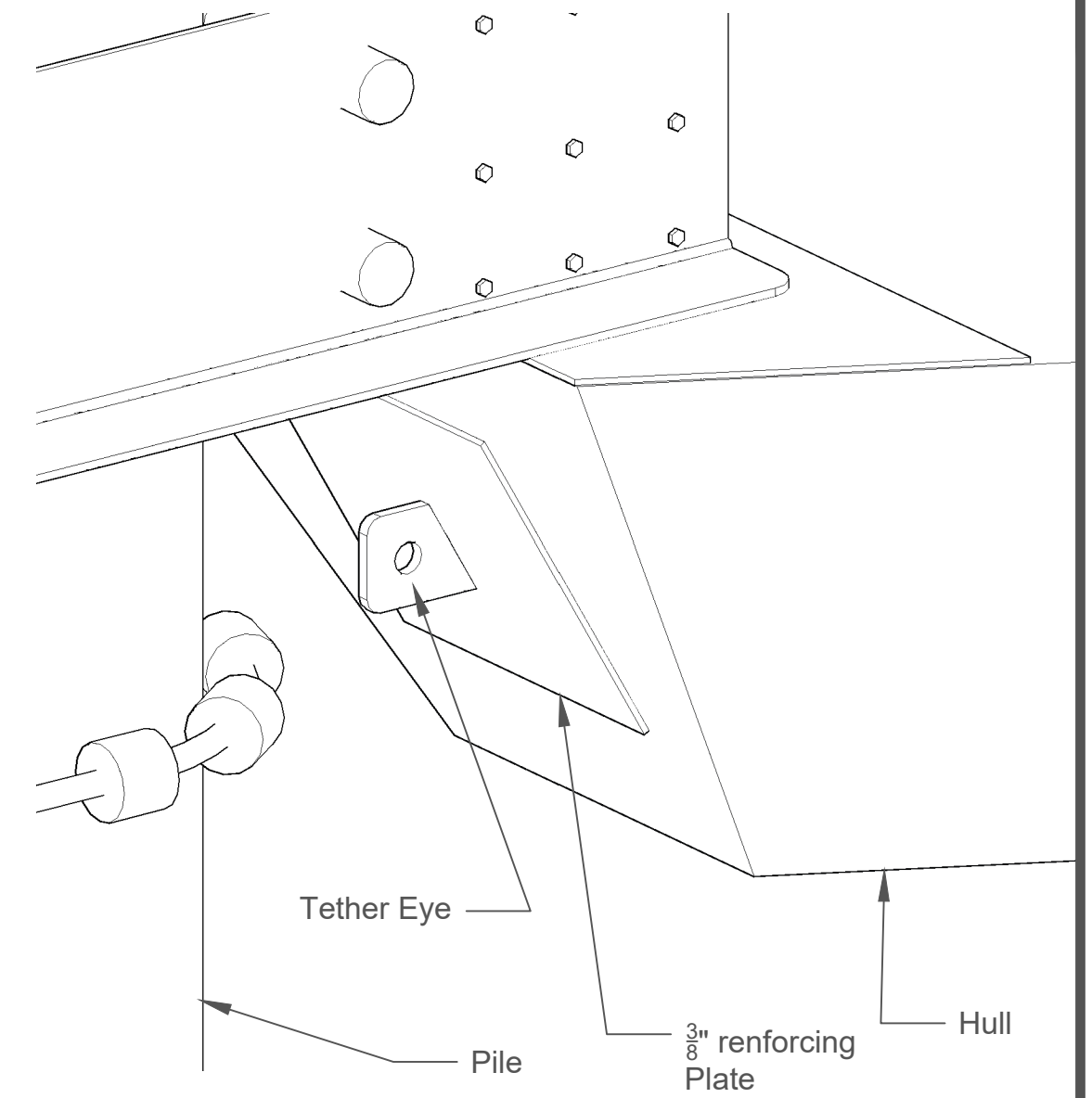
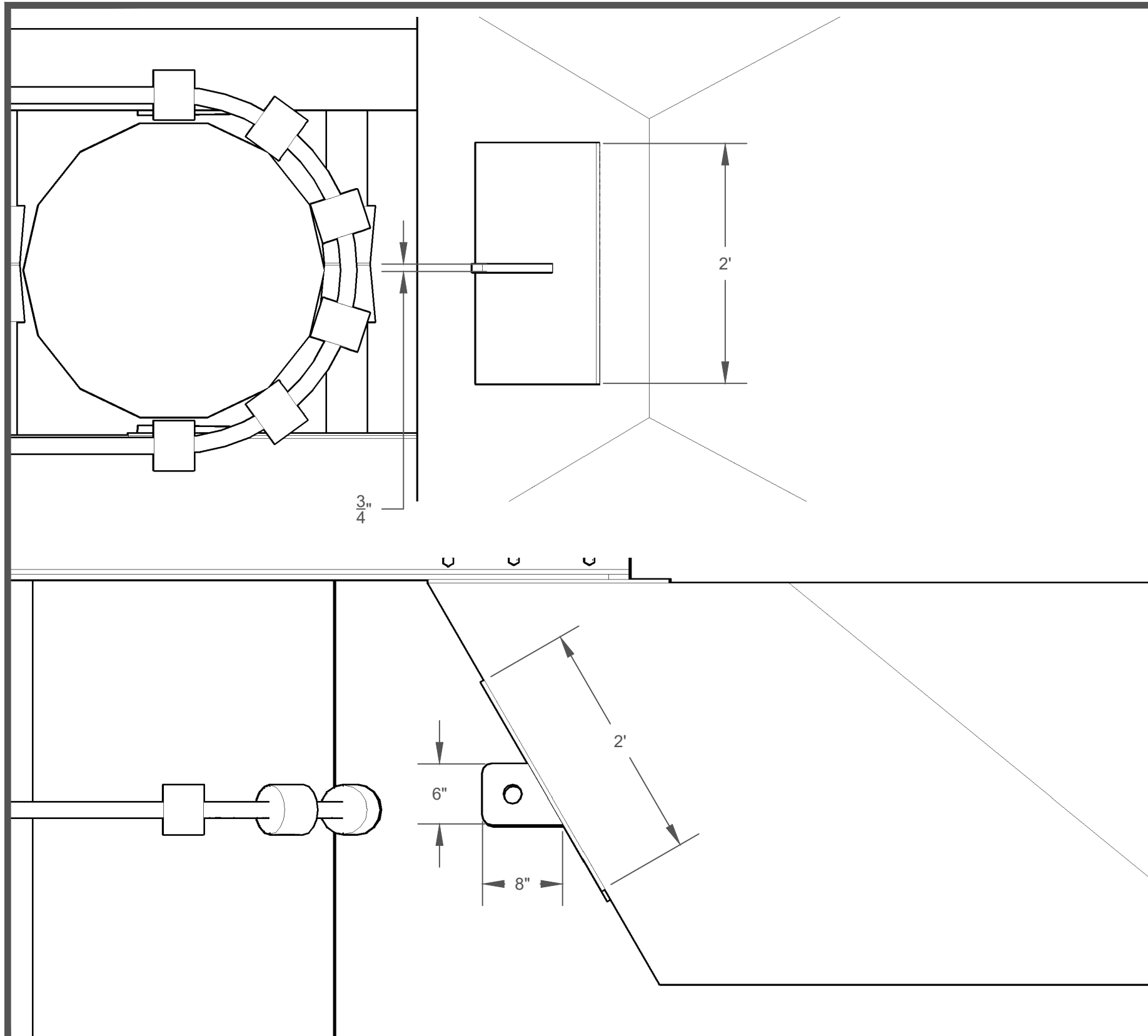
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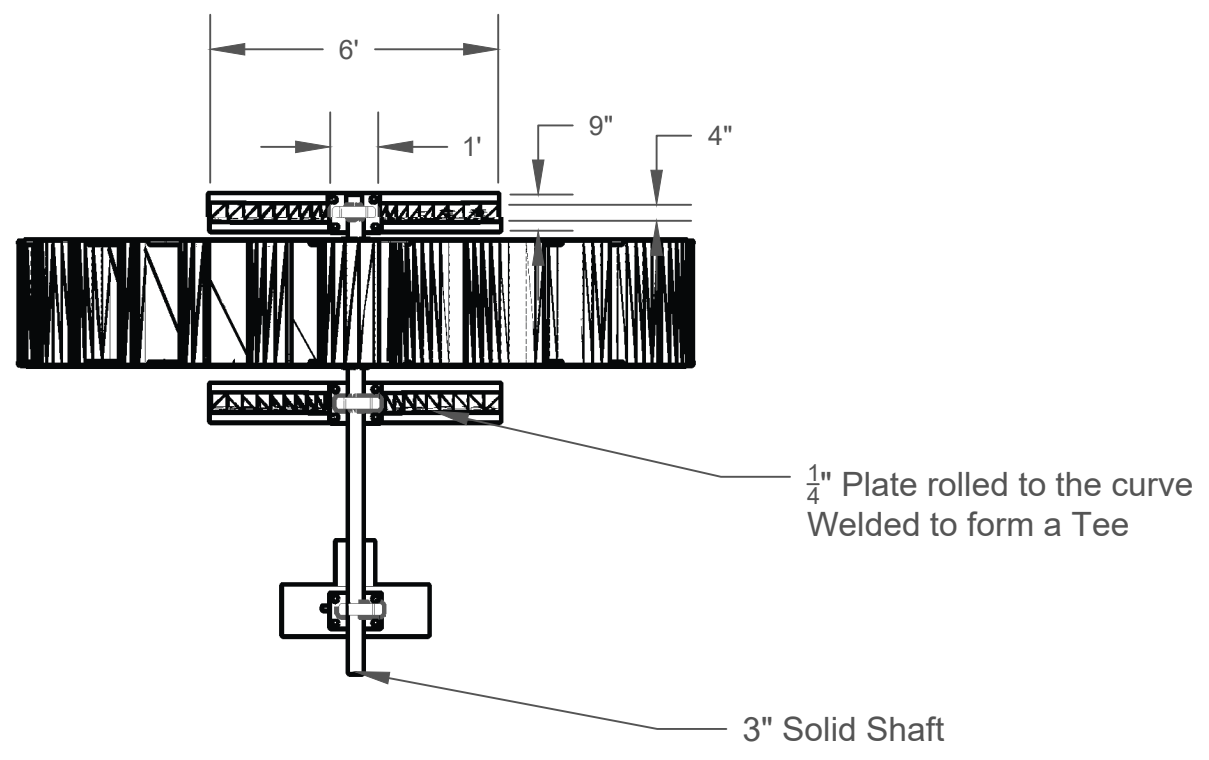
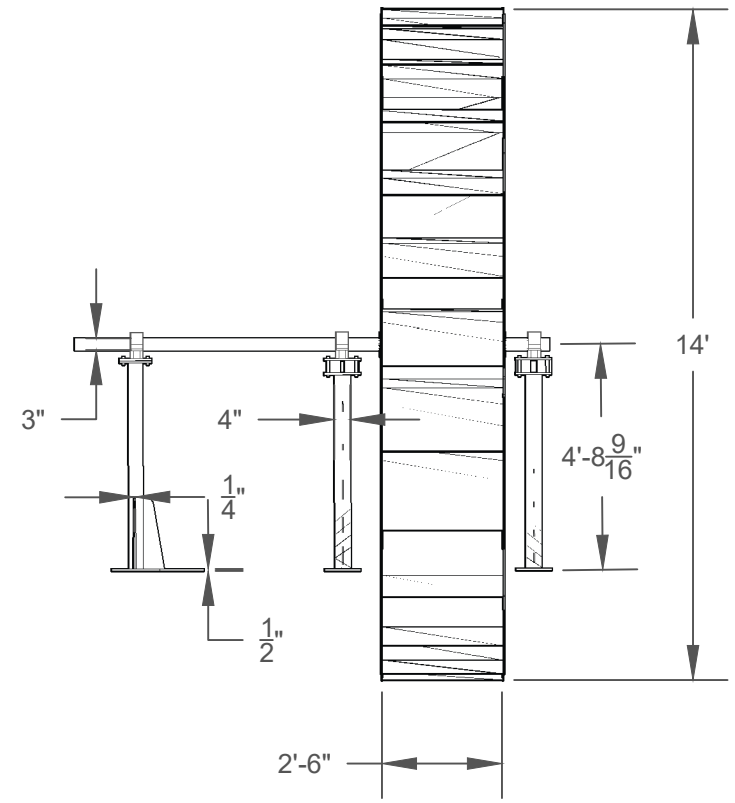
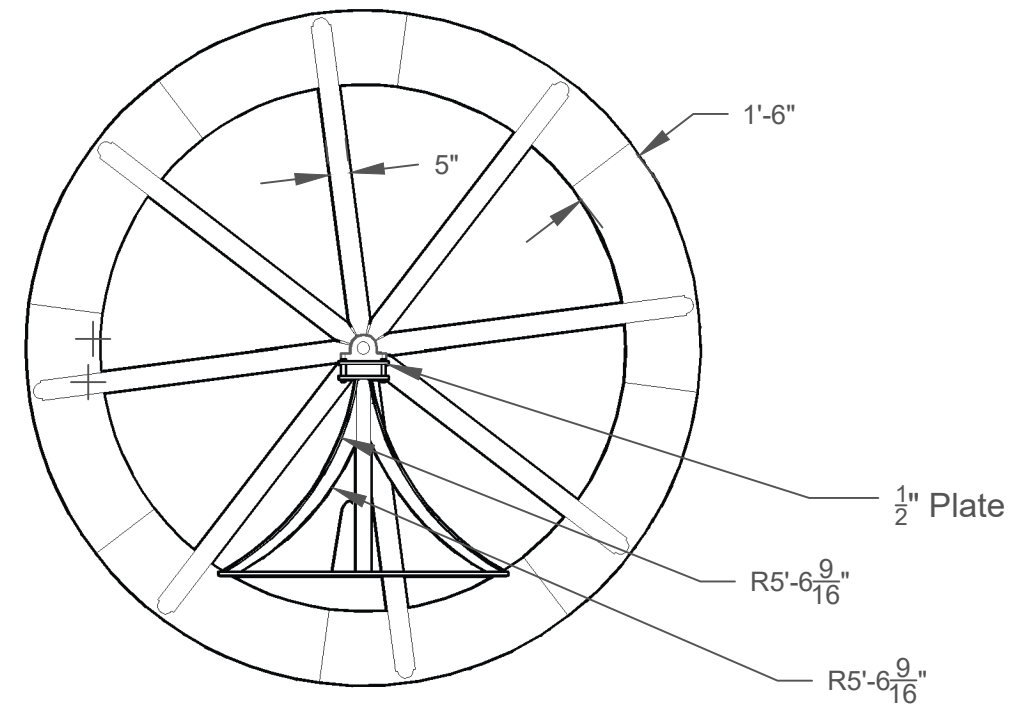
2


1

1



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<p>Clear Fork Trinity River Trash Wheel Tether Connection</p>		
<p>Date 6/30/2022</p>	<p>1" = 1'</p>	<p>Page 18 of 19</p>



 CLEARWATER MILLS Sustainable Environmental Technologies	Clearwater Mills, LLC. 4965 Mountain Road Pasadena, MD 21122
Clear Fork Trinity River Trash Wheel WaterWheel	
Date 9/7/2022	1/4' = 1'
Page 19 of 19	

Appendix 2
Hydrologic Analysis TSDIV by Rampp

Title:	ANCHOR PILE ANALYSIS AND DESIGN		CALC NO. FWTHFS00259-CALC-001		
			REV. 000		
Client:	City of Fort Worth	Project Identifier:	FWTHFS00259		
Item	Cover Sheet Items			Yes	No
1	Does this calculation contain any open assumptions, including preliminary information, that require confirmation? (If YES , identify the assumptions.)			<input type="checkbox"/>	<input checked="" type="checkbox"/>
2	Does this calculation serve as an "Alternate Calculation"? (If YES , identify the approved calculation.) Original Calculation No. <u>N/A.</u>			<input type="checkbox"/>	<input checked="" type="checkbox"/>
3	Does this calculation supersede an existing Calculation? (If YES , identify the approved calculation.) Superseded Calculation No. <u>N/A.</u>			<input type="checkbox"/>	<input type="checkbox"/>
Scope of Revision: Initial Submittal					
Revision Impact on Results: N/A.					
<input type="checkbox"/> Study Calculation <input checked="" type="checkbox"/> Final Calculation					
<input type="checkbox"/> Safety-Related <input type="checkbox"/> Augmented Quality <input checked="" type="checkbox"/> Non-safety Related <input type="checkbox"/> Safety Class <input type="checkbox"/> Safety Significant <input type="checkbox"/> General Services <input type="checkbox"/> Production Support					
<i>(Print Name and Sign)</i>					
Preparer: Sandeep Menon				Date:	
Design Verifier (Design Reviewer¹): Brian Pace				Date:	
Approver:				Date:	

Note 1: For Nonsafety Related, DOE General Services, or DOE Production Support calculations, design verification can be substituted by review.

Title:	ANCHOR PILE ANALYSIS AND DESIGN	CALC NO.	FWTHFS00259-CALC-001
		REV.	000

CALCULATION REVISION STATUS

<u>REVISION</u>	<u>DATE</u>	<u>DESCRIPTION</u>
0	See Cover Page	Initial Submittal

PAGE REVISION STATUS

<u>PAGE NO.</u>	<u>REVISION</u>	<u>PAGE NO.</u>	<u>REVISION</u>
-	-	-	-

APPENDIX/ATTACHMENT REVISION STATUS

<u>APPENDIX NO.</u>	<u>NO. OF PAGES</u>	<u>REVISION NO.</u>	<u>ATTACHMENT NO.</u>	<u>NO. OF PAGES</u>	<u>REVISION NO.</u>
1	10	0	1	1	0
			2	1	0

Title:	ANCHOR PILE ANALYSIS AND DESIGN	CALC NO.	FWTHFS00259-CALC-001
		REV.	000

1.0	Purpose and Scope	4
2.0	Summary of Results and Conclusions	4
3.0	References	4
4.0	Assumption	5
5.0	Design Inputs	5
6.0	Methodology	6
7.0	Calculations	7
8.0	Computer Software	110
	Appendices	111
	Attachments	120
	Calculation Preparation Checklist	122

Title:	ANCHOR PILE ANALYSIS AND DESIGN	CALC NO.	FWTHFS00259-CALC-001
		REV.	000

1.0 Purpose and Scope

The purpose of this calculation is to provide mooring piles to support the waterwheel platform powered trash interceptor including the log loader to be installed on the Clear Fork area of the Trinity River in Fort Worth, Texas. This calculation also documents the adequacy of the tethering system to anchor the trash wheel equipment during a standard project flood (SPF) condition.

2.0 Summary of Results and Conclusions

The Clear Fork interceptor mooring platform is to be supported by three – 30 inch diameter piles $\frac{3}{4}$ " thick. See Section **Error! Reference source not found.** for pile calculations. See Project Plans in Appendix 1.

The trash interceptor supplier provides calculations and specifications for design of the waterwheel, mooring platform, anchorage of the mooring platform to the mooring piles, log loader and associated support and anchorage of the floating booms procured and installed by an approved vendor. The pile locations are determined by the trash interceptor supplier and the City of Fort Worth.

3.0 References

- 3.1 Texas Department of Transportation (TXDOT) Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges, 2014.
- 3.2 AASHTO LRFD Bridge Design Specification – Publication Code LRFDUS-6
- 3.3 International Building Code (IBC), 2015
- 3.4 ACI CODE-318-14: Building Code Requirements for Structural Concrete and Commentary
- 3.5 Steel Construction Manual, AISC 14th Edition
- 3.6 Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10.
- 3.7 CMJ PROJECT NO. 2878-21-01 - Geotechnical Engineering Study Proposed Trash Wheels West Fork And Clear Fork Trinity River Fort Worth, Texas - July 2021
- 3.8 Drawing FWTHS-00259-DWG-S101, Rev. 0
- 3.9 Drawing FWTHS-00259-DWG-S102, Sheet 1, Rev. 0
- 3.10 Drawing FWTHS-00259-DWG-S102, Sheet 2, Rev. 0
- 3.11 Drawing FWTHS-00259-DWG-S103, Rev. 0

Title:	ANCHOR PILE ANALYSIS AND DESIGN	CALC NO.	FWTHFS00259-CALC-001
		REV.	000

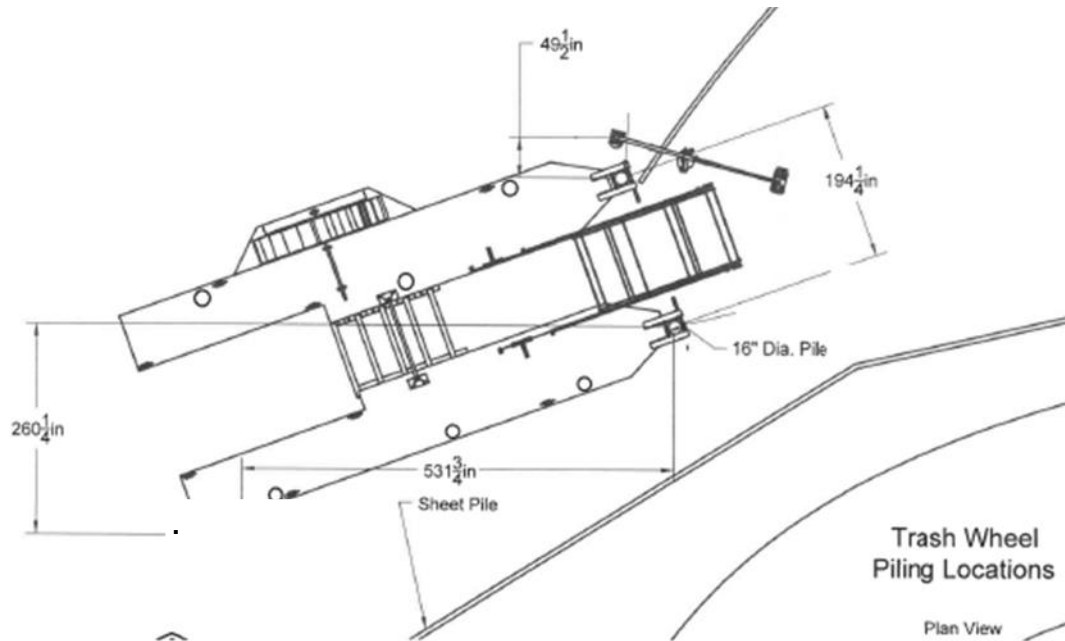
4.0 Assumption

There are no assumptions that require later justification in this calculation

5.0 Design Inputs

5.1 Mooring platform parameters

Ref. Layout for a previous project provided by Clearwater Mills, LLC for developing the design inputs –



Pontoon Hull Sections 8' W x 52' L x 40" D

5.2 Hydrology parameters

Title:	ANCHOR PILE ANALYSIS AND DESIGN	CALC NO.	FWTHFS00259-CALC-001
		REV.	000

Clear Fork (Location is between RS 1980, for 100 year storm conservatively using inputs from 260154.) See Attachment **Error! Reference source not found.**

Average Water Velocity = 8.42 ft/s

Water Surface elevation (WS) = 540.36 ft.

Minimum Channel elevation = 512.88 ft.

6.0 Methodology

This calculation analyzes the mooring platform piles for the loading conditions specified in

AASHTO. Following loads were considered for the design of the mooring piles:

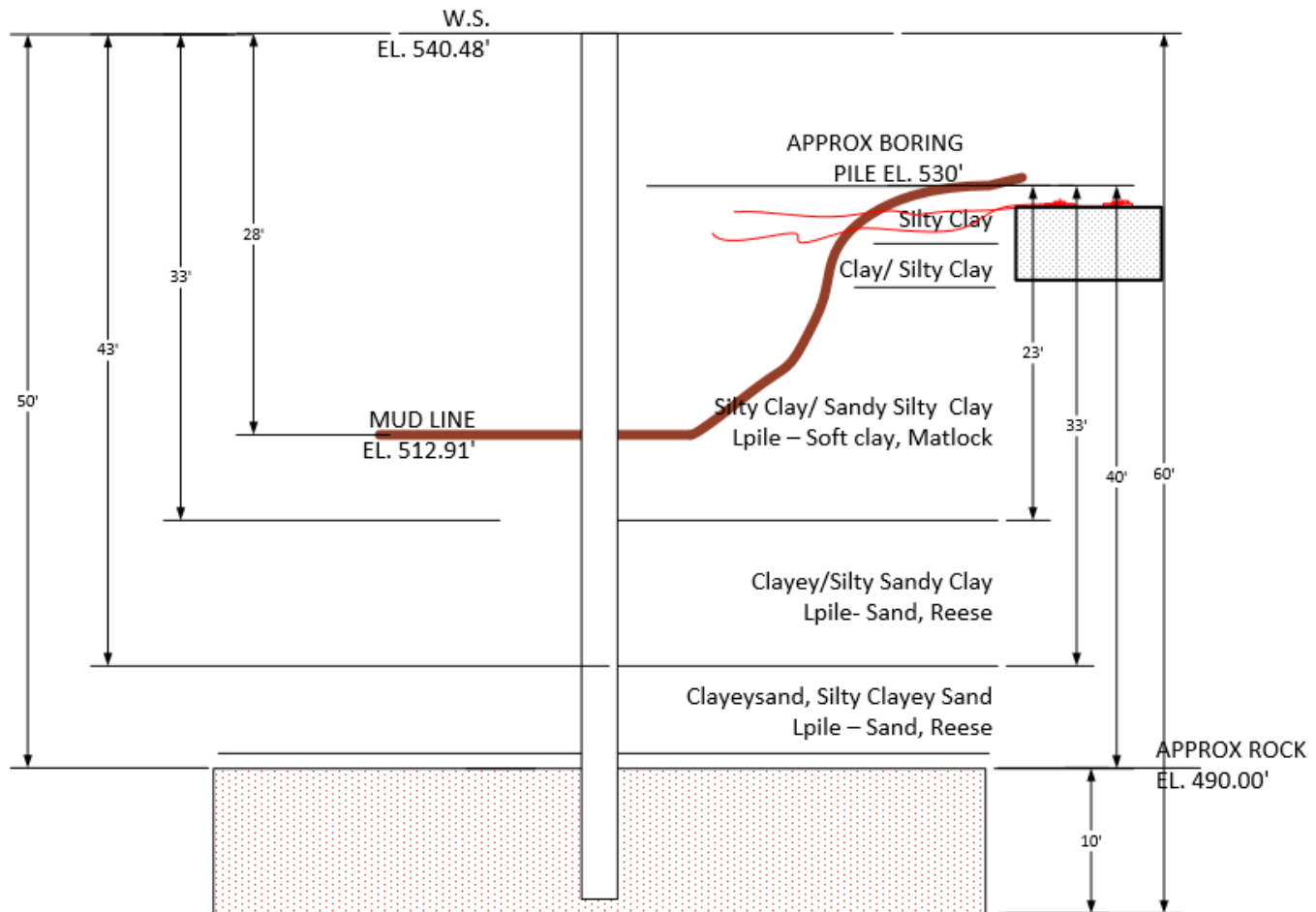
- Stream Current – AASHTO LRFD Section 3.7.3
- Ice Loads – AASHTO Section 3.9.2
- Wind loads – AASHTO LRFD 3.8

The critical load combinations considered in this calculation are from the AASHTO Load Combinations.

- Strength III: 1.0 (current on pile & hull + wave + boom) + 1.0 wind on platform resisted by 1 of 3 piles
- Extreme II - Primarily for ice impact loading
- Service I - Will be considered to limit deflections

Approximate layout of the pile for the trash wheel support structure and the soil profile based on the geotechnical report are drawn to help design the pile foundation. As per the recommendation in the geotechnical report (section 4.2.1) the piles have to be embedded 5.00' deeper in to unweathered rock.

Loads are calculated for each trash interceptor location using the Excel spreadsheet. The pile is then designed using L-Pile software. The pile is evaluated for strength using the maximum Strength or Extreme Event level load combination and for deflection using the maximum Service level load combination.



**SOIL PROFILE FOR PILE DESIGN
AT CLEAR FORK LOCATION**

Note – Geotech report section 4.2.1 recommends that the piers should penetrate into the bearing stratum a minimum of 5.00'. Conservatively used 10.00' as the depth in unweathered rock

7.0 Mooring Pile Design Calculations

B) Loading on Mooring Pile at Clear Fork Trinity River Fort Worth, Texas

1. Stream Current Calculations

$V := 8.42$	Design velocity of water for the 100-year design flood in strength and service limit states and for the check flood in the extreme event limit state (ft/sec). Attachment 1
$C_D := 1.4$	Drag coefficient for piers considering debris lodged against the pier. AASHTO Table 3.7.3.1-1
$p := \frac{C_D \cdot V^2}{1000} \cdot \text{ksf} = 0.099 \cdot \text{ksf}$	Pressure of flowing water. AASHTO Eq. 3.7.3.1-1
$H_p := 27.57 \text{ ft}$	Height above mud line to flood elevation. Attachment 1
$d_{\text{pile}} := 30 \text{ in}$	Diameter of pile (Spiralweld pipe Yield strength of 60 ksi)
$F_{\text{current}} := d_{\text{pile}} \cdot H_p \cdot p = 6.841 \text{ kip}$	Force due to current pressure considered to be acting at the top of the pile.

2. Current Pressure on Booms

$L := 50 \text{ ft}$	Transverse distance between two piles (conservative). Appendix 1
$S := 10 \text{ ft}$	Assume between straight line and boom. Appendix 1
$X := \frac{L}{2} = 25 \text{ ft}$	Distance to max sag location
$t_{\text{boom}} := 1.33 \text{ ft}$	Boom thickness. Appendix 1
$q_{\text{boom}} := p \cdot t_{\text{boom}} = 0.132 \cdot \frac{\text{kip}}{\text{ft}}$	Distributed load along boom
$L_{\text{beam}} := 8 \text{ ft}$	Length of beams between hulls. Appendix 1
$F_{\text{beam}} := \frac{q_{\text{boom}} \cdot L_{\text{beam}}}{2} = 0.528 \text{ kip}$	Longitudinal reaction on piles
$F_{\text{boom.trans}} := \frac{0.75 \cdot q_{\text{boom}} \cdot X^2}{2 \cdot S} = 3.094 \text{ kip}$	Transverse component of tension
$F_{\text{boom.long}} := 0.75 \cdot q_{\text{boom}} \cdot X = 2.475 \text{ kip}$	Longitudinal component of tension
$F_{\text{boom}} := \sqrt{F_{\text{boom.trans}}^2 + F_{\text{boom.long}}^2} + F_{\text{beam}} = 4.49 \text{ kip}$	Force on piles due to booms

3. Ice Load Calculations

$$p_{ice} := 8.0 \text{ksf}$$

Effective Ice Strength, where breakup occurs at melting temperatures and the ice structure is substantially disintegrated. AASHTO 3.9.2.1

$$\alpha := 0.8$$

Coefficient for local conditions, normally less than 1.0 considering "windy lake without snow". AASHTO C3.9.2.2

Date	T (degrees)	$\Sigma(32-T)$
2/9/2021	30.72	1.28
2/10/2021	28.11	3.89
2/11/2021	24.91	7.09
2/12/2021	22.85	9.15
2/13/2021	22.31	9.69
2/14/2021	13.47	18.53
2/15/2021	6.27	25.73
2/16/2021	11	21
2/17/2021	20.83	11.17
2/18/2021	23.83	8.17
2/19/2021	26.92	5.08
SUM		120.78

Freezing index calculation, considering February 2021 Winter Storm - Data used from this website - <https://www.wunderground.com/history/monthly/us/tx/fort-worth/KFTW/date/2021-2>

$$S_f := 120.78$$

Freezing index, summed from the date of freeze-up to the date of interest, in degree days. AASHTO C3.9.2.2

$$t := 0.083\alpha \sqrt{S_f} \cdot \text{ft} = 8.757 \cdot \text{in}$$

Thickness of ice. AASHTO C3.9.2.2-1

$$C_a := \sqrt{5 \cdot \frac{t}{d_{pile}} + 1} = 1.568$$

Coefficient accounting for the effect of the pier width/ice thickness ratio where the flow fails by crushing AASHTO Equation 3.9.2.2-3

AASHTO considers a "small stream" to be a stream which has a width of less than 300 ft at the mean water levee. The width is approximately 200 ft at mean water level.

Assuming that an ice flow would be smaller than most winter areas and the number of bridge piers upstream of the location, an Area of 400 ft² is considered for the largest ice floe.

$$A := 400 \text{ft}^2$$

Plan area of the largest ice floe

$$r := \frac{d_{pile}}{2} = 1.25 \text{ft}$$

Radius of pier nose

$$K_{1,\text{table}} := \frac{A}{r^2} = 256$$

Reduction Factor K1 for small streams criteria
AASHTO Table C3.9.2.3-1

$$K_1 := 0.737$$

Reduction Factor K1 for small streams.
AASHTO Table C3.9.2.3-1

$$F_{\text{ice}} := K_1 \cdot C_a \cdot p_{\text{ice}} \cdot t \cdot d_{\text{pile}} = 16.869 \text{ kip}$$

Horizontal ice force caused by ice floes that fail by crushing over the full width of the pier. AASHTO Eq. 3.9.2.2-1. This load is conservative as Fort Worth do not see extreme cold weather conditions. This load also accounts for any impact loads from the debris during a flood condition

4. Wind Load on Trash Collector

$$A_w := 275 \text{ ft}^2$$

Estimated area of covered wheel. Appendix 1

$$V_{\text{DZ}} := 100$$

Design wind velocity (mph) (below 30ft). AASHTO 3.8.1.1

$$P_B := 0.04$$

Base pressures corresponding to V.B=100 mph for large flat surfaces. (ksf) AASHTO Table 3.8.1.2.1-1

$$P_D := P_B \cdot \frac{V_{\text{DZ}}^2}{10000} \cdot \text{ksf} = 0.04 \text{ ksf}$$

Design wind pressure. AASHTO Eq 3.8.1.2.1-1

$$F_{\text{wind}} := A_w \cdot P_D = 11 \text{ kip}$$

Force due to wind pressure

Wind on the pile is ignored. It is assumed that the maximum wind load occurs during the design basis flood event, where the wind load is due to the wind on the trash wheel itself.

Pile Resistance Calculations

1. Flexural Resistance (AASHTO Section 6.12.2.2.3)

$$\phi_f := 1.00$$

Resistance factor for flexure. AASHTO 6.5.4.2

$$t_{\text{pile}} := 0.75 \text{ in}$$

Thickness of pile

$$\frac{d_{\text{pile}}}{t_{\text{pile}}} = \frac{30 \cdot \text{in}}{0.75 \cdot \text{in}} = 40$$

Width to thickness ratio

$$E_{\text{pile}} := 29000 \text{ ksi}$$

Modulus of Elasticity of steel. AASHTO 6.4.1

$$F_{y,\text{pile}} := 60 \text{ ksi}$$

Specified minimum yield strength of steel.
Attachment 2

$$0.11 \cdot \frac{E_{\text{pile}}}{F_{y,\text{pile}}} = 53.167 \quad 0.11 \cdot \frac{E_{\text{pile}}}{F_{y,\text{pile}}} > \frac{d_{\text{pile}}}{t_{\text{pile}}} = 1$$

Requirement for depth to thickness of circular tubes. AASHTO 6.9.4.2.1-5

$$\text{localbuckling} := \begin{cases} \text{"OKAY"} & \text{if } \frac{d_{\text{pile}}}{t_{\text{pile}}} > 0.07 \cdot \frac{E_{\text{pile}}}{F_{y,\text{pile}}} \\ \text{"Check"} & \text{otherwise} \end{cases}$$

Check for local buckling applicability. If not true, check local buckling per 6.12.2.2.3

localbuckling = "OKAY"

$$S_{\text{pile}} := \frac{\pi \left[d_{\text{pile}}^4 - (d_{\text{pile}} - 2 \cdot t_{\text{pile}})^4 \right]}{32 \cdot d_{\text{pile}}} = 491.692 \cdot \text{in}^3$$

Elastic section modulus

$$F_{\text{cr,local}} := \frac{0.33 \cdot E_{\text{pile}}}{\left(\frac{d_{\text{pile}}}{t_{\text{pile}}} \right)} = 239.25 \cdot \text{ksi}$$

Elastic local buckling stress,
(AASHTO Section 6.12.2.2.3-4)

$$\frac{0.31 \cdot E_{\text{pile}}}{F_{y,\text{pile}}} = 149.833$$

$$M_{\text{n,local}} := \begin{cases} \left(\frac{0.021 \cdot E_{\text{pile}}}{\frac{d_{\text{pile}}}{t_{\text{pile}}} + F_{y,\text{pile}}} \right) \cdot S_{\text{pile}} & \text{if } \frac{d_{\text{pile}}}{t_{\text{pile}}} < 0.31 \cdot \frac{E_{\text{pile}}}{F_{y,\text{pile}}} \\ F_{\text{cr,local}} \cdot S_{\text{pile}} & \text{otherwise} \end{cases} = 36987.513 \cdot \text{kip} \cdot \text{in}$$

(AASHTO Section 6.12.2.2.3-2, -3)

$$Z := \frac{(d_{\text{pile}})^3}{6} - \frac{(d_{\text{pile}} - 2 \cdot t_{\text{pile}})^3}{6} = 641.813 \cdot \text{in}^3$$

Plastic section modulus of round pile

$$M_{\text{p}} := F_{y,\text{pile}} \cdot Z = 38508.75 \cdot \text{kip} \cdot \text{in}$$

Plastic moment for Circular Tubes
AASHTO Equation 6.12.2.2.3-1

$$M_{\text{n}} := \min(M_{\text{p}}, M_{\text{n,local}}) = 36987.513 \cdot \text{kip} \cdot \text{in}$$

Nominal flexural resistance specified in Articles 6.12.2.2
for non composite members

$$M_{\text{r}} := \phi_f \cdot M_{\text{n}} = 36987.513 \cdot \text{kip} \cdot \text{in}$$

Factored flexural resistance
AASHTO Equation 6.12.1.2.1-1

2. Shear resistance. (AASHTO Section 6.12.1.2.3c)

$$\phi_v := 1.00$$

Resistance factor for shear. AASHTO 6.5.4.2

$$L_v := 48\text{in}$$

Distance between points of maximum and zero shear

$$F_{cr1} := \frac{1.60E_{pile}}{\sqrt{\frac{L_v}{d_{pile}} \cdot \left(\frac{d_{pile}}{t_{pile}}\right)^4}} = 52510.42 \text{ ksf}$$

Shear buckling resistance - first criteria
AASHTO Equation 6.12.1.2.3c-2

$$F_{cr2} := \frac{0.78 \cdot E_{pile}}{\left(\frac{d_{pile}}{t_{pile}}\right)^2} = 12875.53 \text{ ksf}$$

Shear buckling resistance - second criteria
AASHTO Eq 6.12.1.2.3c-3

$$F_{cr,max} := 0.58 \cdot F_{y,pile} = 5011.2 \text{ ksf}$$

Maximum allowable shear buckling resistance.
AASHTO Eq. 6.12.1.2.3c-2&3

$$F_{cr} := \min(F_{cr1}, F_{cr2}, F_{cr,max}) = 5011.2 \text{ ksf}$$

Shear buckling resistance

$$A_{g,pile} := 68.92\text{in}^2$$

Gross area of the pile section. Attachment 2

$$V_n := 0.5 \cdot F_{cr} \cdot A_{g,pile} = 1199.208 \text{ kip}$$

Nominal shear resistance. AASHTO 6.12.1.2.3c-1

$$V_r := \phi_v \cdot V_n = 1199.208 \text{ kip}$$

Factored shear resistance. AASHTO 6.12.1.2.3a-1

These calculations capture the reasonably expected loads to occur on the trash wheel, booms, and mooring piles. Due to the varying nature of rivers, the pile design itself will be limited to utilization ratios of 0.6 to be conservative enough to account for potential unknowns (i.e. higher impact loads, flood loads, ice loads, etc.).

There are three applicable loading combinations:

1. Strength III - General strength. AASHTO code for bridge design considers this using 55 mph winds, but for this design, the full 100 mph wind load will be considered.
2. Extreme II - Primarily for ice impact loading
3. Service I - Will be considered to limit deflections

$$F_{\text{current}} = 6.841 \text{ kip}$$

$$F_{\text{boom}} = 4.49 \cdot \text{kip}$$

$$F_{\text{wind}} = 11 \text{ kip}$$

Wind is applied to 2 piles.

$$F_{\text{ice}} = 16.869 \text{ kip}$$

$$\text{Strength}_{\text{III}} := 1.00 \cdot F_{\text{current}} + 1.00 \cdot F_{\text{boom}} + \frac{1.4 \cdot F_{\text{wind}}}{2} = 19.031 \cdot \text{kip}$$

$$\text{Extreme}_{\text{II}} := 1.00 \cdot F_{\text{current}} + 1.00 \cdot F_{\text{boom}} + 1.00 \cdot F_{\text{ice}} = 28.2 \text{ kip}$$

$$\text{Service}_{\text{I}} := 1.00 \cdot F_{\text{current}} + 1.00 \cdot F_{\text{boom}} + \frac{0.3 \cdot F_{\text{wind}}}{2} = 12.981 \text{ kip}$$

$$P_{\text{top}} := \max(\text{Strength}_{\text{III}}, \text{Extreme}_{\text{II}}, \text{Service}_{\text{I}}) = 28.2 \text{ kip}$$

Additional Moment on the pile due to Log Loader - (Not functional during any flood condition.)

$$P_{\text{logloader}} := 1500 \text{ lbf}$$

$$L_{\text{logloader}} := 12 \text{ ft}$$

$$M_{\text{pile}} := 1.25 P_{\text{logloader}} \cdot L_{\text{logloader}} = 270000 \cdot \text{lbf} \cdot \text{in}$$

This log loader is used to clear logs during normal operation condition and only used after a flood condition.

$$L_{\text{pile}} := 60 \text{ ft}$$

Length of pile. From Appendix 1

$$M_{\text{max}} := P_{\text{top}} \cdot L_{\text{pile}} = 20304.131 \text{ kip} \cdot \text{in}$$

Maximum Moment from LPILE Output pg. 66, (18277200. inch-lbs)

$$M := \begin{cases} \text{"good"} & \text{if } M_{\text{r}} \geq M_{\text{max}} \\ \text{"redesign"} & \text{otherwise} \end{cases}$$

M = "good"

$$V_{\text{max}} := 42 \text{ kip}$$

Maximum Shear Load. LPILE Output pg. 66

$$V := \begin{cases} \text{"good"} & \text{if } V_{\text{r}} \geq V_{\text{max}} \\ \text{"redesign"} & \text{otherwise} \end{cases}$$

V = "good"

$$UT_{\text{b}} := \frac{M_{\text{max}}}{M_{\text{r}}} = 0.549$$

$$UT_{\text{b}} < 0.6 = 1$$

Utilization for bending. Limited to 0.6 for project specific conditions

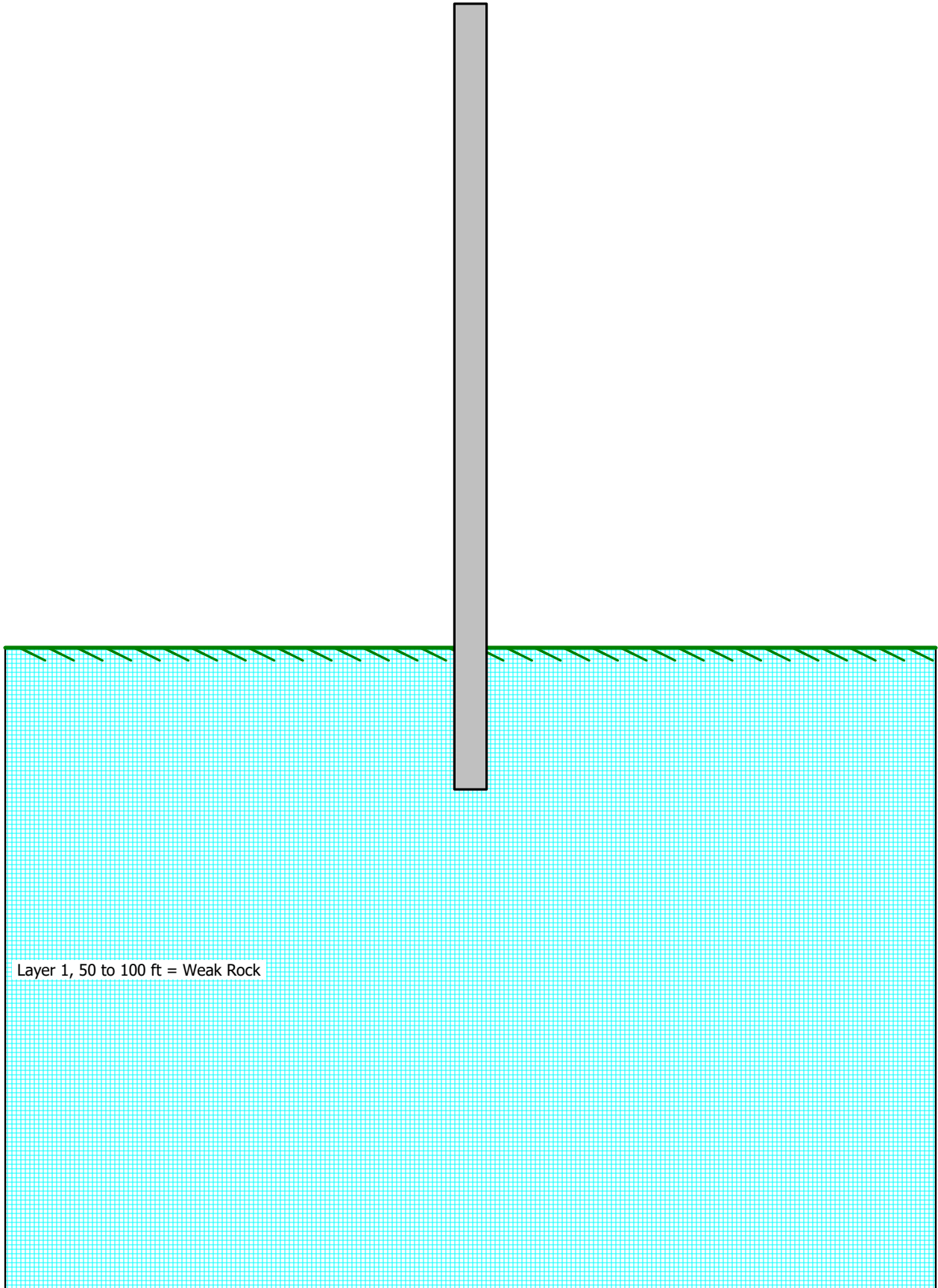
$$UT_{\text{v}} := \frac{V_{\text{max}}}{V_{\text{r}}} = 0.035$$

$$UT_{\text{v}} < 0.6 = 1$$

Utilization for shear. Limited to 0.6 for project specific conditions

The Pile section selected is adequate to support the Trash wheel equipment.

CASE 1 - ANCHOR PILE ONLY ON ROCK



=====
LPIle for Windows, Version 2022-12.003

Analysis of Individual Files and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

Path to file locations:

\\enercon.sharepoint.com@SSL\DavWWWRoot\sites\NSG_NC\Clients\FWTH\FWTHFS\FWTHFS-00254\FWTHFS-002
42 (Original Project Docs)\Deliverables_SP\Calculations\Trash Wheel\Final\clearfork\08092022\

Name of input data file:

Clear Fork rock.lp12d

Name of output report file:

Clear Fork rock.lp12o

Name of plot output file:

Clear Fork rock.lp12p

Name of runtime message file:

Clear Fork rock.lp12r

Date and Time of Analysis

Date: August 9, 2022

Time: 15:16:47

Problem Title

Project Name: Fort Worth Trash Wheel

Job Number: FWTHFS-00242

Client: City of Fort Worth

Engineer: Sandeep Menon

Description: Clear Fork LPILE

Program Options and Settings

Computational Options:

- Conventional Analysis

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 300.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 61.000 ft
Depth of ground surface below top of pile = 50.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	30.0000
2	61.000	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a steel pipe pile
Length of section = 61.000000 ft

y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with
 specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

File Section No. 1:

Dimensions and Properties of Steel Pipe Pile:

Length of Section	=	61.000000 ft
Outer Diameter of Pipe	=	30.000000 in
Pipe Wall Thickness	=	0.750000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	68.918689 sq. in.
Moment of Inertia	=	7375. in^4
Elastic Bending Stiffness	=	213885920. kip-in^2
Plastic Modulus, Z	=	641.812500 in^3
Plastic Moment Capacity = Fy Z	=	32091. in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	3445.934 kips
Nominal Axial Tensile Capacity	=	-3445.934 kips

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
-----	-----
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in2	Depth to N Axis in	Max Total Stress ksi	Run Msg
-----	-----	-----	-----	-----	---
0.00000244	522.3962477	213875170.	15.0000000	1.0518750	
0.00000489	1045.	213875170.	15.0000000	2.1037500	
0.00000733	1567.	213875170.	15.0000000	3.1556250	
0.00000977	2090.	213875170.	15.0000000	4.2075000	
0.00001221	2612.	213875170.	15.0000000	5.2593750	
0.00001466	3134.	213875170.	15.0000000	6.3112500	
0.00001710	3657.	213875170.	15.0000000	7.3631250	
0.00001954	4179.	213875170.	15.0000000	8.4150001	
0.00002198	4702.	213875170.	15.0000000	9.4668751	
0.00002443	5224.	213875170.	15.0000000	10.5187501	
0.00002687	5746.	213875170.	15.0000000	11.5706251	
0.00002931	6269.	213875170.	15.0000000	12.6225001	

0.00003175	6791.	213875170.	15.0000000	13.6743751	
0.00003420	7314.	213875170.	15.0000000	14.7262501	
0.00003664	7836.	213875170.	15.0000000	15.7781251	
0.00003908	8358.	213875170.	15.0000000	16.8300001	
0.00004152	8881.	213875170.	15.0000000	17.8818751	
0.00004397	9403.	213875170.	15.0000000	18.9337501	
0.00004641	9926.	213875170.	15.0000000	19.9856251	
0.00004885	10448.	213875170.	15.0000000	21.0375001	
0.00005129	10970.	213875170.	15.0000000	22.0893751	
0.00005374	11493.	213875170.	15.0000000	23.1412502	
0.00005618	12015.	213875170.	15.0000000	24.1931252	
0.00005862	12538.	213875170.	15.0000000	25.2450002	
0.00006106	13060.	213875170.	15.0000000	26.2968752	
0.00006351	13582.	213875170.	15.0000000	27.3487502	
0.00006595	14105.	213875170.	15.0000000	28.4006252	
0.00006839	14627.	213875170.	15.0000000	29.4525002	
0.00007083	15149.	213875170.	15.0000000	30.5043752	
0.00007328	15672.	213875170.	15.0000000	31.5562502	
0.00007572	16194.	213875170.	15.0000000	32.6081252	
0.00007816	16717.	213875170.	15.0000000	33.6600002	
0.00008060	17239.	213875170.	15.0000000	34.7118752	
0.00008305	17761.	213875170.	15.0000000	35.7637502	
0.00008549	18284.	213875170.	15.0000000	36.8156252	
0.00008793	18806.	213875170.	15.0000000	37.8675003	
0.00009037	19329.	213875170.	15.0000000	38.9193753	
0.00009282	19851.	213875170.	15.0000000	39.9712503	
0.00009526	20373.	213875170.	15.0000000	41.0231253	
0.0001001	21418.	213875170.	15.0000000	43.1268753	
0.0001050	22463.	213875170.	15.0000000	45.2306253	
0.0001099	23508.	213875170.	15.0000000	47.3343753	
0.0001148	24553.	213875170.	15.0000000	49.4381253	
0.0001197	25511.	213152380.	15.0000000	50.0000000	Y
0.0001246	26232.	210583666.	15.0000000	50.0000000	Y
0.0001295	26800.	207022224.	15.0000000	50.0000000	Y
0.0001343	27269.	202983179.	15.0000000	50.0000000	Y
0.0001392	27670.	198746654.	15.0000000	50.0000000	Y
0.0001441	28017.	194414878.	15.0000000	50.0000000	Y
0.0001490	28323.	190095167.	15.0000000	50.0000000	Y
0.0001539	28591.	185802169.	15.0000000	50.0000000	Y
0.0001588	28829.	181585311.	15.0000000	50.0000000	Y
0.0001636	29043.	177470462.	15.0000000	50.0000000	Y
0.0001685	29235.	173468097.	15.0000000	50.0000000	Y
0.0001734	29409.	169585196.	15.0000000	50.0000000	Y
0.0001783	29568.	165826064.	15.0000000	50.0000000	Y
0.0001832	29712.	162192964.	15.0000000	50.0000000	Y
0.0001881	29844.	158681275.	15.0000000	50.0000000	Y
0.0001930	29963.	155281614.	15.0000000	50.0000000	Y
0.0001978	30074.	152005500.	15.0000000	50.0000000	Y
0.0002027	30177.	148851238.	15.0000000	50.0000000	Y
0.0002076	30271.	145802256.	15.0000000	50.0000000	Y
0.0002125	30357.	142857873.	15.0000000	50.0000000	Y
0.0002174	30440.	140027612.	15.0000000	50.0000000	Y
0.0002223	30514.	137283086.	15.0000000	50.0000000	Y
0.0002272	30585.	134642575.	15.0000000	50.0000000	Y
0.0002320	30650.	132089238.	15.0000000	50.0000000	Y
0.0002369	30711.	129625023.	15.0000000	50.0000000	Y
0.0002418	30769.	127243261.	15.0000000	50.0000000	Y
0.0002467	30823.	124943000.	15.0000000	50.0000000	Y
0.0002516	30873.	122715893.	15.0000000	50.0000000	Y
0.0002565	30922.	120568203.	15.0000000	50.0000000	Y
0.0002614	30965.	118481064.	15.0000000	50.0000000	Y
0.0002662	31009.	116470517.	15.0000000	50.0000000	Y
0.0002711	31047.	114515408.	15.0000000	50.0000000	Y
0.0002760	31085.	112624803.	15.0000000	50.0000000	Y
0.0002809	31122.	110797855.	15.0000000	50.0000000	Y
0.0002858	31154.	109016833.	15.0000000	50.0000000	Y
0.0002907	31187.	107295678.	15.0000000	50.0000000	Y
0.0003102	31301.	100904523.	15.0000000	50.0000000	Y
0.0003297	31393.	95205408.	15.0000000	50.0000000	Y
0.0003493	31471.	90100759.	15.0000000	50.0000000	Y
0.0003688	31535.	85502779.	15.0000000	50.0000000	Y
0.0003884	31590.	81340543.	15.0000000	50.0000000	Y
0.0004079	31637.	77559576.	15.0000000	50.0000000	Y

0.0004274	31679.	74112823.	15.0000000	50.0000000	Y
0.0004470	31713.	70949672.	15.0000000	50.0000000	Y
0.0004665	31745.	68046000.	15.0000000	50.0000000	Y
0.0004861	31772.	65365798.	15.0000000	50.0000000	Y
0.0005056	31797.	62889062.	15.0000000	50.0000000	Y
0.0005251	31818.	60588308.	15.0000000	50.0000000	Y
0.0005447	31838.	58452630.	15.0000000	50.0000000	Y
0.0005642	31854.	56456945.	15.0000000	50.0000000	Y
0.0005838	31870.	54593653.	15.0000000	50.0000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	31870.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Computed Values of Pile Loading and Deflection
for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 30000.0 lbs
Applied moment at pile head = 270000.0 in-lbs
Axial thrust load on pile head = 0.0 lbs

Depth Spr.	Deflect. Distrib.	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Es*H
X Lat. Load	y inches	in-lbs	lbs	radians	psi*	lb-in ²	lb/inch	
feet	lb/inch							
0.00	0.00	270000.	30000.	-0.02963	549.1245	2.14E+11	0.00	
0.00	0.6100	489600.	30000.	-0.02962	995.7458	2.14E+11	0.00	
0.00	1.2200	709200.	30000.	-0.02960	1442.	2.14E+11	0.00	
0.00	1.8300	928800.	30000.	-0.02957	1889.	2.14E+11	0.00	
0.00	2.4400	1148400.	30000.	-0.02953	2336.	2.14E+11	0.00	
0.00	3.0500	1368000.	30000.	-0.02949	2782.	2.14E+11	0.00	
0.00	3.6600	1587600.	30000.	-0.02944	3229.	2.14E+11	0.00	
0.00	4.2700	1807200.	30000.	-0.02938	3675.	2.14E+11	0.00	
0.00	4.8800	2026800.	30000.	-0.02932	4122.	2.14E+11	0.00	

0.00	0.00							
5.4900	10.6425	2246400.	30000.	-0.02924	4569.	2.14E+11	0.00	
0.00	0.00							
6.1000	10.4288	2466000.	30000.	-0.02916	5015.	2.14E+11	0.00	
0.00	0.00							
6.7100	10.2156	2685600.	30000.	-0.02907	5462.	2.14E+11	0.00	
0.00	0.00							
7.3200	10.0031	2905200.	30000.	-0.02898	5909.	2.14E+11	0.00	
0.00	0.00							
7.9300	9.7913	3124800.	30000.	-0.02888	6355.	2.14E+11	0.00	
0.00	0.00							
8.5400	9.5804	3344400.	30000.	-0.02877	6802.	2.14E+11	0.00	
0.00	0.00							
9.1500	9.3702	3564000.	30000.	-0.02865	7248.	2.14E+11	0.00	
0.00	0.00							
9.7600	9.1610	3783600.	30000.	-0.02852	7695.	2.14E+11	0.00	
0.00	0.00							
10.3700	8.9527	4003200.	30000.	-0.02839	8142.	2.14E+11	0.00	
0.00	0.00							
10.9800	8.7454	4222800.	30000.	-0.02825	8588.	2.14E+11	0.00	
0.00	0.00							
11.5900	8.5391	4442400.	30000.	-0.02810	9035.	2.14E+11	0.00	
0.00	0.00							
12.2000	8.3340	4662000.	30000.	-0.02794	9482.	2.14E+11	0.00	
0.00	0.00							
12.8100	8.1300	4881600.	30000.	-0.02778	9928.	2.14E+11	0.00	
0.00	0.00							
13.4200	7.9273	5101200.	30000.	-0.02761	10375.	2.14E+11	0.00	
0.00	0.00							
14.0300	7.7258	5320800.	30000.	-0.02743	10821.	2.14E+11	0.00	
0.00	0.00							
14.6400	7.5257	5540400.	30000.	-0.02724	11268.	2.14E+11	0.00	
0.00	0.00							
15.2500	7.3270	5760000.	30000.	-0.02705	11715.	2.14E+11	0.00	
0.00	0.00							
15.8600	7.1297	5979600.	30000.	-0.02685	12161.	2.14E+11	0.00	
0.00	0.00							
16.4700	6.9339	6199200.	30000.	-0.02664	12608.	2.14E+11	0.00	
0.00	0.00							
17.0800	6.7396	6418800.	30000.	-0.02643	13055.	2.14E+11	0.00	
0.00	0.00							
17.6900	6.5470	6638400.	30000.	-0.02620	13501.	2.14E+11	0.00	
0.00	0.00							
18.3000	6.3560	6858000.	30000.	-0.02597	13948.	2.14E+11	0.00	
0.00	0.00							
18.9100	6.1668	7077600.	30000.	-0.02573	14394.	2.14E+11	0.00	
0.00	0.00							
19.5200	5.9793	7297200.	30000.	-0.02549	14841.	2.14E+11	0.00	
0.00	0.00							
20.1300	5.7936	7516800.	30000.	-0.02523	15288.	2.14E+11	0.00	
0.00	0.00							
20.7400	5.6099	7736400.	30000.	-0.02497	15734.	2.14E+11	0.00	
0.00	0.00							
21.3500	5.4280	7956000.	30000.	-0.02470	16181.	2.14E+11	0.00	
0.00	0.00							
21.9600	5.2482	8175600.	30000.	-0.02443	16627.	2.14E+11	0.00	
0.00	0.00							
22.5700	5.0704	8395200.	30000.	-0.02414	17074.	2.14E+11	0.00	
0.00	0.00							
23.1800	4.8947	8614800.	30000.	-0.02385	17521.	2.14E+11	0.00	
0.00	0.00							
23.7900	4.7212	8834400.	30000.	-0.02355	17967.	2.14E+11	0.00	
0.00	0.00							
24.4000	4.5499	9054000.	30000.	-0.02325	18414.	2.14E+11	0.00	
0.00	0.00							
25.0100	4.3808	9273600.	30000.	-0.02294	18861.	2.14E+11	0.00	
0.00	0.00							
25.6200	4.2141	9493200.	30000.	-0.02261	19307.	2.14E+11	0.00	
0.00	0.00							
26.2300	4.0498	9712800.	30000.	-0.02229	19754.	2.14E+11	0.00	
0.00	0.00							
26.8400	3.8879	9932400.	30000.	-0.02195	20200.	2.14E+11	0.00	
0.00	0.00							

27.4500	3.7284	1.02E+07	30000.	-0.02161	20647.	2.14E+11	0.00
0.00	0.00						
28.0600	3.5716	1.04E+07	30000.	-0.02125	21094.	2.14E+11	0.00
0.00	0.00						
28.6700	3.4173	1.06E+07	30000.	-0.02090	21540.	2.14E+11	0.00
0.00	0.00						
29.2800	3.2657	1.08E+07	30000.	-0.02053	21987.	2.14E+11	0.00
0.00	0.00						
29.8900	3.1167	1.10E+07	30000.	-0.02016	22434.	2.14E+11	0.00
0.00	0.00						
30.5000	2.9706	1.12E+07	30000.	-0.01977	22880.	2.14E+11	0.00
0.00	0.00						
31.1100	2.8272	1.15E+07	30000.	-0.01939	23327.	2.14E+11	0.00
0.00	0.00						
31.7200	2.6868	1.17E+07	30000.	-0.01899	23773.	2.14E+11	0.00
0.00	0.00						
32.3300	2.5492	1.19E+07	30000.	-0.01859	24220.	2.14E+11	0.00
0.00	0.00						
32.9400	2.4147	1.21E+07	30000.	-0.01817	24667.	2.14E+11	0.00
0.00	0.00						
33.5500	2.2832	1.23E+07	30000.	-0.01776	25113.	2.14E+11	0.00
0.00	0.00						
34.1600	2.1548	1.26E+07	30000.	-0.01733	25560.	2.14E+11	0.00
0.00	0.00						
34.7700	2.0295	1.28E+07	30000.	-0.01689	26007.	2.14E+11	0.00
0.00	0.00						
35.3800	1.9074	1.30E+07	30000.	-0.01645	26453.	2.14E+11	0.00
0.00	0.00						
35.9900	1.7886	1.32E+07	30000.	-0.01600	26900.	2.14E+11	0.00
0.00	0.00						
36.6000	1.6731	1.34E+07	30000.	-0.01555	27346.	2.14E+11	0.00
0.00	0.00						
37.2100	1.5610	1.37E+07	30000.	-0.01508	27793.	2.14E+11	0.00
0.00	0.00						
37.8200	1.4523	1.39E+07	30000.	-0.01461	28240.	2.14E+11	0.00
0.00	0.00						
38.4300	1.3471	1.41E+07	30000.	-0.01413	28686.	2.14E+11	0.00
0.00	0.00						
39.0400	1.2454	1.43E+07	30000.	-0.01365	29133.	2.14E+11	0.00
0.00	0.00						
39.6500	1.1473	1.45E+07	30000.	-0.01315	29580.	2.14E+11	0.00
0.00	0.00						
40.2600	1.0528	1.48E+07	30000.	-0.01265	30026.	2.14E+11	0.00
0.00	0.00						
40.8700	0.9620	1.50E+07	30000.	-0.01214	30473.	2.14E+11	0.00
0.00	0.00						
41.4800	0.8750	1.52E+07	30000.	-0.01163	30919.	2.14E+11	0.00
0.00	0.00						
42.0900	0.7918	1.54E+07	30000.	-0.01110	31366.	2.14E+11	0.00
0.00	0.00						
42.7000	0.7125	1.56E+07	30000.	-0.01057	31813.	2.14E+11	0.00
0.00	0.00						
43.3100	0.6371	1.59E+07	30000.	-0.01003	32259.	2.14E+11	0.00
0.00	0.00						
43.9200	0.5657	1.61E+07	30000.	-0.00948	32706.	2.14E+11	0.00
0.00	0.00						
44.5300	0.4982	1.63E+07	30000.	-0.00893	33152.	2.14E+11	0.00
0.00	0.00						
45.1400	0.4349	1.65E+07	30000.	-0.00837	33599.	2.14E+11	0.00
0.00	0.00						
45.7500	0.3757	1.67E+07	30000.	-0.00780	34046.	2.14E+11	0.00
0.00	0.00						
46.3600	0.3207	1.70E+07	30000.	-0.00722	34492.	2.14E+11	0.00
0.00	0.00						
46.9700	0.2700	1.72E+07	30000.	-0.00664	34939.	2.14E+11	0.00
0.00	0.00						
47.5800	0.2235	1.74E+07	30000.	-0.00605	35386.	2.14E+11	0.00
0.00	0.00						
48.1900	0.1815	1.76E+07	30000.	-0.00545	35832.	2.14E+11	0.00
0.00	0.00						
48.8000	0.1438	1.78E+07	30000.	-0.00484	36279.	2.14E+11	0.00
0.00	0.00						
49.4100	0.1106	1.81E+07	30000.	-0.00423	36725.	2.14E+11	0.00

0.00	0.00							
50.0200	0.08191	1.83E+07	5573.	-0.00360	37172.	2.14E+11	-6674.	
596443.	0.00							
50.6300	0.05781	1.81E+07	-51532.	-0.00298	36891.	2.14E+11	-8929.	
1130541.	0.00							
51.2400	0.03826	1.75E+07	-122885.	-0.00237	35638.	2.14E+11	-10567.	
2021755.	0.00							
51.8500	0.02309	1.63E+07	-202520.	-0.00179	33233.	2.14E+11	-11192.	
3547321.	0.00							
52.4600	0.01202	1.46E+07	-284115.	-0.00126	29608.	2.14E+11	-11102.	
6758234.	0.00							
53.0700	0.00460	1.22E+07	-361304.	-8.06E-04	24773.	2.14E+11	-9988.	
1.59E+07	0.00							
53.6800	2.32E-04	9268390.	-417378.	-4.38E-04	18850.	2.14E+11	-5333.	
1.68E+08	0.00							
54.2900	-0.00182	6070301.	-400652.	-1.76E-04	12346.	2.14E+11	9903.	
3.99E+07	0.00							
54.9000	-0.00234	3402847.	-321894.	-1.39E-05	6921.	2.14E+11	11615.	
3.63E+07	0.00							
55.5100	-0.00202	1357778.	-234687.	6.76E-05	2761.	2.14E+11	12212.	
4.43E+07	0.00							
56.1200	-0.00135	-32968.	-146164.	9.03E-05	67.0507	2.14E+11	11975.	
6.47E+07	0.00							
56.7300	-6.98E-04	-782061.	-62339.	7.63E-05	1591.	2.14E+11	10928.	
1.15E+08	0.00							
57.3400	-2.37E-04	-945608.	10377.	4.68E-05	1923.	2.14E+11	8940.	
2.76E+08	0.00							
57.9500	-1.31E-05	-630145.	45491.	1.98E-05	1282.	2.14E+11	654.3483	
3.66E+08	0.00							
58.5600	5.29E-05	-279620.	38207.	4.23E-06	568.6906	2.14E+11	-2644.	
3.66E+08	0.00							
59.1700	4.88E-05	-70788.	19597.	-1.77E-06	143.9690	2.14E+11	-2440.	
3.66E+08	0.00							
59.7800	2.70E-05	7279.	5725.	-2.86E-06	14.8042	2.14E+11	-1350.	
3.66E+08	0.00							
60.3900	7.01E-06	13023.	-497.206	-2.51E-06	26.4868	2.14E+11	-350.257	
3.66E+08	0.00							
61.0000	-9.72E-06	0.00	0.00	-2.29E-06	0.00	2.14E+11	486.1056	
1.83E+08	0.00							

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 12.58529038 inches
 Computed slope at pile head = -0.0296311 radians
 Maximum bending moment = 18277200. inch-lbs
 Maximum shear force = -417378. lbs
 Depth of maximum bending moment = 50.02000000 feet below pile head
 Depth of maximum shear force = 53.68000000 feet below pile head
 Number of iterations = 25
 Number of zero deflection points = 3
 Pile deflection at ground = 0.08284846 inches

 Pile-head Deflection vs. Pile Length for Load Case 1

Boundary Condition Type 1, Shear and Moment

Shear = 30000. lbs
 Moment = 270000. in-lbs
 Axial Load = 0. lbs

File Length feet	File Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
61.00000	12.58529038	18277200.	-417378.
57.95000	12.74897307	18419940.	-422467.

Summary of Pile-head Responses for Conventional Analyses

Definitions of Pile-head Loading Conditions:

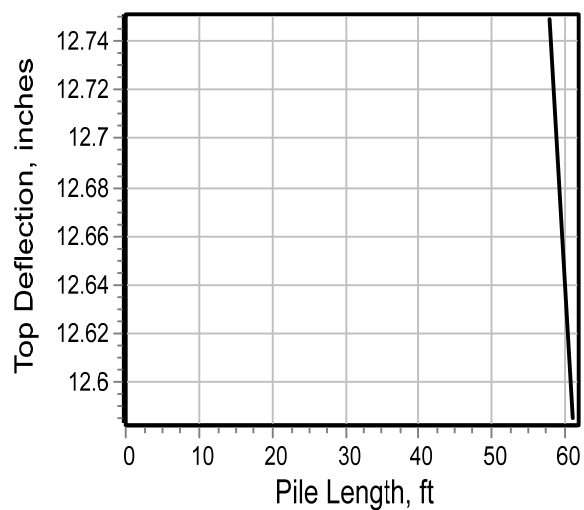
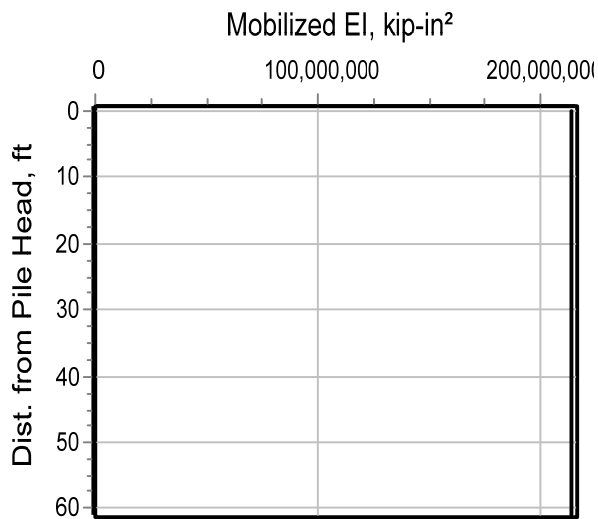
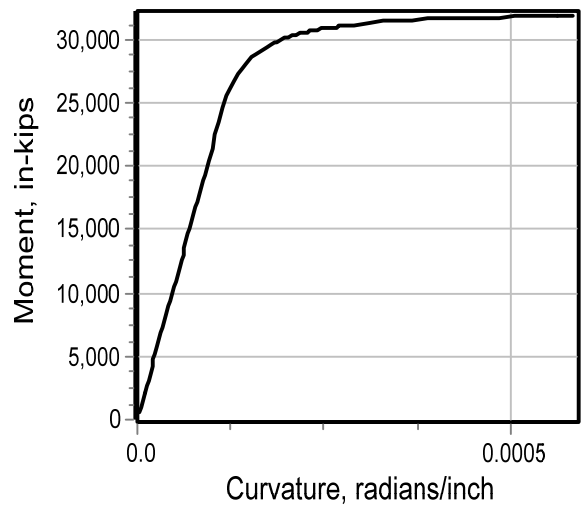
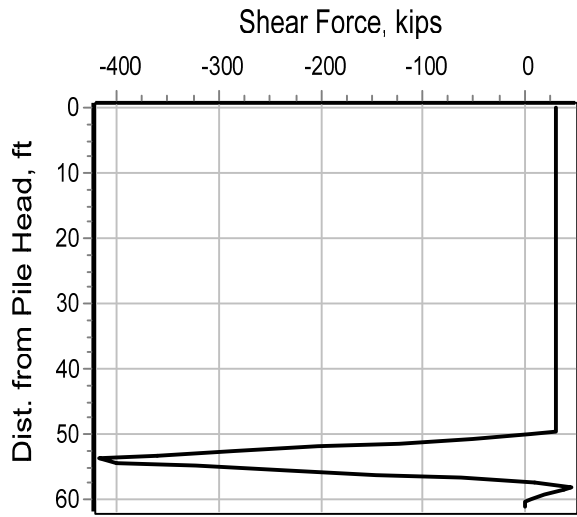
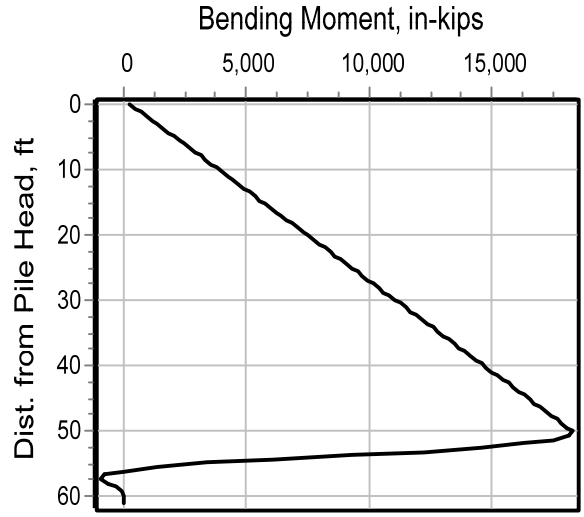
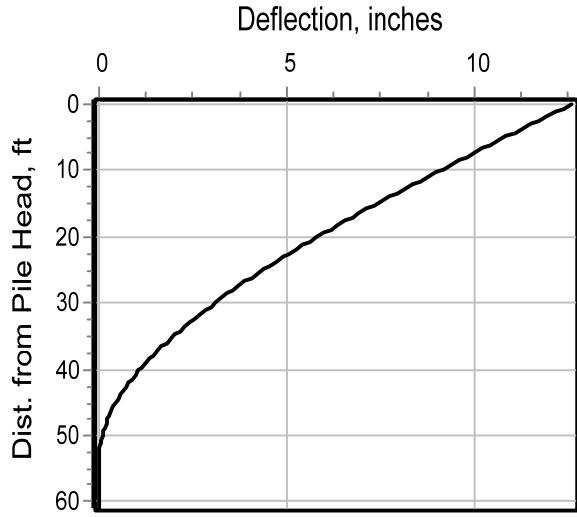
Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case	Load Type	Load	Load	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max Shear in Pile	Max Moment in Pile
No.		1	2	lbs	inches	radians	lbs	in-lbs
1	V, lb	30000.	M, in-lb	270000.	0.00	12.5853	-0.02963	-417378.

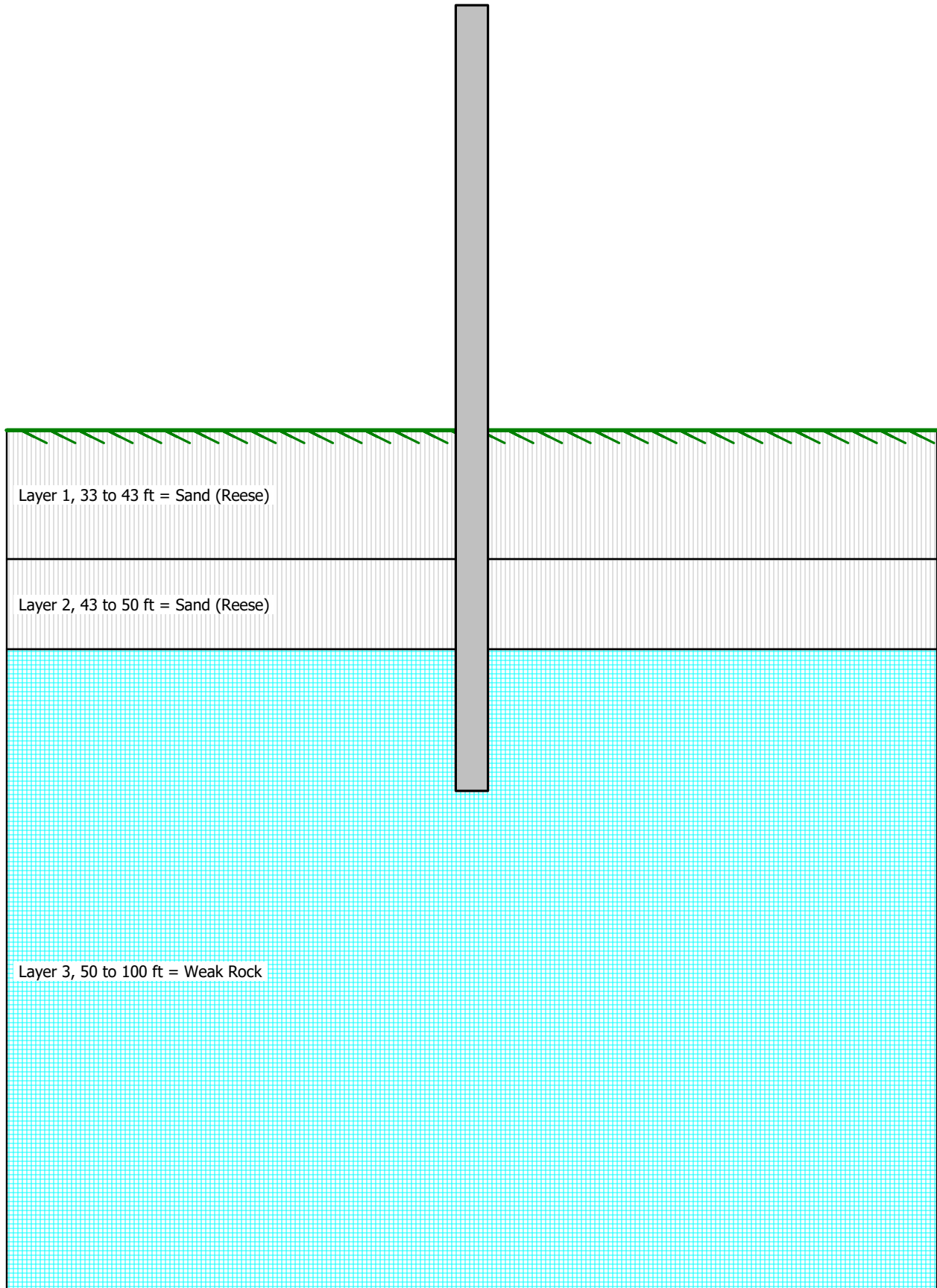
Maximum pile-head deflection = 12.5852903829 inches
Maximum pile-head rotation = -0.0296311209 radians = -1.697738 deg.

The analysis ended normally.

**CASE 1 - RESULTS SUMMARY ANCHOR
PILE ONLY ON ROCK**



CASE 2 - ANCHOR PILE WITH 2 SOIL LAYERS AND ROCK



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LPIle for Windows, Version 2022-12.003

Analysis of Individual Piles and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

Path to file locations:

\\enercon.sharepoint.com@SSL\DavWWWRoot\sites\NSG_NC\Clients\FWTH\FWTHFS\FWTHFS-00254\FWTHFS-002
42 (Original Project Docs)\Deliverables_SP\Calculations\Trash Wheel\Final\clearfork\08092022\

Name of input data file:

Clear Fork all ayer.lp12d

Name of output report file:

Clear Fork all ayer.lp12o

Name of plot output file:

Clear Fork all ayer.lp12p

Name of runtime message file:

Clear Fork all ayer.lp12r

Date and Time of Analysis

Date: August 9, 2022

Time: 15:27:05

Problem Title

Project Name: Fort Worth Trash Wheel

Job Number: FWTHFS-00242

Client: City of Fort Worth

Engineer: Sandeep Menon

Description: Clear Fork LPILE

Program Options and Settings

Computational Options:

- Conventional Analysis

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 300.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified

- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 61.000 ft
Depth of ground surface below top of pile = 33.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	30.0000
2	61.000	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a steel pipe pile
Length of section = 61.000000 ft

Pile diameter = 30.000000 in

 Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 33.000000 ft
 Distance from top of pile to bottom of layer = 43.000000 ft
 Effective unit weight at top of layer = 125.000000 pcf
 Effective unit weight at bottom of layer = 125.000000 pcf
 Friction angle at top of layer = 36.000000 deg.
 Friction angle at bottom of layer = 36.000000 deg.
 Subgrade k at top of layer = 120.000000 pci
 Subgrade k at bottom of layer = 120.000000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 43.000000 ft
 Distance from top of pile to bottom of layer = 50.000000 ft
 Effective unit weight at top of layer = 125.000000 pcf
 Effective unit weight at bottom of layer = 125.000000 pcf
 Friction angle at top of layer = 36.000000 deg.
 Friction angle at bottom of layer = 36.000000 deg.
 Subgrade k at top of layer = 120.000000 pci
 Subgrade k at bottom of layer = 120.000000 pci

Layer 3 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer = 50.000000 ft
 Distance from top of pile to bottom of layer = 100.000000 ft
 Effective unit weight at top of layer = 140.000000 pcf
 Effective unit weight at bottom of layer = 140.000000 pcf
 Uniaxial compressive strength at top of layer = 275.000000 psi
 Uniaxial compressive strength at bottom of layer = 275.000000 psi
 Initial modulus of rock at top of layer = 100000. psi
 Initial modulus of rock at bottom of layer = 100000. psi
 RQD of rock at top of layer = 30.000000 %
 RQD of rock at bottom of layer = 30.000000 %
 k_{rm} of rock at top of layer = 0.0001000
 k_{rm} of rock at bottom of layer = 0.0001000

(Depth of the lowest soil layer extends 39.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer E50 Num. or k _{rm}	Soil Type Name k _{py} (p-y Curve Type) pci	Layer Rock Mass Modulus psi	Layer Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	Uniaxial qu psi	RQD %
1	Sand		33.0000	125.0000	36.0000	--	--
--	120.0000	--					
--	(Reese, et al.)	--	43.0000	125.0000	36.0000	--	--
--	120.0000	--					
2	Sand		43.0000	125.0000	36.0000	--	--
--	120.0000	--					
--	(Reese, et al.)	--	50.0000	125.0000	36.0000	--	--

--	120.0000	--				
3	Weak		50.0000	140.0000	--	275.0000 30.0000
1.00E-04	--		100000.			
	Rock		100.0000	140.0000	--	275.0000 30.0000
1.00E-04	--		100000.			

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load y No. Length	Load Run Analysis Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top vs. Pile
1	1	V = 30000. lbs	M = 270000. in-lbs	0.0000000	Yes
	Yes				

V = shear force applied normal to pile axis
 M = bending moment applied to pile head
 y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Steel Pipe Pile:

Length of Section	=	61.000000 ft
Outer Diameter of Pipe	=	30.000000 in
Pipe Wall Thickness	=	0.750000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	68.918689 sq. in.
Moment of Inertia	=	7375. in^4
Elastic Bending Stiffness	=	213885920. kip-in^2
Plastic Modulus, Z	=	641.812500 in^3
Plastic Moment Capacity = Fy Z	=	32091. in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	3445.934 kips
Nominal Axial Tensile Capacity	=	-3445.934 kips

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in ²	Depth to N Axis in	Max Total Stress ksi	Run Msg
0.00000244	522.3962477	213875170.	15.0000000	1.0518750	
0.00000489	1045.	213875170.	15.0000000	2.1037500	
0.00000733	1567.	213875170.	15.0000000	3.1556250	
0.00000977	2090.	213875170.	15.0000000	4.2075000	
0.00001221	2612.	213875170.	15.0000000	5.2593750	
0.00001466	3134.	213875170.	15.0000000	6.3112500	
0.00001710	3657.	213875170.	15.0000000	7.3631250	
0.00001954	4179.	213875170.	15.0000000	8.4150001	
0.00002198	4702.	213875170.	15.0000000	9.4668751	
0.00002443	5224.	213875170.	15.0000000	10.5187501	
0.00002687	5746.	213875170.	15.0000000	11.5706251	
0.00002931	6269.	213875170.	15.0000000	12.6225001	
0.00003175	6791.	213875170.	15.0000000	13.6743751	
0.00003420	7314.	213875170.	15.0000000	14.7262501	
0.00003664	7836.	213875170.	15.0000000	15.7781251	
0.00003908	8358.	213875170.	15.0000000	16.8300001	
0.00004152	8881.	213875170.	15.0000000	17.8818751	
0.00004397	9403.	213875170.	15.0000000	18.9337501	
0.00004641	9926.	213875170.	15.0000000	19.9856251	
0.00004885	10448.	213875170.	15.0000000	21.0375001	
0.00005129	10970.	213875170.	15.0000000	22.0893751	
0.00005374	11493.	213875170.	15.0000000	23.1412502	
0.00005618	12015.	213875170.	15.0000000	24.1931252	
0.00005862	12538.	213875170.	15.0000000	25.2450002	
0.00006106	13060.	213875170.	15.0000000	26.2968752	
0.00006351	13582.	213875170.	15.0000000	27.3487502	
0.00006595	14105.	213875170.	15.0000000	28.4006252	
0.00006839	14627.	213875170.	15.0000000	29.4525002	
0.00007083	15149.	213875170.	15.0000000	30.5043752	
0.00007328	15672.	213875170.	15.0000000	31.5562502	
0.00007572	16194.	213875170.	15.0000000	32.6081252	
0.00007816	16717.	213875170.	15.0000000	33.6600002	
0.00008060	17239.	213875170.	15.0000000	34.7118752	
0.00008305	17761.	213875170.	15.0000000	35.7637502	
0.00008549	18284.	213875170.	15.0000000	36.8156252	
0.00008793	18806.	213875170.	15.0000000	37.8675003	
0.00009037	19329.	213875170.	15.0000000	38.9193753	
0.00009282	19851.	213875170.	15.0000000	39.9712503	
0.00009526	20373.	213875170.	15.0000000	41.0231253	
0.0001001	21418.	213875170.	15.0000000	43.1268753	
0.0001050	22463.	213875170.	15.0000000	45.2306253	
0.0001099	23508.	213875170.	15.0000000	47.3343753	
0.0001148	24553.	213875170.	15.0000000	49.4381253	
0.0001197	25511.	213152380.	15.0000000	50.0000000	Y
0.0001246	26232.	210583666.	15.0000000	50.0000000	Y
0.0001295	26800.	207022224.	15.0000000	50.0000000	Y
0.0001343	27269.	202983179.	15.0000000	50.0000000	Y
0.0001392	27670.	198746654.	15.0000000	50.0000000	Y
0.0001441	28017.	194414878.	15.0000000	50.0000000	Y
0.0001490	28323.	190095167.	15.0000000	50.0000000	Y
0.0001539	28591.	185802169.	15.0000000	50.0000000	Y
0.0001588	28829.	181585311.	15.0000000	50.0000000	Y
0.0001636	29043.	177470462.	15.0000000	50.0000000	Y

0.0001685	29235.	173468097.	15.0000000	50.0000000	Y
0.0001734	29409.	169585196.	15.0000000	50.0000000	Y
0.0001783	29568.	165826064.	15.0000000	50.0000000	Y
0.0001832	29712.	162192964.	15.0000000	50.0000000	Y
0.0001881	29844.	158681275.	15.0000000	50.0000000	Y
0.0001930	29963.	155281614.	15.0000000	50.0000000	Y
0.0001978	30074.	152005500.	15.0000000	50.0000000	Y
0.0002027	30177.	148851238.	15.0000000	50.0000000	Y
0.0002076	30271.	145802256.	15.0000000	50.0000000	Y
0.0002125	30357.	142857873.	15.0000000	50.0000000	Y
0.0002174	30440.	140027612.	15.0000000	50.0000000	Y
0.0002223	30514.	137283086.	15.0000000	50.0000000	Y
0.0002272	30585.	134642575.	15.0000000	50.0000000	Y
0.0002320	30650.	132089238.	15.0000000	50.0000000	Y
0.0002369	30711.	129625023.	15.0000000	50.0000000	Y
0.0002418	30769.	127243261.	15.0000000	50.0000000	Y
0.0002467	30823.	124943000.	15.0000000	50.0000000	Y
0.0002516	30873.	122715893.	15.0000000	50.0000000	Y
0.0002565	30922.	120568203.	15.0000000	50.0000000	Y
0.0002614	30965.	118481064.	15.0000000	50.0000000	Y
0.0002662	31009.	116470517.	15.0000000	50.0000000	Y
0.0002711	31047.	114515408.	15.0000000	50.0000000	Y
0.0002760	31085.	112624803.	15.0000000	50.0000000	Y
0.0002809	31122.	110797855.	15.0000000	50.0000000	Y
0.0002858	31154.	109016833.	15.0000000	50.0000000	Y
0.0002907	31187.	107295678.	15.0000000	50.0000000	Y
0.0003102	31301.	100904523.	15.0000000	50.0000000	Y
0.0003297	31393.	95205408.	15.0000000	50.0000000	Y
0.0003493	31471.	90100759.	15.0000000	50.0000000	Y
0.0003688	31535.	85502779.	15.0000000	50.0000000	Y
0.0003884	31590.	81340543.	15.0000000	50.0000000	Y
0.0004079	31637.	77559576.	15.0000000	50.0000000	Y
0.0004274	31679.	74112823.	15.0000000	50.0000000	Y
0.0004470	31713.	70949672.	15.0000000	50.0000000	Y
0.0004665	31745.	68046000.	15.0000000	50.0000000	Y
0.0004861	31772.	65365798.	15.0000000	50.0000000	Y
0.0005056	31797.	62889062.	15.0000000	50.0000000	Y
0.0005251	31818.	60588308.	15.0000000	50.0000000	Y
0.0005447	31838.	58452630.	15.0000000	50.0000000	Y
0.0005642	31854.	56456945.	15.0000000	50.0000000	Y
0.0005838	31870.	54593653.	15.0000000	50.0000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	31870.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of Equivalent

Layer No.	Layer Below Pile Head ft	Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	33.0000	0.00	N.A.	No	0.00	222057.
2	43.0000	10.0000	Yes	No	222057.	558325.
3	50.0000	17.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

 Computed Values of Pile Loading and Deflection
 for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 30000.0 lbs
 Applied moment at pile head = 270000.0 in-lbs
 Axial thrust load on pile head = 0.0 lbs

Depth Spr.	Deflect. Distrib.	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Es*H
X	y	in-lbs	lbs	radians	psi*	lb-in ²	lb/inch	
Lat. Load lb/inch	inches lb/inch							
0.00	7.5569	270000.	30000.	-0.02099	549.1245	2.14E+11	0.00	
0.00	0.00							
0.00	0.6100	489600.	30000.	-0.02098	995.7458	2.14E+11	0.00	
0.00	0.00							
0.00	1.2200	709200.	30000.	-0.02096	1442.	2.14E+11	0.00	
0.00	0.00							
0.00	1.8300	928800.	30000.	-0.02093	1889.	2.14E+11	0.00	
0.00	0.00							
0.00	2.4400	1148400.	30000.	-0.02090	2336.	2.14E+11	0.00	
0.00	0.00							
0.00	3.0500	1368000.	30000.	-0.02085	2782.	2.14E+11	0.00	
0.00	0.00							
0.00	3.6600	1587600.	30000.	-0.02080	3229.	2.14E+11	0.00	
0.00	0.00							
0.00	4.2700	1807200.	30000.	-0.02075	3675.	2.14E+11	0.00	
0.00	0.00							
0.00	4.8800	2026800.	30000.	-0.02068	4122.	2.14E+11	0.00	
0.00	0.00							
0.00	5.4900	2246400.	30000.	-0.02061	4569.	2.14E+11	0.00	
0.00	0.00							
0.00	6.1000	2466000.	30000.	-0.02053	5015.	2.14E+11	0.00	
0.00	0.00							
0.00	6.7100	2685600.	30000.	-0.02044	5462.	2.14E+11	0.00	
0.00	0.00							
0.00	7.3200	2905200.	30000.	-0.02034	5909.	2.14E+11	0.00	
0.00	0.00							
0.00	7.9300	3124800.	30000.	-0.02024	6355.	2.14E+11	0.00	
0.00	0.00							
0.00	8.5400	3344400.	30000.	-0.02013	6802.	2.14E+11	0.00	
0.00	0.00							
0.00	9.1500	3564000.	30000.	-0.02001	7248.	2.14E+11	0.00	
0.00	0.00							
0.00	9.7600	3783600.	30000.	-0.01988	7695.	2.14E+11	0.00	
0.00	0.00							
0.00	10.3700	4003200.	30000.	-0.01975	8142.	2.14E+11	0.00	
0.00	0.00							

10.9800	4.8550	4222800.	30000.	-0.01961	8588.	2.14E+11	0.00
0.00	0.00						
11.5900	4.7120	4442400.	30000.	-0.01946	9035.	2.14E+11	0.00
0.00	0.00						
12.2000	4.5701	4662000.	30000.	-0.01931	9482.	2.14E+11	0.00
0.00	0.00						
12.8100	4.4294	4881600.	30000.	-0.01914	9928.	2.14E+11	0.00
0.00	0.00						
13.4200	4.2899	5101200.	30000.	-0.01897	10375.	2.14E+11	0.00
0.00	0.00						
14.0300	4.1516	5320800.	30000.	-0.01879	10821.	2.14E+11	0.00
0.00	0.00						
14.6400	4.0147	5540400.	30000.	-0.01861	11268.	2.14E+11	0.00
0.00	0.00						
15.2500	3.8792	5760000.	30000.	-0.01841	11715.	2.14E+11	0.00
0.00	0.00						
15.8600	3.7451	5979600.	30000.	-0.01821	12161.	2.14E+11	0.00
0.00	0.00						
16.4700	3.6126	6199200.	30000.	-0.01800	12608.	2.14E+11	0.00
0.00	0.00						
17.0800	3.4815	6418800.	30000.	-0.01779	13055.	2.14E+11	0.00
0.00	0.00						
17.6900	3.3521	6638400.	30000.	-0.01757	13501.	2.14E+11	0.00
0.00	0.00						
18.3000	3.2244	6858000.	30000.	-0.01733	13948.	2.14E+11	0.00
0.00	0.00						
18.9100	3.0984	7077600.	30000.	-0.01710	14394.	2.14E+11	0.00
0.00	0.00						
19.5200	2.9741	7297200.	30000.	-0.01685	14841.	2.14E+11	0.00
0.00	0.00						
20.1300	2.8517	7516800.	30000.	-0.01660	15288.	2.14E+11	0.00
0.00	0.00						
20.7400	2.7311	7736400.	30000.	-0.01634	15734.	2.14E+11	0.00
0.00	0.00						
21.3500	2.6125	7956000.	30000.	-0.01607	16181.	2.14E+11	0.00
0.00	0.00						
21.9600	2.4959	8175600.	30000.	-0.01579	16627.	2.14E+11	0.00
0.00	0.00						
22.5700	2.3813	8395200.	30000.	-0.01551	17074.	2.14E+11	0.00
0.00	0.00						
23.1800	2.2689	8614800.	30000.	-0.01522	17521.	2.14E+11	0.00
0.00	0.00						
23.7900	2.1586	8834400.	30000.	-0.01492	17967.	2.14E+11	0.00
0.00	0.00						
24.4000	2.0505	9054000.	30000.	-0.01461	18414.	2.14E+11	0.00
0.00	0.00						
25.0100	1.9447	9273600.	30000.	-0.01430	18861.	2.14E+11	0.00
0.00	0.00						
25.6200	1.8412	9493200.	30000.	-0.01398	19307.	2.14E+11	0.00
0.00	0.00						
26.2300	1.7401	9712800.	30000.	-0.01365	19754.	2.14E+11	0.00
0.00	0.00						
26.8400	1.6414	9932400.	30000.	-0.01331	20200.	2.14E+11	0.00
0.00	0.00						
27.4500	1.5452	1.02E+07	30000.	-0.01297	20647.	2.14E+11	0.00
0.00	0.00						
28.0600	1.4515	1.04E+07	30000.	-0.01262	21094.	2.14E+11	0.00
0.00	0.00						
28.6700	1.3605	1.06E+07	30000.	-0.01226	21540.	2.14E+11	0.00
0.00	0.00						
29.2800	1.2721	1.08E+07	30000.	-0.01189	21987.	2.14E+11	0.00
0.00	0.00						
29.8900	1.1864	1.10E+07	30000.	-0.01152	22434.	2.14E+11	0.00
0.00	0.00						
30.5000	1.1034	1.12E+07	30000.	-0.01114	22880.	2.14E+11	0.00
0.00	0.00						
31.1100	1.0233	1.15E+07	30000.	-0.01075	23327.	2.14E+11	0.00
0.00	0.00						
31.7200	0.9461	1.17E+07	30000.	-0.01035	23773.	2.14E+11	0.00
0.00	0.00						
32.3300	0.8718	1.19E+07	30000.	-0.00995	24220.	2.14E+11	0.00
0.00	0.00						
32.9400	0.8004	1.21E+07	30000.	-0.00954	24667.	2.14E+11	0.00

0.00	0.00							
33.5500	0.7321	1.23E+07	29491.	-0.00912	25113.	2.14E+11	-138.970	
1389.	0.00							
34.1600	0.6670	1.26E+07	27841.	-0.00869	25545.	2.14E+11	-312.079	
3425.	0.00							
34.7700	0.6049	1.28E+07	24897.	-0.00826	25942.	2.14E+11	-492.084	
5955.	0.00							
35.3800	0.5461	1.29E+07	20656.	-0.00782	26286.	2.14E+11	-666.773	
8938.	0.00							
35.9900	0.4904	1.31E+07	15179.	-0.00737	26557.	2.14E+11	-829.551	
12381.	0.00							
36.6000	0.4381	1.31E+07	8597.	-0.00693	26738.	2.14E+11	-968.841	
16188.	0.00							
37.2100	0.3890	1.32E+07	1059.	-0.00648	26813.	2.14E+11	-1091.	
20522.	0.00							
37.8200	0.3433	1.32E+07	-7264.	-0.00602	26770.	2.14E+11	-1183.	
25232.	0.00							
38.4300	0.3009	1.31E+07	-16173.	-0.00558	26597.	2.14E+11	-1251.	
30435.	0.00							
39.0400	0.2617	1.29E+07	-25458.	-0.00513	26288.	2.14E+11	-1286.	
35969.	0.00							
39.6500	0.2257	1.27E+07	-34894.	-0.00469	25839.	2.14E+11	-1292.	
41911.	0.00							
40.2600	0.1930	1.24E+07	-44244.	-0.00426	25249.	2.14E+11	-1262.	
47868.	0.00							
40.8700	0.1634	1.21E+07	-53320.	-0.00384	24522.	2.14E+11	-1218.	
54566.	0.00							
41.4800	0.1367	1.16E+07	-61998.	-0.00344	23661.	2.14E+11	-1153.	
61748.	0.00							
42.0900	0.1130	1.11E+07	-70066.	-0.00305	22676.	2.14E+11	-1051.	
68067.	0.00							
42.7000	0.09211	1.06E+07	-77261.	-0.00268	21575.	2.14E+11	-914.793	
72697.	0.00							
43.3100	0.07386	1.00E+07	-83591.	-0.00232	20375.	2.14E+11	-814.902	
80764.	0.00							
43.9200	0.05811	9384613.	-89351.	-0.00199	19086.	2.14E+11	-758.701	
95567.	0.00							
44.5300	0.04472	8710239.	-94650.	-0.00168	17715.	2.14E+11	-689.068	
112791.	0.00							
45.1400	0.03351	7998943.	-99315.	-0.00139	16268.	2.14E+11	-585.777	
127965.	0.00							
45.7500	0.02430	7256260.	-103092.	-0.00113	14758.	2.14E+11	-446.161	
134395.	0.00							
46.3600	0.01691	6489670.	-105916.	-8.98E-04	13199.	2.14E+11	-325.344	
140825.	0.00							
46.9700	0.01115	5705648.	-107928.	-6.90E-04	11604.	2.14E+11	-224.251	
147255.	0.00							
47.5800	0.00681	4909610.	-109272.	-5.08E-04	9985.	2.14E+11	-143.045	
153685.	0.00							
48.1900	0.00371	4105907.	-110092.	-3.54E-04	8351.	2.14E+11	-81.129	
160115.	0.00							
48.8000	0.00163	3297857.	-110525.	-2.27E-04	6707.	2.14E+11	-37.163	
166545.	0.00							
49.4100	3.84E-04	2487816.	-110695.	-1.28E-04	5060.	2.14E+11	-9.075	
172975.	0.00							
50.0200	-2.42E-04	1677289.	-104231.	-5.68E-05	3411.	2.14E+11	1775.	
5.37E+07	0.00							
50.6300	-4.48E-04	961869.	-87587.	-1.17E-05	1956.	2.14E+11	2773.	
4.53E+07	0.00							
51.2400	-4.13E-04	395018.	-64982.	1.16E-05	803.3864	2.14E+11	3403.	
6.03E+07	0.00							
51.8500	-2.79E-04	10530.	-38957.	1.85E-05	21.4164	2.14E+11	3707.	
9.73E+07	0.00							
52.4600	-1.42E-04	-175306.	-13366.	1.57E-05	356.5359	2.14E+11	3285.	
1.69E+08	0.00							
53.0700	-4.93E-05	-185143.	3413.	9.51E-06	376.5437	2.14E+11	1300.	
1.93E+08	0.00							
53.6800	-2.89E-06	-125333.	8484.	4.19E-06	254.9024	2.14E+11	85.5149	
2.17E+08	0.00							
54.2900	1.21E-05	-60941.	7339.	1.01E-06	123.9422	2.14E+11	-398.267	
2.41E+08	0.00							
54.9000	1.18E-05	-17889.	4315.	-3.43E-07	36.3833	2.14E+11	-427.970	
2.64E+08	0.00							

55.5100	7.09E-06	2231.	1726.	-6.11E-07	4.5373	2.14E+11	-279.400
2.88E+08	0.00						
56.1200	2.90E-06	7380.	250.5285	-4.46E-07	15.0102	2.14E+11	-123.754
3.12E+08	0.00						
56.7300	5.60E-07	5899.	-296.450	-2.19E-07	11.9968	2.14E+11	-25.693
3.36E+08	0.00						
57.3400	-3.05E-07	3040.	-335.661	-6.61E-08	6.1834	2.14E+11	14.9800
3.60E+08	0.00						
57.9500	-4.08E-07	984.6349	-206.216	2.79E-09	2.0025	2.14E+11	20.3875
3.66E+08	0.00						
58.5600	-2.64E-07	21.3427	-83.282	2.00E-08	0.04341	2.14E+11	13.2009
3.66E+08	0.00						
59.1700	-1.15E-07	-234.613	-13.933	1.64E-08	0.4772	2.14E+11	5.7469
3.66E+08	0.00						
59.7800	-2.46E-08	-182.633	11.6097	9.21E-09	0.3714	2.14E+11	1.2319
3.66E+08	0.00						
60.3900	1.99E-08	-64.647	12.4749	4.98E-09	0.1315	2.14E+11	-0.995
3.66E+08	0.00						
61.0000	4.83E-08	0.00	0.00	3.87E-09	0.00	2.14E+11	-2.413
1.83E+08	0.00						

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

Pile-head deflection = 7.55689501 inches
 Computed slope at pile head = -0.0209938 radians
 Maximum bending moment = 13183851. inch-lbs
 Maximum shear force = -110695. lbs
 Depth of maximum bending moment = 37.21000000 feet below pile head
 Depth of maximum shear force = 49.41000000 feet below pile head
 Number of iterations = 17
 Number of zero deflection points = 4
 Pile deflection at ground = 0.79372108 inches

----- Pile-head Deflection vs. Pile Length for Load Case 1 -----

Boundary Condition Type 1, Shear and Moment

Shear = 30000. lbs
 Moment = 270000. in-lbs
 Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
61.00000	7.55689501	13183851.	-110695.
57.95000	7.55623391	13181216.	-109906.
54.90000	7.55462878	13183217.	-109633.
51.85000	7.58138763	13177349.	-113319.
48.80000	12.59019274	13055534.	-152992.

----- Summary of Pile-head Responses for Conventional Analyses -----

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians
 Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.

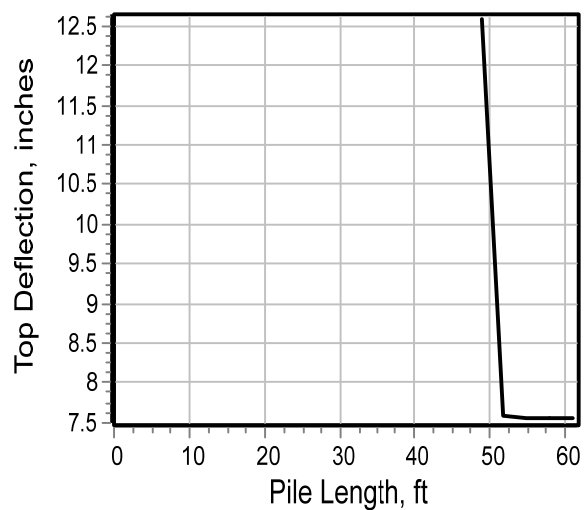
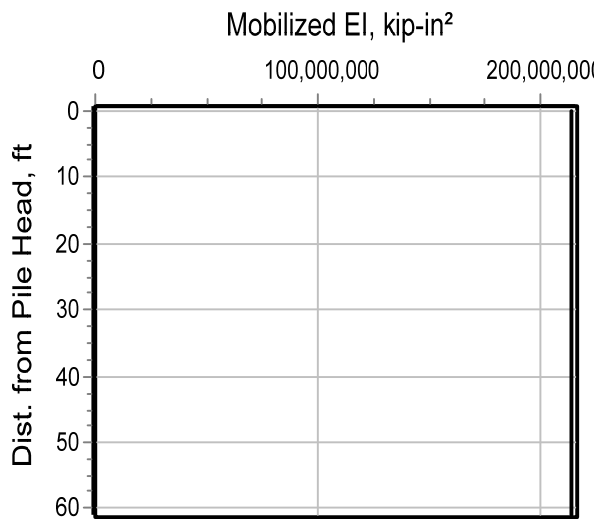
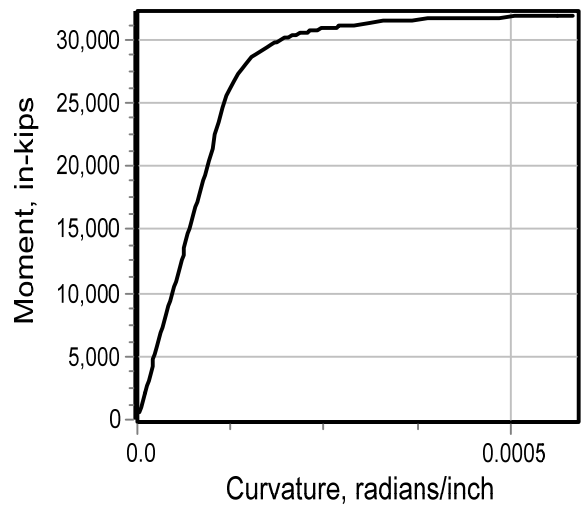
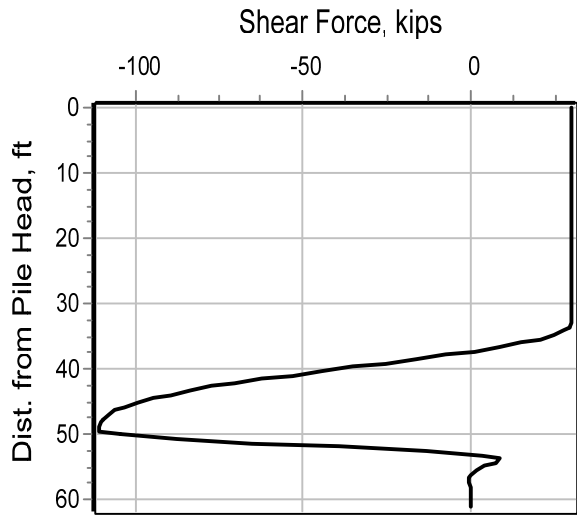
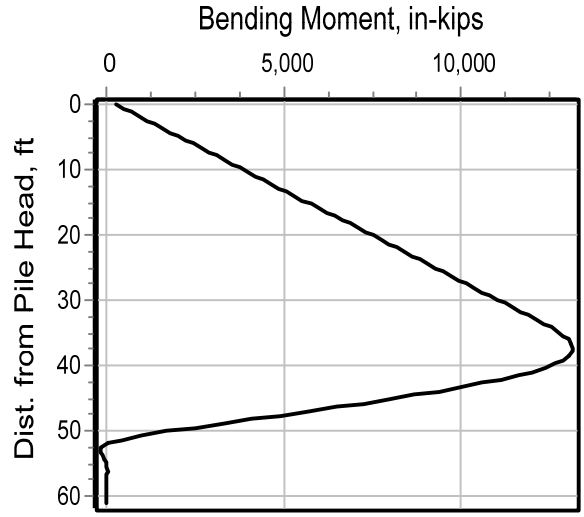
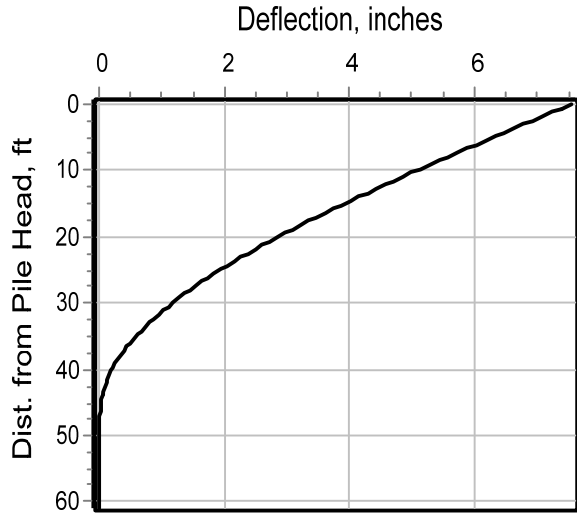
Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Case	Load Type	Load 1	Load 2	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max Shear in Pile	Max Moment in Pile
No.		Load 1	Load 2	lbs	inches	radians	lbs	in-lbs
1	V, lb	30000.	M, in-lb	270000.	0.00	7.5569	-0.02099	-110695.
		1.32E+07						

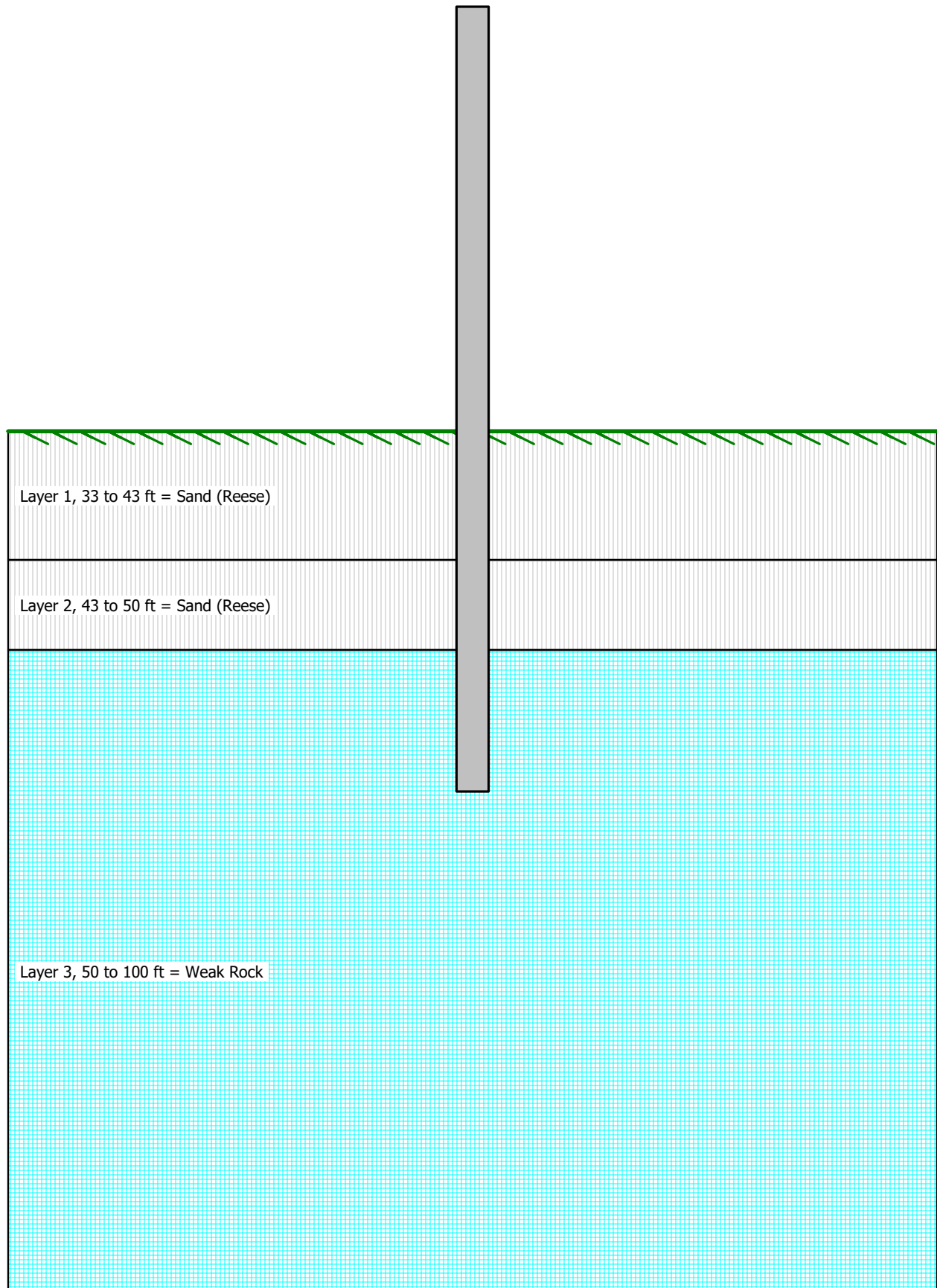
Maximum pile-head deflection = 7.5568950056 inches
 Maximum pile-head rotation = -0.0209938345 radians = -1.202858 deg.

The analysis ended normally.

**CASE 2 - RESULTS SUMMARY ANCHOR
PILE WITH 2 SOIL LAYERS AND ROCK**



CASE 3 - ANCHOR PILE - SERVICE LOAD



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LPIle for Windows, Version 2022-12.003

Analysis of Individual Files and Drilled Shafts
Subjected to Lateral Loading Using the p-y Method
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Files Used for Analysis

Path to file locations:

\\enercon.sharepoint.com@SSL\DavWWWRoot\sites\NSG_NC\Clients\FWTH\FWTHFS\FWTHFS-00254\FWTHFS-002
42 (Original Project Docs)\Deliverables_SP\Calculations\Trash Wheel\Final\clearfork\08092022\

Name of input data file:

Clear Fork all ayer - Copy.lp12d

Name of output report file:

Clear Fork all ayer - Copy.lp12o

Name of plot output file:

Clear Fork all ayer - Copy.lp12p

Name of runtime message file:

Clear Fork all ayer - Copy.lp12r

Date and Time of Analysis

Date: August 13, 2022

Time: 20:04:06

Problem Title

Project Name: Fort Worth Trash Wheel

Job Number: FWTHFS-00242

Client: City of Fort Worth

Engineer: Sandeep Menon

Description: Clear Fork LPILE

Program Options and Settings

Computational Options:

- Conventional Analysis

Engineering Units Used for Data Input and Computations:

- US Customary System Units (pounds, feet, inches)

Analysis Control Options:

- Maximum number of iterations allowed = 500
- Deflection tolerance for convergence = 1.0000E-05 in
- Maximum allowable deflection = 300.0000 in
- Number of pile increments = 100

Loading Type and Number of Cycles of Loading:

- Static loading specified
- Use of p-y modification factors for p-y curves not selected
- Analysis uses layering correction (Method of Georgiadis)
- No distributed lateral loads are entered
- Loading by lateral soil movements acting on pile not selected
- Input of shear resistance at the pile tip not selected
- Input of moment resistance at the pile tip not selected
- Computation of pile-head foundation stiffness matrix not selected
- Push-over analysis of pile not selected
- Buckling analysis of pile not selected

Output Options:

- Output files use decimal points to denote decimal symbols.
- Values of pile-head deflection, bending moment, shear force, and soil reaction are printed for full length of pile.
- Printing Increment (nodal spacing of output points) = 1
- No p-y curves to be computed and reported for user-specified depths
- Print using wide report formats

Pile Structural Properties and Geometry

Number of pile sections defined = 1
Total length of pile = 61.000 ft
Depth of ground surface below top of pile = 33.0000 ft

Pile diameters used for p-y curve computations are defined using 2 points.

p-y curves are computed using pile diameter values interpolated with depth over the length of the pile. A summary of values of pile diameter vs. depth follows.

Point No.	Depth Below Pile Head feet	Pile Diameter inches
1	0.000	30.0000
2	61.000	30.0000

Input Structural Properties for Pile Sections:

Pile Section No. 1:

Section 1 is a steel pipe pile
Length of section = 61.000000 ft

Pile diameter = 30.000000 in

 Soil and Rock Layering Information

The soil profile is modelled using 3 layers

Layer 1 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 33.000000 ft
 Distance from top of pile to bottom of layer = 43.000000 ft
 Effective unit weight at top of layer = 125.000000 pcf
 Effective unit weight at bottom of layer = 125.000000 pcf
 Friction angle at top of layer = 36.000000 deg.
 Friction angle at bottom of layer = 36.000000 deg.
 Subgrade k at top of layer = 120.000000 pci
 Subgrade k at bottom of layer = 120.000000 pci

Layer 2 is sand, p-y criteria by Reese et al., 1974

Distance from top of pile to top of layer = 43.000000 ft
 Distance from top of pile to bottom of layer = 50.000000 ft
 Effective unit weight at top of layer = 125.000000 pcf
 Effective unit weight at bottom of layer = 125.000000 pcf
 Friction angle at top of layer = 36.000000 deg.
 Friction angle at bottom of layer = 36.000000 deg.
 Subgrade k at top of layer = 120.000000 pci
 Subgrade k at bottom of layer = 120.000000 pci

Layer 3 is weak rock, p-y criteria by Reese, 1997

Distance from top of pile to top of layer = 50.000000 ft
 Distance from top of pile to bottom of layer = 100.000000 ft
 Effective unit weight at top of layer = 140.000000 pcf
 Effective unit weight at bottom of layer = 140.000000 pcf
 Uniaxial compressive strength at top of layer = 275.000000 psi
 Uniaxial compressive strength at bottom of layer = 275.000000 psi
 Initial modulus of rock at top of layer = 100000. psi
 Initial modulus of rock at bottom of layer = 100000. psi
 RQD of rock at top of layer = 30.000000 %
 RQD of rock at bottom of layer = 30.000000 %
 k_{rm} of rock at top of layer = 0.0001000
 k_{rm} of rock at bottom of layer = 0.0001000

(Depth of the lowest soil layer extends 39.000 ft below the pile tip)

 Summary of Input Soil Properties

Layer E50 Num. or k _{rm}	Soil Type Name (p-y Curve Type)	Layer Rock Mass Modulus Depth ft	Effective Unit Wt. pcf	Angle of Friction deg.	Uniaxial qu psi	RQD %
1	Sand	33.0000	125.0000	36.0000	--	--
--	120.0000 (Reese, et al.)	--	43.0000	125.0000	36.0000	--
--	120.0000	--	43.0000	125.0000	36.0000	--
2	Sand	43.0000	125.0000	36.0000	--	--
--	120.0000 (Reese, et al.)	--	50.0000	125.0000	36.0000	--

--	120.0000	--				
3	Weak		50.0000	140.0000	--	275.0000 30.0000
1.00E-04	--		100000.			
	Rock		100.0000	140.0000	--	275.0000 30.0000
1.00E-04	--		100000.			

 Static Loading Type

Static loading criteria were used when computing p-y curves for all analyses.

 Pile-head Loading and Pile-head Fixity Conditions

Number of loads specified = 1

Load y No. Length	Load Run Analysis Type	Condition 1	Condition 2	Axial Thrust Force, lbs	Compute Top vs. Pile
1	1	V = 12981. lbs	M = 270000. in-lbs	0.0000000	Yes
	Yes				

V = shear force applied normal to pile axis
 M = bending moment applied to pile head
 y = lateral deflection normal to pile axis
 S = pile slope relative to original pile batter angle
 R = rotational stiffness applied to pile head
 Values of top y vs. pile lengths can be computed only for load types with specified shear loading (Load Types 1, 2, and 3).
 Thrust force is assumed to be acting axially for all pile batter angles.

 Computations of Nominal Moment Capacity and Nonlinear Bending Stiffness

Axial thrust force values were determined from pile-head loading conditions

Number of Pile Sections Analyzed = 1

Pile Section No. 1:

Dimensions and Properties of Steel Pipe Pile:

Length of Section	=	61.000000 ft
Outer Diameter of Pipe	=	30.000000 in
Pipe Wall Thickness	=	0.750000 in
Yield Stress of Pipe	=	50.000000 ksi
Elastic Modulus	=	29000. ksi
Cross-sectional Area	=	68.918689 sq. in.
Moment of Inertia	=	7375. in^4
Elastic Bending Stiffness	=	213885920. kip-in^2
Plastic Modulus, Z	=	641.812500 in^3
Plastic Moment Capacity = Fy Z	=	32091. in-kip

Axial Structural Capacities:

Nom. Axial Structural Capacity = Fy As	=	3445.934 kips
Nominal Axial Tensile Capacity	=	-3445.934 kips

Number of Axial Thrust Force Values Determined from Pile-head Loadings = 1

Number	Axial Thrust Force kips
1	0.000

Definition of Run Messages:

Y = part of pipe section has yielded.

Axial Thrust Force = 0.000 kips

Bending Curvature rad/in.	Bending Moment in-kip	Bending Stiffness kip-in ²	Depth to N Axis in	Max Total Stress ksi	Run Msg
0.00000244	522.3962477	213875170.	15.0000000	1.0518750	
0.00000489	1045.	213875170.	15.0000000	2.1037500	
0.00000733	1567.	213875170.	15.0000000	3.1556250	
0.00000977	2090.	213875170.	15.0000000	4.2075000	
0.00001221	2612.	213875170.	15.0000000	5.2593750	
0.00001466	3134.	213875170.	15.0000000	6.3112500	
0.00001710	3657.	213875170.	15.0000000	7.3631250	
0.00001954	4179.	213875170.	15.0000000	8.4150001	
0.00002198	4702.	213875170.	15.0000000	9.4668751	
0.00002443	5224.	213875170.	15.0000000	10.5187501	
0.00002687	5746.	213875170.	15.0000000	11.5706251	
0.00002931	6269.	213875170.	15.0000000	12.6225001	
0.00003175	6791.	213875170.	15.0000000	13.6743751	
0.00003420	7314.	213875170.	15.0000000	14.7262501	
0.00003664	7836.	213875170.	15.0000000	15.7781251	
0.00003908	8358.	213875170.	15.0000000	16.8300001	
0.00004152	8881.	213875170.	15.0000000	17.8818751	
0.00004397	9403.	213875170.	15.0000000	18.9337501	
0.00004641	9926.	213875170.	15.0000000	19.9856251	
0.00004885	10448.	213875170.	15.0000000	21.0375001	
0.00005129	10970.	213875170.	15.0000000	22.0893751	
0.00005374	11493.	213875170.	15.0000000	23.1412502	
0.00005618	12015.	213875170.	15.0000000	24.1931252	
0.00005862	12538.	213875170.	15.0000000	25.2450002	
0.00006106	13060.	213875170.	15.0000000	26.2968752	
0.00006351	13582.	213875170.	15.0000000	27.3487502	
0.00006595	14105.	213875170.	15.0000000	28.4006252	
0.00006839	14627.	213875170.	15.0000000	29.4525002	
0.00007083	15149.	213875170.	15.0000000	30.5043752	
0.00007328	15672.	213875170.	15.0000000	31.5562502	
0.00007572	16194.	213875170.	15.0000000	32.6081252	
0.00007816	16717.	213875170.	15.0000000	33.6600002	
0.00008060	17239.	213875170.	15.0000000	34.7118752	
0.00008305	17761.	213875170.	15.0000000	35.7637502	
0.00008549	18284.	213875170.	15.0000000	36.8156252	
0.00008793	18806.	213875170.	15.0000000	37.8675003	
0.00009037	19329.	213875170.	15.0000000	38.9193753	
0.00009282	19851.	213875170.	15.0000000	39.9712503	
0.00009526	20373.	213875170.	15.0000000	41.0231253	
0.0001001	21418.	213875170.	15.0000000	43.1268753	
0.0001050	22463.	213875170.	15.0000000	45.2306253	
0.0001099	23508.	213875170.	15.0000000	47.3343753	
0.0001148	24553.	213875170.	15.0000000	49.4381253	
0.0001197	25511.	213152380.	15.0000000	50.0000000	Y
0.0001246	26232.	210583666.	15.0000000	50.0000000	Y
0.0001295	26800.	207022224.	15.0000000	50.0000000	Y
0.0001343	27269.	202983179.	15.0000000	50.0000000	Y
0.0001392	27670.	198746654.	15.0000000	50.0000000	Y
0.0001441	28017.	194414878.	15.0000000	50.0000000	Y
0.0001490	28323.	190095167.	15.0000000	50.0000000	Y
0.0001539	28591.	185802169.	15.0000000	50.0000000	Y
0.0001588	28829.	181585311.	15.0000000	50.0000000	Y
0.0001636	29043.	177470462.	15.0000000	50.0000000	Y

0.0001685	29235.	173468097.	15.0000000	50.0000000	Y
0.0001734	29409.	169585196.	15.0000000	50.0000000	Y
0.0001783	29568.	165826064.	15.0000000	50.0000000	Y
0.0001832	29712.	162192964.	15.0000000	50.0000000	Y
0.0001881	29844.	158681275.	15.0000000	50.0000000	Y
0.0001930	29963.	155281614.	15.0000000	50.0000000	Y
0.0001978	30074.	152005500.	15.0000000	50.0000000	Y
0.0002027	30177.	148851238.	15.0000000	50.0000000	Y
0.0002076	30271.	145802256.	15.0000000	50.0000000	Y
0.0002125	30357.	142857873.	15.0000000	50.0000000	Y
0.0002174	30440.	140027612.	15.0000000	50.0000000	Y
0.0002223	30514.	137283086.	15.0000000	50.0000000	Y
0.0002272	30585.	134642575.	15.0000000	50.0000000	Y
0.0002320	30650.	132089238.	15.0000000	50.0000000	Y
0.0002369	30711.	129625023.	15.0000000	50.0000000	Y
0.0002418	30769.	127243261.	15.0000000	50.0000000	Y
0.0002467	30823.	124943000.	15.0000000	50.0000000	Y
0.0002516	30873.	122715893.	15.0000000	50.0000000	Y
0.0002565	30922.	120568203.	15.0000000	50.0000000	Y
0.0002614	30965.	118481064.	15.0000000	50.0000000	Y
0.0002662	31009.	116470517.	15.0000000	50.0000000	Y
0.0002711	31047.	114515408.	15.0000000	50.0000000	Y
0.0002760	31085.	112624803.	15.0000000	50.0000000	Y
0.0002809	31122.	110797855.	15.0000000	50.0000000	Y
0.0002858	31154.	109016833.	15.0000000	50.0000000	Y
0.0002907	31187.	107295678.	15.0000000	50.0000000	Y
0.0003102	31301.	100904523.	15.0000000	50.0000000	Y
0.0003297	31393.	95205408.	15.0000000	50.0000000	Y
0.0003493	31471.	90100759.	15.0000000	50.0000000	Y
0.0003688	31535.	85502779.	15.0000000	50.0000000	Y
0.0003884	31590.	81340543.	15.0000000	50.0000000	Y
0.0004079	31637.	77559576.	15.0000000	50.0000000	Y
0.0004274	31679.	74112823.	15.0000000	50.0000000	Y
0.0004470	31713.	70949672.	15.0000000	50.0000000	Y
0.0004665	31745.	68046000.	15.0000000	50.0000000	Y
0.0004861	31772.	65365798.	15.0000000	50.0000000	Y
0.0005056	31797.	62889062.	15.0000000	50.0000000	Y
0.0005251	31818.	60588308.	15.0000000	50.0000000	Y
0.0005447	31838.	58452630.	15.0000000	50.0000000	Y
0.0005642	31854.	56456945.	15.0000000	50.0000000	Y
0.0005838	31870.	54593653.	15.0000000	50.0000000	Y

Summary of Results for Nominal Moment Capacity for Section 1

Load No.	Axial Thrust kips	Nominal Moment Capacity in-kips
1	0.00000000	31870.

Note that the values in the above table are not factored by a strength reduction factor for LRFD.

The value of the strength reduction factor depends on the provisions of the LRFD code being followed.

The above values should be multiplied by the appropriate strength reduction factor to compute ultimate moment capacity according to the LRFD structural design standard being followed.

Layering Correction Equivalent Depths of Soil & Rock Layers

Top of Equivalent

Layer No.	Layer Below Pile Head ft	Top Depth Below Grnd Surf ft	Same Layer Type As Layer Above	Layer is Rock or is Below Rock Layer	F0 Integral for Layer lbs	F1 Integral for Layer lbs
1	33.0000	0.00	N.A.	No	0.00	222057.
2	43.0000	10.0000	Yes	No	222057.	558325.
3	50.0000	17.0000	No	Yes	N.A.	N.A.

Notes: The F0 integral of Layer n+1 equals the sum of the F0 and F1 integrals for Layer n. Layering correction equivalent depths are computed only for soil types with both shallow-depth and deep-depth expressions for peak lateral load transfer. These soil types are soft and stiff clays, non-liquefied sands, and cemented c-phi soil.

 Computed Values of Pile Loading and Deflection
 for Lateral Loading for Load Case Number 1

Pile-head conditions are Shear and Moment (Loading Type 1)

Shear force at pile head = 12981.0 lbs
 Applied moment at pile head = 270000.0 in-lbs
 Axial thrust load on pile head = 0.0 lbs

Depth Spr.	Deflect. Distrib.	Bending Moment	Shear Force	Slope S	Total Stress	Bending Stiffness	Soil Res. p	Soil Es*H
X	y	in-lbs	lbs	radians	psi*	lb-in ²	lb/inch	
Lat. Load feet lb/inch	inches lb/inch							
0.00	3.0625	270000.	12981.	-0.00890	549.1245	2.14E+11	0.00	
0.00	0.00							
0.00	0.6100	2.9974	365021.	12981.	-0.00889	742.3775	2.14E+11	0.00
0.00	0.00							
0.00	1.2200	2.9324	460042.	12981.	-0.00887	935.6305	2.14E+11	0.00
0.00	0.00							
0.00	1.8300	2.8675	555063.	12981.	-0.00885	1129.	2.14E+11	0.00
0.00	0.00							
0.00	2.4400	2.8028	650084.	12981.	-0.00883	1322.	2.14E+11	0.00
0.00	0.00							
0.00	3.0500	2.7382	745105.	12981.	-0.00881	1515.	2.14E+11	0.00
0.00	0.00							
0.00	3.6600	2.6738	840126.	12981.	-0.00878	1709.	2.14E+11	0.00
0.00	0.00							
0.00	4.2700	2.6096	935146.	12981.	-0.00875	1902.	2.14E+11	0.00
0.00	0.00							
0.00	4.8800	2.5457	1030167.	12981.	-0.00872	2095.	2.14E+11	0.00
0.00	0.00							
0.00	5.4900	2.4820	1125188.	12981.	-0.00868	2288.	2.14E+11	0.00
0.00	0.00							
0.00	6.1000	2.4186	1220209.	12981.	-0.00864	2482.	2.14E+11	0.00
0.00	0.00							
0.00	6.7100	2.3555	1315230.	12981.	-0.00860	2675.	2.14E+11	0.00
0.00	0.00							
0.00	7.3200	2.2927	1410251.	12981.	-0.00855	2868.	2.14E+11	0.00
0.00	0.00							
0.00	7.9300	2.2303	1505272.	12981.	-0.00850	3061.	2.14E+11	0.00
0.00	0.00							
0.00	8.5400	2.1682	1600293.	12981.	-0.00845	3255.	2.14E+11	0.00
0.00	0.00							
0.00	9.1500	2.1066	1695314.	12981.	-0.00839	3448.	2.14E+11	0.00
0.00	0.00							
0.00	9.7600	2.0454	1790335.	12981.	-0.00833	3641.	2.14E+11	0.00
0.00	0.00							
0.00	10.3700	1.9846	1885356.	12981.	-0.00827	3834.	2.14E+11	0.00
0.00	0.00							

10.9800	1.9243	1980377.	12981.	-0.00820	4028.	2.14E+11	0.00
0.00	0.00						
11.5900	1.8645	2075397.	12981.	-0.00813	4221.	2.14E+11	0.00
0.00	0.00						
12.2000	1.8052	2170418.	12981.	-0.00806	4414.	2.14E+11	0.00
0.00	0.00						
12.8100	1.7465	2265439.	12981.	-0.00799	4607.	2.14E+11	0.00
0.00	0.00						
13.4200	1.6883	2360460.	12981.	-0.00791	4801.	2.14E+11	0.00
0.00	0.00						
14.0300	1.6308	2455481.	12981.	-0.00782	4994.	2.14E+11	0.00
0.00	0.00						
14.6400	1.5738	2550502.	12981.	-0.00774	5187.	2.14E+11	0.00
0.00	0.00						
15.2500	1.5175	2645523.	12981.	-0.00765	5380.	2.14E+11	0.00
0.00	0.00						
15.8600	1.4618	2740544.	12981.	-0.00756	5574.	2.14E+11	0.00
0.00	0.00						
16.4700	1.4069	2835565.	12981.	-0.00746	5767.	2.14E+11	0.00
0.00	0.00						
17.0800	1.3526	2930586.	12981.	-0.00736	5960.	2.14E+11	0.00
0.00	0.00						
17.6900	1.2991	3025607.	12981.	-0.00726	6153.	2.14E+11	0.00
0.00	0.00						
18.3000	1.2463	3120628.	12981.	-0.00716	6347.	2.14E+11	0.00
0.00	0.00						
18.9100	1.1943	3215649.	12981.	-0.00705	6540.	2.14E+11	0.00
0.00	0.00						
19.5200	1.1431	3310669.	12981.	-0.00694	6733.	2.14E+11	0.00
0.00	0.00						
20.1300	1.0928	3405690.	12981.	-0.00682	6926.	2.14E+11	0.00
0.00	0.00						
20.7400	1.0433	3500711.	12981.	-0.00670	7120.	2.14E+11	0.00
0.00	0.00						
21.3500	0.9946	3595732.	12981.	-0.00658	7313.	2.14E+11	0.00
0.00	0.00						
21.9600	0.9469	3690753.	12981.	-0.00646	7506.	2.14E+11	0.00
0.00	0.00						
22.5700	0.9001	3785774.	12981.	-0.00633	7699.	2.14E+11	0.00
0.00	0.00						
23.1800	0.8543	3880795.	12981.	-0.00620	7893.	2.14E+11	0.00
0.00	0.00						
23.7900	0.8094	3975816.	12981.	-0.00606	8086.	2.14E+11	0.00
0.00	0.00						
24.4000	0.7655	4070837.	12981.	-0.00592	8279.	2.14E+11	0.00
0.00	0.00						
25.0100	0.7227	4165858.	12981.	-0.00578	8472.	2.14E+11	0.00
0.00	0.00						
25.6200	0.6808	4260879.	12981.	-0.00564	8666.	2.14E+11	0.00
0.00	0.00						
26.2300	0.6401	4355900.	12981.	-0.00549	8859.	2.14E+11	0.00
0.00	0.00						
26.8400	0.6004	4450920.	12981.	-0.00534	9052.	2.14E+11	0.00
0.00	0.00						
27.4500	0.5619	4545941.	12981.	-0.00519	9246.	2.14E+11	0.00
0.00	0.00						
28.0600	0.5245	4640962.	12981.	-0.00503	9439.	2.14E+11	0.00
0.00	0.00						
28.6700	0.4882	4735983.	12981.	-0.00487	9632.	2.14E+11	0.00
0.00	0.00						
29.2800	0.4532	4831004.	12981.	-0.00471	9825.	2.14E+11	0.00
0.00	0.00						
29.8900	0.4193	4926025.	12981.	-0.00454	10019.	2.14E+11	0.00
0.00	0.00						
30.5000	0.3867	5021046.	12981.	-0.00437	10212.	2.14E+11	0.00
0.00	0.00						
31.1100	0.3554	5116067.	12981.	-0.00420	10405.	2.14E+11	0.00
0.00	0.00						
31.7200	0.3253	5211088.	12981.	-0.00402	10598.	2.14E+11	0.00
0.00	0.00						
32.3300	0.2965	5306109.	12981.	-0.00384	10792.	2.14E+11	0.00
0.00	0.00						
32.9400	0.2691	5401130.	12981.	-0.00366	10985.	2.14E+11	0.00

0.00	0.00							
33.5500	0.2430	5496151.	12608.	-0.00347	11178.	2.14E+11	-101.807	
3067.	0.00							
34.1600	0.2183	5585716.	11409.	-0.00328	11360.	2.14E+11	-225.790	
7571.	0.00							
34.7700	0.1950	5663184.	9289.	-0.00309	11518.	2.14E+11	-353.568	
13272.	0.00							
35.3800	0.1731	5721706.	6257.	-0.00289	11637.	2.14E+11	-474.858	
20079.	0.00							
35.9900	0.1527	5754785.	2381.	-0.00270	11704.	2.14E+11	-584.183	
28011.	0.00							
36.6000	0.1337	5756561.	-2221.	-0.00250	11708.	2.14E+11	-673.009	
36861.	0.00							
37.2100	0.1161	5722276.	-7259.	-0.00230	11638.	2.14E+11	-703.720	
44377.	0.00							
37.8200	0.09994	5650284.	-12374.	-0.00211	11492.	2.14E+11	-693.681	
50807.	0.00							
38.4300	0.08522	5541123.	-17352.	-0.00192	11270.	2.14E+11	-666.361	
57237.	0.00							
39.0400	0.07189	5396257.	-22079.	-0.00173	10975.	2.14E+11	-625.252	
63666.	0.00							
39.6500	0.05991	5217888.	-26467.	-0.00155	10612.	2.14E+11	-573.666	
70096.	0.00							
40.2600	0.04923	5008781.	-30450.	-0.00137	10187.	2.14E+11	-514.698	
76526.	0.00							
40.8700	0.03981	4772095.	-33986.	-0.00121	9705.	2.14E+11	-451.199	
82956.	0.00							
41.4800	0.03159	4511232.	-37049.	-0.00105	9175.	2.14E+11	-385.751	
89386.	0.00							
42.0900	0.02450	4229701.	-39634.	-8.97E-04	8602.	2.14E+11	-320.650	
95816.	0.00							
42.7000	0.01846	3930988.	-41752.	-7.57E-04	7995.	2.14E+11	-257.889	
102246.	0.00							
43.3100	0.01341	3618456.	-43424.	-6.28E-04	7359.	2.14E+11	-199.149	
108676.	0.00							
43.9200	0.00927	3295254.	-44687.	-5.10E-04	6702.	2.14E+11	-145.794	
115106.	0.00							
44.5300	0.00595	2964240.	-45582.	-4.02E-04	6029.	2.14E+11	-98.869	
121535.	0.00							
45.1400	0.00338	2627929.	-46161.	-3.07E-04	5345.	2.14E+11	-59.100	
127965.	0.00							
45.7500	0.00146	2288450.	-46475.	-2.23E-04	4654.	2.14E+11	-26.896	
134395.	0.00							
46.3600	1.22E-04	1947530.	-46582.	-1.50E-04	3961.	2.14E+11	-2.357	
140825.	0.00							
46.9700	-7.32E-04	1606485.	-46537.	-8.92E-05	3267.	2.14E+11	14.7260	
147255.	0.00							
47.5800	-0.00118	1266228.	-46392.	-4.01E-05	2575.	2.14E+11	24.8598	
153685.	0.00							
48.1900	-0.00132	927303.	-46196.	-2.55E-06	1886.	2.14E+11	28.8488	
160115.	0.00							
48.8000	-0.00122	589924.	-45988.	2.34E-05	1200.	2.14E+11	27.7889	
166545.	0.00							
49.4100	-9.76E-04	254034.	-45802.	3.79E-05	516.6527	2.14E+11	23.0652	
172975.	0.00							
50.0200	-6.67E-04	-80620.	-37315.	4.08E-05	163.9650	2.14E+11	2296.	
2.52E+07	0.00							
50.6300	-3.78E-04	-292251.	-19151.	3.44E-05	594.3790	2.14E+11	2667.	
5.16E+07	0.00							
51.2400	-1.63E-04	-360987.	513.2609	2.33E-05	734.1729	2.14E+11	2706.	
1.22E+08	0.00							
51.8500	-3.78E-05	-284737.	13164.	1.22E-05	579.0968	2.14E+11	750.6421	
1.45E+08	0.00							
52.4600	1.60E-05	-168266.	14560.	4.46E-06	342.2190	2.14E+11	-369.175	
1.69E+08	0.00							
53.0700	2.76E-05	-71577.	10548.	3.59E-07	145.5723	2.14E+11	-726.944	
1.93E+08	0.00							
53.6800	2.12E-05	-13839.	5586.	-1.10E-06	28.1447	2.14E+11	-628.891	
2.17E+08	0.00							
54.2900	1.14E-05	10202.	1909.	-1.16E-06	20.7491	2.14E+11	-375.616	
2.41E+08	0.00							
54.9000	4.18E-06	14116.	-17.589	-7.49E-07	28.7099	2.14E+11	-150.909	
2.64E+08	0.00							

55.5100	4.66E-07	9945.	-637.038	-3.37E-07	20.2254	2.14E+11	-18.340
2.88E+08	0.00						
56.1200	-7.54E-07	4790.	-586.533	-8.46E-08	9.7422	2.14E+11	32.1389
3.12E+08	0.00						
56.7300	-7.73E-07	1358.	-339.064	2.06E-08	2.7615	2.14E+11	35.4754
3.36E+08	0.00						
57.3400	-4.52E-07	-173.717	-127.903	4.09E-08	0.3533	2.14E+11	22.2190
3.60E+08	0.00						
57.9500	-1.75E-07	-514.691	-14.608	2.91E-08	1.0468	2.14E+11	8.7358
3.66E+08	0.00						
58.5600	-2.63E-08	-387.580	22.1742	1.36E-08	0.7883	2.14E+11	1.3141
3.66E+08	0.00						
59.1700	2.51E-08	-190.060	22.3991	3.76E-09	0.3865	2.14E+11	-1.253
3.66E+08	0.00						
59.7800	2.88E-08	-59.657	12.5498	-5.13E-10	0.1213	2.14E+11	-1.438
3.66E+08	0.00						
60.3900	1.75E-08	-6.331	4.0749	-1.64E-09	0.01288	2.14E+11	-0.877
3.66E+08	0.00						
61.0000	4.73E-09	0.00	0.00	-1.75E-09	0.00	2.14E+11	-0.236
1.83E+08	0.00						

* This analysis computed pile response using nonlinear moment-curvature relationships. Values of total stress due to combined axial and bending stresses are computed only for elastic sections only and do not equal the actual stresses in concrete and steel. Stresses in concrete and steel may be interpolated from the output for nonlinear bending properties relative to the magnitude of bending moment developed in the pile.

Output Summary for Load Case No. 1:

File-head deflection = 3.06247915 inches
 Computed slope at pile head = -0.0088963 radians
 Maximum bending moment = 5756561. inch-lbs
 Maximum shear force = -46582. lbs
 Depth of maximum bending moment = 36.60000000 feet below pile head
 Depth of maximum shear force = 46.36000000 feet below pile head
 Number of iterations = 7
 Number of zero deflection points = 5
 Pile deflection at ground = 0.26653594 inches

----- Pile-head Deflection vs. Pile Length for Load Case 1 -----

Boundary Condition Type 1, Shear and Moment

Shear = 12981. lbs
 Moment = 270000. in-lbs
 Axial Load = 0. lbs

Pile Length feet	Pile Head Deflection inches	Maximum Moment ln-lbs	Maximum Shear lbs
61.00000	3.06247915	5756561.	-46582.
57.95000	3.06361494	5758640.	-45962.
54.90000	3.06291959	5758737.	-45798.
51.85000	3.06423216	5757562.	-43977.
48.80000	3.59758433	5737994.	-60306.
45.75000	7.30661085	5687594.	-81667.

----- Summary of Pile-head Responses for Conventional Analyses -----

Definitions of Pile-head Loading Conditions:

Load Type 1: Load 1 = Shear, V, lbs, and Load 2 = Moment, M, in-lbs
 Load Type 2: Load 1 = Shear, V, lbs, and Load 2 = Slope, S, radians

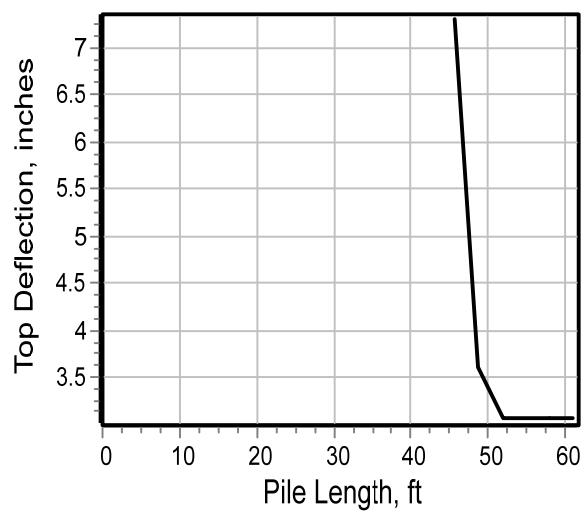
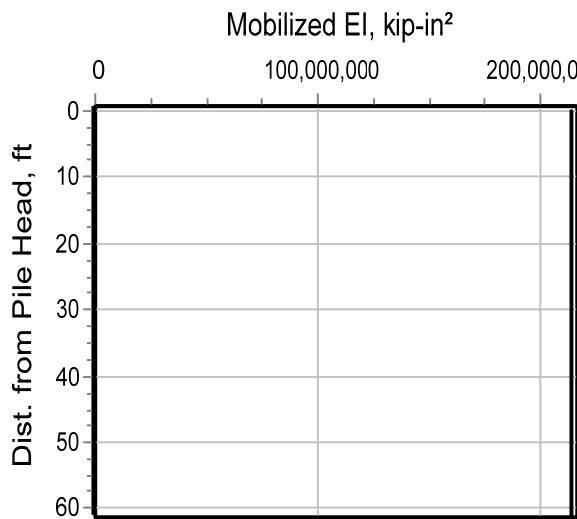
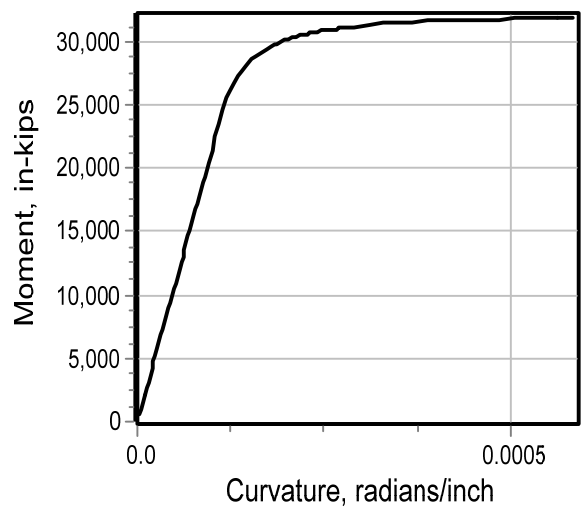
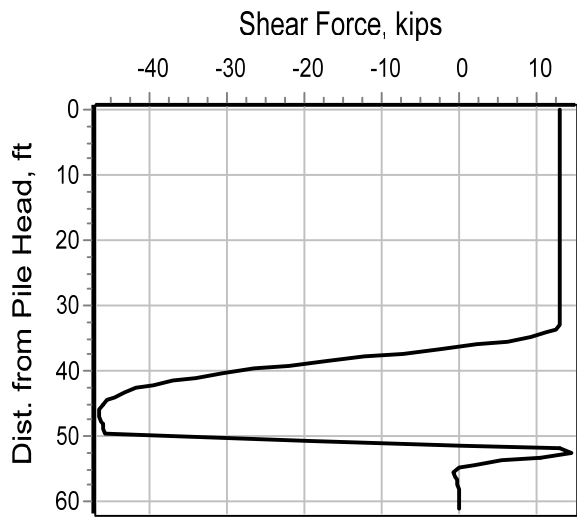
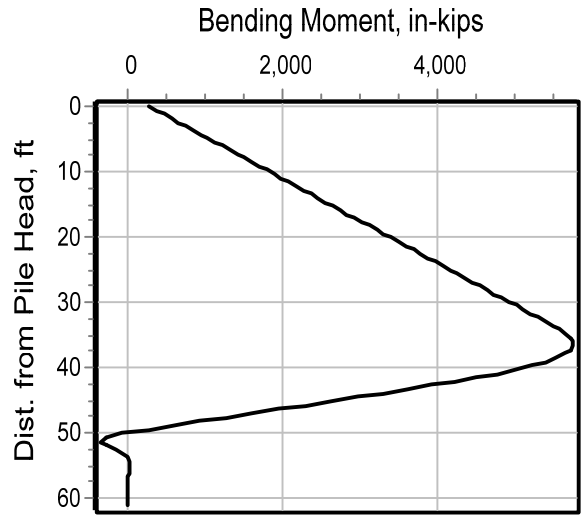
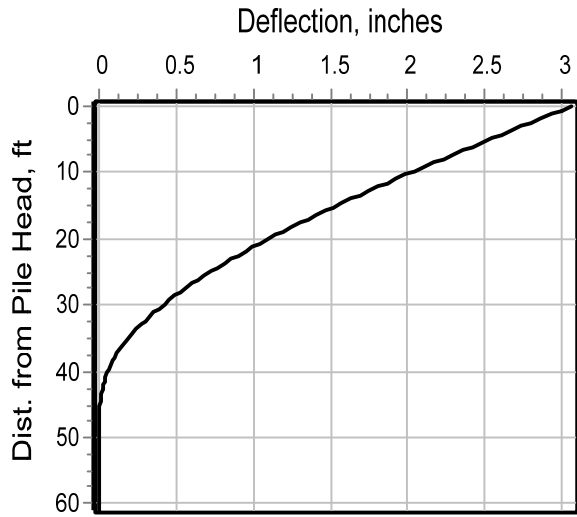
Load Type 3: Load 1 = Shear, V, lbs, and Load 2 = Rot. Stiffness, R, in-lbs/rad.
 Load Type 4: Load 1 = Top Deflection, y, inches, and Load 2 = Moment, M, in-lbs
 Load Type 5: Load 1 = Top Deflection, y, inches, and Load 2 = Slope, S, radians

Load Moment Case	Load Type	Load Pile-head	Load Type	Load Pile-head	Axial Loading	Pile-head Deflection	Pile-head Rotation	Max Shear in Pile	Max
No.	1	Load 1	2	Load 2	lbs	inches	radians	lbs	in-lbs
1	V, lb	12981.	M, in-lb	270000.	0.00	3.0625	-0.00890	-46582.	

Maximum pile-head deflection = 3.0624791456 inches
 Maximum pile-head rotation = -0.0088963378 radians = -0.509723 deg.

The analysis ended normally.

The lateral deflection of the pile is 3.06 in which is approximately span/240 and satisfies the AISC code deflection requirement and is acceptable.



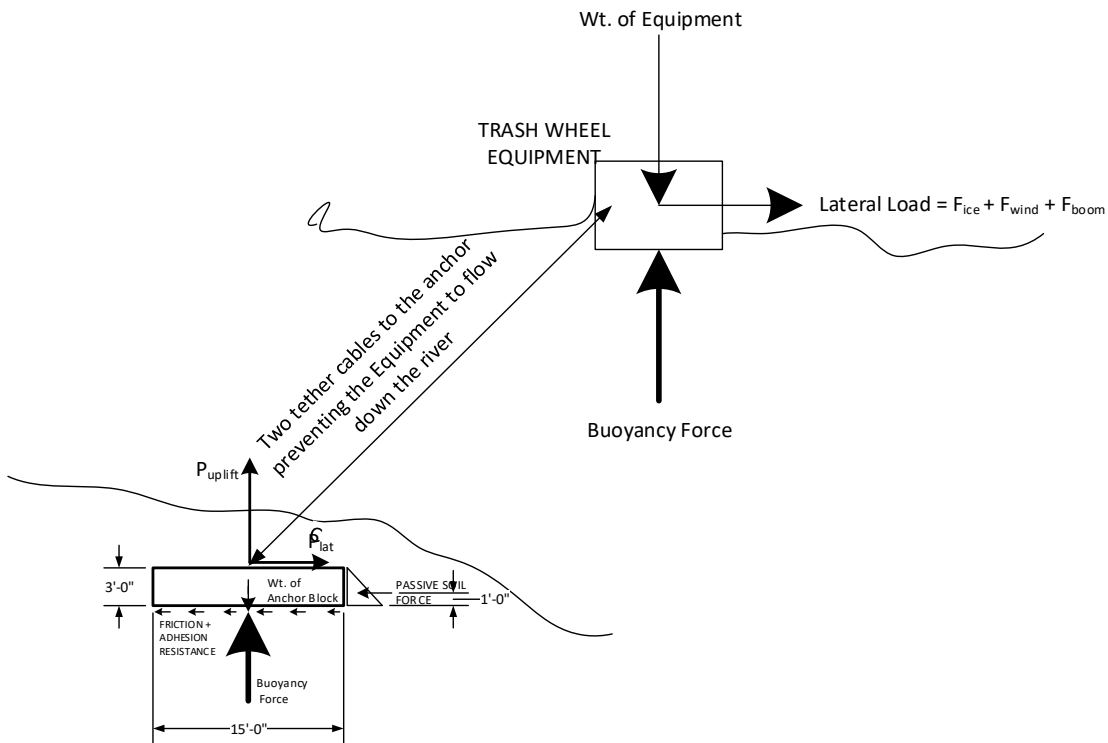
DESIGN OF TETHER ANCHOR

This calculation provides a tether anchor design for the trash wheel equipment during a standard project flood (SFP) event such that the trash wheel does not come loose and collide with other building/bridge structure during this event.

As the trash wheel equipment is floating the vertical dead weight of the equipment is balanced by the buoyant force. The tethering system for the trash wheel will be conservatively designed to resist the lateral pull due to the lateral force acting on the trash wheel i.e. the wind force, the force due to the water current and the ice load as calculated for the pile design. After the tether reaches its maximum length the weight of the trash wheel equipment is assumed to be balanced by the buoyancy force of the river and the contribution of self weight will not be seen on the tether system.

To determine the maximum lateral force acting on the trash wheel during a SFP condition the maximum lateral forces for the Strength II loading condition used in the design for mooring piles is used. This is a conservative assumption as the channel flow velocity for the SFP condition is less than the average velocity considered for the 100 year flood condition and is based on the HEC RAS model input.

Based on the HEC-RAS data available it is assumed the water level will rise approximately 35'-0" above the normal water level and at that time the trash wheel equipment will float above the support structure and the tether system will be engaged. The anchor system is assumed to be installed such that the slings will have a 45 degree angle or less when the tether is active. It is conservative to consider a 45 degree angle for the design purposes as it will generate the worst tension in the cable. Swivel hoist rings will be used on both sides of the tether system for smooth load transfer and to avoid any additional stresses on the system.



$$F_{ice} := 16.022\text{kip}$$

Pg. 10, of this calculation documents the ice and wind load.

$$F_{wind} := 11.0\text{kip}$$

$$F_{boom} := 4.49\text{kip}$$

pg.51 of this calculation (maximum force at both location.)

$$W_{lat} := F_{ice} + F_{wind} + F_{boom} = 31.512\text{kip, Say } W_{lat} := 32.0\text{kip}$$

DESIGN OF TETHER ANCHOR

$$W_{lat} := 32.0 \text{ kip}$$

Conservatively assuming that the tether system has to resist the forces as shown above.

$$\theta := 45 \text{ deg}$$

(Based on the length of the tether cable and vertical rise of the river, θ will never exceed 45 degree)

$$T_{ten} := 1.25 \cdot \frac{W_{lat}}{\cos(45 \text{ deg})} = 56.569 \cdot \text{kip}$$

Conservatively using a 25% safety margin and the total force is resisted by 2 anchor points.

$$Lat_{force} := T_{ten} \cdot \cos(\theta) = 40 \cdot \text{kip}$$

Forces to be resisted by the Tether block

$$Uplift_{force} := T_{ten} \cdot \sin(\theta) = 40 \cdot \text{kip}$$

Design Inputs - Using a Concrete Block 15'-0" x 15'-0" x 3'-0" deep

$$L_{pedestal} := 15 \text{ ft}$$

$$w_{pedestal} := 15 \text{ ft}$$

Length and Width of Concrete block

$$z := 3.0 \text{ ft}$$

Height of the concrete block.

$$a_{soil} := 400 \text{ psf}$$

$$p_{soil} := 900 \text{ psf}$$

$$\mu_{soil} := 0.30$$

Adhesion, Passive resistance and coefficient of frictional resistance. Soil properties from Geotechnical report

$$F_p := p_{soil} \cdot L_{pedestal} \cdot z \cdot 0.5 = 20.25 \cdot \text{kip}$$

Conservatively assuming 50% of the effective length of pedestal resisting the lateral pull.

$$\gamma_{conc} := 150 \text{ pcf}$$

$$\gamma_{water} := 62.4 \text{ pcf}$$

Density of concrete and water.

Check for Uplift -

$$P_{uplift} := L_{pedestal} \cdot w_{pedestal} \cdot z \cdot (\gamma_{conc} - \gamma_{water}) = 59.13 \text{ kip} > Uplift_{force} = 40 \text{ kip}$$

∴ Adequate to resist the uplift

Check for Sliding -

$$P_{lat} := L_{pedestal} \cdot w_{pedestal} \cdot a_{soil} + F_p + P_{uplift} \cdot \mu_{soil} = 127.989 \text{ kip} > Lat_{force} = 40 \text{ kip}$$

$$FS_{sliding} := \frac{P_{lat}}{Lat_{force}} = 3.2$$

The concrete anchor block is safe and will not slide.

Check for Over turning/Rotation -

$$OT_{mom} := Lat_{force} \cdot z + Uplift_{force} \cdot \frac{L_{pedestal}}{2} = 420 \cdot \text{kip} \cdot \text{ft}$$

Overturning Moment

$$R_{mom} := \left[L_{pedestal} \cdot w_{pedestal} \cdot z \cdot (\gamma_{conc} - \gamma_{water}) \right] \cdot \frac{L_{pedestal}}{2} + F_p \cdot \frac{z}{3} = 463.725 \text{ ft} \cdot \text{kip}$$

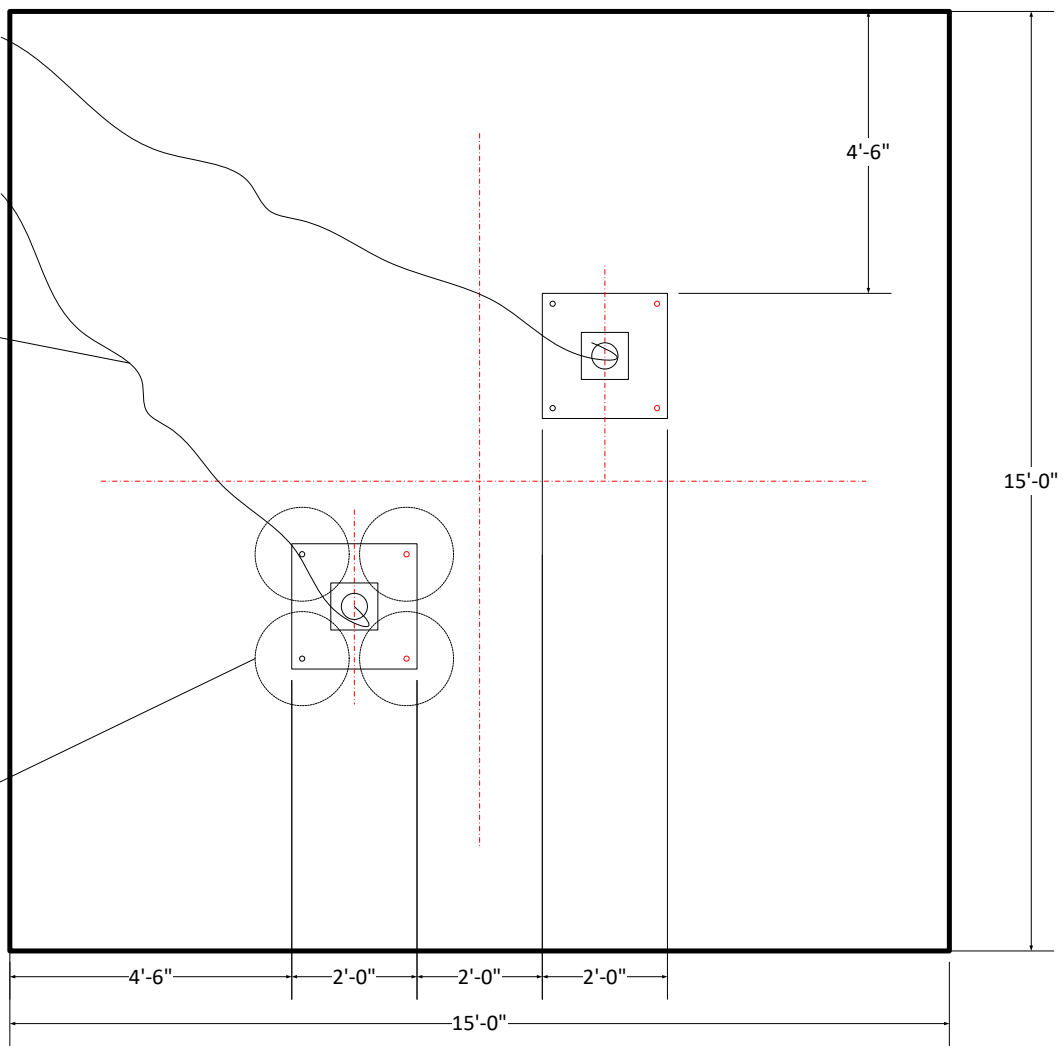
Resisting Moment

$$FS_{rot} := \frac{R_{mom}}{OT_{mom}} = 1.104$$

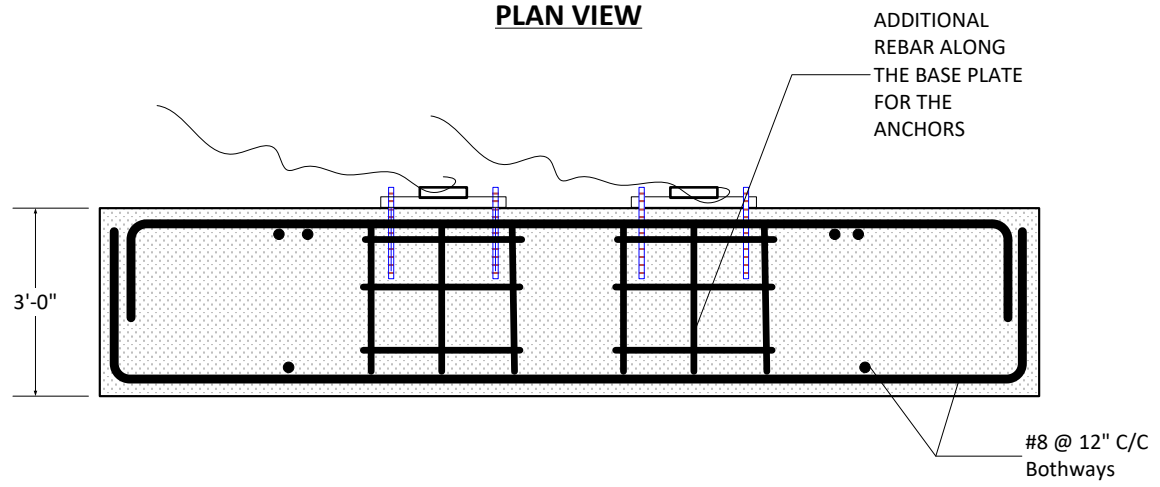
The concrete anchor block is safe and will not rotate.

INSTALL CABLE INSIDE
2" PVC FLEXIBLE
CONDUIT MINIMUM 3"
BELOW GRADE. (CABLE
CAPACITY RESIST 60 KIP
TENSION)

PULL OUT AREA



PLAN VIEW

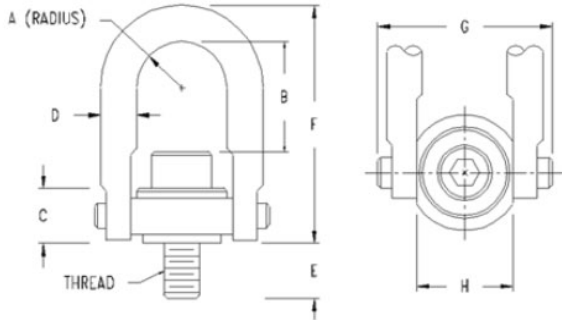


SECTION

Tether Cable length

1. Clear Fork Location - The block is approximately 65'-0" away from the pile and conservatively assuming additional 15'-0" for the ground profile and 30'-0" of travel on the pile from the mud line to the top of pile and a additional 30'-0" for the trash wheel to move out of the current location the total cable length = 65'-0" + 15'-0" + 30'-0" + 30'-0" = 140'-0" say 150'-0"

SWIVEL HOIST to be procured shall meet or exceed the minimum requirements tabulated below -



Rated Load (Lbs.)	55000
Size	2-3/4" - 4
Thread Protrusion	4"
Dim. B (mm)	6.16
Torque	2100ft/lb
Weight	1.0000

2 3/4" - 4 Swivel Hoist Ring
(with 5:1 design safety factor.)

$P_{swivel} := 55\text{kip}$

$P_{swivel} = 55 \cdot \text{kip} > \frac{T_{ten}}{2} = 28.284 \cdot \text{kip}, \therefore \text{Swivel is adequate for the load.}$

Slings 225'-0" (minimum) 2 no's. for both location to be procured and shall meet or exceed the 55.0 kip requirements calculated above .

Plate to anchor the Swivel hoist -

$T_{ten} = 56.569 \cdot \text{kip}$

Total tension, Conservatively using as the vertical uplift force

$F_{y_plate} := 36\text{ksi}$

$L_{plate} := 2\text{ft}$

$w_{plate} := 6\text{in}$ Conservatively assuming only 6" central width of the plate will resist the bending

$t_{plate} := 4\text{in}$

$M_{plate} := \frac{T_{ten}}{2} \cdot L_{plate}$

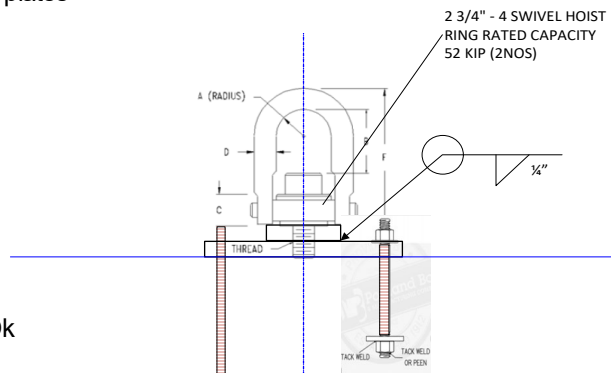
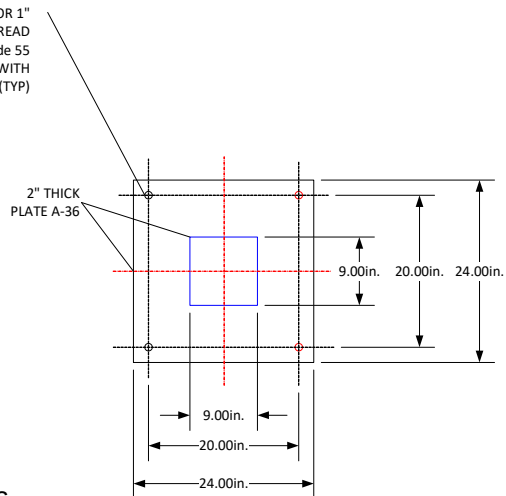
Conservative assuming the plates to be simply supported.

$Z_x := \frac{w_{plate} \cdot t_{plate}^2}{4} = 24 \cdot \text{in}^3$

$\Omega := 1.67$ Per AISC, the default omega factor (Ω) for Flexure is 1.67

$f_{y_act} := \frac{M_{plate}}{Z_x} = 7.071 \cdot \text{ksi} < \frac{F_{y_plate}}{\Omega} = 21.557 \cdot \text{ksi}, \therefore \text{Ok}$

1-1/8" DIA HOLE FOR 1" ANCHOR ROD ALL THREAD ROD F1554 F1554 Grade 55 MINIMUM 12" LONG WITH NUTS AND WASHER (TYP)



Concrete Anchor Bolt design -

1. References

1. Manual of Steel Construction 9th Edition (Allowable Stress Design) : AISC
2. Base Plate and Anchor Rod Design 2nd Edition : AISC Steel Design Guide
3. Building Code Requirements for Structural concrete : ACI 318-14

2. Design Basis

This calculation Based on ACI 328-02 Appendix D (CCD Method)

Tension and Shear are acting simultaneously on anchor bolt.

3. Input Units and Material Constants

3.1 Material Constants

Yield strength of F1554 Grade 55 Steel : $f_{ya} := 55 \cdot \text{ksi}$

Ultimate strength of F1554 Grade 55 Bolt : $f_{ua} := 75 \cdot \text{ksi}$

Compressive strength of Concrete : $f'_c := 5 \cdot \text{ksi}$

Strength reduction factor ϕ_t for Tension load: $\phi_t := 0.75$ ACI 318, Section 17.3.3

Strength reduction factor ϕ_v for shear load: $\phi_v := 0.65$

3.2 Factored Load on Anchor Bolt

Note - The actual forces are 20.0 kip uplift and 20.0 kip shear on each anchor plate . As the previous anchor bolt calculations used a conservative value no changes have been made for this section.

Shear and Tension Governing Case

Tension force $P_{\text{pull}} := \text{Uplift}_{\text{force}} = 30.052 \cdot \text{kip}$ Total pull to be resisted by the Anchor rods

Shear force $H := \text{Lat}_{\text{force}} = 30.052 \cdot \text{kip}$ Total Shear to be resisted by the Anchor rods

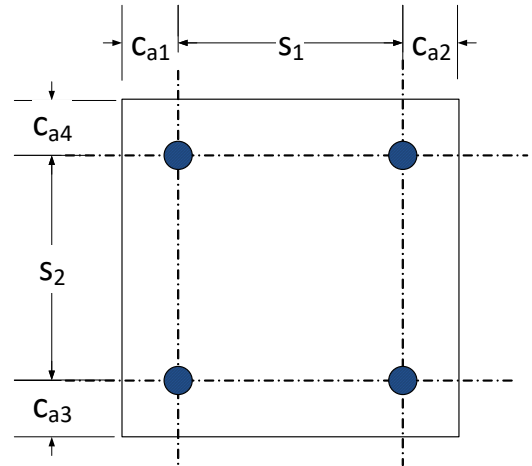
Assume a load factor of 1.4 to convert the loads to Ultimate load $L_f := 1.4$

Tension : $\text{Tension1} := L_f \cdot P_{\text{pull}}$ $\text{Tension1} = 42.07 \cdot \text{kip}$

Shear : $\text{Shear1} := L_f \cdot H$ $\text{Shear1} = 42.07 \cdot \text{kip}$

3.3 Section Property of Base Plate and Anchor Bolt

Base Plate Thk. : $t_b := 2.0 \cdot \text{in}$
 Diameter of Anchor Bolt : $d_o := 1.00 \cdot \text{in}$
 No. of Anchor bolts : $N_{\text{bolt}} := 4$
 Distance between anchor bolt : $s_1 := 20 \cdot \text{in}$
 $s_2 := 20 \cdot \text{in}$



3.5 Pedestal size

Length $P_1 := 120 \cdot \text{in}$
 Width $P_w := 120 \cdot \text{in}$
 Edge Distance $c_{a1} := 26 \text{in}$ $c_{a2} := 40 \text{in}$ $c_{a3} := 40 \text{in}$ $c_{a4} := 26 \text{in}$

4. Anchor Bolt Design

Anchor bolt length will be calculated by trial and error method.
 First, calculate anchor bolt in tension load case only and then calculate by trial & error for tension and shear load case.

4.1 Bolt length in tension force only

Ref. - ACI 318-14, Section 17.4.1.2

Caused by tension

$$f_{uta} := \min(f_{ua}, 1.9 \cdot f_{ya}, 125000 \cdot \text{psi}) = \min(75 \cdot \text{ksi}, 104.5 \cdot \text{ksi}, 125000 \cdot \text{psi}) \quad f_{uta} = 75 \cdot \text{ksi}$$

$$A_{se_calc} := \frac{\text{Tension1}}{\phi_t \cdot f_{uta} \cdot N_{\text{bolt}}} = \frac{42.073 \cdot \text{kip}}{0.75 \cdot 75 \cdot \text{ksi} \cdot 4}$$

$$A_{se_calc} = 0.187 \cdot \text{in}^2$$

Use 1" anchor bolt - 12" long

$$d_o = 1 \cdot \text{in} \quad n_t := \frac{10}{\text{in}} \quad 10 \text{ UNC Threading}$$

$$\text{Effective cross section area of bolt} \quad A_{se} := \frac{\pi}{4} \left(d_o - \frac{0.9743}{n_t} \right)^2 \quad A_{se} = 0.64 \text{in}^2 > A_{se_calc} = 0.187 \text{in}^2$$

4.2 Calculate Tensile Design Strength

$h_{ef} := 12 \cdot \text{in}$ Considering the bolt to be minimum 12" long

4.2.1 Steel Tensile Strength (Ref. ACI 318-14, Section 17.4.1)

ϕ_t : strength reduction factor ductile steel tension : 0.75 $\phi_t = 0.75$

$\phi N_s := \phi_t \cdot N_{o_{bolt}} \cdot A_{se} \cdot f_{uta}$ ACI 318-14, Section 17.4.1.2

$\phi N_s = 143.957 \text{kip} > \text{Tension1} = 42.073 \text{kip}$ Steel Strength in tension

4.2.2 Concrete breakout strength (Ref. ACI 318-14, Section 17.4.2)

c_{max} = the largest edge distance, in.

c_{min} = the smallest edge distance, in.

$c_{max} := \max(c_{a1}, c_{a2}, c_{a3}, c_{a4})$ $c_{max} = 40 \cdot \text{in}$

$c_{min} := \min(c_{a1}, c_{a2}, c_{a3}, c_{a4})$ $c_{min} = 26 \cdot \text{in}$

ϕ_c : strength reduction factor, see ACI 318-14 Section 17.3.3 $\phi_c := 0.70$

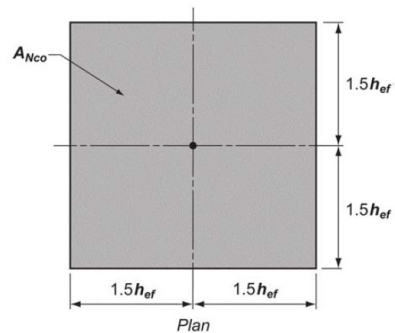
Check if one edge distance is at least $1.5h_{ef}$, Ref. ACI 318-14, Section 17.4.2.1

$c_{min} \geq 1.5 \cdot h_{ef}$ explicit, $C_{min}, h_{ef} = c_{min} \geq 1.5 \cdot 12 \cdot \text{in} = c_{min} \geq 18.0 \cdot \text{in}$

Check := $\begin{cases} \text{"OKAY"} & \text{if } c_{min} \geq 1.5 \cdot h_{ef} \\ \text{"Section 17.4.2.1.2"} & \text{otherwise} \end{cases}$ Check = "OKAY"

Projected concrete failure area for 1 bolt

$A_{Nco} := 9 \cdot h_{ef}^2$ $A_{Nco} = 9 \cdot \text{ft}^2$



$A_{Nco} = (2 \times 1.5h_{ef}) \times (2 \times 1.5h_{ef}) = 9h_{ef}^2$

ACI 318-14, Fig. R17.4.2.1

DESIGN OF TETHER ANCHOR

Projected concrete failure area for group bolt

Consider the assumed pedestal size and base plate

Define $c_{a1_t} := \min(c_{a1}, 1.5 \cdot h_{ef})$ $c_{a1_t} = 18 \cdot \text{in}$

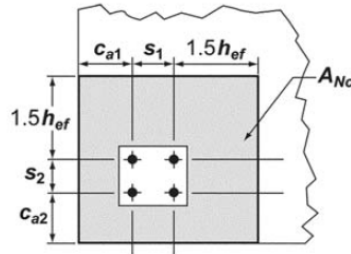
$c_{a2_t} := \min(c_{a2}, 1.5 \cdot h_{ef})$ $c_{a2_t} = 18 \cdot \text{in}$

$c_{a3_t} := \min(c_{a3}, 1.5 \cdot h_{ef})$ $c_{a3_t} = 18 \cdot \text{in}$

$c_{a4_t} := \min(c_{a4}, 1.5 \cdot h_{ef})$ $c_{a4_t} = 18 \cdot \text{in}$

$s_{1_t} := \min(s_1, 3 \cdot h_{ef})$ $s_{1_t} = 20 \cdot \text{in}$

$s_{2_t} := \min(s_2, 3 \cdot h_{ef})$ $s_{2_t} = 20 \cdot \text{in}$



$A_{Nc} = (c_{a1} + s_1 + 1.5 h_{ef})(c_{a2} + s_2 + 1.5 h_{ef})$
if c_{a1} and $c_{a2} < 1.5 h_{ef}$
and s_1 and $s_2 < 3 h_{ef}$

ACI 318-14, Fig. R17.4.2.1

$A_{Nc} := (c_{a1_t} + s_{1_t} + c_{a2_t}) \cdot (c_{a3_t} + s_{2_t} + c_{a4_t})$ $A_{Nc} = 3136 \cdot \text{in}^2$

$A_{Nc} := \begin{cases} A_{Nc} & \text{if } A_{Nc} \leq N_{o\text{bolt}} \cdot A_{Nco} \\ N_{o\text{bolt}} \cdot A_{Nco} & \text{otherwise} \end{cases}$ $A_{Nc} = 3136 \cdot \text{in}^2$

For single anchor, consider upper corner anchor

$A_{Ns} := (c_{a1_t} + 0.5 \cdot s_{1_t}) \cdot (c_{a4_t} + 0.5 \cdot s_{2_t})$ $A_{Ns} = 784 \cdot \text{in}^2$

$k_c := 24$ for cast-in anchors; and $ACI 318-14, Section 17.4.2.2a$ and Appendix B

$k_2 := 17$ for post-installed anchors.

$\lambda_a := 1.0$ $ACI 318-14 Section 17.2.6$ and Table 19.2.4.2 for normal weight concrete

$N_b := k_c \cdot \lambda_a \cdot \sqrt{f'_c} \cdot lbf \cdot h_{ef}^{1.5} \cdot \text{in}^{-.5}$ $N_b = 70.545 \cdot \text{kip}$ $ACI 318-14, Eq 17.4.2.2a, b$

Modification factor for eccentricity

$e_{N1} := 0 \cdot \text{in}$

$\psi_{ecN} := 1$ ((ACI 318-14, Section 17.4.2.4) Factor equals 1, since there is no eccentric load.)

Modification factor for edge effects

c_{min} : min edge distance $c_{min} = 26 \cdot \text{in}$

$\psi_{edN} := \begin{cases} 1 & \text{if } c_{min} \geq 1.5 \cdot h_{ef} \\ 0.7 + 0.3 \cdot \frac{c_{min}}{1.5 \cdot h_{ef}} & \text{otherwise} \end{cases}$ $\psi_{edN} = 1$ (ACI 318-14, Section 17.4.2.5a,b)

Modification factor for crack = 1 : cracked concrete
 = 1.25 no cracked concrete(cast-in)
 = 1.4 no cracked concrete(post-install)

$\psi_{cN} := 1$ ACI 318-14, Section 17.4.2.6, cracked concrete

Breakout splitting factor

$\psi_{cpN} := 1$ ACI 318-14, Section 17.4.2.7a,b, cast-in anchors

Concrete breakout strength of anchor in tension:

For a single anchor (does not apply for group of four anchors, calculated for completeness of code provisions):

$$N_{cb} := \frac{A_{Ns}}{A_{Nco}} \cdot \psi_{edN} \cdot \psi_{cN} \cdot \psi_{cpN} \cdot N_b \quad N_{cb} = 42.68 \cdot \text{kip} \quad \text{ACI 318-14, Eqn. 17.4.2.1a}$$

For a group of anchors:

$$N_{cbg} := \frac{A_{Nc}}{A_{Nco}} \cdot \psi_{ecN} \cdot \psi_{edN} \cdot \psi_{cN} \cdot \psi_{cpN} \cdot N_b \quad N_{cbg} = 170.702 \cdot \text{kip} \quad \text{ACI 318-14, Eqn. 17.4.2.1b}$$

$$\phi N_{cbg} := \phi_c \cdot N_{cbg} \quad \phi N_{cbg} = 119.492 \text{kip} > \text{Tension1} = 42.073 \text{kip}$$

Additional_bar := $\begin{cases} \text{"additional bar is necessary"} & \text{if } \phi N_{cbg} \leq \text{Tension1} \\ \text{"additional bar is not necessary"} & \text{otherwise} \end{cases}$

Additional_bar = "additional bar is not necessary"

The concrete tension breakout strength is adequate to resist the factored tension load.

4.2.3 Pullout Strength (ACI 318-14 Section 17.4.3)

Strength reduction factor for tension load see ACI 318-14 Section 17.3.3 (C) ii $\phi_p := 0.70$

Modification factor for pullout strength for cracking ACI 318-14, Section 17.4.3.6
 = 1.0 : concrete cracking at service load
 = 1.4 : no concrete cracking at service load $\psi_{cP} := 1.0$

Bolt_{type} := 1 1 : single headed or headed bolt (D.5.3.4)
 2 : hooked type (D.5.3.5)

Bearing area of anchor head : $A_{brg} := 1.472 \cdot \text{in}^2$ Using area of hex nut

outside diameter of hook type : $d_o := \text{Dia}_{\text{bolt}}$ $d_o = 1 \cdot \text{in}$

DESIGN OF TETHER ANCHOR

distance between inner space of J type bolt $e_h := 0$

$$N_p := \begin{cases} 8A_{brg} \cdot f_c & \text{if Bolt}_{type} = 1 & \text{(ACI 318-14, Eqn. 17.4.3.4)} \\ 0.9 \cdot f_c \cdot e_h \cdot d_o & \text{otherwise} & \text{(ACI 318-14, Eqn. 17.4.3.5)} \end{cases}$$

$N_p = 58.88 \cdot \text{kip}$ We have four bolts $N_{obolt} = 4$

$\phi N_p := N_{obolt} \cdot \phi_p \cdot \psi_{cP} \cdot N_p$ $\phi N_p = 164.864 \text{kip} > \text{Tension1} = 42.073 \text{kip}$ ACI 318-14, Table 17.3.1.1

4.2.4 Side face blowout strength (ACI 318-14, Section 17.4.4)

The side face distance : $c_{min} = 26 \cdot \text{in}$ $h_{ef} = 12 \cdot \text{in} < 2.5 \cdot c_{min} = 65 \cdot \text{in}$

$\phi_{sfb} := 0.7$

Strength reduction factor for tension load
see ACI 318-14 Section 17.3.3 (C) ii

$$\text{fact} := \begin{cases} \frac{\left(1 + \frac{c_{a2}}{c_{a1}}\right)}{4} & \text{if } 1.0 \leq \frac{c_{a2}}{c_{a3}} \leq 3.0 & \text{fact} = 0.635 \\ 1 & \text{otherwise} \end{cases}$$

$N_{sb} := \text{fact} \cdot 160 \cdot c_{a1} \cdot \sqrt{A_{brg} \cdot \text{in}^2} \cdot \lambda_a \cdot \sqrt{f_c \cdot \text{psi} \cdot \text{in}^{-1}} = 226.487 \cdot \text{kip}$

$\phi N_{sbg} := \phi_{sfb} \cdot \left(1 + \frac{c_{min}}{6 \cdot c_{a1}}\right) \cdot N_{sb} = 184.964 \cdot \text{kip}$ $\phi N_{sbg} = 184.964 \text{kip} > \text{Tension1} = 42.073 \text{kip}$

4.2.5 Summary of Tensile Strength

Steel Tensile Strength $\phi N_s = 143.957 \cdot \text{kip}$

Concrete breakout strength $\phi N_{cbg} = 119.492 \cdot \text{kip}$ ←-----Controls

Pullout strength $\phi N_p = 164.864 \cdot \text{kip}$

Side face blowout strength $\phi N_{sbg} = 184.964 \cdot \text{kip}$

Min. tensile strength : $\phi N := \min(\phi N_s, \phi N_{cbg}, \phi N_p, \phi N_{sbg})$ $\phi N = 119.492 \cdot \text{kip}$

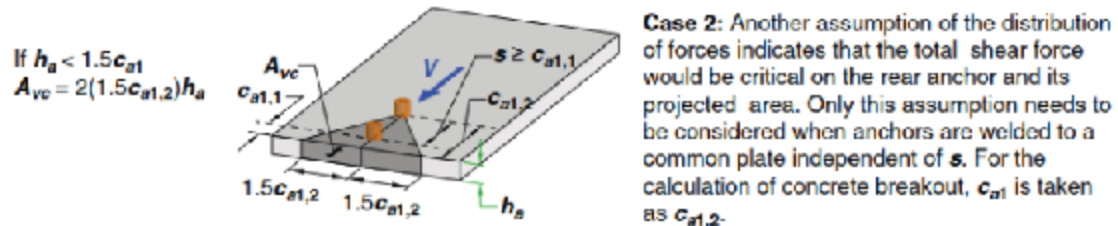
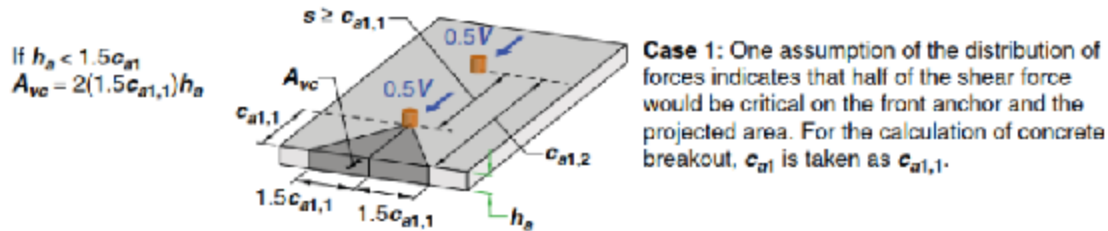
$\phi N = 119.492 \text{kip} > \text{Tension1} = 42.073 \text{kip} > P_{pull} = 30.052 \text{kip}$

The anchor bolts will adequately transfer the load to the concrete block

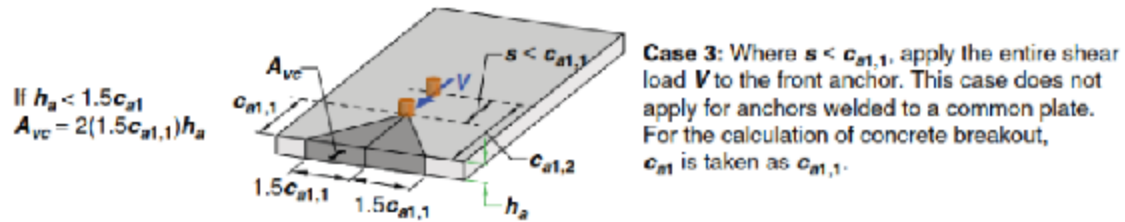
DESIGN OF TETHER ANCHOR

Depth of pedestal is greater than $1.5 \cdot c_{a1} = 39\text{-in}$

$h_a := 60\text{-in}$



Note: For $s \geq c_{a1,1}$, both Case 1 and Case 2 should be evaluated to determine which controls for design except as noted for anchors welded to a common plate



From ACI 318-14 - Fig. R17.5.2.1b

Check := $\begin{cases} \text{"Evaluate Case 1 and Case 2"} & \text{if } s_1 \geq c_{a1} \\ \text{"Evaluate Case 3"} & \text{otherwise} \end{cases}$

Check = "Evaluate Case 3"

For group of anchors, two bolts on leading edge per Case 3 of Fig. R17.5.2.1b

$$A_{Vc} := (c_{a4_s} + s_{2_s} + c_{a3_s}) \cdot 1.5 \cdot c_{a1} \quad A_{Vc} = 3315 \cdot \text{in}^2$$

Number of anchors in the group $n := 4$

$$A_{Vc} := \begin{cases} A_{Vc} & \text{if } A_{Vc} \leq n \cdot A_{Vco} \\ n \cdot A_{Vco} & \text{otherwise} \end{cases} \quad A_{Vc} = 3315 \cdot \text{in}^2 \quad \text{ACI 318-14 Section 17.5.2.1}$$

For single anchors, consider upper corner anchor

$$A_{Vs} := (c_{a4_s} + \min(0.5s_{2_s}, 1.5c_{a1})) \cdot 1.5 \cdot c_{a1} \quad A_{Vs} = 1404 \cdot \text{in}^2$$

Breakout eccentricity factor

$$e'_V := 0 \cdot \text{in}$$

$$\psi_{ecV} := \frac{1}{\left(1 + \frac{2 \cdot e'_V}{3 \cdot c_{a1}}\right)} \quad \text{ACI 318-14, Eqn. 17.5.2.5}$$

$$\psi_{ecV} = 1$$

Breakout edge effect factor

$$c_{a4} = \text{orthogonal to } c_{a1} \quad c_{a4} = 26 \cdot \text{in} \quad 1.5 \cdot c_{a1} = 39 \cdot \text{in}$$

$$\psi_{edV} := \begin{cases} 1.0 & \text{if } c_{a4} \geq 1.5 \cdot c_{a1} \\ 0.7 + 0.3 \cdot \frac{c_{a4}}{1.5 \cdot c_{a1}} & \text{otherwise} \end{cases} \quad \psi_{edV} = 0.9 \quad \text{ACI 318-14 Eqn. 17.5.2.6a, b}$$

Breakout cracking Modification factor, ACI 318-14 Section - 17.5.2.7

$\psi_{c,V} = 1.0$ for anchors in cracked concrete without supplementary reinforcement or with edge reinforcement smaller than a No. 13 bar

$\psi_{c,V} = 1.2$ for anchors in cracked concrete with reinforcement of a No. 13 bar or greater between the anchor and the edge

$\psi_{c,V} = 1.4$ for anchors in cracked concrete with reinforcement of a No. 13 bar or greater between the anchor and the edge, and with the reinforcement enclosed within stirrups spaced at not more than 100 mm

$$\psi_{cV} := 1.0 \quad \text{Without supplemental steel}$$

Breakout thickness factor, ACI 318-14 Section - 17.5.2.8

$$\psi_{hV} := \begin{cases} \sqrt{\frac{1.5 \cdot c_{a1}}{h_a}} & \text{if } h_a \leq 1.5 \cdot c_{a1} \\ 1.0 & \text{if } \sqrt{\frac{1.5 \cdot c_{a1}}{h_a}} < 1.0 \end{cases} \quad \psi_{hV} = 1$$

DESIGN OF TETHER ANCHOR

L_{breakout} : load bearing length for shear, ACI 318-14, Section 17.5.2.2

$$\begin{aligned} &= 8d_o : \text{generally used} & l_c &:= \min(8 \cdot d_o, h_{\text{ef}}) \\ &= h_{\text{ef}} : \text{anchor with head} \\ &= 2d_o : \text{torque control exp. anchor} & l_c &= 8 \cdot \text{in} \end{aligned}$$

$$V_{b1} := 7 \cdot \left(\frac{l_c}{d_o}\right)^{0.2} \cdot \sqrt{\frac{d_o}{\text{in}}} \cdot \lambda_a \cdot \sqrt{f'_c \cdot \text{lb} \cdot \text{ft}} \cdot c_{a1}^{1.5} \cdot \text{in}^{-.5} \quad V_{b1} = 99.463 \cdot \text{kip} \quad \text{ACI 318-14, Eqn. 17.5.2.2a \& App. B}$$

$$V_{b2} := 9 \cdot \lambda_a \cdot \sqrt{f'_c \cdot \text{lb} \cdot \text{ft}} \cdot \left(c_{a1}^{1.5} \cdot \text{in}^{-.5}\right) \quad V_{b2} = 84.37 \cdot \text{kip} \quad \text{ACI 318-14, Eqn. 17.5.2.2b}$$

$$V_b := \min(V_{b1}, V_{b2}) \quad V_b = 84.37 \cdot \text{kip}$$

Concrete breakout strength of single anchor in shear

$$\phi_{cb} V_{cb} := \phi_{cb} \cdot \frac{A_{Vs}}{A_{Vco}} \cdot \psi_{edV} \cdot \psi_{cV} \cdot \psi_{hV} \cdot V_b \quad \phi_{cb} V_{cb} = 24.532 \cdot \text{kip}$$

Concrete breakout strength of group of anchors in shear

$$\phi_{cb} V_{cbg} := \phi_{cb} \cdot \frac{A_{Vc}}{A_{Vco}} \cdot (\psi_{ecV} \cdot \psi_{edV} \cdot \psi_{cV} \cdot \psi_{hV} \cdot V_b) \quad \phi_{cb} V_{cbg} = 57.923 \text{kip} > \text{Shear1} = 42.073 \text{kip}, \therefore \text{Ok}$$

4.2.3 Pryout Strength Ref. ACI 318-14 Section 17.5.3

$$\phi_{cb} : \text{strength reduction factor see ACI 318-14 Section 17.3.3} \quad \phi_{cp} := 0.7$$

$$\begin{aligned} k_{cp} &= 1.0 \quad h_{\text{ef}} < 2.5 \text{ in} \\ &= 2.0 \quad h_{\text{ef}} > 2.5 \text{ in} & k_{cp} &:= 2 \end{aligned}$$

$$N_{cp} := N_{cb} = 42.676 \cdot \text{kip} \quad \text{For single anchor per ACI 318-14 Section 17.5.3}$$

$$N_{cpg} := N_{cbg} = 170.702 \cdot \text{kip} \quad \text{For group of anchors per ACI 318-14 Section 17.5.3}$$

$$\phi_{cp} V_{cp} := \phi_{cp} \cdot k_{cp} \cdot N_{cp} \quad \phi_{cp} V_{cp} = 59.746 \cdot \text{kip} \quad \text{ACI 318-14, Eqn. 17.5.3.1a}$$

$$\phi_{cp} V_{cpg} := \phi_{cp} \cdot k_{cp} \cdot N_{cpg} \quad \phi_{cp} V_{cpg} = 238.983 \text{kip} > \text{Shear1} = 42.073 \text{kip}, \therefore \text{Ok}$$

4.3.4 Summary of Shear Strength

Steel Shear Strength $(\phi_s V_s) = 59.886 \cdot \text{kip}$
 Concrete breakout strength $(\phi_{cb} V_{cbg}) = 57.923 \cdot \text{kip}$ <-----Controls
 Pryout strength $(\phi_{cp} V_{cpg}) = 238.983 \cdot \text{kip}$
 Min. shear strength : $(\phi V := \min(\phi_s V_s, \phi_{cb} V_{cbg}, \phi_{cp} V_{cpg}))$
 $(\phi V) = 57.923 \cdot \text{kip}$

4.4 Check Tension and Shear Interaction (Ref. ACI 318-14 Section 17.6)

If $V_u < 0.2 \phi V_n$: then full strength in shear shall be permitted $\phi N_n > N_u$

If $N_u < 0.2 \phi N_n$: then full strength in tension shall be permitted $\phi V_n > V_u$

If $V_u > 0.2 \phi V_n$ and $N_u > 0.2 \phi N_n$, then $\frac{N_u}{\phi N_n} + \frac{V_u}{\phi V_n} \leq 1.2$

$V_u := \text{Shear1}$ $V_u = 42.073 \cdot \text{kip}$ $\phi V = 57.923 \cdot \text{kip}$

$N_u := \text{Tension1}$ $N_u = 42.073 \cdot \text{kip}$ $\phi N = 119.492 \cdot \text{kip}$

Shear_check := $\begin{cases} \text{"full tension Strength"} & \text{if } V_u \leq 0.2 \cdot \phi V \\ \text{"check interection"} & \text{otherwise} \end{cases}$

Shear_check = "check interection"

Tensile_check := $\begin{cases} \text{"full shear Strength"} & \text{if } N_u \leq 0.2 \cdot \phi N \\ \text{"check interection"} & \text{otherwise} \end{cases}$

Tensile_check = "check interection"

Interaction := $\frac{N_u}{\phi N} + \frac{V_u}{\phi V}$ (Interaction) = 1.078

Interaction_check := $\begin{cases} \text{"OKAY"} & \text{if } \text{Interaction} \leq 1.2 \\ \text{"Check again"} & \text{otherwise} \end{cases}$

(Interaction_check) = "OKAY"

ATTACHMENT C

Geotechnical Report and Information

**GEOTECHNICAL ENGINEERING STUDY
PROPOSED TRASH WHEELS
WEST FORK AND CLEAR FORK TRINITY RIVER
FORT WORTH, TEXAS**

Presented To:

Enercon

July 2021

CMJ PROJECT NO. 2878-21-01

July 20, 2021
CMJ Report No. 2878-21-01 (Revised)

Enercon
777 Main Street, Suite 620
Fort Worth, Texas 76102

Attn: Mr. Brian Pace, P.E.

**GEOTECHNICAL ENGINEERING STUDY
PROPOSED TRASH WHEELS
WEST FORK AND CLEAR FORK TRINITY RIVER
FORT WORTH, TEXAS**

Dear Mr. Pace:

Submitted herein are the results of the geotechnical engineering services for the referenced project. The geotechnical services were performed in accordance with Proposal No. 21-8103 (Revised) dated May 17, 2021. The geotechnical services were authorized via Enercon Purchase Order No. CMJE-1001-00-N, dated June 2, 2021.

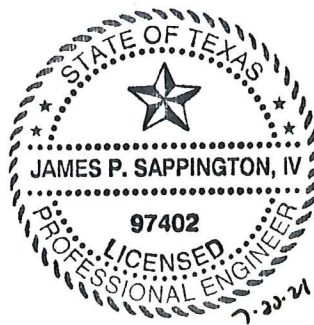
Engineering analyses and recommendations are contained in the text section of the report. Results of the field and laboratory services are included in Appendix A of the report.

We appreciate the opportunity to be of service to Enercon. Please contact us if you have any questions or if we may be of further service at this time.

Respectfully submitted,
CMJ ENGINEERING, INC.
TEXAS FIRM REGISTRATION NO. F-9177



James P. Sappington IV, P.E.
President
Texas No. 97402



copies submitted: (2) Mr. Brian Pace, P.E.; Enercon (by email and mail)
(1) Mr. Darren Lovvorn; Enercon (by email and mail)

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1.0 INTRODUCTION

1.1 Project Description

The project, as currently planned, will consist of installing trash collection wheels on the Clear Fork of the Trinity River in Fort Worth, Texas. The Clear Fork location is immediately west of Panther Island Pavilion. Each floating structure will be held in place with deep foundation elements consisting of either driven or drilled straight shafts. In addition, access boat ramps will be constructed at each trash wheel as part of the project. Plates A.1A and A.1B, Plan of Borings, presents the project vicinity and approximate locations of the exploration borings.

1.2 Purpose and Scope

The purpose of this geotechnical engineering study has been to determine the general subsurface conditions, evaluate the engineering characteristics of the subsurface materials encountered, and develop shaft LPile parameters and recommendations for the type or types of foundations suitable for the ramps aspect of the project.

To accomplish its intended purposes, the study has been conducted in the following phases: (1) drilling sample borings to determine the general subsurface conditions and to obtain samples for testing; (2) performing laboratory tests on appropriate samples to determine pertinent engineering properties of the subsurface materials; and (3) performing engineering analyses, using the field and laboratory data to develop geotechnical recommendations for the proposed construction.

The design is currently in progress and the locations and/or elevations of the structures could change. Once the final design is near completion (80-percent to 90-percent stage), it is recommended that CMJ Engineering, Inc. be retained to review those portions of the construction documents pertaining to the geotechnical recommendations, as a means to determine that our recommendations have been interpreted as intended.

1.3 Report Format

The text of the report is contained in Sections 1 through 10. All plates and large tables are contained in Appendix A. The alpha-numeric plate and table numbers identify the appendix in which they appear. Small tables of less than one page in length may appear in the body of the text and are numbered according to the section in which they occur.

Units used in the report are based on the English system and may include tons per square foot (tsf), kips (1 kip = 1,000 pounds), kips per square foot (ksf), pounds per square foot (psf), pounds per cubic foot (pcf), and pounds per square inch (psi).

2.0 FIELD EXPLORATION AND LABORATORY TESTING

2.1 Field Exploration

Subsurface materials at the project site were explored by two (2) vertical soil borings. The borings were drilled with a truck-mounted CME-75 drilling rig using hollow-stem augers at the approximate locations shown on Plates A.1A and A.1B, Plan of Borings. Boring CF-1 was drilled to a depth of 50 feet below existing grade at the river bank near the Clear Fork trash wheel location and Boring WF-1 was drilled to a depth of 55 feet at the river bank near the West Fork trash wheel location.

Undisturbed samples of cohesive soils were obtained with nominal 3-inch diameter thin-walled (Shelby) tube samplers which operate inside the hollow-stem augers at the locations shown on the logs of borings. The Shelby tube sampler consists of a thin-walled steel tube with a sharp cutting edge connected to a head equipped with a ball valve threaded for rod connection. The tube is pushed into the soil by the hydraulic pulldown of the drilling rig. The soil specimens were extruded from the tube in the field, logged, tested for consistency with a hand penetrometer, sealed, and packaged to limit loss of moisture.

The consistency of cohesive soil samples was evaluated in the field using a calibrated hand penetrometer. In this test a 0.25-inch diameter piston is pushed into the relatively undisturbed sample at a constant rate to a depth of 0.25 inch. The results of these tests, in tsf, are tabulated at respective sample depths on the logs. When the capacity of the penetrometer is exceeded, the value is tabulated as 4.5+.

Disturbed samples of the noncohesive granular or stiff to hard cohesive materials were obtained utilizing a nominal 2-inch O.D. split-barrel (split-spoon) sampler in conjunction with the Standard Penetration Test (ASTM D 1586). This test employs a 140-pound hammer that drops a free fall vertical distance of 30 inches, driving the split-spoon sampler into the material. The number of blows required for 18 inches of penetration is recorded and the value for the last 12 inches, or the penetration obtained from 50 blows, is reported as the Standard Penetration Value (N) at the appropriate depth on the log of boring.

To evaluate the relative density and consistency of the harder formations, a modified version of the Texas Cone Penetration test was performed at selected locations. Texas Department of Transportation (TXDOT) Test Method Tex-132-E specifies driving a 3-inch diameter cone with a 170-pound hammer freely falling 24 inches. This results in 340 foot-pounds of energy for each blow. In relatively soft materials, the penetrometer cone is driven 1 foot and the number of blows required for each 6-inch penetration is tabulated at respected test depths, as blows per 6 inches on the log. In hard materials (rock or rock-like), the penetrometer cone is driven with the resulting penetrations, in inches, recorded for the first and second 50 blows, a total of 100 blows. The penetration for the total 100 blows is recorded at the respective testing depths on the boring logs.

Continuous coring was performed at selected intervals in rock and rock-like materials using an NW (formerly NX) size, double-tube core barrel. This core barrel produces a nominal 2-inch diameter core sample. The core recovery and Rock Quality Designation (RQD) in percent are included in the appropriate column on the logs of borings. The recovered percent is presented first for each core run and the RQD percent is presented immediately beside the recovered percent, in the adjacent column.

Ground-water observations during and after completion of the borings are shown on the upper right of the boring log. Upon completion of the borings, the bore holes were backfilled with soil cuttings and plugged at the surface by hand tamping.

2.2 Laboratory Testing

Laboratory soil tests were performed on selected representative samples recovered from the borings. In addition to the classification tests (liquid limits, plastic limits, gradations), moisture content, unconfined compressive strength, and unit weight tests were performed. Results of the laboratory classification tests, moisture content, unconfined compressive strength, and unit weight tests conducted for this project are included on the boring logs. Gradation analyses are presented on Plates A.6 through A.8, Particle Size Distribution Reports.

The above laboratory tests were performed in general accordance with applicable ASTM procedures, or generally accepted practice.

3.0 SUBSURFACE CONDITIONS

3.1 Geology

The Dallas Sheet of the Geologic Atlas of Texas indicates the project sites are located in Alluvium Deposits of the Clear Fork and West Fork Trinity River overlying the Duck Creek, Kiamichi, and/or Goodland formations. The alluvial and terrace deposits are generally a mixture of fine-grained and coarse materials, which are typically layered with grain sizes increasing with depth. At the surface the clay portions of these deposits can be moderately to highly active. Ground-water is typically present in these deposits, especially in proximity to the river. The Duck Creek and Goodland formations consist of limestone with some shale portions, as discussed below.

3.2 Soil and Rock Conditions

Specific types and depths of subsurface strata encountered at the boring locations are shown on the boring logs in Appendix A. The generalized subsurface stratigraphy encountered in the borings are discussed below. Note that depths on the borings and in the discussion below refer to the depth from the existing ground surface present at the time of the investigation, and the boundaries between the various soil types are approximate.

Natural soils encountered consist of dark brown, brown, reddish brown, tan and gray silty clays, silty sandy clays, sandy silty clays and clays. The various clayey soils are generally stiff to hard (soil basis) in Boring WF-1 and above a depth of 6 feet in Boring CF-1, with pocket penetrometer readings of 2.0 to over 4.5 tsf. Soft to firm and occasionally stiff (soil basis) conditions are noted within the silty clay and sandy silty clay materials below 6 feet in Boring CF-1, with pocket penetrometer readings of 0.25 to 1.75 tsf and Standard Penetration (N) values of 6 to 9 blows per foot.

More granular tan and gray clayey sands, silty clayey sands, clayey silty sands, and clayey sandy silts are next present in the borings below depths of 33 and 13 feet in Borings CF-1 and WF-1, respectively. These granular soils vary from loose to dense or soft to firm (soil basis), with Standard Penetration (N) values of 4 to 38 blows per foot of penetration and a pocket penetrometer value of 0.75 tsf.

The various soils encountered had tested Liquid Limits (LL) of 22 to 51 with Plasticity Indices (PI) of 6 to 35, and classify as SM, SC, ML, CL and CH according to the USCS. Tested unit weight and

unconfined compressive strength values range from 106 to 123 pcf and 840 to 5,800 psf, respectively. Select lower strength test values reflect more granular or silty materials.

Tan limestone is next present in Boring CF-1 at a depth of 39 feet. The tan limestone occurs weathered and is considered moderately hard (sedimentary rock basis), with a Standard Penetration (SPT) test result of 2¾ inches of penetration for 50 hammer blows.

Gray limestone typically containing shale seams and layers is next present in Borings CF-1 and WF-1 at depths of 40 to 42½ feet. Borings CF-1 and WF-1 were terminated within the gray limestone at depths of 50 to 55 feet. The gray limestone exhibits unconfined compression test values varying from 41,660 to 211,250 psf. These values are considered to range widely from low to relatively high (sedimentary rock basis) from the viewpoint of rock strength. Lower strength test results typically reflect the presence of shale seams and layers within the gray limestone materials. Rock quality designation (RQD) measurements of recovered core samples within the gray limestone were similarly highly variable, ranging from 7 to 60 percent. The gray limestone exhibits Texas Cone Penetrometer (THD) test values of ½ to 2 inches of penetration for 100 hammer blows and a Standard Penetration (SPT) test result of 1½ inches of penetration for 50 hammer blows.

The Atterberg Limits tests indicate the assorted soils encountered in the borings vary from generally slightly to highly active with respect to moisture induced volume changes. Active clays can experience volume changes (expansion or contraction) with fluctuations in their moisture content.

3.3 Ground-Water Conditions

3.3.1 Observations

Borings were drilled using hollow-stem augers in order to observe ground-water seepage during drilling. Ground-water seepage was encountered during drilling in Borings CF-1 and WF-1 at depths of 17 to 22 feet. Wet rotary drilling methods were utilized below depths of 40 to 45 feet in the borings, precluding subsequent accurate water level measurements. Table 3.3-1 summarizes water level data.

While it is not possible to accurately predict the magnitude of subsurface water fluctuation that might occur based upon these short-term observations, it should be recognized that ground-water

conditions will vary with fluctuations in rainfall. Seepage near the observed levels should be anticipated throughout the year.

TABLE 3.3.1		
Ground-Water Observations		
Boring No.	Seepage During Drilling (ft.)	Water at Completion (ft.)
CF-1	22	N/A, wet rotary drilling below 40
WF-1	17	N/A, wet rotary drilling below 45

Fluctuations of the ground-water level can occur due to seasonal variations in the amount of rainfall; site topography and runoff; hydraulic conductivity of soil strata; and other factors not evident at the time the borings were performed. Water may be encountered in sand seams/layers, joints, fractures, or permeable seams within the various alluvial deposit soils and should be considered when developing the design and construction plans for the project.

Water traveling through the soil (subsurface water) is often unpredictable. This could be due to seasonal changes in ground water and due to the unpredictable nature of ground-water paths. Therefore, it is necessary during construction for the contractor to be observant for ground-water seepage in excavations in order to assess the situation and take appropriate action.

Due to the variable subsurface conditions, long-term observations would be necessary to more accurately evaluate the ground-water level. Such observations would require installation of piezometer or observation wells which are sealed to prevent the influence of surface water.

4.0 LPILE RECOMMENDATIONS

4.1 Lateral Loading Design Criteria (LPile)

Shaft design parameters for use with LPile based on laboratory test and field test results are presented in Tables 4.1-1 and 4.1-2. For development of clay parameters, unconfined compressive strength data was utilized. Standard Penetration test (SPT) values were utilized for sand criteria, while TxDOT Cone Penetrometer (THD) test values and unconfined compressive strength of recovered rock cores were used to develop the limestone values. Selection of the appropriate LPile parameters was accomplished using the above test results, published values,

and our past experience with similar conditions. These values should, therefore, be considered approximate. For the limestone, the “Weak Rock, Reese” model is suitable for use with LPile.

TABLE 4.1-1 - Recommended LPile Design Values							
Boring No. CF-1							
Soil Type	Depth Interval (ft)	Design Total Unit Weight (pcf)	Design Strength		Design ϵ_{50} or k_{rm}	k-value (pci)	E (psi)
Clay (Soft Clay, Matlock)	to 33	125	Cohesion (psi)	Friction Angle (degrees)	0.02	30	-
			3	-			
Clayey Sand (Sand, Reese)	33-40	125	-	36	-	120	-
Gray Limestone (Estimated RQD =30%)	40+	140	Uniaxial Compressive Strength (psi)		0.0001	-	1 x 10 ⁵
			275				

TABLE 4.1-2 - Recommended LPile Design Values							
Boring No. WF-1							
Soil Type	Depth Interval (ft)	Design Total Unit Weight (pcf)	Design Strength		Design ϵ_{50} or k_{rm}	k-value (pci)	E (psi)
Clayey Sandy Silt (Soft Clay, Matlock)	to 28	125	Cohesion (psi)	Friction Angle (degrees)	0.02	30	-
			3	-			
Clayey Silty Sand (Sand, Reese)	28-38	110	-	24	-	20	-
Clayey Sand (Sand, Reese)	38-42½	120	-	32	-	60	-
Gray Limestone (Estimated RQD =30%)	42½+	140	Uniaxial Compressive Strength (psi)		0.0001	-	1 x 10 ⁵
			275				

Note that depth intervals above refer to the depth from the existing ground surface at the boring locations, and the boundaries between the soil types are approximate.

5.0 RETAINING STRUCTURES

5.1 General Retaining Wall Considerations

Retaining structures may be required in association with the proposed boat ramps. Five geotechnical design criteria must be satisfied in the selection of the type and configuration of the retaining walls. These criteria are; the wall must have an acceptable factor of safety with respect to (1) overturning failure, (2) a sliding (translation) failure, (3) a bearing capacity failure, and (4) a global (deep-seated) slope failure. In addition, (5) the deformation of the wall caused by deflection from earth pressure, and from settlement or heave of the foundation soils or backfill soils, must be within tolerable limits during the functional life of the structures.

5.2 Potential Vertical Movements

Structures placed near existing grade will be subject to movement as a result of moisture-induced volume changes in the slightly active to highly active silty clays and clays. The clays expand (heave) with increases in moisture and contract (shrink) with decreases in moisture. The movement typically occurs as post-construction heave. The potential magnitude of the moisture-induced movements is rather indeterminate. It is influenced by the soil properties, overburden pressures, and to a great extent by soil moisture levels at the time of construction. The greatest potential for post-construction movement occurs when the soils are in a dry condition at the time of construction. Based on the conditions encountered in the boring, potential moisture-induced movements are estimated to be on the order of 2¾ inches for soils in a dry condition. Soil movements, significantly larger than estimated, could occur due to inadequate site grading, poor drainage, ponding of rainfall, and/or leaking pipelines.

5.3 Foundations

If the retaining walls are sensitive to movements, we recommend they be supported on a deep foundation system as previously discussed. If differential movements are acceptable, the retaining wall foundations can be supported on continuous footings situated in the surficial silty clays or clays. Footings situated a minimum of 2 feet below finished grade may be proportioned using a maximum allowable bearing pressure of 1,000 psf. Soils existing in a soft to firm state should be evaluated on a case-by-case basis. Close inspection of soil strength should be conducted by a geotechnical engineer to allow the designation and removal of very soft soils not meeting the bearing capacity stated above. The base of all excavated footings should be inspected by a

geotechnical engineer or geotechnician under his or her supervision to assure that the bottom is firm, level and free of loose soil material and/or debris.

It should be noted that retaining wall foundations are typically subjected to non-uniform pressure across the foundation, and possibly negative pressure (separation of foundation from soil) under a portion of the foundation, due to the overturning moment induced by the lateral earth pressures. The allowable foundation pressures given above are for the maximum pressure induced by the foundation loads, and not the average pressure under the foundation base.

The horizontal bases of the footings will develop resistance to sliding by means of a combination of friction and adhesion (for cohesive foundation materials). Given the nature of the foundation materials, an adhesion of 400 psf may be used for earth formed footings. An ultimate friction factor of 0.3 may be used to calculate sliding resistance of the footings bearing on site soils.

Foundations for the retaining walls designed in accordance with these recommendations will have a minimum factor of safety of 3 with respect to a bearing capacity failure and should experience a total settlement of 1 inch or less and a differential settlement of 0.5 inch or less, after construction.

5.4 Lateral Earth Pressures

5.4.1 General

The retaining walls must be designed for lateral pressures including, but not necessarily limited to, earth, water, surcharge, swelling, and vibration. In addition, the lateral pressures will be influenced by whether the backfill is drained or undrained, and above or below the groundwater table.

5.4.2 Equivalent Fluid Pressures

Lateral earth pressures on retaining walls will depend on a variety of factors, including the type of soils behind the wall, the condition of the soils, and the drainage conditions behind the wall. Recommended lateral earth pressures expressed as equivalent fluid pressures, per foot of wall height, are presented in Table 5.4.2-1 for a wall with a level backfill behind the top of the wall. The equivalent fluid pressure for an undrained condition should be used if a drainage system is not present to remove water trapped in the backfill and behind the wall. Pressures are provided for at-rest and active earth pressure conditions. In order to allow for an active condition, the top of the wall(s) must deflect on the order of 0.4 percent.

TABLE 5.4.2-1 – Equivalent Fluid Pressures				
Backfill Material	At-Rest Equivalent Fluid Pressure (pcf)		Active Equivalent Fluid Pressure (pcf)	
	Drained	Undrained	Drained	Undrained
Excavated on-site clay or clay fill material	100	110	85	100
Select fill or on-site soils meeting material specifications or flowable fill	65	90	50	85
Free draining granular backfill material	50	90	35	80

For the select fill or free draining granular backfill, these values assume that a “full” wedge of the material is present behind the wall. The wedge is defined where the wall backfill limits extend outward at least 2 feet from the base of the wall and then upward on a 1H:2V slope. For narrower backfill widths of granular or select fill soils, the equivalent fluid pressures for the on-site soils should be used.

5.4.3 Additional Lateral Pressures

The location and magnitude of permanent surcharge loads (if present) should be determined, and the additional pressure generated by these loads such as the weight of construction equipment and vehicular loads that are used at the time the structures are being built must also be considered in the design. The effect of this or any other surcharge loading may be accounted for by adding an additional uniform load to the full depth of the side walls equivalent to one-half of the expected vertical surcharge intensity for select backfill materials, or equal to the full vertical surcharge intensity for clay backfill. The equivalent fluid pressures, given here, do not include a safety factor. Analysis of surcharge loads (if any) should be performed on a case-by-case basis. This is not included in the scope of this study. These services can be provided as additional services upon request.

5.5 Wall Backfill Material Requirements

Granular Wall Backfill: All free draining granular wall backfill material should be a crushed stone, sand/gravel mixture, or sand/crushed stone mixture. The material should have less than 3 percent passing the No. 200 sieve and less than 30 percent passing the No. 40 sieve. The minus No. 40

sieve material should be non-plastic. Granular wall backfill should not be water jetted during installation.

Select Fill Behind Walls: All wall select backfill should consist of clayey sand and/or sandy clay material with a plasticity index of 16 or less, with a liquid limit not exceeding 35. The select fill should be placed in maximum 8-inch lifts and compacted to between 95 and 100 percent of Standard Proctor density (ASTM D 698) within a moisture range of plus to minus 3 percentage points of the optimum moisture. Compaction within five feet of the walls should be accomplished using hand compaction equipment and should be compacted between 90 and 95 percent of the Standard Proctor Density.

Flowable Backfill: Item 401, Texas Department of Transportation Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges, 2014 Edition.

On-Site Soil Backfill: For wall backfill areas with site-excavated materials or similar imported materials, all oversized fragments larger than four inches in maximum dimension should be removed from the backfill materials prior to placement. The backfill should be free of all organic and deleterious materials and should be placed in maximum 8-inch compacted lifts at a minimum of 95 percent of Standard Proctor density (ASTM D 698) within a moisture range of plus to minus 3 percentage points of optimum moisture. Compaction within five feet of the walls should be accomplished using hand compaction equipment and should be between 90 and 95 percent of the Standard Proctor Density.

5.6 Wall Backfill Settlement

Settlement of the wall backfill should be anticipated. Piping and conduits through the fill should be designed for potential soil loading due to fill settlement. Floor slabs, sidewalls, and pavements over fills also may settle. Backfill compacted to the density recommended above is anticipated to settle on the order of 0.2 to 0.5 percent of the fill thickness.

5.7 Wall Drainage

The design recommendations presented above assume hydrostatic pressure will not develop behind the retaining wall. In order to achieve the drained condition for lateral earth pressure for low-permeability walls (concrete, masonry, etc.), a vertical drainage blanket or geocomposite drainage member must be installed adjacent to the wall on the backfill side. Drainage could be

provided using a collector pipe or weep holes near the base of the retaining wall. Drains should be properly filtered to minimize the potential for erosion through these drains, and /or the plugging of drain lines. Design or specific recommendations for drainage members is beyond the scope of this study. These services can be provided as an additional service upon request.

6.0 PAVEMENTS / RAMPS

6.1 Pavement Subgrade Preparation

Finished grades near the presently existing grade will consist of slightly to moderately plastic silty clays. These silty clays are subject to loss in support value with the moisture increases which occur beneath pavement sections. They react with hydrated lime, which serves to improve and maintain their support value. Treatment of these soils with hydrated lime is typically performed beneath pavements to improve their subgrade characteristics to support anticipated vehicles and equipment.

In lieu of a lime stabilized subgrade, and since the pavement/ramp areas for this project are relatively small, a flexible base meeting TxDOT Item 247, Type A, Grades 1 or 2 may be utilized. The flexible base should be compacted to at least 95 percent of Standard Proctor Density and at a moisture content between minus 2 and plus 5 percentage points of the optimum moisture value. The option of using a flexible base in lieu of lime stabilizing the subgrade presents a relatively quick, straight forward solution to preparing the materials prior to pavement placement. Alternatively, the recommended concrete pavement thicknesses presented in Section 6.2 may be increased by 2 inches, and placed atop a properly compacted subgrade.

Portions of the boat ramps will be within near saturated soils in the most portions of the year. Care should be taken to dewater this area and cause as minimal disturbance as possible during construction. If not dewatered, soils can act like a “quick” condition, in which soil strength reduces to very small magnitudes when vibratory construction equipment traverses this soil. If disturbance occurs or where soft or loose soil and ground-water conditions occur, the ramp should be constructed upon a minimum 1-foot crushed stone pad with a geotextile “separator” fabric below the stone pad. Otherwise, with minimal disturbance, the ramp may rest atop the flexible base or soils. Erosion protection, such as 6- to 12-inch inch size riprap also should be provided around the structure to limit undermining. The exact size riprap should be based on river flow velocities.

Each construction area should be shaped to allow drainage of surface water during earthwork operations, and surface water should be pumped immediately from each construction area after each rain and a firm subgrade condition maintained. Water should not be allowed to pond in order to prevent percolation and subgrade softening, and lime should be added to the subgrade after removal of all surface vegetation and debris. Sand should be specifically prohibited beneath pavement areas, since these more porous soils can allow water inflow, resulting in heave and strength loss of subgrade soils. After fine grading each area in preparation for paving, the subgrade surface should be lightly moistened, as needed, and recompact to obtain a tight non-yielding subgrade.

Prior to the flexible base or pavement placement, the subgrade should be proof rolled in accordance with the earthwork procedures presented in the following report section. Any loose/soft materials should be removed and replaced with acceptable fill materials.

Surface drainage is critical to the performance of this pavement. Water should be allowed to exit the pavement surface quickly. All pavement construction should be performed in accordance with the following procedures.

6.2 Pavement Sections

The project may include the construction of drives / boat ramps. At the time of this investigation, site paving plans or vehicle traffic studies were not available. Therefore, several rigid pavement sections are presented for a 20-year design life based on our experience with similar facilities for Medium-Duty Facilities, and Medium- to Heavy-Duty Facilities. In general, these areas are defined as follows:

Medium-Duty Facilities are those pavements subjected to a variety of light-duty vehicles to medium-duty vehicles and occasional heavy-duty equipment or truck (1 to 2 per week).

Medium- to Heavy-Duty Facilities are those pavements subjected to a variety of light to heavy-duty vehicles. These pavements include areas subject to significant truck traffic or heavy equipment vehicles.

We recommend that rigid pavements be utilized at this project whenever possible, since they tend to provide better long-term performance when subjected to significant slow moving and turning traffic.

For Portland cement concrete pavement, a minimum thickness of 6 inches is recommended for medium-duty facilities, and 7 inches for medium- to heavy-duty areas.

A California Bearing Ratio or other strength tests were not performed because they were not within the scope of our services on this project. A subgrade modulus of 100 psi was considered appropriate for the near-surface soils. If heavier vehicles are planned, the above cross sections can be confirmed by performing strength tests on the subgrade materials once the traffic characteristics are established. Periodic maintenance of pavement structures normally improves the durability of the overall pavement and enhances its expected life.

The above sections should be considered minimum pavement thicknesses and higher traffic volumes and heavy trucks may require thicker pavement sections. Additional recommendations can be provided after traffic volumes and loads are known. Periodic maintenance should be anticipated for minimum pavement thickness. This maintenance should consist of sealing cracks and timely repair of isolated distressed areas.

6.3 Pavement Material Requirements

Reinforced Portland Cement Concrete: Reinforced Portland cement concrete pavement should consist of Portland cement concrete having a 28-day compressive strength of at least 3,500 psi. The mix should be designed in accordance with the ACI Code 318 using 3 to 6 percent air entrainment. The pavement should be adequately reinforced with temperature steel and all construction joints or expansion/contraction joints should be provided with load transfer dowels. The spacing of the joints will depend primarily on the type of steel used in the pavement. We recommend using No. 3 steel rebar spaced at 18 inches on center in both the longitudinal and transverse direction. Control joints formed by sawing are recommended every 12 to 15 feet in both the longitudinal and transverse direction. The cutting of the joints should be performed as soon as the concrete has “set-up” enough to allow for sawing operations.

Flexible Base: Crushed Stone Flexible Base – Item 247, Type A, Grades 1 or 2, Texas Department of Transportation Standard Specifications for Construction of Maintenance of Highways, Streets, and Bridges, 2014 Edition.

6.4 General Pavement Considerations

The design of the pavement drainage and grading should consider the potential for differential ground movement due to future soil swelling of up to 2¾ inches. In order to minimize rainwater infiltration through the pavement surface, and thereby minimizing future upward movement of the pavement slabs, all cracks and joints in the pavement should be sealed on a routine basis after construction.

7.0 SEISMIC CONSIDERATIONS

Based on the conditions encountered in the borings for the above referenced project, the IBC-2015 site classification is TYPE D for seismic evaluation.

8.0 EARTHWORK

8.1 Site Preparation

The proposed landside construction areas should be stripped of vegetation, roots, old construction debris, and other organic material. It is estimated that the depth of stripping will be on the order of 6 to 8 inches. The actual stripping depth should be based on field observations with particular attention given to old drainage areas, uneven topography, and excessively wet soils. The stripped areas should be observed to determine if additional excavation is required to remove weak or otherwise objectionable materials that would adversely affect the fill placement or other construction activities.

The subgrade should be firm and able to support the construction equipment without displacement. Soft or yielding subgrade should be corrected and made stable before construction proceeds. The subgrade should be proof rolled to detect soft spots, which if exist, should be reworked to provide a firm and otherwise suitable subgrade. Proof rolling should be performed using a heavy pneumatic tired roller, loaded dump truck, or similar piece of equipment. The proof rolling operations should be observed by the project geotechnical engineer or his/her representative. Prior to fill placement, the subgrade should be scarified to a minimum depth of 8 inches, its moisture content adjusted, and recompacted to the moisture and density recommended for fill.

The on-site soils are suitable for use in general site grading. Imported fill material should be clean soil with a Liquid Limit less than 50 and no rock greater than 4 inches in maximum dimension. The fill materials should be free of vegetation and debris.

8.2 Placement and Compaction

Fill material should be placed in loose lifts not exceeding 8 inches in uncompacted thickness. The uncompacted lift thickness should be reduced to 4 inches for structure backfill zones requiring hand-operated power compactors or small self-propelled compactors. The fill material should be uniform with respect to material type and moisture content. Clods and chunks of material should be broken down and the fill material mixed by disking, blading, or plowing, as necessary, so that a material of uniform moisture and density is obtained for each lift. Water required for sprinkling to bring the fill material to the proper moisture content should be applied evenly through each layer.

The fill material should be compacted to a minimum of 95 percent of the maximum dry density determined by the Standard Proctor test, ASTM D 698. In conjunction with the compacting operation, the fill material should be brought to the proper moisture content. The moisture content for general earth fill should range from 2 percentage points below optimum to 5 percentage points above optimum (-2 to +5). These ranges of moisture contents are given as maximum recommended ranges. For some soils and under some conditions, the contractor may have to maintain a more narrow range of moisture content (within the recommended range) in order to consistently achieve the recommended density.

Field density tests should be taken as each lift of fill material is placed. As a guide, one field density test per lift for each 5,000 square feet of compacted area is recommended. For small areas or critical areas the frequency of testing may need to be increased to one test per 2,500 square feet. A minimum of 2 tests per lift should be required. The earthwork operations should be observed and tested on a continuing basis by an experienced geotechnician working in conjunction with the project geotechnical engineer.

Each lift should be compacted, tested, and approved before another lift is added. The purpose of the field density tests is to provide some indication that uniform and adequate compaction is being obtained. The actual quality of the fill, as compacted, should be the responsibility of the contractor and satisfactory results from the tests should not be considered as a guarantee of the quality of the contractor's filling operations.

8.3 Excavation

The side slopes of excavations through the overburden soils should be made in such a manner to provide for their stability during construction. Existing structures, pipelines or other facilities, which

are constructed prior to or during the currently proposed construction and which require excavation, should be protected from loss of end bearing or lateral support.

Temporary construction slopes and/or permanent embankment slopes should be protected from surface runoff water. Site grading should be designed to allow drainage at planned areas where erosion protection is provided, instead of allowing surface water to flow down unprotected slopes.

Trench safety recommendations are beyond the scope of this report. The contractor must comply with all applicable safety regulations concerning trench safety and excavations including, but not limited to, OSHA regulations.

8.4 Acceptance of Imported Fill

Any soil imported from off-site sources should be tested for compliance with the recommendations for the particular application and approved by the project geotechnical engineer prior to the materials being used. The owner should also require the contractor to obtain a written, notarized certification from the landowner of each proposed off-site soil borrow source stating that to the best of the landowner's knowledge and belief there has never been contamination of the borrow source site with hazardous or toxic materials. The certification should be furnished to the owner prior to proceeding to furnish soils to the site. Soil materials derived from the excavation of underground petroleum storage tanks should not be used as fill on this project.

8.5 Soil Corrosion Potential

Specific testing for soil corrosion potential was not included in the scope of this study. However, based upon past experience on other projects in the vicinity, the soils at this site may be corrosive. Standard construction practices for protecting metal pipe and similar facilities in contact with these soils should be used.

8.6 Erosion and Sediment Control

All disturbed areas should be protected from erosion and sedimentation during construction, and all permanent slopes and other areas subject to erosion or sedimentation should be provided with permanent erosion and sediment control facilities. All applicable ordinances and codes regarding erosion and sediment control should be followed.

9.0 CONSTRUCTION OBSERVATIONS

In any geotechnical investigation, the design recommendations are based on a limited amount of information about the subsurface conditions. In the analysis, the geotechnical engineer must assume the subsurface conditions are similar to the conditions encountered in the borings. However, quite often during construction anomalies in the subsurface conditions are revealed. Therefore, it is recommended that CMJ Engineering, Inc. be retained to observe earthwork and perform materials evaluation during the construction phase of the project. This enables the geotechnical engineer to stay abreast of the project and to be readily available to evaluate unanticipated conditions, to conduct additional tests if required and, when necessary, to recommend alternative solutions to unanticipated conditions. Until these construction phase services are performed by the project geotechnical engineer, the recommendations contained in this report on such items as final foundation bearing elevations, proper soil moisture condition, and other such subsurface related recommendations should be considered as preliminary.

It is proposed that construction phase observation and materials testing commence by the project geotechnical engineer at the outset of the project. Experience has shown that the most suitable method for procuring these services is for the owner or the owner's design engineers to contract directly with the project geotechnical engineer. This results in a clear, direct line of communication between the owner and the owner's design engineers and the geotechnical engineer.

10.0 REPORT CLOSURE

The locations and elevations of the borings should be considered accurate only to the degree implied by the methods used in their determination. The boring logs shown in this report contain information related to the types of soil encountered at specific locations and times and show lines delineating the interface between these materials. The logs also contain our field representative's interpretation of conditions that are believed to exist in those depth intervals between the actual samples taken. Therefore, these boring logs contain both factual and interpretive information. Laboratory soil classification tests were also performed on samples from selected depths in the borings. The results of these tests, along with visual-manual procedures were used to generally classify each stratum. Therefore, it should be understood that the classification data on the logs of borings represent visual estimates of classifications for those portions of each stratum on which the full range of laboratory soil classification tests were not performed. It is not implied that these logs are representative of subsurface conditions at other locations and times.

With regard to ground-water conditions, this report presents data on ground-water levels as they were observed during the course of the field work. In particular, water level readings have been made in the borings at the times and under conditions stated in the text of the report and on the boring logs. It should be noted that fluctuations in the level of the ground-water table can occur with passage of time due to variations in rainfall, temperature and other factors. Also, this report does not include quantitative information on rates of flow of ground water into excavations, on pumping capacities necessary to dewater the excavations, or on methods of dewatering excavations. Unanticipated soil conditions at a construction site are commonly encountered and cannot be fully predicted by mere soil samples, test borings or test pits. Such unexpected conditions frequently require that additional expenditures be made by the owner to attain a properly designed and constructed project. Therefore, provision for some contingency fund is recommended to accommodate such potential extra cost.

The analyses, conclusions and recommendations contained in this report are based on site conditions as they existed at the time of our field investigation and further on the assumption that the exploratory borings are representative of the subsurface conditions throughout the site; that is, the subsurface conditions everywhere are not significantly different from those disclosed by the borings at the time they were completed. If, during construction, different subsurface conditions from those encountered in our borings are observed, or appear to be present in excavations, we must be advised promptly so that we can review these conditions and reconsider our recommendations where necessary. If there is a substantial lapse of time between submission of this report and the start of the work at the site, if conditions have changed due either to natural causes or to construction operations at or adjacent to the site, or if structure locations, structural loads or finish grades are changed, we urge that we be promptly informed and retained to review our report to determine the applicability of the conclusions and recommendations, considering the changed conditions and/or time lapse.

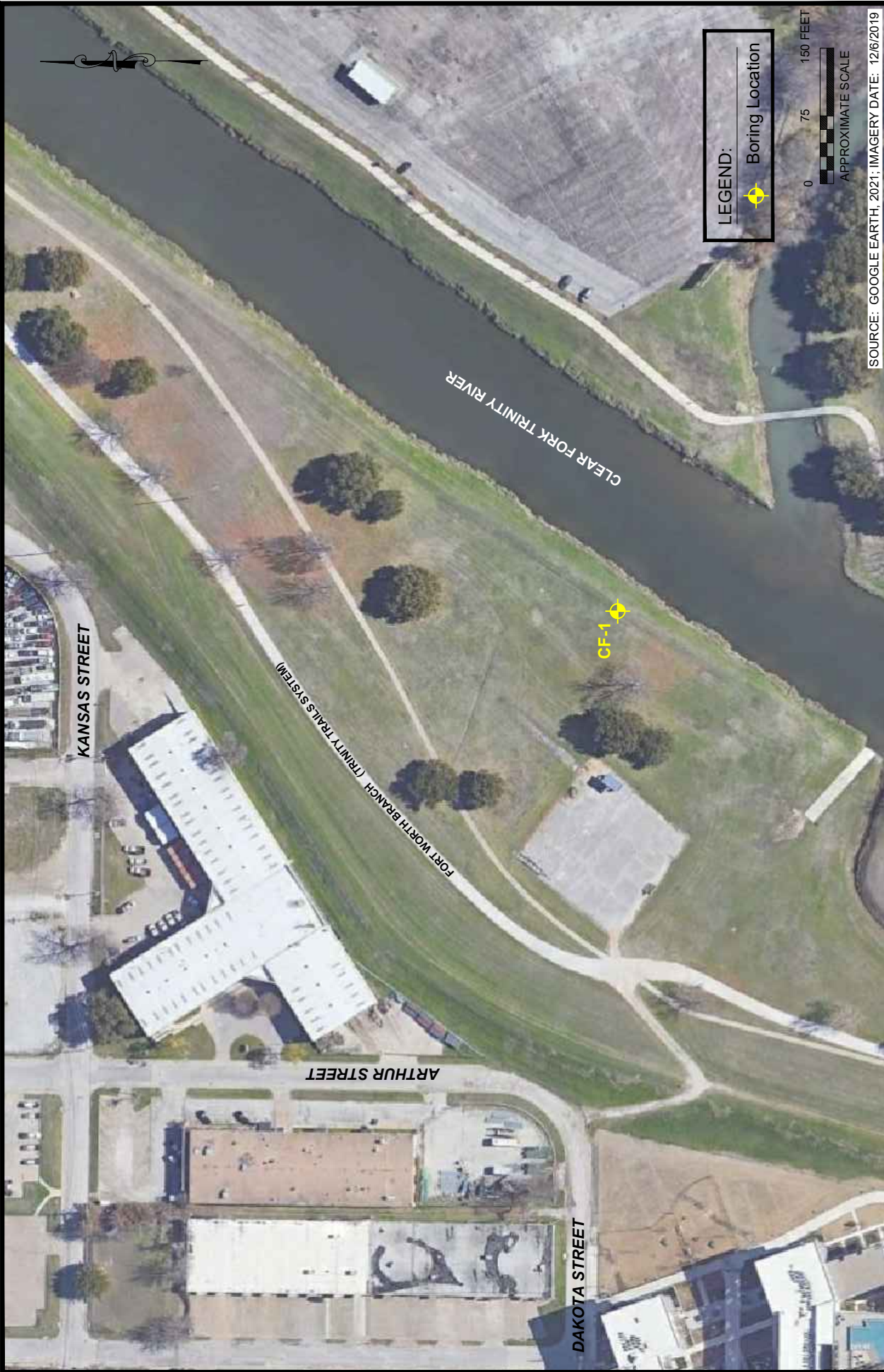
Further, it is urged that CMJ Engineering, Inc. be retained to review those portions of the plans and specifications for this particular project that pertain to earthwork and foundations as a means to determine whether the plans and specifications are consistent with the recommendations contained in this report. In addition, we are available to observe construction, particularly the compaction of structural fill, or backfill and the construction of foundations as recommended in the report, and such other field observations as might be necessary.

The scope of our services did not include any environmental assessment or investigation for the presence or absence of wetlands or hazardous or toxic materials in the soil, surface water, ground water or air, on or below or around the site.

This report has been prepared for use in developing an overall design concept. Paragraphs, statements, test results, boring logs, diagrams, etc. should not be taken out of context, nor utilized without a knowledge and awareness of their intent within the overall concept of this report. The reproduction of this report, or any part thereof, supplied to persons other than the owner, should indicate that this study was made for design purposes only and that verification of the subsurface conditions for purposes of determining difficulty of excavation, trafficability, etc. are responsibilities of the contractor.

This report has been prepared for the exclusive use of Enercon for specific application to design of this project. The only warranty made by us in connection with the services provided is that we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of our profession practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended.

* * * *



CMJ ENGINEERING, INC.
 CMJ PROJECT No. 2878-2I-01

PLAN OF BORINGS
 PROPOSED TRASH WHEELS
 CLEAR FORK AND WEST FORK TRINITY RIVER
 FORT WORTH, TEXAS

PLATE
 A.1A

Major Divisions		Grp. Sym.	Typical Names	Laboratory Classification Criteria			
Coarse-grained soils (more than half of the material is larger than No. 200 sieve size)	Gravels (More than half of coarse fraction is larger than No. 4 sieve size)	Clean gravels (Little or no fines)	GW	Well-graded gravels, gravel-sand mixtures, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 4: $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		
		GP	Poorly graded gravels, gravel-sand mixtures, little or no fines	Not meeting all gradation requirements for GW			
		Gravels with fines (Appreciable amount of fines)	GM	Silty gravels, gravel-sand-silt mixtures	Liquid and Plastic limits below "A" line or P.I. greater than 4	Liquid and plastic limits plotting in hatched zone between 4 and 7 are borderline cases requiring use of dual symbols	
			GC	Clayey gravels, gravel-sand-clay mixtures	Liquid and Plastic limits above "A" line with P.I. greater than 7		
	Sands (More than half of coarse fraction is smaller than No. 4 sieve size)	Clean sands (Little or no fines)	SW	Well-graded sands, gravelly sands, little or no fines	$C_u = \frac{D_{60}}{D_{10}}$ greater than 6: $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ between 1 and 3		
			SP	Poorly graded sands; gravelly sands, little or no fines		Not meeting all gradation requirements for SW	
		Sands with fines (Appreciable amount of fines)	SM	Silty sands, sand-silt mixtures	Liquid and Plastic limits below "A" line or P.I. less than 4	Liquid and plastic limits plotting between 4 and 7 are borderline cases requiring use of dual symbols	
			SC	Clayey sands, sand-clay mixtures	Liquid and Plastic limits above "A" line with P.I. greater than 7		
		Determine percentages of sand and gravel from grain size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows: Less than 5 percent.....GW, GP, SW, SP More than 12 percent.....GM, GC, SM, SC 5 to 12 percent..... <i>Borderline</i> cases requiring dual symbols					
		Fine-grained soils (More than half of material is smaller than No. 200 sieve)	Sils and clays (Liquid limit less than 50)	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands, or clayey silts with slight plasticity		
CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, and lean clays						
OL	Organic silts and organic silty clays of low plasticity						
Sils and clays (Liquid limit greater than 50)	MH		Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts				
	CH		Inorganic clays of high plasticity, fat clays				
	OH		Organic clays of medium to high plasticity, organic silts				
Highly Organic soils	Pt		Peat and other highly organic soils				

SOIL OR ROCK TYPES											
	GRAVEL		LEAN CLAY		LIMESTONE						
	SAND		SANDY		SHALE						
	SILT		SILTY		SANDSTONE						
	CLAYEY		HIGHLY PLASTIC CLAY		CONGLOMERATE						

TERMS DESCRIBING CONSISTENCY, CONDITION, AND STRUCTURE OF SOIL

Fine Grained Soils (More than 50% Passing No. 200 Sieve)

Descriptive Item	Penetrometer Reading, (tsf)
Soft	0.0 to 1.0
Firm	1.0 to 1.5
Stiff	1.5 to 3.0
Very Stiff	3.0 to 4.5
Hard	4.5+

Coarse Grained Soils (More than 50% Retained on No. 200 Sieve)

Penetration Resistance (blows/foot)	Descriptive Item	Relative Density
0 to 4	Very Loose	0 to 20%
4 to 10	Loose	20 to 40%
10 to 30	Medium Dense	40 to 70%
30 to 50	Dense	70 to 90%
Over 50	Very Dense	90 to 100%

Soil Structure

Calcareous	Contains appreciable deposits of calcium carbonate; generally nodular
Slickensided	Having inclined planes of weakness that are slick and glossy in appearance
Laminated	Composed of thin layers of varying color or texture
Fissured	Containing cracks, sometimes filled with fine sand or silt
Interbedded	Composed of alternate layers of different soil types, usually in approximately equal proportions

TERMS DESCRIBING PHYSICAL PROPERTIES OF ROCK

Hardness and Degree of Cementation

Very Soft or Plastic	Can be remolded in hand; corresponds in consistency up to very stiff in soils
Soft	Can be scratched with fingernail
Moderately Hard	Can be scratched easily with knife; cannot be scratched with fingernail
Hard	Difficult to scratch with knife
Very Hard	Cannot be scratched with knife
Poorly Cemented or Friable	Easily crumbled
Cemented	Bound together by chemically precipitated material; Quartz, calcite, dolomite, siderite, and iron oxide are common cementing materials.

Degree of Weathering

Unweathered	Rock in its natural state before being exposed to atmospheric agents
Slightly Weathered	Noted predominantly by color change with no disintegrated zones
Weathered	Complete color change with zones of slightly decomposed rock
Extremely Weathered	Complete color change with consistency, texture, and general appearance approaching soil

Project No. 2878-21-01	Boring No. CF-1	Project Proposed Trash Wheels Clear Fork Trinity River - Fort Worth, Texas
Location See Plate A.1		Water Observations Seepage at 22' during drilling; wet rotary drilling below 40'
Completion Depth 50.0'	Completion Date 6-23-21	

Depth, Ft.	Symbol	Samples	Surface Elevation	Type	REC %	RQD %	Blows/Ft. or Pen Reading, T.S.F.	Passing No 200 Sieve, %	Liquid Limit, %	Plastic Limit, %	Plasticity Index	Moisture Content, %	Unit Dry Wt. Lbs./Cu. Ft.	Unconfined Compression Pounds/Sq. Ft.
			CME-75, w/ HSA											
Stratum Description														
				SILTY CLAY , brown, w/ calcareous nodules and occasional ironstone nodules, stiff to hard			2.75		33	17	16	11		
							4.5+					16		
5				CLAY / SILTY CLAY , dark brown, w/ calcareous nodules and occasional ironstone nodules, very stiff			4.25		50	17	33	18		
				-firm below 6'			1.25					21		
				SILTY CLAY / SANDY SILTY CLAY , dark brown and tan, w/ calcareous nodules and occasional ironstone nodules, soft to firm			0.25					23	109	840
10														
15							9	76	42	16	26	21		
20							1.0					23	106	1570
25				CLAY / SILTY SANDY CLAY , gray, w/ gravel and calcareous nodules, firm to stiff			1.75					21	108	2100
30							6	78	51	16	35	24		
35				CLAYEY SAND / SILTY CLAYEY SAND , tan and gray, w/ gravel, ironstone nodules, iron stains, and calcareous nodules, dense			38	23	29	15	14	10		
40				LIMESTONE , tan, weathered, moderately hard			50/2.75"					13		
				LIMESTONE , gray, very hard, w/ moderately hard shale seams and layers	87	7	100/0.5"							
45					83	60	100/0.5"							
												7	142	41660
50							100/0.5"							

LOG OF BORING 2878-21-01.GPJ CMJ.GDT 7/16/21

ATTACHMENT D

Diversity and Inclusion - Business Equity Division (DVIN-BE)
M/WBE Participation Documentation



City of Fort Worth Business Equity (M/WBE) Specifications Prime Contractor Waiver Form

OFFEROR COMPANY NAME:		Check applicable block to describe Prime
		<input type="checkbox"/> M/WBE <input type="checkbox"/> NON-M/WBE
PROJECT NAME:		BID DATE
City's MBE Project Goal:	Offeror's MBE Project Commitment:	PROJECT NUMBER
%	%	

If both answers to this form are **YES**, do not complete ATTACHMENT 1C (Good Faith Effort Form). All questions on this form must be completed and a detailed explanation provided, if applicable. If the answer to either question is **NO**, then you must complete ATTACHMENT 1C. This form is only applicable if **both** answers are yes.

Failure to complete this form in its entirety and be received by the Purchasing Division no later than 2:00 p.m., on the second City business day after bid opening, exclusive of the bid opening date, will result in the bid being considered non-responsive to bid specifications.

Will you perform this entire contract without subcontractors?	<input type="checkbox"/> YES
If yes, please provide a detailed explanation that proves based on the size and scope of this project, this is your normal business practice and provide an operational profile of your business.	<input type="checkbox"/> NO
Will you perform this entire contract without suppliers?	<input type="checkbox"/> YES
If yes, please provide a detailed explanation that proves based on the size and scope of this project, this is your normal business practice and provide an inventory profile of your business.	<input type="checkbox"/> NO

The Offeror further agrees to provide, directly to the City upon request, complete and accurate information regarding actual work performed by all subcontractors, including certified M/WBE(s) on this contract, the payment thereof and any proposed changes to the original M/WBE(s) arrangements submitted with this bid. The Offeror also agrees to allow an audit and/or examination of any books, records and files held by their company that will substantiate the actual work performed by the M/WBEs on this contract, by an authorized officer or employee of the City. Any intentional and/or knowing misrepresentation of facts will be grounds for terminating the contract or debarment from City work for a period of not less than three (3) years and for initiating action under Federal, State or Local laws concerning false statements. Any failure to comply with this ordinance creates a material breach of contract and may result in a determination of an irresponsible Offeror and barred from participating in City work for a period of time not less than one (1) year.

Authorized Signature

Printed Signature

Title

Contact Name (if different)

Company Name

Phone Number Fax Number

Address

Email Address

City/State/Zip

Date



CITY OF FORT WORTH
M/WBE Joint Venture Eligibility Form

All questions must be answered; use "N/A" if not applicable.

Name of City project: _____
A joint venture form must be completed on each project
RFP/Bid/Purchasing Number: _____

1. Joint venture information:

Joint Venture Name:			
Joint Venture Address: <i>(If applicable)</i>			
Telephone:	Facsimile:	E-mail address:	
Cellular:			
Identify the firms that comprise the joint venture: <i>Please attach extra sheets if additional space is required to provide detailed explanations of work to be performed by each firm comprising the joint venture</i>			
M/WBE firm name:		Non-M/WBE firm name:	
Business Address:		Business Address:	
City, State, Zip:		City, State, Zip:	
Telephone	Facsimile	E-mail	Facsimile
Cellular			
Certification Status:		E-mail address	
Name of Certifying Agency:			

2. Scope of work performed by the Joint Venture:

Describe the scope of work of the M/WBE:	Describe the scope of work of the non-M/WBE:

3. What is the percentage of M/WBE participation on this joint venture that you wish to be counted toward meeting the project goal? _____

4. Attach a copy of the joint venture agreement.

5. List components of ownership of joint venture: *(Do not complete if this information is described in joint venture agreement)*

Profit and loss sharing:	
Capital contributions, including equipment:	
Other applicable ownership interests:	

6. Identify by name, race, sex and firm those individuals (with titles) who are responsible for the day-to-day management and decision making of the joint venture:

Financial decisions (to include Account Payable and Receivable):	
Management decisions:	
a. Estimating	
b. Marketing and Sales	
c. Hiring and Firing of management personnel	
d. Purchasing of major equipment and/or supplies	
Supervision of field operations	

The City's Business Equity Division will review your joint venture submission and will have final approval of the M/WBE percentage applied toward the goal for the project listed on this form.

NOTE:

From and after the date of project award, if any of the participants, the individually defined scopes of work or the dollar amounts/percentages change from the originally approved information, then the participants must inform the City's Business Equity Division immediately for approval. Any unjustified change or deletion shall be a material breach of contract and may result in debarment in accord with the procedures outlined in the City's Business Equity Ordinance [25165-10-2021](#) .

AFFIDAVIT

The undersigned affirms that the foregoing statements are true and correct and include all material information necessary to identify and explain the terms and operation of the joint venture. Furthermore, the undersigned shall agree to provide to the joint venture the stated scope of work, decision-making responsibilities and payments herein.

The City also reserves the right to request any additional information deemed necessary to determine if the joint venture is eligible. Failure to cooperate and/or provide requested information within the time specified is grounds for termination of the eligibility process.

The undersigned agree to permit audits, interviews with owners and examination of the books, records and files of the joint venture by any authorized representatives of the City of Fort Worth. Failure to comply with this provision shall result in the termination of any contract, which may be awarded under the provisions of this joint venture's eligibility and may initiate action under Federal, State and/or Local laws/ordinances concerning false statements or willful misrepresentation of facts.

Name of MBE firm	Name of non-MBE firm
Printed Name of Owner	Printed Name of Owner
Signature of Owner	Signature of Owner
Printed Name of Owner	Printed Name of Owner
Signature of Owner	Signature of Owner
Title	Title
Date	Date

Notarization

State of _____ County of _____

On this _____ day of _____, 20____, before me appeared

_____ and _____

to me personally known and who, being duly sworn, did execute the foregoing affidavit and did state that they were properly authorized to execute this affidavit and did so as their free act and deed.

Notary Public _____
Print Name

Notary Public _____
Signature

Commission Expires _____

(seal)

2.) Obtain a current (not more than two (2) months old from the bid open date) list of Business Equity subcontractors and/or suppliers from the City's Business Equity Division.

Yes

Date of Listing _____

No

3.) Did you solicit bids from Business Equity firms, within the subcontracting and/or supplier areas previously listed, at least ten calendar days prior to bid opening by telephone, exclusive of the day the bids are opened?

Yes (If yes, attach list to include name of Business Equity firm, person contacted, phone number and date and time of contact.)

No

4.) Did you solicit bids from Business Equity firms, within the subcontracting and/or supplier areas previously listed, at least ten calendar days prior to bid opening by fax, exclusive of the day the bids are opened?

Yes (If yes, attach list to include name of Business Equity firm, fax number and date and time of contact. In addition, if the fax is returned as undeliverable, then that "undeliverable confirmation" received must be printed directly from the facsimile for proper documentation. Failure to submit confirmation and/or "undeliverable confirmation" documentation may render the

No GFE non-responsive.)

5.) Did you solicit bids from Business Equity firms, within the subcontracting and/or supplier areas previously listed, at least ten calendar days prior to bid opening by email, exclusive of the day the bids are opened?

Yes (If yes, attach email confirmation to include name of Business Equity firm, date and time. In addition, if an email is returned as undeliverable, then that "undeliverable message" receipt must be printed directly from the email system for proper documentation. Failure to submit confirmation and/or "undeliverable message"

No documentation may render the GFE non-responsive.)

NOTE: The three methods identified above are acceptable for soliciting bids, and each selected method must be applied to the applicable contract. The Prime/Offeror must document that either at least two attempts were made using two of the three methods or that at least one successful contact was made using one of the three methods in order to be deemed responsive to the Good Faith Effort requirement.

NOTE: The Prime/Offeror must contact the entire Business Equity list specific to each subcontracting and supplier opportunity to be in compliance with questions 3 thru 5.

6.) Did you provide plans and specifications to potential Business Equity firms?

Yes

No

7.) Did you provide the information regarding the location of plans and specifications in order to assist the Business Equity firms?

Yes

No

8.) Did you prepare a quotation for the Business Equity firms to bid on goods/services specific to their skill set?

- Yes (If yes, attach all copies of quotations.)
 No

9.) Was the contact information on any of the listings not valid?

- Yes (If yes, attach the information that was not valid in order for the Business Equity Division to address the corrections needed.)
 No

10.) Submit documentation if Business Equity firms quotes were rejected. The documentation submitted should be in the firms forms of an affidavit, include a detailed explanation of why the Business Equity firms was rejected and any supporting documentation the Prime/Offeror wishes to be considered by the City. In the event of a bona fide dispute concerning quotes, the Prime/Offeror will provide for confidential in-camera access to an inspection of any relevant documentation by City personnel.

(Please use additional sheets, if necessary, and attach.)

Company Name	Telephone	Contact Person	Scope of Work	Reason for Rejection

ADDITIONAL INFORMATION:

Please provide additional information you feel will further explain your good and honest efforts to obtain Business Equity firm participation on this project.

The Prime/Offeror further agrees to provide, directly to the City upon request, complete and accurate information regarding actual work performed on this contract, the payment thereof and any proposed changes to the original arrangements submitted with this bid. The Prime/Offeror also agrees to allow an audit and/or examination of any books, records and files held by their company that will substantiate the actual work performed on this contract, by an authorized officer or employee of the City.

A Prime/Offeror who intentionally and/or knowingly misrepresents material facts shall be Debarred for a period of time of not less than three (3) years.

The undersigned certifies that the information provided and the Business Equity firms listed was/were contacted in good faith. It is understood that any Business Equity firms listed in Attachment 1C will be contacted and the reasons for not using them will be verified by the City's Business Equity Division.

Authorized Signature

Printed Signature

Title

Contact Name and Title (if different)

Company Name

Phone Number

Address

Email Address

City/State/Zip

Date

Business Equity Division
Email: DVIN_BEOffice@fortworthtexas.gov
Phone: (817) 392-2674



City of Fort Worth Business Equity Division

INSTRUCTIONS TO BIDDERS ABOUT THE BUSINESS EQUITY GOAL

Bid number: ENV 24-01 Business Equity Goal: 10 %

It is the policy of the City of Fort Worth to ensure the full and equitable utilization of Business Equity Firms when appropriate, in the procurement of all goods and services. When a Business Equity Goal is established for a bid, it means that the City of Fort Worth believes that there are Business Equity Firms available that can provide goods or services requested by the bid.

The Business Equity Goal for Bid number **ENV 24-01** is **10** %. This means that the City believes that there are available Business Equity Firms that can provide goods or services required by this bid and therefore, **10** % of the Bidder's awarded amount must be spent with a Business Equity Firm. All requirements and regulations stated in the City's current [Business Equity Ordinance #25165-10-2021](#) apply to this bid. Definitions are at the end of this document.

Because a Business Equity Goal has been established for this bid, in order for your bid to be considered, a Bidder **must satisfy one (1) of the conditions below**.

A. Commit to Meet or Exceed the Business Equity Goal

Hire Business Equity Firm(s) to provide goods or services and spend at least the goal amount with the Business Equity Firm(s).

Step 1: Obtain a listing of Business Equity Firms by completing the "Request for Listing of Certified Firms Form" located at the City of Fort Worth's [Business Equity Division](#) website.

Step 2: Request bids from Business Equity Firms to provide goods or services at least 10 calendar days before bid opening.

Step 3: Submit the following two (2) forms:
a. Utilization Plan
b. Letter(s) of Intent

B. Prove a Good Faith Effort

Show attempt to hire Business Equity Firms to meet or exceed the goal, but was unsuccessful.

This can occur in two (2) ways:

1) Bidder proposes a smaller Goal

Step 1: Obtain a listing of Business Equity Firms by completing the "Request for Listing of Certified Firms Form" located at the City of Fort Worth's [Business Equity Division](#) website.

Step 2: Request bids from Business Equity Firms to provide goods or services at least 10 calendar days before bid opening.

Step 3: Submit the following three (3) forms:
a. Utilization Plan
b. Letter(s) of Intent
c. Good Faith Effort

2) Bidder proposes a 0% Goal

Step 1: Obtain a listing of Business Equity Firms by completing the "Request for Listing of Certified Firms Form" located at the City of Fort Worth's [Business Equity Division](#) website.

Step 2: Request bids from Business Equity Firms to provide goods or services at least 10 calendar days before bid opening.

Step 3: If unsuccessful, submit Good Faith Effort Form. Please see [Ordinance §20-370 \(g\)](#) page for requirements of an acceptable Good Faith Effort.

C. Prove that the Bidder Can Perform the Service and Provide all Materials on the Project as the Prime Contractor

Bidder must show that the Bidder is providing all of the goods and services through their own company and that there are no goods or services provided by a third party or an affiliate. Bidder will not purchase any supplies or inventory from a third party.

Step 1: Must submit Prime Contract Waiver Form

D. Create a Joint Venture with a Business Equity Firm

At least one or both of the firms must be a Business Equity Firm

Step 1: Must submit Joint Venture Form

DEADLINE TO SUBMIT REQUIRED DOCUMENTS AND FORMS

Bidders must submit sealed bids to be opened at the date, time, and place stated in the solicitation for the public opening of bids. **Faxed copies will not be accepted.**

FREQUENTLY ASKED QUESTIONS

1. If I am Business Equity Firm, can I count my performance of the bid?

Answer: A Business Equity Prime Contractor can count its self-performance towards meeting the Business Equity Goal for the assigned North American Industry Classification System (NAICS) commodity codes on its Minority Business Enterprise (MBE) or Women Business Enterprise (WBE) certification.

2. What if I am a Business Equity Firm, but I am unable to self perform all work or provide all of the goods under the bid, can I count my performance under the Bid?

Answer: If the Business Equity Prime cannot self-perform all of the work, it will be accountable for subcontracting with certified firms to meet the overall goal. Business Equity Firms that qualify under the "Significant Business Presence" definition may count in the Program upon approval of DVIN-BE.

3. This bid does not have a set amount that the City will purchase from the Awarded Bidder, how do I complete the form?

Answers:

a. For a low bid procurement, the lowest bidder shall submit a Utilization Plan no later than 2:00 PM on the third business day after bids are opened detailing all Subcontractors the Contractor intends to utilize in its performance of a Contract. Contractors that are Business Equity Firms may count their self-performed services towards meeting a Business Equity Goal.

b. For a Best Value procurement, all bidders who wish to be considered for evaluation scoring shall submit a Utilization Plan by 2:00 PM on the third business day after the bids are opened detailing all Subcontractors the Contractor intends to utilize in its performance of a Contract. Contractors that are Business Equity Firms may count their self-performed services towards meeting a Business Equity Goal.

c. Non-compliance. If the lowest bidder for a low bid procurement or any bidder for a Best Value procurement does not timely submit its Utilization Plan with the required documents, that bidder will be deemed Non-Responsive. For a low bid procurement, the City will notify the next lowest bidder who shall then submit a Utilization Plan with required documents no later than 2:00 PM on the third business day after the bidder receives notification. This process will be followed until a bidder submitting the required documents is selected.

DEFINITIONS

Business Equity Firm means an Independent Firm that is a Certified minority- and/or women-owned business enterprise (M/WBE) with a Significant Business Presence in the City's Marketplace.

Business Equity Goal means a calculation prepared by the DVIN-BE that includes all the following factors: the detailed cost estimate of the work to be performed, or goods purchased; the 6-county Marketplace; the availability of Business Equity Firms and non-Business Equity Firms in the Marketplace determined on a Contract-by-Contract basis; and the subcontracting/supplier opportunities of each project.

Certified means those firms identified by the North American Industry Classification System (NAICS) that have been determined to be a bona fide MBE or WBE by the North Central Texas Regional Certification Agency (NCTRCA), the Dallas/Fort Worth Minority Supplier Development Council (DFW /MSDC), Women's Business Council-SW (WBCS), Texas Department of Transportation (TxDOT) or another certifying agency that the DVIN-BE may deem appropriate and accepted by the City of Fort Worth.

DVIN-BE means the City's Department of Diversity and Inclusion – Business Equity Division

Good Faith Efforts means the actions undertaken by a Contractor and approved by DVIN-BE as described in the Business Equity Ordinance §20-370 (g).

Joint Venture means a business entity formed by two or more independent Persons for the purpose of pursuing a common objective, such as a prime contract. The resulting business entity has additional resources and capacity, enhancing its ability to compete for larger awards. A joint venture is generally characterized by shared ownership, shared returns and risks, and shared governance. In a joint venture, the prime managing partner holds 51 % or more interest in the business. Partner(s) hold less than 51 % interest but in most cases, not less than 20%.

Marketplace means the geographic area as defined by the City's most current Disparity Study (i.e., Tarrant, Dallas, Denton, Johnson, Parker and Wise counties).

Responsive means that a Person is compliant with the requirements of the Business Equity Ordinance.

Significant Business Presence means a Person (1) which has its principal place of business located inside the Marketplace; (2) which has its principal place of business located outside the Marketplace but has been verified to be in existence for a minimum of 24 months and from which at least 20% of the business's workforce is based in the Marketplace; or (3) which has cumulative business receipts greater than \$1,000,000 for work done in the Marketplace since January 1, 2013.

Utilization Plan means the list of Business Equity Firms that a Contractor commits will be utilized to meet the Business Equity Goal for a specific project, the scopes of the work and the dollar values or the percentages of the work to be performed.

VIOLATIONS AND SANCTIONS

1. Failure to comply with the City's Business Equity Ordinance will result in the bid being considered "Non-Responsive."
2. Failure to submit the required Business Equity forms and documentation will result in the bid being considered non-responsive and a "written warning" letter that may impact the Offeror's evaluation scoring on future City bid opportunities for up to 12 months, refer to [Ordinance §20-373 on VIOLATIONS AND SANCTIONS](#) for continued offenses or failures to comply.

If you have any questions, contact Department of Diversity & Inclusion, Business Equity Division

Email: DVIN_BE@fortworthtexas.gov | Phone: 817-392-2674



PROJECT # _____ BID # _____
 (If Applicable Please Check One)
 Amendment Change Order

Business Equity Division LETTER OF INTENT

A. Business Equity Sub-Contractor/Consultant Information:

A certified Business Equity firm is owned by a Minority or Woman Business Enterprise (M/WBE)

[Pursuant to the City of Fort Worth's Business Equity Ordinance, certified Business Equity firms participating under the Ordinance must be certified prior to recommendation of award in order to be counted towards the Business Equity contract goal. Certifying agencies acceptable by the City: North Central Texas Regional Certification Agency (NCTRCA), Dallas/Fort Worth Minority Supplier Development Council, Inc. (DFW MSDC), Women's Business Council - Southwest (WBCS), or the Texas Department of Transportation (TXDOT). **Note:** For Federally-Funded projects the firm must be certified as a Disadvantaged Business Enterprise (DBE) by the NCTRCA and/or TXDOT only.] **All Fields are Required - Do not leave blank.**

1. Name of Project: _____
2. Name of Offeror/Prime Contractor: _____
3. Name of Business Equity Firm: _____
 Address: _____ Firm Contact Name/Phone: _____
4. The undersigned is prepared to perform the following described work and/or supply the material listed in connection with the above project (where applicable specify "supply" or "install" or both):

NAICS Code: _____ In the amount of \$ _____

(Owner/ Authorized Agent) Type or Print Name	(Name of Certified Business Equity Firm)
(Signature of Owner /Authorized Agent of Certified Business Equity Firm)	(Date)
(Email Address)	(Phone Number)

B. Affidavit of Offeror/Prime

I HEREBY DECLARE AND AFFIRM that _____ am the duly authorized representative of
 (Owner/Authorized Agent)

_____ and that I have personally reviewed the material and facts
 (Name of Offeror/Prime)

set forth in this Letter of Intent. To the best of my knowledge, information and belief, the facts in this form are true, and no material facts have been omitted.

Pursuant to the City of Fort Worth's Business Equity Ordinance, any person/entity that makes a false or fraudulent statement in connection with participation of a certified firm in any City of Fort Worth contract may be referred for debarment procedures under the City of Fort Worth's Business Equity Ordinance.

I do solemnly swear or affirm that the signatures contained herein and the information provided by the Offeror/Prime are true and correct, and that I am authorized on behalf of the Offeror/Prime to make the affidavit.

(Owner/ Authorized Agent) Type or Print Name	(Name of Offeror/Prime)
(Signature of Owner/Authorized Agent)	(Date)
(Email Address)	(Phone Number)

Effective 01/01/2021



City of Fort Worth Business Equity Utilization Form

Disadvantaged Business Enterprise Utilization Form (Applicable if Federally-Funded)

PRIME/OFFEROR/OWNER COMPANY NAME:			
PROJECT NAME:			
PROJECT NUMBER:	BID DATE:	City's Business Equity Goal: <input type="checkbox"/> (Check if addressing DBE Goal) %	Offeror's Business Equity (or DBE) Commitment: %
Check all applicable boxes to describe Prime/Offeror/Owner's Classification:			
<input type="checkbox"/> Not Certified	<input type="checkbox"/> MBE	<input type="checkbox"/> WBE	<input type="checkbox"/> DBE
<input type="checkbox"/> HUB	<input type="checkbox"/> VOSB	<input type="checkbox"/> Section 3	
Certifying Agency:			
<input type="checkbox"/> NCTRCA	<input type="checkbox"/> D/FW MSDC	<input type="checkbox"/> TX DOT	<input type="checkbox"/> WBCS
<input type="checkbox"/> Other:			
Ethnicity:			
<input type="checkbox"/> African American	<input type="checkbox"/> Hispanic	<input type="checkbox"/> Caucasian	<input type="checkbox"/> Asian
<input type="checkbox"/> Native American	Gender:		
	<input type="checkbox"/> Male	<input type="checkbox"/> Female	<input type="checkbox"/> Non-Binary
Definitions: Business Equity Firm: Certified MBE Minority Business Enterprise or WBE Women Business Enterprise DBE: Disadvantaged Business Enterprise			
HUB: Historically Under Utilized Business VOSB: Veteran Owned Small Business Section 3: Certified Housing Urban Development Vendors			

ALL BUSINESS EQUITY FIRMS MUST BE CERTIFIED BEFORE CONTRACT AWARD

Failure to complete this form, in its entirety, and received by the Purchasing Division no later than 2:00 p.m. on the third City business day after bid opening, exclusive of bid opening date, will result in the bid being considered non-responsive to bid specifications. Exception: CFA, ICA, and CDBG projects, documents will be submitted to the City Project Manager if publicly bid or to the Developer if privately bid.

The undersigned Prime/Offeror agrees to enter into a formal agreement with the Business Equity firm(s) listed in this utilization schedule, conditioned upon execution of a contract with the City of Fort Worth (Exception: Developer projects). The intentional and/or knowing misrepresentation of facts is grounds for consideration of disqualification and will result in the bid being considered non-responsive to bid specifications.

Business Equity firms listed toward meeting the project goal must be located in the City's marketplace at the time of bid or the business has a Significant Business Presence in the Marketplace. The marketplace is the City of Fort Worth including portions of Denton, Parker, Wise, and all of Tarrant, Dallas, and Johnson counties.

Certified means those Business Equity Firms, located within the Marketplace, that have been determined to be a bona-fide minority or women business enterprise by the North Central Texas Regional Certification Agency (NCTRCA), Dallas/Fort Worth Minority Supplier Development Council (D/FW MSDC) and Women's Business Council-Southwest (WBCS).

If hauling services are utilized, the Prime/Offeror will be given credit as long as the Business Equity firm listed owns and operates at least one fully licensed and operational truck to be used on the contract. The Business Equity firms may lease trucks from another Business Equity firm, including Business Equity owner-operated, and receive full Business Equity credit. The Business Equity firm may lease trucks from non-Business Equity firms, including owner-operated, but will only receive credit for the fees and commissions earned by the Business Equity as outlined in the lease agreement.

Federally-funded Projects (ONLY), Counting DBE Participation: If materials or supplies are obtained from a DBE manufacturer, count 100 percent of the cost of the materials or supplies towards the goal. If the **materials or supplies are purchased** from a **DBE regular dealer**, count 60 percent of the cost of the materials and supplies toward the DBE goal. When materials or supplies are purchased from a **DBE neither a manufacturer nor a regular dealer**, count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies or fees or transportation charges for the delivery of the materials or supplies delivered to the job site. In all cases, the Prime/Offeror is responsible to identify the amounts to be used toward the committed DBE goal. **Note: For DBE Goals, 60% of the services count towards the goal.**

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Business Equity Utilization Form

Please note that only certified Business Equity firms will be counted to meet the Business Equity goal. Prime/Offerors are required to identify **ALL** subcontractors/suppliers, regardless of status; i.e., Business Equity firms and non-Business Equity firms. Prime/Offerors must identify by tier level all subcontractors/suppliers. Tier: means the level of subcontracting below the Prime/Offeror i.e. a direct payment from the Prime/Offeror to a subcontractor is considered 1st tier, a payment by a subcontractor to its supplier is considered 2nd tier. Business Equity firms are to be listed before non-Business Equity firms. The Prime/Offeror is responsible to provide proof of payment of all tiered sub-contractors/suppliers identified as a Business Equity firm and counting those dollars towards meeting the contract committed goal.

Certified Business Equity Prime/Offeror Contractors counting their self-performance towards meeting the contract goal, must be certified within those NAICS commodity codes with a certifying agency acceptable by the City of Fort Worth. Certified Business Equity Prime/Offeror counting self-performing services towards the goal, the service(s) to be performed should be listed first on the Utilization form.

Check this box if certified Prime Contractor services will be counting towards the Business Equity contracting goal. Please list services first below.

Please list certified Business Equity firm names as listed on their certification, including DBA names.

NAMES AND ADDRESSES OF CONTRACTORS/SUPPLIERS	TYPE OF SERVICES/SUPPLIES PROVIDED (NAICS Required)	Specify Tier Name 1st Tier	Certification Agency	Gender and Ethnicity:
Business Name: _____ Address: _____ Phone: _____ Email: _____ Contact Person: _____	Type of Service/Supplies: _____ NAICS Code: _____ \$ AMOUNT: _____		Certified By: <input type="checkbox"/> D/FW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> TXDOT <input type="checkbox"/> WBCS <input type="checkbox"/> Other: _____	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American
Business Name: _____ Address: _____ Phone: _____ Email: _____ Contact Person: _____	Type of Service/Supplies: _____ NAICS Code: ENV 22-12 \$ AMOUNT: _____		Certified By: <input type="checkbox"/> D/FW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> WBCS <input type="checkbox"/> TXDOT <input type="checkbox"/> Other: _____	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American
Business Name: _____ Address: _____ Phone: _____ Email: _____ Contact Person: _____	Type of Service/Supplies: _____ NAICS Code: _____ \$ AMOUNT: _____		Certified By: <input type="checkbox"/> D/FW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> WBCS <input type="checkbox"/> TXDOT <input type="checkbox"/> Other: _____	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American

Business Equity Utilization Form

Please include multiple copies of this page if needed to list all contractors and suppliers.

NAMES AND ADDRESSES OF CONTRACTORS/SUPPLIERS	TYPE OF SERVICES/SUPPLIES PROVIDED (NAICS Required)	Specify Tier Name 1st Tier	Certification Agency	Gender and Ethnicity:
Business Name: Address: Phone: Email: Contact Person:	Type of Service/Supplies: NAICS Code: \$ AMOUNT:		Certified By: <input type="checkbox"/> D/FW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> TXDOT <input type="checkbox"/> WBCS <input type="checkbox"/> Other:	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American
Business Name: Address: Phone: Email: Contact Person:	Type of Service/Supplies: NAICS Code: \$ AMOUNT:		Certified By: <input type="checkbox"/> DFW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> WBCS <input type="checkbox"/> TXDOT <input type="checkbox"/> Other:	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American
Business Name: Address: Phone: Email: Contact Person:	Type of Service/Supplies: NAICS Code: \$ AMOUNT:		Certified By: <input type="checkbox"/> DFW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> WBCS <input type="checkbox"/> TXDOT <input type="checkbox"/> Other:	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American
Business Name: Address: Phone: Email: Contact Person:	Type of Service/Supplies: NAICS Code: \$ AMOUNT:		Certified By: <input type="checkbox"/> DFW MSDC <input type="checkbox"/> NCTRCA <input type="checkbox"/> WBCS <input type="checkbox"/> TXDOT <input type="checkbox"/> Other:	<input type="checkbox"/> Male <input type="checkbox"/> Female <input type="checkbox"/> Non-Binary <input type="checkbox"/> African American <input type="checkbox"/> Hispanic <input type="checkbox"/> Asian <input type="checkbox"/> Caucasian <input type="checkbox"/> Native American



Business Equity Utilization Form

Total Dollar Amount of Certified Prime/Offeror Services towards contract goal	\$
Total Dollar Amount of Business Equity (or DBE if applicable) Subcontractors/Suppliers	\$
Total Dollar Amount of Non-Business Equity Subcontractors/Suppliers	\$
TOTAL DOLLAR AMOUNT OF CERTIFIED PRIME/ALL SUBCONTRACTORS/SUPPLIERS	\$

The Prime/Offeror will not make additions, deletions, or substitutions to this certified list without the prior approval of the Business Equity Division through the submittal of a ***Request for Approval of Change/Addition online***. Any unjustified change or deletion shall be a material breach of contract and may result in debarment in accord with the procedures outlined in the ordinance. The Prime/Offeror shall submit a detailed explanation of how the requested change/addition or deletion will affect the committed Business Equity goal. If the detail explanation is not submitted, it will affect the final compliance determination.

By affixing a signature to this form, the Prime/Offeror further agrees to provide, directly to the City upon request, complete and accurate information regarding actual work performed by all subcontractors, including non-Business Equity firms. The Prime/Offeror also agrees to allow an audit and/or examination of any books, records and files held by their company. The Prime/Offeror agrees to allow the transmission of interviews with owners, principals, officers, employees and applicable subcontractors/suppliers participating on the contract that will substantiate the actual work performed by the Business Equity firms on this contract, by an authorized officer or employee of the City. A Prime/Offeror who intentionally and/or knowingly misrepresents material facts shall be Debarred for a period of time of not less than three (3) years.

Authorized Signature

Printed Signature

Title

Contact Name and Title (if different)

Company Name

Phone Number

Address

Email Address

City/State/Zip Code

Date

ATTACHMENT E

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

STANDARD GENERAL CONDITIONS OF THE CONSTRUCTION CONTRACT

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ARTICLE 1 – DEFINITIONS AND TERMINOLOGY

1.01 *Defined Terms*

- A. Wherever used in these General Conditions or in other Contract Documents, the terms listed below have the meanings indicated which are applicable to both the singular and plural thereof, and words denoting gender shall include the masculine, feminine and neuter. Said terms are generally capitalized or written in italics, but not always. When used in a context consistent with the definition of a listed-defined term, the term shall have a meaning as defined below whether capitalized or italicized or otherwise. In addition to terms specifically defined, terms with initial capital letters in the Contract Documents include references to identified articles and paragraphs, and the titles of other documents or forms.
1. *Addenda*—Written or graphic instruments issued prior to the opening of Bids which clarify, correct, or change the Bidding Requirements or the proposed Contract Documents.
 2. *Agreement*—The written instrument which is evidence of the agreement between City and Contractor covering the Work.
 3. *Application for Payment*—The form acceptable to City which is to be used by Contractor during the course of the Work in requesting progress or final payments and which is to be accompanied by such supporting documentation as is required by the Contract Documents.
 4. *Asbestos*—Any material that contains more than one percent asbestos and is friable or is releasing asbestos fibers into the air above current action levels established by the United States Occupational Safety and Health Administration.
 5. *Award* – Authorization by the City Council for the City to enter into an Agreement.
 6. *Bid*—The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the Work to be performed.
 7. *Bidder*—The individual or entity who submits a Bid directly to City.
 8. *Bidding Documents*—The Bidding Requirements and the proposed Contract Documents (including all Addenda).
 9. *Bidding Requirements*—The advertisement or Invitation to Bid, Instructions to Bidders, Bid security of acceptable form, if any, and the Bid Form with any supplements.
 10. *Business Day* – A business day is defined as a day that the City conducts normal business, generally Monday through Friday, except for federal or state holidays observed by the City.
 11. *Calendar Day* – A day consisting of 24 hours measured from midnight to the next midnight.

12. *Change Order*—A document, which is prepared and approved by the City, which is signed by Contractor and City and authorizes an addition, deletion, or revision in the Work or an adjustment in the Contract Price or the Contract Time, issued on or after the Effective Date of the Agreement.
13. *City*— The City of Fort Worth, Texas, a home-rule municipal corporation, authorized and chartered under the Texas State Statutes, acting by its governing body through its City Manager, his designee, or agents authorized under his behalf, each of which is required by Charter to perform specific duties with responsibility for final enforcement of the contracts involving the City of Fort Worth is by Charter vested in the City Manager and is the entity with whom Contractor has entered into the Agreement and for whom the Work is to be performed.
14. *City Attorney* – The officially appointed City Attorney of the City of Fort Worth, Texas, or his duly authorized representative.
15. *City Council* - The duly elected and qualified governing body of the City of Fort Worth, Texas.
16. *City Manager* – The officially appointed and authorized City Manager of the City of Fort Worth, Texas, or his duly authorized representative.
17. *Contract Claim*—A demand or assertion by City or Contractor seeking an adjustment of Contract Price or Contract Time, or both, or other relief with respect to the terms of the Contract. A demand for money or services by a third party is not a Contract Claim.
18. *Contract*—The entire and integrated written document between the City and Contractor concerning the Work. The Contract contains the Agreement and all Contract Documents and supersedes prior negotiations, representations, or agreements, whether written or oral.
19. *Contract Documents*—Those items so designated in the Agreement. All items listed in the Agreement are Contract Documents. Approved Submittals, other Contractor submittals, and the reports and drawings of subsurface and physical conditions are not Contract Documents.
20. *Contract Price*—The moneys payable by City to Contractor for completion of the Work in accordance with the Contract Documents as stated in the Agreement (subject to the provisions of Paragraph 11.03 in the case of Unit Price Work).
21. *Contract Time*—The number of days or the dates stated in the Agreement to: (i) achieve Milestones, if any and (ii) complete the Work so that it is ready for Final Acceptance.
22. *Contractor*—The individual or entity with whom City has entered into the Agreement.
23. *Cost of the Work*—See Paragraph 11.01 of these General Conditions for definition.

24. *Damage Claims* – A demand for money or services arising from the Project or Site from a third party, City or Contractor exclusive of a Contract Claim.
25. *Day or day* – A day, unless otherwise defined, shall mean a Calendar Day.
26. *Director of Aviation* – The officially appointed Director of the Aviation Department of the City of Fort Worth, Texas, or his duly appointed representative, assistant, or agents.
27. *Director of Parks and Community Services* – The officially appointed Director of the Parks and Community Services Department of the City of Fort Worth, Texas, or his duly appointed representative, assistant, or agents.
28. *Director of Planning and Development* – The officially appointed Director of the Planning and Development Department of the City of Fort Worth, Texas, or his duly appointed representative, assistant, or agents.
29. *Director of Transportation Public Works* – The officially appointed Director of the Transportation Public Works Department of the City of Fort Worth, Texas, or his duly appointed representative, assistant, or agents.
30. *Director of Water Department* – The officially appointed Director of the Water Department of the City of Fort Worth, Texas, or his duly appointed representative, assistant, or agents.
31. *Drawings*—That part of the Contract Documents prepared or approved by Engineer which graphically shows the scope, extent, and character of the Work to be performed by Contractor. Submittals are not Drawings as so defined.
32. *Effective Date of the Agreement*—The date indicated in the Agreement on which it becomes effective, but if no such date is indicated, it means the date on which the Agreement is signed and delivered by the last of the two parties to sign and deliver.
33. *Engineer*—The licensed professional engineer or engineering firm registered in the State of Texas performing professional services for the City.
34. *Extra Work* – Additional work made necessary by changes or alterations of the Contract Documents or of quantities or for other reasons for which no prices are provided in the Contract Documents. Extra work shall be part of the Work.
35. *Field Order* — A written order issued by City which requires changes in the Work but which does not involve a change in the Contract Price, Contract Time, or the intent of the Engineer. Field Orders are paid from Field Order Allowances incorporated into the Contract by funded work type at the time of award.
36. *Final Acceptance* – The written notice given by the City to the Contractor that the Work specified in the Contract Documents has been completed to the satisfaction of the City.

37. *Final Inspection* – Inspection carried out by the City to verify that the Contractor has completed the Work, and each and every part or appurtenance thereof, fully, entirely, and in conformance with the Contract Documents.
38. *General Requirements*—Sections of Division 1 of the Contract Documents.
39. *Hazardous Environmental Condition*—The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Waste, Radioactive Material, or other materials in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
40. *Hazardous Waste*—Hazardous waste is defined as any solid waste listed as hazardous or possesses one or more hazardous characteristics as defined in the federal waste regulations, as amended from time to time.
41. *Laws and Regulations*—Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
42. *Liens*—Charges, security interests, or encumbrances upon Project funds, real property, or personal property.
43. *Major Item* – An Item of work included in the Contract Documents that has a total cost equal to or greater than 5% of the original Contract Price or \$25,000 whichever is less.
44. *Milestone*—A principal event specified in the Contract Documents relating to an intermediate Contract Time prior to Final Acceptance of the Work.
45. *Notice of Award*—The written notice by City to the Successful Bidder stating that upon timely compliance by the Successful Bidder with the conditions precedent listed therein, City will sign and deliver the Agreement.
46. *Notice to Proceed*—A written notice given by City to Contractor fixing the date on which the Contract Time will commence to run and on which Contractor shall start to perform the Work specified in Contract Documents.
47. *PCBs*—Polychlorinated biphenyls.
48. *Petroleum*—Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Hazardous Waste and crude oils.
49. *Plans* – See definition of Drawings.

50. *Project Schedule*—A schedule, prepared and maintained by Contractor, in accordance with the General Requirements, describing the sequence and duration of the activities comprising the Contractor's plan to accomplish the Work within the Contract Time.
51. *Project*—The Work to be performed under the Contract Documents.
52. *Project Manager*—The authorized representative of the City who will be assigned to the Site.
53. *Public Meeting* – An announced meeting conducted by the City to facilitate public participation and to assist the public in gaining an informed view of the Project.
54. *Radioactive Material*—Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
55. *Regular Working Hours* – Hours beginning at 7:00 a.m. and ending at 6:00 p.m., Monday thru Friday (excluding legal holidays).
56. *Samples*—Physical examples of materials, equipment, or workmanship that are representative of some portion of the Work and which establish the standards by which such portion of the Work will be judged.
57. *Schedule of Submittals*—A schedule, prepared and maintained by Contractor, of required submittals and the time requirements to support scheduled performance of related construction activities.
58. *Schedule of Values*—A schedule, prepared and maintained by Contractor, allocating portions of the Contract Price to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.
59. *Site*—Lands or areas indicated in the Contract Documents as being furnished by City upon which the Work is to be performed, including rights-of-way, permits, and easements for access thereto, and such other lands furnished by City which are designated for the use of Contractor.
60. *Specifications*—That part of the Contract Documents consisting of written requirements for materials, equipment, systems, standards and workmanship as applied to the Work, and certain administrative requirements and procedural matters applicable thereto. Specifications may be specifically made a part of the Contract Documents by attachment or, if not attached, may be incorporated by reference as indicated in the Table of Contents (Division 00 00 00) of each Project.
61. *Subcontractor*—An individual or entity having a direct contract with Contractor or with any other Subcontractor for the performance of a part of the Work at the Site.

62. *Submittals*—All drawings, diagrams, illustrations, schedules, and other data or information which are specifically prepared or assembled by or for Contractor and submitted by Contractor to illustrate some portion of the Work.
63. *Substantial Completion* – The stage in the progress of the Project when the Work is sufficiently complete in accordance with the Contract Documents for Final Inspection.
64. *Successful Bidder*—The Bidder submitting the lowest and most responsive Bid to whom City makes an Award.
65. *Superintendent* – The representative of the Contractor who is available at all times and able to receive instructions from the City and to act for the Contractor.
66. *Supplementary Conditions*—That part of the Contract Documents which amends or supplements these General Conditions.
67. *Supplier*—A manufacturer, fabricator, supplier, distributor, materialman, or vendor having a direct contract with Contractor or with any Subcontractor to furnish materials or equipment to be incorporated in the Work by Contractor or Subcontractor.
68. *Underground Facilities*—All underground pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, tunnels, or other such facilities or attachments, and any encasements containing such facilities, including but not limited to, those that convey electricity, gases, steam, liquid petroleum products, telephone or other communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems.
69. *Unit Price Work*—See Paragraph 11.03 of these General Conditions for definition.
70. *Weekend Working Hours* – Hours beginning at 9:00 a.m. and ending at 5:00 p.m., Saturday, Sunday or legal holiday, as approved in advance by the City.
71. *Work*—The entire construction or the various separately identifiable parts thereof required to be provided under the Contract Documents. Work includes and is the result of performing or providing all labor, services, and documentation necessary to produce such construction including any Change Order or Field Order, and furnishing, installing, and incorporating all materials and equipment into such construction, all as required by the Contract Documents.
72. *Working Day* – A working day is defined as a day, not including Saturdays, Sundays, or legal holidays authorized by the City for contract purposes, in which weather or other conditions not under the control of the Contractor will permit the performance of the principal unit of work underway for a continuous period of not less than 7 hours between 7 a.m. and 6 p.m.

1.02 *Terminology*

- A. The words and terms discussed in Paragraph 1.02.B through E are not defined but, when used in the Bidding Requirements or Contract Documents, have the indicated meaning.
- B. *Intent of Certain Terms or Adjectives:*

1. The Contract Documents include the terms “as allowed,” “as approved,” “as ordered,” “as directed” or terms of like effect or import to authorize an exercise of judgment by City. In addition, the adjectives “reasonable,” “suitable,” “acceptable,” “proper,” “satisfactory,” or adjectives of like effect or import are used to describe an action or determination of City as to the Work. It is intended that such exercise of professional judgment, action, or determination will be solely to evaluate, in general, the Work for compliance with the information in the Contract Documents and with the design concept of the Project as a functioning whole as shown or indicated in the Contract Documents (unless there is a specific statement indicating otherwise).

C. *Defective:*

1. The word “defective,” when modifying the word “Work,” refers to Work that is unsatisfactory, faulty, or deficient in that it:
 - a. does not conform to the Contract Documents; or
 - b. does not meet the requirements of any applicable inspection, reference standard, test, or approval referred to in the Contract Documents; or
 - c. has been damaged prior to City’s written acceptance.

D. *Furnish, Install, Perform, Provide:*

1. The word “Furnish” or the word “Install” or the word “Perform” or the word “Provide” or the word “Supply,” or any combination or similar directive or usage thereof, shall mean furnishing and incorporating in the Work including all necessary labor, materials, equipment, and everything necessary to perform the Work indicated, unless specifically limited in the context used.

- E. Unless stated otherwise in the Contract Documents, words or phrases that have a well-known technical or construction industry or trade meaning are used in the Contract Documents in accordance with such recognized meaning.

ARTICLE 2 – PRELIMINARY MATTERS

2.01 *Copies of Documents*

City shall furnish to Contractor one (1) original executed copy and one (1) electronic copy of the Contract Documents, and four (4) additional copies of the Drawings. Additional copies will be furnished upon request at the cost of reproduction.

2.02 *Commencement of Contract Time; Notice to Proceed*

The Contract Time will commence to run on the day indicated in the Notice to Proceed. A Notice to Proceed may be given no earlier than 14 days after the Effective Date of the Agreement, unless agreed to by both parties in writing.

2.03 *Starting the Work*

Contractor shall start to perform the Work on the date when the Contract Time commences to run. No Work shall be done at the Site prior to the date on which the Contract Time commences to run.

2.04 *Before Starting Construction*

Baseline Schedules: Submit in accordance with the Contract Documents, and prior to starting the Work.

2.05 *Preconstruction Conference*

Before any Work at the Site is started, the Contractor shall attend a Preconstruction Conference as specified in the Contract Documents.

2.06 *Public Meeting*

Contractor may not mobilize any equipment, materials or resources to the Site prior to Contractor attending the Public Meeting as scheduled by the City.

2.07 *Initial Acceptance of Schedules*

No progress payment shall be made to Contractor until acceptable schedules are submitted to City in accordance with the Schedule Specification as provided in the Contract Documents.

ARTICLE 3 – CONTRACT DOCUMENTS: INTENT, AMENDING, REUSE

3.01 *Intent*

- A. The Contract Documents are complementary; what is required by one is as binding as if required by all.
- B. It is the intent of the Contract Documents to describe a functionally complete project (or part thereof) to be constructed in accordance with the Contract Documents. Any labor, documentation, services, materials, or equipment that reasonably may be inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce the indicated result will be provided whether or not specifically called for, at no additional cost to City.
- C. Clarifications and interpretations of the Contract Documents shall be issued by City.
- D. The Specifications may vary in form, format and style. Some Specification sections may be written in varying degrees of streamlined or declarative style and some sections may be relatively narrative by comparison. Omission of such words and phrases as “the Contractor shall,” “in conformity with,” “as shown,” or “as specified” are intentional in streamlined sections. Omitted words and phrases shall be supplied by inference. Similar types of provisions may appear in various parts of a section or articles within a part depending on the format of the

section. The Contractor shall not take advantage of any variation of form, format or style in making Contract Claims.

- E. The cross referencing of specification sections under the subparagraph heading “Related Sections include but are not necessarily limited to:” and elsewhere within each Specification section is provided as an aid and convenience to the Contractor. The Contractor shall not rely on the cross referencing provided and shall be responsible to coordinate the entire Work under the Contract Documents and provide a complete Project whether or not the cross referencing is provided in each section or whether or not the cross referencing is complete.

3.02 *Reference Standards*

A. Standards, Specifications, Codes, Laws, and Regulations

1. Reference to standards, specifications, manuals, or codes of any technical society, organization, or association, or to Laws or Regulations, whether such reference be specific or by implication, shall mean the standard, specification, manual, code, or Laws or Regulations in effect at the time of opening of Bids (or on the Effective Date of the Agreement if there were no Bids), except as may be otherwise specifically stated in the Contract Documents.
2. No provision of any such standard, specification, manual, or code, or any instruction of a Supplier, shall be effective to change the duties or responsibilities of City, Contractor, or any of their subcontractors, consultants, agents, or employees, from those set forth in the Contract Documents. No such provision or instruction shall be effective to assign to City, or any of its officers, directors, members, partners, employees, agents, consultants, or subcontractors, any duty or authority to supervise or direct the performance of the Work or any duty or authority to undertake responsibility inconsistent with the provisions of the Contract Documents.

3.03 *Reporting and Resolving Discrepancies*

A. *Reporting Discrepancies:*

1. *Contractor’s Review of Contract Documents Before Starting Work:* Before undertaking each part of the Work, Contractor shall carefully study and compare the Contract Documents and check and verify pertinent figures therein against all applicable field measurements and conditions. Contractor shall promptly report in writing to City any conflict, error, ambiguity, or discrepancy which Contractor discovers, or has actual knowledge of, and shall obtain a written interpretation or clarification from City before proceeding with any Work affected thereby.
2. *Contractor’s Review of Contract Documents During Performance of Work:* If, during the performance of the Work, Contractor discovers any conflict, error, ambiguity, or discrepancy within the Contract Documents, or between the Contract Documents and (a) any applicable Law or Regulation , (b) any standard, specification, manual, or code, or (c) any instruction of any Supplier, then Contractor shall promptly report it to City in writing. Contractor shall not proceed with the Work affected thereby (except in an emergency as required by Paragraph

6.17.A) until an amendment or supplement to the Contract Documents has been issued by one of the methods indicated in Paragraph 3.04.

3. Contractor shall not be liable to City for failure to report any conflict, error, ambiguity, or discrepancy in the Contract Documents unless Contractor had actual knowledge thereof.

B. *Resolving Discrepancies:*

1. Except as may be otherwise specifically stated in the Contract Documents, the provisions of the Contract Documents shall take precedence in resolving any conflict, error, ambiguity, or discrepancy between the provisions of the Contract Documents and the provisions of any standard, specification, manual, or the instruction of any Supplier (whether or not specifically incorporated by reference in the Contract Documents).
2. In case of discrepancies, figured dimensions shall govern over scaled dimensions, Plans shall govern over Specifications, Supplementary Conditions shall govern over General Conditions and Specifications, and quantities shown on the Plans shall govern over those shown in the proposal.

3.04 *Amending and Supplementing Contract Documents*

- A. The Contract Documents may be amended to provide for additions, deletions, and revisions in the Work or to modify the terms and conditions thereof by a Change Order.
- B. The requirements of the Contract Documents may be supplemented, and minor variations and deviations in the Work not involving a change in Contract Price or Contract Time, may be authorized, by one or more of the following ways:
 1. A Field Order;
 2. City's review of a Submittal (subject to the provisions of Paragraph 6.18.C); or
 3. City's written interpretation or clarification.

3.05 *Reuse of Documents*

- A. Contractor and any Subcontractor or Supplier shall not:
 1. have or acquire any title to or ownership rights in any of the Drawings, Specifications, or other documents (or copies of any thereof) prepared by or bearing the seal of Engineer, including electronic media editions; or
 2. reuse any such Drawings, Specifications, other documents, or copies thereof on extensions of the Project or any other project without written consent of City and specific written verification or adaptation by Engineer.

- B. The prohibitions of this Paragraph 3.05 will survive final payment, or termination of the Contract. Nothing herein shall preclude Contractor from retaining copies of the Contract Documents for record purposes.

3.06 *Electronic Data*

- A. Unless otherwise stated in the Supplementary Conditions, the data furnished by City or Engineer to Contractor, or by Contractor to City or Engineer, that may be relied upon are limited to the printed copies included in the Contract Documents (also known as hard copies) and other Specifications referenced and located on the City's on-line electronic document management and collaboration system site. Files in electronic media format of text, data, graphics, or other types are furnished only for the convenience of the receiving party. Any conclusion or information obtained or derived from such electronic files will be at the user's sole risk. If there is a discrepancy between the electronic files and the hard copies, the hard copies govern.
- B. When transferring documents in electronic media format, the transferring party makes no representations as to long term compatibility, usability, or readability of documents resulting from the use of software application packages, operating systems, or computer hardware differing from those used by the data's creator.

ARTICLE 4 – AVAILABILITY OF LANDS; SUBSURFACE AND PHYSICAL CONDITIONS; HAZARDOUS ENVIRONMENTAL CONDITIONS; REFERENCE POINTS

4.01 *Availability of Lands*

- A. City shall furnish the Site. City shall notify Contractor of any encumbrances or restrictions not of general application but specifically related to use of the Site with which Contractor must comply in performing the Work. City will obtain in a timely manner and pay for easements for permanent structures or permanent changes in existing facilities.
 - 1. The City has obtained or anticipates acquisition of and/or access to right-of-way, and/or easements. Any outstanding right-of-way and/or easements are anticipated to be acquired in accordance with the schedule set forth in the Supplementary Conditions. The Project Schedule submitted by the Contractor in accordance with the Contract Documents must consider any outstanding right-of-way, and/or easements.
 - 2. The City has or anticipates removing and/or relocating utilities, and obstructions to the Site. Any outstanding removal or relocation of utilities or obstructions is anticipated in accordance with the schedule set forth in the Supplementary Conditions. The Project Schedule submitted by the Contractor in accordance with the Contract Documents must consider any outstanding utilities or obstructions to be removed, adjusted, and/or relocated by others.
- B. Upon reasonable written request, City shall furnish Contractor with a current statement of record legal title and legal description of the lands upon which the Work is to be performed.

C. Contractor shall provide for all additional lands and access thereto that may be required for construction facilities or storage of materials and equipment.

4.02 *Subsurface and Physical Conditions*

A. *Reports and Drawings*: The Supplementary Conditions identify:

1. those reports known to City of explorations and tests of subsurface conditions at or contiguous to the Site; and
2. those drawings known to City of physical conditions relating to existing surface or subsurface structures at the Site (except Underground Facilities).

B. *Limited Reliance by Contractor on Technical Data Authorized*: Contractor may rely upon the accuracy of the “technical data” contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such “technical data” is identified in the Supplementary Conditions. Contractor may not make any Contract Claim against City, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

1. the completeness of such reports and drawings for Contractor’s purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences, and procedures of construction to be employed by Contractor, and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions, and information contained in such reports or shown or indicated in such drawings; or
3. any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions, or information.

4.03 *Differing Subsurface or Physical Conditions*

A. *Notice*: If Contractor believes that any subsurface or physical condition that is uncovered or revealed either:

1. is of such a nature as to establish that any “technical data” on which Contractor is entitled to rely as provided in Paragraph 4.02 is materially inaccurate; or
2. is of such a nature as to require a change in the Contract Documents; or
3. differs materially from that shown or indicated in the Contract Documents; or
4. is of an unusual nature, and differs materially from conditions ordinarily encountered and generally recognized as inherent in work of the character provided for in the Contract Documents;

then Contractor shall, promptly after becoming aware thereof and before further disturbing the subsurface or physical conditions or performing any Work in connection therewith (except in an emergency as required by Paragraph 6.17.A), notify City in writing about such condition.

B. *Possible Price and Time Adjustments*

Contractor shall not be entitled to any adjustment in the Contract Price or Contract Time if:

1. Contractor knew of the existence of such conditions at the time Contractor made a final commitment to City with respect to Contract Price and Contract Time by the submission of a Bid or becoming bound under a negotiated contract; or
2. the existence of such condition could reasonably have been discovered or revealed as a result of the examination of the Contract Documents or the Site; or
3. Contractor failed to give the written notice as required by Paragraph 4.03.A.

4.04 *Underground Facilities*

A. *Shown or Indicated:* The information and data shown or indicated in the Contract Documents with respect to existing Underground Facilities at or contiguous to the Site is based on information and data furnished to City or Engineer by the owners of such Underground Facilities, including City, or by others. Unless it is otherwise expressly provided in the Supplementary Conditions:

1. City and Engineer shall not be responsible for the accuracy or completeness of any such information or data provided by others; and
2. the cost of all of the following will be included in the Contract Price, and Contractor shall have full responsibility for:
 - a. reviewing and checking all such information and data;
 - b. locating all Underground Facilities shown or indicated in the Contract Documents;
 - c. coordination and adjustment of the Work with the owners of such Underground Facilities, including City, during construction; and
 - d. the safety and protection of all such Underground Facilities and repairing any damage thereto resulting from the Work.

B. *Not Shown or Indicated:*

1. If an Underground Facility which conflicts with the Work is uncovered or revealed at or contiguous to the Site which was not shown or indicated, or not shown or indicated with reasonable accuracy in the Contract Documents, Contractor shall, promptly after becoming aware thereof and before further disturbing conditions affected thereby or performing any

Work in connection therewith (except in an emergency as required by Paragraph 6.17.A), identify the owner of such Underground Facility and give notice to that owner and to City. City will review the discovered Underground Facility and determine the extent, if any, to which a change may be required in the Contract Documents to reflect and document the consequences of the existence or location of the Underground Facility. Contractor shall be responsible for the safety and protection of such discovered Underground Facility.

2. If City concludes that a change in the Contract Documents is required, a Change Order may be issued to reflect and document such consequences.
3. Verification of existing utilities, structures, and service lines shall include notification of all utility companies a minimum of 48 hours in advance of construction including exploratory excavation if necessary.

4.05 *Reference Points*

- A. City shall provide engineering surveys to establish reference points for construction, which in City's judgment are necessary to enable Contractor to proceed with the Work. City will provide construction stakes or other customary method of marking to establish line and grades for roadway and utility construction, centerlines and benchmarks for bridgework. Contractor shall protect and preserve the established reference points and property monuments, and shall make no changes or relocations. Contractor shall report to City whenever any reference point or property monument is lost or destroyed or requires relocation because of necessary changes in grades or locations. The City shall be responsible for the replacement or relocation of reference points or property monuments not carelessly or willfully destroyed by the Contractor. The Contractor shall notify City in advance and with sufficient time to avoid delays.
- B. Whenever, in the opinion of the City, any reference point or monument has been carelessly or willfully destroyed, disturbed, or removed by the Contractor or any of his employees, the full cost for replacing such points plus 25% will be charged against the Contractor, and the full amount will be deducted from payment due the Contractor.

4.06 *Hazardous Environmental Condition at Site*

- A. *Reports and Drawings:* The Supplementary Conditions identify those reports and drawings known to City relating to Hazardous Environmental Conditions that have been identified at the Site.
- B. *Limited Reliance by Contractor on Technical Data Authorized:* Contractor may rely upon the accuracy of the "technical data" contained in such reports and drawings, but such reports and drawings are not Contract Documents. Such "technical data" is identified in the Supplementary Conditions. Contractor may not make any Contract Claim against City, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:
 1. the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of

- construction to be employed by Contractor and safety precautions and programs incident thereto; or
2. other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 3. any Contractor interpretation of or conclusion drawn from any “technical data” or any such other data, interpretations, opinions or information.
- C. Contractor shall not be responsible for any Hazardous Environmental Condition uncovered or revealed at the Site which was not shown or indicated in Drawings or Specifications or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Hazardous Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- D. If Contractor encounters a Hazardous Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Hazardous Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency as required by Paragraph 6.17.A); and (iii) notify City (and promptly thereafter confirm such notice in writing). City may consider the necessity to retain a qualified expert to evaluate such condition or take corrective action, if any.
- E. Contractor shall not be required to resume Work in connection with such condition or in any affected area until after City has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered suitable for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed.
- F. If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such special conditions, then City may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. City may have such deleted portion of the Work performed by City’s own forces or others.
- G. *To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless City, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 4.06.G shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual’s or entity’s own negligence.*
- H. The provisions of Paragraphs 4.02, 4.03, and 4.04 do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

ARTICLE 5 – BONDS AND INSURANCE

5.01 *Licensed Sureties and Insurers*

All bonds and insurance required by the Contract Documents to be purchased and maintained by Contractor shall be obtained from surety or insurance companies that are duly licensed or authorized in the State of Texas to issue bonds or insurance policies for the limits and coverages so required. Such surety and insurance companies shall also meet such additional requirements and qualifications as may be provided in the Supplementary Conditions.

5.02 *Performance, Payment, and Maintenance Bonds*

- A. Contractor shall furnish performance and payment bonds, in accordance with Texas Government Code Chapter 2253 or successor statute, each in an amount equal to the Contract Price as security for the faithful performance and payment of all of Contractor's obligations under the Contract Documents.
- B. Contractor shall furnish maintenance bonds in an amount equal to the Contract Price as security to protect the City against any defects in any portion of the Work described in the Contract Documents. Maintenance bonds shall remain in effect for two (2) years after the date of Final Acceptance by the City.
- C. All bonds shall be in the form prescribed by the Contract Documents except as provided otherwise by Laws or Regulations, and shall be executed by such sureties as are named in the list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Financial Management Service, Surety Bond Branch, U.S. Department of the Treasury. All bonds signed by an agent or attorney-in-fact must be accompanied by a sealed and dated power of attorney which shall show that it is effective on the date the agent or attorney-in-fact signed each bond.
- D. If the surety on any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in the State of Texas or it ceases to meet the requirements of Paragraph 5.02.C, Contractor shall promptly notify City and shall, within 30 days after the event giving rise to such notification, provide another bond and surety, both of which shall comply with the requirements of Paragraphs 5.01 and 5.02.C.

5.03 *Certificates of Insurance*

Contractor shall deliver to City, with copies to each additional insured and loss payee identified in the Supplementary Conditions, certificates of insurance (other evidence of insurance requested by City or any other additional insured) in at least the minimum amount as specified in the Supplementary Conditions which Contractor is required to purchase and maintain.

- 1. The certificate of insurance shall document the City, and all identified entities named in the Supplementary Conditions as "Additional Insured" on all liability policies.

2. The Contractor's general liability insurance shall include a, "per project" or "per location", endorsement, which shall be identified in the certificate of insurance provided to the City.
3. The certificate shall be signed by an agent authorized to bind coverage on behalf of the insured, be complete in its entirety, and show complete insurance carrier names as listed in the current A.M. Best Property & Casualty Guide
4. The insurers for all policies must be licensed and/or approved to do business in the State of Texas. Except for workers' compensation, all insurers must have a minimum rating of A-: VII in the current A. M. Best Key Rating Guide or have reasonably equivalent financial strength and solvency to the satisfaction of Risk Management. If the rating is below that required, written approval of City is required.
5. All applicable policies shall include a Waiver of Subrogation (Rights of Recovery) in favor of the City. In addition, the Contractor agrees to waive all rights of subrogation against the Engineer (if applicable), and each additional insured identified in the Supplementary Conditions
6. Failure of the City to demand such certificates or other evidence of full compliance with the insurance requirements or failure of the City to identify a deficiency from evidence that is provided shall not be construed as a waiver of Contractor's obligation to maintain such lines of insurance coverage.
7. If insurance policies are not written for specified coverage limits, an Umbrella or Excess Liability insurance for any differences is required. Excess Liability shall follow form of the primary coverage.
8. Unless otherwise stated, all required insurance shall be written on the "occurrence basis". If coverage is underwritten on a claims-made basis, the retroactive date shall be coincident with or prior to the date of the effective date of the agreement and the certificate of insurance shall state that the coverage is claims-made and the retroactive date. The insurance coverage shall be maintained for the duration of the Contract and for three (3) years following Final Acceptance provided under the Contract Documents or for the warranty period, whichever is longer. An annual certificate of insurance submitted to the City shall evidence such insurance coverage.
9. Policies shall have no exclusions by endorsements, which, neither nullify or amend, the required lines of coverage, nor decrease the limits of said coverage unless such endorsements are approved in writing by the City. In the event a Contract has been bid or executed and the exclusions are determined to be unacceptable or the City desires additional insurance coverage, and the City desires the contractor/engineer to obtain such coverage, the contract price shall be adjusted by the cost of the premium for such additional coverage plus 10%.
10. Any self-insured retention (SIR), in excess of \$25,000.00, affecting required insurance coverage shall be approved by the City in regards to asset value and stockholders' equity. In

lieu of traditional insurance, alternative coverage maintained through insurance pools or risk retention groups, must also be approved by City.

11. Any deductible in excess of \$5,000.00, for any policy that does not provide coverage on a first-dollar basis, must be acceptable to and approved by the City.
12. City, at its sole discretion, reserves the right to review the insurance requirements and to make reasonable adjustments to insurance coverage's and their limits when deemed necessary and prudent by the City based upon changes in statutory law, court decision or the claims history of the industry as well as of the contracting party to the City. The City shall be required to provide prior notice of 90 days, and the insurance adjustments shall be incorporated into the Work by Change Order.
13. City shall be entitled, upon written request and without expense, to receive copies of policies and endorsements thereto and may make any reasonable requests for deletion or revision or modifications of particular policy terms, conditions, limitations, or exclusions necessary to conform the policy and endorsements to the requirements of the Contract. Deletions, revisions, or modifications shall not be required where policy provisions are established by law or regulations binding upon either party or the underwriter on any such policies.
14. City shall not be responsible for the direct payment of insurance premium costs for Contractor's insurance.

5.04 *Contractor's Insurance*

- A. *Workers Compensation and Employers' Liability.* Contractor shall purchase and maintain such insurance coverage with limits consistent with statutory benefits outlined in the Texas Workers' Compensation Act (Texas Labor Code, Ch. 406, as amended), and minimum limits for Employers' Liability as is appropriate for the Work being performed and as will provide protection from claims set forth below which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Contract Documents, whether it is to be performed by Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable:
 1. claims under workers' compensation, disability benefits, and other similar employee benefit acts;
 2. claims for damages because of bodily injury, occupational sickness or disease, or death of Contractor's employees.
- B. *Commercial General Liability.* Coverage shall include but not be limited to covering liability (bodily injury or property damage) arising from: premises/operations, independent contractors, products/completed operations, personal injury, and liability under an insured contract. Insurance shall be provided on an occurrence basis, and as comprehensive as the current Insurance Services Office (ISO) policy. This insurance shall apply as primary insurance with respect to any other

insurance or self-insurance programs afforded to the City. The Commercial General Liability policy, shall have no exclusions by endorsements that would alter or nullify premises/operations, products/completed operations, contractual, personal injury, or advertising injury, which are normally contained with the policy, unless the City approves such exclusions in writing.

For construction projects that present a substantial completed operation exposure, the City may require the contractor to maintain completed operations coverage for a minimum of no less than three (3) years following the completion of the project (if identified in the Supplementary Conditions).

- C. *Automobile Liability.* A commercial business auto policy shall provide coverage on “any auto”, defined as autos owned, hired and non-owned and provide indemnity for claims for damages because bodily injury or death of any person and or property damage arising out of the work, maintenance or use of any motor vehicle by the Contractor, any Subcontractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable.
- D. *Railroad Protective Liability.* If any of the work or any warranty work is within the limits of railroad right-of-way, the Contractor shall comply with the requirements identified in the Supplementary Conditions.
- E. *Notification of Policy Cancellation:* Contractor shall immediately notify City upon cancellation or other loss of insurance coverage. Contractor shall stop work until replacement insurance has been procured. There shall be no time credit for days not worked pursuant to this section.

5.05 *Acceptance of Bonds and Insurance; Option to Replace*

If City has any objection to the coverage afforded by or other provisions of the bonds or insurance required to be purchased and maintained by the Contractor in accordance with Article 5 on the basis of non-conformance with the Contract Documents, the City shall so notify the Contractor in writing within 10 Business Days after receipt of the certificates (or other evidence requested). Contractor shall provide to the City such additional information in respect of insurance provided as the City may reasonably request. If Contractor does not purchase or maintain all of the bonds and insurance required by the Contract Documents, the City shall notify the Contractor in writing of such failure prior to the start of the Work, or of such failure to maintain prior to any change in the required coverage.

ARTICLE 6 – CONTRACTOR’S RESPONSIBILITIES

6.01 *Supervision and Superintendence*

- A. Contractor shall supervise, inspect, and direct the Work competently and efficiently, devoting such attention thereto and applying such skills and expertise as may be necessary to perform the Work in accordance with the Contract Documents. Contractor shall be solely responsible for the means, methods, techniques, sequences, and procedures of construction.

B. At all times during the progress of the Work, Contractor shall assign a competent, English-speaking, Superintendent who shall not be replaced without written notice to City. The Superintendent will be Contractor's representative at the Site and shall have authority to act on behalf of Contractor. All communication given to or received from the Superintendent shall be binding on Contractor.

C. Contractor shall notify the City 24 hours prior to moving areas during the sequence of construction.

6.02 *Labor; Working Hours*

A. Contractor shall provide competent, suitably qualified personnel to perform construction as required by the Contract Documents. Contractor shall at all times maintain good discipline and order at the Site.

B. Except as otherwise required for the safety or protection of persons or the Work or property at the Site or adjacent thereto, and except as otherwise stated in the Contract Documents, all Work at the Site shall be performed during Regular Working Hours. Contractor will not permit the performance of Work beyond Regular Working Hours or for Weekend Working Hours without City's written consent (which will not be unreasonably withheld). Written request (by letter or electronic communication) to perform Work:

1. for beyond Regular Working Hours request must be made by noon at least two (2) Business Days prior
2. for Weekend Working Hours request must be made by noon of the preceding Thursday
3. for legal holidays request must be made by noon two Business Days prior to the legal holiday.

6.03 *Services, Materials, and Equipment*

A. Unless otherwise specified in the Contract Documents, Contractor shall provide and assume full responsibility for all services, materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, telephone, water, sanitary facilities, temporary facilities, and all other facilities and incidentals necessary for the performance, Contractor required testing, start-up, and completion of the Work.

B. All materials and equipment incorporated into the Work shall be as specified or, if not specified, shall be of good quality and new, except as otherwise provided in the Contract Documents. All special warranties and guarantees required by the Specifications shall expressly run to the benefit of City. If required by City, Contractor shall furnish satisfactory evidence (including reports of required tests) as to the source, kind, and quality of materials and equipment.

- C. All materials and equipment to be incorporated into the Work shall be stored, applied, installed, connected, erected, protected, used, cleaned, and conditioned in accordance with instructions of the applicable Supplier, except as otherwise may be provided in the Contract Documents.
- D. All items of standard equipment to be incorporated into the Work shall be the latest model at the time of bid, unless otherwise specified.

6.04 *Project Schedule*

- A. Contractor shall adhere to the Project Schedule established in accordance with Paragraph 2.07 and the General Requirements as it may be adjusted from time to time as provided below.
 - 1. Contractor shall submit to City for acceptance (to the extent indicated in Paragraph 2.07 and the General Requirements) proposed adjustments in the Project Schedule that will not result in changing the Contract Time. Such adjustments will comply with any provisions of the General Requirements applicable thereto.
 - 2. Contractor shall submit to City a monthly Project Schedule with a monthly progress payment for the duration of the Contract in accordance with the schedule specification 01 32 16.
 - 3. Proposed adjustments in the Project Schedule that will change the Contract Time shall be submitted in accordance with the requirements of Article 12. Adjustments in Contract Time may only be made by a Change Order.

6.05 *Substitutes and "Or-Equals"*

- A. Whenever an item of material or equipment is specified or described in the Contract Documents by using the name of a proprietary item or the name of a particular Supplier, the specification or description is intended to establish the type, function, appearance, and quality required. Unless the specification or description contains or is followed by words reading that no like, equivalent, or "or-equal" item or no substitution is permitted, other items of material or equipment of other Suppliers may be submitted to City for review under the circumstances described below.
 - 1. *"Or-Equal" Items:* If in City's sole discretion an item of material or equipment proposed by Contractor is functionally equal to that named and sufficiently similar so that no change in related Work will be required, it may be considered by City as an "or-equal" item, in which case review and approval of the proposed item may, in City's sole discretion, be accomplished without compliance with some or all of the requirements for approval of proposed substitute items. For the purposes of this Paragraph 6.05.A.1, a proposed item of material or equipment will be considered functionally equal to an item so named if:
 - a. the City determines that:
 - 1) it is at least equal in materials of construction, quality, durability, appearance, strength, and design characteristics;

- 2) it will reliably perform at least equally well the function and achieve the results imposed by the design concept of the completed Project as a functioning whole; and
 - 3) it has a proven record of performance and availability of responsive service; and
- b. Contractor certifies that, if approved and incorporated into the Work:
- 1) there will be no increase in cost to the City or increase in Contract Time; and
 - 2) it will conform substantially to the detailed requirements of the item named in the Contract Documents.

2. *Substitute Items:*

- a. If in City's sole discretion an item of material or equipment proposed by Contractor does not qualify as an "or-equal" item under Paragraph 6.05.A.1, it may be submitted as a proposed substitute item.
- b. Contractor shall submit sufficient information as provided below to allow City to determine if the item of material or equipment proposed is essentially equivalent to that named and an acceptable substitute therefor. Requests for review of proposed substitute items of material or equipment will not be accepted by City from anyone other than Contractor.
- c. Contractor shall make written application to City for review of a proposed substitute item of material or equipment that Contractor seeks to furnish or use. The application shall comply with Section 01 25 00 and:
 - 1) shall certify that the proposed substitute item will:
 - a) perform adequately the functions and achieve the results called for by the general design;
 - b) be similar in substance to that specified;
 - c) be suited to the same use as that specified; and
 - 2) will state:
 - a) the extent, if any, to which the use of the proposed substitute item will prejudice Contractor's achievement of final completion on time;
 - b) whether use of the proposed substitute item in the Work will require a change in any of the Contract Documents (or in the provisions of any other direct contract with City for other work on the Project) to adapt the design to the proposed substitute item;

- c) whether incorporation or use of the proposed substitute item in connection with the Work is subject to payment of any license fee or royalty; and
- 3) will identify:
 - a) all variations of the proposed substitute item from that specified;
 - b) available engineering, sales, maintenance, repair, and replacement services; and
- 4) shall contain an itemized estimate of all costs or credits that will result directly or indirectly from use of such substitute item, including costs of redesign and Damage Claims of other contractors affected by any resulting change.

- B. *Substitute Construction Methods or Procedures:* If a specific means, method, technique, sequence, or procedure of construction is expressly required by the Contract Documents, Contractor may furnish or utilize a substitute means, method, technique, sequence, or procedure of construction approved by City. Contractor shall submit sufficient information to allow City, in City's sole discretion, to determine that the substitute proposed is equivalent to that expressly called for by the Contract Documents. Contractor shall make written application to City for review in the same manner as those provided in Paragraph 6.05.A.2.
- C. *City's Evaluation:* City will be allowed a reasonable time within which to evaluate each proposal or submittal made pursuant to Paragraphs 6.05.A and 6.05.B. City may require Contractor to furnish additional data about the proposed substitute. City will be the sole judge of acceptability. No "or-equal" or substitute will be ordered, installed or utilized until City's review is complete, which will be evidenced by a Change Order in the case of a substitute and an accepted Submittal for an "or-equal." City will advise Contractor in writing of its determination.
- D. *Special Guarantee:* City may require Contractor to furnish at Contractor's expense a special performance guarantee, warranty, or other surety with respect to any substitute. *Contractor shall indemnify and hold harmless City and anyone directly or indirectly employed by them from and against any and all claims, damages, losses and expenses (including attorneys fees) arising out of the use of substituted materials or equipment.*
- E. *City's Cost Reimbursement:* City will record City's costs in evaluating a substitute proposed or submitted by Contractor pursuant to Paragraphs 6.05.A.2 and 6.05.B. Whether or not City approves a substitute so proposed or submitted by Contractor, Contractor may be required to reimburse City for evaluating each such proposed substitute. Contractor may also be required to reimburse City for the charges for making changes in the Contract Documents (or in the provisions of any other direct contract with City) resulting from the acceptance of each proposed substitute.
- F. *Contractor's Expense:* Contractor shall provide all data in support of any proposed substitute or "or-equal" at Contractor's expense.

G. *City Substitute Reimbursement*: Costs (savings or charges) attributable to acceptance of a substitute shall be incorporated to the Contract by Change Order.

H. *Time Extensions*: No additional time will be granted for substitutions.

6.06 *Concerning Subcontractors, Suppliers, and Others*

A. Contractor shall perform with his own organization, work of a value not less than 35% of the value embraced on the Contract, unless otherwise approved by the City.

B. Contractor shall not employ any Subcontractor, Supplier, or other individual or entity, whether initially or as a replacement, against whom City may have reasonable objection. Contractor shall not be required to employ any Subcontractor, Supplier, or other individual or entity to furnish or perform any of the Work against whom Contractor has reasonable objection (excluding those acceptable to City as indicated in Paragraph 6.06.C).

C. The City may from time to time require the use of certain Subcontractors, Suppliers, or other individuals or entities on the project, and will provide such requirements in the Supplementary Conditions.

D. *Minority Business Enterprise Compliance*: It is City policy to ensure the full and equitable participation by Minority Business Enterprises (MBE) in the procurement of goods and services on a contractual basis. If the Contract Documents provide for a MBE goal, Contractor is required to comply with the intent of the City's MBE Ordinance (as amended) by the following:

1. Contractor shall, upon request by City, provide complete and accurate information regarding actual work performed by a MBE on the Contract and payment therefor.
2. Contractor will not make additions, deletions, or substitutions of accepted MBE without written consent of the City. Any unjustified change or deletion shall be a material breach of Contract and may result in debarment in accordance with the procedures outlined in the Ordinance.
3. Contractor shall, upon request by City, allow an audit and/or examination of any books, records, or files in the possession of the Contractor that will substantiate the actual work performed by an MBE. Material misrepresentation of any nature will be grounds for termination of the Contract in accordance with Paragraph 15.02.A. Any such misrepresentation may be grounds for disqualification of Contractor to bid on future contracts with the City for a period of not less than three years.

E. Contractor shall be fully responsible to City for all acts and omissions of the Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work just as Contractor is responsible for Contractor's own acts and omissions. Nothing in the Contract Documents:

1. shall create for the benefit of any such Subcontractor, Supplier, or other individual or entity any contractual relationship between City and any such Subcontractor, Supplier or other individual or entity; nor
 2. shall create any obligation on the part of City to pay or to see to the payment of any moneys due any such Subcontractor, Supplier, or other individual or entity except as may otherwise be required by Laws and Regulations.
- F. Contractor shall be solely responsible for scheduling and coordinating the Work of Subcontractors, Suppliers, and other individuals or entities performing or furnishing any of the Work under a direct or indirect contract with Contractor.
- G. All Subcontractors, Suppliers, and such other individuals or entities performing or furnishing any of the Work shall communicate with City through Contractor.
- H. All Work performed for Contractor by a Subcontractor or Supplier will be pursuant to an appropriate agreement between Contractor and the Subcontractor or Supplier which specifically binds the Subcontractor or Supplier to the applicable terms and conditions of the Contract Documents for the benefit of City.

6.07 *Wage Rates*

- A. *Duty to pay Prevailing Wage Rates.* The Contractor shall comply with all requirements of Chapter 2258, Texas Government Code (as amended), including the payment of not less than the rates determined by the City Council of the City of Fort Worth to be the prevailing wage rates in accordance with Chapter 2258. Such prevailing wage rates are included in these Contract Documents.
- B. *Penalty for Violation.* A Contractor or any Subcontractor who does not pay the prevailing wage shall, upon demand made by the City, pay to the City \$60 for each worker employed for each calendar day or part of the day that the worker is paid less than the prevailing wage rates stipulated in these contract documents. This penalty shall be retained by the City to offset its administrative costs, pursuant to Texas Government Code 2258.023.
- C. *Complaints of Violations and City Determination of Good Cause.* On receipt of information, including a complaint by a worker, concerning an alleged violation of 2258.023, Texas Government Code, by a Contractor or Subcontractor, the City shall make an initial determination, before the 31st day after the date the City receives the information, as to whether good cause exists to believe that the violation occurred. The City shall notify in writing the Contractor or Subcontractor and any affected worker of its initial determination. Upon the City's determination that there is good cause to believe the Contractor or Subcontractor has violated Chapter 2258, the City shall retain the full amounts claimed by the claimant or claimants as the difference between wages paid and wages due under the prevailing wage rates, such amounts being subtracted from successive progress payments pending a final determination of the violation.

- D. *Arbitration Required if Violation Not Resolved.* An issue relating to an alleged violation of Section 2258.023, Texas Government Code, including a penalty owed to the City or an affected worker, shall be submitted to binding arbitration in accordance with the Texas General Arbitration Act (Article 224 et seq., Revised Statutes) if the Contractor or Subcontractor and any affected worker does not resolve the issue by agreement before the 15th day after the date the City makes its initial determination pursuant to Paragraph C above. If the persons required to arbitrate under this section do not agree on an arbitrator before the 11th day after the date that arbitration is required, a district court shall appoint an arbitrator on the petition of any of the persons. The City is not a party in the arbitration. The decision and award of the arbitrator is final and binding on all parties and may be enforced in any court of competent jurisdiction.
- E. *Records to be Maintained.* The Contractor and each Subcontractor shall, for a period of three (3) years following the date of acceptance of the work, maintain records that show (i) the name and occupation of each worker employed by the Contractor in the construction of the Work provided for in this Contract; and (ii) the actual per diem wages paid to each worker. The records shall be open at all reasonable hours for inspection by the City. The provisions of Paragraph 6.23, Right to Audit, shall pertain to this inspection.
- F. *Progress Payments.* With each progress payment or payroll period, whichever is less, the Contractor shall submit an affidavit stating that the Contractor has complied with the requirements of Chapter 2258, Texas Government Code.
- G. *Posting of Wage Rates.* The Contractor shall post prevailing wage rates in a conspicuous place at all times.
- H. *Subcontractor Compliance.* The Contractor shall include in its subcontracts and/or shall otherwise require all of its Subcontractors to comply with Paragraphs A through G above.

6.08 *Patent Fees and Royalties*

- A. Contractor shall pay all license fees and royalties and assume all costs incident to the use in the performance of the Work or the incorporation in the Work of any invention, design, process, product, or device which is the subject of patent rights or copyrights held by others. If a particular invention, design, process, product, or device is specified in the Contract Documents for use in the performance of the Work and if, to the actual knowledge of City, its use is subject to patent rights or copyrights calling for the payment of any license fee or royalty to others, the existence of such rights shall be disclosed by City in the Contract Documents. Failure of the City to disclose such information does not relieve the Contractor from its obligations to pay for the use of said fees or royalties to others.
- B. *To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless City, from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to any infringement of patent rights or copyrights incident to the use in the performance of the Work or resulting from*

the incorporation in the Work of any invention, design, process, product, or device not specified in the Contract Documents.

6.09 *Permits and Utilities*

- A. *Contractor obtained permits and licenses.* Contractor shall obtain and pay for all construction permits and licenses except those provided for in the Supplementary Conditions or Contract Documents. City shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which are applicable at the time of opening of Bids, or, if there are no Bids, on the Effective Date of the Agreement, except for permits provided by the City as specified in 6.09.B. City shall pay all charges of utility owners for connections for providing permanent service to the Work.
- B. *City obtained permits and licenses.* City will obtain and pay for all permits and licenses as provided for in the Supplementary Conditions or Contract Documents. It will be the Contractor's responsibility to carry out the provisions of the permit. If the Contractor initiates changes to the Contract and the City approves the changes, the Contractor is responsible for obtaining clearances and coordinating with the appropriate regulatory agency. The City will not reimburse the Contractor for any cost associated with these requirements of any City acquired permit. The following are permits the City will obtain if required:
1. Texas Department of Transportation Permits
 2. U.S. Army Corps of Engineers Permits
 3. Texas Commission on Environmental Quality Permits
 4. Railroad Company Permits
- C. *Outstanding permits and licenses.* The City anticipates acquisition of and/or access to permits and licenses. Any outstanding permits and licenses are anticipated to be acquired in accordance with the schedule set forth in the Supplementary Conditions. The Project Schedule submitted by the Contractor in accordance with the Contract Documents must consider any outstanding permits and licenses.

6.10 *Laws and Regulations*

- A. Contractor shall give all notices required by and shall comply with all Laws and Regulations applicable to the performance of the Work. Except where otherwise expressly required by applicable Laws and Regulations, the City shall not be responsible for monitoring Contractor's compliance with any Laws or Regulations.
- B. If Contractor performs any Work knowing or having reason to know that it is contrary to Laws or Regulations, Contractor shall bear all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all

court or arbitration or other dispute resolution costs) arising out of or relating to such Work. However, it shall not be Contractor's responsibility to make certain that the Specifications and Drawings are in accordance with Laws and Regulations, but this shall not relieve Contractor of Contractor's obligations under Paragraph 3.02.

- C. Changes in Laws or Regulations not known at the time of opening of Bids having an effect on the cost or time of performance of the Work may be the subject of an adjustment in Contract Price or Contract Time.

6.11 *Taxes*

- A. On a contract awarded by the City, an organization which qualifies for exemption pursuant to Texas Tax Code, Subchapter H, Sections 151.301-335 (as amended), the Contractor may purchase, rent or lease all materials, supplies and equipment used or consumed in the performance of this contract by issuing to his supplier an exemption certificate in lieu of the tax, said exemption certificate to comply with State Comptroller's Ruling .007. Any such exemption certificate issued to the Contractor in lieu of the tax shall be subject to and shall comply with the provision of State Comptroller's Ruling .011, and any other applicable rulings pertaining to the Texas Tax Code, Subchapter H.

- B. Texas Tax permits and information may be obtained from:

1. Comptroller of Public Accounts
Sales Tax Division
Capitol Station
Austin, TX 78711; or
2. <http://www.window.state.tx.us/taxinfo/taxforms/93-forms.html>

6.12 *Use of Site and Other Areas*

- A. *Limitation on Use of Site and Other Areas:*

1. Contractor shall confine construction equipment, the storage of materials and equipment, and the operations of workers to the Site and other areas permitted by Laws and Regulations, and shall not unreasonably encumber the Site and other areas with construction equipment or other materials or equipment. Contractor shall assume full responsibility for any damage to any such land or area, or to the owner or occupant thereof, or of any adjacent land or areas resulting from the performance of the Work.
2. At any time when, in the judgment of the City, the Contractor has obstructed or closed or is carrying on operations in a portion of a street, right-of-way, or easement greater than is necessary for proper execution of the Work, the City may require the Contractor to finish the section on which operations are in progress before work is commenced on any additional area of the Site.

3. Should any Damage Claim be made by any such owner or occupant because of the performance of the Work, Contractor shall promptly attempt to resolve the Damage Claim.
 4. *Pursuant to Paragraph 6.21, Contractor shall indemnify and hold harmless City, from and against all claims, costs, losses, and damages arising out of or relating to any claim or action, legal or equitable, brought by any such owner or occupant against City.*
- B. *Removal of Debris During Performance of the Work:* During the progress of the Work Contractor shall keep the Site and other areas free from accumulations of waste materials, rubbish, and other debris. Removal and disposal of such waste materials, rubbish, and other debris shall conform to applicable Laws and Regulations.
 - C. *Site Maintenance Cleaning:* 24 hours after written notice is given to the Contractor that the clean-up on the job site is proceeding in a manner unsatisfactory to the City, if the Contractor fails to correct the unsatisfactory procedure, the City may take such direct action as the City deems appropriate to correct the clean-up deficiencies cited to the Contractor in the written notice (by letter or electronic communication), and the costs of such direct action, plus 25 % of such costs, shall be deducted from the monies due or to become due to the Contractor.
 - D. *Final Site Cleaning:* Prior to Final Acceptance of the Work Contractor shall clean the Site and the Work and make it ready for utilization by City or adjacent property owner. At the completion of the Work Contractor shall remove from the Site all tools, appliances, construction equipment and machinery, and surplus materials and shall restore to original condition or better all property disturbed by the Work.
 - E. *Loading Structures:* Contractor shall not load nor permit any part of any structure to be loaded in any manner that will endanger the structure, nor shall Contractor subject any part of the Work or adjacent property to stresses or pressures that will endanger it.

6.13 *Record Documents*

- A. Contractor shall maintain in a safe place at the Site or in a place designated by the Contractor and approved by the City, one (1) record copy of all Drawings, Specifications, Addenda, Change Orders, Field Orders, and written interpretations and clarifications in good order and annotated to show changes made during construction. These record documents together with all approved Samples and a counterpart of all accepted Submittals will be available to City for reference. Upon completion of the Work, these record documents, any operation and maintenance manuals, and Submittals will be delivered to City prior to Final Inspection. Contractor shall include accurate locations for buried and imbedded items.

6.14 *Safety and Protection*

- A. Contractor shall be solely responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the Work. Such responsibility does not relieve Subcontractors of their responsibility for the safety of persons or property in the performance of their work, nor for compliance with applicable safety Laws and Regulations. Contractor shall

take all necessary precautions for the safety of, and shall provide the necessary protection to prevent damage, injury or loss to:

1. all persons on the Site or who may be affected by the Work;
 2. all the Work and materials and equipment to be incorporated therein, whether in storage on or off the Site; and
 3. other property at the Site or adjacent thereto, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and Underground Facilities not designated for removal, relocation, or replacement in the course of construction.
- B. Contractor shall comply with all applicable Laws and Regulations relating to the safety of persons or property, or to the protection of persons or property from damage, injury, or loss; and shall erect and maintain all necessary safeguards for such safety and protection. Contractor shall notify owners of adjacent property and of Underground Facilities and other utility owners when prosecution of the Work may affect them, and shall cooperate with them in the protection, removal, relocation, and replacement of their property.
- C. Contractor shall comply with the applicable requirements of City's safety programs, if any.
- D. Contractor shall inform City of the specific requirements of Contractor's safety program, if any, with which City's employees and representatives must comply while at the Site.
- E. All damage, injury, or loss to any property referred to in Paragraph 6.14.A.2 or 6.14.A.3 caused, directly or indirectly, in whole or in part, by Contractor, any Subcontractor, Supplier, or any other individual or entity directly or indirectly employed by any of them to perform any of the Work, or anyone for whose acts any of them may be liable, shall be remedied by Contractor.
- F. Contractor's duties and responsibilities for safety and for protection of the Work shall continue until such time as all the Work is completed and City has accepted the Work.

6.15 *Safety Representative*

Contractor shall inform City in writing of Contractor's designated safety representative at the Site.

6.16 *Hazard Communication Programs*

Contractor shall be responsible for coordinating any exchange of material safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers in accordance with Laws or Regulations.

6.17 *Emergencies and/or Rectification*

- A. In emergencies affecting the safety or protection of persons or the Work or property at the Site or adjacent thereto, Contractor is obligated to act to prevent threatened damage, injury, or loss. Contractor shall give City prompt written notice if Contractor believes that any significant

changes in the Work or variations from the Contract Documents have been caused thereby or are required as a result thereof. If City determines that a change in the Contract Documents is required because of the action taken by Contractor in response to such an emergency, a Change Order may be issued.

- B. Should the Contractor fail to respond to a request from the City to rectify any discrepancies, omissions, or correction necessary to conform with the requirements of the Contract Documents, the City shall give the Contractor written notice that such work or changes are to be performed. The written notice shall direct attention to the discrepant condition and request the Contractor to take remedial action to correct the condition. In the event the Contractor does not take positive steps to fulfill this written request, or does not show just cause for not taking the proper action, within 24 hours, the City may take such remedial action with City forces or by contract. The City shall deduct an amount equal to the entire costs for such remedial action, plus 25%, from any funds due or become due the Contractor on the Project.

6.18 *Submittals*

- A. Contractor shall submit required Submittals to City for review and acceptance in accordance with the accepted Schedule of Submittals (as required by Paragraph 2.07). Each submittal will be identified as City may require.
 - 1. Submit number of copies specified in the General Requirements.
 - 2. Data shown on the Submittals will be complete with respect to quantities, dimensions, specified performance and design criteria, materials, and similar data to show City the services, materials, and equipment Contractor proposes to provide and to enable City to review the information for the limited purposes required by Paragraph 6.18.C.
 - 3. Submittals submitted as herein provided by Contractor and reviewed by City for conformance with the design concept shall be executed in conformity with the Contract Documents unless otherwise required by City.
 - 4. When Submittals are submitted for the purpose of showing the installation in greater detail, their review shall not excuse Contractor from requirements shown on the Drawings and Specifications.
 - 5. For-Information-Only submittals upon which the City is not expected to conduct review or take responsive action may be so identified in the Contract Documents.
 - 6. Submit required number of Samples specified in the Specifications.
 - 7. Clearly identify each Sample as to material, Supplier, pertinent data such as catalog numbers, the use for which intended and other data as City may require to enable City to review the submittal for the limited purposes required by Paragraph 6.18.C.

B. Where a Submittal is required by the Contract Documents or the Schedule of Submittals, any related Work performed prior to City's review and acceptance of the pertinent submittal will be at the sole expense and responsibility of Contractor.

C. *City's Review:*

1. City will provide timely review of required Submittals in accordance with the Schedule of Submittals acceptable to City. City's review and acceptance will be only to determine if the items covered by the submittals will, after installation or incorporation in the Work, conform to the information given in the Contract Documents and be compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents.
2. City's review and acceptance will not extend to means, methods, techniques, sequences, or procedures of construction (except where a particular means, method, technique, sequence, or procedure of construction is specifically and expressly called for by the Contract Documents) or to safety precautions or programs incident thereto. The review and acceptance of a separate item as such will not indicate approval of the assembly in which the item functions.
3. City's review and acceptance shall not relieve Contractor from responsibility for any variation from the requirements of the Contract Documents unless Contractor has complied with the requirements of Section 01 33 00 and City has given written acceptance of each such variation by specific written notation thereof incorporated in or accompanying the Submittal. City's review and acceptance shall not relieve Contractor from responsibility for complying with the requirements of the Contract Documents.

6.19 *Continuing the Work*

Except as otherwise provided, Contractor shall carry on the Work and adhere to the Project Schedule during all disputes or disagreements with City. No Work shall be delayed or postponed pending resolution of any disputes or disagreements, except as City and Contractor may otherwise agree in writing.

6.20 *Contractor's General Warranty and Guarantee*

- A. Contractor warrants and guarantees to City that all Work will be in accordance with the Contract Documents and will not be defective. City and its officers, directors, members, partners, employees, agents, consultants, and subcontractors shall be entitled to rely on representation of Contractor's warranty and guarantee.
- B. Contractor's warranty and guarantee hereunder excludes defects or damage caused by:
 1. abuse, modification, or improper maintenance or operation by persons other than Contractor, Subcontractors, Suppliers, or any other individual or entity for whom Contractor is responsible; or

2. normal wear and tear under normal usage.
- C. Contractor's obligation to perform and complete the Work in accordance with the Contract Documents shall be absolute. None of the following will constitute an acceptance of Work that is not in accordance with the Contract Documents or a release of Contractor's obligation to perform the Work in accordance with the Contract Documents:
1. observations by City;
 2. recommendation or payment by City of any progress or final payment;
 3. the issuance of a certificate of Final Acceptance by City or any payment related thereto by City;
 4. use or occupancy of the Work or any part thereof by City;
 5. any review and acceptance of a Submittal by City;
 6. any inspection, test, or approval by others; or
 7. any correction of defective Work by City.
- D. The Contractor shall remedy any defects or damages in the Work and pay for any damage to other work or property resulting therefrom which shall appear within a period of two (2) years from the date of Final Acceptance of the Work unless a longer period is specified and shall furnish a good and sufficient maintenance bond, complying with the requirements of Article 5.02.B. The City will give notice of observed defects with reasonable promptness.

6.21 Indemnification

- A. Contractor covenants and agrees to indemnify, hold harmless and defend, at its own expense, the City, its officers, servants and employees, from and against any and all claims arising out of, or alleged to arise out of, the work and services to be performed by the Contractor, its officers, agents, employees, subcontractors, licenses or invitees under this Contract. **THIS INDEMNIFICATION PROVISION IS SPECIFICALLY INTENDED TO OPERATE AND BE EFFECTIVE EVEN IF IT IS ALLEGED OR PROVEN THAT ALL OR SOME OF THE DAMAGES BEING SOUGHT WERE CAUSED, IN WHOLE OR IN PART, BY ANY ACT, OMISSION OR NEGLIGENCE OF THE CITY.** This indemnity provision is intended to include, without limitation, indemnity for costs, expenses and legal fees incurred by the City in defending against such claims and causes of actions.
- B. Contractor covenants and agrees to indemnify and hold harmless, at its own expense, the City, its officers, servants and employees, from and against any and all loss, damage or destruction of property of the City, arising out of, or alleged to arise out of, the work and services to be performed by the Contractor, its officers, agents, employees, subcontractors, licensees or invitees under this Contract. **THIS INDEMNIFICATION PROVISION IS**

SPECIFICALLY INTENDED TO OPERATE AND BE EFFECTIVE EVEN IF IT IS ALLEGED OR PROVEN THAT ALL OR SOME OF THE DAMAGES BEING SOUGHT WERE CAUSED, IN WHOLE OR IN PART, BY ANY ACT, OMISSION OR NEGLIGENCE OF THE CITY.

6.22 *Delegation of Professional Design Services*

- A. Contractor will not be required to provide professional design services unless such services are specifically required by the Contract Documents for a portion of the Work or unless such services are required to carry out Contractor's responsibilities for construction means, methods, techniques, sequences and procedures.
- B. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of Contractor by the Contract Documents, City will specify all performance and design criteria that such services must satisfy. Contractor shall cause such services or certifications to be provided by a properly licensed professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, and Submittals prepared by such professional. Submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to City.
- C. City shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications or approvals performed by such design professionals, provided City has specified to Contractor performance and design criteria that such services must satisfy.
- D. Pursuant to this Paragraph 6.22, City's review and acceptance of design calculations and design drawings will be only for the limited purpose of checking for conformance with performance and design criteria given and the design concept expressed in the Contract Documents. City's review and acceptance of Submittals (except design calculations and design drawings) will be only for the purpose stated in Paragraph 6.18.C.

6.23 *Right to Audit*

- A. The Contractor agrees that the City shall, until the expiration of three (3) years after final payment under this Contract, have access to and the right to examine and photocopy any directly pertinent books, documents, papers, and records of the Contractor involving transactions relating to this Contract. Contractor agrees that the City shall have access during Regular Working Hours to all necessary Contractor facilities and shall be provided adequate and appropriate work space in order to conduct audits in compliance with the provisions of this Paragraph. The City shall give Contractor reasonable advance notice of intended audits.
- B. Contractor further agrees to include in all its subcontracts hereunder a provision to the effect that the subcontractor agrees that the City shall, until the expiration of three (3) years after final payment under this Contract, have access to and the right to examine and photocopy any directly pertinent books, documents, papers, and records of such Subcontractor, involving transactions to the subcontract, and further, that City shall have access during Regular Working Hours to all

Subcontractor facilities, and shall be provided adequate and appropriate work space in order to conduct audits in compliance with the provisions of this Paragraph. The City shall give Subcontractor reasonable advance notice of intended audits.

- C. Contractor and Subcontractor agree to photocopy such documents as may be requested by the City. The City agrees to reimburse Contractor for the cost of the copies as follows at the rate published in the Texas Administrative Code in effect as of the time copying is performed.

6.24 *Nondiscrimination*

- A. The City is responsible for operating Public Transportation Programs and implementing transit-related projects, which are funded in part with Federal financial assistance awarded by the U.S. Department of Transportation and the Federal Transit Administration (FTA), without discriminating against any person in the United States on the basis of race, color, or national origin.
- B. *Title VI, Civil Rights Act of 1964 as amended:* Contractor shall comply with the requirements of the Act and the Regulations as further defined in the Supplementary Conditions for any project receiving Federal assistance.

ARTICLE 7 – OTHER WORK AT THE SITE

7.01 *Related Work at Site*

- A. City may perform other work related to the Project at the Site with City's employees, or other City contractors, or through other direct contracts therefor, or have other work performed by utility owners. If such other work is not noted in the Contract Documents, then written notice thereof will be given to Contractor prior to starting any such other work; and
- B. Contractor shall afford each other contractor who is a party to such a direct contract, each utility owner, and City, if City is performing other work with City's employees or other City contractors, proper and safe access to the Site, provide a reasonable opportunity for the introduction and storage of materials and equipment and the execution of such other work, and properly coordinate the Work with theirs. Contractor shall do all cutting, fitting, and patching of the Work that may be required to properly connect or otherwise make its several parts come together and properly integrate with such other work. Contractor shall not endanger any work of others by cutting, excavating, or otherwise altering such work; provided, however, that Contractor may cut or alter others' work with the written consent of City and the others whose work will be affected.
- C. If the proper execution or results of any part of Contractor's Work depends upon work performed by others under this Article 7, Contractor shall inspect such other work and promptly report to City in writing any delays, defects, or deficiencies in such other work that render it unavailable or unsuitable for the proper execution and results of Contractor's Work. Contractor's failure to so report will constitute an acceptance of such other work as fit and proper for integration with Contractor's Work except for latent defects in the work provided by others.

7.02 *Coordination*

- A. If City intends to contract with others for the performance of other work on the Project at the Site, the following will be set forth in Supplementary Conditions:
1. the individual or entity who will have authority and responsibility for coordination of the activities among the various contractors will be identified;
 2. the specific matters to be covered by such authority and responsibility will be itemized; and
 3. the extent of such authority and responsibilities will be provided.
- B. Unless otherwise provided in the Supplementary Conditions, City shall have authority for such coordination.

ARTICLE 8 – CITY’S RESPONSIBILITIES

8.01 *Communications to Contractor*

Except as otherwise provided in the Supplementary Conditions, City shall issue all communications to Contractor.

8.02 *Furnish Data*

City shall timely furnish the data required under the Contract Documents.

8.03 *Pay When Due*

City shall make payments to Contractor in accordance with Article 14.

8.04 *Lands and Easements; Reports and Tests*

City’s duties with respect to providing lands and easements and providing engineering surveys to establish reference points are set forth in Paragraphs 4.01 and 4.05. Paragraph 4.02 refers to City’s identifying and making available to Contractor copies of reports of explorations and tests of subsurface conditions and drawings of physical conditions relating to existing surface or subsurface structures at or contiguous to the Site that have been utilized by City in preparing the Contract Documents.

8.05 *Change Orders*

City shall execute Change Orders in accordance with Paragraph 10.03.

8.06 *Inspections, Tests, and Approvals*

City’s responsibility with respect to certain inspections, tests, and approvals is set forth in Paragraph 13.03.

8.07 *Limitations on City's Responsibilities*

A. The City shall not supervise, direct, or have control or authority over, nor be responsible for, Contractor's means, methods, techniques, sequences, or procedures of construction, or the safety precautions and programs incident thereto, or for any failure of Contractor to comply with Laws and Regulations applicable to the performance of the Work. City will not be responsible for Contractor's failure to perform the Work in accordance with the Contract Documents.

B. City will notify the Contractor of applicable safety plans pursuant to Paragraph 6.14.

8.08 *Undisclosed Hazardous Environmental Condition*

City's responsibility with respect to an undisclosed Hazardous Environmental Condition is set forth in Paragraph 4.06.

8.09 *Compliance with Safety Program*

While at the Site, City's employees and representatives shall comply with the specific applicable requirements of Contractor's safety programs of which City has been informed pursuant to Paragraph 6.14.

ARTICLE 9 – CITY'S OBSERVATION STATUS DURING CONSTRUCTION

9.01 *City's Project Manager*

City will provide one or more Project Manager(s) during the construction period. The duties and responsibilities and the limitations of authority of City's Project Manager during construction are set forth in the Contract Documents. The City's Project Manager for this Contract is identified in the Supplementary Conditions.

9.02 *Visits to Site*

A. City's Project Manager will make visits to the Site at intervals appropriate to the various stages of construction as City deems necessary in order to observe the progress that has been made and the quality of the various aspects of Contractor's executed Work. Based on information obtained during such visits and observations, City's Project Manager will determine, in general, if the Work is proceeding in accordance with the Contract Documents. City's Project Manager will not be required to make exhaustive or continuous inspections on the Site to check the quality or quantity of the Work. City's Project Manager's efforts will be directed toward providing City a greater degree of confidence that the completed Work will conform generally to the Contract Documents.

B. City's Project Manager's visits and observations are subject to all the limitations on authority and responsibility in the Contract Documents including those set forth in Paragraph 8.07.

9.03 *Authorized Variations in Work*

City's Project Manager may authorize minor variations in the Work from the requirements of the Contract Documents which do not involve an adjustment in the Contract Price or the Contract Time and are compatible with the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. These may be accomplished by a Field Order and will be binding on City and also on Contractor, who shall perform the Work involved promptly.

9.04 *Rejecting Defective Work*

City will have authority to reject Work which City's Project Manager believes to be defective, or will not produce a completed Project that conforms to the Contract Documents or that will prejudice the integrity of the design concept of the completed Project as a functioning whole as indicated by the Contract Documents. City will have authority to conduct special inspection or testing of the Work as provided in Article 13, whether or not the Work is fabricated, installed, or completed.

9.05 *Determinations for Work Performed*

Contractor will determine the actual quantities and classifications of Work performed. City's Project Manager will review with Contractor the preliminary determinations on such matters before rendering a written recommendation. City's written decision will be final (except as modified to reflect changed factual conditions or more accurate data).

9.06 *Decisions on Requirements of Contract Documents and Acceptability of Work*

- A. City will be the initial interpreter of the requirements of the Contract Documents and judge of the acceptability of the Work thereunder.
- B. City will render a written decision on any issue referred.
- C. City's written decision on the issue referred will be final and binding on the Contractor, subject to the provisions of Paragraph 10.06.

ARTICLE 10 – CHANGES IN THE WORK; CLAIMS; EXTRA WORK

10.01 *Authorized Changes in the Work*

- A. Without invalidating the Contract and without notice to any surety, City may, at any time or from time to time, order Extra Work. Upon notice of such Extra Work, Contractor shall promptly proceed with the Work involved which will be performed under the applicable conditions of the Contract Documents (except as otherwise specifically provided). Extra Work shall be memorialized by a Change Order which may or may not precede an order of Extra work.
- B. For minor changes of Work not requiring changes to Contract Time or Contract Price, a Field Order may be issued by the City.

10.02 *Unauthorized Changes in the Work*

Contractor shall not be entitled to an increase in the Contract Price or an extension of the Contract Time with respect to any work performed that is not required by the Contract Documents as amended, modified, or supplemented as provided in Paragraph 3.04, except in the case of an emergency as provided in Paragraph 6.17.

10.03 *Execution of Change Orders*

A. City and Contractor shall execute appropriate Change Orders covering:

1. changes in the Work which are: (i) ordered by City pursuant to Paragraph 10.01.A, (ii) required because of acceptance of defective Work under Paragraph 13.08 or City's correction of defective Work under Paragraph 13.09, or (iii) agreed to by the parties;
2. changes in the Contract Price or Contract Time which are agreed to by the parties, including any undisputed sum or amount of time for Work actually performed.

10.04 *Extra Work*

- A. Should a difference arise as to what does or does not constitute Extra Work, or as to the payment thereof, and the City insists upon its performance, the Contractor shall proceed with the work after making written request for written orders and shall keep accurate account of the actual reasonable cost thereof. Contract Claims regarding Extra Work shall be made pursuant to Paragraph 10.06.
- B. The Contractor shall furnish the City such installation records of all deviations from the original Contract Documents as may be necessary to enable the City to prepare for permanent record a corrected set of plans showing the actual installation.
- C. The compensation agreed upon for Extra Work whether or not initiated by a Change Order shall be a full, complete and final payment for all costs Contractor incurs as a result or relating to the change or Extra Work, whether said costs are known, unknown, foreseen or unforeseen at that time, including without limitation, any costs for delay, extended overhead, ripple or impact cost, or any other effect on changed or unchanged work as a result of the change or Extra Work.

10.05 *Notification to Surety*

If the provisions of any bond require notice to be given to a surety of any change affecting the general scope of the Work or the provisions of the Contract Documents (including, but not limited to, Contract Price or Contract Time), the giving of any such notice will be Contractor's responsibility. The amount of each applicable bond will be adjusted by the Contractor to reflect the effect of any such change.

10.06 *Contract Claims Process*

- A. *City's Decision Required:* All Contract Claims, except those waived pursuant to Paragraph 14.09, shall be referred to the City for decision. A decision by City shall be required as a condition precedent to any exercise by Contractor of any rights or remedies he may otherwise have under the Contract Documents or by Laws and Regulations in respect of such Contract Claims.
- B. *Notice:*
1. Written notice stating the general nature of each Contract Claim shall be delivered by the Contractor to City no later than 15 days after the start of the event giving rise thereto. The responsibility to substantiate a Contract Claim shall rest with the party making the Contract Claim.
 2. Notice of the amount or extent of the Contract Claim, with supporting data shall be delivered to the City on or before 45 days from the start of the event giving rise thereto (unless the City allows additional time for Contractor to submit additional or more accurate data in support of such Contract Claim).
 3. A Contract Claim for an adjustment in Contract Price shall be prepared in accordance with the provisions of Paragraph 12.01.
 4. A Contract Claim for an adjustment in Contract Time shall be prepared in accordance with the provisions of Paragraph 12.02.
 5. Each Contract Claim shall be accompanied by Contractor's written statement that the adjustment claimed is the entire adjustment to which the Contractor believes it is entitled as a result of said event.
 6. The City shall submit any response to the Contractor within 30 days after receipt of the claimant's last submittal (unless Contract allows additional time).
- C. *City's Action:* City will review each Contract Claim and, within 30 days after receipt of the last submittal of the Contractor, if any, take one of the following actions in writing:
1. deny the Contract Claim in whole or in part;
 2. approve the Contract Claim; or
 3. notify the Contractor that the City is unable to resolve the Contract Claim if, in the City's sole discretion, it would be inappropriate for the City to do so. For purposes of further resolution of the Contract Claim, such notice shall be deemed a denial.

- D. City's written action under Paragraph 10.06.C will be final and binding, unless City or Contractor invoke the dispute resolution procedure set forth in Article 16 within 30 days of such action or denial.
- E. No Contract Claim for an adjustment in Contract Price or Contract Time will be valid if not submitted in accordance with this Paragraph 10.06.

**ARTICLE 11 – COST OF THE WORK; ALLOWANCES; UNIT PRICE WORK; PLANS
QUANTITY MEASUREMENT**

11.01 *Cost of the Work*

- A. *Costs Included:* The term Cost of the Work means the sum of all costs, except those excluded in Paragraph 11.01.B, necessarily incurred and paid by Contractor in the proper performance of the Work. When the value of any Work covered by a Change Order, the costs to be reimbursed to Contractor will be only those additional or incremental costs required because of the change in the Work. Such costs shall not include any of the costs itemized in Paragraph 11.01.B, and shall include but not be limited to the following items:
 - 1. Payroll costs for employees in the direct employ of Contractor in the performance of the Work under schedules of job classifications agreed upon by City and Contractor. Such employees shall include, without limitation, superintendents, foremen, and other personnel employed full time on the Work. Payroll costs for employees not employed full time on the Work shall be apportioned on the basis of their time spent on the Work. Payroll costs shall include;
 - a. salaries with a 55% markup, or
 - b. salaries and wages plus the cost of fringe benefits, which shall include social security contributions, unemployment, excise, and payroll taxes, workers' compensation, health and retirement benefits, bonuses, sick leave, vacation and holiday pay applicable thereto. The expenses of performing Work outside of Regular Working Hours, Weekend Working Hours, or legal holidays, shall be included in the above to the extent authorized by City.
 - 2. Cost of all materials and equipment furnished and incorporated in the Work, including costs of transportation and storage thereof, and Suppliers' field services required in connection therewith.
 - 3. Rentals of all construction equipment and machinery, and the parts thereof whether rented from Contractor or others in accordance with rental agreements approved by City, and the costs of transportation, loading, unloading, assembly, dismantling, and removal thereof. All such costs shall be in accordance with the terms of said rental agreements. The rental of any such equipment, machinery, or parts shall cease when the use thereof is no longer necessary for the Work.

4. Payments made by Contractor to Subcontractors for Work performed by Subcontractors. If required by City, Contractor shall obtain competitive bids from subcontractors acceptable to City and Contractor and shall deliver such bids to City, who will then determine, which bids, if any, will be acceptable. If any subcontract provides that the Subcontractor is to be paid on the basis of Cost of the Work plus a fee, the Subcontractor's Cost of the Work and fee shall be determined in the same manner as Contractor's Cost of the Work and fee as provided in this Paragraph 11.01.
5. Costs of special consultants (including but not limited to engineers, architects, testing laboratories, surveyors, attorneys, and accountants) employed for services specifically related to the Work.
6. Supplemental costs including the following:
 - a. The proportion of necessary transportation, travel, and subsistence expenses of Contractor's employees incurred in discharge of duties connected with the Work.
 - b. Cost, including transportation and maintenance, of all materials, supplies, equipment, machinery, appliances, office, and temporary facilities at the Site, and hand tools not owned by the workers, which are consumed in the performance of the Work, and cost, less market value, of such items used but not consumed which remain the property of Contractor.
 - c. Sales, consumer, use, and other similar taxes related to the Work, and for which Contractor is liable not covered under Paragraph 6.11, as imposed by Laws and Regulations.
 - d. Deposits lost for causes other than negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, and royalty payments and fees for permits and licenses.
 - e. Losses and damages (and related expenses) caused by damage to the Work, not compensated by insurance or otherwise, sustained by Contractor in connection with the performance of the Work, provided such losses and damages have resulted from causes other than the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable. Such losses shall include settlements made with the written consent and approval of City. No such losses, damages, and expenses shall be included in the Cost of the Work for the purpose of determining Contractor's fee.
 - f. The cost of utilities, fuel, and sanitary facilities at the Site.
 - g. Minor expenses such as telegrams, long distance telephone calls, telephone and communication services at the Site, express and courier services, and similar petty cash items in connection with the Work.

h. The costs of premiums for all bonds and insurance Contractor is required by the Contract Documents to purchase and maintain.

B. *Costs Excluded:* The term Cost of the Work shall not include any of the following items:

1. Payroll costs and other compensation of Contractor's officers, executives, principals (of partnerships and sole proprietorships), general managers, safety managers, engineers, architects, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expeditors, timekeepers, clerks, and other personnel employed by Contractor, whether at the Site or in Contractor's principal or branch office for general administration of the Work and not specifically included in the agreed upon schedule of job classifications referred to in Paragraph 11.01.A.1 or specifically covered by Paragraph 11.01.A.4, all of which are to be considered administrative costs covered by the Contractor's fee.
2. Expenses of Contractor's principal and branch offices other than Contractor's office at the Site.
3. Any part of Contractor's capital expenses, including interest on Contractor's capital employed for the Work and charges against Contractor for delinquent payments.
4. Costs due to the negligence of Contractor, any Subcontractor, or anyone directly or indirectly employed by any of them or for whose acts any of them may be liable, including but not limited to, the correction of defective Work, disposal of materials or equipment wrongly supplied, and making good any damage to property.
5. Other overhead or general expense costs of any kind.

C. *Contractor's Fee:* When all the Work is performed on the basis of cost-plus, Contractor's fee shall be determined as set forth in the Agreement. When the value of any Work covered by a Change Order for an adjustment in Contract Price is determined on the basis of Cost of the Work, Contractor's fee shall be determined as set forth in Paragraph 12.01.C.

D. *Documentation:* Whenever the Cost of the Work for any purpose is to be determined pursuant to Paragraphs 11.01.A and 11.01.B, Contractor will establish and maintain records thereof in accordance with generally accepted accounting practices and submit in a form acceptable to City an itemized cost breakdown together with supporting data.

11.02 Allowances

A. *Specified Allowance:* It is understood that Contractor has included in the Contract Price all allowances so named in the Contract Documents and shall cause the Work so covered to be performed for such sums and by such persons or entities as may be acceptable to City.

B. *Pre-bid Allowances:*

1. Contractor agrees that:

- a. the pre-bid allowances include the cost to Contractor of materials and equipment required by the allowances to be delivered at the Site, and all applicable taxes; and
 - b. Contractor's costs for unloading and handling on the Site, labor, installation, overhead, profit, and other expenses contemplated for the pre-bid allowances have been included in the allowances, and no demand for additional payment on account of any of the foregoing will be valid.
- C. *Contingency Allowance*: Contractor agrees that a contingency allowance, if any, is for the sole use of City.
- D. Prior to final payment, an appropriate Change Order will be issued to reflect actual amounts due Contractor on account of Work covered by allowances, and the Contract Price shall be correspondingly adjusted.

11.03 *Unit Price Work*

- A. Where the Contract Documents provide that all or part of the Work is to be Unit Price Work, initially the Contract Price will be deemed to include for all Unit Price Work an amount equal to the sum of the unit price for each separately identified item of Unit Price Work times the estimated quantity of each item as indicated in the Agreement.
- B. The estimated quantities of items of Unit Price Work are not guaranteed and are solely for the purpose of comparison of Bids and determining an initial Contract Price. Determinations of the actual quantities and classifications of Unit Price Work performed by Contractor will be made by City subject to the provisions of Paragraph 9.05.
- C. Each unit price will be deemed to include an amount considered by Contractor to be adequate to cover Contractor's overhead and profit for each separately identified item. Work described in the Contract Documents, or reasonably inferred as required for a functionally complete installation, but not identified in the listing of unit price items shall be considered incidental to unit price work listed and the cost of incidental work included as part of the unit price.
- D. City may make an adjustment in the Contract Price in accordance with Paragraph 12.01 if:
 1. the quantity of any item of Unit Price Work performed by Contractor differs materially and significantly from the estimated quantity of such item indicated in the Agreement; and
 2. there is no corresponding adjustment with respect to any other item of Work.
- E. *Increased or Decreased Quantities*: The City reserves the right to order Extra Work in accordance with Paragraph 10.01.
 1. If the changes in quantities or the alterations do not significantly change the character of work under the Contract Documents, the altered work will be paid for at the Contract unit price.

2. If the changes in quantities or alterations significantly change the character of work, the Contract will be amended by a Change Order.
3. If no unit prices exist, this will be considered Extra Work and the Contract will be amended by a Change Order in accordance with Article 12.
4. A significant change in the character of work occurs when:
 - a. the character of work for any Item as altered differs materially in kind or nature from that in the Contract or
 - b. a Major Item of work varies by more than 25% from the original Contract quantity.
5. When the quantity of work to be done under any Major Item of the Contract is more than 125% of the original quantity stated in the Contract, then either party to the Contract may request an adjustment to the unit price on the portion of the work that is above 125%.
6. When the quantity of work to be done under any Major Item of the Contract is less than 75% of the original quantity stated in the Contract, then either party to the Contract may request an adjustment to the unit price.

11.04 *Plans Quantity Measurement*

- A. Plans quantities may or may not represent the exact quantity of work performed or material moved, handled, or placed during the execution of the Contract. The estimated bid quantities are designated as final payment quantities, unless revised by the governing Section or this Article.
- B. If the quantity measured as outlined under "Price and Payment Procedures" varies by more than 25% (or as stipulated under "Price and Payment Procedures" for specific Items) from the total estimated quantity for an individual Item originally shown in the Contract Documents, an adjustment may be made to the quantity of authorized work done for payment purposes. The party to the Contract requesting the adjustment will provide field measurements and calculations showing the final quantity for which payment will be made. Payment for revised quantity will be made at the unit price bid for that Item, except as provided for in Article 10.
- C. When quantities are revised by a change in design approved by the City, by Change Order, or to correct an error, or to correct an error on the plans, the plans quantity will be increased or decreased by the amount involved in the change, and the 25% variance will apply to the new plans quantity.
- D. If the total Contract quantity multiplied by the unit price bid for an individual Item is less than \$250 and the Item is not originally a plans quantity Item, then the Item may be paid as a plans quantity Item if the City and Contractor agree in writing to fix the final quantity as a plans quantity.

- E. For callout work or non-site specific Contracts, the plans quantity measurement requirements are not applicable.

ARTICLE 12 – CHANGE OF CONTRACT PRICE; CHANGE OF CONTRACT TIME

12.01 *Change of Contract Price*

- A. The Contract Price may only be changed by a Change Order.
- B. The value of any Work covered by a Change Order will be determined as follows:
 - 1. where the Work involved is covered by unit prices contained in the Contract Documents, by application of such unit prices to the quantities of the items involved (subject to the provisions of Paragraph 11.03); or
 - 2. where the Work involved is not covered by unit prices contained in the Contract Documents, by a mutually agreed lump sum or unit price (which may include an allowance for overhead and profit not necessarily in accordance with Paragraph 12.01.C.2), and shall include the cost of any secondary impacts that are foreseeable at the time of pricing the cost of Extra Work; or
 - 3. where the Work involved is not covered by unit prices contained in the Contract Documents and agreement to a lump sum or unit price is not reached under Paragraph 12.01.B.2, on the basis of the Cost of the Work (determined as provided in Paragraph 11.01) plus a Contractor's fee for overhead and profit (determined as provided in Paragraph 12.01.C).
- C. *Contractor's Fee*: The Contractor's additional fee for overhead and profit shall be determined as follows:
 - 1. a mutually acceptable fixed fee; or
 - 2. if a fixed fee is not agreed upon, then a fee based on the following percentages of the various portions of the Cost of the Work:
 - a. for costs incurred under Paragraphs 11.01.A.1, 11.01.A.2. and 11.01.A.3, the Contractor's additional fee shall be 15 percent except for:
 - 1) rental fees for Contractor's own equipment using standard rental rates;
 - 2) bonds and insurance;
 - b. for costs incurred under Paragraph 11.01.A.4 and 11.01.A.5, the Contractor's fee shall be five percent (5%);
 - 1) where one or more tiers of subcontracts are on the basis of Cost of the Work plus a fee and no fixed fee is agreed upon, the intent of Paragraphs 12.01.C.2.a and 12.01.C.2.b is that the Subcontractor who actually performs the Work, at whatever

tier, will be paid a fee of 15 percent of the costs incurred by such Subcontractor under Paragraphs 11.01.A.1 and 11.01.A.2 and that any higher tier Subcontractor and Contractor will each be paid a fee of five percent (5%) of the amount paid to the next lower tier Subcontractor, however in no case shall the cumulative total of fees paid be in excess of 25%;

- c. no fee shall be payable on the basis of costs itemized under Paragraphs 11.01.A.6, and 11.01.B;
- d. the amount of credit to be allowed by Contractor to City for any change which results in a net decrease in cost will be the amount of the actual net decrease in cost plus a deduction in Contractor's fee by an amount equal to five percent (5%) of such net decrease.

12.02 *Change of Contract Time*

- A. The Contract Time may only be changed by a Change Order.
- B. No extension of the Contract Time will be allowed for Extra Work or for claimed delay unless the Extra Work contemplated or claimed delay is shown to be on the critical path of the Project Schedule or Contractor can show by Critical Path Method analysis how the Extra Work or claimed delay adversely affects the critical path.

12.03 *Delays*

- A. Where Contractor is reasonably delayed in the performance or completion of any part of the Work within the Contract Time due to delay beyond the control of Contractor, the Contract Time may be extended in an amount equal to the time lost due to such delay if a Contract Claim is made therefor. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by City, acts or neglect of utility owners or other contractors performing other work as contemplated by Article 7, fires, floods, epidemics, abnormal weather conditions, or acts of God. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph.
- B. If Contractor is delayed, City shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
- C. Contractor shall not be entitled to an adjustment in Contract Price or Contract Time for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of Contractor.
- D. The Contractor shall receive no compensation for delays or hindrances to the Work, except when direct and unavoidable extra cost to the Contractor is caused by the failure of the City to provide information or material, if any, which is to be furnished by the City.

ARTICLE 13 – TESTS AND INSPECTIONS; CORRECTION, REMOVAL OR ACCEPTANCE OF DEFECTIVE WORK

13.01 Notice of Defects

Notice of all defective Work of which City has actual knowledge will be given to Contractor. Defective Work may be rejected, corrected, or accepted as provided in this Article 13.

13.02 Access to Work

City, independent testing laboratories, and governmental agencies with jurisdictional interests will have access to the Site and the Work at reasonable times for their observation, inspection, and testing. Contractor shall provide them proper and safe conditions for such access and advise them of Contractor's safety procedures and programs so that they may comply therewith as applicable.

13.03 Tests and Inspections

- A. Contractor shall give City timely notice of readiness of the Work for all required inspections, tests, or approvals and shall cooperate with inspection and testing personnel to facilitate required inspections or tests.
- B. If Contract Documents, Laws or Regulations of any public body having jurisdiction require any of the Work (or part thereof) to be inspected, tested, or approved, Contractor shall assume full responsibility for arranging and obtaining such independent inspections, tests, retests or approvals, pay all costs in connection therewith, and furnish City the required certificates of inspection or approval; excepting, however, those fees specifically identified in the Supplementary Conditions or any Texas Department of Licensure and Regulation (TDLR) inspections, which shall be paid as described in the Supplementary Conditions.
- C. Contractor shall be responsible for arranging and obtaining and shall pay all costs in connection with any inspections, tests, re-tests, or approvals required for City's acceptance of materials or equipment to be incorporated in the Work; or acceptance of materials, mix designs, or equipment submitted for approval prior to Contractor's purchase thereof for incorporation in the Work. Such inspections, tests, re-tests, or approvals shall be performed by organizations acceptable to City.
- D. City may arrange for the services of an independent testing laboratory ("Testing Lab") to perform any inspections or tests ("Testing") for any part of the Work, as determined solely by City.
 - 1. City will coordinate such Testing to the extent possible, with Contractor;
 - 2. Should any Testing under this Section 13.03 D result in a "fail", "did not pass" or other similar negative result, the Contractor shall be responsible for paying for any and all retests. Contractor's cancellation without cause of City initiated Testing shall be deemed a negative result and require a retest.

3. Any amounts owed for any retest under this Section 13.03 D shall be paid directly to the Testing Lab by Contractor. City will forward all invoices for retests to Contractor.
4. If Contractor fails to pay the Testing Lab, City will not issue Final Payment until the Testing Lab is paid.
- E. If any Work (or the work of others) that is to be inspected, tested, or approved is covered by Contractor without written concurrence of City, Contractor shall, if requested by City, uncover such Work for observation.
- F. Uncovering Work as provided in Paragraph 13.03.E shall be at Contractor's expense.
- G. Contractor shall have the right to make a Contract Claim regarding any retest or invoice issued under Section 13.03 D.

13.04 *Uncovering Work*

- A. If any Work is covered contrary to the Contract Documents or specific instructions by the City, it must, if requested by City, be uncovered for City's observation and replaced at Contractor's expense.
- B. If City considers it necessary or advisable that covered Work be observed by City or inspected or tested by others, Contractor, at City's request, shall uncover, expose, or otherwise make available for observation, inspection, or testing as City may require, that portion of the Work in question, furnishing all necessary labor, material, and equipment.
 1. If it is found that the uncovered Work is defective, Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) arising out of or relating to such uncovering, exposure, observation, inspection, and testing, and of satisfactory replacement or reconstruction (including but not limited to all costs of repair or replacement of work of others); or City shall be entitled to accept defective Work in accordance with Paragraph 13.08 in which case Contractor shall still be responsible for all costs associated with exposing, observing, and testing the defective Work.
 2. If the uncovered Work is not found to be defective, Contractor shall be allowed an increase in the Contract Price or an extension of the Contract Time, or both, directly attributable to such uncovering, exposure, observation, inspection, testing, replacement, and reconstruction.

13.05 *City May Stop the Work*

If the Work is defective, or Contractor fails to supply sufficient skilled workers or suitable materials or equipment, or fails to perform the Work in such a way that the completed Work will conform to the Contract Documents, City may order Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, this right of City to stop the Work shall not give rise to any duty on the part of City to exercise this right for the benefit of Contractor, any

Subcontractor, any Supplier, any other individual or entity, or any surety for, or employee or agent of any of them.

13.06 *Correction or Removal of Defective Work*

- A. Promptly after receipt of written notice, Contractor shall correct all defective Work pursuant to an acceptable schedule, whether or not fabricated, installed, or completed, or, if the Work has been rejected by City, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, additional testing, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others). Failure to require the removal of any defective Work shall not constitute acceptance of such Work.
- B. When correcting defective Work under the terms of this Paragraph 13.06 or Paragraph 13.07, Contractor shall take no action that would void or otherwise impair City's special warranty and guarantee, if any, on said Work.

13.07 *Correction Period*

- A. If within two (2) years after the date of Final Acceptance (or such longer period of time as may be prescribed by the terms of any applicable special guarantee required by the Contract Documents), any Work is found to be defective, or if the repair of any damages to the land or areas made available for Contractor's use by City or permitted by Laws and Regulations as contemplated in Paragraph 6.10.A is found to be defective, Contractor shall promptly, without cost to City and in accordance with City's written instructions:
 - 1. repair such defective land or areas; or
 - 2. correct such defective Work; or
 - 3. if the defective Work has been rejected by City, remove it from the Project and replace it with Work that is not defective, and
 - 4. satisfactorily correct or repair or remove and replace any damage to other Work, to the work of others or other land or areas resulting therefrom.
- B. If Contractor does not promptly comply with the terms of City's written instructions, or in an emergency where delay would cause serious risk of loss or damage, City may have the defective Work corrected or repaired or may have the rejected Work removed and replaced. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) arising out of or relating to such correction or repair or such removal and replacement (including but not limited to all costs of repair or replacement of work of others) will be paid by Contractor.

- C. In special circumstances where a particular item of equipment is placed in continuous service before Final Acceptance of all the Work, the correction period for that item may start to run from an earlier date if so provided in the Contract Documents.
- D. Where defective Work (and damage to other Work resulting therefrom) has been corrected or removed and replaced under this Paragraph 13.07, the correction period hereunder with respect to such Work may be required to be extended for an additional period of one year after the end of the initial correction period. City shall provide 30 days written notice to Contractor should such additional warranty coverage be required. Contractor may dispute this requirement by filing a Contract Claim, pursuant to Paragraph 10.06.
- E. Contractor's obligations under this Paragraph 13.07 are in addition to any other obligation or warranty. The provisions of this Paragraph 13.07 shall not be construed as a substitute for, or a waiver of, the provisions of any applicable statute of limitation or repose.

13.08 *Acceptance of Defective Work*

If, instead of requiring correction or removal and replacement of defective Work, City prefers to accept it, City may do so. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution costs) attributable to City's evaluation of and determination to accept such defective Work and for the diminished value of the Work to the extent not otherwise paid by Contractor. If any such acceptance occurs prior to Final Acceptance, a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work, and City shall be entitled to an appropriate decrease in the Contract Price, reflecting the diminished value of Work so accepted.

13.09 *City May Correct Defective Work*

- A. If Contractor fails within a reasonable time after written notice from City to correct defective Work, or to remove and replace rejected Work as required by City in accordance with Paragraph 13.06.A, or if Contractor fails to perform the Work in accordance with the Contract Documents, or if Contractor fails to comply with any other provision of the Contract Documents, City may, after seven (7) days written notice to Contractor, correct, or remedy any such deficiency.
- B. In exercising the rights and remedies under this Paragraph 13.09, City shall proceed expeditiously. In connection with such corrective or remedial action, City may exclude Contractor from all or part of the Site, take possession of all or part of the Work and suspend Contractor's services related thereto, and incorporate in the Work all materials and equipment incorporated in the Work, stored at the Site or for which City has paid Contractor but which are stored elsewhere. Contractor shall allow City, City's representatives, agents, consultants, employees, and City's other contractors, access to the Site to enable City to exercise the rights and remedies under this Paragraph.
- C. All claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or other dispute resolution

costs) incurred or sustained by City in exercising the rights and remedies under this Paragraph 13.09 will be charged against Contractor, and a Change Order will be issued incorporating the necessary revisions in the Contract Documents with respect to the Work; and City shall be entitled to an appropriate decrease in the Contract Price.

- D. Contractor shall not be allowed an extension of the Contract Time because of any delay in the performance of the Work attributable to the exercise of City's rights and remedies under this Paragraph 13.09.

ARTICLE 14 – PAYMENTS TO CONTRACTOR AND COMPLETION

14.01 Schedule of Values

The Schedule of Values for lump sum contracts established as provided in Paragraph 2.07 will serve as the basis for progress payments and will be incorporated into a form of Application for Payment acceptable to City. Progress payments on account of Unit Price Work will be based on the number of units completed.

14.02 Progress Payments

A. Applications for Payments:

1. Contractor is responsible for providing all information as required to become a vendor of the City.
2. At least 20 days before the date established in the General Requirements for each progress payment, Contractor shall submit to City for review an Application for Payment filled out and signed by Contractor covering the Work completed as of the date of the Application and accompanied by such supporting documentation as is required by the Contract Documents.
3. If payment is requested on the basis of materials and equipment not incorporated in the Work but delivered and suitably stored at the Site or at another location agreed to in writing, the Application for Payment shall also be accompanied by a bill of sale, invoice, or other documentation warranting that City has received the materials and equipment free and clear of all Liens and evidence that the materials and equipment are covered by appropriate insurance or other arrangements to protect City's interest therein, all of which must be satisfactory to City.
4. Beginning with the second Application for Payment, each Application shall include an affidavit of Contractor stating that previous progress payments received on account of the Work have been applied on account to discharge Contractor's legitimate obligations associated with prior Applications for Payment.
5. The amount of retainage with respect to progress payments will be as described in subsection C. unless otherwise stipulated in the Contract Documents.

B. *Review of Applications:*

1. City will, after receipt of each Application for Payment, either indicate in writing a recommendation of payment or return the Application to Contractor indicating reasons for refusing payment. In the latter case, Contractor may make the necessary corrections and resubmit the Application.
2. City's processing of any payment requested in an Application for Payment will be based on City's observations of the executed Work, and on City's review of the Application for Payment and the accompanying data and schedules, that to the best of City's knowledge:
 - a. the Work has progressed to the point indicated;
 - b. the quality of the Work is generally in accordance with the Contract Documents (subject to an evaluation of the Work as a functioning whole prior to or upon Final Acceptance, the results of any subsequent tests called for in the Contract Documents, a final determination of quantities and classifications for Work performed under Paragraph 9.05, and any other qualifications stated in the recommendation).
3. Processing any such payment will not thereby be deemed to have represented that:
 - a. inspections made to check the quality or the quantity of the Work as it has been performed have been exhaustive, extended to every aspect of the Work in progress, or involved detailed inspections of the Work beyond the responsibilities specifically assigned to City in the Contract Documents; or
 - b. there may not be other matters or issues between the parties that might entitle Contractor to be paid additionally by City or entitle City to withhold payment to Contractor; or
 - c. Contractor has complied with Laws and Regulations applicable to Contractor's performance of the Work.
4. City may refuse to process the whole or any part of any payment because of subsequently discovered evidence or the results of subsequent inspections or tests, and revise or revoke any such payment previously made, to such extent as may be necessary to protect City from loss because:
 - a. the Work is defective or completed Work has been damaged by the Contractor or subcontractors requiring correction or replacement;
 - b. discrepancies in quantities contained in previous applications for payment;
 - c. the Contract Price has been reduced by Change Orders;
 - d. City has been required to correct defective Work or complete Work in accordance with Paragraph 13.09; or

e. City has actual knowledge of the occurrence of any of the events enumerated in Paragraph 15.02.A.

C. *Retainage:*

1. For contracts less than \$400,000 at the time of execution, retainage shall be ten percent (10%).
2. For contracts greater than \$400,000 at the time of execution, retainage shall be five percent (5%).

D. *Liquidated Damages.* For each calendar day that any work shall remain uncompleted after the time specified in the Contract Documents, the sum per day specified in the Agreement will be assessed against the monies due the Contractor, not as a penalty, but as damages suffered by the City.

E. *Payment:* Contractor will be paid pursuant to the requirements of this Article 14 and payment will become due in accordance with the Contract Documents.

F. *Reduction in Payment:*

1. City may refuse to make payment of the amount requested because:
 - a. Liens have been filed in connection with the Work, except where Contractor has delivered a specific bond satisfactory to City to secure the satisfaction and discharge of such Liens;
 - b. there are other items entitling City to a set-off against the amount recommended; or
 - c. City has actual knowledge of the occurrence of any of the events enumerated in Paragraphs 14.02.B.4.a through 14.02.B.4.e or Paragraph 15.02.A.
2. If City refuses to make payment of the amount requested, City will give Contractor written notice stating the reasons for such action and pay Contractor any amount remaining after deduction of the amount so withheld. City shall pay Contractor the amount so withheld, or any adjustment thereto agreed to by City and Contractor, when Contractor remedies the reasons for such action.

14.03 *Contractor's Warranty of Title*

Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to City no later than the time of payment free and clear of all Liens.

14.04 *Partial Utilization*

- A. Prior to Final Acceptance of all the Work, City may use or occupy any part of the Work which has specifically been identified in the Contract Documents, or which City determines constitutes a separately functioning and usable part of the Work that can be used for its intended purpose without significant interference with Contractor's performance of the remainder of the Work. City at any time may notify Contractor in writing to permit City to use or occupy any such part of the Work which City determines to be ready for its intended use, subject to the following conditions:
1. Contractor at any time may notify City in writing that Contractor considers any such part of the Work ready for its intended use.
 2. Within a reasonable time after notification as enumerated in Paragraph 14.05.A.1, City and Contractor shall make an inspection of that part of the Work to determine its status of completion. If City does not consider that part of the Work to be substantially complete, City will notify Contractor in writing giving the reasons therefor.
 3. Partial Utilization will not constitute Final Acceptance by City.

14.05 *Final Inspection*

- A. Upon written notice from Contractor that the entire Work is Substantially Complete in accordance with the Contract Documents:
1. Within 10 days, City will schedule a Final Inspection with Contractor.
 2. City will notify Contractor in writing of all particulars in which this inspection reveals that the Work is incomplete or defective ("Punch List Items"). Contractor shall immediately take such measures as are necessary to complete such Work or remedy such deficiencies.
- B. No time charge will be made against the Contractor between said date of notification to the City of Substantial Completion and the date of Final Inspection.
1. Should the City determine that the Work is not ready for Final Inspection, City will notify the Contractor in writing of the reasons and Contract Time will resume.
 2. Should the City concur that Substantial Completion has been achieved with the exception of any Punch List Items, Contract Time will resume for the duration it takes for Contractor to achieve Final Acceptance.

14.06 *Final Acceptance*

Upon completion by Contractor to City's satisfaction, of any additional Work identified in the Final Inspection, City will issue to Contractor a letter of Final Acceptance.

14.07 *Final Payment*

A. *Application for Payment:*

1. Upon Final Acceptance, and in the opinion of City, Contractor may make an application for final payment following the procedure for progress payments in accordance with the Contract Documents.
2. The final Application for Payment shall be accompanied (except as previously delivered) by:
 - a. all documentation called for in the Contract Documents, including but not limited to the evidence of insurance required by Paragraph 5.03;
 - b. consent of the surety, if any, to final payment;
 - c. a list of all pending or released Damage Claims against City that Contractor believes are unsettled; and
 - d. affidavits of payments and complete and legally effective releases or waivers (satisfactory to City) of all Lien rights arising out of or Liens filed in connection with the Work.

B. *Payment Becomes Due:*

1. After City's acceptance of the Application for Payment and accompanying documentation, requested by Contractor, less previous payments made and any sum City is entitled, including but not limited to liquidated damages, will become due and payable.
2. After all Damage Claims have been resolved:
 - a. directly by the Contractor or;
 - b. Contractor provides evidence that the Damage Claim has been reported to Contractor's insurance provider for resolution.
3. The making of the final payment by the City shall not relieve the Contractor of any guarantees or other requirements of the Contract Documents which specifically continue thereafter.

14.08 *Final Completion Delayed and Partial Retainage Release*

- A. If final completion of the Work is significantly delayed, and if City so confirms, City may, upon receipt of Contractor's final Application for Payment, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance to be held by City for Work not fully completed or corrected is less than the retainage stipulated in Paragraph 14.02.C, and if bonds have been furnished as required in Paragraph 5.02, the written consent of the surety to the payment of the balance due for that

portion of the Work fully completed and accepted shall be submitted by Contractor to City with the Application for such payment. Such payment shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of Contract Claims.

- B. *Partial Retainage Release.* For a Contract that provides for a separate vegetative establishment and maintenance, and test and performance periods following the completion of all other construction in the Contract Documents for all Work locations, the City may release a portion of the amount retained provided that all other work is completed as determined by the City. Before the release, all submittals and final quantities must be completed and accepted for all other work. An amount sufficient to ensure Contract compliance will be retained.

14.09 *Waiver of Claims*

The acceptance of final payment will constitute a release of the City from all claims or liabilities under the Contract for anything done or furnished or relating to the work under the Contract Documents or any act or neglect of City related to or connected with the Contract.

ARTICLE 15 – SUSPENSION OF WORK AND TERMINATION

15.01 *City May Suspend Work*

- A. At any time and without cause, City may suspend the Work or any portion thereof by written notice to Contractor and which may fix the date on which Work will be resumed. Contractor shall resume the Work on the date so fixed. During temporary suspension of the Work covered by these Contract Documents, for any reason, the City will make no extra payment for stand-by time of construction equipment and/or construction crews.
- B. Should the Contractor not be able to complete a portion of the Project due to causes beyond the control of and without the fault or negligence of the Contractor, and should it be determined by mutual consent of the Contractor and City that a solution to allow construction to proceed is not available within a reasonable period of time, Contractor may request an extension in Contract Time, directly attributable to any such suspension.
- C. If it should become necessary to suspend the Work for an indefinite period, the Contractor shall store all materials in such a manner that they will not obstruct or impede the public unnecessarily nor become damaged in any way, and he shall take every precaution to prevent damage or deterioration of the work performed; he shall provide suitable drainage about the work, and erect temporary structures where necessary.
- D. Contractor may be reimbursed for the cost of moving his equipment off the job and returning the necessary equipment to the job when it is determined by the City that construction may be resumed. Such reimbursement shall be based on actual cost to the Contractor of moving the equipment and no profit will be allowed. Reimbursement may not be allowed if the equipment is moved to another construction project for the City.

15.02 *City May Terminate for Cause*

- A. The occurrence of any one or more of the following events by way of example, but not of limitation, may justify termination for cause:
1. Contractor's persistent failure to perform the Work in accordance with the Contract Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment, failure to adhere to the Project Schedule established under Paragraph 2.07 as adjusted from time to time pursuant to Paragraph 6.04, or failure to adhere to the City's Business Diversity Enterprise Ordinance #20020-12-2011 established under Paragraph 6.06.D);
 2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction;
 3. Contractor's repeated disregard of the authority of City; or
 4. Contractor's violation in any substantial way of any provisions of the Contract Documents; or
 5. Contractor's failure to promptly make good any defect in materials or workmanship, or defects of any nature, the correction of which has been directed in writing by the City; or
 6. Substantial indication that the Contractor has made an unauthorized assignment of the Contract or any funds due therefrom for the benefit of any creditor or for any other purpose; or
 7. Substantial evidence that the Contractor has become insolvent or bankrupt, or otherwise financially unable to carry on the Work satisfactorily; or
 8. Contractor commences legal action in a court of competent jurisdiction against the City.
- B. If one or more of the events identified in Paragraph 15.02A. occur, City will provide written notice to Contractor and Surety to arrange a conference with Contractor and Surety to address Contractor's failure to perform the Work. Conference shall be held not later than 15 days, after receipt of notice.
1. If the City, the Contractor, and the Surety do not agree to allow the Contractor to proceed to perform the construction Contract, the City may, to the extent permitted by Laws and Regulations, declare a Contractor default and formally terminate the Contractor's right to complete the Contract. Contractor default shall not be declared earlier than 20 days after the Contractor and Surety have received notice of conference to address Contractor's failure to perform the Work.
 2. If Contractor's services are terminated, Surety shall be obligated to take over and perform the Work. If Surety does not commence performance thereof within 15 consecutive calendar days after date of an additional written notice demanding Surety's performance of its

obligations, then City, without process or action at law, may take over any portion of the Work and complete it as described below.

- a. If City completes the Work, City may exclude Contractor and Surety from the site and take possession of the Work, and all materials and equipment incorporated into the Work stored at the Site or for which City has paid Contractor or Surety but which are stored elsewhere, and finish the Work as City may deem expedient.
3. Whether City or Surety completes the Work, Contractor shall not be entitled to receive any further payment until the Work is finished. If the unpaid balance of the Contract Price exceeds all claims, costs, losses and damages sustained by City arising out of or resulting from completing the Work, such excess will be paid to Contractor. If such claims, costs, losses and damages exceed such unpaid balance, Contractor shall pay the difference to City. Such claims, costs, losses and damages incurred by City will be incorporated in a Change Order, provided that when exercising any rights or remedies under this Paragraph, City shall not be required to obtain the lowest price for the Work performed.
 4. Neither City, nor any of its respective consultants, agents, officers, directors or employees shall be in any way liable or accountable to Contractor or Surety for the method by which the completion of the said Work, or any portion thereof, may be accomplished or for the price paid therefor.
 5. City, notwithstanding the method used in completing the Contract, shall not forfeit the right to recover damages from Contractor or Surety for Contractor's failure to timely complete the entire Contract. Contractor shall not be entitled to any claim on account of the method used by City in completing the Contract.
 6. Maintenance of the Work shall continue to be Contractor's and Surety's responsibilities as provided for in the bond requirements of the Contract Documents or any special guarantees provided for under the Contract Documents or any other obligations otherwise prescribed by law.
- C. Notwithstanding Paragraphs 15.02.B, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within no more than 30 days of receipt of said notice.
 - D. Where Contractor's services have been so terminated by City, the termination will not affect any rights or remedies of City against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by City will not release Contractor from liability.
 - E. If and to the extent that Contractor has provided a performance bond under the provisions of Paragraph 5.02, the termination procedures of that bond shall not supersede the provisions of this Article.

15.03 *City May Terminate For Convenience*

- A. City may, without cause and without prejudice to any other right or remedy of City, terminate the Contract. Any termination shall be effected by mailing a notice of the termination to the Contractor specifying the extent to which performance of Work under the contract is terminated, and the date upon which such termination becomes effective. Receipt of the notice shall be deemed conclusively presumed and established when the letter is placed in the United States Postal Service Mail by the City. Further, it shall be deemed conclusively presumed and established that such termination is made with just cause as therein stated; and no proof in any claim, demand or suit shall be required of the City regarding such discretionary action.
- B. After receipt of a notice of termination, and except as otherwise directed by the City, the Contractor shall:
1. Stop work under the Contract on the date and to the extent specified in the notice of termination;
 2. place no further orders or subcontracts for materials, services or facilities except as may be necessary for completion of such portion of the Work under the Contract as is not terminated;
 3. terminate all orders and subcontracts to the extent that they relate to the performance of the Work terminated by notice of termination;
 4. transfer title to the City and deliver in the manner, at the times, and to the extent, if any, directed by the City:
 - a. the fabricated or unfabricated parts, Work in progress, completed Work, supplies and other material produced as a part of, or acquired in connection with the performance of, the Work terminated by the notice of the termination; and
 - b. the completed, or partially completed plans, drawings, information and other property which, if the Contract had been completed, would have been required to be furnished to the City.
 5. complete performance of such Work as shall not have been terminated by the notice of termination; and
 6. take such action as may be necessary, or as the City may direct, for the protection and preservation of the property related to its contract which is in the possession of the Contractor and in which the owner has or may acquire the rest.
- C. At a time not later than 30 days after the termination date specified in the notice of termination, the Contractor may submit to the City a list, certified as to quantity and quality, of any or all items of termination inventory not previously disposed of, exclusive of items the disposition of which has been directed or authorized by City.

- D. Not later than 15 days thereafter, the City shall accept title to such items provided, that the list submitted shall be subject to verification by the City upon removal of the items or, if the items are stored, within 45 days from the date of submission of the list, and any necessary adjustments to correct the list as submitted, shall be made prior to final settlement.
- E. Not later than 60 days after the notice of termination, the Contractor shall submit his termination claim to the City in the form and with the certification prescribed by the City. Unless an extension is made in writing within such 60 day period by the Contractor, and granted by the City, any and all such claims shall be conclusively deemed waived.
- F. In such case, Contractor shall be paid for (without duplication of any items):
 - 1. completed and acceptable Work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;
 - 2. expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses; and
 - 3. reasonable expenses directly attributable to termination.
- G. In the event of the failure of the Contractor and City to agree upon the whole amount to be paid to the Contractor by reason of the termination of the Work, the City shall determine, on the basis of information available to it, the amount, if any, due to the Contractor by reason of the termination and shall pay to the Contractor the amounts determined. Contractor shall not be paid on account of loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

ARTICLE 16 – DISPUTE RESOLUTION

16.01 Methods and Procedures

- A. Either City or Contractor may request mediation of any Contract Claim submitted for a decision under Paragraph 10.06 before such decision becomes final and binding. The request for mediation shall be submitted to the other party to the Contract. Timely submission of the request shall stay the effect of Paragraph 10.06.E.
- B. City and Contractor shall participate in the mediation process in good faith. The process shall be commenced within 60 days of filing of the request.
- C. If the Contract Claim is not resolved by mediation, City's action under Paragraph 10.06.C or a denial pursuant to Paragraphs 10.06.C.3 or 10.06.D shall become final and binding 30 days after termination of the mediation unless, within that time period, City or Contractor:

1. elects in writing to invoke any other dispute resolution process provided for in the Supplementary Conditions; or
2. agrees with the other party to submit the Contract Claim to another dispute resolution process; or
3. gives written notice to the other party of the intent to submit the Contract Claim to a court of competent jurisdiction.

ARTICLE 17 – MISCELLANEOUS

17.01 Giving Notice

- A. Whenever any provision of the Contract Documents requires the giving of written notice, it will be deemed to have been validly given if:
 1. delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended; or
 2. delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.
- B. Business address changes must be promptly made in writing to the other party.
- C. Whenever the Contract Documents specifies giving notice by electronic means such electronic notice shall be deemed sufficient upon confirmation of receipt by the receiving party.

17.02 Computation of Times

When any period of time is referred to in the Contract Documents by days, it will be computed to exclude the first and include the last day of such period. If the last day of any such period falls on a Saturday or Sunday or on a day made a legal holiday the next Working Day shall become the last day of the period.

17.03 Cumulative Remedies

The duties and obligations imposed by these General Conditions and the rights and remedies available hereunder to the parties hereto are in addition to, and are not to be construed in any way as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by Laws or Regulations, by special warranty or guarantee, or by other provisions of the Contract Documents. The provisions of this Paragraph will be as effective as if repeated specifically in the Contract Documents in connection with each particular duty, obligation, right, and remedy to which they apply.

17.04 *Survival of Obligations*

All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Contract or termination of the services of Contractor.

17.05 *Headings*

Article and paragraph headings are inserted for convenience only and do not constitute parts of these General Conditions.

SECTION 00 73 00
SUPPLEMENTARY CONDITIONS
TO
GENERAL CONDITIONS

Supplementary Conditions

These Supplementary Conditions modify and supplement Section 00 72 00 - General Conditions, and other provisions of the Contract Documents as indicated below. All provisions of the General Conditions that are modified or supplemented remain in full force and effect as so modified or supplemented. All provisions of the General Conditions which are not so modified or supplemented remain in full force and effect.

Defined Terms

The terms used in these Supplementary Conditions which are defined in the General Conditions have the meaning assigned to them in the General Conditions, unless specifically noted herein.

Modifications and Supplements

The following are instructions that modify or supplement specific paragraphs in the General Conditions and other Contract Documents.

SC-3.03B.2, “Resolving Discrepancies”

Plans govern over Specifications.

SC-4.01A, “Availability of Lands”

Easement limits shown on the Drawing are approximate and were provided to establish a basis for bidding. Upon receiving the final easements descriptions, Contractor shall compare them to the lines shown on the Contract Drawings.

SC-4.02A, “Subsurface and Physical Conditions”

The following are reports of explorations and tests of subsurface conditions at the site of the Work:

- (1) Geotechnical Report by CMJ Engineering, Inc. Dated 07/16/2021.

SC-5.03A., “Certificates of Insurance”

The entities listed below are "additional insureds as their interest may appear" including their respective officers, directors, agents and employees.

- (1) City
- (2) Consultant: Enercon Services, Inc.
- (3) Other: Tarrant Regional Water District

SC-5.04A., “Contractor’s Insurance”

The limits of liability for the insurance required by Paragraph GC-5.04 shall provide the following coverages for not less than the following amounts or greater where required by laws and regulations:

5.04A. Workers' Compensation, under Paragraph GC-5.04A.

Statutory limits
Employer's liability
\$100,000 each accident/occurrence
\$100,000 Disease - each employee
\$500,000 Disease - policy limit

SC-5.04B., “Contractor’s Insurance”

5.04B. Commercial General Liability, under Paragraph GC-5.04B. Contractor's Liability Insurance under Paragraph GC-5.04B., which shall be on a per project basis covering the Contractor with minimum limits of:

\$1,000,000 each occurrence
\$2,000,000 aggregate limit

The policy must have an endorsement (Amendment – Aggregate Limits of Insurance) making the General Aggregate Limits apply separately to each job site.

The Commercial General Liability Insurance policies shall provide “X”, “C”, and “U” coverage’s. Verification of such coverage must be shown in the Remarks Article of the Certificate of Insurance.

Environmental Impairment Liability (EIL) and/or Pollution Liability

\$4,000,000 per occurrence.

EIL coverage(s) must be included in policies listed in Commercial General Liability; or such insurance shall be provided under a separate policy or policies. Liability for damage occurring while loading, unloading and transporting materials collected under the contract project shall be included under the Automobile Liability insurance or other policy(s).

SC 5.04C., “Contractor’s Insurance”

5.04C. Automobile Liability, under Paragraph GC-5.04C. Contractor’s Liability Insurance under Paragraph GC-5.04C., which shall be in an amount not less than the following amounts:

- (1) **Automobile Liability** - a commercial business policy shall provide coverage on "Any Auto", defined as autos owned, hired and non-owned.

\$1,000,000 each accident on a combined single limit basis. Split limits are acceptable if limits are at least:

\$250,000 Bodily Injury per person /
\$500,000 Bodily Injury per accident /
\$100,000 Property Damage

SC-6.04., “Project Schedule”

Project schedule shall be **Tier 2** for the project.

SC-6.07., “Wage Rates”

The following is the prevailing wage rate table(s) applicable to this project and is provided in the Appendixes:

2013 Prevailing Wage Rates – Heavy and Highway Construction Projects

A copy of the table is also available by accessing the City’s website at:

<https://apps.fortworthtexas.gov/ProjectResources/>

You can access the file by following the directory path:
02-Construction Documents/Specifications/Div00 – General Conditions

SC-6.09., “Permits and Utilities”

SC-6.09A., “Contractor obtained permits and licenses”

The following are known permits and/or licenses required by the Contract to be acquired by the Contractor:

- (1) Tarrant County Floodplain Permit

SC-6.09B. “City obtained permits and licenses”

The following are known permits and/or licenses required by the Contract to be acquired by the City:

- (1) U.S. Army Corps Engineers Section 408 Permit

SC-6.09C. “Outstanding permits and licenses”

The following is a list of known outstanding permits and/or licenses to be acquired, if any as of August 9, 2022:

Outstanding Permits and/or Licenses to Be Acquired

OWNER	PERMIT OR LICENSE AND LOCATION	TARGET DATE OF POSSESSION
Tarrant Regional Water District	USACE Section 408 Permit	December 31, 2022

SC-7.02., “Coordination”

The individuals or entities listed below have contracts with the City for the performance of other work at the Site: **None**

SC-8.01, “Communications to Contractor”

All communication to the Contractor shall be through the City.

SC-9.01., “City’s Project Manager”

The City’s Project Manager for this Contract is Eric Mason (Phone: 817.392.5456) or his/her successor pursuant to **written notification from the Director of Environmental Quality.**

SC-13.03C., “Tests and Inspections”

None

SC-16.01C.1, “Methods and Procedures”

None

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
1/22/2016	F. Griffin	SC-9.01., "City's Project Representative" wording changed to City's Project Manager.
3/9/2020	D.V. Magaña	SC-6.07, Updated the link such that files can be accessed via the City's website.

- 1 4) ~~Supply and installation of approximately 300 feet of floating booms~~
- 2 ~~(contractor to verify length in the field).~~
- 3 5) ~~Supply and installation of the Waterwheel Trash Interceptor and connection~~
- 4 ~~to the mooring piles, tether foundation and floating booms.~~
- 5 6) ~~Supply and installation of all signs and waterway markers.~~
- 6 7) ~~Supply, installation and maintenance of erosion and sediment control for~~
- 7 ~~onshore work area(s) and turbidity curtains for work in the Trinity River.~~
- 8 c. The Contractor shall acquire the Waterwheel Trash Interceptors and floating
- 9 booms from Clearwater Mills, LLC, located at 4965 Mountain Road, Pasadena,
- 10 MD 21122. No alternate or substitution will be accepted.

11 B. Subsidiary Work

- 12 1. Any and all Work specifically governed by documentary requirements for the
- 13 project, such as conditions imposed by the Drawings or Contract Documents in
- 14 which no specific item for bid has been provided for in the Proposal and the item is
- 15 not a typical unit bid item included on the standard bid item list, then the item shall
- 16 be considered as a subsidiary item of Work, the cost of which shall be included in
- 17 the price bid in the Proposal for various bid items.

18 C. Examination of the Site

- 19 1. Visit the site, to compare drawings and specifications with any work in place, and
- 20 observe all site conditions, including other work, if any, is being performed. Failure
- 21 to visit the site shall not relieve the Contractor from the necessity of furnishing
- 22 materials or performing work required to complete work in accordance with the
- 23 Contract Documents.

24 D. Use of Premises

- 25 1. Coordinate uses of premises under direction of the City.
- 26 2. Assume full responsibility for protection and safekeeping of materials and
- 27 equipment stored on the Site.
- 28 3. Use and occupy only portions of the public streets and alleys, or other public places
- 29 or other rights-of-way as provided for in the ordinances of the City, as shown in the
- 30 Contract Documents, or as may be specifically authorized in writing by the City.
- 31 a. A reasonable number of tools, materials, and equipment for construction
- 32 purposes may be stored in such space, but no more than is necessary to avoid
- 33 delay in the construction operations.
- 34 b. Excavated and waste materials shall be stored in such a way as not to interfere
- 35 with the use of spaces that may be designated to be left free and unobstructed
- 36 and so as not to inconvenience occupants of adjacent property.
- 37 c. If the street is occupied by railroad tracks, the Work shall be carried on in such
- 38 manner as not to interfere with the operation of the railroad.
- 39 1) All Work shall be in accordance with railroad requirements set forth in
- 40 Division 0 as well as the railroad permit.

41 E. Work within Easements

- 42 1. Do not enter upon private property for any purpose without having previously
- 43 obtained permission from the owner of such property.
- 44 2. Do not store equipment or material on private property unless and until the
- 45 specified approval of the property owner has been secured in writing by the
- 46 Contractor and a copy furnished to the City.

- 1 3. Unless specifically provided otherwise, clear all rights-of-way or easements of
2 obstructions which must be removed to make possible proper prosecution of the
3 Work as a part of the project construction operations.
- 4 4. Preserve and use every precaution to prevent damage to, all trees, shrubbery, plants,
5 lawns, fences, culverts, curbing, and all other types of structures or improvements,
6 to all water, sewer, and gas lines, to all conduits, overhead pole lines, or
7 appurtenances thereof, including the construction of temporary fences and to all
8 other public or private property adjacent to the Work.
- 9 5. Notify the proper representatives of the owners or occupants of the public or private
10 lands of interest in lands which might be affected by the Work.
 - 11 a. Such notice shall be made at least 48 hours in advance of the beginning of the
12 Work.
 - 13 b. Notices shall be applicable to both public and private utility companies and any
14 corporation, company, individual, or other, either as owners or occupants, whose
15 land or interest in land might be affected by the Work.
 - 16 c. Be responsible for all damage or injury to property of any character resulting
17 from any act, omission, neglect, or misconduct in the manner or method or
18 execution of the Work, or at any time due to defective work, material, or
19 equipment.
- 20 6. Fence
 - 21 a. Restore all fences encountered and removed during construction of the Project
22 to the original or a better than original condition.
 - 23 b. Erect temporary fencing in place of the fencing removed whenever the Work is
24 not in progress and when the site is vacated overnight, and/or at all times to
25 provide site security.
 - 26 c. The cost for all fence work within easements, including removal, temporary
27 closures and replacement, shall be subsidiary to the various items bid in the
28 project proposal, unless a bid item is specifically provided in the proposal.

1 **1.5 SUBMITTALS [NOT USED]**

2 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

3 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

5 **1.9 QUALITY ASSURANCE [NOT USED]**

6 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

7 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

8 **1.12 WARRANTY [NOT USED]**

9 **PART 2 - PRODUCTS [NOT USED]**

10 **PART 3 - EXECUTION [NOT USED]**

11 **END OF SECTION**

SECTION 01 25 00 SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. The procedure for requesting the approval of substitution of a product that is not equivalent to a product which is specified by descriptive or performance criteria or defined by reference to 1 or more of the following:
 - a. Name of manufacturer
 - b. Name of vendor
 - c. Trade name
 - d. Catalog number
 - 2. Substitutions are not "or-equals".
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Request for Substitution - General
 - 1. Within 30 days after award of Contract (unless noted otherwise), the City will consider formal requests from Contractor for substitution of products in place of those specified.
 - 2. Certain types of equipment and kinds of material are described in Specifications by means of references to names of manufacturers and vendors, trade names, or catalog numbers.
 - a. When this method of specifying is used, it is not intended to exclude from consideration other products bearing other manufacturer's or vendor's names, trade names, or catalog numbers, provided said products are "or-equals," as determined by City.
 - 3. Other types of equipment and kinds of material may be acceptable substitutions under the following conditions:
 - a. Or-equals are unavailable due to strike, discontinued production of products meeting specified requirements, or other factors beyond control of Contractor;
or,

- b. Contractor proposes a cost and/or time reduction incentive to the City.

1.5 SUBMITTALS

- A. See Request for Substitution Form (attached)
- B. Procedure for Requesting Substitution
 - 1. Substitution shall be considered only:
 - a. After award of Contract
 - b. Under the conditions stated herein
 - 2. Submit **3** copies of each written request for substitution, including:
 - a. Documentation
 - 1) Complete data substantiating compliance of proposed substitution with Contract Documents
 - 2) Data relating to changes in construction schedule, when a reduction is proposed
 - 3) Data relating to changes in cost
 - b. For products
 - 1) Product identification
 - a) Manufacturer's name
 - b) Telephone number and representative contact name
 - c) Specification Section or Drawing reference of originally specified product, including discrete name or tag number assigned to original product in the Contract Documents
 - 2) Manufacturer's literature clearly marked to show compliance of proposed product with Contract Documents
 - 3) Itemized comparison of original and proposed product addressing product characteristics including, but not necessarily limited to:
 - a) Size
 - b) Composition or materials of construction
 - c) Weight
 - d) Electrical or mechanical requirements
 - 4) Product experience
 - a) Location of past projects utilizing product
 - b) Name and telephone number of persons associated with referenced projects knowledgeable concerning proposed product
 - c) Available field data and reports associated with proposed product
 - 5) Samples
 - a) Provide at request of City.
 - b) Samples become the property of the City.
 - c. For construction methods:
 - 1) Detailed description of proposed method
 - 2) Illustration drawings
- C. Approval or Rejection
 - 1. Written approval or rejection of substitution given by the City
 - 2. City reserves the right to require proposed product to comply with color and pattern of specified product if necessary to secure design intent.
 - 3. In the event the substitution is approved, the resulting cost and/or time reduction will be documented by Change Order in accordance with the General Conditions.

4. No additional contract time will be given for substitution.
5. Substitution will be rejected if:
 - a. Submittal is not through the Contractor with his stamp of approval
 - b. Request is not made in accordance with this Specification Section
 - c. In the City’s opinion, acceptance will require substantial revision of the original design
 - d. In the City’s opinion, substitution will not perform adequately the function consistent with the design intent

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

- A. In making request for substitution or in using an approved product, the Contractor represents that the Contractor:
1. Has investigated proposed product, and has determined that it is adequate or superior in all respects to that specified, and that it will perform function for which it is intended
 2. Will provide same guarantee for substitute item as for product specified
 3. Will coordinate installation of accepted substitution into Work, to include building modifications if necessary, making such changes as may be required for Work to be complete in all respects
 4. Waives all claims for additional costs related to substitution which subsequently arise

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

**EXHIBIT A
REQUEST FOR SUBSTITUTION FORM:**

TO: _____
PROJECT: _____ DATE: _____

We hereby submit for your consideration the following product instead of the specified item for the above project:

SECTION	PARAGRAPH	SPECIFIED ITEM
---------	-----------	----------------

Proposed Substitution: _____

Reason for Substitution: _____

Include complete information on changes to Drawings and/or Specifications which proposed substitution will require for its proper installation.

Fill in Blanks Below:

A. Will the undersigned contractor pay for changes to the building design, including engineering and detailing costs caused by the requested substitution?

B. _____
What effect does substitution have on other trades?

C. _____
Differences between proposed substitution and specified item?

D. _____
Differences in product cost or product delivery time?

E. _____
Manufacturer's guarantees of the proposed and specified items are:

_____ Equal _____ Better (explain on attachment)

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted By: _____ For Use by City

Signature _____ as noted _____ Recommended _____ Recommended

Firm _____ Address _____ _____ Not recommended _____ Received late

Date _____ By _____

Telephone _____ Date _____ Remarks _____

For Use by City: _____

_____ Approved _____ Rejected
City _____ Date _____

SECTION 01 31 19
PRECONSTRUCTION MEETING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Provisions for the preconstruction meeting to be held prior to the start of Work to clarify construction contract administration procedures
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination
 - 1. Attend preconstruction meeting.
 - 2. Representatives of Contractor, subcontractors and suppliers attending meetings shall be qualified and authorized to act on behalf of the entity each represents.
 - 3. Meeting administered by City may be tape recorded.
 - a. If recorded, tapes will be used to prepare minutes and retained by City for future reference.
- B. Preconstruction Meeting
 - 1. A preconstruction meeting will be held within 14 days after the execution of the Agreement and before Work is started.
 - a. The meeting will be scheduled and administered by the City.
 - 2. The Project Representative will preside at the meeting, prepare the notes of the meeting and distribute copies of same to all participants who so request by fully completing the attendance form to be circulated at the beginning of the meeting.
 - 3. Attendance shall include:
 - a. Project Representative
 - b. Contractor's project manager
 - c. Contractor's superintendent
 - d. Any subcontractor or supplier representatives whom the Contractor may desire to invite or the City may request

- e. Other City representatives
 - f. Others as appropriate
4. Construction Schedule
- a. Prepare baseline construction schedule in accordance with Section 01 32 16 and provide at Preconstruction Meeting.
 - b. City will notify Contractor of any schedule changes upon Notice of Preconstruction Meeting.
5. Preliminary Agenda may include:
- a. Introduction of Project Personnel
 - b. General Description of Project
 - c. Status of right-of-way, utility clearances, easements or other pertinent permits
 - d. Contractor's work plan and schedule
 - e. Contract Time
 - f. Notice to Proceed
 - g. Construction Staking
 - h. Progress Payments
 - i. Extra Work and Change Order Procedures
 - j. Field Orders
 - k. Disposal Site Letter for Waste Material
 - l. Insurance Renewals
 - m. Payroll Certification
 - n. Material Certifications and Quality Control Testing
 - o. Public Safety and Convenience
 - p. Documentation of Pre-Construction Conditions
 - q. Weekend Work Notification
 - r. Legal Holidays
 - s. Trench Safety Plans
 - t. Confined Space Entry Standards
 - u. Coordination with the City's representative for operations of existing water systems
 - v. Storm Water Pollution Prevention Plan
 - w. Coordination with other Contractors
 - x. Early Warning System
 - y. Contractor Evaluation
 - z. Special Conditions applicable to the project
 - aa. Damages Claims
 - bb. Submittal Procedures
 - cc. Substitution Procedures
 - dd. Correspondence Routing
 - ee. Record Drawings
 - ff. Temporary construction facilities
 - gg. M/WBE or MBE/SBE procedures
 - hh. Final Acceptance
 - ii. Final Payment
 - jj. Questions or Comments

- 1.5 SUBMITTALS [NOT USED]
- 1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]
- 1.7 CLOSEOUT SUBMITTALS [NOT USED]
- 1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]
- 1.9 QUALITY ASSURANCE [NOT USED]
- 1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]
- 1.11 FIELD [SITE] CONDITIONS [NOT USED]
- 1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

- 1 3. The Project Representative will preside at progress meetings, prepare the notes of
2 the meeting and distribute copies of the same to all participants who so request by
3 fully completing the attendance form to be circulated at the beginning of each
4 meeting.
- 5 4. Attendance shall include:
 - 6 a. Contractor's project manager
 - 7 b. Contractor's superintendent
 - 8 c. Any subcontractor or supplier representatives whom the Contractor may desire
9 to invite or the City may request
 - 10 d. Engineer's representatives
 - 11 e. City's representatives
 - 12 f. Others, as requested by the Project Representative
- 13 5. Preliminary Agenda may include:
 - 14 a. Review of Work progress since previous meeting
 - 15 b. Field observations, problems, conflicts
 - 16 c. Items which impede construction schedule
 - 17 d. Review of off-site fabrication, delivery schedules
 - 18 e. Review of construction interfacing and sequencing requirements with other
19 construction contracts
 - 20 f. Corrective measures and procedures to regain projected schedule
 - 21 g. Revisions to construction schedule
 - 22 h. Progress, schedule, during succeeding Work period
 - 23 i. Coordination of schedules
 - 24 j. Review submittal schedules
 - 25 k. Maintenance of quality standards
 - 26 l. Pending changes and substitutions
 - 27 m. Review proposed changes for:
 - 28 1) Effect on construction schedule and on completion date
 - 29 2) Effect on other contracts of the Project
 - 30 n. Review Record Documents
 - 31 o. Review monthly pay request
 - 32 p. Review status of Requests for Information
- 33 6. Meeting Schedule
 - 34 a. Progress meetings will be held periodically as determined by the Project
35 Representative.
 - 36 1) Additional meetings may be held at the request of the:
 - 37 a) City
 - 38 b) Engineer
 - 39 c) Contractor
- 40 7. Meeting Location
 - 41 a. The City will establish a meeting location.
 - 42 1) To the extent practicable, meetings will be held at the Site.

- 1 **1.5 SUBMITTALS [NOT USED]**
- 2 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**
- 3 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**
- 4 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**
- 5 **1.9 QUALITY ASSURANCE [NOT USED]**
- 6 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**
- 7 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**
- 8 **1.12 WARRANTY [NOT USED]**

- 9 **PART 2 - PRODUCTS [NOT USED]**

- 10 **PART 3 - EXECUTION [NOT USED]**

- 11 **END OF SECTION**

1 Each project is represented by City’s master project schedule that encompasses the
2 entire scope of activities envisioned by the City to properly deliver the work. When the
3 City contracts with a Contractor to perform construction of the Work, the Contractor
4 will develop and maintain a schedule for their scope of work in alignment with the
5 City’s standard schedule requirements as defined herein. The data and information of
6 each such schedule will be leveraged and become integral in the master project
7 schedule as deemed appropriate by the City’s Project Control Specialist and approved
8 by the City’s Project Manager.
9

10 1. Master Project Schedule

11 The master project schedule is a holistic representation of the scheduled activities
12 and milestones for the total project and be Critical Path Method (CPM) based. The
13 City’s Project Manager is accountable for oversight of the development and
14 maintaining a master project schedule for each project. When the City contracts for
15 the design and/or construction of the project, the master project schedule will
16 incorporate elements of the Design and Construction schedules as deemed
17 appropriate by the City’s Project Control Specialist. The assigned City Project
18 Control Specialist creates and maintains the master project schedule in P6 (City’s
19 scheduling software).
20

21 2. Construction Schedule

22 The Contractor is responsible for developing and maintaining a schedule for the
23 scope of the Contractor’s contractual requirements. The Contractor will issue an
24 initial schedule for review and acceptance by the City’s Project Control Specialist
25 and the City’s Project Manager as a baseline schedule for Contractor’s scope of
26 work. Contractor will issue current, accurate updates of their schedule (Progress
27 Schedule) to the City at the end of each month throughout the life of their work.
28

29 B. Schedule Tiers

30 The City has a portfolio of projects that vary widely in size, complexity and content
31 requiring different scheduling to effectively deliver each project. The City uses a
32 “tiered” approach to align the proper schedule with the criteria for each project. The
33 City’s Project Manager determines the appropriate schedule tier for each project, and
34 includes that designation and the associated requirements in the Contractor’s scope of
35 work. The following is a summary of the “tiers”.
36

37 1. Tier 1: Small Size and Short Duration Project (design not required)

38 The City develops and maintains a Master Project Schedule for the project. No
39 schedule submittal is required from Contractor. City’s Project Control Specialist
40 acquires any necessary schedule status data or information through discussions with
41 the respective party on an as-needed basis.
42

43 2. Tier 2: Small Size and Short to Medium Duration Project

44 The City develops and maintains a Master Project Schedule for the project. The
45 Contractor identifies “start” and “finish” milestone dates on key elements of their
46 work as agreed with the City’s Project Manager at the kickoff of their work effort.
47 The Contractor issues to the City, updates to the “start” and “finish” dates for such
48 milestones at the end of each month throughout the life of their work on the project.
49

3. Tier 3: Medium and Large Size and/or Complex Projects Regardless of Duration

1 The City develops and maintains a Master Project Schedule for the project. The
2 Contractor develops a Baseline Schedule and maintains the schedule of their
3 respective scope of work on the project at a level of detail (generally Level 3) and in
4 alignment with the WBS structure in Section 1.4.H as agreed by the Project
5 Manager. The Contractor issues to the City, updates of their respective schedule
6 (Progress Schedule) at the end of each month throughout the life of their work on the
7 project.

8 C. Schedule Types

9 Project delivery for the City utilizes two types of schedules as noted below. The City
10 develops and maintains a Master Project Schedule as a “baseline” schedule and issue
11 monthly updates to the City Project Manager (end of each month) as a “progress”
12 schedule. The Contractor prepares and submits each schedule type to fulfill their
13 contractual requirements.
14

15 1. Baseline Schedule

16 The Contractor develops and submits to the City, an initial schedule for their scope
17 of work in alignment with this specification. Once reviewed and accepted by the
18 City, it becomes the “Baseline” schedule and is the basis against which all progress
19 is measured. The baseline schedule will be updated when there is a change or
20 addition to the scope of work impacting the duration of the work, and only after
21 receipt of a duly authorized change order issued by the City. In the event progress is
22 significantly behind schedule, the City’s Project Manager may authorize an update
23 to the baseline schedule to facilitate a more practical evaluation of progress. An
24 example of a Baseline Schedule is provided in Specification 01 32 16.1
25 Construction Project Schedule Baseline Example.
26

27 2. Progress Schedule

28 The Contractor updates their schedule at the end of each month to represent the
29 progress achieved in the work which includes any impact from authorized changes
30 in the work. The updated schedule must accurately reflect the current status of the
31 work at that point in time and is referred to as the “Progress Schedule”. The City’s
32 Project Manager and Project Control Specialist reviews and accepts each progress
33 schedule. In the event a progress schedule is deemed not acceptable, the
34 unacceptable issues are identified by the City within 5 working days and the
35 Contractor must provide an acceptable progress schedule within 5 working days
36 after receipt of non-acceptance notification. An example of a Progress Schedule is
37 provided in Specification 01 32 16.2 Construction Project Schedule Progress
38 Example.

39 D. City Standard Schedule requirements

40 The following is an overview of the methodology for developing and maintaining a
41 schedule for delivery of a project.

1 1. Schedule Framework - The schedule will be based on the defined scope of work
2 and follow the (Critical Path Methodology) CPM method. The Contractor's
3 schedule will align with the requirements of this specification and will be *cost*
4 *loaded* to reflect their plan for execution. **Compliance with cost loading can be**
5 **provided with traditional cost loading of line items OR a projected cost per**
6 **month for the project when the initial schedule is submitted, updated on a**
7 **quarterly basis is significant change is anticipated.** Overall schedule duration
8 will align with the contractual requirements for the respective scope of work and be
9 reflected in City's Master Project Schedule. The Project Number and Name of the
10 Project is required on each schedule and must match the City's project data.
11

12 E. Schedule File Name

13 All schedules submitted to the City for a project will have a file name that begins with
14 the City's *project number* followed by the *name of the project* followed by *baseline* (if
15 a baseline schedule) or the *year and month* (if a progress schedule), as shown below.
16

17 • Baseline Schedule File Name

18 Format: City Project Number_Project Name_Baseline

19 Example: 101376_North Montgomery Street HMAC_Baseline
20

21 • Progress Schedule File Name

22 Format: City Project Number_Project Name_YYYY-MM

23 Example: 101376_North Montgomery Street HMAC_2018_01
24

25 • Project Schedule Progress Narrative File Name

26 Format: City Project Number_Project Name_PN_YYYY-MM

27 Example: 101376_North Montgomery Street HMAC_PN_2018_01
28

29 F. Schedule Templates

30 The Contractor will utilize the relevant sections from the City's templates provided in
31 the City's document management system as the basis for creating their respective
32 project schedule. Specifically, the Contractor's schedule will align with the layout of
33 the Construction section. The templates are identified by type of project as noted
34 below.

- 35 • Arterials
- 36 • Aviation
- 37 • Neighborhood Streets
- 38 • Sidewalks (later)
- 39 • Quiet Zones (later)
- 40 • Street Lights (later)
- 41 • Intersection Improvements (later)
- 42 • Parks
- 43 • Storm water
- 44 • Street Maintenance
- 45 • Traffic
- 46 • Water
- 47

48 G. Schedule Calendar

1 The City’s standard calendar for schedule development purposes is based on a 5-day
2 workweek and accounts for the City’s eight standard holidays (New Years, Martin
3 Luther King, Memorial, Independence, Labor, Thanksgiving, day after Thanksgiving,
4 Christmas). The Contractor will establish a schedule calendar as part of the schedule
5 development process and provide to the Project Control Specialist as part of the basis
6 for their schedule. Variations between the City’s calendar and the Contractor’s
7 calendar must be resolved prior to the City’s acceptance of their Baseline project
8 schedule.
9

10 H. WBS & Milestone Standards for Schedule Development

11 The scope of work to be accomplished by the Contractor is represented in the schedule
12 in the form of a Work Breakdown Structure (WBS). The WBS is the basis for the
13 development of the schedule activities and shall be imbedded and depicted in the
14 schedule.

15
16 The following is a summary of the standards to be followed in preparing and
17 maintaining a schedule for project delivery.
18

- 19 1. Contractor is required to utilize the City’s WBS structure and respective
20 project type template for “Construction” as shown in Section 1.4.H below.
21 Additional activities may be added to Levels 1 - 4 to accommodate the needs
22 of the organization executing the work. Specifically the Contractor will add
23 activities under WBS XXXXXX.80.83 “Construction Execution” that
24 delineates the activities associated with the various components of the work.
25
- 26 2. Contractor is required to adhere to the City’s Standard Milestones as shown
27 in Section 1.4.I below. Contractor will include additional milestones
28 representing intermediate deliverables as required to accurately reflect their
29 scope of work.
30

31 I. Schedule Activities

32 Activities are the discrete elements of work that make up the schedule. They will be
33 organized under the umbrella of the WBS. Activity descriptions should adequately
34 describe the activity, and in some cases the extent of the activity. All activities are
35 logically tied with a predecessor and a successor. The only exception to this rule is for
36 “project start” and “project finish” milestones.
37

38 The activity duration is based on the physical amount of work to be performed for the
39 stated activity, with a maximum duration of 20 working days **OR a continuous activity**
40 **in one location**. If the work for any one activity exceeds 20 days, break that activity
41 down incrementally to achieve this duration constraint. Any exception to this requires
42 review and acceptance by the City’s Project Control Specialist.
43

44 J. Change Orders

45 When a Change Order is issued by the City, the impact is incorporated into the
46 previously accepted baseline schedule as an update, to clearly show impact to the
47 project timeline. The Contractor submits this updated baseline schedule to the City for

1 review and acceptance as described in Section 1.5 below. Updated baseline schedules
2 adhere to the following:
3

- 4 1. Time extensions associated with approved contract modifications are limited to the
5 actual amount of time the project activities are anticipated to be delayed, unless
6 otherwise approved by the Program Manager.
7
- 8 2. The re-baselined schedule is submitted by the Contractor *within ten workdays* after
9 the date of receipt of the approved Change Order.
10
- 11 3. The changes in logic or durations approved by the City are used to analyze the impact
12 of the change and is included in the Change Order. The coding for a new activity(s)
13 added to the schedule for the Change Order includes the Change Order number in the
14 Activity ID. Use as many activities as needed to accurately show the work of the
15 Change Order. Revisions to the baseline schedule are not effective until accepted by
16 the City.

17 K. City's Work Breakdown Structure
18

<u>WBS Code</u>	<u>WBS Name</u>
XXXXXX	Project Name
XXXXXX.30	Design
XXXXXX.30.10	Design Contractor Agreement
XXXXXX.30.20	Conceptual Design (30%)
XXXXXX.30.30	Preliminary Design (60%)
XXXXXX.30.40	Final Design
XXXXXX.30.50	Environmental
XXXXXX.30.60	Permits
XXXXXX.30.60.10	Permits - Identification
XXXXXX.30.60.20	Permits - Review/Approve
XXXXXX.40	ROW & Easements
XXXXXX.40.10	ROW Negotiations
XXXXXX.40.20	Condemnation
XXXXXX.70	Utility Relocation
XXXXXX.70.10	Utility Relocation Co-ordination
XXXXXX.80	Construction
XXXXXX.80.81	Bid and Award
XXXXXX.80.83	Construction Execution
XXXXXX.80.85	Inspection
XXXXXX.80.86	Landscaping
XXXXXX.90	Closeout
XXXXXX.90.10	Construction Contract Close-out
XXXXXX.90.40	Design Contract Closure

43 L. City's Standard Milestones

44 The following milestone activities (i.e., important events on a project that mark critical
45 points in time) are of particular interest to the City and must be reflected in the project
46 schedule for all phases of work.
47

1	<u>Activity ID</u>	<u>Activity Name</u>
2		Design
3	3020	Award Design Agreement
4	3040	Issue Notice to Proceed - Design Engineer
5	3100	Design Kick-off Meeting
6	3120	Submit Conceptual Plans to Utilities, ROW, Traffic, Parks, Storm Water,
7		Water & Sewer
8	3150	Peer Review Meeting/Design Review meeting (technical)
9	3160	Conduct Design Public Meeting #1 (required)
10	3170	Conceptual Design Complete
11	3220	Submit Preliminary Plans and Specifications to Utilities, ROW, Traffic,
12		Parks, Storm Water, Water & Sewer
13	3250	Conduct Design Public Meeting #2 (required)
14	3260	Preliminary Design Complete
15	3310	Submit Final Design to Utilities, ROW, Traffic, Parks, Storm Water,
16		Water & Sewer
17	3330	Conduct Design Public Meeting #3 (if required)
18	3360	Final Design Complete
19		ROW & Easements
20	4000	Right of Way Start
21	4230	Right of Way Complete
22		Utility Relocation
23	7000	Utilities Start
24	7120	Utilities Cleared/Complete
25		Construction
26		Bid and Award
27	8110	Start Advertisement
28	8150	Conduct Bid Opening
29	8240	Award Construction Contract
30		Construction Execution
31	8330	Conduct Construction Public Meeting #4 Pre-Construction
32	8350	Construction Start
33	8370	Substantial Completion
34	8540	Construction Completion
35	9130	Notice of Completion/Green Sheet
36	9150	Construction Contract Closed
37	9420	Design Contract Closed

38

39 1.4 SUBMITTALS

40 A. Schedule Submittal & Review

41 The City's Project Manager is responsible for reviews and acceptance of the Contractor's
 42 schedule. The City's Project Control Specialist is responsible for ensuring alignment of
 43 the Contractor's baseline and progress schedules with the Master Project Schedule as
 44 support to the City's Project Manager. The City reviews and accepts or rejects the
 45 schedule *within ten workdays* of Contractor's submittal.
 46

1 1. Schedule Format

2 The Contractor will submit each schedule in two electronic forms, one in native file
3 format (.xer, .xml, .mpx) and the second in a *pdf* format, in the City's document
4 management system in the location dedicated for this purpose and identified by the
5 Project Manager. In the event the Contractor does not use Primavera P6 or MS
6 Project for scheduling purposes, the schedule information must be submitted in *.xls* or
7 *.xlsx* format in compliance with the sample layout (See Specification 01 32 16.1
8 Construction Project Schedule Baseline Example), including activity predecessors,
9 successors and total float.

10
11 2. Initial & Baseline Schedule

12 The Contractor will develop their schedule for their scope of work and submit their
13 initial schedule in electronic form (in the file formats noted above), in the City's
14 document management system in the location dedicated for this purpose **at least 5**
15 **working days prior to Pre Construction Meeting.**

16
17 The City's Project Manager and Project Control Specialist review this initial schedule
18 to determine alignment with the City's Master Project Schedule, including format &
19 WBS structure. Following the City's review, feedback is provided to the Contractor
20 for their use in finalizing their initial schedule and issuing (**within five workdays**) their
21 Baseline Schedule for final review and acceptance by the City.

22
23 3. Progress Schedule

24 The Contractor will update and issue their project schedule (Progress Schedule) **by the**
25 **last day of each month** throughout the life of their work on the project. The Progress
26 Schedule is submitted in electronic form as noted above, in the City's document
27 management system in the location dedicated for this purpose.

28
29 The City's Project Control team reviews each Progress Schedule for data and
30 information that support the assessment of the update to the schedule. In the event
31 data or information is missing or incomplete, the Project Controls Specialist
32 communicates directly with the Contractor's scheduler for providing same. The
33 Contractor re-submits the corrected Progress Schedule **within 5 workdays**, following
34 the submittal process noted above. The City's Project Manager and Project Control
35 Specialist review the Contractor's progress schedule for acceptance and to monitor
36 performance and progress.

37
38 The following list of items are required to ensure proper status information is
39 contained in the Progress Schedule.

- 40 • Baseline Start date
 - 41 • Baseline Finish Date
 - 42 • % Complete
 - 43 • Float
 - 44 • Activity Logic (dependencies)
 - 45 • Critical Path
 - 46 • Activities added or deleted
 - 47 • Expected Baseline Finish date
 - 48 • Variance to the Baseline Finish Date
- 49

1 B. Monthly Construction Status Report
2 The Contractor submits a written status report (referred to as a progress narrative) at the
3 monthly progress meeting (if monthly meetings are held) or at the end of each month to
4 accompany the Progress Schedule submittal, using the standard format provided in
5 Specification 01 32 16.3 Construction Project Schedule Progress Narrative. The content
6 of the Construction Project Schedule Progress Narrative should be concise and complete
7 to include only changes, delays, and anticipated problems.
8

9 C. Submittal Process

- 10 • Schedules and Monthly Construction Status Reports are submitted in in the City’s
11 document management system in the location dedicated for this purpose.
 - 12 • Once the project has been completed and Final Acceptance has been issued by the
13 City, no further progress schedules or construction status reports are required from
14 the Contractor.
- 15 1.

16 **1.5 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

17 **1.6 CLOSEOUT SUBMITTALS [NOT USED]**

18 **1.7 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

19 **1.8 QUALITY ASSURANCE**

- 20 A. The person preparing and revising the construction Progress Schedule shall be
21 experienced in the preparation of schedules of similar complexity.
- 22 B. Schedule and supporting documents addressed in this Specification shall be prepared,
23 updated and revised to accurately reflect the performance of the construction.
- 24 C. Contractor is responsible for the quality of all submittals in this section meeting the
25 standard of care for the construction industry for similar projects.

26 **1.9 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

27 **1.10 FIELD [SITE] CONDITIONS [NOT USED]**

28 **1.11 WARRANTY [NOT USED]**

29 **1.12 ATTACHMENTS**

- 30 Spec 01 32 16.1 Construction Project Schedule Baseline Example
- 31 Spec 01 32 16.2 Construction Project Schedule Progress Example
- 32 Spec 01 32 16.3 Construction Project Schedule Progress Narrative
- 33

1

2 **PART 2 - PRODUCTS [NOT USED]**

3 **PART 3 - EXECUTION [NOT USED]**

4

END OF SECTION

5

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
8/13/2021	Michael Owen	Revised to update specification requirements and eliminate duplicate schedule specifications.

6

SECTION 01 32 33
PRECONSTRUCTION VIDEO

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Administrative and procedural requirements for:
 - a. Preconstruction Videos
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various items bid.
No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Preconstruction Video
 - 1. Produce a preconstruction video of the site/alignment, including all areas in the vicinity of and to be affected by construction.
 - a. Provide digital copy of video upon request by the City.
 - 2. Retain a copy of the preconstruction video until the end of the maintenance surety period.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

SECTION 01 33 00
SUBMITTALS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. General methods and requirements of submissions applicable to the following Work-related submittals:
 - a. Shop Drawings
 - b. Product Data (including Standard Product List submittals)
 - c. Samples
 - d. Mock Ups
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination
 - 1. Notify the City in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
 - 2. Coordination of Submittal Times
 - a. Prepare, prioritize and transmit each submittal sufficiently in advance of performing the related Work or other applicable activities, or within the time specified in the individual Work Sections, of the Specifications.
 - b. Contractor is responsible such that the installation will not be delayed by processing times including, but not limited to:
 - a) Disapproval and resubmittal (if required)
 - b) Coordination with other submittals
 - c) Testing
 - d) Purchasing
 - e) Fabrication
 - f) Delivery
 - g) Similar sequenced activities
 - c. No extension of time will be authorized because of the Contractor's failure to transmit submittals sufficiently in advance of the Work.

- d. Make submittals promptly in accordance with approved schedule, and in such sequence as to cause no delay in the Work or in the work of any other contractor.

B. Submittal Numbering

1. When submitting shop drawings or samples, utilize a 9-character submittal cross-reference identification numbering system in the following manner:
 - a. Use the first 6 digits of the applicable Specification Section Number.
 - b. For the next 2 digits number use numbers 01-99 to sequentially number each initial separate item or drawing submitted under each specific Section number.
 - c. Last use a letter, A-Z, indicating the resubmission of the same drawing (i.e. A=2nd submission, B=3rd submission, C=4th submission, etc.). A typical submittal number would be as follows:

03 30 00-08-B

- 1) 03 30 00 is the Specification Section for Concrete
- 2) 08 is the eighth initial submittal under this Specification Section
- 3) B is the third submission (second resubmission) of that particular shop drawing

C. Contractor Certification

1. Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:
 - a. Field measurements
 - b. Field construction criteria
 - c. Catalog numbers and similar data
 - d. Conformance with the Contract Documents
2. Provide each shop drawing, sample and product data submitted by the Contractor with a Certification Statement affixed including:
 - a. The Contractor's Company name
 - b. Signature of submittal reviewer
 - c. Certification Statement
 - 1) "By this submittal, I hereby represent that I have determined and verified field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings."

D. Submittal Format

1. Fold shop drawings larger than 8 ½ inches x 11 inches to 8 ½ inches x 11 inches.
2. Bind shop drawings and product data sheets together.
3. Order
 - a. Cover Sheet
 - 1) Description of Packet
 - 2) Contractor Certification
 - b. List of items / Table of Contents
 - c. Product Data /Shop Drawings/Samples /Calculations

E. Submittal Content

1. The date of submission and the dates of any previous submissions

2. The Project title and number
3. Contractor identification
4. The names of:
 - a. Contractor
 - b. Supplier
 - c. Manufacturer
5. Identification of the product, with the Specification Section number, page and paragraph(s)
6. Field dimensions, clearly identified as such
7. Relation to adjacent or critical features of the Work or materials
8. Applicable standards, such as ASTM or Federal Specification numbers
9. Identification by highlighting of deviations from Contract Documents
10. Identification by highlighting of revisions on resubmittals
11. An 8-inch x 3-inch blank space for Contractor and City stamps

F. Shop Drawings

1. As specified in individual Work Sections includes, but is not necessarily limited to:
 - a. Custom-prepared data such as fabrication and erection/installation (working) drawings
 - b. Scheduled information
 - c. Setting diagrams
 - d. Actual shopwork manufacturing instructions
 - e. Custom templates
 - f. Special wiring diagrams
 - g. Coordination drawings
 - h. Individual system or equipment inspection and test reports including:
 - 1) Performance curves and certifications
 - i. As applicable to the Work
2. Details
 - a. Relation of the various parts to the main members and lines of the structure
 - b. Where correct fabrication of the Work depends upon field measurements
 - 1) Provide such measurements and note on the drawings prior to submitting for approval.

G. Product Data

1. For submittals of product data for products included on the City's Standard Product List, clearly identify each item selected for use on the Project.
2. For submittals of product data for products not included on the City's Standard Product List, submittal data may include, but is not necessarily limited to:
 - a. Standard prepared data for manufactured products (sometimes referred to as catalog data)
 - 1) Such as the manufacturer's product specification and installation instructions
 - 2) Availability of colors and patterns
 - 3) Manufacturer's printed statements of compliances and applicability
 - 4) Roughing-in diagrams and templates
 - 5) Catalog cuts
 - 6) Product photographs

- 7) Standard wiring diagrams
- 8) Printed performance curves and operational-range diagrams
- 9) Production or quality control inspection and test reports and certifications
- 10) Mill reports
- 11) Product operating and maintenance instructions and recommended spare-parts listing and printed product warranties
- 12) As applicable to the Work

H. Samples

1. As specified in individual Sections, include, but are not necessarily limited to:
 - a. Physical examples of the Work such as:
 - 1) Sections of manufactured or fabricated Work
 - 2) Small cuts or containers of materials
 - 3) Complete units of repetitively used products color/texture/pattern swatches and range sets
 - 4) Specimens for coordination of visual effect
 - 5) Graphic symbols and units of Work to be used by the City for independent inspection and testing, as applicable to the Work

I. Do not start Work requiring a shop drawing, sample or product data nor any material to be fabricated or installed prior to the approval or qualified approval of such item.

1. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data is at the Contractor's risk.
2. The City will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
3. Complete project Work, materials, fabrication, and installations in conformance with approved shop drawings, applicable samples, and product data.

J. Submittal Distribution

1. Electronic Distribution
 - a. Confirm development of Project directory for electronic submittals to be uploaded to City's Buzzsaw site, or another external FTP site approved by the City.
 - b. Shop Drawings
 - 1) Upload submittal to designated project directory and notify appropriate City representatives via email of submittal posting.
 - 2) Hard Copies
 - a) 3 copies for all submittals
 - b) If Contractor requires more than 1 hard copy of Shop Drawings returned, Contractor shall submit more than the number of copies listed above.
 - c. Product Data
 - 1) Upload submittal to designated project directory and notify appropriate City representatives via email of submittal posting.
 - 2) Hard Copies
 - a) 3 copies for all submittals
 - d. Samples
 - 1) Distributed to the Project Representative
2. Hard Copy Distribution (if required in lieu of electronic distribution)

- a. Shop Drawings
 - 1) Distributed to the City
 - 2) Copies
 - a) 8 copies for mechanical submittals
 - b) 7 copies for all other submittals
 - c) If Contractor requires more than 3 copies of Shop Drawings returned, Contractor shall submit more than the number of copies listed above.
 - b. Product Data
 - 1) Distributed to the City
 - 2) Copies
 - a) 4 copies
 - c. Samples
 - 1) Distributed to the Project Representative
 - 2) Copies
 - a) Submit the number stated in the respective Specification Sections.
3. Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the City.
 - a. Provide number of copies as directed by the City but not exceeding the number previously specified.

K. Submittal Review

1. The review of shop drawings, data and samples will be for general conformance with the design concept and Contract Documents. This is not to be construed as:
 - a. Permitting any departure from the Contract requirements
 - b. Relieving the Contractor of responsibility for any errors, including details, dimensions, and materials
 - c. Approving departures from details furnished by the City, except as otherwise provided herein
2. The review and approval of shop drawings, samples or product data by the City does not relieve the Contractor from his/her responsibility with regard to the fulfillment of the terms of the Contract.
 - a. All risks of error and omission are assumed by the Contractor, and the City will have no responsibility therefore.
3. The Contractor remains responsible for details and accuracy, for coordinating the Work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly and for performing Work in a safe manner.
4. If the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which City finds to be in the interest of the City and to be so minor as not to involve a change in Contract Price or time for performance, the City may return the reviewed drawings without noting an exception.
5. Submittals will be returned to the Contractor under 1 of the following codes:
 - a. Code 1
 - 1) "NO EXCEPTIONS TAKEN" is assigned when there are no notations or comments on the submittal.
 - a) When returned under this code the Contractor may release the equipment and/or material for manufacture.
 - b. Code 2

- 1) "EXCEPTIONS NOTED". This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor.
 - a) The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
 - c. Code 3
 - 1) "EXCEPTIONS NOTED/RESUBMIT". This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the package.
 - a) The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
 - b) This resubmittal is to address all comments, omissions and non-conforming items that were noted.
 - c) Resubmittal is to be received by the City within 15 Calendar Days of the date of the City's transmittal requiring the resubmittal.
 - d. Code 4
 - 1) "NOT APPROVED" is assigned when the submittal does not meet the intent of the Contract Documents.
 - a) The Contractor must resubmit the entire package revised to bring the submittal into conformance.
 - b) It may be necessary to resubmit using a different manufacturer/vendor to meet the Contract Documents.
6. Resubmittals
- a. Handled in the same manner as first submittals
 - 1) Corrections other than requested by the City
 - 2) Marked with revision triangle or other similar method
 - a) At Contractor's risk if not marked
 - b. Submittals for each item will be reviewed no more than twice at the City's expense.
 - 1) All subsequent reviews will be performed at times convenient to the City and at the Contractor's expense, based on the City's or City Representative's then prevailing rates.
 - 2) Provide Contractor reimbursement to the City within 30 Calendar Days for all such fees invoiced by the City.
 - c. The need for more than 1 resubmission or any other delay in obtaining City's review of submittals, will not entitle the Contractor to an extension of Contract Time.
7. Partial Submittals
- a. City reserves the right to not review submittals deemed partial, at the City's discretion.
 - b. Submittals deemed by the City to be not complete will be returned to the Contractor, and will be considered "Not Approved" until resubmitted.
 - c. The City may at its option provide a list or mark the submittal directing the Contractor to the areas that are incomplete.
8. If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, then written notice must be provided thereof to the City at least 7 Calendar Days prior to release for manufacture.

9. When the shop drawings have been completed to the satisfaction of the City, the Contractor may carry out the construction in accordance therewith and no further changes therein except upon written instructions from the City.
10. Each submittal, appropriately coded, will be returned within 30 Calendar Days following receipt of submittal by the City.

L. Mock ups

1. Mock Up units as specified in individual Sections, include, but are not necessarily limited to, complete units of the standard of acceptance for that type of Work to be used on the Project. Remove at the completion of the Work or when directed.

M. Qualifications

1. If specifically required in other Sections of these Specifications, submit a P.E. Certification for each item required.

N. Request for Information (RFI)

1. Contractor Request for additional information
 - a. Clarification or interpretation of the contract documents
 - b. When the Contractor believes there is a conflict between Contract Documents
 - c. When the Contractor believes there is a conflict between the Drawings and Specifications
 - 1) Identify the conflict and request clarification
2. Use the Request for Information (RFI) form provided by the City.
3. Numbering of RFI
 - a. Prefix with "RFI" followed by series number, "-xxx", beginning with "01" and increasing sequentially with each additional transmittal.
4. Sufficient information shall be attached to permit a written response without further information.
5. The City will log each request and will review the request.
 - a. If review of the project information request indicates that a change to the Contract Documents is required, the City will issue a Field Order or Change Order, as appropriate.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
12/20/2012	D. Johnson	1.4.K.8. Working Days modified to Calendar Days

- 1 b. All work performed in the TxDOT right-of-way shall be performed in
- 2 compliance with and subject to approval from the Texas Department of
- 3 Transportation
- 4 B. Work near High Voltage Lines
- 5 1. Regulatory Requirements
- 6 a. All Work near High Voltage Lines (more than 600 volts measured between
- 7 conductors or between a conductor and the ground) shall be in accordance with
- 8 Health and Safety Code, Title 9, Subtitle A, Chapter 752.
- 9 2. Warning sign
- 10 a. Provide sign of sufficient size meeting all OSHA requirements.
- 11 3. Equipment operating within 10 feet of high voltage lines will require the following
- 12 safety features
- 13 a. Insulating cage-type of guard about the boom or arm
- 14 b. Insulator links on the lift hook connections for back hoes or dippers
- 15 c. Equipment must meet the safety requirements as set forth by OSHA and the
- 16 safety requirements of the owner of the high voltage lines
- 17 4. Work within 6 feet of high voltage electric lines
- 18 a. Notification shall be given to:
- 19 1) The power company (example: ONCOR)
- 20 a) Maintain an accurate log of all such calls to power company and record
- 21 action taken in each case.
- 22 b. Coordination with power company
- 23 1) After notification coordinate with the power company to:
- 24 a) Erect temporary mechanical barriers, de-energize the lines, or raise or
- 25 lower the lines
- 26 c. No personnel may work within 6 feet of a high voltage line before the above
- 27 requirements have been met.
- 28 C. Confined Space Entry Program
- 29 1. Provide and follow approved Confined Space Entry Program in accordance with
- 30 OSHA requirements.
- 31 2. Confined Spaces include:
- 32 a. Manholes
- 33 b. All other confined spaces in accordance with OSHA's Permit Required for
- 34 Confined Spaces
- 35 D. Use of Explosives, Drop Weight, Etc.
- 36 1. When Contract Documents permit on the project the following will apply:
- 37 a. Public Notification
- 38 1) Submit notice to City and proof of adequate insurance coverage, 24 hours
- 39 prior to commencing.
- 40 2) Minimum 24 hour public notification in accordance with Section 01 31 13
- 41 E. Coordination with United States Army Corps of Engineers (USACE)
- 42 1. At locations in the Project where construction activities occur in areas where
- 43 USACE permits are required, meet all requirements set forth in each designated
- 44 permit.

- 1 F. Dust Control
- 2 1. Use acceptable measures to control dust at the Site.
- 3 a. If water is used to control dust, capture and properly dispose of waste water.
- 4 b. If wet saw cutting is performed, capture and properly dispose of slurry.
- 5 G. Employee Parking
- 6 1. Provide parking for employees at locations approved by the City.

7 **1.5 SUBMITTALS [NOT USED]**

8 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

9 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

10 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

11 **1.9 QUALITY ASSURANCE [NOT USED]**

12 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**

13 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

14 **1.12 WARRANTY [NOT USED]**

15 **PART 2 - PRODUCTS [NOT USED]**

16 **PART 3 - EXECUTION [NOT USED]**

17 **END OF SECTION**

18

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
8/31/2012	D. Johnson	1.4.B – Added requirement of compliance with Health and Safety Code, Title 9. Safety, Subtitle A. Public Safety, Chapter 752. High Voltage Overhead Lines. 1.4.E – Added Contractor responsibility for obtaining a TCEQ Air Permit
3/11/2022	M Owen	Remove references to Air Pollution watch Days and NCTCOG Clean construction Specification requirements. Clarify need for Door Hangers under in addition to contractor notification of public.

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SECTION 01 45 23
TESTING AND INSPECTION SERVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Testing and inspection services procedures and coordination
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various Items bid. No separate payment will be allowed for this Item.
 - a. Contractor is responsible for performing, coordinating, and payment of all Quality Control testing.
 - b. City is responsible for performing and payment for first set of Quality Assurance testing.
 - 1) If the first Quality Assurance test performed by the City fails, the Contractor is responsible for payment of subsequent Quality Assurance testing until a passing test occurs.
 - a) Final acceptance will not be issued by City until all required payments for testing by Contractor have been paid in full.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Testing
 - 1. Complete testing in accordance with the Contract Documents.
 - 2. Coordination
 - a. When testing is required to be performed by the City, notify City, sufficiently in advance, when testing is needed.
 - b. When testing is required to be completed by the Contractor, notify City, sufficiently in advance, that testing will be performed.
 - 3. Distribution of Testing Reports
 - a. Electronic Distribution
 - 1) Confirm development of Project directory for electronic submittals to be uploaded to the City's document management system, or another external FTP site approved by the City.

- 2) Upload test reports to designated project directory and notify appropriate City representatives via email of submittal posting.
- 3) Hard Copies
 - a) 1 copy for all submittals submitted to the Project Representative
- b. Hard Copy Distribution (if required in lieu of electronic distribution)
 - 1) Tests performed by City
 - a) Distribute 1 hard copy to the Contractor
 - 2) Tests performed by the Contractor
 - a) Distribute 3 hard copies to City’s Project Representative
- 4. Provide City’s Project Representative with trip tickets for each delivered load of Concrete or Lime material including the following information:
 - a. Name of pit
 - b. Date of delivery
 - c. Material delivered

B. Inspection

- 1. Inspection or lack of inspection does not relieve the Contractor from obligation to perform work in accordance with the Contract Documents.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
3/9/2020	D.V. Magaña	Removed reference to Buzzsaw and noted that electronic submittals be uploaded through the City’s document management system.

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Provide temporary facilities and controls needed for the Work including, but not necessarily limited to:
 - a. Temporary utilities
 - b. Sanitary facilities
 - c. Storage Sheds and Buildings
 - d. Dust control
 - e. Temporary fencing of the construction site
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various Items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Temporary Utilities
 - 1. Obtaining Temporary Service
 - a. Make arrangements with utility service companies for temporary services.
 - b. Abide by rules and regulations of utility service companies or authorities having jurisdiction.
 - c. Be responsible for utility service costs until Work is approved for Final Acceptance.
 - 1) Included are fuel, power, light, heat and other utility services necessary for execution, completion, testing and initial operation of Work.
 - 2. Water
 - a. Contractor to provide water required for and in connection with Work to be performed and for specified tests of piping, equipment, devices or other use as required for the completion of the Work.
 - b. Provide and maintain adequate supply of potable water for domestic consumption by Contractor personnel and City's Project Representatives.
 - c. Coordination
 - 1) Contact City 1 week before water for construction is desired

- d. Contractor Payment for Construction Water
 - 1) Obtain construction water meter from City for payment as billed by City's established rates.
- 3. Electricity and Lighting
 - a. Provide and pay for electric powered service as required for Work, including testing of Work.
 - 1) Provide power for lighting, operation of equipment, or other use.
 - b. Electric power service includes temporary power service or generator to maintain operations during scheduled shutdown.
- 4. Telephone
 - a. Provide emergency telephone service at Site for use by Contractor personnel and others performing work or furnishing services at Site.
- 5. Temporary Heat and Ventilation
 - a. Provide temporary heat as necessary for protection or completion of Work.
 - b. Provide temporary heat and ventilation to assure safe working conditions.
- B. Sanitary Facilities
 - 1. Provide and maintain sanitary facilities for persons on Site.
 - a. Comply with regulations of State and local departments of health.
 - 2. Enforce use of sanitary facilities by construction personnel at job site.
 - a. Enclose and anchor sanitary facilities.
 - b. No discharge will be allowed from these facilities.
 - c. Collect and store sewage and waste so as not to cause nuisance or health problem.
 - d. Haul sewage and waste off-site at no less than weekly intervals and properly dispose in accordance with applicable regulation.
 - 3. Locate facilities near Work Site and keep clean and maintained throughout Project.
 - 4. Remove facilities at completion of Project
- C. Storage Sheds and Buildings
 - 1. Provide adequately ventilated, watertight, weatherproof storage facilities with floor above ground level for materials and equipment susceptible to weather damage.
 - 2. Storage of materials not susceptible to weather damage may be on blocks off ground.
 - 3. Store materials in a neat and orderly manner.
 - a. Place materials and equipment to permit easy access for identification, inspection and inventory.
 - 4. Equip building with lockable doors and lighting, and provide electrical service for equipment space heaters and heating or ventilation as necessary to provide storage environments acceptable to specified manufacturers.
 - 5. Fill and grade site for temporary structures to provide drainage away from temporary and existing buildings.
 - 6. Remove building from site prior to Final Acceptance.
- D. Temporary Fencing
 - 1. Provide and maintain for the duration or construction when required in contract documents
- E. Dust Control

1. Contractor is responsible for maintaining dust control through the duration of the project.
 - a. Contractor remains on-call at all times
 - b. Must respond in a timely manner

F. Temporary Protection of Construction

1. Contractor or subcontractors are responsible for protecting Work from damage due to weather.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 INSTALLATION

A. Temporary Facilities

1. Maintain all temporary facilities for duration of construction activities as needed.

3.5 [REPAIR] / [RESTORATION]

3.6 RE-INSTALLATION

3.7 FIELD [or] SITE QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES

A. Temporary Facilities

1. Remove all temporary facilities and restore area after completion of the Work, to a condition equal to or better than prior to start of Work.

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

SECTION 01 57 13
STORM WATER POLLUTION PREVENTION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Procedures for Storm Water Pollution Prevention Plans
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements
 - 3. Section 31 25 00 – Erosion and Sediment Control

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Construction Activities resulting in less than 1 acre of disturbance
 - a. Work associated with this Item is considered subsidiary to the various Items bid. No separate payment will be allowed for this Item.
 - 2. Construction Activities resulting in greater than 1 acre of disturbance
 - a. Measurement and Payment shall be in accordance with Section 31 25 00.

1.3 REFERENCES

- A. Abbreviations and Acronyms
 - 1. Notice of Intent: NOI
 - 2. Notice of Termination: NOT
 - 3. Storm Water Pollution Prevention Plan: SWPPP
 - 4. Texas Commission on Environmental Quality: TCEQ
 - 5. Notice of Change: NOC
- A. Reference Standards
 - 1. Reference standards cited in this Specification refer to the current reference standard published at the time of the latest revision date logged at the end of this Specification, unless a date is specifically cited.
 - 2. Integrated Storm Management (iSWM) Technical Manual for Construction Controls

1.4 ADMINISTRATIVE REQUIREMENTS

- A. General
 - 1. Contractor is responsible for resolution and payment of any fines issued associated with compliance to Stormwater Pollution Prevention Plan.

- B. Construction Activities resulting in:
1. Less than 1 acre of disturbance
 - a. Provide erosion and sediment control in accordance with Section 31 25 00 and Drawings.
 2. 1 to less than 5 acres of disturbance
 - a. Texas Pollutant Discharge Elimination System (TPDES) General Construction Permit is required
 - b. Complete SWPPP in accordance with TCEQ requirements
 - 1) TCEQ Small Construction Site Notice Required under general permit TXR150000
 - a) Sign and post at job site
 - b) Prior to Preconstruction Meeting, send 1 copy to City Department of Transportation and Public Works, Environmental Division, (817) 392-6088.
 - 2) Provide erosion and sediment control in accordance with:
 - a) Section 31 25 00
 - b) The Drawings
 - c) TXR150000 General Permit
 - d) SWPPP
 - e) TCEQ requirements
 3. 5 acres or more of Disturbance
 - a. Texas Pollutant Discharge Elimination System (TPDES) General Construction Permit is required
 - b. Complete SWPPP in accordance with TCEQ requirements
 - 1) Prepare a TCEQ NOI form and submit to TCEQ along with required fee
 - a) Sign and post at job site
 - b) Send copy to City Department of Transportation and Public Works, Environmental Division, (817) 392-6088.
 - 2) TCEQ Notice of Change required if making changes or updates to NOI
 - 3) Provide erosion and sediment control in accordance with:
 - a) Section 31 25 00
 - b) The Drawings
 - c) TXR150000 General Permit
 - d) SWPPP
 - e) TCEQ requirements
 - 4) Once the project has been completed and all the closeout requirements of TCEQ have been met a TCEQ Notice of Termination can be submitted.
 - a) Send copy to City Department of Transportation and Public Works, Environmental Division, (817) 392-6088.

1.5 SUBMITTALS

A. SWPPP

1. Submit in accordance with Section 01 33 00, except as stated herein.
 - a. Prior to the Preconstruction Meeting, submit a draft copy of SWPPP to the City as follows:
 - 1) 1 copy to the City Project Manager
 - a) City Project Manager will forward to the City Department of Transportation and Public Works, Environmental Division for review

B. Modified SWPPP

1. If the SWPPP is revised during construction, resubmit modified SWPPP to the City in accordance with Section 01 33 00.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

SECTION 01 58 13
TEMPORARY PROJECT SIGNAGE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Temporary Project Signage Requirements
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various Items bid.
No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED [or] OWNER-SUPPLIED PRODUCTS [NOT USED]

2.2 EQUIPMENT, PRODUCT TYPES, AND MATERIALS

- A. Design Criteria
 - 1. Provide free standing Project Designation Sign in accordance with City's Standard Details for project signs.

B. Materials

1. Sign

- a. Constructed of 3/4-inch fir plywood, grade A-C (exterior) or better

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 INSTALLATION

A. General

1. Provide vertical installation at extents of project.
2. Relocate sign as needed, upon request of the City.

B. Mounting options

- a. Skids
- b. Posts
- c. Barricade

3.5 REPAIR / RESTORATION [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD [or] SITE QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING [NOT USED]

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE

A. General

1. Maintenance will include painting and repairs as needed or directed by the City.

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

SECTION 01 60 00
PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. References for Product Requirements and City Standard Products List
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES [NOT USED]

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. A list of City approved products for use is available through the City’s website at: <https://apps.fortworthtexas.gov/ProjectResources/> and following the directory path; 02 - Construction Documents/Standard Products List
- B. Only products specifically included on City’s Standard Product List in these Contract Documents shall be allowed for use on the Project.
 - 1. Any subsequently approved products will only be allowed for use upon specific approval by the City.
- C. Any specific product requirements in the Contract Documents supersede similar products included on the City’s Standard Product List.
 - 1. The City reserves the right to not allow products to be used for certain projects even though the product is listed on the City’s Standard Product List.
- D. Although a specific product is included on City’s Standard Product List, not all products from that manufacturer are approved for use, including but not limited to, that manufacturer’s standard product.
- E. See Section 01 33 00 for submittal requirements of Product Data included on City’s Standard Product List.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
10/12/12	D. Johnson	Modified Location of City's Standard Product List
3/9/2020	D.V. Magaña	Removed reference to Buzzsaw and noted that the City approved products list is accessible through the City's website.

- 1 5. Clearly and fully mark and identify as to manufacturer, item and installation
2 location.
- 3 6. Provide manufacturer's instructions for storage and handling.
- 4 B. Handling Requirements
- 5 1. Handle products or equipment in accordance with these Contract Documents and
6 manufacturer's recommendations and instructions.
- 7 C. Storage Requirements
- 8 1. Store materials in accordance with manufacturer's recommendations and
9 requirements of these Specifications.
- 10 2. Make necessary provisions for safe storage of materials and equipment.
11 a. Place loose soil materials and materials to be incorporated into Work to prevent
12 damage to any part of Work or existing facilities and to maintain free access at
13 all times to all parts of Work and to utility service company installations in
14 vicinity of Work.
- 15 3. Keep materials and equipment neatly and compactly stored in locations that will
16 cause minimum inconvenience to other contractors, public travel, adjoining owners,
17 tenants and occupants.
18 a. Arrange storage to provide easy access for inspection.
- 19 4. Restrict storage to areas available on construction site for storage of material and
20 equipment as shown on Drawings, or approved by City's Project Representative.
- 21 5. Provide off-site storage and protection when on-site storage is not adequate.
22 a. Provide addresses of and access to off-site storage locations for inspection by
23 City's Project Representative.
- 24 6. Do not use lawns, grass plots or other private property for storage purposes without
25 written permission of owner or other person in possession or control of premises.
- 26 7. Store in manufacturers' unopened containers.
- 27 8. Neatly, safely and compactly stack materials delivered and stored along line of
28 Work to avoid inconvenience and damage to property owners and general public
29 and maintain at least 3 feet from fire hydrant.
- 30 9. Keep public and private driveways and street crossings open.
- 31 10. Repair or replace damaged lawns, sidewalks, streets or other improvements to
32 satisfaction of City's Project Representative.
33 a. Total length which materials may be distributed along route of construction at
34 one time is 1,000 linear feet, unless otherwise approved in writing by City's
35 Project Representative.

1 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**

2 **1.12 WARRANTY [NOT USED]**

3 **PART 2 - PRODUCTS [NOT USED]**

4 **PART 3 - EXECUTION**

5 **3.1 INSTALLERS [NOT USED]**

6 **3.2 EXAMINATION [NOT USED]**

7 **3.3 PREPARATION [NOT USED]**

8 **3.4 ERECTION [NOT USED]**

9 **3.5 REPAIR / RESTORATION [NOT USED]**

10 **3.6 RE-INSTALLATION [NOT USED]**

11 **3.7 FIELD [or] SITE QUALITY CONTROL**

12 A. Tests and Inspections

13 1. Inspect all products or equipment delivered to the site prior to unloading.

14 B. Non-Conforming Work

15 1. Reject all products or equipment that are damaged, used or in any other way
16 unsatisfactory for use on the project.

17 **3.8 SYSTEM STARTUP [NOT USED]**

18 **3.9 ADJUSTING [NOT USED]**

19 **3.10 CLEANING [NOT USED]**

20 **3.11 CLOSEOUT ACTIVITIES [NOT USED]**

21 **3.12 PROTECTION**

22 A. Protect all products or equipment in accordance with manufacturer's written directions.

23 B. Store products or equipment in location to avoid physical damage to items while in
24 storage.

25 C. Protect equipment from exposure to elements and keep thoroughly dry if required by
26 the manufacturer.

27 **3.13 MAINTENANCE [NOT USED]**

28 **3.14 ATTACHMENTS [NOT USED]**

29 **END OF SECTION**

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SECTION 01 70 00
MOBILIZATION AND REMOBILIZATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Mobilization and Demobilization
 - a. Mobilization
 - 1) Transportation of Contractor's personnel, equipment, and operating supplies to the Site
 - 2) Establishment of necessary general facilities for the Contractor's operation at the Site
 - 3) Premiums paid for performance and payment bonds
 - 4) Transportation of Contractor's personnel, equipment, and operating supplies to another location within the designated Site
 - 5) Relocation of necessary general facilities for the Contractor's operation from 1 location to another location on the Site.
 - b. Demobilization
 - 1) Transportation of Contractor's personnel, equipment, and operating supplies away from the Site including disassembly
 - 2) Site Clean-up
 - 3) Removal of all buildings and/or other facilities assembled at the Site for this Contract
 - c. Mobilization and Demobilization do not include activities for specific items of work that are for which payment is provided elsewhere in the contract.
2. Remobilization
 - a. Remobilization for Suspension of Work specifically required in the Contract Documents or as required by City includes:
 - 1) Demobilization
 - a) Transportation of Contractor's personnel, equipment, and operating supplies from the Site including disassembly or temporarily securing equipment, supplies, and other facilities as designated by the Contract Documents necessary to suspend the Work.
 - b) Site Clean-up as designated in the Contract Documents
 - 2) Remobilization
 - a) Transportation of Contractor's personnel, equipment, and operating supplies to the Site necessary to resume the Work.
 - b) Establishment of necessary general facilities for the Contractor's operation at the Site necessary to resume the Work.
 - 3) No Payments will be made for:
 - a) Mobilization and Demobilization from one location to another on the Site in the normal progress of performing the Work.
 - b) Stand-by or idle time
 - c) Lost profits
3. Mobilizations and Demobilization for Miscellaneous Projects
 - a. Mobilization and Demobilization

- 1) Mobilization shall consist of the activities and cost on a Work Order basis necessary for:
 - a) Transportation of Contractor’s personnel, equipment, and operating supplies to the Site for the issued Work Order.
 - b) Establishment of necessary general facilities for the Contractor’s operation at the Site for the issued Work Order
- 2) Demobilization shall consist of the activities and cost necessary for:
 - a) Transportation of Contractor’s personnel, equipment, and operating supplies from the Site including disassembly for each issued Work Order
 - b) Site Clean-up for each issued Work Order
 - c) Removal of all buildings or other facilities assembled at the Site for each Work Oder
- b. Mobilization and Demobilization do not include activities for specific items of work for which payment is provided elsewhere in the contract.
4. Emergency Mobilizations and Demobilization for Miscellaneous Projects
 - a. A Mobilization for Miscellaneous Projects when directed by the City and the mobilization occurs within 24 hours of the issuance of the Work Order.
- B. Deviations from this City of Fort Worth Standard Specification
 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 2. Division 1 – General Requirements
- 1.2 PRICE AND PAYMENT PROCEDURES**
- A. Measurement and Payment
 1. Mobilization and Demobilization
 - a. Measure
 - 1) This Item is considered subsidiary to the various Items bid.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item are subsidiary to the to the various Items bid and no other compensation will be allowed.
 - 2) The work performed and materials furnished for demobilization in accordance with this Item are subsidiary to the to the various Items bid and no other compensation will be allowed.
 2. Remobilization for suspension of Work as specifically required in the Contract Documents
 - a. Measurement
 - 1) Measurement for this Item shall be per each remobilization performed.
 - b. Payment
 - 1) The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit price per each “Specified Remobilization” in accordance with Contract Documents.
 - c. The price shall include:
 - 1) Demobilization as described in Section 1.1.A.2.a.(1)

- 1 2) Remobilization as described in Section 1.1.A.2.a.(2)
- 2 d. No payments will be made for standby, idle time, or lost profits associated this
- 3 Item.
- 4 3. Remobilization for suspension of Work as required by City
- 5 a. Measurement and Payment
- 6 1) This shall be submitted as a Contract Claim in accordance with Article 10
- 7 of Section 00 72 00.
- 8 2) No payments will be made for standby, idle time, or lost profits associated
- 9 with this Item.
- 10 4. Mobilizations and Demobilizations for Miscellaneous Projects
- 11 a. Measurement
- 12 1) Measurement for this Item shall be for each Mobilization and
- 13 Demobilization required by the Contract Documents
- 14 b. Payment
- 15 1) The Work performed and materials furnished in accordance with this Item
- 16 and measured as provided under “Measurement” will be paid for at the unit
- 17 price per each “Work Order Mobilization” in accordance with Contract
- 18 Documents. Demobilization shall be considered subsidiary to mobilization
- 19 and shall not be paid for separately.
- 20 c. The price shall include:
- 21 1) Mobilization as described in Section 1.1.A.3.a.(1)
- 22 2) Demobilization as described in Section 1.1.A.3.a.(2)
- 23 d. No payments will be made for standby, idle time, or lost profits associated this
- 24 Item.
- 25 5. Emergency Mobilizations and Demobilizations for Miscellaneous Projects
- 26 a. Measurement
- 27 1) Measurement for this Item shall be for each Mobilization and
- 28 Demobilization required by the Contract Documents
- 29 b. Payment
- 30 1) The Work performed and materials furnished in accordance with this Item
- 31 and measured as provided under “Measurement” will be paid for at the unit
- 32 price per each “Work Order Emergency Mobilization” in accordance with
- 33 Contract Documents. Demobilization shall be considered subsidiary to
- 34 mobilization and shall not be paid for separately.
- 35 c. The price shall include
- 36 1) Mobilization as described in Section 1.1.A.4.a
- 37 2) Demobilization as described in Section 1.1.A.3.a.(2)
- 38 d. No payments will be made for standby, idle time, or lost profits associated this
- 39 Item.

- 40 **1.3 REFERENCES [NOT USED]**
- 41 **1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]**
- 42 **1.5 SUBMITTALS [NOT USED]**
- 43 **1.6 INFORMATIONAL SUBMITTALS [NOT USED]**
- 44 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**
- 45 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

- 1 **1.9 QUALITY ASSURANCE [NOT USED]**
- 2 **1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]**
- 3 **1.11 FIELD [SITE] CONDITIONS [NOT USED]**
- 4 **1.12 WARRANTY [NOT USED]**
- 5 **PART 2 - PRODUCTS [NOT USED]**
- 6 **PART 3 - EXECUTION [NOT USED]**

7 **END OF SECTION**

8

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
11/22/16	Michael Owen	1.2 Price and Payment Procedures - Revised specification, including blue text, to make specification flexible for either subsidiary or paid bid item for Mobilization.

9

SECTION 01 74 23
CLEANING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Intermediate and final cleaning for Work not including special cleaning of closed systems specified elsewhere
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements
 - 3. Section 32 92 13 – Hydro-Mulching, Seeding and Sodding

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various Items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Scheduling
 - 1. Schedule cleaning operations so that dust and other contaminants disturbed by cleaning process will not fall on newly painted surfaces.
 - 2. Schedule final cleaning upon completion of Work and immediately prior to final inspection.

1.5 SUBMITTALS [NOT USED]

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE [NOT USED]

1.10 STORAGE, AND HANDLING

- A. Storage and Handling Requirements
 - 1. Store cleaning products and cleaning wastes in containers specifically designed for those materials.

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED [or] OWNER-SUPPLIED PRODUCTS [NOT USED]

2.2 MATERIALS

A. Cleaning Agents

1. Compatible with surface being cleaned
2. New and uncontaminated
3. For manufactured surfaces
 - a. Material recommended by manufacturer

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 APPLICATION [NOT USED]

3.5 REPAIR / RESTORATION [NOT USED]

3.6 RE-INSTALLATION [NOT USED]

3.7 FIELD [or] SITE QUALITY CONTROL [NOT USED]

3.8 SYSTEM STARTUP [NOT USED]

3.9 ADJUSTING [NOT USED]

3.10 CLEANING

A. General

1. Prevent accumulation of wastes that create hazardous conditions.
2. Conduct cleaning and disposal operations to comply with laws and safety orders of governing authorities.
3. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains or sewers.
4. Dispose of degradable debris at an approved solid waste disposal site.
5. Dispose of nondegradable debris at an approved solid waste disposal site or in an alternate manner approved by City and regulatory agencies.

6. Handle materials in a controlled manner with as few handlings as possible.
7. Thoroughly clean, sweep, wash and polish all Work and equipment associated with this project.
8. Remove all signs of temporary construction and activities incidental to construction of required permanent Work.
9. If project is not cleaned to the satisfaction of the City, the City reserves the right to have the cleaning completed at the expense of the Contractor.
10. Do not burn on-site.

B. Intermediate Cleaning during Construction

1. Keep Work areas clean so as not to hinder health, safety or convenience of personnel in existing facility operations.
2. At maximum weekly intervals, dispose of waste materials, debris and rubbish.
3. Confine construction debris daily in strategically located container(s):
 - a. Cover to prevent blowing by wind
 - b. Store debris away from construction or operational activities
 - c. Haul from site at a minimum of once per week
4. Vacuum clean interior areas when ready to receive finish painting.
 - a. Continue vacuum cleaning on an as-needed basis, until Final Acceptance.
5. Prior to storm events, thoroughly clean site of all loose or unsecured items, which may become airborne or transported by flowing water during the storm.

C. Interior Final Cleaning

1. Remove grease, mastic, adhesives, dust, dirt, stains, fingerprints, labels and other foreign materials from sight-exposed surfaces.
2. Wipe all lighting fixture reflectors, lenses, lamps and trims clean.
3. Wash and shine glazing and mirrors.
4. Polish glossy surfaces to a clear shine.
5. Ventilating systems
 - a. Clean permanent filters and replace disposable filters if units were operated during construction.
 - b. Clean ducts, blowers and coils if units were operated without filters during construction.
6. Replace all burned out lamps.
7. Broom clean process area floors.
8. Mop office and control room floors.

D. Exterior (Site or Right of Way) Final Cleaning

1. Remove trash and debris containers from site.
 - a. Re-seed areas disturbed by location of trash and debris containers in accordance with Section 32 92 13.
2. Sweep roadway to remove all rocks, pieces of asphalt, concrete or any other object that may hinder or disrupt the flow of traffic along the roadway.
3. Clean any interior areas including, but not limited to, vaults, manholes, structures, junction boxes and inlets.

- 4. If no longer required for maintenance of erosion facilities, and upon approval by City, remove erosion control from site.
- 5. Clean signs, lights, signals, etc.

3.11 CLOSEOUT ACTIVITIES [NOT USED]

3.12 PROTECTION [NOT USED]

3.13 MAINTENANCE [NOT USED]

3.14 ATTACHMENTS [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

1 **PART 3 - EXECUTION**

2 **3.1 INSTALLERS [NOT USED]**

3 **3.2 EXAMINATION [NOT USED]**

4 **3.3 PREPARATION [NOT USED]**

5 **3.4 CLOSEOUT PROCEDURE**

- 6 A. Prior to requesting Final Inspection, submit:
 - 7 1. Project Record Documents in accordance with Section 01 78 39
 - 8 2. Operation and Maintenance Data, if required, in accordance with Section 01 78 23
- 9 B. Prior to requesting Final Inspection, perform final cleaning in accordance with Section
10 01 74 23.
- 11 C. Final Inspection
 - 12 1. After final cleaning, provide notice to the City Project Representative that the Work
13 is completed.
 - 14 a. The City will make an initial Final Inspection with the Contractor present.
 - 15 b. Upon completion of this inspection, the City will notify the Contractor, in
16 writing within 10 business days, of any particulars in which this inspection
17 reveals that the Work is defective or incomplete.
 - 18 2. Upon receiving written notice from the City, immediately undertake the Work
19 required to remedy deficiencies and complete the Work to the satisfaction of the
20 City.
 - 21 3. The Right-of-way shall be cleared of all construction materials, barricades, and
22 temporary signage.
 - 23 4. Upon completion of Work associated with the items listed in the City's written
24 notice, inform the City that the required Work has been completed. Upon receipt of
25 this notice, the City, in the presence of the Contractor, will make a subsequent Final
26 Inspection of the project.
 - 27 5. Provide all special accessories required to place each item of equipment in full
28 operation. These special accessory items include, but are not limited to:
 - 29 a. Specified spare parts
 - 30 b. Adequate oil and grease as required for the first lubrication of the equipment
 - 31 c. Initial fill up of all chemical tanks and fuel tanks
 - 32 d. Light bulbs
 - 33 e. Fuses
 - 34 f. Vault keys
 - 35 g. Handwheels
 - 36 h. Other expendable items as required for initial start-up and operation of all
37 equipment
- 38 D. Notice of Project Completion
 - 39 1. Once the City Project Representative finds the Work subsequent to Final Inspection
40 to be satisfactory, the City will issue a Notice of Project Completion (Green Sheet).
- 41 E. Supporting Documentation

SECTION 01 78 23
OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Product data and related information appropriate for City's maintenance and operation of products furnished under Contract
 - 2. Such products may include, but are not limited to:
 - a. Traffic Controllers
 - b. Irrigation Controllers (to be operated by the City)
 - c. Butterfly Valves
- B. Deviations from this City of Fort Worth Standard Specification
 - 1. None.
- C. Related Specification Sections include, but are not necessarily limited to:
 - 1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
 - 2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

- A. Measurement and Payment
 - 1. Work associated with this Item is considered subsidiary to the various Items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Schedule
 - 1. Submit manuals in final form to the City within 30 calendar days of product shipment to the project site.

1.5 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 . All submittals shall be approved by the City prior to delivery.

1.6 INFORMATIONAL SUBMITTALS

- A. Submittal Form
 - 1. Prepare data in form of an instructional manual for use by City personnel.
 - 2. Format
 - a. Size: 8 ½ inches x 11 inches
 - b. Paper
 - 1) 40 pound minimum, white, for typed pages
 - 2) Holes reinforced with plastic, cloth or metal
 - c. Text: Manufacturer's printed data, or neatly typewritten

- d. Drawings
 - 1) Provide reinforced punched binder tab, bind in with text
 - 2) Reduce larger drawings and fold to size of text pages.
 - e. Provide fly-leaf for each separate product, or each piece of operating equipment.
 - 1) Provide typed description of product, and major component parts of equipment.
 - 2) Provide indexed tabs.
 - f. Cover
 - 1) Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS".
 - 2) List:
 - a) Title of Project
 - b) Identity of separate structure as applicable
 - c) Identity of general subject matter covered in the manual
3. Binders
- a. Commercial quality 3-ring binders with durable and cleanable plastic covers
 - b. When multiple binders are used, correlate the data into related consistent groupings.
4. If available, provide an electronic form of the O&M Manual.
- B. Manual Content
1. Neatly typewritten table of contents for each volume, arranged in systematic order
- a. Contractor, name of responsible principal, address and telephone number
 - b. A list of each product required to be included, indexed to content of the volume
 - c. List, with each product:
 - 1) The name, address and telephone number of the subcontractor or installer
 - 2) A list of each product required to be included, indexed to content of the volume
 - 3) Identify area of responsibility of each
 - 4) Local source of supply for parts and replacement
 - d. Identify each product by product name and other identifying symbols as set forth in Contract Documents.
2. Product Data
- a. Include only those sheets which are pertinent to the specific product.
 - b. Annotate each sheet to:
 - 1) Clearly identify specific product or part installed
 - 2) Clearly identify data applicable to installation
 - 3) Delete references to inapplicable information
3. Drawings
- a. Supplement product data with drawings as necessary to clearly illustrate:
 - 1) Relations of component parts of equipment and systems
 - 2) Control and flow diagrams
 - b. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.
 - c. Do not use Project Record Drawings as maintenance drawings.
4. Written text, as required to supplement product data for the particular installation:
- a. Organize in consistent format under separate headings for different procedures.
 - b. Provide logical sequence of instructions of each procedure.

5. Copy of each warranty, bond and service contract issued
 - a. Provide information sheet for City personnel giving:
 - 1) Proper procedures in event of failure
 - 2) Instances which might affect validity of warranties or bonds
- C. Manual for Materials and Finishes
 1. Submit 5 copies of complete manual in final form.
 2. Content, for architectural products, applied materials and finishes:
 - a. Manufacturer's data, giving full information on products
 - 1) Catalog number, size, composition
 - 2) Color and texture designations
 - 3) Information required for reordering special manufactured products
 - b. Instructions for care and maintenance
 - 1) Manufacturer's recommendation for types of cleaning agents and methods
 - 2) Cautions against cleaning agents and methods which are detrimental to product
 - 3) Recommended schedule for cleaning and maintenance
 3. Content, for moisture protection and weather exposure products:
 - a. Manufacturer's data, giving full information on products
 - 1) Applicable standards
 - 2) Chemical composition
 - 3) Details of installation
 - b. Instructions for inspection, maintenance and repair
- D. Manual for Equipment and Systems
 1. Submit 5 copies of complete manual in final form.
 2. Content, for each unit of equipment and system, as appropriate:
 - a. Description of unit and component parts
 - 1) Function, normal operating characteristics and limiting conditions
 - 2) Performance curves, engineering data and tests
 - 3) Complete nomenclature and commercial number of replaceable parts
 - b. Operating procedures
 - 1) Start-up, break-in, routine and normal operating instructions
 - 2) Regulation, control, stopping, shut-down and emergency instructions
 - 3) Summer and winter operating instructions
 - 4) Special operating instructions
 - c. Maintenance procedures
 - 1) Routine operations
 - 2) Guide to "trouble shooting"
 - 3) Disassembly, repair and reassembly
 - 4) Alignment, adjusting and checking
 - d. Servicing and lubrication schedule
 - 1) List of lubricants required
 - e. Manufacturer's printed operating and maintenance instructions
 - f. Description of sequence of operation by control manufacturer
 - 1) Predicted life of parts subject to wear
 - 2) Items recommended to be stocked as spare parts
 - g. As installed control diagrams by controls manufacturer
 - h. Each contractor's coordination drawings
 - 1) As installed color coded piping diagrams

- i. Charts of valve tag numbers, with location and function of each valve
 - j. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage
 - k. Other data as required under pertinent Sections of Specifications
3. Content, for each electric and electronic system, as appropriate:
- a. Description of system and component parts
 - 1) Function, normal operating characteristics, and limiting conditions
 - 2) Performance curves, engineering data and tests
 - 3) Complete nomenclature and commercial number of replaceable parts
 - b. Circuit directories of panelboards
 - 1) Electrical service
 - 2) Controls
 - 3) Communications
 - c. As installed color coded wiring diagrams
 - d. Operating procedures
 - 1) Routine and normal operating instructions
 - 2) Sequences required
 - 3) Special operating instructions
 - e. Maintenance procedures
 - 1) Routine operations
 - 2) Guide to "trouble shooting"
 - 3) Disassembly, repair and reassembly
 - 4) Adjustment and checking
 - f. Manufacturer's printed operating and maintenance instructions
 - g. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage
 - h. Other data as required under pertinent Sections of Specifications
4. Prepare and include additional data when the need for such data becomes apparent during instruction of City's personnel.

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

- A. Provide operation and maintenance data by personnel with the following criteria:
1. Trained and experienced in maintenance and operation of described products
 2. Skilled as technical writer to the extent required to communicate essential data
 3. Skilled as draftsman competent to prepare required drawings

1.10 DELIVERY, STORAGE, AND HANDLING [NOT USED]

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS [NOT USED]

PART 3 - EXECUTION [NOT USED]

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE
8/31/2012	D. Johnson	1.5.A.1 – title of section removed

SECTION 01 78 39
PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Work associated with the documenting the project and recording changes to project documents, including:
 - a. Record Drawings
 - b. Water Meter Service Reports
 - c. Sanitary Sewer Service Reports
 - d. Large Water Meter Reports

B. Deviations from this City of Fort Worth Standard Specification

1. None.

C. Related Specification Sections include, but are not necessarily limited to:

1. Division 0 – Bidding Requirements, Contract Forms and Conditions of the Contract
2. Division 1 – General Requirements

1.2 PRICE AND PAYMENT PROCEDURES

A. Measurement and Payment

1. Work associated with this Item is considered subsidiary to the various Items bid. No separate payment will be allowed for this Item.

1.3 REFERENCES [NOT USED]

1.4 ADMINISTRATIVE REQUIREMENTS [NOT USED]

1.5 SUBMITTALS

- A. Prior to submitting a request for Final Inspection, deliver Project Record Documents to City's Project Representative.

1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]

1.7 CLOSEOUT SUBMITTALS [NOT USED]

1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]

1.9 QUALITY ASSURANCE

A. Accuracy of Records

1. Thoroughly coordinate changes within the Record Documents, making adequate and proper entries on each page of Specifications and each sheet of Drawings and other Documents where such entry is required to show the change properly.
2. Accuracy of records shall be such that future search for items shown in the Contract Documents may rely reasonably on information obtained from the approved Project Record Documents.

3. To facilitate accuracy of records, make entries within 24 hours after receipt of information that the change has occurred.
4. Provide factual information regarding all aspects of the Work, both concealed and visible, to enable future modification of the Work to proceed without lengthy and expensive site measurement, investigation and examination.

1.10 STORAGE AND HANDLING

A. Storage and Handling Requirements

1. Maintain the job set of Record Documents completely protected from deterioration and from loss and damage until completion of the Work and transfer of all recorded data to the final Project Record Documents.
2. In the event of loss of recorded data, use means necessary to again secure the data to the City's approval.
 - a. In such case, provide replacements to the standards originally required by the Contract Documents.

1.11 FIELD [SITE] CONDITIONS [NOT USED]

1.12 WARRANTY [NOT USED]

PART 2 - PRODUCTS

2.1 OWNER-FURNISHED [OR] OWNER-SUPPLIED PRODUCTS [NOT USED]

2.2 RECORD DOCUMENTS

A. Job set

1. Promptly following receipt of the Notice to Proceed, secure from the City, at no charge to the Contractor, 1 complete set of all Documents comprising the Contract.

B. Final Record Documents

1. At a time nearing the completion of the Work and prior to Final Inspection, provide the City 1 complete set of all Final Record Drawings in the Contract.

2.3 ACCESSORIES [NOT USED]

2.4 SOURCE QUALITY CONTROL [NOT USED]

PART 3 - EXECUTION

3.1 INSTALLERS [NOT USED]

3.2 EXAMINATION [NOT USED]

3.3 PREPARATION [NOT USED]

3.4 MAINTENANCE DOCUMENTS

A. Maintenance of Job Set

1. Immediately upon receipt of the job set, identify each of the Documents with the title, "RECORD DOCUMENTS - JOB SET".

2. Preservation
 - a. Considering the Contract completion time, the probable number of occasions upon which the job set must be taken out for new entries and for examination, and the conditions under which these activities will be performed, devise a suitable method for protecting the job set.
 - b. Do not use the job set for any purpose except entry of new data and for review by the City, until start of transfer of data to final Project Record Documents.
 - c. Maintain the job set at the site of work.
 3. Coordination with Construction Survey
 - a. At a minimum, in accordance with the intervals set forth in Section 01 71 23, clearly mark any deviations from Contract Documents associated with installation of the infrastructure.
 4. Making entries on Drawings
 - a. Record any deviations from Contract Documents.
 - b. Use an erasable colored pencil (not ink or indelible pencil), clearly describe the change by graphic line and note as required.
 - c. Date all entries.
 - d. Call attention to the entry by a "cloud" drawn around the area or areas affected.
 - e. In the event of overlapping changes, use different colors for the overlapping changes.
 5. Conversion of schematic layouts
 - a. In some cases on the Drawings, arrangements of conduits, circuits, piping, ducts, and similar items, are shown schematically and are not intended to portray precise physical layout.
 - 1) Final physical arrangement is determined by the Contractor, subject to the City's approval.
 - 2) However, design of future modifications of the facility may require accurate information as to the final physical layout of items which are shown only schematically on the Drawings.
 - b. Show on the job set of Record Drawings, by dimension accurate to within 1 inch, the centerline of each run of items.
 - 1) Final physical arrangement is determined by the Contractor, subject to the City's approval.
 - 2) Show, by symbol or note, the vertical location of the Item ("under slab", "in ceiling plenum", "exposed", and the like).
 - 3) Make all identification sufficiently descriptive that it may be related reliably to the Specifications.
 - c. The City may waive the requirements for conversion of schematic layouts where, in the City's judgment, conversion serves no useful purpose. However, do not rely upon waivers being issued except as specifically issued in writing by the City.
- B. Final Project Record Documents
1. Transfer of data to Drawings
 - a. Carefully transfer change data shown on the job set of Record Drawings to the corresponding final documents, coordinating the changes as required.
 - b. Clearly indicate at each affected detail and other Drawing a full description of changes made during construction, and the actual location of items.

- c. Call attention to each entry by drawing a "cloud" around the area or areas affected.
 - d. Make changes neatly, consistently and with the proper media to assure longevity and clear reproduction.
2. Transfer of data to other Documents
- a. If the Documents, other than Drawings, have been kept clean during progress of the Work, and if entries thereon have been orderly to the approval of the City, the job set of those Documents, other than Drawings, will be accepted as final Record Documents.
 - b. If any such Document is not so approved by the City, secure a new copy of that Document from the City at the City's usual charge for reproduction and handling, and carefully transfer the change data to the new copy to the approval of the City.

- 3.5 REPAIR / RESTORATION [NOT USED]**
- 3.6 RE-INSTALLATION [NOT USED]**
- 3.7 FIELD [OR] SITE QUALITY CONTROL [NOT USED]**
- 3.8 SYSTEM STARTUP [NOT USED]**
- 3.9 ADJUSTING [NOT USED]**
- 3.10 CLEANING [NOT USED]**
- 3.11 CLOSEOUT ACTIVITIES [NOT USED]**
- 3.12 PROTECTION [NOT USED]**
- 3.13 MAINTENANCE [NOT USED]**
- 3.14 ATTACHMENTS [NOT USED]**

END OF SECTION

Revision Log		
DATE	NAME	SUMMARY OF CHANGE

- 1 6) Hauling
- 2 7) Disposal of excess material not used elsewhere onsite
- 3 8) Scarification
- 4 9) Clean-up

5 **1.3 REFERENCES [NOT USED]**

6 A. Definitions

- 7 1. Unclassified Excavation – Without regard to materials, all excavations shall be
- 8 considered unclassified and shall include all materials excavated. Any reference to
- 9 Rock or other materials on the Drawings or in the specifications is solely for the
- 10 City and the Contractor’s information and is not to be taken as a classification of
- 11 the excavation.

12 **1.4 ADMINSTRATIVE REQUIREMENTS**

- 13 A. The Contractor will provide the City with a Disposal Letter in accordance to Division
- 14 01.

15 **1.5 SUBMITTALS [NOT USED]**

16 **1.6 ACTION SUBMITTALS/INFORMATIONAL SUBMITTALS [NOT USED]**

17 **1.7 CLOSEOUT SUBMITTALS [NOT USED]**

18 **1.8 MAINTENANCE MATERIAL SUBMITTALS [NOT USED]**

19 **1.9 QUALITY ASSURANCE**

20 A. Excavation Safety

- 21 1. The Contractor shall be solely responsible for making all excavations in a safe
- 22 manner.
- 23 2. All excavation and related sheeting and bracing shall comply with the requirements
- 24 of OSHA excavation safety standards 29 CFR part 1926 and state requirements.

25 **1.10 DELIVERY, STORAGE, AND HANDLING**

26 A. Storage

- 27 1. Within Existing Rights-of-Way (ROW)
- 28 a. Soil may be stored within existing ROW, easements or temporary construction
- 29 easements, unless specifically disallowed in the Contract Documents.
- 30 b. Do not block drainage ways, inlets or driveways.
- 31 c. Provide erosion control in accordance with Section 31 25 00.
- 32 d. When the Work is performed in active traffic areas, store materials only in
- 33 areas barricaded as provided in the traffic control plans.
- 34 e. In non-paved areas, do not store material on the root zone of any trees or in
- 35 landscaped areas.
- 36 2. Designated Storage Areas
- 37 a. If the Contract Documents do not allow the storage of spoils within the ROW,
- 38 easement or temporary construction easement, then secure and maintain an
- 39 adequate storage location.
- 40 b. Provide an affidavit that rights have been secured to store the materials on
- 41 private property.

- 1 c. Provide erosion control in accordance with Section 31 25 00.
- 2 d. Do not block drainage ways.

3 **1.11 FIELD CONDITIONS**

4 A. Existing Conditions

- 5 1. Any data which has been or may be provided on subsurface conditions is not
- 6 intended as a representation or warranty of accuracy or continuity between soils. It
- 7 is expressly understood that neither the City nor the Engineer will be responsible
- 8 for interpretations or conclusions drawn there from by the Contractor.
- 9 2. Data is made available for the convenience of the Contractor.

10 **1.12 WARRANTY [NOT USED]**

11 **PART 2 - PRODUCTS [NOT USED]**

12 **2.1 OWNER-FURNISHED [NOT USED]**

13 **2.2 PRODUCT TYPES AND MATERIALS**

14 A. Materials

- 15 1. Unacceptable Fill Material
- 16 a. In-situ soils classified as ML, MH, PT, OL or OH in accordance with ASTM
- 17 D2487

18 **PART 3 - EXECUTION**

19 **3.1 INSTALLERS [NOT USED]**

20 **3.2 EXAMINATION [NOT USED]**

21 **3.3 PREPARATION [NOT USED]**

22 **3.4 CONSTRUCTION**

- 23 A. Accept ownership of unsuitable or excess material and dispose of material off-site
- 24 accordance with local, state, and federal regulations at locations.
- 25 B. Excavations shall be performed in the dry, and kept free from water, snow and ice
- 26 during construction with the exception of water that is applied for dust control.
- 27 C. Separate Unacceptable Fill Material from other materials, remove from the Site and
- 28 properly dispose according to disposal plan.
- 29 D. Maintain drainage in the excavated area to avoid damage to the roadway sections and
- 30 proposed or existing structures.
- 31 E. Correct any damage to the subgrade caused by weather, at no additional cost to the
- 32 City.
- 33 F. Shape slopes to avoid loosening material below or outside the proposed grades.
- 34 Remove and dispose of slides as directed.
- 35 G. Rock Cuts

APPENDIX

GC-4.02 Subsurface and Physical Conditions

GC-6.06.D Minority and Women Owned Business Enterprise Compliance (Subcontractor/Supplier Utilization Form, Prime Contractor Waiver Form, Good Faith Effort Form, and Joint Venture Eligibility Form)

GC-6.07 Wage Rates

GC-6.09 Permits and Utilities