City of San Diego

CONTRACTOR'S NAME: Dick Miller Inc.
ADDRESS: 930 Boardwalk, Suite H, San Marcos, CA 92078
TELEPHONE NO.: 760-471-6842 **FAX NO.:** 760-471-6178
CITY CONTACT: Ronald McMinn Jr., **Contract Specialist, Email**: RMcMinn@sandiego.gov
Phone No. (619) 533-4618
H. Fathi / R.W. Bustamante / egz

BIDDING DOCUMENTS

e - Bidding

FINAL

FOR

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS

BID NO.: K-19-1780-DBB-3
SAP NO. (WBS/IO/CC): L-18002.2
CLIENT DEPARTMENT: 2115
COUNCIL DISTRICT: 6
PROJECT TYPE: FA

THIS CONTRACT WILL BE SUBJECT TO THE FOLLOWING:

- THE CITY'S SUBCONTRACTING PARTICIPATION REQUIREMENTS FOR SLBE PROGRAM
- PREVAILING WAGE RATES: STATE ☒ FEDERAL ☐
- APPRENTICESHIP

BID DUE DATE:

2:00 PM
OCTOBER 17, 2018
CITY OF SAN DIEGO
PUBLIC WORKS CONTRACTS
525 B STREET, SUITE 750, MS 908A
SAN DIEGO, CA 92101

ENGINEER OF WORK

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

1) Registered Engineer	9/6/2018 Date	Seal:
2) For City Engineer	9-6-18 Date	Seal:

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NOTICE INVITING BIDS

1. **SUMMARY OF WORK:** This is the City of San Diego's (City) solicitation process to acquire Construction services for **Miramar Landfill Storm Water Conveyance Improvements.** For additional information refer to Attachment A.

2. **FULL AND OPEN COMPETITION:** This contract is open to full competition and may be bid on by Contractors who are on the City's current Prequalified Contractors' List. For information regarding the Contractors Prequalified list visit the City's web site: http://www.sandiego.gov.

3. **ESTIMATED CONSTRUCTION COST:** The City's estimated construction cost for this project is **$2,730,000.**

4. **BID DUE DATE AND TIME ARE: OCTOBER 17, 2018, AT 2:00 PM.**

5. **PREVAILING WAGE RATES APPLY TO THIS CONTRACT:** Refer to Attachment D.

6. **LICENSE REQUIREMENT**: The City has determined that the following licensing classification(s) are required for this contract: **A**

7. **SUBCONTRACTING PARTICIPATION PERCENTAGES**: Subcontracting participation percentages apply to this contract.

7.1. The City has incorporated **mandatory** SLBE-ELBE subcontractor participation percentages to enhance competition and maximize subcontracting opportunities. For the purpose of achieving the mandatory subcontractor participation percentages, a recommended breakdown of the SLBE and ELBE subcontractor participation percentages based upon certified SLBE and ELBE firms has also been provided to achieve the mandatory subcontractor participation percentages:

1.	SLBE participation	**7.3%**
2.	ELBE participation	**8.5%**
3.	Total mandatory participation	**15.8%**

7.2. The Bid may be declared non-responsive if the Bidder fails to meet the following requirements:

7.2.1. Include SLBE-ELBE certified subcontractors at the overall mandatory participation percentage identified in this document; **OR**

7.2.2. Submit Good Faith Effort documentation, saved in searchable Portable Document Format (PDF) and stored on Compact Disc (CD) or Digital Video Disc (DVD), demonstrating the Bidder made a good faith effort to outreach to and include SLBE-ELBE Subcontractors required in this document within **3 Working Days** of the Bid opening if the overall mandatory participation percentage is not met.

8. **PRE-BID SITE VISIT:** All those wishing to submit a bid, are **ENCOURAGED** to visit the Work Site with the Engineer. **The purpose of the Site Visit is to acquaint Bidders with the Site Conditions, Work Location and Scope of Work.** Bidders will not have another chance to visit the site prior to submittal of their bid.

To request a sign language or oral interpreter for this visit, call Public Works Contracts at (619) 533-3450 at least 5 Working Days prior to the site visit to ensure availability. The Pre-Bid Site Visit is scheduled as follows:

Time: **10:00 AM**
Date: **SEPTEMBER 20, 2018**
Location: **Miramar Landfill**
5180 Convoy Street, San Diego, California 92111

MEET AT THE PARKING LOT IMMEDIATELY EAST OF THE ENTRANCE SCALES.
BE PROMPT.
AT 10:15 AM, a guided tour will commence.
Pickup trucks are recommended for off-road travel.

9. **AWARD PROCESS:**

9.1. The Award of this contract is contingent upon the Contractor's compliance with all conditions of Award as stated within these documents and within the Notice of Intent to Award.

9.2. Upon acceptance of bids and determination of the apparent low bidder, the City will prepare the contract documents for execution within approximately 21 days of the date of the bid opening. The City will then award the contract upon receipt of properly signed Contract, bonds, and insurance documents.

9.3. This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form by the City Attorney's Office.

9.4. The low Bid will be determined by the Base Bid alone.

9.5. Once the low bid has been determined, the City may, at its sole discretion, award the contract for the Base Bid alone.

10. **SUBMISSION OF QUESTIONS:**

10.1. The Director (or Designee) of the Public Works Department is the officer responsible for opening, examining, and evaluating the competitive Bids submitted to the City for the acquisition, construction and completion of any public improvement except when otherwise set forth in these documents. Any questions related to this solicitation shall be submitted to:

Public Works Contracts
525 B Street, Suite 750, MS 908A
San Diego, California, 92101
Attention: Ronald McMinn Jr.

OR:

RMcMinn@sandiego.gov

10.2. Questions received less than 14 days prior to the date for opening of Bids may not be considered.

10.3. Questions or clarifications deemed by the City to be material shall be answered via issuance of an addendum and posted to the City's online bidding service.

10.4. Only questions answered by formal written addenda shall be binding. Oral and other interpretations or clarifications shall be without legal effect. It is the Bidder's responsibility to be informed of any addenda that have been issued and to include all such information in its Bid.

1. PREQUALIFICATION OF CONTRACTORS:

1.1. Contractors submitting a Bid must be pre-qualified for the total amount proposed, including all alternate items, prior to the date of submittal. Bids from contractors who have not been pre-qualified as applicable and Bids that exceed the maximum dollar amount at which contractors are pre-qualified may be deemed non-responsive and ineligible for award.

1.2. The completed application must be submitted online no later than 2 weeks prior to the bid opening.

1.3. **Joint Venture Bidders:** For projects with an engineer's estimate of $30,000,000 or greater, Joint Ventures submitting bids may be deemed responsive and eligible for award if the cumulative maximum bidding capacity of the individual Joint Venture entities is equal to or greater than the total amount proposed. Each of the entities of the Joint Venture must have been previously prequalified at a minimum of $15,000,000. The Joint Venture designated as the Apparent Low Bidder shall provide evidence of its corporate existence and furnish good and approved bonds in the name of the Joint Venture within 14 days of receipt by the Bidder of a form of contract for execution.

1.4. Complete information and links to the on-line prequalification application are available at:

http://www.sandiego.gov/cip/bidopps/prequalification.shtml

1.5. Due to the City's responsibility to protect the confidentiality of the contractors' information, City staff will not be able to provide information regarding contractors' prequalification status over the telephone. Contractors may access real-time information about their prequalification status via their vendor profile on PlanetBids™."

2. ELECTRONIC FORMAT RECEIPT AND OPENING OF BIDS:

Bids will be received in electronic format (eBids) EXCLUSIVELY at the City of San Diego's electronic bidding (eBidding) site, at: http://www.sandiego.gov/cip/bidopps/index.shtml and are due by the date, and time shown on the cover of this solicitation.

2.1. **BIDDERS MUST BE PRE-REGISTERED** with the City's bidding system and possess a system-assigned Digital ID in order to submit and electronic bid.

2.2. The City's bidding system will automatically track information submitted to the site including IP addresses, browsers being used and the URLs from which information was submitted. In addition, the City's bidding system will keep a history of every login instance including the time of login, and other information about the user's computer configuration such as the operating system, browser type, version, and more. Because of these security features, Contractors who disable their browsers' cookies will not be able to log in and use the City's bidding system.

2.3. The City's electronic bidding system is responsible for bid tabulations. Upon the bidder's or proposer's entry of their bid, the system will ensure that all required fields are entered. **The system will not accept a bid for which any required information is missing.** This includes all necessary pricing, subcontractor listing(s) and any other essential documentation and supporting materials and forms requested or contained in these solicitation documents.

2.4. **BIDS REMAIN SEALED UNTIL BID DEADLINE.** eBids are transmitted into the City's bidding system via hypertext transfer protocol secure (https) mechanism using SSL 128-256 bit security certificates issued from Verisign/Thawte which encrypts data being transferred from client to server. Bids submitted prior to the "Bid Due Date and Time" are not available for review by anyone other than the submitter who has until the "Bid Due Date and Time" to change, rescind or retrieve its proposal should it desire to do so.

2.5. **BIDS MUST BE SUBMITTED BY BID DUE DATE AND TIME**. Once the bid deadline is reached, no further submissions are accepted into the system. Once the Bid Due Date and Time has lapsed, bidders, proposers, the general public, and City staff are able to immediately see the results on line. City staff may then begin reviewing the submissions for responsiveness, EOCP compliance and other issues. The City may require any Bidder to furnish statement of experience, financial responsibility, technical ability, equipment, and references.

2.6. **RECAPITULATION OF THE WORK**. Bids shall not contain any recapitulation of the Work. Conditional Bids may be rejected as being non-responsive. Alternative proposals will not be considered unless called for.

2.7. **BIDS MAY BE WITHDRAWN** by the Bidder only up to the bid due date and time.

2.7.1. Important Note: Submission of the electronic bid into the system may not be instantaneous. Due to the speed and capabilities of the user's internet service provider (ISP), bandwidth, computer hardware and other variables, it may take time for the bidder's submission to upload and be received by the City's eBidding system. It is the bidder's sole responsibility to ensure their bids are received on time by the City's eBidding system. The City of San Diego is not responsible for bids that do not arrive by the required date and time.

2.8. **ACCESSIBILITY AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE:** To request a copy of this solicitation in an alternative format, contact the Public Works Contract Specialist listed on the cover of this solicitation at least five (5) working days prior to the Bid/Proposal due date to ensure availability.

3. ELECTRONIC BID SUBMISSIONS CARRY FULL FORCE AND EFFECT

3.1. The bidder, by submitting its electronic bid, acknowledges that doing so carries the same force and full legal effect as a paper submission with a longhand (wet) signature.

3.2. By submitting an electronic bid, the bidder certifies that the bidder has thoroughly examined and understands the entire Contract Documents (which consist of the plans and specifications, drawings, forms, affidavits and the solicitation documents), and that by submitting the eBid as its bid proposal, the bidder acknowledges, agrees to and is bound by the entire Contract Documents, including any addenda issued thereto, and incorporated by reference in the Contract Documents.

3.3. The Bidder, by submitting its electronic bid, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certification, forms and affidavits submitted as part of this bid are true and correct.

3.4. The Bidder agrees to the construction of the project as described in Attachment "A – Scope of Work" for the City of San Diego, in accordance with the requirements set forth herein for the electronically submitted prices. The Bidder guarantees the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee shall be extended by the number of days required for the City to obtain all items necessary to fulfill all conditions precedent.

4. **BIDS ARE PUBLIC RECORDS:** Upon receipt by the City, Bids shall become public records subject to public disclosure. It is the responsibility of the respondent to clearly identify any confidential, proprietary, trade secret or otherwise legally privileged information contained within the Bid. General references to sections of the California Public Records Act (PRA) will not suffice. If the Contractor does not provide applicable case law that clearly establishes that the requested information is exempt from the disclosure requirements of the PRA, the City shall be free to release the information when required in accordance with the PRA, pursuant to any other applicable law, or by order of any court or government agency, and the Contractor will hold the City harmless for release of this information.

5. **CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM:**

5.1. **Prior** to the Award of the Contract or Task Order, you and your Subcontractors and Suppliers must register with the City's web-based vendor registration and bid management system. For additional information go to:

http://www.sandiego.gov/purchasing/bids-contracts/vendorreg.shtml.

5.2. The City may not award the contract until registration of all subcontractors and suppliers is complete. In the event this requirement is not met within the time frame specified in the Notice of Intent to Award letter, the City reserves the right to rescind the Notice of Award / Intent to Award and to make the award to the next responsive and responsible bidder / proposer.

6. **JOINT VENTURE CONTRACTORS:** Provide a copy of the Joint Venture agreement and the Joint Venture license to the City within 14 Calendar Days after receiving the Contract forms.

7. **PREVAILING WAGE RATES WILL APPLY:** Refer to Attachment D.

8. **SUBCONTRACTING PARTICIPATION PERCENTAGES**: Subcontracting participation percentages apply to this contract. Refer to Attachment E.

9. INSURANCE REQUIREMENTS:

9.1. All certificates of insurance and endorsements required by the contract are to be provided upon issuance of the City's Notice of Intent to Award letter.

9.2. Refer to sections 7-3, "LIABILITY INSURANCE", and 7-4, "WORKERS' COMPENSATION INSURANCE" of the Supplementary Special Provisions (SSP) for the insurance requirements which must be met.

10. REFERENCE STANDARDS: Except as otherwise noted or specified, the Work shall be completed in accordance with the following standards:

Title	Edition	Document Number
Standard Specifications for Public Works Construction ("The GREENBOOK") http://www.greenbookspecs.org/	2015	PWPI070116-01
City of San Diego Standard Specifications for Public Works Construction ("The WHITEBOOK")* https://www.sandiego.gov/publicworks/edocref/greenbook	2015	PWPI070116-02
City of San Diego Standard Drawings* https://www.sandiego.gov/publicworks/edocref/standarddraw	2016	PWPI070116-03
Citywide Computer Aided Design and Drafting (CADD) Standards https://www.sandiego.gov/publicworks/edocref/drawings	2016	PWPI092816-04
California Department of Transportation (CALTRANS) Standard Specifications – http://www.dot.ca.gov/des/oe/construction-contract-standards.html	2015	PWPI092816-05
CALTRANS Standard Plans http://www.dot.ca.gov/des/oe/construction-contract-standards.html	2015	PWPI092816-06
California Manual on Uniform Traffic Control Devices Revision 1 (CA MUTCD Rev 1) - http://www.dot.ca.gov/trafficops/camutcd/	2014	PWPIO92816-07
NOTE: *Available online under Engineering Documents and References at: http://www.sandiego.gov/publicworks/edocref/index.shtml		

11. CITY'S RESPONSES AND ADDENDA: The City, at its discretion, may respond to any or all questions submitted in writing via the City's eBidding web site in the **form of an addendum**. No other responses to questions, oral or written shall be of any force or effect with respect to this solicitation. The changes to the Contract Documents through addenda are made effective as though originally issued with the Bid. The Bidders shall acknowledge the receipt of Addenda at the time of bid submission.

12. CITY'S RIGHTS RESERVED: The City reserves the right to cancel the Notice Inviting Bids at any time, and further reserves the right to reject submitted Bids, without giving any reason for such action, at its sole discretion and without liability. Costs incurred by the Bidder(s) as a result of preparing Bids under the Notice Inviting Bids shall be the sole responsibility of each bidder. The Notice Inviting Bids creates or imposes no obligation upon the City to enter a contract.

13. CONTRACT PRICING: This solicitation is for a Lump Sum contract with Unit Price provisions as set forth herein. The Bidder agrees to perform construction services for the City of San Diego in accordance with these contract documents for the prices listed below. The Bidder further agrees to guarantee the Contract Price for a period of 120 days from the date of Bid opening. The duration of the Contract Price guarantee may be extended, by mutual consent of the parties, by the number of days required for the City to obtain all items necessary to fulfill all contractual conditions.

14. SUBCONTRACTOR INFORMATION:

14.1. LISTING OF SUBCONTRACTORS. In accordance with the requirements provided in the "Subletting and Subcontracting Fair Practices Act" of the California Public Contract Code, the Bidder shall provide the **NAME** and **ADDRESS** of each Subcontractor who will perform work, labor, render services or who specially fabricates and installs a portion [type] of the work or improvement, in an amount in excess of 0.5% of the Contractor's total Bid. The Bidder shall also state within the description, whether the subcontractor is a **CONSTRUCTOR**, **CONSULTANT** or **SUPPLIER**. The Bidder shall state the **DIR REGISTRATION NUMBER** for all subcontractors and shall further state within the description, the **PORTION** of the work which will be performed by each subcontractor under this Contract. The Contractor shall list only one Subcontractor for each portion of the Work. The **DOLLAR VALUE** of the total Bid to be performed shall be stated for all subcontractors listed. Failure to comply with this requirement may result in the Bid being rejected as **non-responsive** and ineligible for award. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3, "Subcontracts", which stipulates the percent of the Work to be performed with the Bidders' own forces. The Bidder shall list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which Bidders are seeking recognition towards achieving any mandatory, voluntary (or both) subcontracting participation goals.

Additionally, pursuant to California Senate Bill 96 and in accordance with the requirements of Labor Code sections 1771.1 and 1725.5, by submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the California Department of Industrial Relations (DIR**). The Bidder shall provide the name, address, license number, DIR registration number of any Subcontractor – regardless of tier** - who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement pursuant to the contract.

14.2. LISTING OF SUPPLIERS. Any Bidder seeking the recognition of Suppliers of equipment, materials, or supplies obtained from third party Suppliers towards achieving any mandatory or voluntary (or both) subcontracting participation goals shall provide, at a minimum, the **NAME**, **LOCATION (CITY), DIR REGISTRATION NUMBER** and the **DOLLAR VALUE** of each supplier. The Bidder will be credited up to 60% of the amount to be paid to the Suppliers for materials and supplies unless vendor manufactures or substantially alters materials and supplies, in which case, 100% will be credited. The Bidder is to indicate within the description whether the listed firm is a supplier or manufacturer. If no indication is provided, the listed firm will be credited at 60% of the listed dollar value for purposes of calculating the Subcontractor Participation Percentage.

14.3. LISTING OF SUBCONTRACTORS OR SUPPLIERS FOR ALTERNATES. For subcontractors or suppliers to be used on additive or deductive alternate items, in addition to the above requirements, bidder shall further note "ALTERNATE" and alternate item number within the description.

15. SUBMITTAL OF "OR EQUAL" ITEMS: See Section 4-1.6, "Trade Names or Equals" in The WHITEBOOK and as amended in the SSP.

16. AWARD:

16.1. The Award of this contract is contingent upon the Contractor's compliance with all conditions precedent to Award.

16.2. Upon acceptance of a Bid, the City will prepare contract documents for execution within approximately 21 days of the date of the Bid opening and award the Contract approximately within 7 days of receipt of properly executed Contract, bonds, and insurance documents.

16.3. This contract will be deemed executed and effective only upon the signing of the Contract by the Mayor or his designee and approval as to form the City Attorney's Office.

17. SUBCONTRACT LIMITATIONS: The Bidder's attention is directed to Standard Specifications for Public Works Construction, Section 2-3, "SUBCONTRACTS" in The GREENBOOK and as amended in the SSP which requires the Contractor to self-perform not less than the specified amount. Failure to comply with this requirement shall render the bid **non-responsive** and ineligible for award.

18. AVAILABILITY OF PLANS AND SPECIFICATIONS: Contract Documents may be obtained by visiting the City's website: http://www.sandiego.gov/cip/. Plans and Specifications for this contract are also available for review in the office of the City Clerk or Public Works Contracts.

19. ONLY ONE BID PER CONTRACTOR SHALL BE ACCEPTED: No person, firm, or corporation shall be allowed to make, file, or be interested in more than one (1) Bid for the same work unless alternate Bids are called for. A person, firm or corporation who has submitted a sub-proposal to a Bidder, or who has quoted prices on materials to a Bidder, is not hereby

disqualified from submitting a sub-proposal or quoting prices to other Bidders or from submitting a Bid in its own behalf. Any Bidder who submits more than one bid will result in the rejection of all bids submitted.

20. SAN DIEGO BUSINESS TAX CERTIFICATE: The Contractor and Subcontractors, not already having a City of San Diego Business Tax Certificate for the work contemplated shall secure the appropriate certificate from the City Treasurer, Civic Center Plaza, First floor and submit to the Contract Specialist upon request or as specified in the Contract Documents. Tax Identification numbers for both the Bidder and the listed Subcontractors must be submitted on the City provided forms within these documents.

21. BIDDER'S GUARANTEE OF GOOD FAITH (BID SECURITY) FOR DESIGN-BID-BUILD CONTRACTS:

21.1. For bids $250,000 and above, bidders shall submit Bid Security at bid time. Bid Security shall be in one of the following forms: a cashier's check, or a properly certified check upon some responsible bank; or an approved corporate surety bond payable to the City of San Diego for an amount of not less than 10% of the total bid amount.

21.2. This check or bond, and the monies represented thereby, will be held by the City as a guarantee that the Bidder, if awarded the contract, will in good faith enter into the contract and furnish the required final performance and payment bonds.

21.3. The Bidder agrees that in the event of the Bidder's failure to execute this contract and provide the required final bonds, the money represented by the cashier's or certified check will remain the property of the City; and the Surety agrees that it will pay to the City the damages, not exceeding the sum of 10% of the amount of the Bid, that the City may suffer as a result of such failure.

21.4. At the time of bid submission, bidders must upload and submit an electronic PDF copy of the aforementioned bid security. Whether in the form of a cashier's check, a properly certified check or an approved corporate surety bond payable to the City of San Diego, the bid security must be uploaded to the City's eBidding system. Within twenty-four (24) hours after the bid due date and time, the first five (5) apparent low bidders must provide the City with the original bid security.

21.5. Failure to submit the electronic version of the bid security at the time of bid submission AND failure to provide the original within twenty-four (24) hours may cause the bid to be rejected and deemed **non-responsive**.

22. AWARD OF CONTRACT OR REJECTION OF BIDS:

22.1. This contract may be awarded to the lowest responsible and reliable Bidder.

22.2. Bidders shall complete ALL eBid forms as required by this solicitation. Incomplete eBids will not be accepted.

22.3. The City reserves the right to reject any or all Bids, to waive any informality or technicality in Bids received, and to waive any requirements of these specifications as to bidding procedure.

22.4. Bidders will not be released on account of their errors of judgment. Bidders may be released only upon receipt by the City within 3 Working Days of the bid opening, written notice from the Bidder which shows proof of honest, credible, clerical error of a material nature, free from fraud or fraudulent intent; and of evidence that reasonable care was observed in the preparation of the Bid.

22.5. A bidder who is not selected for contract award may protest the award of a contract to another bidder by submitting a written protest in accordance with the San Diego Municipal Code.

22.6. The City of San Diego will not discriminate in the award of contracts with regard to race, religion creed, color, national origin, ancestry, physical handicap, marital status, sex or age.

22.7. Each Bid package properly signed as required by these specifications shall constitute a firm offer which may be accepted by the City within the time specified herein.

22.8. The City reserves the right to evaluate all Bids and determine the lowest Bidder on the basis of the base bid and any proposed alternates or options as detailed herein.

23. BID RESULTS:

23.1. The availability of the bids on the City's eBidding system shall constitute the public announcement of the apparent low bidder. In the event that the apparent low bidder is subsequently deemed non-responsive or non-responsible, a notation of such will be made on the eBidding system. The new ranking and apparent low bidder will be adjusted accordingly.

23.2. To obtain the bid results, view the results on the City's web site, or request the results by U.S. mail and provide a self-addressed, stamped envelope. If requesting by mail, be sure to reference the bid name and number. The bid tabulations will be mailed to you upon their completion. The results will not be given over the telephone.

24. THE CONTRACT:

24.1. The Bidder to whom award is made shall execute a written contract with the City of San Diego and furnish good and approved bonds and insurance certificates specified by the City within 14 days after receipt by Bidder of a form of contract for execution unless an extension of time is granted to the Bidder in writing.

24.2. If the Bidder takes longer than 14 days to fulfill these requirements, then the additional time taken shall be added to the Bid guarantee. The Contract shall be made in the form adopted by the City, which includes the provision that no claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.

24.3. If the Bidder to whom the award is made fails to enter into the contract as herein provided, the award may be annulled and the Bidder's Guarantee of Good Faith will be subject to forfeiture. An award may be made to the next lowest responsible and reliable Bidder who shall fulfill every stipulation embraced herein as if it were the party to whom the first award was made.

24.4. Pursuant to the San Diego City Charter section 94, the City may only award a public works contract to the lowest responsible and reliable Bidder. The City will require the Apparent Low Bidder to (i) submit information to determine the Bidder's responsibility and reliability, (ii) execute the Contract in form provided by the City, and (iii) furnish good and approved bonds and insurance certificates specified by the City within 14 Days, unless otherwise approved by the City, in writing after the Bidder receives notification from the City, designating the Bidder as the Apparent Low Bidder and formally requesting the above mentioned items.

24.5. The award of the Contract is contingent upon the satisfactory completion of the above-mentioned items and becomes effective upon the signing of the Contract by the Mayor or designee and approval as to form the City Attorney's Office. If the Apparent Low Bidder does not execute the Contract or submit required documents and information, the City may award the Contract to the next lowest responsible and reliable Bidder who shall fulfill every condition precedent to award. A corporation designated as the Apparent Low Bidder shall furnish evidence of its corporate existence and evidence that the officer signing the Contract and bond for the corporation is duly authorized to do so.

25. EXAMINATION OF PLANS, SPECIFICATIONS, AND SITE OF WORK: The Bidder shall examine carefully the Project Site, the Plans and Specifications, other materials as described in the Special Provisions, Section 2-7, and the proposal forms (e.g., Bidding Documents). The submission of a Bid shall be conclusive evidence that the Bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and scope of Work, the quantities of materials to be furnished, and as to the requirements of the Bidding Documents Proposal, Plans, and Specifications.

26. CITY STANDARD PROVISIONS: This contract is subject to the following standard provisions. See The WHITEBOOK for details.

26.1. The City of San Diego Resolution No. R-277952 adopted on May 20, 1991 for a Drug-Free Workplace.

26.2. The City of San Diego Resolution No. R-282153 adopted on June 14, 1993 related to the Americans with Disabilities Act.

26.3. The City of San Diego Municipal Code §22.3004 for Contractor Standards.

26.4. The City of San Diego's Labor Compliance Program and the State of California Labor Code §§1771.5(b) and 1776.

26.5. Sections 1777.5, 1777.6, and 1777.7 of the State of California Labor Code concerning the employment of apprentices by contractors and subcontractors performing public works contracts.

26.6. The City's Equal Benefits Ordinance (EBO), Chapter 2, Article 2, Division 43 of The San Diego Municipal Code (SDMC).

26.7. The City's Information Security Policy (ISP) as defined in the City's Administrative Regulation 90.63.

27. PRE-AWARD ACTIVITIES:

27.1. The contractor selected by the City to execute a contract for this Work shall submit the required documentation as specified in the herein and in the Notice of Award. Failure to provide the information as specified may result in the Bid being rejected as **non-responsive.**

27.2. The decision that bid is non-responsive for failure to provide the information required within the time specified shall be at the sole discretion of the City.

Bond No. 024070532
Premium: $16,412.00

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND

FAITHFUL PERFORMANCE BOND AND LABOR AND MATERIALMEN'S BOND:

Dick Miller, Inc., a corporation, as principal, and The Ohio Casualty Insurance Company, a corporation authorized to do business in the State of California, as Surety, hereby obligate themselves, their successors and assigns, jointly and severally, to The City of San Diego a municipal corporation in the sum of **TWO MILLION THIRTY THOUSAND FOUR HUNDRED FIVE DOLLARS AND SIX CENTS ($2,030,405.06)** for the faithful performance of the annexed contract, and in the sum of **TWO MILLION THIRTY THOUSAND FOUR HUNDRED FIVE DOLLARS AND SIX CENTS ($2,030,405.06)** for the benefit of laborers and materialmen designated below.

Conditions:

If the Principal shall faithfully perform the annexed contract with the City of San Diego, California, then the obligation herein with respect to a faithful performance shall be void; otherwise it shall remain in full force.

If the Principal shall promptly pay all persons, firms and corporations furnishing materials for or performing labor in the execution of this contract, and shall pay all amounts due under the California Unemployment Insurance Act then the obligation herein with respect to laborers and materialmen shall be void; otherwise it shall remain in full force.

The obligation herein with respect to laborers and materialmen shall inure to the benefit of all persons, firms and corporations entitled to file claims under the provisions of Article 2. Claimants, (iii) public works of improvement commencing with Civil Code Section 9100 of the Civil Code of the State of California.

Changes in the terms of the annexed contract or specifications accompanying same or referred to therein shall not affect the Surety's obligation on this bond, and the Surety hereby waives notice of same.

PERFORMANCE BOND, LABOR AND MATERIALMEN'S BOND (continued)

The Surety shall pay reasonable attorney's fees should suit be brought to enforce the provisions of this bond.

Dated December 11, 2018

Approved as to Form

Mara W. Elliott, City Attorney

By _____
Deputy City Attorney

Approved:

By: _____
Stephen Samara
Principal Contract Specialist
Public Works Department

Dick Miller, Inc.
Principal

By _____

Glen F. Bullock, President
Printed Name of Person Signing for Principal

The Ohio Casualty Insurance Company
Surety

By _____
Bart Stewart Attorney-in-fact

790 The City Drive South, Suite 200
Local Address of Surety

Orange, CA 92868
Local Address (City, State) of Surety

(714) 634-3311
Local Telephone No. of Surety

Premium $ 16,412.00

Bond No. 024070532

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.
This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 8090326

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint,

Molly Cashman; Bart Stewart

all of the city of Encinitas, state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 9th day of May, 2018.

The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: David M. Carey
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 9th day of May, 2018, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: Teresa Pastella
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 11th day of December, 2018.

By: Renee C. Llewellyn
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

LMS_12873_022017

ALL- PURPOSE
CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California }

County of San Diego }

On 12/11/2018 before me, Erin Elyse Haugh, Notary Public,
(Here insert name and title of the officer)

personally appeared Bart Stewart,
who proved to me on the basis of satisfactory evidence to be the person(~~s~~) whose name(~~s~~) (is)/are subscribed to the within instrument and acknowledged to me that (he)/she/they executed the same in (his)/her/their authorized capacity(~~ies~~), and that by (his)/her/their signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public Signature (Notary Public Seal)

ERIN ELYSE HAUGH
Commission No. 2227679
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
Commission Expires January 6, 2022

ADDITIONAL OPTIONAL INFORMATION

DESCRIPTION OF THE ATTACHED DOCUMENT

(Title or description of attached document)

(Title or description of attached document continued)

Number of Pages _____ Document Date_____

CAPACITY CLAIMED BY THE SIGNER

- ☐ Individual (s)
- ☐ Corporate Officer

(Title)

- ☐ Partner(s)
- ☐ Attorney-in-Fact
- ☐ Trustee(s)
- ☐ Other _____

2015 Version www.NotaryClasses.com 800-873-9865

INSTRUCTIONS FOR COMPLETING THIS FORM

This form complies with current California statutes regarding notary wording and, if needed, should be completed and attached to the document. Acknolwedgents from other states may be completed for documents being sent to that state so long as the wording does not require the California notary to violate California notary law.

- State and County information must be the State and County where the document signer(s) personally appeared before the notary public for acknowledgment.
- Date of notarization must be the date that the signer(s) personally appeared which must also be the same date the acknowledgment is completed.
- The notary public must print his or her name as it appears within his or her commission followed by a comma and then your title (notary public).
- Print the name(s) of document signer(s) who personally appear at the time of notarization.
- Indicate the correct singular or plural forms by crossing off incorrect forms (i.e. ~~he~~/she/~~they,~~ is /~~are~~) or circling the correct forms. Failure to correctly indicate this information may lead to rejection of document recording.
- The notary seal impression must be clear and photographically reproducible. Impression must not cover text or lines. If seal impression smudges, re-seal if a sufficient area permits, otherwise complete a different acknowledgment form.
- Signature of the notary public must match the signature on file with the office of the county clerk.
  - Additional information is not required but could help to ensure this acknowledgment is not misused or attached to a different document.
  - Indicate title or type of attached document, number of pages and date.
  - Indicate the capacity claimed by the signer. If the claimed capacity is a corporate officer, indicate the title (i.e. CEO, CFO, Secretary).
- Securely attach this document to the signed document with a staple.

ATTACHMENTS

ATTACHMENT A

SCOPE OF WORK

SCOPE OF WORK

1. **SCOPE OF WORK:** Construct storm water Best Management Practice (BMP) improvements to reduce sediment and other pollutants in storm water discharges at the West Miramar Landfill. This project will focus primarily on improving storm water conveyance, storm drain modification at sedimentation basin inlets, access road stabiliazation, select erosion and sediment controls, and run-off controls.

1.1. The Work shall be performed in accordance with:

1.1.1. The Notice Inviting Bids and Plans numbered **40626-01-D** through **40626-22-D**, inclusive.

2. **LOCATION OF WORK:** The location of the Work is as follows:

5180 Convoy Street, San Diego, California 92111

3. **CONTRACT TIME:** The Contract Time for completion of the Work shall be **100 Working Days**.

ATTACHMENT B

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ATTACHMENT C

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ATTACHMENT D

PREVAILING WAGES

PREVAILING WAGES

1. PREVAILING WAGE RATES: Pursuant to San Diego Municipal Code section 22.3019, construction, alteration, demolition, repair and maintenance work performed under this Contract is subject to State prevailing wage laws. For construction work performed under this Contract cumulatively exceeding $25,000 and for alteration, demolition, repair and maintenance work performed under this Contract cumulatively exceeding $15,000, the Contractor and its subcontractors shall comply with State prevailing wage laws including, but not limited to, the requirements listed below.

1.1. Compliance with Prevailing Wage Requirements. Pursuant to sections 1720 through 1861 of the California Labor Code, the Contractor and its subcontractors shall ensure that all workers who perform work under this Contract are paid not less than the prevailing rate of per diem wages as determined by the Director of the California Department of Industrial Relations (DIR). This includes work performed during the design and preconstruction phases of construction including, but not limited to, inspection and land surveying work.

1.1.1. Copies of such prevailing rate of per diem wages are on file at the City and are available for inspection to any interested party on request. Copies of the prevailing rate of per diem wages also may be found at http://www.dir.ca.gov/OPRL/DPreWageDetermination.htm. Contractor and its subcontractors shall post a copy of the prevailing rate of per diem wages determination at each job site and shall make them available to any interested party upon request.

1.1.2. The wage rates determined by the DIR refer to expiration dates. If the published wage rate does not refer to a predetermined wage rate to be paid after the expiration date, then the published rate of wage shall be in effect for the life of this Contract. If the published wage rate refers to a predetermined wage rate to become effective upon expiration of the published wage rate and the predetermined wage rate is on file with the DIR, such predetermined wage rate shall become effective on the date following the expiration date and shall apply to this Contract in the same manner as if it had been published in said publication. If the predetermined wage rate refers to one or more additional expiration dates with additional predetermined wage rates, which expiration dates occur during the life of this Contract, each successive predetermined wage rate shall apply to this Contract on the date following the expiration date of the previous wage rate. If the last of such predetermined wage rates expires during the life of this Contract, such wage rate shall apply to the balance of the Contract.

1.2. Penalties for Violations. Contractor and its subcontractors shall comply with California Labor Code section 1775 in the event a worker is paid less than the prevailing wage rate for the work or craft in which the worker is employed. This shall be in addition to any other applicable penalties allowed under Labor Code sections 1720 – 1861.

1.3. **Payroll Records.** Contractor and its subcontractors shall comply with California Labor Code section 1776, which generally requires keeping accurate payroll records, verifying and certifying payroll records, and making them available for inspection. Contractor shall require its subcontractors to also comply with section 1776. Contractor and its subcontractors shall submit weekly certified payroll records online via the City's web-based Labor Compliance Program. Contractor is responsible for ensuring its subcontractors submit certified payroll records to the City.

1.3.1. Contractor and their subcontractors shall also furnish records specified in Labor Code section 1776 directly to the Labor Commissioner in the manner required by Labor Code section 1771.4.

1.4. **Apprentices.** Contractor and its subcontractors shall comply with California Labor Code sections 1777.5, 1777.6 and 1777.7 concerning the employment and wages of apprentices. Contractor is held responsible for the compliance of their subcontractors with sections 1777.5, 1777.6 and 1777.7.

1.5. **Working Hours.** Contractor and their subcontractors shall comply with California Labor Code sections 1810 through 1815, including but not limited to: (i) restrict working hours on public works contracts to eight hours a day and forty hours a week, unless all hours worked in excess of 8 hours per day are compensated at not less than 1½ times the basic rate of pay; and (ii) specify penalties to be imposed on contractors and subcontractors of $25 per worker per day for each day the worker works more than 8 hours per day and 40 hours per week in violation of California Labor Code sections1810 through 1815.

1.6. **Required Provisions for Subcontracts.** Contractor shall include at a minimum a copy of the following provisions in any contract they enter into with a subcontractor: California Labor Code sections 1771, 1771.1, 1775, 1776, 1777.5, 1810, 1813, 1815, 1860 and 1861.

1.7. **Labor Code Section 1861 Certification.** Contractor in accordance with California Labor Code section 3700 is required to secure the payment of compensation of its employees and by signing this Contract, Contractor certifies that "I am aware of the provisions of Section 3700 of the California Labor Code which require every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this Contract."

1.8. **Labor Compliance Program**. The City has its own Labor Compliance Program authorized in August 2011 by the DIR. The City will withhold contract payments when payroll records are delinquent or deemed inadequate by the City or other governmental entity, or it has been established after an investigation by the City or other governmental entity that underpayment(s) have occurred. For questions or assistance, please contact the City of San Diego's Prevailing Wage Unit at 858-627-3200.

1.9. Contractor and Subcontractor Registration Requirements. This project is subject to compliance monitoring and enforcement by the DIR. A contractor or subcontractor shall not be qualified to bid on, be listed in a bid or proposal, subject to the requirements of section 4104 of the Public Contract Code, or engage in the performance of any contract for public work, unless currently registered and qualified to perform public work pursuant to Labor Code section 1725.5 It is not a violation of this section for an unregistered contractor to submit a bid that is authorized by Section 7029.1 of the Business and Professions code or by Section 10164 or 20103.5 of the Public Contract Code, provided the contractor is registered to perform public work pursuant to Section 1725.5 at the time the contract is awarded.

1.9.1. A Contractor's inadvertent error in listing a subcontractor who is not registered pursuant to Labor Code section 1725.5 in response to a solicitation shall not be grounds for filing a bid protest or grounds for considering the bid non-responsive provided that any of the following apply: (1) the subcontractor is registered prior to bid opening; (2) within twenty-four hours after the bid opening, the subcontractor is registered and has paid the penalty registration fee specified in Labor Code section 1725.5; or (3) the subcontractor is replaced by another registered subcontractor pursuant to Public Contract Code section 4107.

1.9.2. By submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the DIR in compliance with Labor Code sections 1771.1 and 1725.5, and Contractor shall provide proof of registration for themselves and all listed subcontractors to the City at the time of bid or proposal due date or upon request.

1.10. Stop Order. For Contractor or its subcontractors engaging in the performance of any public work contract without having been registered in violation of Labor Code sections 1725.5 or 1771.1, the Labor Commissioner shall issue and serve a stop order prohibiting the use of the unregistered contractors or unregistered subcontractor(s) on ALL public works until the unregistered contractor or unregistered subcontractor(s) is registered. Failure to observe a stop order is a misdemeanor.

1.11. List of all Subcontractors. The Contractor shall provide the list of subcontractors (regardless of tier), along with their DIR registration numbers, utilized on this Contract prior to any work being performed; and the Contractor shall provide a complete list of all subcontractors with each invoice. Additionally, Contractor shall provide the City with a complete list of all subcontractors (regardless of tier) utilized on this contract within ten working days of the completion of the contract, along with their DIR registration numbers. The City shall withhold final payment to Construction Management Professional until at least thirty (30) days after this information is provided to the City.

1.12. Exemptions for Small Projects. There are limited exemptions for installation, alteration, demolition, or repair work done on projects of $25,000 or less. The Contractor shall still comply with Labor Code sections 1720 et. seq. The only recognized exemptions are listed below:

1.12.1. Registration. The Contractor will not be required to register with the DIR for small projects. (Labor Code section 1771.1

1.12.2. Certified Payroll Records. The records required in Labor Code section 1776 shall be required to be kept and submitted to the City of San Diego, but will not be required to be submitted online with the DIR directly. The Contractor will need to keep those records for at least three years following the completion of the Contract. (Labor Code section 1771.4).

1.12.3. List of all Subcontractors. The Contractor shall not be required to hire only registered subcontractors and is exempt from submitting the list of all subcontractors that is required in section 4.20.11 above. (Labor code section 1773.3).

ATTACHMENT E

SUPPLEMENTARY SPECIAL PROVISIONS

SUPPLEMENTARY SPECIAL PROVISIONS

The following Supplementary Special Provisions (SSP) modifies the following documents:

1. The **2015 Edition** of the Standard Specifications for Public Works Construction (The "GREENBOOK").
2. The **2015 Edition** of the City of San Diego Standard Specifications for Public Works Construction (The "WHITEBOOK"), including the following:
   a) General Provisions (A) for all Contracts.

SECTION 1 – TERMS, DEFINITIONS, ABBREVIATIONS, UNITS OF MEASURE, AND SYMBOLS

1-2 TERMS AND DEFINITIONS. To the "WHITEBOOK", item 54, "Normal Working Hours", ADD the following:

The **Normal Working Hours** are **7:00 AM** to **4:00 PM**.

SECTION 2 - SCOPE AND CONTROL OF WORK

2-3.2 Self Performance. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. You shall perform, with your own organization, Contract Work amounting to at least 50% of the base Bid **AND** 50% of any alternates.

2-5.4.2 Asset Specific Red-lines. To the "WHITEBOOK", ADD the following:

1. **Fiber Optic and WIFI Device Red-lines.** Fiber Optic and WIFI Device Red-lines shall clearly record by dimension from 2 known fixed points and by depth of underground facilities all deviations, modifications, and changes in the Work. Records, deviations, modifications, and changes on the day the Work is performed shall reflect the actual Work location and shall be marked in red at the scale of the Plan sheet on which they are recorded. Red-lines shall show the equipment locations and associated information for the following:

   a) Locations and depths of underground utilities.

   b) Revisions to the routing of piping and conduits.

   c) Actual equipment locations.

d) Pull Boxes.

e) Electrical Meter, including meter address.

f) Items abandoned in place.

2-9.1 **Permanent Survey Markers.** To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. You shall submit to the Engineer a minimum of 7 Days prior to the start of the Work a list of controlling survey monuments which may be disturbed. CMFS (or the private owner for Permit Work) shall perform the following:

   a) Set survey points outside the affected Work area that reference and locate each controlling survey monument that may be disturbed.

   b) File a Corner Record or Record of Survey with the County Surveyor after setting the survey points to be used for re-establishment of the disturbed controlling survey monuments.

   c) File a Corner Record or Record of Survey with the County Surveyor after re-establishment of the disturbed controlling survey monuments.

ADD:

2-10 **AUTHORITY OF THE BOARD AND THE ENGINEER.** To the "GREENBOOK", Paragraph (2), DELETE in its entirety and SUBSTITUTE with the following:

The decision of the Engineer is final and binding on all questions relating to: quantities; acceptability of material, equipment, or work; execution, progress or sequence of work; requests for information (RFI), and interpretation of the Plans, Specifications, or other Contract Documents. This shall be precedent to any payment under the Contract. The Engineer shall be the single point of contact and shall be included in all communications.

2-15 **TECHNICAL STUDIES AND DATA.** To the "WHITEBOOK", ADD the following:

3. In preparation of the Contract Documents, the designer has relied upon the following reports of explorations and tests at the Work Site:

   a) Miramar Landfill Storm Water Conveyance Improvements Hydrology and Hydraulic Calculations (Drainage/Hydrology) City of San Diego, California, Dated June 15, 2018, by D-Max Engineering, Inc.

   b) West Basin Slope Stability Analysis, Memorandum, Dated May 30, 2018, by Geosyntec consultants

4. The reports listed are included in this contract as **Appendix I** and **Appendix J**, and are available for review by contacting the Contract Specialist.

2-16 CONTRACTOR REGISTRATION AND ELECTRONIC REPORTING SYSTEM. To the "WHITEBOOK", item 1, DELETE in its entirety.

SECTION 3 – CHANGES IN WORK

3-3.2.3 Markup. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. Work paid under Allowance Bid items for permits, governmental fees, or direct payments specified in the Contract Documents shall not be subject to any markups.

2. The allowance for overhead and profit shall not exceed the values listed in the table below:

Component	Overhead	Profit
Labor	10%	10%
Material	10%	5%
Equipment	10%	5%

3. Markups for materials shall be applied to the actual cost of the material before applying the sales tax.

4. When a Subcontractor is performing Extra Work, the allowance for overhead and profit shall be applied to the labor, materials, and equipment costs of the Subcontractor as follows:

    a) Regardless of the number of Subcontractor tasks for Extra Work, you may only apply 10% for the first $50,000 of the Subcontractor's portion of accumulated total cost.

    b) If the accumulated costs of single or subsequent tasks exceed the $50,000 threshold, you shall instead only apply 5% to any amounts in excess of the $50,000.

    c) You shall not apply 10% to any costs after the first $50,000 of accumulated total costs from performing Extra Work.

    d) Regardless of the number of hierarchical tiers of Subcontractors, you may only markup a Subcontractor's Work once.

3-5.1 Claims. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

ADD:

3-5.1 Claims.

1. A Claim is a written demand by you that seeks an adjustment in the Contract Price, Contract Time, or other relief associated with a dispute arising under or relating to the Contract, including a breach of any provision thereof. A voucher, invoice, or other routine request for payment is not a Claim.

2. A Claim shall conform to these specifications and may be considered after the City has previously denied a request by you for a Change Order seeking the demanded relief.

3. You shall submit a Claim to the Engineer if a dispute occurs that arises from or relates to the Contract. The Claim shall seek all relief to which you assert you are entitled as a result of the event(s) giving rise to the dispute. Your failure to process a Claim in accordance with these specifications shall constitute a waiver of all relief associated with the dispute. Claims are subject to 6-11, "Right to Audit".

4. You shall continue to perform the Services and Work and shall maintain the Schedule during any dispute proceedings. The Engineer will continue to make payments for undisputed Services and Work.

5. The City's Claims process specified herein shall not relieve you of your statutory obligations to present claims prior to any action under the California Government Code.

3-5.1.1 Initiation of Claim.

1. You shall promptly, but no later than 30 Days after the event(s) giving rise to the Claim, deliver the Claim to the Engineer.

2. You shall not process a Claim unless the Engineer has previously denied a request by you for a Change Order that sought the relief to be pursued in the claim.

3-5.1.1.1 Claim Certification Submittal.

1. If your Claim seeks an increase in the Contract Price, the Contract Time, or both, submit with the Claim an affidavit certifying the following:

   a) The Claim is made in good faith and covers all costs and delays to which you are entitled as a result of the event(s) giving rise to the Claim.

   b) The amount claimed accurately reflects the adjustments in the Contract Price, the Contract Time, or both to which you believe you are entitled.

c) All supporting costs and pricing data are current, accurate, and complete to the best of your knowledge. The cost breakdown per item of Work shall be supplied.

d) You shall ensure that the affidavit is executed by an official who has the authority to legally bind you.

3-5.1.2 Initial Determination.

1. The Engineer will respond in writing to your Claim within 30 Days of receipt of the Claim.

3-5.1.3 Settlement Meeting.

1. If you disagree with the Initial Determination, you shall request a Settlement Meeting within 30 Days. Upon receipt of this request, the Engineer will schedule the Settlement Meeting within 15 Working Days.

3-5.1.4 City's Final Determination.

1. If a settle agreement is not reached, the City shall make a written Final Determination within 10 Working Days after the Settlement Meeting.
2. If you disagree with the City's Final Determination, notify the Engineer in writing of your objection within 15 Working Days after receipt of the written determination and file a "Request for Mediation" in accordance with 3-5.2, "Dispute Resolution Process".
3. Failure to give notice of objection within the 15 Working Days period shall waive your right to pursue the Claim.

3-5.1.5 Mandatory Assistance.

1. If a third party dispute, litigation, or both arises out of or relates in any way to the Services provided under the Contract, upon the City's request, you shall agree to assist in resolving the dispute or litigation. Your assistance includes, but is not limited to the following:

   a) Providing professional consultations.

   b) Attending mediations, arbitrations, depositions, trials, or any event related to the dispute resolution and litigation.

3-5.1.5.1 Compensation for Mandatory Assistance.

1. The City will reimburse you for reasonable fees and expenses incurred by you for any required assistance rendered in accordance with 3-5.1.5, "Mandatory Assistance" as Extra Work.

2. The Engineer will determine whether these fees and expenses were necessary due to your conduct or failure to act.

3. If the Engineer determines that the basis of the dispute or litigation in which these fees and expenses were incurred were the result of your conduct or your failure to act in part or in whole, you shall reimburse the City for any payments made for these fees and expenses.

4. Reimbursement may be through any legal means necessary, including the City's withholding of your payment.

3-5.2.3 Selection of Mediator. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. A single mediator, knowledgeable in construction aspects and acceptable to both parties, shall be used to mediate the dispute.

2. To initiate mediation, the initiating party shall serve a Request for Mediation at the American Arbitration Association (AAA) on the opposing party.

3. If AAA is used, the initiating party shall concurrently file with AAA a "Request for Mediation" along with the appropriate fees, a copy of requested mediators marked in preference order, and a preference for available dates.

4. If AAA is selected to coordinate the mediation (Administrator), within 10 Working Days from the receipt of the initiating party's Request for Mediation, the opposing party shall file the following:

   a) A copy of the list of the preferred mediators listed in preference order after striking any mediators to which they have any objection.

   b) A preference for available dates.

   c) Appropriate fees.

5. If the parties cannot agree on a mediator, then each party shall select a mediator and those mediators shall select the neutral third party to mediate the matter.

3-5.3 Forum of Litigation. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. It is the express intention that all legal actions and proceedings related to the Contract or Agreement with the City or to any rights or any relationship between the parties arising therefrom shall be solely and exclusively initiated and maintained in courts of the State of California for the County of San Diego.

ADD:

3-5.4 Pre-judgment Interest.

1. The parties stipulate that if a judgment is entered against a party for breaching this Contract, the pre-judgment interest shall be two percent (2%) per annum.

SECTION 4 - CONTROL OF MATERIALS

4-1.3.2 **Inspection by the Agency.** To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. The City will provide inspection and testing laboratory services within the continental United States within a 200-mile radius of the geographical limits of the City.

4-1.3.5 **Special Inspection**. To the "WHITEBOOK", ADD the following:

5. The payment for special inspection Work specified under this section shall be paid in accordance with 4-1.3.4.1, "Payment".

4-1.3.6 **Preapproved Materials.** To the "WHITEBOOK", ADD the following:

3. You shall submit in writing a list of all products to be incorporated in the Work that are on the AML.

4-1.6 **Trade Names or Equals.** To the "WHITEBOOK", ADD the following:

11. You shall submit your list of proposed substitutions for an "equal" item **no less than 15 Working Days prior to the Bid due date** and on the City's Product Submittal Form available at:

    http://www.sandiego.gov/publicworks/edocref/index.shtml

SECTION 5 – UTILITIES

5-1.1 **General.** To the "WHITEBOOK", ADD the following:

9. **90 Calendar Days** prior to any paving work, you shall notify the utility owner to provide them adequate time to adjust their utility box frame and cover to finish grade.

SECTION 6 - PROSECUTION, PROGRESS AND ACCEPTANCE OF WORK

6-1.1 **Construction Schedule.** To the "WHITEBOOK", items 5, 9, 20, and 22, DELETE in their entirety and SUBSTITUTE with the following:

5. Monthly progress payments are contingent upon the submittal of an updated Schedule and cash flow forecast as discussed in item 22 of 6-1.1, "Construction Schedule" to the Engineer. The Engineer may refuse to recommend the whole or part of any monthly payment if, in the Engineer's opinion, your failure or refusal to provide the required Schedule and cash

flow forecast information precludes a proper evaluation of your ability to complete the Project within the Contract Time and amount.

9. Inclusive to the Contract Time, include 15 Working Days to the Schedule for the generation of the Punchlist. You shall Work diligently to complete all Punchlist items within 30 Working Days after the Engineer provides the Punchlist.

20. The **90 Calendar Days** for the Plant Establishment Period is included in the stipulated Contract Time. Time and shall begin with the acceptance of installation of the vegetation plan in accordance with Section 801-6, "MAINTENANCE AND PLANT ESTABLISHMENT".

22. With every pay request, submit the following:

    a) An updated cash flow forecast showing periodic and cumulative construction billing amounts for the duration of the Contract Time. If there has been any Extra Work since the last update, include only the approved amounts.

    b) A curve value percentage comparison between the Contract Price and the updated cash flow forecast for each Project ID included in the Contract Documents. Curve values shall be set on a scale from 0% to 100% in intervals of 5% of the Contract Time. Refer to the Sample City Invoice materials in **Appendix D – Sample City Invoice with Spend Curve** and use the format shown. Your invoice amounts shall be supported by this curve value percentage. For previous periods, use the actual values and percentages and update the curve value percentages accordingly. See "Cash Flow Curve Fitting Example" at the location below:

    https://www.sandiego.gov/publicworks/edocref

ADD:

6-3.2.1.1 Environmental Document.

1. The City of San Diego has prepared a **CEQA Section 15162 Consistency Evaluation** for **Miramar Landfill Storm Water Conveyance Improvements Project**, as referenced in the Contract Appendix. You shall comply with all requirements of the **CEQA Sectopm 15172 Consistency Evaluation** as set forth in **Appendix A.**

2. Compliance with the City's environmental document shall be included in the Contract Price, unless separate bid items have been provided.

6-8.1.1 Requirements Preparatory to Requesting a Walk-through. To the "WHITEBOOK", ADD the following:

2. You shall notify the Engineer to arrange a final inspection of permanent BMPs installed and shall obtain the completed, signed, and stamped DS-563 Form 30 Days prior to the issuance of the Notice of Completion**.**

SECTION 7 - RESPONSIBILITIES OF THE CONTRACTOR

7-3 INSURANCE. To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

7-3 INSURANCE.

1. The insurance provisions herein shall not be construed to limit your indemnity obligations contained in the Contract.

7-3.1 Policies and Procedures.

1. You shall procure the insurance described below, at its sole cost and expense, to provide coverage against claims for loss including injuries to persons or damage to property, which may arise out of or in connection with the performance of the Work by you, your agents, representatives, officers, employees or Subcontractors.

2. Insurance coverage for property damage resulting from your operations is on a replacement cost valuation. The market value will not be accepted.

3. You shall maintain this insurance for the duration of this Contract and at all times thereafter when you are correcting, removing, or replacing Work in accordance with this Contract. Your liabilities under the Contract, e.g., your indemnity obligations, is not deemed limited to the insurance coverage required by this Contract.

4. The payment for insurance shall be included in the Contract Price as bid by you. Except as specifically agreed to by the City in writing, you are not entitled to any additional payment. Do not begin any Work under this Contract until you have provided and the City has approved all required insurance.

5. Policies of insurance shall provide that the City is entitled to 30 Days (10 Days for cancellation due to non-payment of premium) prior written notice of cancellation or non-renewal of the policy. Maintenance of specified insurance coverage is a material element of the Contract. Your failure to maintain or renew coverage or to provide evidence of renewal during the term of the Contract may be treated by the City as a material breach of the Contract.

7-3.2 Types of Insurance.

7-3.2.1 Commercial General Liability Insurance.

1. Commercial General Liability Insurance shall be written on the current version of the ISO Occurrence form CG 00 01 07 98 or an equivalent form providing coverage at least as broad.

2. The policy shall cover liability arising from premises and operations, XCU (explosions, underground, and collapse), independent contractors, products/completed operations, personal injury and advertising injury, bodily injury, property damage, and liability assumed under an insured's contract (including the tort liability of another assumed in a business contract).

3. There shall be no endorsement or modification limiting the scope of coverage for either "insured vs. insured" claims or contractual liability. You shall maintain the same or equivalent insurance for at least 10 years following completion of the Work.

4. All costs of defense shall be outside the policy limits. Policy coverage shall be in liability limits of not less than the following:

General Annual Aggregate Limit	Limits of Liability
Other than Products/Completed Operations	$2,000,000
Products/Completed Operations Aggregate Limit	$2,000,000
Personal Injury Limit	$1,000,000
Each Occurrence	$1,000,000

7-3.2.2 Commercial Automobile Liability Insurance.

1. You shall provide a policy or policies of Commercial Automobile Liability Insurance written on the current version of the ISO form CA 00 01 12 90 or later version or equivalent form providing coverage at least as broad in the amount of $1,000,000 combined single limit per accident, covering bodily injury and property damage for owned, non-owned, and hired automobiles ("Any Auto").

2. All costs of defense shall be outside the limits of the policy.

7-3.3 Rating Requirements. Except for the State Compensation Insurance Fund, all insurance required by this Contract as described herein shall be carried only by responsible insurance companies with a rating of, or equivalent to, at least "A-, VI" by A.M. Best Company, that are authorized by the California Insurance Commissioner to do business in the State, and that have been approved by the City.

7-3.3.1 **Non-Admitted Carriers.** The City will accept insurance provided by non-admitted, "surplus lines" carriers only if the carrier is authorized to do business in the State and is included on the List of Approved Surplus Lines Insurers (LASLI list).

All policies of insurance carried by non-admitted carriers shall be subject to all of the requirements for policies of insurance provided by admitted carriers described herein.

7-3.4 **Evidence of Insurance.** Furnish to the City documents e.g., certificates of insurance and endorsements evidencing the insurance required herein, and furnish renewal documentation prior to expiration of this insurance. Each required document shall be signed by the insurer or a person authorized by the insurer to bind coverage on its behalf. We reserve the right to require complete, certified copies of all insurance policies required herein.

7-3.5 **Policy Endorsements.**

7-3.5.1 **Commercial General Liability Insurance.**

7-3.5.1.1 **Additional Insured.**

1. You shall provide at your expense policy endorsement written on the current version of the ISO Occurrence form CG 20 10 11 85 or an equivalent form providing coverage at least as broad.

2. To the fullest extent allowed by law e.g., California Insurance Code §11580.04, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured.

3. The additional insured coverage for projects for which the Engineer's Estimate is $1,000,000 or more shall include liability arising out of:

   a) Ongoing operations performed by you or on your behalf,

   b) your products,

   c) your Work, e.g., your completed operations performed by you or on your behalf, or

   d) premises owned, leased, controlled, or used by you.

4. The additional insured coverage for projects for which the Engineer's Estimate is less than $1,000,000 shall include liability arising out of:

   a) Ongoing operations performed by you or on your behalf,

   b) your products, or

   c) premises owned, leased, controlled, or used by you.

7-3.5.1.2 **Primary and Non-Contributory Coverage.** The policy shall be endorsed to provide that the coverage with respect to operations, including the completed operations, if appropriate, of the Named Insured is primary to any insurance or self-insurance of the

City and its elected officials, officers, employees, agents and representatives. Further, it shall provide that any insurance maintained by the City and its elected officials, officers, employees, agents and representatives shall be in excess of your insurance and shall not contribute to it.

7-3.5.1.3 **Project General Aggregate Limit.** The policy or policies shall be endorsed to provide a Designated Construction Project General Aggregate Limit that will apply only to the Work. Only claims payments which arise from the Work shall reduce the Designated Construction Project General Aggregate Limit. The Designated Construction Project General Aggregate Limit shall be in addition to the aggregate limit provided for the products-completed operations hazard.

7-3.5.2 **Commercial Automobile Liability Insurance.**

7-3.5.2.1 **Additional Insured.** Unless the policy or policies of Commercial Auto Liability Insurance are written on an ISO form CA 00 01 12 90 or a later version of this form or equivalent form providing coverage at least as broad, the policy shall be endorsed to include the City and its respective elected officials, officers, employees, agents, and representatives as additional insured, with respect to liability arising out of automobiles owned, leased, hired or borrowed by you or on your behalf. This endorsement is limited to the obligations permitted by California Insurance Code §11580.04.

7-3.6 **Deductibles and Self-Insured Retentions.** You shall pay for all deductibles and self-insured retentions. You shall disclose deductibles and self-insured retentions to the City at the time the evidence of insurance is provided.

7-3.7 **Reservation of Rights.** The City reserves the right, from time to time, to review your insurance coverage, limits, deductibles and self-insured retentions to determine if they are acceptable to the City. The City will reimburse you, without overhead, profit, or any other markup, for the cost of additional premium for any coverage requested by the Engineer but not required by this Contract.

7-3.8 **Notice of Changes to Insurance.** You shall notify the City 30 Days prior to any material change to the policies of insurance provided under this Contract.

7-3.9 **Excess Insurance.** Policies providing excess coverage shall follow the form of the primary policy or policies e.g., all endorsements.

7-4 **NOT USED.** To the "GREENBOOK", DELETE in its entirety and SUBSTITUTE with the following:

7-4 **WORKERS' COMPENSATION INSURANCE AND EMPLOYERS LIABILITY INSURANCE.**

1. In accordance with the provisions of §3700 of the California Labor Code, you shall provide at your expense Workers' Compensation Insurance and Employers Liability Insurance to protect you against all claims under applicable

state workers compensation laws. The City, its elected officials, and employees will not be responsible for any claims in law or equity occasioned by your failure to comply with the requirements of this section.

2. Limits for this insurance shall be not less than the following:

Workers' Compensation	Statutory Employers Liability
Bodily Injury by Accident	$1,000,000 each accident
Bodily Injury by Disease	$1,000,000 each employee
Bodily Injury by Disease	$1,000,000 policy limit

3. By signing and returning the Contract you certify that you are aware of the provisions of §3700 of the Labor Code which requires every employer to be insured against liability for worker's compensation or to undertake self-insurance in accordance with the provisions of that code and you shall comply with such provisions before commencing the Work as required by §1861 of the California Labor Code.

7-4.1 **Waiver of Subrogation.** The policy or policies shall be endorsed to provide that the insurer will waive all rights of subrogation against the City and its respective elected officials, officers, employees, agents, and representatives for losses paid under the terms of the policy or policies and which arise from Work performed by the Named Insured for the City.

ADD:

7-6 **THE CONTRACTORS REPRESENTATIVE.** To the "GREENBOOK", ADD the following:

1. Both the representative and alternative representative shall be employees of the Contractor and shall not be assigned to a Subcontractor unless otherwise approved by the City in writing.

7-8.6 **Water Pollution Control.** To the "WHITEBOOK", ADD the following:

6. Based on a preliminary assessment by the City, this Contract is subject to SWPPP (Not Subject to Permanent Storm Water Requirements).

7-10.6.2 **Project Identification Sign.** To the "WHITEBOOK", item 1, DELETE in its entirety and SUBSTITUTE with the following:

1. The City shall provide 1 to 4 signs. Project signs shall include the funding source if project is funded in part by State Gas Tax Revenue (SB1). Contact the Engineer to pick up the Project signs, install them at the Work location(s), and maintain them in a manner approved by the Engineer.

7-13.4 Contractor Standards and Pledge of Compliance. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. The Contract is subject to City's Municipal Code §22.3004 as amended 10/29/13 by ordinance O-20316.

2. You shall complete a Pledge of Compliance attesting under penalty of perjury that you complied with the requirements of this section.

3. You shall ensure that all Subcontractors complete a Pledge of Compliance attesting under penalty of perjury that they complied with the requirements of this section.

4. You shall require in each subcontract that the Subcontractor shall abide by the provisions of the City's Municipal Code §22.3004. A sample provision is as follows:

   "Compliance with San Diego Municipal Code §22.3004. The Subcontractor acknowledges that it is familiar with the requirements of San Diego Municipal Code §22.3004 ("Contractor Standards"), and agrees to comply with requirements of that section. The Subcontractor further agrees to complete the Pledge of Compliance, incorporated herein by reference."

ADD:

7-13.8 Equal Pay Ordinance.

1. You shall comply with the Equal Pay Ordinance (EPO) codified in the San Diego Municipal Code (SDMC) in section 22.4801 through 22.4809, unless compliance is not required based on an exception listed in SDMC section 22.4804.

2. You shall require all of your Subcontractors to certify compliance with the EPO in their written subcontracts.

3. You shall post a notice informing your employees of their rights under the EPO in the workplace or job site.

4. By signing this Contract with the City of San Diego, you acknowledge the EPO requirements and pledge ongoing compliance with the requirements of SDMC Division 48, section 22.4801 et seq., throughout the duration of this Contract.

7-16.3 Exclusive Community Liaison Services. To the "WHITEBOOK", ADD the following:

2. You shall retain an Exclusive Community Liaison for the Project that shall implement Work in accordance with the specifications described in 7-16.2 "Community Outreach Services" and 7-16.3 "Exclusive Community Liaison Services".

7-20 ELECTRONIC COMMUNICATION. To the "WHITEBOOK", ADD the following:

2. Virtual Project Manager shall be used on this Contract.

7-21.1 General. To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. During the construction phase of projects, the minimum waste management reduction goal is 90% of the inert material (a material not subject to decomposition such as concrete, asphalt, brick, rock, block, dirt, metal, glass, and etc.) and 65% of the remaining project waste. You shall provide appropriate documentation, including a Waste Management Form attached as an appendix, and evidence of recycling and reuse of materials to meet the waste reduction goals specified.

SECTION 217 – BEDDING AND BACKFILL MATERIALS

217-2.2 Stones, Boulders, and Broken Concrete. To the "GREENBOOK", Table 217-2.2, DELETE in its entirety and SUBSTITUTE with the following:

TABLE 217-2.2

<table>
<tr><th>Zone</th><th>Zone Limits</th><th>Maximum Size (greatest dimension)</th><th>Backfill Requirements in Addition to 217-2.1</th></tr>
<tr><td>Street or Surface Zone</td><td rowspan="2">From ground surface to 12" (300 mm) below pavement subgrade or ground surface</td><td>2.5" (63 mm)</td><td>As required by the Plans or Special Provisions.</td></tr>
<tr><td>Street or Surface Zone
Backfill of Tunnels beneath Concrete Flatwork</td><td>Sand</td><td>Sand equivalent of not less than 30.</td></tr>
<tr><td>Trench Zone</td><td>From 12" (300 mm) below pavement subgrade or ground surface to 12" (300 mm) above top of pipe or box</td><td>6" (150 mm)</td><td></td></tr>
<tr><td>Deep Trench Zone (Trenches 3' (0.9 m) wide or wider)</td><td>From 60" (1.5 m) below finished surface to 12" (300 mm) above top of pipe or box</td><td>Rocks up to 12" (300 mm) excavated from trench may be placed as backfill</td><td></td></tr>
</table>

Zone	Zone Limits	Maximum Size (greatest dimension)	Backfill Requirements in Addition to 217-2.1
Pipe Zone	From 12" (300 mm) above top of pipe or box to 6" (150 mm) below bottom of pipe or box exterior	2.5" (63 mm)	Sand equivalent of not less than 30 or a coefficient of permeability greater than 1-½ inches/hour (35 mm per hour).
Overexcavation	Backfill more than 6" (150 mm) below bottom of pipe or box exterior	6" (150 mm)	Sand equivalent of not less than 30 or a coefficient of permeability greater than 1-½ inches/hour (35 mm per hour). Trench backfill slurry (100-E-100) per 201-1 may also be used.

SECTION 302 – ROADWAY SURFACING

302-4.12.4 Measurement and Payment. To the "WHITEBOOK", item 2, DELETE in its entirety and SUBSTITUTE with the following:

2. The payment for RPMS shall be the total square footage used on the project calculated using the method described and shall be paid under the following Bid items:

BID DESCRIPTION	UNIT
Rubber Polymer Modified Slurry (RPMS) Type I	SF
Rubber Polymer Modified Slurry (RPMS) Type II	SF
Rubber Polymer Modified Slurry (RPMS) Type III	SF
Rubber Polymer Modified Slurry (RPMS) Type I (Bike Lane)	SF

The Bid items for RPMS shall include full compensation for the specified surface preparation not included in other Bid items and shall include the Work necessary to construct the RPMS as specified on the Plans. Sweeping, removals, and furnishing the aggregate required for the mix design shall also be included in this Bid item.

302-5.9 **Measurement and Payment.** To the "WHITEBOOK", item 2, DELETE in its entirety.

SECTION 304 – METAL FABRICATION AND CONSTRUCTION

304-5 **PAYMENT.** To the "WHITEBOOK", REVISE section "**304-5**" to "**304-6**".

SECTION 306 – OPEN TRENCH CONDUIT CONSTRUCTION

306-3.3 **Removal and Abandonment of Existing Conduits and Structures.** To the "GREENBOOK", ADD the following:

1. For 16 inch (406.4 mm) and larger conduits, abandoned pipe shall be filled with sand or CLSM in accordance with 201-6, "Controlled Low Strength Material (CLSM)".

306-3.3.4.1 **Non-Friable Asbestos Cement Pipe (ACP).** To the "WHITEBOOK", item 2, subsection "i", DELETE in its entirety and SUBSTITUTE with the following:

i) A minimum of 5 Working Days prior to the transportation of the ACP disposal bins or friable asbestos waste, you shall provide notice to and assist the Resident Engineer in completing the Inspection Work Request Form for the Asbestos, Lead, and Mold Program. The form is located below:

https://forms.sandiego.gov/f/gs2064

306-6.5.1 **General.** To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. For PVC water pipes:

   a) Bedding material shall:

      i. Either be sand, crushed aggregate, or native free-draining granular material.

      ii. 100% of the bedding material shall pass the no. 4 sieve and shall have an expansion when saturated with water of not more than 0.5%.

      iii. Have a sand equivalent of SE 50. SE 30 or higher may be substituted for SE 50 as bedding material if all of the following requirements are met:

         - The top of the pipe and haunch areas are mechanically compacted by means of tamping, vibrating roller, or other mechanical tamper.

- Equipment is of size and type approved by the Engineer.
- 90% relative compaction or better is achieved.

b) When jetting, care shall be exercised to avoid floating of the pipe.

2. PVC sewer pipes shall be bedded in 3/8 inch (9.5 mm) or 1/2 inch (12.5 mm) crushed rock in accordance with 200-1.2, "Crushed Rock and Rock Dust". Crushed rock for PVC sewer pipes may contain recycled Portland Cement Concrete and shall conform to gradation requirements for 3/8 inch or1/2 inch nominal size as shown in Table 200-1.2.1 (A).

3. Storm drains and all types of non-PVC sewer mains shall be bedded in 3/4 inch (19 mm) crushed rock in accordance with 200-1.2, "Crushed Rock and Rock Dust". Crushed rock for storm drains may contain recycled Portland Cement Concrete and shall conform to gradation requirements for 3/4 inch nominal size as shown in Table 200-1.2.1 (A). Bedding shall be placed to a depth of 4 inches (101.6 mm) below the outside diameter of the pipe or 1 inch (25.4 mm) below the bell of the pipe, whichever is greater.

SECTION 314 – TRAFFIC STRIPING, CURB AND PAVEMENT MARKINGS, AND PAVEMENT MARKERS

314-4.3.7 Payment. To the "GREENBOOK", ADD the following:

2. The payment for the replacement of existing traffic striping, pavement markings, and pavement markers shall be included in the Bid item for "Striping" and shall also include the payment for new installations of traffic striping, pavement markings, and pavement markers.

314-4.4.6 Payment. To the "WHITEBOOK", DELETE in its entirety and SUBSTITUTE with the following:

1. No separate payment shall be made for establishing alignment for stripes and layout Work.

2. The payment for the installation of proposed thermoplastic striping and thermoplastic pavement markings, in accordance to the Plans, shall be included in the Bid item for "Thermoplastic Traffic Striping" and "Thermoplastic Pavement Markings.

3. The payment for the thermoplastic striping of continental crosswalks shall be included in the Bid item for "Continental Crosswalks" and shall include the removal of existing striping, pavement markers, and paving markings.

4. The payment for the removal and replacement of existing traffic striping, pavement markings, and pavement markers shall be included in the Bid item for "Striping" and shall also include the payment for new installations of traffic striping, pavement markings, and pavement markers.

SECTION 600 - ACCESS

ADD:

600-1 GENERAL. To the "WHITEBOOK", item 5, DELETE in its entirety and SUBSTITUTE with the following:

5. If the City's crews are unable to provide the citizens with the mandated services due to your failure to comply with these specifications, you shall collect trash, recyclables, and yard waste on the City's schedule and deliver to the City's designated locations. If you fail to perform this Work, you shall incur additional costs for the City to reschedule pick up of an area.

SECTION 601 - TEMPORARY TRAFFIC CONTROL FOR CONSTRUCTION AND MAINTENANCE WORK ZONES

601-6 PAYMENT. To the "WHITEBOOK", item 5, ADD the following:

e) The payment for furnishing, installing, programming, maintaining, and removing City approved temporary video or radar detection systems as specified in 601-1, "GENERAL" shall be included in the Bid item for each "Temporary Detection System" required at each intersection.

SECTION 701 – CONSTRUCTION

701-2 PAYMENT. To the "WHITEBOOK", ADD the following:

19. The payment for Pedestrian Barricades shall be included in the Bid item for each "Pedestrian Barricade".

20. The payment for Curb Ramp Barricades shall be included in the Bid item for each "Curb Ramp Barricade".

SECTION 900 – MATERIALS

900-1.1.1 Galvanized Pipe. To the "WHITEBOOK", Item 8 Hoses, DELETE in its entirety and SUBSTITUTE with the following:

8. Hoses:

a) User Connection (Service Meters).

i. For meters up to 1 inch (25.4 mm), the hose shall be 1 inch (25.4 mm) potable water hose with 300 WP rating. End connections shall be galvanized steel, "Chicago" 2-lug, quarter-turn, quick-disconnect fittings banded to the hose.

ii. Materials shall meet the NSF/ANSI 61 certification for potable water use in conformance with AWWA C651-14.

b) Curves and Curbs.

i. Hose shall be 2 inch (50.8 mm) potable water hose with 300 WP rating. End connections shall be galvanized steel grooved mechanical end fittings in compliance with ASTM C606 banded to the hose.

ii. Materials shall meet the NSF/ANSI 61 certification for potable water use in conformance with AWWA C651-14.

900-1.1.3 Yelomine Pipe. To the "WHITEBOOK", Item 8 Hoses, DELETE in its entirety and SUBSTITUTE with the following:

8. Hoses:

a) User Connection (Service Meters).

i. For meters up to 1 inch (25.4 mm), the hose shall be 1 inch (25.4 mm) potable water hose with 300 WP rating. End connections shall be galvanized steel, "Chicago" 2-lug, quarter-turn, quick-disconnect fittings banded to the hose.

ii. Materials shall meet the NSF/ANSI 61 certification for potable water use in conformance with AWWA C651-14.

b) Curves and Curbs.

i. Hose shall be 2 inch (50.8 mm) potable water hose with 300 WP rating. End connections shall be galvanized steel grooved

mechanical end fittings in compliance with ASTM C606 banded to the hose.

ii. Materials shall meet the NSF/ANSI 61 certification for potable water use in conformance with AWWA C651-14.

900-1.2 **Payment.** To the "WHITEBOOK", item 2, DELETE in its entirety and SUBSTITUTE with the following:

2. The Payment for your high-lining materials (fittings, valves, and hardware), including delivery and unloading, shall be paid for under the linear foot Bid item "Furnished Materials for Contractor High-line Work".

SECTION 901 – INSTALLATION AND CONNECTION

901-2.5 **Payment.** To the "WHITEBOOK", item 3, DELETE in its entirety and SUBSTITUTE with the following:

3. Traffic control, saw cutting the trench area, trench caps, and other spot repairs in the vicinity of the disturbed area at each restored connection shall be included in the square foot Bid item for "Pavement Restoration for Final Connection". Asphalt overlay and slurry seal Work shall be paid for under separate Bid items.

EQUAL OPPORTUNITY CONTRACTING PROGRAM (EOCP) SECTION A – GENERAL REQUIREMENTS

4.1 **Nondiscrimination in Contracting Ordinance.** To the "WHITEBOOK", subsection 4.1.1, paragraph (2), sentence (1), DELETE in its entirety and SUBSTITUTE with the following:

You shall not discriminate on the basis of race, gender, gender expression, gender identity, religion, national origin, ethnicity, sexual orientation, age, or disability in the solicitation, selection, hiring, or treatment of subcontractors, vendors, or suppliers.

END OF SUPPLEMENTARY SPECIAL PROVISIONS (SSP)

TECHNICALS

Miramar Landfill – Storm Water Improvement Specifications

Section Number	Title
00 10 00	Summary of Work
00 31 13.16	Construction Schedule
01 31 19	Project Meetings
01 33 00	Submittal Procedures
01 42 00	References
01 50 00	Construction Facilities and Temporary Controls
01 55 19	Temporary Parking Areas
01 55 26	Traffic Control
01 55 29	Staging Areas
01 56 00	Environmental Protection
01 57 23	Temporary Storm Water Pollution Controls
01 57 26	Site Watering for Dust Control
03 10 00	Concrete Formwork
03 20 00	Reinforcement Steel
03 29 00	Joints in Concrete Structures
03 30 00	Cast-in-Place Concrete
31 05 13	Soils for Earthwork
31 05 16	Aggregates for Earthwork
31 05 19.13	Geotextile
31 14 13.16	Soil Stockpiling
31 22 16.13	Roadway Subgrade Reshaping
31 25 14	Erosion and Sedimentation Control
33 40 00	Drainage
34 71 00	Roadway Construction

Section 00 10 00
Summary of Work

PART 1 - GENERAL

1.1 *Section Includes*

A. City and Contractor responsibilities.

B. Contractor use of site and premises.

C. Scope of Work.

1.2 *City And Contractor Responsibilities*

A. City's responsibilities:

1. Identify staging area.
2. Identify parking area.
3. Identify sensitive resource areas and exclusion zones.
4. Identify soil disposal area.
5. Furnish compost mulch.
6. Furnish recycled water.

B. Contractor's responsibilities:

1. Furnish and implement all work described in these documents.
2. Coordinate with the Engineer.
3. Protection of work areas.

1.3 *CONTRACTOR USE OF SITE*

A. Limit use of site to allow:

1. Coordinate with the Engineer to limit access in work areas as necessary.

1.4 *SCOPE OF WORK*

A. Project Objective:

1. The Project's objective is to reduce sediment and other pollutants in storm water discharges at the West Miramar Waste Disposal Facility (Facility) through grading and stabilizing sections of Access Roads with aggregate or vegetation, reducing erosive storm water runoff and sediment mobilization through construction or implementation of stabilized roads, drainage ditches, channels, sediment traps,

stabilized low flow crossings, slope interruption devices, drainage inlet protection, drain pipe outlet energy dissipaters, realignment of existing and installation of new storm drains, and application of hydroseed and hydraulic mulch on less traveled roads, swales, and select slopes. Hydroseeding work shall be timed to occur between October 1 and December 15th. Contractor's Health and Safety Plan shall include working around hazards that are inherent to an active landfill site.

B. Scope of Work:

1. Mobilization.

2. Grading, subgrade, installation of woven geotextile mat, and placement and compaction of coarse aggregate on access roads (referred to as "Graded Gravel Road with Roadside Ditches" and "Graded Gravel Road Tie-In") as indicated on Construction Drawings.

3. Moisture condition and subgrade preparation, installation of woven geotextile mat, and placement and compaction of coarse aggregate on access roads (referred to as "Gravel Surfacing" and "Gravel Surfacing Gravel Road Tie-In" as indicated on the Construction Drawings.

4. Moisture condition and soil preparation, application of compost, hydroseed and hydromulch to ungraded "Vegetated Access Roads" as indicated on Construction Drawings.

5. Grading, moisture condition and soil preparation, application of compost, hydroseed and hydromulch to graded "Vegetated Access Roads" as indicated on Construction Drawings.

6. Moisture condition and soil preparation, application of compost, track walk, install straw wattle slope interruption devices on contour, apply hydroseed and hydromulch at "Erosion Control Area 1" as indicated on Construction Drawings.

7. Moisture condition and soil preparation, application of compost, install straw waddle slope interruption devices on contour, apply hydroseed, and hydromulch at "Vegetated Swales" as indicated on Construction Drawings.

8. Grading, subgrade preparation, placement of woven geotextile mat, cut-off walls, articulated concrete block at "Low Flow Crossings" as indicated on Construction Drawings.

9. Excavation, grading, subgrade preparation, placement of woven geotextile mat and coarse aggregate in constructed channels (referred to as "Coarse Aggregate Channel") as indicated on Construction Drawings.

10. Excavation, installation of woven geotextile mat and rip rap at Down Drain #1, #2, #3 and #15 (referred to as "Inlet Protection") as indicated on Construction Drawings.

11. Excavation, grading and installation of woven geotextile mat, concrete Eco Blocks, and Reno mattresses at Down Drains #3, #8, #15, #17 and #18 and Culvert #1 (referred to as "Energy Dissipaters") as indicated on Construction Drawings.

12. Grading bench for installation of concrete footing and K-rail thrust block, installation of concrete footing, HDPE Tee and Fasteners, and K-rail thrust block at Down Drains #1, #2, #14, and #16 (referred to as "Down Drain Termination") as indicated on Construction Drawings.

13. Excavation, grading, and installation concrete sediment trap liner, woven geotextile mat, articulated concrete block, gabion basket weir structures, and cut-off walls at Sediment Traps #1 and #2 and as indicated on Construction Drawings.

14. Concrete forming to raise height of existing headwall at Down Drain #7 as indicated on Construction Drawings.

15. Excavation, concrete forming to raise height of existing headwall at Down Drain #8 as indicated on Construction Drawings.

16. Realignment and re-use of existing 36-inch HDPE storm drain, and installation of new anchor system at Down Drain #14 as indicated on Construction Drawing.

17. Removal of existing reno mattress, grading, excavation, installation of new re-aligned 36-inch smooth HDPE storm drain, anchor system, headwall, and energy dissipater at Down Drain #15 as indicated on Construction Drawing.

18. Excavation and grading of the bottom and side slopes of the West Sediment Basin, as indicated on the Construction Drawings.

19. Installation of K-rail along toe of slope of the West Basin Access Road.

20. Installation of Tapered Inlet, Down Drain Flume, and Energy Dissipation on East Basin Access Road as indicated on Construction Drawings.

21. Contract close-out and de-mobilization.

C. A more detailed description of work scope elements is given in the specification sections that follow this section.

PART 2 - Materials (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT (Not Used)

END OF SECTION

Section 00 31 13.16
Construction Schedule

PART 1 - GENERAL (NOT USED)

1.1 *WORK OF THIS SECTION*

PART 2 - Materials (Not Used)

PART 3 - EXECUTION

3.1 *WORK on roadways*

A. Contractor shall execute work on active access roads in a manner which minimizes operational impacts to landfill operations.

B. Grading, placement of geotextile mat and aggregate shall be limited to a single drive lane. Contractor shall provide signage within work zones and continuous traffic control utilizing flag-persons with 2-way radios to ensure proper control and flow of traffic.

C. Work along shoulders for grading and placement aggregate in drainage ditches and channel with coarse aggregate shall be performed in a manner that ensures bi-directional traffic flow is maintained at all times. Signage and flag persons shall be utilized in immediate work zones where materials are being placed to ensure proper control and flow of traffic.

3.2 *WORK OUTSIDE OF ROADWAYS*

A. Contractor's work shall not impact the City's landfilling or greenery operations.

PART 4 - MEASUREMENT AND PAYMENT (Not Used)

END OF SECTION

Section 01 31 19
Project Meetings

PART 1 - GENERAL

1.1 *Work of this section*

A. The Contractor shall participate in project meetings including, but not limited to, the following:

1. *Preconstruction conference.*
2. *Progress meetings.*
3. *Pre- and final Site walks.*

1.2 *Related sections*

A. The Work of the following Sections apply to the Work of this Section. Work of other Sections of the Specifications not referenced below shall also apply to the extent required for the proper performance of the Work.

1. Section 00 31 13.16 Construction Schedule.

1.3 *Preconstruction Meeting*

A. Prior to the commencement of the Work at the site, a preconstruction meeting will be held at a mutually agreed time and place which shall be attended by the Contractor's Project Manager, its superintendent, and its subcontractors, as the Contractor deems appropriate. Other attendees will be:

1. Construction Manager.
2. City's representatives.
3. Governmental representatives as appropriate.
4. Engineer.
5. Others as requested by Contractor, City, or Construction Manager.

B. Unless previously submitted to the Engineer, the Contractor shall bring to the conference one copy of each of the following:

1. Proposed Construction Schedule and Construction Sequencing.
2. Procurement schedule of major equipment and materials, and items requiring long lead time.

C. The purpose of the preconstruction meeting is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established. The complete agenda will be furnished by the Engineer to the Contractor prior to the meeting date. However, the Contractor should be prepared to discuss all the items listed below.

1. Status of Contractor's insurance and bonds.
2. Contractor's tentative schedules.
3. Transmittal, review, and distribution of Contractor's submittals.
4. Processing applications for payment.
5. Maintaining record documents.
6. Work sequencing.
7. Traffic control and safety.
8. Field decisions and change orders.
9. Use of project site, office and storage areas, security, and housekeeping.
10. City's needs.
11. Major equipment deliveries and priorities.

D. The Engineer will preside at the preconstruction meeting and will arrange for keeping and distributing the minutes to all persons in attendance.

1.4 *Progress meetings*

A. The Engineer will schedule and hold regular on-site progress meetings at least weekly and at other times as required by progress of the Work. The Contractor, Engineer, and all subcontractors active on the site shall attend each progress meeting. The Engineer may, at his or her discretion, request attendance by representatives of the Contractor's suppliers, manufacturers, and other subcontractors.

B. The Engineer shall preside at the meetings and will arrange for keeping and distributing the minutes. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop. During each meeting, the Contractor is required to present any issues which may impact his work, with a plan to resolve these issues expeditiously.

C. The agenda will include but will not be limited to the following:

1. Transcript or minutes of previous meeting.
2. Safety and traffic control issues.
3. Community and public relations issues.
4. Progress since the last meeting.
5. The Contractor's three-week look-ahead schedule and planned Work progress for the next Work period.

6. Shop drawings, requests for information, survey requests, and substitution requests review.
7. Problems, conflicts, disputed issues, potential claims, and observations.
8. Field orders and change orders.
9. Applications for payment.
10. Quality standards and control.
11. Schedules, including off-site fabrication and delivery schedules. Corrective measures required.
12. Coordination between parties.

PART 2 - Materials (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - Measurement and payment

4.1 *Project meetings*

A. All work associated with Project Meetings for this project shall be included in the Lump Sum Price for Mobilization. No separate payment for this item will be made.

END OF SECTION

Section 01 33 00
Submittal Procedures

PART 1 - GENERAL

1.1 *Work of this section*

A. Wherever submittals are required hereunder, all such submittals by the Contractor shall be submitted to the Engineer in accordance with the GREENBOOK and WHITEBOOK Section 2-5.3 Submittals.

B. Within 10 working days after the date of commencement as stated in the Notice to Proceed, the Contractor shall submit the following items to the Engineer for review:

1. A Submittal Schedule of Shop Drawings, Samples, and proposed Substitutes ("Or-Equal") submittals. Additional submittals will not be accepted for review prior to acceptance of the Submittal Schedule by the Construction Manager.

2. A list of all permits and licenses the Contractor shall obtain. Indicate the agency required to grant the permit, the expected date of submittal for the permit, and the required date for receipt of the permit.

1.2 *Related sections*

A. The Work of the following Section apply to Work of this Section. The Work of other Sections of the Specifications, not referenced below, shall also apply to the extent required for proper performance of the Work.

1. Section 00 31 13.16 - Construction Schedule.

2. Section 01 31 19 – Project Meetings.

3. Section 01 50 00 - Construction Facilities and Temporary Controls.

4. Section 01 55 26 - Traffic Control.

5. Section 01 57 26 – Site Watering for Dust Control.

6. Section 01 57 23 – Temporary Storm Water Pollution Controls.

7. Section 01 56 00 – Environmental Protection.

8. Section 03 30 00 - Cast-in-Place Concrete

9. Section 33 40 00 – Drainage.

10. Section 31 22 16.13 – Roadway Subgrade Reshaping.

11. Section 31 25 14 –Erosion and Sedimentation Control.

1.3 *Preliminary submittals list*

A. The following is a preliminary list of submittals to be reviewed, updated and completed by the Contractor and submitted during the pre-construction meeting, the Contractor shall provide to the City for the Engineer's review a complete listing of all anticipated Contractor submittals and the proposed submittal dates for each, including but not limited to the following:

B. General Submittals

1. Project Schedule.
2. Storm Water Pollution Prevention Plan (SWPPP).
3. Worker Health and Safety Plan.
4. Community Health and Safety Plan.
5. Shop Drawings, if needed.
6. Earthwork Volume Calculations.
7. Compost Material Calculations

C. Earthwork submittals

1. Project Sequencing Plan.

D. Miscellaneous Civil submittals

1. Woven Geotextile Manufacturer’s Product Data, Certificate of Compliance.
2. On-site Soil and Imported Aggregate Gradations, Certificate of Compliance for Concrete, and Drainage Inlet Protection.
3. Compaction test results performed on the cover soil and roadway aggregates.
4. Analytical test results performed on the roadway aggregates.
5. Articulated Concrete Mat Manufacturer’s Product Data.
6. Portland Cement Mix Design, Certificate of Compliance.
7. Wire Mesh Manufacturer’s Product Data.
8. Reinforcement Bar Plan.
9. Wooden Stake Manufacturer’s Catalog Cut Sheets.
10. Hydroseed Mixture Certifications.
11. Weed-free Straw Waddle Certification.
12. Hydraulic Mulch / Tackifier Design Mix.
13. Gabion Basket Manufacturer’s Product Data.
14. K-rail Manufacturer’s Product Data.

1.4 *Contractor's options*

A. For products specified only by reference standard, select products by any manufacturer meeting that standard. To the maximum extent possible, provide products of the same generic kind from a single source.

B. For products specified by naming several products or manufacturers, select any one of the products or manufacturers named that complies with the Contract Documents.

C. For products specified by naming one or more products or manufacturers and stating, "or equal," submit a Request for Substitution to the Engineer for any product or manufacturer that is not specifically named.

Note that a limited period is specified for the Contractor to submit Requests for Substitution. After that period has elapsed, the Engineer will no longer accept Requests for Substitution for review.

D. Where more than one choice is available as a Contractor's option, select a product that is compatible with other products already selected or specified.

1.5 *Shop drawings (if needed)*

A. Submit Shop Drawings, if needed, to Engineer for review and acceptance in accordance with the accepted schedule of Shop Drawings and Sample submittals.

B. Determine and verify before submitting each Shop Drawing or Sample:

1. Field measurements, quantities, dimensions, specified performance criteria, installation requirements, materials, catalog numbers, and similar information with respect thereto.

2. Materials with respect to intended use, fabrication, shipping, handling, storage, assembly, and installation pertaining to the performance of the Work.

3. Information relative to Contractor's sole responsibilities in respect of means, methods, techniques, sequences, and procedures of construction, and safety precautions and programs incident thereto.

C. Contractor shall review and coordinate each Shop Drawing or Sample with other Shop Drawings and Samples, and with the requirements of the Work and Contract Documents.

D. All Contractor Shop Drawing Submittals shall be carefully reviewed by an authorized representative of the Contractor, prior to submission to the Engineer. Each submittal shall be dated, signed, and certified by the Contractor, as being correct and in strict conformance with the Contract Documents. In the case of shop drawings, each sheet shall be so dated, signed, and certified. No consideration for review by the Engineer of any Contractor submittals will be made for any items which have not been so certified by the Contractor. All non-certified submittals will be returned to the Contractor without action taken by the Engineer, and any delays caused thereby shall be the sole responsibility of the Contractor.

E. At the time of each submission, Contractor shall give Engineer specific written notice of variations, if any, that the Shop Drawing or Sample submitted may have from the requirements of the Contract documents. The notice shall be by written communication separate from the submittal; and, in addition, shall cause a specific notation to be made on each Shop Drawing and Sample submitted to Engineer for review and acceptance of each such variation.

F. Review and acceptance of Shop Drawings and Samples will be only to determine if items covered by submittals will, after installation or incorporation in the Work, conform to 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. 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. The review and acceptance of a separate item as such will not indicate acceptance of the assembly in which the item functions. The review of Contractor shop drawing submittals shall not relieve the Contractor of the entire responsibility for the correctness of details and dimensions. The Contractor shall assume all responsibility and risk for any misfits due to any errors in Contractor submittals. The Contractor shall be responsible for the dimensions and the design of adequate connections and details. Contractor shall make corrections required to submittals and shall return the required number of corrected copies of Shop Drawings and submit as required new Samples for review and acceptance. Contractor shall direct specific attention in writing to revisions other than corrections called for on previous submittals.

G. Review and acceptance of Shop Drawings or Samples shall not relieve Contractor from responsibility for variation from requirements of the Contract Documents, unless Contractor has in writing called attention to each such variation at the time of submission, and written acceptance has been given of each such variation by specific written notation thereof incorporated in, or accompanying, the Shop Drawing or Sample acceptance.

H. Where a Shop Drawing or Sample is required by Contract Documents or schedule of Shop Drawings and Sample submissions accepted by Engineer, related Work performed prior to review and approval of pertinent submittal will be at the sole expense and responsibility of Contractor.

1.6 *Submittal procedures*

A. Wherever called for in the Contract documents, or where required by the Engineer, the Contractor shall furnish to the Engineer for review, 4 copies, plus the number the Contractor wants returned, not to exceed 6 copies, plus one reproducible copy, of each shop drawing submittal. The term “Shop Drawings” as used herein shall be understood to include detail design calculations, shop drawings, fabrication, and installation drawings, erection drawings, lists, graphs, catalog sheets, data sheets, and similar items.

B. Normally, a separate transmittal form shall be used for each specific item or class of material or equipment for which a submittal is required. Transmittal of a submittal of various items using a single transmittal form will be permitted only when the items taken together constitute a manufacturers "package or are so functionally related that expediency indicates review of the group or package as a whole. A multiple-page submittal shall be collated into sets, and each set shall be stapled or bound, as appropriate, prior to transmittal to the Engineer.

C. A standard transmittal form approved by the Engineer shall be used for the project. Transmittal form shall identify Contractor, indicate date of submittal, and include information prescribed by the transmitted form and assign a sequential number to each submittal in a format approved by the Engineer. Process transmittal forms to record actions regarding sample panels and sample installations.

To indicate that the submittals have been Reviewed and Approved by Contractor as to conformance to Contract Documents, Contractor shall have made and shall use labels and/or a rubber stamp which shall materially conform to the following sample:

Submittal No:			
Contract No.		Project No.:	
Contractor:			
Reviewed and Approved for Conformance with the Contract Documents by:		(Signature)	
References:			
Drawing Sheet Nos.			
Specification Section Nos.			

D. Except as may otherwise be indicated herein, the Engineer will return prints of each submittal to the Contractor with its comments noted thereon, within 15 calendar days following their receipt by the Engineer. It is considered reasonable that the Contractor shall make a complete and acceptable submittal to the Engineer by the second submission of a submittal item. The City reserves the right to withhold monies due the Contractor to cover additional costs of the review beyond the second submittal. The maximum review period for each submittal, including all resubmittals, will be 15 days per submittal.

E. If copies of a submittal are returned to the Contractor marked "NO EXCEPTIONS TAKEN," formal revision and resubmission of said submittal will not be required.

F. If copies of a submittal are returned to the Contractor marked "MAKE CORRECTIONS NOTED,"" formal revision and resubmission of said submittal will be required when requested for confirmation.

G. If a submittal is returned to the Contractor marked "REVISE-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required number of copies of said revised submittal to the Engineer.

H. If a submittal is returned to the Contractor marked "REJECTED-RESUBMIT," the Contractor shall revise said submittal and shall resubmit the required.

I. Fabrication of an item shall be commenced only after the Engineer has reviewed the pertinent submittals and returned copies to the Contractor marked either "NO EXCEPTIONS TAKEN" or "MAKE CORRECTIONS NOTED." Corrections noted on submittals shall be considered as changes necessary to meet the requirements of the Contract Documents and shall not be taken as the basis for changes to the contract requirements.

J. Submittal Log

Contractor shall maintain an accurate submittal log which lists all the submittals required by this Contract, showing status of each submittal.

Make the submittal log available for review upon request.

1.6 *Submittal format and copies*

A. Format for Shop Drawings:

1. For shop drawings presented on sheets larger than 8 ½ inches by 17 inches, include on each drawing the drawing title, number, date, and revision numbers and dates.
2. For shop drawings presented on sheets 8 ½ inches by 17 inches or less, conform to the format and quantity requirements for product data, and present as a part of the bound volume for the submittals required by the Section.
3. Dimension drawings, except diagrams and schematic drawings; prepare dimensioned drawings to scale. Identify materials and products for work shown.
4. Shop drawings shall be not less than 8 ½ inches by 11 inches nor more than 30 inches by 42 inches.
5. Submit detailed drawings and descriptions of proposed deviations from details or component arrangement indicated on the drawings.
6. Provide finished drawings for approval indicating proposed installation of the Work, and materials and equipment being furnished.
7. Copies of plans will not be accepted for submission as drawings, nor will catalog numbers alone of materials or equipment.
8. Data shown on working drawings shall be complete with respect to dimensions, design criteria, material of construction, and other detail to enable review.

B. Format for Product Data:

1. Present product data submittals for each Section of the Specifications as a complete, bound volume. Include a table of contents listing page and catalog item numbers for product data.
2. Indicate, by prominent notation, each product which is being submitted; indicate the Section and paragraph numbers to which it pertains.
3. Supplement product data with material prepared for the project to satisfy submittal requirements for which product data does not exist. Note that the material is developed specifically for the project.
4. Catalog data shall be explicit regarding details of products being furnished and complete enough to enable the Design Consultant to determine that products submitted conform to requirements of specifications.

5. For submittals with more than one style, size, capacity, etc. of a product on a sheet, clearly indicate exactly which product type is being submitted for approval. Failure to do this is cause for rejection. Catalog data shall bear name of manufacturer of product.

C. Samples:

1. Label or tag each sample identifying the specification Section number, manufacturers name and address, brand name, product identification number, and intended use in the Work.

D. Format of Administrative and Closeout Submittals:

1. Submit administrative and closeout submittals in the format and quantities required for shop drawings.

2. If the submittal includes a document which is to be used in the project or become a part of the project record, other than as a submittal, do not apply the Contractor's approval stamp to the document, but to a separate sheet accompanying the document.

1.7 *Manufacturer's instructions*

A. Submit manufacturer's printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, in quantities specified for shop drawings when specified in individual Sections.

B. Identify conflicts between manufacturers' instructions and Contract Documents.

C. Resolve conflicts as directed by Engineer at no additional cost to City.

1.8 *manufacturer's certificates*

A. When specified in individual Sections, submit manufacturers' certificate(s) to Engineer for review, in quantities specified for shop drawings.

B. Indicate material and equipment conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

C. Certificates may be recent or previous test results on material or product but must be acceptable to Engineer.

D. Where specified in Contract Documents that a certificate and/or affidavit shall be submitted to City for approval of a product, or component of a product, such submittals shall be made in accordance with the following:

1. A certificate submitted for a product, or component of a product, indicates test results proving that product, or component, meets the requirements of the standard specified in the Contract Documents.

2. An affidavit consisting of a sworn statement by an official of the company manufacturing the product indicating that information on certificate is true and accurate shall accompany the certificate.

3. A statement originating from Contractor, or his subcontractors, suppliers, or other agent which merely indicates that an item of equipment, product, or component of a product, meets the requirements of Contract Documents shall not be considered a certificate. A submittal made in this manner will not be accepted and corresponding equipment, product, or component, shall not be finally accepted.

PART 2 - Materials (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - Measurement and Payment

4.1. *Submittals*

A. All work associated with Submittals for this project shall include the unit price for each item requiring a submittal. No separate payment for this item shall be made.

END OF SECTION

Section 01 42 00
References

PART 1 - General

1.1. *Abbreviations and Acronyms*

A. Within these Specifications, the following abbreviations and acronyms are used:

ACI: American Concrete Institute

AOS: Apparent Opening Size

ANSI: American National Standards Institute

APCD: Air Pollution Control District

ASTM: American Society for Testing and Materials

BMP: Best Management Practice

CASQA: California Stormwater Quality Association

CBC: California Building Code

cm: centimeter

CMP: Corrugated Metal Pipe

CQA: Construction Quality Assurance

CRSI: Concrete Reinforcing Steel Institute

CSDSD: City of San Diego Standard Drawing

FHWA: Federal Highway Administration

ft: foot or feet

HASP: Health and Safety Plan

HDPE: High Density Polyethylene

IGP: Industrial General Permit

IIPP: Injury and Illness Prevention Program

ISO: International Standards Organization

KN: Kilonewtons

lbs: pounds

LEA: Local Enforcement Agency

MPa: Mega Pascal

mm: millimeter

NPDES: National Pollutant Discharge Elimination System

OSHA: Occupational Safety and Hazards Administration

PLS: Pure Live Seed

psi: pounds per square inch

PVC: Poly Vinyl Chloride

RWQCB: Regional Water Quality Control Board

SID: Slope Interruption Devices

SSPWC: Standard Specifications for Public Works Construction, 2015 Edition, also known as the Greenbook

SWPPP: Storm Water Pollution Prevention Plan

SWRCB: State Water Resources Control Board

UL: Underwriters Laboratories

UV: Ultra Violet

WPCP: Water Pollution Control Plan

1.2 *Definitions and Terms of Reference*

A. Within these Specifications, the following terms are defined per the definitions in this Section:

1. Contractor: The individual, partnership, corporation, joint venture, or other legal entity having a Contract with the City to perform the Work. In the case of Work being done under a permit issued by the City, the Contractor shall also be construed as the permittee.

2. Construction Documents: Your plans and details, including plans showing installation of major systems, equipment, fixed furnishings and graphics, the technical specifications and all other technical drawings, schedules, diagrams and specifications, attached Shop Drawings, Working Drawings, and submittals that are necessary to set forth in detail the requirements for the Project.

3. Construction Drawings: The drawings, profiles, cross sections, Standard Plans, Working Drawings, and Shop Drawings, or reproductions thereof, approved by the Engineer, which show the location, character, dimensions, or details of the Work.

4. Construction Manager: On-site Owner representative.

5. Design Consultant: Other engineer personnel hired by the City to consult on the design.
6. Engineer: The Chief Engineer of the City, Director of Public Works, or other person designated by the Board, acting either directly or through authorized agents.
7. Field Orders: A Field Order is a written agreement by the Engineer to compensate you for Work items in accordance with 3-3, "EXTRA WORK" or 3-4, "CHANGED CONDITIONS". A Field Order does not change the Contract Price or Contract Time or the intent of the Contract. The unused portions of the Field Orders shall revert to the City upon Acceptance.
8. Greenbook: The 2015 edition of the Standard Specifications for Public Works Construction
9. Owner: See City.
10. Requests for Information: Formal request by the Contractor to the Engineer for information regarding Contract Documents.
11. Shop Drawings: Drawings showing details of manufactured or assembled products proposed to be incorporated into the Work.
12. Substitution Requests: Submittals by the Contractor regarding proposed alternate materials than those specified in Contract Documents.
13. WHITEBOOK: The 2015 edition of the City of San Diego Standard Specifications for Public Works Construction
14. Work: That which is proposed to be constructed or done under the Contract or permit, including the furnishing of all labor, materials, equipment, and services.

PART 2 - Materials (not used)

PART 3 - Execution (not used)

PART 4 - Measurement and Payment (not used)

END OF SECTION

Section 01 50 00
Construction Facilities and Temporary Controls

PART 1 - GENERAL

1.1 *Work of this section*

A. The Contractor shall provide facilities required for construction and temporary controls during construction, see WHITEBOOK and GREENBOOK SECTION 7, including the following:

1. Layout of temporary facilities.
2. Temporary utilities: Furnish utilizes as required for own use. Coordinate with landfill operation and service utility agencies for use of existing facilities on site.
3. Payment for utility service.
4. Barriers.
5. Protection of installed work.
6. Temporary controls.
7. Security.
8. Traffic controls.
9. Provide office and sanitary facilities as required for own use.
10. Removal of utilities, facilities and controls.
11. Removal of the above on completion of the Work.

1.2 *related sections*

A. The Work of the following Sections apply to Work of this Section. Work of other Sections for the Specifications not referenced below shall also apply to the extent required for proper performance of the Work.

1. Section 00 10 00- Summary of Work

1.3 *layout of temporary facilities*

A. Submit drawings for approval showing proposed locations and sizes of offices, material and equipment staging area and similar facilities. Where onsite space for temporary facilities is limited, allocation of available space will be made by Engineer. Should Contractor require space in addition to that allocated, Contractor shall make his own arrangements for storage of materials and equipment in a location off the construction site. For allocated space, submit to Engineer for approval proposed plan and layout for temporary offices, sanitary facilities, temporary construction roads, and temporary power service and distribution. Said facilities shall be located so as not to impede or prevent the principal function of existing facilities.

B. Coordinate with City to limit access in work areas as necessary.

C. Maintain construction site free of debris and stage materials in areas approved by the Engineer.

1.4 *Temporary utilities*

A. General:

1. Furnish utilities as required for own use. Coordinate with Engineer and servicing utility agencies for use of existing facilities on site.

2. Recycled water will be provided by the City to the Contractor at no cost for completion of on-site work activities.

3. Costs for all connections, meters, switch gear, phone board, construction potable water meter fees, costs for power, temporary power poles, phone service and equipment, construction water, drinking water, internet service, etc. for Contractor's field office shall be paid by Contractor. Include costs associated with these services in mobilization Lump Sum Price.

4. The Contractor shall pay all potable water permit fees and any fees for the potable water meter(s). All charges for potable water use shall be paid for by the Contractor, except as noted below.

5. Potable Water Connections: The Contractor shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the Contractor shall first attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.

6. The Contractor shall provide potable water service for field offices.

B. Sanitary Facilities:

1. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for the use of Contractor's employees. Toilets at construction job sites shall conform to the requirements of Subpart d, Section 1926.51 of the Occupational Safety and Hazards Administration (OSHA) Standards for Construction.

2. Sanitary and Other Organic Wastes: The Contractor shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the Contractor or organic material wastes from any other source related to the Contractor's operations shall be disposed of away from the site in a manner satisfactory to the Engineer and in accordance with all laws and regulations pertaining thereto.

3. Remove temporary facilities at completion of Work.

1.5 *Barriers*

A. Provide barriers to prevent unauthorized entry to construction, areas of excavation and to protect existing facilities and adjacent properties from damage from construction operations.

B. Protect non-owned vehicular traffic, stored materials, site and structures from damage.

1.6 *Protection of installed work*

A. Protect installed Work and provide special protection where specified in individual speciation Sections.

B. Provide temporary and removable protection for installed Products. Control activities in immediate Work are to minimize damage.

1.7 *Temporary controls*

A. Drainage and Erosion Control

1. The Contractor shall comply with all applicable requirements for storm water discharge control contained in Section 01 56 00, Environmental Protection.
2. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
3. Protect site from puddling or running water. Provide best management practices as required to minimize soil erosion and avoid downstream sedimentation. Plan and execute construction using methods to control surface drainage from cuts and fills, as well as from borrow and waste disposal areas.
4. Minimize amount of bare soil exposed at any one time.
5. Provide temporary measures such as soil berms, dikes, and drains to control water flow.
6. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
7. Periodically inspect earthwork to detect evidence of erosion and sedimentation and promptly apply corrective measures when warranted.

B. Dust Control

1. Execute Work using methods to minimize raising dust from construction operations and, to prevent air-borne dust from dispersing into atmosphere.
2. Provide barriers to prevent unauthorized entry to construction and to protect existing facilities and adjacent properties from damage from demolition and construction operations.

C. Construction Noise Control

1. The Contractor shall oversee or undertake all construction activities to comply with all City noise regulations. Use appropriate construction methods and equipment, and furnish and install acoustical barriers as necessary, to avoid exceeding legal noise levels.

D. Rodent and Pest Control

1. Keep work area, including storage areas, free from rodents, noxious pests, and other vermin.

2. The Engineer shall notify Contractor on any non-compliance with this requirement and of the corrective action required. This notice, when delivered to Contractor or Contractor's representative at site of Work, shall be deemed sufficient notice of noncompliance and corrective action shall be required. After receiving notice, immediately take corrective action. If Contractor fails or refuses to eliminate rodents, pests or vermin and causes thereof promptly, City may have necessary extermination work performed and charge costs to Contractor.

E. Pollution Control

1. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

2. During the progress of the Work:

   a. Keep the Work and surrounding premises within Work limits free of accumulations of dirt, dust, waste materials, debris and rubbish.

   b. Keep dust generating areas wetted as needed to prevent air-borne dust.

   c. Provide suitable containers for storage of waste materials, debris and rubbish until time of disposal.

   d. Transport and Dispose of waste, debris and rubbish to the active landfilling area within Miramar Landfill. There will be no tipping fee assessed for existing in-place refuse that is removed and transported for disposal at onsite active landfilling area.

1.8 *Security*

A. Security Program:

1. Protect Work from theft, vandalism, and unauthorized entry.

2. Develop, and submit a written Contractor security plan to be approved by the City prior to job mobilization.

3. Maintain program throughout construction period until directed by Engineer.

1.9 *Traffic controls*

A. Traffic Control Program:

1. Provide Traffic Control to protect Workers and minimize disruption of operational activities at Miramar Landfill.

2. Develop and submit a written Contractor traffic plan to be approved by the City prior to job mobilization.

3. Maintain program throughout construction period until directed by Engineer.

1.10 *Field offices*

A. Contractor's field office: Provide and maintain temporary offices on the job site. Post a sign identifying Contractor and listing emergency telephone number(s) at, and outside of, Contractor's field office.

PART 2 - Materials (Not Used)

PART 3 - EXECUTION (Not Used)

PART 4 - MEASUREMENT AND PAYMENT

4.1 *Temporary Facilities for Own Use*

A. All work associated with Temporary Facilities and Utilities for Contractor's Own Use for this project shall be included in the mobilization Lump Sum Price.

END OF SECTION

Section 01 55 19
Temporary Parking Areas

PART 1 - General

1.1 *Section Includes*

A. City and Contractor's responsibilities.

B. Contractor use of site premises for parking and staging.

1.2 *City and Contractor Responsibilities*

A. City's responsibilities:

1. Identify staging area.
2. Identify parking area.

B. Contractor's responsibilities:

1. Maintain parking area and staging area clean and free of debris.
2. Limit access to parking area and staging area to Contractor's personnel, vehicles, and equipment.

1.3 *Contractor Use of Site*

A. Contractor shall limit use of site to work associated with the project.

B. Contractor shall coordinate with City to gain access to site as needed for the scope of the project.

C. Contractor shall maintain parking area free of debris and stage materials in areas approved by City Engineer.

PART 2 - Materials (Not Used)

PART 3 - Execution (Not Used)

PART 4 - Measurement and Payments

A. No compensation is provided for this section.

END OF SECTION

Section 01 55 26
Traffic Control

PART 1 - General

1.1 WORK OF THIS SECTION

A. The Contractor shall provide and implement a Traffic Control Plan for work before any Work area activity that would restrict or constrict operational use of the facility roads conducted in accordance with the Contract Documents.

1.2 RELATED SECTIONS

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 Submittals

1.3 REFERENCE SPECIFICATION, CODES AND STANDARDS

A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC) together with the latest adopted editions of the "WHITEBOOK."

1.4 CONTRACTOR SUBMITTALS

A. The Contractor shall submit in writing the Traffic Control Plan to be implemented on site within seven days of award of Contract.

PART 2 MATERIALS (NOT USED)

PART 3 EXECUTION (NOT USED)

PART 4 MEASUREMENT AND PAYMENT

4.1 *Traffic Control Plan*

A. All labor and materials associated with the Traffic Control Plan shall be included in the mobilization lump sum price.

END OF SECTION

Section 01 55 29
Staging Areas

PART 1 - GENERAL

1.1 *Work of this section*

A. City and Contractor's responsibilities.

B. Contractor use of site premises for staging areas.

1.2 *Related sections*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not reference below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 – Submittal Procedures
2. Section 01 50 00 – Construction Facilities and Temporary Controls
3. Section 01 55 19 – Temporary Parking Areas
4. Section 01 57 23 – Temporary Storm Water Pollution Controls
5. Section 01 56 00 – Environmental Protection
6. Section 31 14 13.16 – Soil Stockpiles

1.3 *City and Contractor Responsibilities*

A. City's responsibilities:

1. *Identify staging area.*

B. Contractor's responsibilities:

1. Maintain parking area clean and free of debris.
2. Limit access to parking area to Contractor's personnel, vehicles, and equipment.
3. Comply with Section 7 of the WHITEBOOK

1.4 *Contractor Use of Site*

A. Contractor shall limit use of site to work associated with the project.

B. Contractor shall coordinate with City to gain access to site as needed for the scope of the project.

C. Contractor shall maintain staging area free of debris and stage materials in areas approved by the Engineer.

D. Contractor shall store materials to prevent contact of pollutant with storm water, segregate and properly store chemicals and potentially hazardous materials, keep waste bins and containers closed when not in active use.

PART 2 - Materials (Not Used)

PART 3 - Execution (Not Used)

PART 4 - Measurement and Payment

A. No payment is provided for this section.

END OF SECTION

Section 01 56 00
Environmental Protection

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor and all its employees and agents shall observe and comply with existing laws, ordinances, regulations and orders, in relationship to the protection of the total environment.

B. The Contractor shall provide the following environmental controls:

1. Worker Health and Safety Plan (HASP)
2. Community Health and Safety Plan (HASP)
3. Noise Abatement
4. Storm Water Pollution Control (addressed in Section 015723)
5. Implementation and monitoring of all APCD mitigation measure requirements, prior to excavation through waste

1.2 *Related Sections*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section – 00 10 10 Summary of Work
2. Section – 01 33 00 Submittal Procedures

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC) together with the latest adopted editions of the City of San Diego Supplement Amendments.

1.4 *CONTRACTOR SUBMITTALS*

A. The Contractor shall submit, in writing, a copy of Worker HASP and Community HASP within seven days of award of the Contract. The HASPs shall include:

1. One Worker Health and Safety Plan that includes hazards inherent to working on an active landfill site, and One Community Health and Safety Plan prepared in accordance with Local Enforcement Agency (LEA) requirements.

1.5 *Biologically Sensitive Areas*

A. The Contractor shall verify the location of sensitive resources with the CITY prior to the commencement of work. Sensitive areas are identified on the Natural Resource Map dated February 2016 included in **Appendix E**.

B. No personnel or equipment is allowed in the sensitive resources identified in the vicinity. The Contractor is responsible for excluding personnel and equipment from sensitive areas for the duration of the project.

1.6 *Noise Abatement*

A. The Contractor shall comply with all City of San Diego Noise Abatement and Control Ordinances.

1.7 *Health and Safety Plan Provisions*

A. Within seven days of the award of the Contract, the Contractor shall submit for review, to the Engineer and to the LEA, a copy of its Worker and Community HASPs. The HASPs shall be in sufficient detail to include all aspects of health and safety that may be anticipated by the scope of work. The HASPs must be approved by the LEA.

B. The HASPS shall be in effect at least 1 week prior to the commencement of the work. The HASP shall comply with all OSHA and other applicable requirements.

C. The Contractor is advised that decomposing refuse produces landfill gas which is approximately 50 percent methane (natural gas) by volume. Landfill gas is colorless, can be odorless, may contain hydrogen sulfide, is combustible, and contains no oxygen. Landfill gas can also migrate through soil near the landfill. The Contractor is, therefore, advised of the need for precautions against fire, explosion, and asphyxiation when working in or near construction areas which are in or near refuse areas. The Contractor's IIPP shall address this issue.

D. The HASPS shall specifically address procedures and protocols tha shall be followed to monitor for the presence of hazardous atmosphere possibility for engulfment, gasses due to organic soils or proximity to landfills, exposure to hazardous products such as may be released when grinding, cutting or touching galvanized or painted surfaces, contaminated soil and groundwater. Identify reponse actions that shall be taken when these conditions are encountered.

E. The Contractor has the ultimate responsibility for the health and safety of its employees. Review of the Contractor's HASPs by the City shall not limit the Contractor's liability nor assume that the City, its employees, or designate shall assume any of the Contractor's liability associated with Site safety considerations.

F. The City shall not assume any role in determining the adequacy of the HASP on the Contractor's behalf.

G. The contents of the HASP must meet all regulatory requirements for the specific work that is proposed. The following is a list of some of the elements for a HASP. Those plan elements which will not apply to the specific contract should be noted (such as "this construction does not involve any confined space work").

H. One or more of the following may be required to be included in an employer's (Contactor's) Worker and Community HASP.

I. Mandatory

1. *Site Background and Scope of Work: Site specific with an emphasis on the type(s) of service(s) performed, the hazards associated with such work, and the programs in effect to protect the employee against those recognized hazards.*
2. *Injury and Illness Prevention Program (Title 8, California Code of Regulations, Section 3203): Required of all employers of 10 or more employees.*
3. *Code of Safe Practices (Cal. Code Regs., Title 8, §1509): All employers are required to have a Code of Safe Practices in writing and posted at the work place.*
4. *Emergency Medical Services (Cal. Code Regs., Title 8, §1512): All employers are required to have this program in writing.*
5. *Fire Protection Program (Cal. Code Regs., Title 8, §1920): All employers are required to have this program in writing.*

J. Required by Scope of Work

1. Hazard Communication Program (Cal. Code Regs., Title 8, §5194): All employers are required to have this program in writing if there is a potential for their employees to come in contact with any products that may be hazardous.
2. Hearing Conservation Program (Cal. Code Regs., Title 8 §5097): This program shall be written into the HASP if employee noise exposures meet or exceed the levels outlined in Cal. Code Regs., Title 8, §5097.
3. Personal Protective Equipment (Cal. Code Regs., Title 8, §§3380-3400): Requirements must be included in the HASP if personal protective equipment is required for the contracted work.

1.8 *Nuisance Water*

A. It is anticipated that nuisance water, such as rainfall or surface runoff, may be encountered within the construction site during the period of construction under this contract. The Contractor, by submitting his bid, will be held to have investigated the risks arising from such waters and to have made his bid in accordance therewith.

B. The Contractor shall always protect the work from damage by such waters and shall take all due measures to prevent delays in progress of the work caused by such waters.

The cost for any repairs due to such damage shall be the responsibility of the Contractor. The Contractor shall dispose of nuisance water at his own expense and without adverse effects upon the work site or any other property.

C. The Contractor shall limit water which contacts waste. Water which contacts waste shall be managed as leachate.

1.9 *Drainage Precaution*

A. At the completion of each work day, the Contractor shall take all necessary preventive measures to avoid or minimize damage resulting in erosion or impounding caused by storm water runoff within the construction area. Erosion control measures shall consist of constructing gravel bag berms, desilting basins, drains, temporary storm water pumping facilities, and other such measures required to provide for the prevention, control and

abatement of storm water discharges and damage resulting therefrom. The cost for any repairs due to such damage shall be the sole responsibility of the Contractor.

1.10 *Construction Water*

A. The Contractor shall make arrangements for developing water sources at the project and supply of all labor and equipment to collect, load, transport, apply, and dispose of water as necessary for compaction of materials, testing, dust control and other construction use.

B. The Contractor may develop sources of water supply or obtain water from private sources. Payment for all cost connected with developing a water source or obtaining water shall be made by the Contractor. Water shall be clean and free from objectionable amounts of acids, alkalis, salts or organic materials. The Contractor may be required to furnish the Engineer with a water analysis performed by a laboratory acceptable to the Engineer. The Contractor shall pay all costs of sampling, testing and reporting the test results.

PART 2 - Materials (Not Used)

PART 3 - Execution (Not Used)

PART 4 - Measurement And Payment

4.1 *Contract Unit Price Completeness*

A. All work associated with Contractor preparation and implementation of the HASP, Biologically Sensitive Areas, Noise Abatement, Nuisance Water, Drainage Precaution, and Construction Water or other site controls as necessary for Environmental Protection for this project shall be included in the various Bid items.

END OF SECTION

Section 01 57 23
Temporary Storm Water Pollution Controls

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor and its employees and agents shall observe and comply with existing laws, ordinances, regulations and orders, in relationship to the protection of storm water. See the GREENBOOK and WHITEBOOK Section 7-8 for requirements.

B. The Contractor shall provide the following storm water pollution controls:

1. Storm Water Pollution Prevention Plan (SWPPP) Development
2. Storm Water Pollution Prevention Plan (SWPPP) Implementation

1.2 *RELATED SECTIONS*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 00 10 10 Summary of Work
2. Section 01 33 00 Submittals
3. Section 31 14 13.16 Soil Stockpiling

1.3 *WATER POLLUTION CONTROL*

A. The Project is subject to the requirements of Order No. R9-2013-0001, *National Pollutant Discharge Elimination System (NPDES) Permit and Waste Discharge Requirements for Discharges from the Municipal Separate Storm Sewer Systems* (MS4s) Draining the Watersheds within the San Diego Region on May 8, 2013 (hereafter referred to as "MS4 Permit"), under the State Water Resources Control Board (SWRCB) and the requirements of Order No Order No. 2014-0057-DWQ (NPDES No. CAS000001) *General Permit for Storm Water Discharges Associated with Industrial Activities* (IGP or General Permit). All permit related documents can be located at the SWRCB website at www.waterboards.ca.gov. This project lies within the boundaries of the San Diego Regional Water Quality Control Board (RWQCB). Compliance manuals applicable to this project are the California Best Management Practices Handbook found at www.cabmphandbooks.com and the City of San Diego Storm Water Standards Manual found at www.sandiego.gov (hereafter referred to as "the Manuals"). The City of San Diego WPCP template can be found at www.sandiego.gov.

B. This project shall conform to the MS4 and IGP Permit and modifications thereto. The Contractor shall therefore understand and have necessary certifications and fully comply with the applicable provisions of the Permits and all modifications, thereto, the Manuals, and Federal, State and local regulations and requirements that govern the Contractor's operations and storm water and non-storm water discharges from both the project site and areas of disturbance outside of the project limits during all construction phases. Attention is directed to Section 7- "Responsibilities of the Contractor" of the Standard Specifications for Public Works Construction (SSPWC) Section 7-3-Liability Insurance and 7-4-Workers' Compensation

Insurance, of the SSPWC. The Contractor shall comply with the requirements of the Permits and Manuals for those areas and shall implement, inspect and maintain the required water pollution control practices. Installing, inspecting and maintaining water pollution control practices on areas outside the project area and City right of way, not specifically arranged and provided for by the City in the execution of this contract, will not be paid for without prior written approval.

C. For projects subject to a SWPPP, the Contractor shall prepare, submit, and implement a SWPPP in accordance with the "WHITEBOOK" Section 7-8.6 "Water Pollution Control."

D. The Contractor's SWPPP shall include a construction activity Best Management Practice (BMP) plan (consistent with the latest California Storm Water Quality Association (CASQA) Construction BMP Handbook and the Order) developed to work in conjunction with the site's SWPPP and as required to eliminate both non-storm water pollution and storm water run-off related pollution resulting from the construction activities.

E. A detailed narrative with a general description of the Contractor's Stormwater Management Protocol, implementation procedures, BMP's, pre-and post- storm inspection activities, and record keeping in sufficient detail to indicate to the Engineer that the Contractor understands his responsibilities for providing BMP's consistent with the Order.

F. Name and emergency contact information of Contractor's responsible site personnel.

G. The Contractor is responsible for installing BMPs, and for providing BMP inspections, and repair of any damaged BMP before, during and after a storm event.

H. Contractor shall not be entitled to any time extensions or compensation for any cost due to any action required as a result of Contractor's preparation, compliance or failure to comply with those provisions of the SWPPP within Contractor's control. Contractor will be responsible for ensuring that Contractor's subcontractor(s) comply with the provisions of this Section.

I. Contractor shall be liable for any action or fine imposed by the regulatory agencies for any incidents of non-compliance.

J. The Contractor shall always exercise reasonable precaution to protect channels, storm drains and bodies of water from pollution, including siltation arising from Contractor's

K. operations, or erosion siltation from completed areas. Pollution control work shall consist of implementing Best Management Practices or constructing facilities in accordance with local, state, or federal regulations which may be required to provide for control of pollutants.

1.4 *CONTRACTOR SUBMITTALS*

A. The Contractor shall submit, in writing, the SWPPP, and other pertinent information satisfactory to the Engineer, demonstrating that materials and methods Contractor proposes to use will comply with the provisions of this Section. Submittals shall be in accordance with the requirements of Section 01 33 00.

PART 2 - Materials [NOT USED]

PART 3 - Execution [NOT USED]

PART 4 - Measurement And Payment

4.1 *WATER POLLUTION CONTROL*

A. All work associated with the storm water pollution control including Contractor preparation and implementation of the SWPPP or other site controls as necessary for Temporary Storm Water Pollution Controls for this project shall be included as a bid item unit rate.

END OF SECTION

Section 01 57 26
Site Watering for Dust Control

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor is responsible for compliance with Fugitive Dust Regulations issued by the Air Pollution Control District (APCD).

1.2 *RELATED SECTIONS*

A. Section 01 33 00 – Submittal Procedures

B. Section 31 05 13 – Soils for Earthwork

C. Section 34 71 00 – Roadway Construction

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the GREENBOOK together with the latest adopted editions of the WHITEBOOK. See Section 7 of the WHITEBOOK and GREENBOOK.

1.4 *CONTRACTOR SUBMITTALS*

A. The Contractor shall submit, in writing, a recycled water use log and other pertinent information satisfactory to the Engineer, demonstrating the recycled water use on site, for dust control or other purposes. Submittals shall be in accordance with the requirements of Section 01 33 00 – Submittals.

PART 2 - Materials

2.1 *RECYCLED WATER*

A. Recycled water will be made available on the project site by the City for dust control purposes at no cost to the Contractor.

2.2 *OTHER*

A. The Contractor may choose to use an alternative source of water for dust control purposes.

PART 3 - Execution

3.1 *WATER APPLICATION*

A. Dust control operations shall be performed by the Contractor at the time, location and in the amount required, and as often as necessary to prevent project related activities from producing dust in amounts harmful to persons or causing a nuisance to persons living nearby or occupying buildings in the vicinity of the work.

B. Water shall be applied by the Contractor at a rate that does not cause runoff from the area where water is applied.

C. If recycled water is used, non-potable tanks, pipes, and other conveyances shall be marked "NON-POTABLE WATER – DO NOT DRINK."

D. If recycled water is used, non-potable water shall be conveyed in tanks or drain pipes that will not be used to convey potable water at a later time.

E. If recycled water is used, the Contractor shall meet California Department of Health Services water reclamation criteria and the Regional Water Quality Control Board requirements for discharge.

PART 4 - Measurement And Payment

4.1 *WATER APPLICATION FOR DUST CONTROL*

A. All costs for equipment and labor associated with Dust Control for this project shall be included in the various Bid items. No separate payment for this item shall be made.

END OF SECTION

Section 03 10 00
Concrete Formwork

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The CONTRACTOR shall provide concrete formwork, bracing, shoring, supports, and false work, in accordance with the CONTRACT DOCUMENTS.

B. Work Included in this Section. Principal items are:

1. Furnishing, erection, and removal of forms.
2. Shoring and bracing of formwork.
3. Setting of embedded items and pipe sleeves for mechanical and electrical work under direction of respective trade.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections apply to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of the Work.

1. Section 01 33 00 Submittals
2. Section 03 20 00 Reinforcement Steel
3. Section 03 29 00 Joints in Concrete Structures
4. Section 03 30 00 Cast-in-Place Concrete

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC), together with the latest adopted editions of the City of San Diego Supplement Amendments.

B. The current edition of the California Building Code (CBC) as adopted by the City of San Diego Municipal Code.

C. Except as otherwise indicated, the current editions of the following apply to the Work of this Section:

1. PS 1. U.S. Product Standard for Concrete Forms, Class I
2. PS 20. American Softwood Lumber Standard
3. ACI 117. Standard Tolerances for Concrete Construction and Materials.
4. ACI 347 Recommended Practice for Concrete Formwork

1.4 *SUBMITTAL*

A. The CONTRACTOR shall, in accordance with the requirements in Section 01 33 00 - Submittals, submit detailed drawings of the false work proposed to be used. Such drawings shall be in sufficient detail to indicate the general layout, sizes of members, anticipated stresses, grade of materials to be used in the false work, means of protecting existing construction which supports false work, and typical soil conditions. Shoring and falsework design drawings and calculations shall be stamped and signed by a professional engineer registered in the State of California.

B. The CONTRACTOR shall, in accordance with the requirements in Section 01 33 00 - Submittals, submit the following.

C. Form ties and all related accessories, including taper tie plugs, if taper ties are used.

D. Form gaskets.

E. The CONTRACTOR shall provide concrete construction joints and expansion Joints of the types and locations indicated on the Drawings. The CONTRACTOR shall submit shop drawings showing the proposed location and type of required construction for any joints not shown on the Drawings, and the sequence of forming and concrete placing operations.

1.5 *QUALITY ASSURANCE*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

B. The CONTRACTOR shall comply with the requirements of California Division of Occupational Health and Safety Construction Safety Orders Section 1717 and OSHA Part 1926, Section 1926.701 that apply to the Work of this Section. The CONTRACTOR shall prepare and maintain at least one copy of the required drawings at the site. Design of the structures shown on the Drawings does not include any allowance or consideration for imposed construction loads. Shoring and falsework design drawings and calculations shall be stamped and signed by a professional engineer registered in the State of California. The CONTRACTOR shall provide forms, shoring and falsework adequate for imposed live and dead loads, including equipment, height of concrete drop, concrete and foundation pressures, stresses, lateral stability, and other safety factors during construction.

C. Tolerances: The CONTRACTOR shall employ formwork complying with ACI 347 Guide to Formwork for Concrete, except as exceeded by the requirements of regulatory agencies, or as otherwise indicated or specified. The CONTRACTOR shall design and construct formwork to produce finished concrete conforming to tolerances given in ACI 117.

PART 2 - Materials

2.1 *GENERAL*

A. Except as otherwise expressly accepted by the RESIDENT ENGINEER, all lumber brought on the job site for use as forms, shoring, or bracing shall be new material. All forms shall be smooth surface forms and shall be of the following materials:

1. All other work-Steel panels, plywood or tongue and groove lumber

B. Form materials which may remain or leave residues on or in the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.2 *FORM AND FALSE WORK MATERIALS*

A. Materials for concrete forms, formwork, and false work shall conform to the following requirements:

1. Lumber shall be Douglas Fir or Southern Yellow Pine, construction grade or better, in conformance with U.S. Product Standard PS 20.

2. Plywood for concrete formwork shall be new, waterproof, synthetic resin bonded, exterior type Douglas Fir or Southern Yellow Pine plywood manufactured especially for concrete formwork and shall conform to the requirements of PS 1 for Concrete Forms, Class I, and shall be edge sealed.

3. Form materials shall be metal, wood, plywood, or other approved material that will not adversely affect the concrete and will facilitate placement of concrete to the shape, form, line, and grade shown. Metal forms shall be an approved type that will accomplish such results. Wood forms for surfaces to be painted shall be Medium Density Overlaid plywood, MDO Ext. Grade.

2.3 *FORM TIES*

A. Form ties with integral waterstops shall be provided with a plastic cone or other suitable means for forming a conical hole to ensure that the form tie may be broken off back of the face of the concrete. The maximum diameter of removable cones for rod ties, or of other removable form-tie fasteners having a circular cross-section, shall not exceed 1-1/2 inches; and all such fasteners shall be such as to leave holes of regular shape for reaming. Form ties shall be Burke Penta-Tie system by The Burke Company; Richmond Snap-Tys by the Richmond Screw Anchor Company; or equal.

B. Form ties for water-retaining structures shall have integral waterstops. Removable taper ties may be used when approved by the RESIDENT ENGINEER. A preformed neoprene or polyurethane tapered plug sized to seat at the center of the wall shall be inserted in the hole left by the removal of the taper tie. Use Burke Taper-Tie System by The Burke Company; Taper-Ty by the Richmond Screw Anchor Company; or equal.

2.4 *FORM COATING*

A. Non-grain raising and non-staining resin or polymer type that will not leave residual matter on surface of concrete or adversely affect bonding to concrete of paint, plaster, mortar, protective coatings, waterproofing or other applied materials. Coatings containing mineral oils, paraffins, waxes or other nondrying ingredients, are not permitted. For concrete surfaces contacting portable stored water, use only coatings and form-release agents that are completely nontoxic.

2.5 *FORM JOINT SEALERS*

A. For joints between form panels, use resilient foam rubber strips, non- hardening plastic-type caulking compound free of oil, or waterproof pressure- sensitive plastic tape of minimum 8 mil thickness and 2 inches width. For form tie holes, use rubber plugs, plastic caulking compound, or equal.

PART 3 - EXECUTION

3.1 *GENERAL*

A. Forms to confine the concrete and shape it to the required lines shall be used wherever necessary. The CONTRACTOR shall assume full responsibility for the adequate design of all forms, and any forms which are unsafe or inadequate in any respect shall promptly be removed from the Work and replaced at no Increased cost to the OWNER. The CONTRACTOR shall provide worker protection from protruding reinforcement bars in accordance with applicable safety codes. A sufficient number of forms of each kind shall be provided to permit the required rate of progress to be maintained. The design and inspection of concrete forms, false work, and shoring shall comply with applicable local, state and Federal regulations. Plumb and string lines shall be installed before concrete placement and shall be maintained during placement. Such lines shall be used by CONTRACTOR's personnel and by the RESIDENT ENGINEER and shall be in sufficient number and properly installed. During concrete placement, the CONTRACTOR shall continually monitor plumb and string line form positions and immediately correct deficiencies.

B. Concrete forms shall conform to the shape, lines, and dimensions of members as called for on the Drawings, and shall be substantial, free from surface defects, and sufficiently tight to prevent leakage. Forms shall be properly braced or tied together to maintain their position and shape under a load of freshly placed concrete. If adequate foundation for shores cannot be secured, trussed supports shall be provided.

C. Unless otherwise indicated, exterior corners in concrete members shall be provided with 3/4-inch chamfers. Re-entrant corners in concrete members shall not have fillets unless otherwise indicated.

3.2 *FORM DESIGN*

A. All forms shall be true in every respect to the required shape and size, shall conform to the established alignment and grade, and shall be of sufficient strength and rigidity to maintain their position and shape under the loads and operations incident to placing and vibrating the concrete. Suitable and effective means shall be provided on all forms for holding adjacent edges and ends of panels and sections tightly together and in accurate alignment to prevent the formation of ridges, fins, offsets, or similar surface defects in the finished concrete. Plywood, 5/8-inch and greater in thickness, may be fastened directly to studding if the studs are spaced close enough to prevent visible deflection marks in the concrete. The forms shall be tight to prevent the loss of water, cement and fines during placing and vibrating of the concrete. Specifically, the bottom of wall forms that rest on concrete footings or slabs shall be provided with a gasket to prevent loss of fines and paste during placement and vibration of concrete. Such gasket may be a 1- to 1-1/2-inch diameter polyethylene rod held in position to the underside of the wall form. Adequate clean-out holes shall be provided at the bottom of

each lift of forms. The size, number, and location of such clean-outs shall be as acceptable to the RESIDENT ENGINEER. Whenever concrete cannot be placed from the top of a wall form in a manner that meets the requirements of the Contract Documents, form windows shall be provided in the size and spacing needed to allow placement of concrete to the requirements of Section 03 30 00 - Cast-in-Place Concrete. The size, number, and location of such form windows shall be as acceptable to the RESIDENT ENGINEER.

3.3 *CONSTRUCTION*

A. Vertical Surfaces: All vertical surfaces of concrete members shall be formed, except where placement of the concrete against the ground Is shown. Not less than 1 inch of concrete shall be added to the thickness of the concrete member as shown where concrete is permitted to be placed against trimmed ground in lieu of forms. Such permission will be granted only for members of comparatively limited height and where the character of the ground is such that It can be trimmed to the required lines and will stand securely without caving or sloughing until the concrete has been placed.

B. Construction Joints: Concrete construction joints will not be permitted at locations other than those shown or specified, except as may be acceptable to the RESIDENT ENGINEER. When a second lift is placed on hardened concrete, special precautions shall be taken in the way of the number, location, and tightening of ties at the top of the old lift and the bottom of the new to prevent any unsatisfactory effect whatsoever on the concrete. Pipe stubs and anchor bolts shall be set in the forms where required.

C. Form Ties:

1. Embedded Ties: Holes left by the removal of form tie cones shall be reamed with suitable toothed reamers to leave the surface of the holes clean and rough before being filled with mortar as specified for "Finish of Concrete Surfaces" in Section 03 30 00 - Cast-In-Place Concrete. Wire ties for holding forms will not be permitted. No form-tying device or part thereof, other than metal, shall be left embedded in the concrete. Ties shall not be removed in such manner as to leave a hole extending through the interior of the concrete members. The use of snap-ties which cause spalling of the concrete upon form stripping or tie removal will not be permitted. If steel panel forms are used, rubber grommets shall be provided where the ties pass through the form to prevent loss of cement paste. Where metal rods extending through the concrete are used to support or to strengthen forms, the rods shall remain embedded and shall terminate not less than 1 inch back from the formed face or faces of the concrete.

2. Removable Ties: Where taper ties are approved for use, the larger end of the taper tie shall be on the west side of walls in water retaining structures. After the taper tie is removed, the hole shall be thoroughly cleaned and roughened for bond. A precast neoprene or polyurethane tapered plug shall be located at the wall centerline. The hole shall be filled with non-shrink grout for water bearing and below-grade walls. The hole shall be filled with non-shrink or regular cement grout for above-grade walls which are dry on both sides. Exposed faces of walls shall have the outer 2 inches of the exposed face filled with a cement grout which shall match the color and texture of the surrounding wall surface.

3.4 *REMOVAL OF FORMS*

A. Careful procedures for the removal of forms shall be strictly followed, and this Work shall be done with care to avoid injury to the concrete. No heavy loading on green concrete will be permitted. In the case of roof slabs and above-ground floor slabs, forms for supported slab, but not shoring, shall remain in place until test cylinders for the roof concrete attain a minimum compressive strength of 75 percent of the 28-day strength specified in Section 03 30 00 - Cast-in-Place Concrete; provided, that no forms shall be disturbed or removed under an individual panel or unit before the concrete in the adjacent panel or unit has attained 75 percent of the specified 28-day strength and has been in place for a minimum of 7 days. The time required to establish said strength shall be as determined by the RESIDENT ENGINEER who will make several test cylinders for this purpose from concrete used in the first group of roof panels placed. If the time so determined is more than the 7-day minimum, then that time shall be used as the minimum length of time. Forms for all vertical walls and columns shall remain in place at least 2 days after the concrete has been placed. Forms for all parts of the Work not specifically mentioned herein shall remain in place for periods of time as determined by the RESIDENT ENGINEER.

3.5 *REUSE OF FORMS*

A. Forms may be reused only if in good condition and only if acceptable to the RESIDENT ENGINEER. Light sanding between uses will be required wherever necessary to obtain uniform surface texture on all exposed concrete surfaces. Exposed concrete surfaces are defined as surfaces which are permanently exposed to view. In the case of forms for the inside wall surfaces of hydraulic/water retaining structures, unused tie rod holes in forms shall be covered with metal caps or shall be filled by other methods acceptable to the RESIDENT ENGINEER.

3.6 *MAINTENANCE OF FORMS*

A. Forms shall be maintained in good condition, particularly as to size, shape, strength, rigidity, tightness, and smoothness of surface. Forms, when in place, shall conform to the established alignment and grades. Before concrete is placed, the forms shall be thoroughly cleaned. The form surfaces shall be treated with a non-staining mineral oil or other lubricant acceptable to the RESIDENT ENGINEER. Any excess lubricant shall be satisfactorily removed before placing the concrete. Where field oiling of forms is required, the CONTRACTOR shall perform the oiling at least 2 weeks in advance of their use. Care shall be exercised to keep oil off the surfaces of steel reinforcement and other metal items to be embedded in concrete.

3.7 *FALSE WORK*

A. The CONTRACTOR shall be responsible for the design, engineering, construction, maintenance, and safety of all false work, including staging, walkways, forms, ladders, and similar appurtenances, which shall equal or exceed the applicable requirements of the provisions of the OSHA Safety and Health Standards for Construction, and the requirements of the California Division of Industrial Safety.

3.8 *REMOVAL OF SHORING AND FALSE WORK*

A. The CONTRACTOR shall not remove shoring and false work until 21 days after concrete placement, or concrete has attained at least 90 percent of the 28-day design compressive strength as demonstrated by control test cylinders, but not sooner than 14 days.

PART 4 - Measurement And Payment

A. No direct payment will be made for formwork in the construction of reinforced concrete structures; measurement and payment shall be included in the unit cost bid item of work of which it is a part (i.e., drainage structures) as indicated in Section 33 40 00.

END OF SECTION

Section 03 20 00
Reinforcement Steel

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The CONTRACTOR shall provide concrete reinforcement steel, welded wire fabric, couplers, concrete inserts, wires, clips, supports, chairs, spacers, and other accessories in accordance with the CONTRACT DOCUMENTS.

B. Work Included in this Section. Principal items are:

1. Furnishing and placing bar and mesh reinforcing for cast-in-place concrete.
2. Furnishing reinforcing steel bars for masonry, including delivery to the site.
3. Submittals.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections apply to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 Submittals
2. Section 03 20 00 Reinforcement Steel
3. Section 03 29 00 Joints in Concrete Structures
4. Section 03 30 00 Cast-in-Place Concrete

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section of the Specifications, the CONTRACTOR shall comply with the latest adopted edition of the Standard specifications for Public Works Construction (SSPWC), together with the latest adopted editions of the City of San Diego Supplement Amendments.

B. The current edition of the California Building Code (CBC) as adopted by the City of San Diego Municipal Code.

C. Commercial Standards (Current Edition):

1. ACI 315 Details and Detailing of Concrete Reinforcement
2. ACI 318 Building Code Requirements for Structural Concrete
3. CRSI MSP Concrete Reinforcing Steel Institute Manual of Standard Practice
4. WRI Manual of Standard Practice for Welded Wire Fabric
5. AWS D1.4 Structural Welding Code - Reinforcing Steel

D. ASTM Standards in Building Codes (Current Edition):

1. ASTM A82 Specification for Steel Wire, Plain, for Concrete Reinforcement
2. ASTM A 185 Specification for Welded Steel Wire Fabric, Plain, for Concrete Reinforcement
3. ASTM A 615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
4. ASTM A 706 Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
5. ASTM A 775 Specification for Epoxy-Coated Reinforcing Steel Bars

1.4 *SUBMITtALS*

A. The CONTRACTOR shall furnish shop bending diagrams, placing lists, and drawings of all reinforcement steel before fabrication in accordance with the requirements of Section 01 33 00 - Submittals.

B. Details of the concrete reinforcement steel and concrete inserts shall be submitted as soon as possible after receipt of the Notice to Proceed. Details of reinforcement steel for fabrication and erection shall conform to ACI 315 and the requirements Indicated. The shop bending diagrams shall show the actual lengths of bars, to the nearest inch, measured to the Intersection of the extensions (tangents for bars of circular cross section) of the outside surface. The shop drawings shall Include bar placement diagrams which clearly indicate the dimensions of each bar splice.

1.5 *QUALITY ASSURANCE*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

B. If requested by the RESIDENT ENGINEER, the CONTRACTOR shall furnish samples from each heat of reinforcement steel delivered in a quantity adequate for testing. Costs of initial tests will be paid by the OWNER. Costs of additional tests due to material failing initial tests shall be paid by the CONTRACTOR.

PART 2 - Materials

2.1 *MATERIAL REQUIREMENTS*

A. Materials which may remain or leave residues on or within the concrete shall be classified as acceptable for potable water use by the Environmental Protection Agency within 30 days of application or use.

2.2 *REINFORCEMENT STEEL*

A. Reinforcement steel for all cast-in-place reinforced concrete construction shall conform to the following requirements:

1. Bar reinforcement shall conform to the requirements of ASTM A 615 for Grade 60 or Grade 40 Billet Steel Reinforcement or as otherwise indicated.

2. All welded reinforcement, specifically detailed or otherwise indicated, shall be low-alloy grade 60 or grade 40 deformed bars conforming to the requirements of ASTM A 706.

3. Welded wire fabric reinforcement shall conform to the requirements of ASTM A 185 and the details indicated; provided, that welded wire fabric with longitudinal wire of W4 size wire and smaller shall be either provided in flat sheets or in rolls with a core diameter of not less than 10 inches; and provided further, that welded wire fabric with longitudinal wires larger than W4 size shall be provided in flat sheets only.

4. Spiral reinforcement shall be cold-drawn steel wire conforming to the requirements of ASTM A 82.

5. Tie wire shall be Annealed Steel, 14 gauges minimum.

B. Accessories:

1. Accessories shall include all necessary chairs, slab bolsters, concrete blocks, tie wires, dips, supports, spacers, and other devices to position reinforcement during concrete placement. All bar supports shall meet the requirements of the CRSI Manual of Standard Practice, Chapter 3, including special requirements for supporting epoxy coated reinforcing bars. Wire bar supports shall be CRSI Class 1 for maximum protection with a c-inch minimum thickness of plastic coating which extends at least 2-inch from the concrete surface. Plastic shall be gray in color.

2. Concrete blocks (dories), used to support and position reinforcement steel, shall have the same or higher compressive strength as specified for the concrete in which it Is located. Wire ties shall be embedded in concrete block bar supports.

C. Epoxy coating for reinforcing and accessories, where indicated, shall conform to ASTM A 775.

2.3 *MECHANICAL COUPLERS*

A. Mechanical couplers shall not be used.

2.4 *WELDED SPLICES*

A. Welded splices shall not be used.

2.5 *EPOXY GROUT*

A. Epoxy for grouting reinforcing bars shall be specifically formulated for such application, for the moisture condition, application temperature, and orientation of the hole to be filled.

PART 3 - Execution

3.1 *GENERAL*

A. All reinforcement steel, welded wire fabric, and other appurtenances shall be fabricated, and placed in accordance with the requirements of the Uniform Building Code and the supplementary requirements indicated herein.

3.2 *FABRICATION AND DELIVERY*

A. The CONTRACTOR shall conform to CRSI MSP, Chapters 6 and 7, except as otherwise indicated or specified. The CONTRACTOR shall bundle reinforcement and tag with suitable Identification to facilitate sorting and placing, and transport and store at site so as not to damage material. The CONTRACTOR shall keep a sufficient supply of tested, approved, and proper reinforcement at site to avoid delays.

B. Bending and Forming: The CONTRACTOR shall bend bars of indicated size and accurately form in accordance with the requirements of ACI 315 and ACI 318 to shapes and lengths Indicated on drawings and required by methods not injurious to materials. The CONTRACTOR shall not heat reinforcement for bending. Bars with kinks or bends not scheduled will be rejected.

C. Fabricating tolerance: All fabrication of reinforcing bars shall meet the requirements of ACI 117.

3.3 *PLACING*

A. Reinforcement steel shall be accurately positioned and shall be supported and wired together to prevent displacement, using annealed iron wire ties or suitable clips at intersections. All reinforcement steel shall be supported by concrete, plastic or metal supports, spacers or metal hangers which are strong and rigid enough to prevent any displacement of the reinforcement steel. Where concrete is to be placed on the ground, supporting concrete blocks (or dories) shall be used, in sufficient numbers to support the bars without settlement, but in no case shall such support be continuous. All concrete blocks used to support reinforcement steel shall be tied to the steel with wire ties which are embedded in the blocks. For concrete over formwork, the CONTRACTOR shall furnish concrete, metal, plastic, or other acceptable bar chairs and spacers.

B. Limitations on the use of bar support materials shall be as follows:

1. Concrete Dobie's: Permitted at all locations.
2. Wire Bar Supports: Permitted only at slabs over dry areas, interior dry wall surfaces, and exterior wall surfaces.
3. Plastic Bar Supports: Permitted at all locations except on grade.

C. Tie wires shall be bent away from the forms to provide the specified concrete coverage.

D. Bars additional to those shown which may be found necessary or desirable by the CONTRACTOR for securing reinforcement in position shall be provided by the CONTRACTOR at no additional cost to the OWNER.

E. Unless otherwise specified, reinforcement placing tolerances shall be within the limits specified in Section 7.5 of ACI 318 except where in conflict with the requirements of the CBC.

F. Bars may be moved as necessary to avoid interference with other reinforcement steel, conduits, or embedded Items. If bars are moved more than one bar diameter, or enough to exceed the above tolerances, the resulting arrangement of bars shall be subject to the approval of the RESIDENT ENGINEER.

G. Welded wire fabric reinforcement placed over horizontal forms shall be supported on slab bolsters. Slab bolsters shall be spaced not more than 30 inches on centers, shall extend continuously across the entire width of the reinforcement mat, and shall support the reinforcement mat in the plane Indicated.

H. Welded wire fabric placed over the ground shall be supported on wired concrete blocks (dories) spaced not more than 3 feet on centers in any direction. The construction practice of placing welded wire fabric on the ground and hooking into place in the freshly placed concrete shall not be used.

I. Epoxy coated reinforcing bars shall be stored, transported, and placed in such a manner as to avoid chipping of the epoxy coating. Nonabrasive slings made of nylon and similar materials shall be used. Specially coated bar supports shall be used. All chips or cracks in the epoxy coating shall be repaired with a compatible epoxy repair material prior to placing concrete.

J. Accessories supporting reinforcing bars shall be spaced such that there is no deflection of the accessory from the weight of the supported bars. When used to space the reinforcing bars from wall forms, the forms and bars shall be located so that there is no deflection of the accessory when the forms are tightened into position.

3.4 *SPLICES*

A. Splicing shall be in accordance with ACl-318, unless otherwise noted on Drawings.

B. Vertical Bars. Except as specifically detailed or otherwise Indicated, splicing of vertical bars in concrete is not permitted, except at the indicated or approved horizontal construction joints or as otherwise specifically detailed.

C. Horizontal Bars. Except as specifically detailed or otherwise Indicated, splicing of horizontal bars in concrete is not permitted.

3.5 *WELDED WIRE MESH*

A. The CONTRACTOR shall install necessary supports and chairs to hold the wire mesh in place during concrete pours. The CONTRACTOR shall straighten mesh to lay in a flat plane and bend mesh as shown or required to fit work. The CONTRACTOR shall provide laps of no less than one complete mesh, unless otherwise detailed, and shall tie every other wire waterstop laps. Roll mesh Is not acceptable.

3.6 *EMBEDMENT OF DRILLED REINFORCING STEEL DOWELS*

A. Hole Preparation:

1. The hole diameter shall be as recommended by the epoxy manufacturer but shall be no larger than 0.25 inch greater than the diameter of the outer surface of the reinforcing bar deformations.

2. The depth of the hole shall be as recommended by the epoxy manufacturer to fully develop the bar but shall not be less than 12 bar diameters, unless noted otherwise.

3. The hole shall be drilled by methods which do not interfere with the proper bonding of epoxy.

4. Existing reinforcing steel in the vicinity of proposed holes shall be located prior to drilling. The location of holes to be drilled shall be adjusted to avoid drilling through or nicking any existing reinforcing bars.

5. The hole shall be blown clean with clean, dry compressed air to remove all dust and loose particles.

6. Epoxy shall be injected into the hole through a tube placed to the bottom of the hole. The tube shall be withdrawn as epoxy is placed but kept immersed to prevent formation of air pockets. The hole shall be filled to a depth that insures that excess material will be expelled from the hole during dowel placement.

7. Dowels shall be twisted during insertion into the partially filled hole to guarantee full wetting of the bar surface with epoxy. The bar shall be inserted slowly enough to avoid developing air pockets.

PART 4 - <u>Measurement And Payment</u>

A. No direct payment will be made for reinforcing steel used in the construction of reinforced concrete structures; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures) as indicated in Section 33 40 00.

END OF SECTION

Section 03 29 00
Joints in Concrete Structures

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The CONTRACTOR shall provide joints in concrete at the locations indicated, in accordance with the CONTRACT DOCUMENTS.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections apply to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of the Work.

1. Section 01 33 00 Submittals
2. Section 03 10 90 Concrete Formwork
3. Section 03 20 00 Reinforcement Steel
4. Section 03 30 00 Cast-in-Place Concrete

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the CONTRACTOR shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC), together with the latest adopted editions of the City of San Diego Supplement Amendments.

B. The current edition of the California Building Code (CBC) as adopted by the City of San Diego Municipal Code.

C. Federal Specifications (Current Edition):

1. TT-S-0227E (3) Sealing Compound, elastomeric type, Multi- component for Caulking, Sealing, and Glazing Buildings and Other Structures.
2. SS-S-21 OA Sealing compound for expansion joints.

D. U.S. Army Corps of Engineers Specifications:

1. CRD-C572 PVC Waterstop

E. ASTM Standards in Building Codes (Current Edition):

1. ASTM A 775 Specification for Epoxy-Coated Reinforcing Steel Bars
2. ASTM C 920 Specification for Elastomeric Joint Sealants
3. ASTM D 412 Test Methods for Rubber Properties in Tension
4. ASTM D 624 Test Method for Rubber Property -- Tear Resistance
5. ASTM D 638 Test Method for Tensile Properties of Plastics
6. ASTM D 746 Test Method for Brittleness Temperature of Plastics and Elastomers by Impact

7. ASTM D 747 Test Method for Apparent Bending Modulus of Plastics by Means of a Cantilever Beam
8. ASTM A 775 Specification for Epoxy-Coated Reinforcing Steel Bar
9. ASTM D 1056 Specification for Flexible Cellular Materials -- Sponge or Expanded Rubber
10. ASTM D 1752 Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
11. ASTM D 2000 Standard Classification System for Rubber Product in Automotive Applications
12. ASTM D 2240 Test Method for Rubber Property -- Durometer Hardness
13. ASTM D 2241 Specification for Poly Vinyl Chloride (PVC) Pressure- Rated Pipe (SDR-Series)

1.4 *TYPES OF JOINTS*

A. Construction Joints: When fresh concrete is placed against a hardened concrete surface, the joint between the two pours is called a construction joint. Unless otherwise indicated, all joints in water bearing members shall be provided with a waterstop and/or sealant groove of the shape indicated. The surface of the first pour may also be required to receive a coating of bond breaker as indicated.

B. Contraction Joints: Contraction Joints are similar to construction Joints except that the fresh concrete shall not bond to the hardened surface of the first pour, which shall be coated with a bond breaker. The slab reinforcement shall be stopped 2-4 Inches from the joint; which is provided with a sleeve-type dowel, to allow shrinkage of the concrete of the second pour. Waterstop and/or sealant groove shall also be provided unless otherwise indicated on the Drawings.

C. Expansion Joints: To allow the concrete to expand freely, a space is provided between the two pours; the joint shall be formed as indicated. This space is obtained by placing a filler joint material against the first pour, which acts as a form for the second pour. Unless otherwise indicated, all expansion joints in water bearing members shall be provided with a center-bulb type waterstop.

D. Control Joints: The function of the control joint is to provide a weaker plane in the concrete, where shrinkage cracks will probably occur. A groove, of the shape and dimensions indicated, is formed or saw-cut in the concrete. This groove is filled afterward with a joint sealant material as specified.

1.5 *SUBMITTAL*

A. The CONTRACTOR shall submit the following in compliance with Section 01 33 00 - Submittals:

1. Waterstops: Before production of the required materials, qualification samples shall be submitted. Such samples shall consist of extruded or molded sections of each size or shape to be used and shall be accomplished so that the material and workmanship represents in all respects the material to be provided under this contract. The balance of the material to be used under this contract shall not be produced until after the RESIDENT ENGINEER has reviewed the qualification samples.

2. Joint Sealant: Before ordering the sealant material, the CONTRACTOR shall submit sufficient data to show general compliance with the requirements of the CONTRACT DOCUMENTS.

3. Before the sealant is used on the job, the CONTRACTOR shall submit certified test reports from the sealant manufacturer on the actual batch of material being supplied indicating compliance with the above requirements.

4. Shipping Certification: The CONTRACTOR shall furnish written certification from the manufacturer as an integral part of the shipping form, to show that all the material shipped to this project meets or exceeds the physical property requirements of the CONTRACT DOCUMENTS. Supplier certificates are not acceptable.

5. Joint Location: The CONTRACTOR shall submit placement shop drawings showing the location and type of all joints for each structure.

1.6 *QUALITY ASSURANCE*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

B. Waterstop Inspection: All waterstop field joints shall be subject to rigid inspection, and no such work shall be scheduled or started without the CONTRACTOR having made prior arrangements with the RESIDENT ENGINEER to provide for the required inspections. Not less than 24 hours' notice shall be given to the RESIDENT ENGINEER for scheduling such inspections.

C. All field joints in waterstops shall be subject to rigid inspection for misalignment, bubbles, Inadequate bond, porosity, cracks, offsets, and other defects which would reduce the potential resistance of the material to water pressure at any point. All

defective Joints shall be replaced with material which shall pass said inspection, and all faulty material shall be removed from the site and disposed of by the CONTRACTOR at no increase in cost to the OWNER.

D. The following waterstop defects represent a partial list of defects which shall be grounds for rejection:

1. Offsets at joints greater than 1/16 inch or 15 percent of material thickness, at any point, whichever Is less.

2. Exterior crack at joint, due to incomplete bond, which Is deeper than 1/16 Inch or 15 percent of material thickness, at any point, whichever Is less.

3. Any combination of offset or exterior crack which will result in a net reduction in the cross section of the waterstop in excess of 1/16-inch or 15% of material thickness at any point, whichever Is less.

4. Misalignment of joint which result in misalignment of the waterstop in excess of 2 inch in 10 feet.

5. Porosity in the welded joint as evidenced by visual inspection.

6. Bubbles or inadequate bonding which can be detected with a penknife test. If, while prodding the entire joint with the point of a pen knife, the knife breaks through the outer portion of the weld into a bubble, the joint shall be considered defective.

E. Waterstop Samples: Before use of the waterstop material in the field, a sample of a fabricated mitered cross and a tee constructed of each size or shape of material to be used shall be submitted to the RESIDENT ENGINEER for review. These samples shall be fabricated so that the material and workmanship represent in all respects the fittings to be provided under this contract. Field samples of fabricated fittings will be selected at random by the RESIDENT ENGINEER for testing by a laboratory at the OWNER'S expense. When tested, PVC waterstops shall have a tensile strength across the Joints equal to at least 600 psi.

F. Construction Joint Sealant: The CONTRACTOR shall prepare adhesion and cohesion test specimens as indicated, at intervals of 5 working days while sealants are being installed.

G. The sealant material shall show no signs of adhesive or cohesive failure when tested in accordance with the following procedure in laboratory and field tests:

1. Sealant specimens shall be prepared between two concrete blocks (1 inch by 2 inches by 3 inches). Spacing between the blocks shall be 1 inch. Coated spacers (2 inches by 12 inches by 2 inch) shall be used to insure sealant cross-sections of 2 inch by 2 inches with a width of 1-inch.

2. Sealant shall be cast and cured according to manufacturer's recommendations except that curing period shall be not less than 24 hours.

3. Following curing period, the gap between blocks shall be widened to 1-2 inch. Spacers shall be used to maintain this gap for 24 hours before inspection for failure.

1.7 *WARRANTY*

A. The CONTRACTOR shall furnish a 5-year written warranty of the entire sealant installation against faulty and/or Incompatible materials and workmanship, along with a statement that it agrees to repair or replace, to the satisfaction of the RESIDENT ENGINEER and at no additional cost to the OWNER, any defects that appear during the warranty period.

PART 2 - Materials

2.1 *GENERAL*

A. All joint materials specified herein shall be classified by the Environmental Protection Agency as acceptable for potable water use.

2.2 *PVC WATERSTOPS*

A. General: Waterstops shall be extruded from an elastomeric polyvinyl chloride compound containing the plasticizers, resins, stabilizers, and other materials necessary to meet the requirements of these Specifications. No reclaimed or scrap material shall be used. The CONTRACTOR shall obtain from the waterstop manufacturer and submit to the RESIDENT

ENGINEER current test reports and a written certification that the material to be shipped meets the physical requirements outlined in the U.S. Army Corps of Engineers Specification CRD-C572 and those listed herein.

B. Flat strip and Center-Bulb Waterstops: At no place shall the thickness of flat strip waterstops, Including the center bulb type, be less than d inch. Flat strip and center-bulb waterstops shall be manufactured by Kirkhill Rubber Co., Brea, California; Water Seals, Inc., Chicago, Illinois; Progress Unlimited, Inc., New York, New York; Green streak Plastic Products Co., St. Louis, Missouri; or equal.

C. Multi-Rib Waterstops: Multi-rib waterstops, where required, shall be manufactured by Water Seals, Inc., Chicago, Illinois; Progress Unlimited, Inc., New York, New York; Green streak Plastic Products Co., St. Louis, Missouri; or equal. Prefabricated joint fittings shall be used at all intersections of the ribbed-type waterstops.

D. Other Types of Waterstops: When other types of waterstop not listed above are required and indicated, they shall be subjected to the same requirements as those listed herein.

E. Waterstop Testing Requirements: When tested in accordance with the standards, the waterstop material shall meet or exceed the following requirements:

Physical Property	Sheet Material Value	ASTM Std.
Tensile Strength-min {psi)	1,750	D 638, Type IV
Ultimate Elongation-min (%)	350	D 638, Type IV
Low Temp Brittleness-max (degrees F)	-35	D 746
Stiffness in Flexure-min (psi)	400	D 747
Accelerated Extraction (CRD-C572)		
Tensile Strength-min (psi)	1,500	D 638, Type IV
Ultimate Elongation-min (%)	300	D 638, Type IV
Effect of Alkalis (CRD-C572)		
Change in Weight (%)+0.25/-0.10		
Change in Durometer, Shore A	+5	D 2240
Finish Waterstop		
Tensile Strength-min (psi)	1,400	D 638, Type IV
Ultimate Elongation-min (%)	280	D 638, Type IV

2.3 *JOINT SEALANT*

A. Joint sealant shall be polyurethane polymer designed for bonding to concrete which is continuously submerged in water. No material will be acceptable which has an unsatisfactory history as to bond or durability when used in the joints of water retaining structures.

B. Joint sealant material shall meet the following requirements (73 degrees F and 50% relative humidity):

1. Work Life : 45 - 180 minutes
2. Time to Reach 20 Shore "A" Hardness: 24 hours, maximum (at 77 degrees F, 200 gr quantity)
3. Ultimate Hardness (ASTM D 2240): 20 - 45 Shore "A"
4. Tensile Strength (ASTM D 412): 200 psi, minimum
5. Ultimate Elongation (ASTM D 412): 400%, minimum
6. Tear Resistance (Die C ASTM D 624): 75 pounds per inch of thickness, minimum
7. Color: Light Gray

C. All polyurethane sealants for waterstop joints in concrete shall conform to the following requirements:

1. Sealant shall be two-part polyurethane with the physical properties of the cured sealant conforming to or exceeding the requirements of ANSI/ASTM C 920 or Federal Specification TT-S-0227 E (3) for two- part material, as applicable.
2. For vertical joints and overhead horizontal joints, only "nonwage" compounds shall be used; all such compounds shall conform to the requirements of ANSI/ASTM C 920 Class 25, Grade NS, or Federal Specification TT-S-0227 E (3), Type II, Class A.
3. For plane horizontal joints, the self-leveling compounds which meet the requirements of ANSI/ASTM C 920 Class 25, Grade P, or Federal Specification TT-S-0227 E (3), Type I shall be used. For Joints subject to either pedestrian or vehicular traffic, a compound providing non-cracking characteristics, and having a Shore "A" hardness range of 35 to 45, shall be used.
4. Primer materials, if recommended by the sealant manufacturer, shall conform to the printed recommendations of the sealant manufacturer.

D. All sealants, wherever shown, or required hereunder shall be PSl-270 as manufactured by Polymeric Systems Inc.; Elastothane 227R as manufactured by Pacific Polymers; Sikaflex 2C, as manufactured by Sika Corporation, or equal.

2.4 *JOINT MATERIALS*

A. Bearing Pad: Bearing pad to be neoprene conforming to ASTM D 2000 BC 420, 40 durometer hardness unless otherwise indicated.

B. Neoprene Sponge: Sponge to be neoprene, closed-cell, expanded, conforming to ASTM D 1056, Type 2C3-E1.

C. Joint Filler:

1. Joint filler for expansion joints in water holding structures shall be neoprene conforming to ASTM D 1056, Type 2C5-E1.

2. Joint filler material in other locations shall be of the preformed non-extruding type joint filler constructed of cellular neoprene sponge rubber or polyurethane of firm texture. Bituminous fiber type will not be permitted. All non-extruding and resilient-type preformed expansion joint fillers shall conform to the requirements and tests set forth in ASTM D 1752 for Type I, except as otherwise indicated.

2.5 *BACKING ROD*

A. Backing rod shall be an extruded closed-cell, polyethylene foam rod. The material shall be compatible with the joint sealant material used and shall have a tensile strength of not less than 40 psi and a compression deflection of approximately 25% at 8 psi. The rod shall be 1/4 inch larger in diameter than the joint width except that a 1-inch diameter rod shall be used for a 3/4-inch wide joint.

2.6 *BOND BREAKER*

A. Bond breaker shall be Super Bond Breaker as manufactured by Burke Company, San Mateo, California; Select Cure CRB as manufactured by Select Products Co., Upland, California, or equal. It shall contain a fugitive dye so that areas of application will be readily distinguishable.

2.7 *SLIP DOWELS*

A. Slip dowels in joints shall be A36 smooth epoxy-coated bars, as indicated on the Drawings, and conforming to ASTM A 775.

2.8 *PVC TUBING*

A. PVC tubing in joints shall be Sch. SDR 13.5, conforming to ASTM D 2241.

PART 3 - Execution

3.1 *GENERAL*

A. Waterstops of the type indicated shall be embedded in the concrete across joints as indicated. All waterstops shall be fully continuous for the extent of the joint. Splices necessary to provide such continuity shall be accomplished in conformance to printed instructions of manufacturer of the waterstops. The CONTRACTOR shall take suitable precautions and means to support and protect the waterstops during the progress of the Work and repair or replace at its own expense any waterstops damaged during the progress of the Work. All waterstops shall be stored to permit free circulation of air around the waterstop material.

B. When any waterstop is installed in the concrete on one side of a joint, while the other half or portion of the waterstop remains exposed to the atmosphere for more than 2 days, suitable precautions shall be taken to shade and protect the exposed waterstop from direct rays of the sun during the entire exposure and until the exposed portion of the waterstop is embedded in concrete.

3.2 *SPLICES IN WATERSTOPS*

A. Splices in waterstops shall be performed by heat sealing the adjacent waterstop sections in accordance with the manufacturer's printed recommendations. It is essential that:

1. The material not be damaged by heat sealing.
2. The splices have a tensile strength of not less than 60% of the unspliced materials tensile strength.
3. The continuity of the waterstop ribs and of its tubular center axis be maintained.

B. Butt joints of the ends of two identical waterstop sections may be made while the material is in the forms.

C. All joints with waterstops involving more than two ends to be jointed together and all joints which involve an angle cut, alignment change, or the joining of two dissimilar waterstop sections shall be prefabricated before placement in the forms, allowing not less than 24-inch long strips of waterstop material beyond the joint. Upon being inspected and approved, such prefabricated waterstop joint assemblies shall be Installed in the forms and the ends of the 24-inch strips shall be butt welded to the straight run portions of waterstop in place in the forms.

D. Where a center bulb waterstop intersects and is jointed with a non-center bulb waterstop, care shall be taken to seal the end of the center bulb, using additional PVC material if needed.

3.3 *JOINT CONSTRUCTION*

A. Setting waterstops: To eliminate faulty installation that may result in joint leakage, care shall be taken of the correct positioning of the waterstops during installation. Adequate provisions shall be made to support and anchor the waterstops during the progress of the Work and to ensure the proper embedment in the concrete. The symmetrical halves of the waterstops shall be equally divided between the concrete pours at the Joints. The center axis of the waterstops shall be coincident with the Joint openings. Maximum density and Imperviousness of the concrete shall be ensured by thoroughly working It in the vicinity of all Joints.

B. In placing flat-strip waterstops in the forms, a means shall be provided to prevent them from being folded over by the concrete as It is placed. Unless otherwise indicated, all waterstops shall be held in place with light wire ties on12-inch centers which shall be passed through the edge of the waterstop and tied to the curtain of reinforcing steel. Horizontal waterstops, with their flat face in a vertical plane, shall be held in place with continuous supports to which the top edge of the waterstop shall be tacked. In placing concrete around horizontal waterstops, with their flat face in a horizontal plane, concrete shall be worked under the waterstops by hand to avoid the formation of air and rock pockets.

C. In placing center bulb waterstops in expansion joints, the center bulb shall be centered on the joint filler material.

D. Waterstop in vertical wall joints shall stop 6 inches from the top of the wall where such waterstop does not connect with any other waterstop and is not to be connected to for a future concrete placement.

E. Joint Location: Construction joints, and other types of joints, shall be provided where indicated. When not indicated, construction joints shall be provided at 25-foot maximum spacing for all concrete construction, unless noted otherwise. The location of all joints, of any type, shall be submitted for acceptance by the RESIDENT ENGINEER.

F. Joint Preparation: Special care shall be used in preparing concrete surfaces at joints where bonding between two sections of concrete is required. Unless otherwise indicated, such bonding will be required at all horizontal joints in walls. Surfaces shall be prepared in accordance with the requirements of Section 03 30 00 - Cast-In-Place Concrete.

G. Pre-molded expansion joint material shall be installed with the edge at the indicated distance below or back from finished concrete surface, and shall have a slightly tapered, dressed, and oiled wood strip secured to or placed at the edge thereof during concrete placement, which shall later be removed to form space for sealing material.

H. The space so formed shall be filled with a joint sealant material as specified. To keep the two wall or slab elements in line the joint shall also be provided with a sleeve-type dowel, unless otherwise indicated on Drawings.

I. Construction Joint Sealant: Construction joints in water-bearing floor slabs, and elsewhere as indicated, shall be provided with grooves, which shall be filled with a construction joint sealant. The material used for forming the grooves shall be left in the grooves until just before the grooves are cleaned and filled with joint sealant. After removing the forms from the grooves, all laitance and fins shall be removed, and the grooves shall be sand-blasted. The grooves shall be allowed to become thoroughly dry, after which they shall be blown out; immediately thereafter, they shall be primed, bond breaker tape placed in the bottom of the groove and filled with the joint sealant. The primer used shall be supplied by the same manufacturer supplying the sealant. No sealant will be permitted to be used completely fill the sealant grooves. Areas designated to receive a sealant fillet shall be thoroughly cleaned, as outlined for the grooves, before application of the sealant.

J. The primer and sealant shall be placed strictly in accordance with the printed recommendations of the manufacturer, taking special care to properly mix the sealant before application. The sides of the sealant groove shall not be coated with bond breaker, curing compound, or any other substance which would interfere with proper bonding of the sealant. All sealant shall achieve final cure at least 7 days before the structure is filled with water.

K. All sealant shall be installed by a competent waterproofing specialty CONTRACTOR who has a successful record of performance in similar installations. Before Work is commenced, the crew doing the Work shall be instructed as to the proper method of application by a representative of the sealant manufacturer.

L. Thorough, uniform mixing of two-part, catalyst-cured materials is essential; special care shall be taken to properly mix the sealer before Its application. Before any sealer is placed, arrange to have the crew doing the Work carefully instructed as to the proper method of mixing and application by a representative of the sealant manufacturer.

M. Any Joint sealant which, after the manufacturer's recommended curing time for the job conditions of the Work hereunder, fails to fully and properly cure shall be completely removed; the groove shall be thoroughly sandblasted to remove all traces of the uncured or partially cured sealant and primer, and shall be resealed with the indicated joint sealant. All costs of such removal, joint treatment, resealing, and appurtenant work shall be at no additional cost to the OWNER.

N. Bentonite Waterstop

1. Bentonite waterstop is not permitted.

PART 4 - MEASUREMENT AND PAYMENT

A. No direct payment will be made for construction of joints used in the construction of reinforced concrete structures; measurement and payment shall be included in the lump sum bid item of work of which it is a part (i.e., drainage structures) as indicated in Section 33 40 00.

END OF SECTION

Section 03 30 00
Cast-In-Place Concrete

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The CONTRACTOR shall provide finished structural concrete, complete, in accordance with the CONTRACT DOCUMENTS.

B. The following types of concrete are covered in this Section:

1. Structural Concrete: Concrete to be used in all cases except where noted otherwise in the CONTRACT DOCUMENTS.

2. Lean Concrete: Concrete to be used for thrust blocks, anchor blocks, pipe trench cut-off blocks and cradles, where the preceding items are detailed on the Drawings as unreinforced. Concrete to be used as protective cover for dowels intended for future connection.

C. The term "hydraulic structure" used in these Specifications refers to environmental engineering concrete structures for the containment, treatment, or transmission of water, or other fluids.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 Submittals
2. Section 03 10 00 Concrete Formwork
3. Section 03 20 00 Reinforcement Steel
4. Section 03 29 00 Joints in Concrete Structures
5. Section 31 05 13 Soils for Earthwork

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the CONTRACTOR shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC), together with the latest adopted editions of the City of San Diego Supplement Amendments.

B. The current edition of the California Building Code (CBC) as adopted by the City of San Diego Municipal Code.

C. Except as otherwise indicated, the current editions of the following standards apply to the work of this Section:

1. Federal Specifications:

   a. UU-B-790A (1)(2): Building Paper, Vegetable Fiber (Kraft, Water-proofed, Water Repellant and Fire Resistant)

2. Commercial Standards:
    a. ACI 117 Standard Tolerances for Concrete Construction and Materials
    b. ACI 214 Recommended Practice for Evaluation of Strength Test Results of Concrete
    c. ACI 301 Specifications for Structural Concrete for Buildings
    d. ACI 304R Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
    e. ACI 305R Hot Weather Concreting
    f. AC306 Cold Weather Concreting
    g. ACI 309 Consolidation of Concrete
    h. ACI 315 Details and Detailing of Concrete Reinforcement
    i. ACI 318 Building Code Requirements for Reinforced Concrete
    j. ACI 350R Environmental Engineering Concrete Structures
3. ASTM Standards in Building Codes:
    a. ASTM C 31 Practice for Making and Curing Concrete Test Specimens in the Field
    b. ASTM C 33 Specification for Concrete Aggregates
    c. ASTM C 39 Test Method for Compressive Strength of Cylindrical Concrete Specimens
    d. ASTM C 40 Test Method for Organic Impurities in Fine Aggregates for Concrete
    e. ASTM C 42 Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
    f. ASTM C 88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
    g. ASTM C 94 Specification for Ready-Mixed Concrete
    h. ASTM C 136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
    i. ASTM C 138 Test Method for Unit Weight, Yield, and Air Content of Concrete
    j. ASTM C 143 Test Method for Slump of Hydraulic Cement Concrete
    k. ASTM C 150 Specification for Portland Cement
    l. ASTM C 156 Test Method for Water Retention by Concrete Curing Materials
    m. ASTM C 157 Test Method for Length Change of Hardened Hydraulic Cement Mortar and Concrete

n. ASTM C 192 Practice for Making and Curing Concrete Test Specimens in the Laboratory

o. ASTM C 231 Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method

p. ASTM C 260 Specification for Air-Entraining Admixtures for Concrete

q. ASTM C 289 Test Method for Potential Reactivity of Aggregates (Chemical Method)

r. ASTM C 309 Specifications for Liquid Membrane-Forming Compounds for Curing Concrete

s. ASTM C 494 Specification for Chemical Admixtures for Concrete

t. ASTM C 1077 Practice for Laboratories Testing Concrete and Concrete Aggregates for use in Construction & Criteria for Laboratory Evaluation

u. ASTM D 1751 Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types)

v. ASTM D 2419 Test Method for Sand Equivalent Value of Soils and Fine Aggregate

w. ASTM E 119 Method for Fire Tests of Building Construction and Materials

x. NSF/ANSI 61 Drinking Water System Components - Health Effects, NSF International

1.4 *SUBMITTALS*

A. Mix Designs: Before starting the Work and within 14 days of the notice to proceed, the CONTRACTOR shall submit to the RESIDENT ENGINEER, for review, preliminary concrete mix designs which shall show the proportions and gradations of all materials proposed and 28-day compression test reports for each class and type of concrete specified herein in accordance with Section 01 33 00 - Submittals. The mix designs shall be checked and certified to conform to these specifications by an independent testing laboratory acceptable to the RESIDENT ENGINEER to be in conformance with these Specifications. All costs related to such checking and testing shall be borne by the CONTRACTOR at no increased cost to the OWNER.

B. Delivery Tickets: Where ready-mix concrete is used, the CONTRACTOR shall furnish delivery tickets at the time of delivery of each load of concrete. Each ticket shall show the state certified equipment used for measuring and the total quantities, by weight, of cement, sand, each class of aggregate, admixtures, and the amounts of water in the aggregate added at the batching plant, and the amount allowed to be added at the site for the specific design mix. In addition, each ticket shall state the mix number, total yield in cubic yards, and the time of day, to the nearest minute, corresponding to the times when the batch was dispatched, when it left the plant, when it arrived at the site, when unloading began, and when unloading was finished.

C. Cement and concrete admixtures shall be NSF 61 certified. NSF 61 certificates of compliance shall be provided as submittals

D. The CONTRACTOR shall provide the following submittals in accordance with ACI 301:

1. Mill tests for cement.
2. Admixture certification. Chloride ion content must be included.
3. Aggregate gradation and certification.
4. Materials and methods for curing.

E. The CONTRACTOR shall provide catalog cuts and other manufacturer's technical data demonstrating compliance with the requirements indicated and specified herein for all admixtures used in the concrete mix design.

1.5 *CONCRETE CONFERENCE*

A. A meeting shall be held to review the detailed requirements of the CONTRACTOR's proposed concrete design mixes and to determine the procedures for producing proper concrete construction no later than 14 days after the Notice to Proceed.

B. All parties involved in the concrete work shall attend the conference, including the following:

1. CONTRACTOR's representative
2. Testing laboratory representative
3. Concrete subcontractor
4. Reinforcing steel subcontractor and detailer
5. Concrete supplier
6. Admixture manufacturer's representative

C. The conference shall be held at a mutually agreed upon time and place. The RESIDENT ENGINEER shall be notified no less than 5 days before the date of the conference.

1.6 *QUALITY ASSURANCE*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

B. General:

1. Tests on component materials and for compressive strength of concrete will be performed as specified herein. Test for determining slump will be in accordance with the requirements of ASTM C 143.
2. The cost of all laboratory tests requested by the RESIDENT ENGINEER on cement, aggregates, and concrete, will be borne by the OWNER. However, the CONTRACTOR will be charged for the cost of any additional tests and investigation on work performed which does not meet the Specifications. The laboratory must meet or exceed the requirements of ASTM C 1077.

3. Concrete for testing shall be supplied by the CONTRACTOR at no cost to the OWNER, and the CONTRACTOR shall assist the RESIDENT ENGINEER in obtaining samples, and disposal and cleanup of excess material.

C. Field Compression Tests:

1. Compression test specimens will be taken during construction from the first placement of each class of concrete specified herein and at intervals thereafter as selected by the RESIDENT ENGINEER to ensure continued compliance with these Specifications. Each set of test specimens will be a minimum of five cylinders.

2. Compression test specimens for concrete shall be made in accordance with section 9.2 of ASTM C 31. Specimens shall be 6-inch diameter by 12-inch high cylinders.

3. Compression tests shall be performed in accordance with ASTM C 39. One test cylinder will be tested at 7 days and two at 28 days. The remaining cylinders will be held to verify test results, if needed.

D. Evaluation and Acceptance of Concrete:

1. Evaluation and acceptance of the compressive strength of concrete shall be according to the requirements of ACI 318, Chapter 5 "Concrete Quality," and as specified herein.

2. A statistical analysis of compression test results will be performed according to the requirements of ACI 214. The standard deviation of the test results shall not exceed 640 psi, when ordered at equivalent water content as estimated by slump.

   If any concrete fails to meet these requirements, immediate corrective action shall be taken to increase the compressive strength for all subsequent batches of the type of concrete affected.

3. When the standard deviation of the test results exceeds 640 psi, the average strength for which the mix is designed shall be increased by an amount necessary to satisfy the statistical requirement that the probability of any test being more than 500 psi below or the average of any three consecutive tests being below the specified compressive strength Is 1 in 100. The required average strength shall be calculated by Criterion No. 3 of ACI 214 using the actual standard of deviation.

4. All concrete which fails to meet the ACI requirements and these Specifications, is subject to removal and replacement at no increase in cost to the OWNER.

E. Shrinkage Tests:

1. Drying shrinkage tests will be made for the trial batch, the first placement of each class of concrete, and during construction to insure continued compliance with these Specifications.

2. Drying shrinkage specimens shall be 4-inch by 4-inch by 11-inch prisms with an effective gage length of 1O inches, fabricated, cured, dried and measured in accordance with ASTM C 157 modified as follows: specimens shall be removed from molds at an age of 23 ± 1 hours after trial batching, shall be placed immediately in water at 70 degrees F ±3 degrees F for at least 30 minutes, and shall be measured within 30 minutes thereafter to determine

original length and then submerged in saturated lime water at 73 degrees F ±3 degrees F. Measurement to determine expansion expressed as a percentage of original length shall be made at age 7 days. This length at age 7 days shall be the base length for drying shrinkage calculations ("O" days drying age). Specimens then shall be stored immediately in a humidity control room maintained at 73 degrees F ±3 degrees F and 50 percent ±4 percent relative humidity for the remainder of the test. Measurements to determine shrinkage expressed as percentage of base length shall be made and reported separately for 7, 14, 21, and 28 days of drying after 7 days of moist curing.

3. The drying shrinkage deformation of each specimen shall be computed as the difference between the base length (at "O" days drying age) and the length after at each test age. The average drying shrinkage deformation of the specimens shall be computed to the nearest 0.0001 inch at each test age. If the drying shrinkage of any specimen departs from the average of the test age by more than 0.0004-inch, the results obtained from the specimen shall be disregarded. Results of the shrinkage test shall be reported to the nearest 0.001 percent of shrinkage. Compression test specimens shall be taken in each case from the same concrete used for preparing drying shrinkage specimens. These tests shall be considered a part of the normal compression tests for the projects. Allowable shrinkage limitations shall be as specified herein to ensure that the completed Work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance Is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the Specifications, permissible deviations will be in accordance with ACI 117.

F. Construction Tolerances: Set and maintain concrete forms and perform finishing operations to ensure that the completed Work is within the tolerances specified herein. Surface defects and irregularities are defined as finishes and are to be distinguished from tolerances. Tolerance Is the specified permissible variation from lines, grades, or dimensions shown. Where tolerances are not stated in the Specifications, permissible deviations will be in accordance with ACI 117.

1. The following construction tolerances are hereby established and apply to finished walls and slab unless otherwise shown:
    - *Variation of the constructed: In 10 feet: 1/4-inch*
    - *Linear outline from the established position in plan*: In 20 feet or more: 1/2-inch
    - *Variation from the level in 10 feet*: 1/4-inch
    - *or from the grades shown in 20 feet or more*: 1/2-inch
    - *Variation from plumb in 10 feet:* 1/4-inch;
    - *In 20 feet or more*: 1/2-inch
    - *Variation in the thickness of slabs and walls:* Minus 1/4-inch; Plus 1/2-inch
    - *Variation in the locations and sizes of slabs and wall openings:* Plus, or minus 1/4-inch

PART 2 - Materials

2.1 *CONCRETE MATERIALS*

A. General:

1. All materials furnished for the Work shall comply with the requirements of Sections 201, 203, and 204 of ACI 301, as applicable.

2. Storage of materials shall conform to the requirements of Section 2.5 of ACI 301 or the SSPWC.

B. Materials for concrete shall conform to the following requirements:

1. Cement shall be standard brand Portland cement conforming to ASTM C 150 for Type 11/V, including Table 2 optional requirements. A minimum of 85 percent of cement by weight shall pass a 325 screen. A single brand of cement shall be used throughout the Work, and before its use, the brand shall be acceptable to the RESIDENT ENGINEER. The cement shall be suitably protected from exposure· to moisture until used. Cement that has become lumpy shall not be used. Sacked cement shall be stored in such a manner to permit access for inspection and sampling. Certified mill test reports, including fineness, for each shipment of cement to be used shall be submitted to the RESIDENT ENGINEER if requested regarding compliance with these Specifications.

2. Water for mixing and curing shall be potable, clean, and free from objectionable quantities of silty organic matter, alkali, salts and other Impurities. The water shall be considered potable, for the purposes of this Section only, if it meets the requirements of the local governmental agencies. Agricultural water with high total dissolved solids concentration (over 1,000 mg/l) shall not be used.

3. Aggregates shall be obtained from pits acceptable to the RESIDENT ENGINEER, shall be nonreactive, and shall conform to ASTM C 33. Maximum size of coarse aggregate shall be as specified herein. Lightweight sand for fine aggregate will not be permitted.

    a. Coarse aggregates shall consist of clean, hard, durable gravel, crushed gravel, crushed rock or a combination thereof. The coarse aggregates shall be prepared and handled in two or more size groups for combined aggregates with a maximum size greater than 3/4 inch. When the aggregates are proportioned for each batch of concrete the two size groups shall be combined.

    b. Fine aggregates shall be natural sand or a combination of natural and manufactured sand that are hard and durable. When tested in accordance with ASTM D 2419, the sand equivalency shall not be less than 75 percent for an average of three samples, nor less than 70 percent for an individual test. Gradation of fine aggregate shall conform to ASTM C 33, with 15 to 30 percent passing the number 50 screen and 5 to 10 percent passing the number 100 screen. The fineness modulus of sand used shall not be over 3.00.

    c. Combined aggregates shall be well graded from coarse to fine sizes and shall be uniformly graded between screen sizes to produce a concrete that has optimum workability and consolidation characteristics. Where a trial batch is required for a mix design, the final combined aggregate gradations will be established during the trial batch process.

d. When tested in accordance with ASTM C 33, the ratio of silica released to reduction in alkalinity shall not exceed 1.0.

e. When tested in accordance with ASTM C 33, the fine aggregate shall produce a color in the supernatant liquid no darker than the reference standard color solution.

f. When tested in accordance with ASTM C 33, the coarse aggregate shall show a loss not exceeding 42 percent after 500 revolutions, or 10.5 percent after 100 revolutions.

g. When tested in accordance with ASTM C 33, the loss resulting after five cycles shall not exceed 10 percent for fine or coarse aggregate when using sodium sulfate.

4. Ready-mix concrete shall conform to the requirements of ASTM C 94.

5. Admixtures: All admixtures shall be compatible and by a single manufacturer capable of providing qualified field service representation. Admixtures shall be used in accordance with manufacturer's recommendations. If the use of an admixture is producing an inferior result, discontinue use of the admixture. Admixtures shall not contain thiocyanates nor more than 0.05 percent chloride ion and shall be nontoxic after 30 days.

   a. Air-entraining agent meeting the requirements of ASTM C 260, shall be used. Sufficient air-entraining agent shall be used to provide a total air content of 3 to 5 percent. The RESIDENT ENGINEER reserves the right, at any time, to sample and test the air-entraining agent received on the job. The air-entraining agent shall be added to the batch in a portion of the mixing water. The solution shall be matched by means of a mechanical batcher capable of accurate measurement. Air content shall be tested at the point of placement. Air entraining agent shall be Dare II by W.R. Grace; AEA-92 by Euclid Chemical Company; or equal.

   b. Set controlling and water reducing admixtures: Admixtures may be added at the CONTRACTOR's option to control the set, effect water reduction, and increase workability. The addition of an admixture shall be at no increase in cost to the OWNER. The use of an admixture shall be subject to acceptance by the RESIDENT ENGINEER. Concrete containing an admixture shall be first placed at a location determined by the RESIDENT ENGINEER. Admixtures specified herein shall conform to the requirements of ASTM C 494. The required quantity of cement shall be used in the mix regardless of whether an admixture is used.

   c. Concrete shall not contain more than one water reducing admixture. Concrete containing an admixture shall be first placed at a location determined by the RESIDENT ENGINEER.

   d. Set controlling admixture shall be either with or without water-reducing properties. Where the air temperature at the time of placement Is expected to be consistently over 80 degrees F, a set retarding admixture such as Eucon Retarder by Euclid Chemical Company; Daratard 17 by W.R. Grace; or equal shall be used. Where the air temperature at the time of placement is expected to be consistently under 40 degrees F, a noncorrosive set accelerating admixture such as Plastocrete 161FL by Sika Corporation; Pozzutec 20 by Master Builders; Daraset by W.R. Grace; or equal shall be used.

e. Normal range water reducer shall conform to ASTM C 494, Type A. WRDA 64 by W.R. Grace; Eucon WR-91 by Euclid Chemical Company; or equal. The quantity of admixture used and the method of m1x1ng shall be in accordance with the Manufacturer's instructions and recommendations.

f. High range water reducer shall conform to ASTM C 494, Type for G. ADVA 190 by W.R. Grace; Eucon 1037 by Euclid Chemical Company; or equal. High range water reducer shall be added to the concrete after all other ingredients have been mixed and initial slump has been verified. No more than 14 ounces of water reducer per sack of cement shall be used. Water reducer shall be considered as part of the mixing water when calculating water cement ratio.

g. If the high range water reducer is added to the concrete at the job site, it may be used in conjunction with the same water reducer added at the batch plant. Concrete shall have a slump of 3 inches ± 2 inch before adding the high range water reducing admixture at the job site. The high range water reducing admixture shall be accurately measured and pressure injected into the mixer as a single dose by an experienced technician. A standby system shall be provided and tested before each day's operation of the job site system.

h. Concrete shall be mixed at mixing speed for a minimum of 30 mixer revolutions after the addition of the high range water reducer.

i. Fly ash: Flash shall conform to the requirements of ASTM C618, Class F and Loss of Ignition shall not exceed 4 percent. Fly ash, as a percentage by weight of total cementitious materials, shall not exceed 15 percent.

2.2 *CURING MATERIALS*

A. Materials for curing concrete as specified herein shall conform to the following requirements and ASTM C 309:

1. All curing compounds shall be white pigmented, and resin based. Sodium silicate compounds shall not be allowed. Concrete curing compound shall be Kurez by Euclid Chemical Company; L&M Cure R; MB-429 as manufactured by Master Builders; or equal. Water based resin curing compounds shall be used only where local air quality regulations prohibit the use of a solvent based compound. Water based curing compounds shall be L&M Cure R-2; Aqua-Cure by Euclid Chemical Company; Masterkure-W by Master Builders; or equal.

2. Polyethylene sheet for use as concrete curing blanket shall be white and shall have a nominal thickness of 6 mils. The loss of moisture when determined in accordance with the requirements of ASTM C 156 shall not exceed 0.055 grams per square centimeter of surface.

3. Polyethylene-coated waterproof paper sheeting for use as concrete curing blanket shall consist of white polyethylene sheeting free of visible defects, uniform in appearance, having a nominal thickness of 2 mils and permanently bonded to waterproof paper conforming to the requirements of Federal Specification UU-B-790A (1) (2). The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

4. Polyethylene-coated burlap for use as concrete curing blanket shall be 4 mils thick, white opaque polyethylene film impregnated or extruded into one side of the burlap. Burlap shall weigh not less than 9 ounces per square yard. The loss of moisture, when determined in accordance with the requirements of ASTM C 156, shall not exceed 0.055 gram per square centimeter of surface.

5. Curing mats for use in Curing Method 6 as specified herein, shall be heavy shag rugs or carpets or cotton mats quilted at 4 inches on center. Curing mats shall weigh a minimum of 12 ounces per square yard when dry.

6. Evaporation retardant shall be a material such as Confilm as manufactured by Master Builders; Eucobar as manufactured by Euclid Chemical Company; or equal.

2.3 *NONWATERSTOP JOINT MATERIALS*

A. Materials for non-waterstop Joints in concrete shall conform to the following requirements:

1. Preformed joint filler shall be a non-extruding, resilient, bituminous type conforming to the requirements of ASTM D 1751.

2. Elastomeric joint sealer shall conform to ASTM C 920, Type S, Grade NSA, Class 25, and shall be polyurethane-based. The sealant shall be formulated for exterior use and exposure to ultraviolet rays.

3. Mastic joint sealer shall be a material that does not contain evaporating solvents; that will tenaciously adhere to concrete surfaces; that will remain permanently resilient and pliable; that will not be affected by continuous presence of water and will not in any way contaminate potable water; and that will effectively seal the joints against moisture infiltration even when the joints are subject to movement due to expansion and contraction. The sealer shall be composed of special asphalts or similar materials blended with lubricating and plasticizing agents to form a tough, durable mastic substance containing no volatile oils or lubricants and shall be capable of meeting the test requirements set forth hereinafter, if testing is required by the RESIDENT ENGINEER.

2.4 *MISCELLANEOUS MATERIALS*

A. Damp-proofing agent shall be an asphalt emulsion, such as Hydrocide 600 by Sonneborn; Damp-proofing Asphalt Coating by Euclid Chemical Company; Sealmastic by W. R. Meadows Inc., or equal.

B. Bonding agents shall be epoxy adhesives conforming to the following products for the applications specified:

1. For bonding freshly-mixed, plastic concrete to hardened concrete, Sikadur 32 HI-Mod Epoxy Adhesive, as manufactured by Sika Corporation; Concresive Liquid (LPL), as manufactured by Master Builders; BurkEpoxy MV as manufactured by The Burke Company; or equal.

2. For bonding hardened concrete or masonry to steel, Sikadur 31 HI-Mod Gel as manufactured by Sika Corporation; BurkEpoxy NS as manufactured by The Burke Company; Concresive Paste (LPL) as manufactured by Master Builders; or equal.

2.5 *CONCRETE DESIGN REQUIREMENTS*

A. Mix Design.

1. General: Concrete shall be composed of cement, admixtures, aggregates and water. These materials shall be of the qualities specified. The exact proportions in which these materials are to be used for different parts of the Work will be determined during the trial batch. In general, the mix shall be designed to produce a concrete capable of being deposited to obtain maximum density and minimum shrinkage and, where deposited in forms, to have good consolidation properties and maximum smoothness of surface. In mix designs, the percentage of sand of the total weight of fine and coarse aggregate shall not exceed 41 for hydraulic structures or 50 for all other structures, unless noted otherwise. The aggregate gradations shall be formulated to provide fresh concrete that will not promote rock pockets around reinforcing steel or embedded items. The proportions shall be changed whenever necessary or desirable to meet the required results at no additional cost to the OWNER. All changes shall be subject to review by the RESIDENT ENGINEER.

2. Water-Cement Ratio and Compressive Strength: The minimum compressive strength and cement content of concrete shall be not less than that specified in the following tabulation.

Type of Work	Min 28-Day Compressive Strength (psi)	Max Size Aggregate (in)	Minimum Cement per yd^3 (lb)	Max W/C Ratio (by weight)
Structural Concrete:				
Roof, floor slabs, columns, walls and all other concrete items not specified elsewhere	4,000	3/4	564	0.45

Type of Work	Min 28-Day Compressive Strength (psi)	Max Size Aggregate (in)	Minimum Cement per yd^3 (lb)	Max W/C Ratio (by weight)
12" and thicker walls, slabs on grade and footings, with written approval of the RESIDENT ENGINEER	4,000	1	564	0.45
Pea Gravel Mix Thin sections and areas with congested with congested12" and thicker walls, slabs on Grade and footings, with written approval of the RESIDENT ENGINEER	4,000	3/8	752	0.40
Other Concrete:				
Sitework	3,000	1	470	0.50
Lean Concrete	2,500	1-1/2	376	0.50

Note: The CONTRACTOR is cautioned that the limiting parameters specified above are not a mix design. Additional cement or water reducing agent may be required to achieve workability demanded by the CONTRACTOR's construction methods and aggregates. The CONTRACTOR is responsible for any costs associated with furnishing concrete with the required workability.

3. Adjustments to Mix Design: The mixes used shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish and the CONTRACTOR shall be entitled to no additional compensation because of such changes.

B. Consistency

1. The quantity of water entering a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation, and which can be compacted by the vibratory methods herein specified to give the desired density, impermeability and smoothness of surface. The quantity of water shall be changed as necessary, with variations in the nature or moisture content of the aggregates, to maintain uniform production of a desired consistency. The consistency of the concrete in successive batches shall be determined by slump tests in accordance with ASTM C 143. The slumps shall be as follows:

Part of Work	Slump (in)
All concrete, unless note otherwise	3 inches ± 1 inch
With high range water reducer added	6 inches ± 1 inch
Pea gravel mix	7 inches ± 1 inch
Duct banks	5 inches ± 1 inch

C. Trial Batch and Laboratory Tests

1. Before placing any concrete, a testing laboratory designated by the RESIDENT ENGINEER will prepare a trial batch of each class of structural concrete, based on the preliminary concrete mixes submitted by the CONTRACTOR. During the trial batch the aggregate proportions may be adjusted by the testing laboratory using the two coarse aggregate size ranges to obtain the required properties. If one size range produces an acceptable mix, a second size range need not be used. Such adjustments shall be considered refinements to the mix design and shall not be the basis for extra compensation to the CONTRACTOR. All concrete shall conform to the requirements of this Section, whether the aggregate proportions are from the CONTRACTOR's preliminary mix design, or whether the proportions have been adjusted during the trial batch process. The trial batch will be prepared using the aggregates, cement and admixture proposed for the project. The trial batch materials shall be of a quantity such that the testing laboratory can obtain six compression test specimens from each batch. The cost of not more than three laboratory trial batch tests for each specified concrete strength will be borne by the OWNER but the CONTRACTOR shall furnish and deliver the materials in steel drums at no cost. Any additional trial batch testing required shall be performed by the CONTRACTOR at no additional cost to the OWNER.

2. The determination of compressive strength will be made by testing 6-inch diameter by 12-lnch high cylinders; made, cured and tested in accordance with ASTM C 192 and ASTM C 39. Three compression test cylinders will be tested at 7 days and 3 at 28 days. The average compressive strength for the three cylinders tested at 28 days for any given trial batch shall not be less than 125 percent of the specified compressive strength.

3. A sieve analysis of the combined aggregate for each trial batch shall be performed according to the requirements of ASTM C 136. Values shall be given for percent passing each sieve.

4. In lieu of trial batch and laboratory tests specified in this Section, the CONTRACTOR may submit previously-designed, tested, and successfully-used concrete mixes, using materials similar to those intended for this project, together with a minimum of three certified test reports of the 28-day strength of the proposed concrete mix.

D. Measurement of Cement and Aggregate

1. The amount of cement and of each separate size of aggregate entering each batch of concrete shall be determined by direct weighing equipment acceptable to RESIDENT ENGINEER.

   Weighing Tolerances:

Material	Percent of Total Weight
Cement	1
Aggregates	3
Admixtures	3

E. Measurement of Water

1. The quantity of water entering the mixer shall be measured by a suitable water meter or other measuring device of a type acceptable to the RESIDENT ENGINEER and capable of measuring the water in variable amounts within a tolerance of one percent. The water feed control mechanism shall be capable of being locked in position to deliver constantly any specified amount of water to each batch of concrete. A positive quick-acting valve shall be used for a cut-off in the water line to the mixer. The operating mechanism must be such that leakage will not occur when the valves are closed.

2.6 *READY MIXED CONCRETE*

A. At the CONTRACTOR's option, ready-mixed concrete may be used meeting the requirements as to materials, batching, mixing, transporting, and placing as specified herein and in accordance with ASTM C 94, including the following supplementary requirements.

B. Ready-mixed concrete shall be delivered to the site of the Work, and discharge shall be completed within one hour after the addition of the cement to the aggregates or before the drum has been revolved 250 revolutions, whichever is first.

C. Truck mixers shall be equipped with electrically-actuated counters by which the number of revolutions of the drum or blades may be readily verified. The counter shall be of the resettable, recording type, and shall be mounted in the driver's cab. The counters shall be actuated at the time of starting mixers at mixing speeds.

D. Each batch of concrete shall be mixed in a truck mixer for not less than 70 revolutions of the drum or blades at the rate of rotation designated by the manufacturer of equipment. Additional mixing, if any, shall be at the speed designated by the manufacturer of the equipment as agitating speed. All materials including mixing water shall be in the mixer drum before actuating the revolution counter for determining the number of revolution of mixing.

E. Truck mixers and their operation shall be such that the concrete throughout the mixed batch as discharged is within acceptable limits of uniformity with respect to consistency, mix, and

grading. If slump tests taken at approximately the 1/4 and 3/4 points of the load during discharge give slumps differing by more than one Inch when the specified slump is 3 inches or less, or if they differ by more than 2 inches when the specified slump is more than 3 inches, the mixer shall not be used on the Work unless the causing condition is corrected, and satisfactory performance is verified by additional slump tests. All mechanical details of the mixer, such as water measuring and discharge apparatus, condition of the blades, speed of rotation, general mechanical condition of the unit, and clearance of the drum, shall be checked before a further attempt to use the unit will be permitted.

F. Each batch of ready-mixed concrete delivered at the job site shall be accompanied by a delivery ticket furnished to the RESIDENT ENGINEER in accordance with Subsection 03 30 00-1.4B.

G. The use of non-agitating equipment for transporting ready-mixed concrete will not be permitted. Combination truck and trailer equipment for transporting ready-mixed concrete will not be permitted. The quality and quantity of materials use-d in ready-mixed concrete and in batch aggregates shall be subject to continuous inspection at the batching plant by the RESIDENT ENGINEER.

2.7 *FLOOR HARDENER (SURFACE APPLIED)*

A. Surface hardener shall be a light reflective nonoxidizing metallic aggregate dry shake surface hardener.

1. Surface hardener shall be premeasured, premixed and packaged at the factory.
2. Apply surface hardener at the rate of 1.8 to 2.5 lb per square foot
3. Surface hardener shall be Alumiplate@, by Master Builders, Inc., or equal.

B. Curing Compound shall meet the moisture retention requirements of ASTM C 309 and surface hardener manufacturer's recommendations.

C. Monomolecular Film: Evaporation retarder shall be used to aid in maintaining concrete moisture during the early placement stages of plastic concrete. Evaporation retarder shall be as recommended by surface hardener manufacturer.

2.8 *SHRINKAGE LIMITATION*

A. The maximum concrete shrinkage for specimens cast in the laboratory from the trial batch, as measured at 21-day drying age or at 28-day drying age shall be 0.036 percent or 0.042 percent respectively. The Contractor shall only use a mix design for construction that has first met the trial batch shrinkage requirements. Shrinkage limitations apply only to structural concrete used as part of a hydraulic structure.

B. The maximum concrete shrinkage for specimens cast in the field shall not exceed the trial batch maximum shrinkage requirement by more than 20 percent.

C. If the required shrinkage limitation is not met during construction, the Contractor shall take any or all of the following actions, at no additional cost to the OWNER, for securing the

specified shrinkage requirements. These actions may include changing the source or aggregates, cement and/or admixtures; reducing water content; washing of aggregate to reduce fines; increasing the number of construction joints; modifying the curing requirements; or other actions designed to minimize shrinkage or the effects of shrinkage.

PART 3 - EXECUTION

3.1 *PROPORTIONING AND MIXING*

A. Proportioning: Proportioning of the concrete mix shall conform to the requirements of Chapter 3 "Proportioning" of ACI 301.

B. Mixing: Mixing of concrete shall conform to the requirements of Chapter 7 of said ACI 301 Specifications.

C. Slump: Maximum slumps shall be as specified herein.

D. Re-tempering: Re-tempering of concrete or mortar which has partially hardened shall not be permitted.

3.2 *PREPARATION OF SURFACES FOR CONCRETING*

A. General: Earth surfaces shall be thoroughly wetted by sprinkling, before the placing of any concrete, and these surfaces shall be kept moist by frequent sprinkling up to the time of placing concrete thereon. The surface shall be free from standing water, mud, and debris at the time of placing concrete.

B. Joints in Concrete: Concrete surfaces upon or against which concrete is to be placed, where the placement of the concrete has been stopped or interrupted so that, as determined by the RESIDENT ENGINEER, the new concrete cannot be incorporated integrally with that previously placed, are defined as construction joints. The surfaces of horizontal joints shall be given a compacted, roughened surface for good bond. The joint surfaces shall be cleaned of all laitance, loose or defective concrete, foreign material, and roughened to a minimum 1/4-inch amplitude. Such cleaning and roughening shall be accomplished by hydroblastlng or sandblasting (exposing aggregate) followed by thorough washing. All pools of water shall be removed from the surface of construction joints, and the joint surface shall be coated with an epoxy-bonding agent, unless indicated otherwise, before the new concrete is placed.

C. Placing Interruptions: When placing of concrete is to be interrupted long enough for the concrete to take a set, the working face shall be given a shape using forms or other means, that will secure proper union with subsequent Work; provided construction Joints shall be made only where acceptable to the RESIDENT ENGINEER.

D. Embedded Items: No concrete shall be placed until all formwork, installation of parts to be embedded, reinforcement steel, and preparation of surfaces involved in the placing have been completed and accepted by the RESIDENT ENGINEER at least 4 hours before placement of concrete. All surfaces of forms and embedded items that have become encrusted with dried grout from concrete previously placed shall be cleaned of all such grout before the surrounding or adjacent concrete is placed.

E. All inserts or other embedded items shall conform to the requirements herein.

F. All reinforcement, anchor bolts, sleeves, inserts, and similar items shall be set and secured in the forms where shown or by shop drawings and shall be acceptable to the RESIDENT ENGINEER before any concrete is placed. Accuracy of placement is the responsibility of the CONTRACTOR.

G. Casting New Concrete Against Old: Where concrete is to be cast against old concrete (any concrete which is greater than 60 days of age), the surface of the old concrete shall be thoroughly cleaned and roughened by hydro-blasting or sandblasting (exposing aggregate). The joint surface shall be coated with an epoxy bonding agent unless indicated otherwise by the RESIDENT ENGINEER.

H. No concrete shall be placed in any structure until all water entering the space to be filled with concrete has been properly cut off or has been diverted by pipes, or other means, and carried out of the forms, clear of the Work. No concrete shall be deposited underwater nor shall the CONTRACTOR allow still water to rise on any concrete until the concrete has attained its Initial set. Water shall not be permitted to flow over the surface of any concrete in such manner and at such velocity as will injure the surface finish of the concrete. Pumping or other necessary dewatering operations for removing ground water, if required, will be subject to the review of the RESIDENT ENGINEER.

I. Corrosion Protection: Pipe, conduit, dowels, and other ferrous items required to be embedded in concrete construction shall be so positioned and supported before placement of concrete that there will be a minimum of 2 inches clearance between said items and any part of the concrete reinforcement. Securing such items in position by wiring or welding them to the reinforcement will not be permitted.

J. Openings for pipes, inserts for pipe hangers and brackets, and the setting of anchors shall, where practicable, be provided for during the placing of concrete.

K. Anchor bolts shall be accurately set and shall be maintained in position by templates while being embedded in concrete.

L. Cleaning: The surfaces of all metalwork to be in contact with concrete shall be thoroughly cleaned of all dirt, grease, loose scale and rust, grout, mortar, and other foreign substances immediately before the concrete is placed.

3.3 *HANDLING, TRANSPORTING, AND PLACING*

A. General: Placing of concrete shall conform to the applicable requirements of Chapter 8 of ACI 301 and the requirements of this Section. No aluminum materials shall be used in conveying any concrete.

B. Nonconforming Work or Materials: Concrete which upon or before placing is found not to conform to the requirements specified herein shall be rejected and immediately removed from the Work. Concrete which is not placed in accordance with these Specifications, or which is of inferior quality, shall be removed and replaced at no additional expense to the OWNER.

C. Unauthorized Placement: No concrete shall be placed except in the presence of duly authorized representative of the RESIDENT ENGINEER. The CONTRACTOR shall notify the RESIDENT ENGINEER in writing at least 24 hours in advance of placement of any concrete.

D. Placement in Wall Forms: Concrete shall not be dropped through reinforcement steel or into any deep form, nor shall concrete be placed in any form in such a manner as to leave accumulation of mortar on the form surfaces above the placed concrete. In such cases, some means such as the use of hoppers and, if necessary, vertical ducts of canvas, rubber, or metal shall be used for placing concrete in the forms in a manner that it may reach the place of final deposit without separation. In no case shall the free fall of concrete exceed 4 feet below the ends of ducts, chutes, or buggies. Concrete shall be uniformly distributed during the process of depositing and in no case after depositing shall any portion be displaced in the forms more than 6 feet in horizontal direction. Concrete in forms shall be deposited in uniform horizontal layers not deeper than 2 feet; and care shall be taken to avoid inclined layers or inclined construction joints except where such are required for sloping members. Each layer shall be placed while the previous layer is still soft. The rate of placing concrete in forms shall not exceed 5 feet of vertical rise per hour. Sufficient Illumination shall be provided in the interior of all forms so that the concrete at the places of deposit is visible from the deck or runway.

E. Conveyor Belts and Chutes: All ends of chutes, hopper gates, and all other points of concrete discharge throughout the CONTRACTOR's conveying, hoisting and placing system shall be so designed and arranged that concrete passing from them will not fall separated into whatever receptacle Immediately receives it. Conveyor belts, if used, shall be of a type to the RESIDENT ENGINEER. Chutes longer than 50 feet will not be permitted. Minimum slopes of chutes shall be such that concrete of the specified consistency will readily flow in them. If a conveyor belt is used, it shall be wiped clean by a device operated in such a manner that none of the mortar adhering to the belt will be wasted. All conveyor belts and chutes shall be covered.

F. Placement in Slabs: Concrete placed in sloping slabs shall proceed uniformly from the bottom of the slab to the top, for the full width of the placement. As the Work progresses, the concrete shall be vibrated and carefully worked around the slab reinforcement, and the surface of the slab shall be screeded in an up-slope direction.

Temperature of Concrete: The temperature of concrete when it is being placed shall be not more than 90 degrees F nor less than 55 degrees F for sections less than 12 inches thick nor less than 50 degrees for all other sections. Concrete ingredients shall not be heated to a temperature higher than that necessary to keep the temperature of the mixed concrete, as placed, from falling below the specified minimum temperature. When the temperature of the concrete is 85 degrees F or above, the time between the introduction of the cement to the aggregates and discharge shall not exceed 45 minutes. If concrete is placed when the weather is such that the temperature of the concrete would exceed 90 degrees F, the CONTRACTOR shall employ effective means, such as precooling of aggregates and mixing water using ice or placing at night, as necessary to maintain the temperature of the concrete, as it is placed, below 90 degrees F. The CONTRACTOR shall be entitled to no additional compensation on account of the foregoing requirements.

G. Hot Weather Placement: Placement of concrete shall conform to ACI 305R - Hot Weather Concreting, and the following.

1. Only set retarding admixture shall be used in concrete when air temperature is expected to be consistently over 80 degrees F.

2. The maximum temperature of concrete shall not exceed 90 degrees F immediately before placement.

3. From the initial placement to the curing state, concrete shall be protected from the adverse effect of high temperature, low humidity, and wind.

3.4 *PUMPING OF CONCRETE*

A. General: If the pumped concrete does not produce satisfactory end results, discontinue the pumping operation and proceed with the placing of concrete using conventional methods.

B. Pumping Equipment: The pumping equipment must have two cylinders and be designed to operate with one cylinder only in case the other one is not functioning. In lieu of this requirement, the CONTRACTOR may have a standby pump on the site during pumping.

C. The minimum diameter of the hose (conduits) shall be in accordance with ACI 304.2R.

D. Pumping equipment and hoses (conduits) that are not functioning properly, shall be replaced.

E. Aluminum conduits for conveying the concrete shall not be permitted.

F. Field Control: Concrete samples for slump, air content, and test cylinders will be taken at the placement (discharge) end of the line.

3.5 *ORDER OF PLACING CONCRETE*

A. The order of placing concrete in all parts of the Work shall be acceptable to the RESIDENT ENGINEER. To minimize the effects of shrinkage, the concrete shall be placed in units as bounded by construction joints shown. The placing of units shall be done by placing alternate units in a manner such that each unit placed shall have cured at least 7 days for hydraulic structures and 3 days for all other structures before the contiguous unit or units are placed, except that the corner sections of vertical walls shall not be placed until the two adjacent wall panels have cured at least 14 days for hydraulic structures and 7 days for all other structures.

B. The surface of the concrete shall be level whenever a run of concrete Is stopped. To ensure a level, straight joint on the exposed surface of walls, a wood strip at least 3/4-Inch-thick shall be tacked to the forms on these surfaces. The concrete shall be carried about 1/2 inch above the underside of the strip. About one hour after the concrete Is placed, the strip shall be removed and any irregularities in the edge formed by the strip shall be leveled with a trowel and all laitance shall be removed.

3.6 *TAMPING AND VIBRATING*

A. As concrete is placed in the forms or in excavations, it shall be thoroughly settled and compacted, throughout the entire depth of the layer, which is being consolidated, into a dense, homogeneous mass, filling all corners and angles, thoroughly embedding the reinforcement, eliminating rock pockets, and bringing only a slight excess of water to the exposed surface of concrete during placement. Vibrators shall be Group 3 (per ACI 309) high speed power vibrators (8,000 to 12,000 rpm) of an immersion type in sufficient number and with (at least one) standby units as required. Group 2 vibrators may be used only at specific locations when accepted by the RESIDENT ENGINEER.

B. Care shall be used in placing concrete around waterstops. The concrete shall be carefully worked by rodding and vibrating to make sure that all air and rock pockets have been eliminated. Where flat-strip type waterstops are placed horizontally, the concrete shall be worked under the waterstops by hand, making sure that all air and rock pockets have been eliminated. Concrete surrounding the waterstops shall be given additional vibration, over and above that used for adjacent concrete placement to assure complete embedment of the waterstops in the concrete.

C. Concrete in walls shall be internally vibrated and at the same time rammed, stirred, or worked with suitable appliances, tamping bars, shovels, or forked tools until it completely fills the forms or excavations and closes snugly against all surfaces. Subsequent layers of concrete shall not be placed until the layers previously placed have been worked thoroughly as specified. Vibrators shall be provided in sufficient numbers, with standby units as required, to accomplish the results herein specified within 15 minutes after concrete of the prescribed consistency is placed in the forms. The vibrating head shall be kept from contact with the surfaces of the forms. Care shall be taken not to vibrate concrete excessively or to work it in any manner that causes segregation of its constituents.

3.7 *FINISHING CONCRETE SURFACES*

A. General: Surfaces shall be free from fins, bulges, ridges, offsets, honeycombing, or roughness of any kind, and shall present a finished, smooth, continuous hard surface. Allowable deviations from plumb or level and from the alignment, profiles, and dimensions shown are defined as tolerances and are specified In Part 1, herein. These tolerances are to be distinguished from irregularities in finish as described herein. Aluminum finishing tools shall not be used.

B. Formed Surfaces: No treatment is required after form removal except for curing, repair of defective concrete, and treatment of surface defects. Where architectural finish is required, it shall be as specified or as shown.

C. Surface holes larger than 1/2 inch in diameter or deeper than 1/4- inch are defined as surface defects in basins and exposed walls.

D. Unformed Surfaces: After proper and adequate vibration and tamping, all unformed top surfaces of slabs, floors, walls, and curbs shall be brought to a uniform surface with suitable tools. Immediately after the concrete has been screeded, it shall be treated with a liquid evaporation retardant. The retardant shall be used again after each Work operation as necessary to prevent drying shrinkage cracks. The classes of finish specified for unformed concrete surfaces are designated and defined as follows:

1. Finish U1 - Sufficient leveling and screeding to produce an even, uniform surface with surface irregularities not to exceed 3/8 inch. No further special finish is required.

2. Finish U2 - After sufficient stiffening of the screeded concrete, surfaces shall be float finished with wood or metal floats or with a finishing machine using float blades. Excessive floating of surfaces while the concrete is plastic and dusting of dry cement and sand on the concrete surface to absorb excess moisture will not be permitted.

Floating shall be the minimum necessary to produce a surface that is free from screed marks and is uniform in texture. Surface irregularities shall not exceed 1/4-inch. Joints and edges shall be tooled where shown or as determined by the RESIDENT ENGINEER.

3. Finish U3 - After the floated surface (as specified for Finish U2) has hardened sufficiently to prevent excess of fine material from being drawn to the surface, steel troweling shall be performed with firm pressure such as will flatten the sandy texture of the floated surface and produce a dense, uniform surface free from blemishes, ripples, and trowel marks. The finish shall be smooth and free of all irregularities.

4. Finish U4 - Steel trowel finish (as specified for Finish U3) without local depressions or high points, in addition, the surface shall be given a light hairbroom finish with brooming perpendicular to drainage unless otherwise shown. The resulting surface shall be rough enough to provide a non-skid finish.

3.8 *CURING AND DAMPPROOFING*

A. General: All concrete shall be cured for not less than 14 days after placing, in accordance with the methods specified herein for the different parts of the Work, and described in detail in the following paragraphs:

Surface to be Cured or Dampproofed	Method
Unstripped forms	1
Wall sections with forms removed	6
Construction joints between footings and walls, and between floor slab and columns	2
Encasement concrete and thrust blocks	3
All concrete surfaces not specifically provided for elsewhere in this Paragraph	4
Floor slabs on grade	5
Slabs not on grade	6

1. Method 1: Wooden forms shall be wetted immediately after concrete has been placed and shall be kept wet with water until removed. If steel forms are used the exposed concrete surfaces shall be kept continuously wet until the forms are removed. If forms are removed within 14 days of placing the concrete, curing shall be continued in accordance with Method 6, herein.

2. Method 2: The surface shall be covered with burlap mats which shall be kept wet with water for the duration of the curing period, until the concrete in the walls has been placed. No curing compound shall be applied to surfaces cured under Method 2.

3. Method 3: The surface shall be covered with moist earth not less than 4 hours, nor more than 24 hours, after the concrete Is placed. Earthwork operations that may damage the concrete shall not begin until at least 7 days after placement of concrete.

4. Method 4: The surface shall be sprayed with a liquid curing compound.

B. It shall be applied in accordance with the manufacturer's printed instructions at a maximum coverage rate of 200 square feet per gallon and in such a manner as to cover the surface with a uniform film which will seal thoroughly.

C. Where the curing compound method is used, care shall be exercised to avoid damage to the seal during the curing period. Should the seal be damaged or broken before the expiration of the curing period, the break shall be repaired Immediately by the application of additional curing compound over the damaged portion.

D. Wherever curing compound may have been applied by mistake to surfaces against which concrete subsequently Is to be placed and to which It is to adhere, said compound shall be entirely removed by wet. sandblasting just before the placing of new concrete.

E. Where curing compound Is specified, it shall be applied as soon as the concrete has hardened enough to prevent marring on unformed surfaces, and within 2 hours after removal of forms from contact with formed surfaces. Repairs required to be made to formed surfaces shall be made within the said 2-hour period; provided, however, that any such repairs which cannot be made within the said 2-hour period shall be delayed until after the curing compound has been applied. When repairs are to be made to an area on which curing compound has been applied, the area Involved shall first be wet-sandblasted to remove the curing compound, following which repairs shall be made as specified herein.

F. At all locations where concrete is placed adjacent to a panel which has been coated with curing compound, the previously coated panel shall have curing compound reapplied to an area within 6 feet of the joint and to any other location where the curing membrane has been disturbed.

G. Before final acceptance of the Work, all visible traces of curing compound shall be removed from all surfaces in such a manner that does not damage surface finish.

H. Method 5: Until the concrete surface Is covered with curing compound, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed. The concrete shall be given a coat of curing compound in accordance with Method 4, herein. Not less than 1 hour nor more than 4 hours after the coat of curing compound has been applied, the surface shall be wetted with water delivered through a fog nozzle, and concrete-curing blankets shall be placed on the slabs. The curing blankets shall be polyethylene sheet, polyethylene-coated waterproof paper sheeting or polyethylene-coated burlap. The blankets shall be laid with the edges butted together and with the joints between strips sealed with 2-inch wide strips of sealing tape or with edges lapped not less than 3 inches and fastened together with a waterproof cement to form a continuous watertight joint.

I. The curing blankets shall be left in place during the 14-day curing period and shall not be removed until after concrete for adjacent Work has been placed. Should the curing blankets become torn or otherwise ineffective, replace damaged sections. During the first 3 days of the curing period, no traffic of any nature and no depositing, temporary or otherwise, of any materials shall be permitted on the curing blankets. During the remainder of the curing period, foot traffic and temporary depositing of materials that impose light pressure will be permitted only on top of plywood sheets 5/8-inch minimum thickness, laid over the curing blanket. Add water under the curing blanket as often as necessary to maintain damp concrete surfaces.

J. Method 6: This method applies to both walls and slabs.

1. The concrete shall be kept continuously wet by the application of water for a minimum period of at least 14 consecutive days beginning immediately after the concrete has reached final set or forms have been removed.

2. Until the concrete surface is covered with the curing medium, the entire surface shall be kept damp by applying water using nozzles that atomize the flow so that the surface is not marred or washed.

3. Heavy curing mats shall be used as a curing medium to retain the moisture during the curing period. The curing medium shall be weighted or otherwise held in place to prevent being dislodged by wind or any other causes and to be substantially in contact with the concrete surface. All edges shall be continuously held in place.

4. The curing blankets and concrete shall be kept continuously wet using sprinklers or other means both during and after normal working hours.

5. Immediately after the application of water has terminated at the end of the curing period, the curing medium shall be removed, any dry spots shall be rewetted and curing compound shall be immediately applied in accordance with Method 4, herein.

6. Dispose of excess water from the curing operation to avoid damage to the Work.

K. Damp proofing: The exterior surface of all buried roof slabs shall be dam-proofed as follows:

Immediately after completion of curing the surface shall be sprayed with a dam-proofing agent consisting of an asphalt emulsion. Application shall be in two coats. The first coat shall be diluted to 1/2 strength by the addition of water and shall be sprayed on to provide a maximum coverage rate of 100 square feet per gallon of dilute solution. The second coat shall consist of an application of the specified material, undiluted, and shall be sprayed on to provide a maximum coverage rate of 100 square feet per gallon. Dam-proofing material shall be as specified herein.

As soon as the asphalt emulsion, applied as specified herein, has taken an initial set, the entire area thus coated shall be coated with whitewash. Any formula for mixing the whitewash may be used which produces a uniformly coated white surface and which so remains until placing of the backfill. Should the whitewash fail to remain on the surface until the backfill is placed, apply additional whitewash.

3.9 *PROTECTION*

A. Protect all concrete against injury until final acceptance by the RESIDENT ENGINEER.

B. Fresh concrete shall be protected from damage due to rain, hail, sleet, or snow. Provide such protection while the concrete is still plastic and whenever such precipitation is imminent or occurring.

3.10 *TREATMENT OF SURFACE DEFECTS*

A. As soon as forms are removed, all exposed surfaces shall be carefully examined, and any irregularities shall be immediately rubbed or ground in a satisfactory manner to secure a smooth, uniform, and continuous surface. Plastering or coating of surfaces to be smoothed will not be permitted. No repairs shall be made until after inspection by the RESIDENT ENGINEER. In no case will extensive patching of honeycombed concrete be permitted. Concrete containing minor voids, holes, honeycombing, or similar depression defects shall have them repaired as specified herein. Concrete containing extensive voids, holes, honeycombing, or similar depression defects, shall be completely removed and replaced. All repairs and replacements herein specified shall be promptly executed by the CONTRACTOR at its own expense.

B. Defective surfaces to be repaired shall be cut back from true line a minimum depth of 2 inch over the entire area. Feathered edges will not be permitted. Where chipping or cutting tools are not required to deepen the area properly, the surface shall be prepared for bonding by the removal of all laitance or soft material, and not less than 1/32-inch depth of the surface film from all hard portions, by means of an efficient sandblast. After cutting and sandblasting, the surface shall be wetted sufficiently in advance of shooting with shotcrete or with cement mortar so that while the repair material is being applied, the surfaces under repair will remain moist, but not so wet as to overcome the suction upon which a good bond depends. The material used for repair proposed shall consist of a mixture of one sack of cement to 3 cubic feet of sand. For exposed walls, the cement shall contain such a proportion of Atlas white Portland cement as is required to make the color of the patch match the color of the surrounding concrete.

C. Holes left by tie-rod cones shall be reamed with suitable toothed reamers to leave the surfaces of the holes clean and rough. These holes then shall be repaired in an approved manner with dry-packed cement grout. Holes left by form-tying devices having a rectangular cross-section, and other imperfections having a depth greater than their least surface dimension, shall not be reamed but shall be repaired in an approved manner with dry-packed cement grout.

D. All repairs shall be built up and shaped in such a manner that the completed Work will conform to the requirements of this Section, as applicable, using approved methods which will not disturb the bond, cause sagging, or cause horizontal fractures. Surfaces of said repairs shall receive the same kind and amount of curing treatment as required for the concrete in the repaired section.

E. Before filling any structure with water, all cracks that may have developed shall be "vee'd" and filled with construction joint sealant for water-bearing structures conforming to the materials and methods specified in Section 03 29 00 - Joints in Concrete Structures. This repair method shall be done on the water bearing face of members. Before backfilling, faces of members in contact with fill, which are not covered with a waterproofing membrane, shall also have cracks repaired as specified.

3.11 *PATCHING HOLES IN CONCRETE*

A. Patching Small Holes:

Holes which are less than 12 inches in their least dimension and extend completely through concrete members, shall be filled as specified herein.

1. Small holes in members which are water-bearing or in contact with soil or another fill material, shall be filled with non-shrink grout. Where a face of the member is exposed to view, the non-shrink grout shall be held back 2 Inches from the finished surface. The remaining 2 inches shall then be patched according to the paragraph in Part 3 entitled "Treatment of Surface Defects."

2. Small holes through all other concrete members shall be filled with non-shrink grout, with exposed faces treated as above.

B. Patching Large Holes:

1. Holes which are larger than 12 inches in their least dimension, shall have a keyway chipped into the edge of the opening all around, unless a formed keyway exists. The holes shall then be filled with concrete as specified herein.

2. Holes which are larger than 24 inches in their least dimension and which do not have reinforcing steel extending from the existing concrete, shall have reinforcing steel set in grout in drilled holes. The reinforcing added shall match the reinforcing in the existing wall unless shown.

3. Large holes in members which are water bearing or in contact with soil or other fill, shall have a bentonite type waterstop material placed around the perimeter of the hole as specified in the Section 03 29 00 - Joints in Concrete Structures, unless there is an existing waterstop in place.

3.12 *CARE AND REPAIR OF CONCRETE*

A. The CONTRACTOR shall protect all concrete against injury or damage from excessive heat, lack of moisture, overstress, or any other cause until final acceptance by the RESIDENT ENGINEER. Care shall be taken to prevent the drying of concrete and to avoid roughening or otherwise damaging the surface. Any concrete found to be damaged, or which may have been originally defective, or which becomes defective at any time before the final acceptance of the completed Work, or which departs from the established line or grade, or which, for any other reason, does not conform to the requirements of the CONTRACT DOCUMENTS, shall be satisfactorily repaired or removed and replaced with acceptable concrete at the CONTRACTOR's expense.

PART 4 - MEASUREMENT AND PAYMENT

A. No direct payment will be made for cast-in-place concrete used in the construction of reinforced concrete structures; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures) as indicated in Section 33 40 00.

END OF SECTION

Section 31 05 13
Soils for Earthwork

PART 1 - GENERAL

1.1 *Description of Work*

A. This section sets forth the requirements for the grading, subgrade preparation, excavation, fill placement, processing, placement, and compaction of soil material for the roadways and the earthwork for various elements of the Project including but not limited to inlet protections, sediment traps, low flow crossings, sediment basin, and energy dissipaters. Work will be performed in accordance with the applicable provisions of "Section 300 – Earthwork" of the Standard Specifications for Public Works Construction (SSPWC) as modified and supplemented herein. See Section 300 of the GREENBOOK and WHITEBOOK.

1.2 *Work Included*

A. In general, earthwork operations include the following:

1. Compliance with Rule 59 mitigation measures as approved by the Air Pollution Control Officer of the Air Pollution Control District (APCD). Compliance with Title V Site Permits. The Contractor shall be responsible for implementation and monitoring of all APCD mitigation measure requirements.

2. Excavate waste material and transport to on-site disposal area.

3. Excavate, transport, process, disk, dry and/or moisture condition, place, and compact fill, local borrow, and imported borrow.

1.3 *Introduction/Special Conditions*

A. Construction Drawings

1. The Construction Drawings were prepared based on topographic maps of the landfill, provided by the City. The surface of the landfill at present and for the duration of this Contract is not necessarily that shown as existing contours on the grading plan due to differential settlement of the landfill mass and re-grading for maintenance purposes. It is anticipated that there may be additional movement during construction. The proposed grading and improvement project is a "line and grade" project. Prior to Construction of any improvement, the Contractor shall verify actual field conditions, and shall make all adjustments in the subgrade for roadway and hardscape installation as appropriate, to meet this design intent.

2. Field modifications of subgrade, and excavation and fill volumes for earthwork, may result in an adjustment of Contract Bid Quantities. Such modifications do not constitute a change in the "character" of the work, as these adjustments are anticipated, and are typical of landfill surface improvement construction.

3. Adjustments in Contract quantities will be compensated under the applicable Bid Item, and in accordance with SSPWC, unless otherwise noted.

1.4 *Submittals Required*

A. The Contractor shall thoroughly review the Specifications and identify all required project submittals. The submittals listed below are intended as a general summary of the submittal items contained in this section. This submittal list does not release the Contractor from the responsibility of identifying and providing all information requested.

B. Submittals as required by the General Conditions and these Technical Specifications.

PART 2 - MATERIAL

2.1 *Unclassified fill material*

A. Fill material to be used for unclassified fills shall be generated from the unclassified excavations or stockpile(s) stockpiled in proximity to the work by the CITY.

B. Rocks or rock fragments greater than 6 inches in any dimension shall be removed from the fill and disposed of as directed by the Engineer. Rocks or rock fragments less than 6 inches shall be distributed evenly throughout the fill. "Nesting" of rock or rock fragments will not be permitted.

C. Local borrow shall consist of material excavated and used in the construction of fills, for use as selected material, or for other construction purposes. Local borrow shall be obtained by widening cuts or by excavating from other sources outside the planned or authorized cross section within the right-of-way and within the limits of the Work.

D. Local borrow shall be material which is excavated from sources specified or designated by the Engineer. The source of material to be excavated shall be approved in advance by the Engineer. Local borrow shall be excavated to the lines and grades established by the Engineer.

E. Local borrow may be used in roadways under the select material and in other hardscape installation locations to raise the existing grade. It may be also used in the west basin.

F. The Contractor shall obtain approval from the Engineer prior to using local borrow.

PART 3 - Execution

3.1 *General*

A. All earthwork shall conform to the following requirements, where applicable, unless otherwise noted in these Specifications:

1. The Contractor shall be solely responsible for the satisfactory completion of all earthwork in accordance with the Drawings and Specifications.

2. Equipment used in the excavation, transport, stockpiling, processing, drying, placement and compaction of all materials used in construction of the Project will be standard-of-practice grading machinery of known specifications suitable for performing the required work in a timely and efficient manner.

3. All material considered by the Engineer to be unsuitable for use in the construction of the project shall be removed. All materials incorporated as part of the compacted fill must be inspected and placement must be observed by the Engineer.

4. All clearing, grubbing, stripping, and site preparation for the Project shall be accomplished to the satisfaction of the Engineer prior to placement of fill material.

5. Material deemed unlikely to meet the performance specification and not disposed of during clearing and grubbing of demolition shall be removed from the stockpiles, borrow and/or fill as directed by the Engineer.

6. The surface to receive fill shall be prepared (cleared, grubbed, or stripped) to the satisfaction of the engineer and the fill shall be placed, spread, mixed, watered and compacted in accordance with the project specifications and as recommended by the engineer.

7. The intermediate cover surface prepared to receive fill shall be scarified, disked, or bladed until it is uniform and free from uneven features which may prevent uniform compaction. The scarified intermediate cover surface shall then be brought to ±2 percent of optimum moisture content, mixed as required, and compacted to a minimum of 90 percent of the maximum dry density as determined by American Society for Testing and Materials (ASTM) D1557. The prepared surface shall be firm and unyielding. If the scarified zone is greater than eight inches in depth, the excess material shall be removed and placed in lifts of six to eight inches in uncompacted thickness. Prior to fill placement, the ground surface to receive fill shall be inspected by the Engineer.

8. All existing roads that will receive gravel surfacing, but will not be graded, shall be prepared to remove erosional features (e.g. rills, gullies) prior to placement of geotextile fabric and gravel. Road surfaces with erosional features shall be moisture conditioned, scarified, disked, or bladed until it is uniform and free of erosional features which may prevent smooth placement of the geotextile fabric.

9. Irreducible rock or rock fragments more than three (3) inches in maximum dimension shall not be utilized for the upper 12-inches of subgrade surfaces.

10. Suitable and sufficient processing and compaction equipment shall be on the job site to handle the amount of fill being stockpiled, processed, mixed and/or placed. If necessary, excavation or import equipment will be shut down temporarily to allow time for proper preparation and/or compaction of fills. Sufficient water apparatus shall be provided with due consideration to the type of fill material, curing characteristics, rate of placement, and time of year.

11. Fill material shall be placed in thin, horizontal lifts with a maximum uncompacted thickness not to exceed six to eight inches. Each layer shall be spread evenly and thoroughly mixed to obtain a near uniform condition in each layer. In areas of excess lift thickness, re-grading of the surface to the maximum lift thickness will be completed prior to construction of additional lifts.

12. The minimum compaction for all fill materials placed shall be 90 percent of the maximum dry density as determined by ASTM D1557 and the specified moisture content is +/- 2 percent of optimum moisture content as determined by ASTM D1557 and D2216.

13. Material import shall not exceed the capability of the processing operation to meet the project specifications.

14. Representative samples of fill material will be tested in the laboratory to determine the physical characteristics of the material. During processing and/or grading operations, no soils, or soil types, other than those previously analyzed may be used unless the Engineer documents the suitability of these soils with appropriate additional testing paid for by the Contractor.

15. Where tests by the Engineer indicate that the moisture content or density of any layer of fill, or portion thereof, does not meet the Project requirements, the layer or portion thereof will be reworked until the required moisture/density has been attained. The moisture/density of the reworked fill will be verified by re-testing by the Engineer. No additional fill shall be placed over an area until the prior fill has been tested horizontally and vertically and meets the requirements of these Specifications to the satisfaction of the Engineer.

16. Where work is interrupted by heavy rains, fill operations shall not be resumed until observations and field tests by the Engineer indicate the moisture content and density of the in-place fills and/or materials intended for placement are within the limits previously specified. This requirement does not preclude the Contractor from disking or aerating excessively wet areas to enhance drying.

17. As determined by the Engineer, fill over cut slopes shall be properly keyed through top soils, colluvium, or creep material into firm material. Final cover soils placed over foundation layer soils shall be excluded from this requirement. All transitions shall be stripped of all loose soils prior to placing fill.

18. Throughout construction, all excavated and/or fill areas shall be graded to provide positive drainage to collection/transport features and to prevent ponding of water. No ponding of water will be allowed on the landfill surface. Surface water shall be controlled to avoid damage to adjoining properties or to finished work on the site.

19. The Contractor shall assume all responsibility for damage to completed portions of the final cover improvements arising from sequencing of work and location of haul routes.

3.2 *Excavation adjacent to Landfill Gas Extraction or monitoring welland groundwater monitoring Wells*

A. The Contractor shall protect in place gas extraction and monitoring wells, and groundwater monitoring wells, as well as other existing landfill gas system infrastructure prior to any earthwork activity adjacent to gas or groundwater wells.

B. The contractor shall take necessary cautionary actions during excavation adjacent to a gas or groundwater monitoring well, or other existing landfill gas infrastructure to prevent damaging the HDPE liner and other infrastructure below ground surface within a 15-foot radius of a gas and groundwater monitoring well.

3.3 *Refuse Removal and Reconsolidation*

A. A portion of work will occur in soil cover areas overlying refuse. The contractor may encounter refuse in limited areas during the earthwork for this project.

B. The Contractor shall be responsible for implementation and monitoring of all requirements of the Rule 59 mitigation measures as required by APCD.

C. If refuse is encountered the contractor shall excavate and remove refuse and dispose of the material onsite at the direction of the City. All excavated refuse shall be transported in covered vehicles to the active disposal area of the Miramar Landfill or other area as directed by the Engineer. A one-foot-thick interim cover layer of soil shall be placed and compacted by the

Contractor above the exposed waste. The contractor may encounter refuse during excavation operations adjacent to existing haul roads and at various designated areas of the project to establish revised slope gradients, and/or to accommodate construction of various improvements. At the conclusion of each day's operation, all exposed waste material, whether in the excavation area or reconsolidation area, shall be covered with a minimum of 6-inches of soil, or other material as approved by the Engineer.

3.4 *Subgrade Preparation*

A. Subgrade preparation shall be performed in accordance with Section 31 22 16.13 of these specifications.

B. The subgrade shall be prepared to create the lines and grades to be reflected in the ultimate project improvement final grade. The Contractor's proposed sequencing and methods for achieving the design intent for development of the subgrade shall be outlined in the submitted Earthwork Operations Plan.

PART 4 - MEASUREMENT AND PAYMENT

4.1 *Refuse Excavation and Disposal*

A. The Contract unit price per cubic yard for refuse removal and transport to the active disposal area of the Miramar Landfill or to locations within the Miramar Landfill boundary as directed by the Engineer for disposal shall include full compensation for all labor, material, and equipment required for excavation of waste material, including daily health and safety monitoring, and transport to the working face of the approved disposal area.

B. Measurement and payment for refuse excavation and disposal and associated placement of clean fill shall be considered under the Refuse Excavation/Disposal and Clean Fill Placement Bid Item. Final pay quantities for refuse excavation and disposal will be based on surveyed pre-excavation and post-excavation topography and shall include all previously landfilled refuse removed and disposed in accordance with these specifications to the limits indicated on the drawings. Final pay quantities of clean fill shall be determined by comparing the volumetric difference between the post-excavation and post-construction topographic surveys of the fill areas. The topographic surveys will be performed or commissioned by the City at no cost to the Contractor. Work performed outside of these limits will not be compensated unless the work has been authorized by the Engineer.

4.2 *Excavation And Fill*

A. No direct payment will be made for excavation and fill; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures and roadway construction) as indicated in Section 33 40 00 and 34 71 00.

4.3 *Local Borrow*

A. No direct payment will be made for local borrow material; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures and roadway construction) as indicated in Section 33 40 00 and 34 71 00.

END OF SECTION

Section 31 05 16
Aggregates for Earthwork

PART 1 - GENERAL

1.1 *Description of Work*

A. Aggregate shall be placed as shown on the Construction Drawings.

B. The Contractor shall furnish all labor, materials, tools, supervision, transportation, and equipment necessary to install aggregate as shown on the Construction Drawings.

1.2 *Related Sections*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 – Submittal Procedures
2. Section 31 05 13 – Soils for Earthwork
3. Section 31 05 19.13 – Geotextile
4. Section 31 14 13.16 – Soil Stockpiling
5. Section 31 25 14 – Erosion and Sedimentation Control
6. Section 31 22 16.13 – Roadway Subgrade Reshaping
7. Section 33 40 00 – Drainage
8. Section 34 71 00 – Roadway Construction

1.3 *References*

A. 2015 Standard Specifications for Public Works Construction (Greenbook)

B. 2015 City of San Diego Standard Specification for Public Works Construction (WHITEBOOK)

C. American Society for Testing and Materials (ASTM) standards:

1. ASTM C 33 Standard Specification for Concrete Aggregates
2. ASTM C 131 Resistance of Small Size Coarse Aggregate to Degradation in the Los Angeles Machine

1.4 *Submittals*

A. The Contractor shall submit, in writing, materials testing reports and other pertinent information satisfactory to the Engineer, Construction Manager, and Construction Quality Assurance (CQA) Consultant. These submittals shall demonstrate the materials and methods Contractor proposes to use and how these materials and methods comply with the provisions of this Section. Submittals shall be in conformance with Section 01 33 00. Material shall not be delivered until approved by the Construction Manager, CQA Consultant, and Engineer.

B. Suitability Tests of Proposed Materials: For materials not produced by a supplier currently authorized by the City Materials and Testing Lab, tests for conformance with the Specifications

shall be performed before start of the Work. The samples shall be identified to show the name of the material, aggregate source, name of the supplier, contract number, and the segment of the Work where the material represented by the sample is to be used. Results of all tests shall be submitted to the Resident Engineer for approval. Materials to be tested shall include aggregate base.

C. The Contractor shall submit certification and test records of all proposed materials showing that they meet the applicable requirements.

1.5 *Quality Assurance*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. Frequency of sampling and testing for quality control laboratory testing for alternative materials is at the sole discretion of the Engineer. This Section does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

B. The Contractor shall ensure that the materials and methods used for placement of aggregate meets the requirements of the Construction Drawings and this Section. Any material or method that does not conform to these documents, or to alternatives approved in writing by the Engineer will be rejected and shall be repaired or replaced by the Contractor.

PART 2 - MATERIALS

2.1 *General*

A. Aggregate materials shall meet grading and durability requirements specified in the Standard Specifications for Public Works Construction (SSPWC) Section 200, the 2015 Caltrans Standard Specifications, and/or the current version of ASTM C33.

B. Alternative materials to those specified below may be proposed by the Contractor. Alternative materials must meet gradation and durability requirements as specified by the Engineer and confirmed by the City's material testing laboratory. Frequency of sampling and testing for quality control laboratory testing for alternative materials is at the sole discretion of the Engineer.

2.2 *Roadway Aggregate*

A. The Contractor shall use an aggregate mix that matches Vulcan Materials Class II Permeable Base sourced at Chula Vista as listed below or an approved equal by the Engineer.

Class II Permeable Base Gradation

Sieve Size.		Percent Passing
1"	25 mm	100
¾"	19 mm	90-100
3/8"	9.5 mm	40-100
#4	4.75 mm	25-40
# 8	2.36 mm	18-33
# 30	600 µm	5-15
# 50	300 µm	0-7
# 200	75 µm	0-3

B. The Contractor shall present the results of analytical soil testing for presence of Title 22 metals to the Engineer 10 days prior to initiation of compaction activities on the roadways. No Title 22 exceedances shall be permitted in imported aggregate materials.

2.3 *Rip Rap*

A. Caltrans No. 1

1. No. 1 Rip Rap shall be used in the Inlet Protection, or as directed by the Engineer.
2. No. 1 Rip Rap shall conform to the requirements of the 2015 Caltrans Standard Specifications Section 72-2 for No. 1 rock slope protection.
3. No. 1 Rip Rap shall meet the quality requirements of the SSPWC Section 200-1.6.3.

B. Caltrans No. 2

1. No. 2 Rip Rap shall be used in the Sediment Traps and Sediment Trap Gabion Weir Structures, or as directed by the Engineer.
2. No. 2 Rip Rap shall conform to the requirements of the 2015 Caltrans Standard Specifications Section 72-2 for No. 2 rock slope protection.
3. No. 2 Rip Rap shall meet the quality requirements of the SSPWC Section 200-1.6.3.

C. Caltrans No. 3

1. No. 3 Rip Rap shall be used in the proposed Coarse Aggregate Channels, Roadside Ditches, and Energy Dissipater Reno mattresses, or as directed by the Engineer.
2. No. 3 Rip Rap shall conform to the requirements of the 2015 Caltrans Standard Specifications Section 72-2 for No. 3 rock slope protection.
3. No. 3 Rip Rap shall meet the quality requirements of the SSPWC Section 200-1.6.3.

D. ¼ Ton

1. ¼ Ton Rip Rap shall be used in the Type 2 Energy Dissipater, or as directed by the Engineer.
2. ¼ Ton Rip Rap shall conform to the requirements of the 2015 Caltrans Standard Specifications Section 72-2 for ¼ Ton rock slope protection.
3. ¼ Ton Rip Rap shall meet the quality requirements of the SSPWC Section 200-1.6.3.

PART 3 - EXECUTION

3.1 *PLACEMENT*

A. The Contractor shall place the aggregate on the roadways, drainage ditches, and channels in a manner which does not tear or otherwise damage any underlying, overlying, or otherwise adjacent geosynthetic installed per Section 31 05 19.13.

B. The Contractor shall load and place aggregate on the roadways, ditches and channels in a manner which minimizes fines production and migration. Spread aggregate in same direction as the fabric is lapped.

C. Aggregate placed on roadway surfaces in "Gravel Surfaces" and Graded Gravel Roads with Roadside Ditches" shall be placed in 2 lifts not to exceed 8 inches thick of uncompacted material. Preferred method of pacement is through a paver. Set paver adjustments on application thickness and width to avoid need for grader. Aggregate shall be tied in to adjacent road surfaces per "Gravel Road Tie-In" per Detail 10 in Construction Drawings. Aggregate shall be moistened in place with a water truck and vibratory compacted. If edge of placed aggregate is supported – first pass roll shall be slow in static mode on the outside edge of the placed aggregate. If edge of aggregate is unsupported – first pass roll shall be slow in static mode near, but not over unsupported outside edge. Once aggregate is firm, move progressively closer to outside edge with static passes until unsupported edge is firm. Initial pass over aggregate shall be completed in static mode. All successive passes shall be in vibratory mode. The final pass shall be in static mode. Adequate compaction is indicated when no further depressions are created with a roller or loaded dump truck.

3.2 *Protection of Work*

A. The Contractor shall use all means necessary to protect all work of this Section.

PART 4 - Measurement and Payment

A. No direct payment will be made for aggregates for earthwork; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures and roadway construction) as indicated in Section 33 40 00 and 34 71 00.

END OF SECTION

Section 31 05 19.13
Geotextile

PART 1 - General

1.1 *DESCRIPTION OF WORK*

A. This section includes providing all material, labor, tools and equipment for delivery, storage, placement, seaming, and installation of geotextiles as shown in the Contract Documents and as specified in this section.

1.2 *RELATED SECTIONS AND DIVISIONS*

A. The applicable provisions of the General Conditions shall govern the work in this Section.

B. Section 00 10 00 – Summary of Work

C. Section 01 33 00 – Submittal Procedures

D. Section 31 05 13 – Soils for Earthwork

E. Section 31 05 16 – Aggregates for Earthwork

F. Section 31 22 16.13 – Roadway Subgrade Reshaping

G. Section 31 25 14 – Erosion and Sedimentation Control

H. Section 33 40 00 – Drainage

I. Section 34 71 00 – Roadway Construction

1.3 *REFERENCES*

A. American Society for Testing and Materials (ASTM) standards:

1. *ASTM D 4355 Standard Test Method for Deterioration of Geotextile from Exposure to Ultraviolet Light and Water*
2. *ASTM D 4491 Standard Test Method for Water Permeability of Geotextile by Permittivity*
3. *ASTM D 4533 Standard Test Method for Trapezoid Tearing Strength of Geotextile*
4. *ASTM D 4632 Standard Test Method for Breaking Load and Elongation of Geotextile (Grab Method)*
5. *ASTM D 4751 Standard Test Method for Determining Apparent Opening Size of a Geotextile*
6. *ASTM D 6241 Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe*
7. *ASTM D 5261 Standard Test Method for Measuring Mass Per Unit Area of Geotextile*

1.4 *SUBMITTALS*

A. The Contractor shall submit to the Engineer, at least 7 days prior to geotextile delivery, the following information regarding the proposed geotextile:

1. *Manufacturer and product name;*

2. *Minimum property values of the proposed geotextile and the corresponding test procedures;*
3. *Projected geotextile delivery dates; and*
4. *List of geotextile roll numbers for rolls to be delivered to the site.*

B. At least 7 days prior to geotextile placement, the Contractor shall submit to the Engineer the manufacturing quality control certificates for each roll of geotextile. The certificates shall be signed by responsible parties employed by the geotextile manufacturer (such as the production manager). The quality control certificates shall include:

1. *Lot, batch, and/or roll numbers and identification; and*
2. *Results of quality control tests, including a description of the test methods used.*

1.5 *QUALITY ASSURANCE*

A. The Contractor shall ensure that the geotextile and installation methods used meet the requirements of the Construction Drawings and this Section. Any material or method that does not conform to these documents, or to alternatives approved in writing by the Engineer, will be rejected and shall be repaired or replaced by the Contractor.

B. Quality assurance testing, if needed, will be provided by the City Materials and Testing Lab. Frequency of sampling and testing for quality control laboratory testing for alternative materials is at the sole discretion of the Engineer. This Section does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

PART 2 - Materials

2.1 *GEOTEXTILE PROPERTIES*

A. Geotextile suppliers shall furnish materials in which the "Minimum Average Roll Values", as defined by the Federal Highway Administration (FHWA), meet or exceed the criteria specified in Table 31 05 19.13-1.

B. The geotextile for "Graded Gravel Road with Roadside Ditches", "Gravel Surfacing," "Coarse Aggregate Channel" "Inlet Protections," "Low Flow Crossing,"" Gabion Weir," "Energy Dissipater," and "Gravel Road Tie-In" shall be TenCate Mirafi 500X woven polypropylene geotextile or equivalent as approved by the Engineer.

2.2 *MANUFACTURING QUALITY CONTROL*

A. **T**he geotextile shall be manufactured with quality control procedures that meet or exceed generally accepted industry standards.

B. The Geotextile Manufacturer shall sample and test the geotextile to demonstrate that the material conforms to the requirements of these Specifications.

C. Any geotextile sample that does not comply with this Section shall result in rejection of the roll from which the sample was obtained. The Contractor shall replace any rejected rolls.

D. If a geotextile sample fails to meet the quality control requirements of this Section the Geotextile

Manufacturer shall sample and test, at the expense of the Manufacturer, rolls manufactured in the same lot, or at the same time, as the failing roll. Sampling and testing of rolls shall continue until a pattern of acceptable test results is established to bound the failed roll(s).

E. Additional sample testing may be performed, at the Geotextile Manufacturer's discretion and expense, to identify more closely any non-complying rolls and/or to qualify individual rolls.

F. Sampling shall, in general, be performed on sacrificial portions of the geotextile material such that repair is not required. The Geotextile Manufacturer shall sample and test the geotextile, at a minimum once every 130,000 ft2, to demonstrate that the geotextile properties conform to the values specified in Table 31 05 19.13-1. At a minimum, the following manufacturing quality control tests shall be performed on each type of geotextile:

1. *Mass per unit area according to ASTM D5261*
2. *Grab strength according to ASTM D4632*
3. *Tear strength according to ASTM D4533*
4. *Puncture strength according to ASTM D4833*
5. *Apparent opening size (AOS) according to ASTM D4751*

G. The Geotextile Manufacturer shall comply with the certification and submittal requirements of these Specifications.

2.3 *PACKING AND LABELING*

A. Geotextile shall be supplied in rolls wrapped in relatively impermeable and opaque protective covers.

B. Geotextile rolls shall be marked or tagged with the following information:

1. *Manufacturer's name;*
2. *Product identification;*
3. *Lot or batch number;*
4. *Roll number; and*
5. *Roll dimensions.*

2.4 *TRANSPORTATION, HANDLING, AND STORAGE*

A. Handling, unloading, storage, and care of the geotextile prior to and following installation at the site, is the responsibility of the Contractor. The Contractor shall be liable for any damage to the materials incurred prior to final acceptance by the Engineer.

B. The geotextile shall be protected from sunlight, excessive heat or cold, puncture, or other damaging or deleterious conditions. The geotextile shall be protected from mud, dirt, and dust. Any additional storage procedures required by the Geotextile Manufacturer shall be the responsibility of the Contractor.

PART 3 - Execution

3.1 *FAMILIARIZATION*

A. Prior to implementing any of the work described in this Section, the Contractor shall become thoroughly familiar with the site, the site conditions, and all portions of the work falling within this Section.

B. Inspection:

1. *The Contractor shall carefully inspect the installed work of all other Sections and verify that all such work is complete to the point where the installation of this Section may properly commence without adverse effect.*
2. *If the Contractor has any concerns regarding the installed work of other Sections or the site, the Engineer shall be notified, in writing, prior to commencing the work. Failure to notify the Engineer or installation of the geotextile will be construed as Contractor's acceptance of the related work of all other Sections.*

3.2 *PLACEMENT*

A. The Contractor shall handle all geotextile in such a manner as to ensure they are not damaged in any way.

B. The Contractor shall take any necessary precautions to prevent damage to underlying materials during placement of the geotextile.

C. After unwrapping the geotextile from its opaque cover, the geotextile shall not be left exposed for a period in excess of 15 days unless a longer exposure period is approved in writing by the Geotextile Manufacturer.

D. The Contractor shall take care not to entrap stones, excessive dust, or moisture beneath the geotextile during placement.

E. The Contractor shall anchor or weight all geotextile with sandbags, or the equivalent, to prevent wind uplift.

F. The Contractor shall examine the entire geotextile surface after installation to ensure that no foreign objects are present that may damage the geotextile or adjacent layers. The Contractor shall remove any such foreign objects and shall replace any damaged geotextile.

3.3 *SEAMS AND OVERLAPS*

A. Geotextile shall be overlapped a minimum of 12 inches. Overlap geotextile in the same direction at each seam, placing the sheet on top in the direction the gravel will be laid.

3.4 *REPAIR*

A. Any holes or tears in the geotextile shall be repaired using a patch made from the same geotextile. Geotextile patches shall be overlapped a minimum of 12 inches. Should any tear exceed 50% of the width of the roll, that roll shall be removed and replaced.

B. Where geosynthetic materials underlie the geotextile being placed, care shall be taken to remove any soil or other material that may have penetrated the torn geotextile.

3.5 *PLACEMENT OF OVERLYING MATERIALS*

A. The Contractor shall place overlying materials (aggregate, rebar, rebar chairs, concrete, etc.) on top of the geotextile in such a manner as to ensure that:

1. The geotextile and the underlying materials are not damaged;
2. Minimum slippage occurs between the geotextile and the underlying layers during placement; and
3. Excess stresses are not produced in the geotextile.

B. Sections of plywood or other approved methods shall be employed by the Contractor in highly trafficked areas and where materials are to be stockpiled (i.e. under rebar bundles) to minimize the potential for damage to the underlying geotextile.

C. Equipment shall not be driven directly on the geotextile.

D. At no time shall stakes or other objects be driven through the geotextile.

3.6 *PROTECTION OF WORK*

A. The Contractor shall use all means necessary to protect all work of this Section.

B. In the event of damage, the Contractor shall make repairs and replacements to the satisfaction of the Engineer at the expense of the Contractor.

TABLE 31 05 19.13 – 1

REQUIRED PROPERTY VALUES FOR GEOTEXTILE

PROPERTIES	QUALIFIERS	UNITS	MINIMUM AVERAGE ROLL VALUES		TEST METHOD
			MACHINE DIRECTION	CROSS DIRECTION	
Type			woven		--
Mechanical Requirements					
Grab tensile strength	minimum	lb	200	200	ASTM D 4632
Grab tensile elongation	minimum	%	15%	15%	
Trapezoid tear strength	minimum	lb	75	75	ASTM D 4533
Puncture strength	minimum	lb	700	700	ASTM D 6241
Durability					
Ultraviolet resistance @ 500 hours	minimum	% strength	70	70	ASTM D 4355

TABLE 31 05 19.13 – 1

REQUIRED PROPERTY VALUES FOR GEOTEXTILE

PROPERTIES	QUALIFIERS	UNITS	MINIMUM AVERAGE ROLL VALUES		TEST METHOD
			MACHINE DIRECTION	CROSS DIRECTION	
		retained			
Filter Requirements					
Apparent opening size (O_{95})	maximum	mm	0.425		ASTM D 4751
Permittivity	minimum	S^{-1}	0.05		ATSM D 4491

PART 4 - Payment and Measurement

A. No direct payment will be made for geotextiles; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures and roadway construction) as indicated in Section 33 40 00 and 34 71 00.

END OF SECTION

Section 31 14 13.16
Soil Stockpiling

PART 1 - GENERAL

B. All soil stockpiles shall conform to the following requirements, where applicable, unless otherwise noted in these Specifications:

1. The Contractor shall be solely responsible for the proper management of soil stockpiles as outlined below.
2. Soil stockpiles shall be placed outside of concentrated flow paths.
3. The perimeter of stockpiles shall be protected at the end of each day using temporary perimeter sediment barriers.
4. Water shall be applied to soil stockpiles for dust control in conformance with Section 01 57 26.
5. Soil stockpiles shall be covered or protected with soil stabilization immediately following cessation of use if the soil stockpile is not scheduled to be used within 14 days, or after 14 days of unplanned inactivity, as applicable.
6. Soil stockpiles shall be covered or protected with soil stabilization in the event of a predicted rain event.
7. Proper management of soil stockpiles is required for the duration of the project.
8. Any additional soil stockpile management Best Management Practices (BMPs) prescribed in the current Industrial General Permit (IGP) Storm Water Pollution Prevention Plan (SWPPP) for the Miramar Landfill facility are required to be implemented during the project.

PART 2 - Materials (not used)

PART 3 - Execution (not used)

PART 4 - MEASUREMENT AND PAYMENT

A. No direct payment will be made for soil stockpiling; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures and roadway construction) as indicated in Section 33 40 00 and 34 71 00.

END OF SECTION

Section 31 22 16.13
Roadway Subgrade Reshaping

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor shall prepare the existing subgrade for installation of geotextile and aggregate in accordance with the Contract Documents.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 Submittal Procedures
2. Section 01 55 29 Traffic Control
3. Section 31 05 13 Soils for Earthwork
4. Section 31 05 16 Aggregates for Earthwork
5. Section 31 05 19.13 Geotextile
6. Section 31 14 13.16 Soil Stockpiling
7. Section 34 71 00 Roadway Construction

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC) together with the latest adopted editions of the City of San Diego Supplement Amendments.

1.4 *Contractor SUBMITTALS*

A. The Contractor shall submit, in writing, materials testing reports and other pertinent information satisfactory to the Engineer, demonstrating that materials and methods Contractor proposes to use will comply with the provisions of this Section. Submittals shall be in accordance with the requirements of Section 01 33 00.

PART 2 - Materials

2.1 *Use of Existing Materials*

A. It is anticipated that roadway subgrade reshaping will involve use of on-site borrow material or off-site import of additional materials to achieve design grades. Such materials shall be in conformance with Section 31 05 13 and Section 31 05 16 of these specifications.

PART 3 - EXECUTION

3.1 *SUBGRADE PREPARATION*

A. The subgrade shall be prepared to create the lines and grades to be reflected in the ultimate project improvement final grade. The Contractor's proposed sequencing and methods for achieving the design intent for development of the subgrade shall be presented at the pre-construction meeting.

B. Subgrade preparation and placement of geotextile fabric and aggregate shall be in accordance with SSPWC Section 300 and SSPWC Section 301, except where superseded by these specifications.

C. Subgrade shall be graded with machinery sufficient to remove loose and unsuitable soils prior to placement of geotextile fabric and aggregate. Subgrade acceptance will be by proof roll. The geotechnical design engineer will be contacted at least 48 hours prior to the scheduled proof roll and the geotechnical engineer or his/her representative shall be onsite for the proof roll. The proof roll shall be conducted according to the direction of the geotechnical design engineer or his/her representative with a fully loaded three-axle dump truck. Areas identified during the proof roll as unacceptable shall be excavated to a depth sufficient to reach competent soils, moisture conditioned, and recompacted per SSPWC Section 301-1. If the unacceptable area is located on refuse, the interim cover soil shall be replaced with competent soils to a depth approved by the geotechnical design engineer, moisture conditioned and recompacted per SSPWC Section 301-1.

PART 4 - MEASUREMENT AND PAYMENT

A. No direct payment will be made for roadway subgrade reshaping; measurement and payment shall be included in the unit cost of the bid item of work of which it is a part (i.e., drainage structures and roadway construction) as indicated in Section 33 40 00 and 34 71 00.

END OF SECTION

Section 31 25 14
Erosion and Sedimentation Control

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the installation of erosion and sediment controls. The work shall be carried out as specified herein and in accordance with the Construction Drawings.

B. The work shall include, but not be limited to, delivery, storage, and placement of the various erosion and sediment control components of the project.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. *Section 01 30 00 Submittals*
2. *Section 01 56 00 Environmental Protection*
3. *Section 01 57 23 Temporary Storm Water Pollution Controls*
4. *Section 015726 Site Watering for Dust Control*
5. *Section 03 05 13 Earthwork*
6. *Section 31 05 19.13 Geotextile*
7. *Section 33 40 00 Drainage*
8. *Section 31 14 13.16 Soil Stockpiling*
9. *Section 34 71 00 Roadway Construction*

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC) together with the latest adopted editions of the City of San Diego Supplemental Amendments.

1.4 *CONTRACTOR SUBMITTALS*

A. The Contractor shall submit, in writing, materials testing reports, job-mix formulas, and other pertinent information satisfactory to the Engineer, demonstrating that materials and methods the Contractor proposes to use will comply with the provisions of this Section. Submittals shall be in accordance with the requirements of Section 01 30 00 – Submittal Procedures.

1.5 *QUALITY ASSURANCE*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

PART 2 - Materials

2.1 *Straw wattles*

A. Straw wattles shall consist of burlap wrapped exterior and an interior made from 100% weed free rice straw to achieve a nominal finished diameter of nine (9) inches.

2.2 *WOODEN STAKES*

A. Wooden stakes shall be 2-inch x 2-inch x 18-inches in length per Construction Drawings.

2.3 *WATER TRUCK*

A. Materials for water truck shall conform to the requirements of Section 01 57 26.

2.4 *SEEDING MIXTURE*

A. Seeding mixtures shall consist of the following species and application rates per the Construction Drawings:

Vegetated Access Road Seed Mixture

Species	Common Name	*PLS lbs/acre
Acmispon heermannii	Prostrate Wooly Lotus	1.0
Poa secunda	Pine Bluegrass	8.0
Festuca microstachys	Small Fescue	5.0
Ambrosia psilostachya	Western Ragweed	1.0
Stipa pulchra	Purple Needlegrass	4.0
Festuca idahoensis	Idaho Fescue	8.0
Agrostis pallens	San Diego Bent Grass	1.0
Plantago insularis	Plantain	20.0
Trifolium willdenovii	Tomcat Clover	4.0
Linum lewisii	Blue Flax	1.0
	Total PLS lbs/acre	53.0

*NOTE: PLS % = % Purity X % Germination.

Vegetated Swale Seed Mixture

Species	Common Name	*PLS lbs/acre
Sisyrinchium bellum	Blue-eyed Grass	1.0
Trifolium obtusiflorum	Creek Clover	4.0
Agrostis pallens	San Diego Bent Grass	2.0
Elymus triticoides	Creeping Wild Rye	3.0
Deschampsia cespitosa	Tufted Hairgrass	1.0
Festuca idahoensis	Idaho Fescue	8.0
Hordeum brachyantherum	Meadow Barley	6.0
Eschscholzia caespitosa	Dwarf California Poppy	1.0
Lasthenia glabrata	Goldfields	1.0
Plantago insularis	Plantain	20.0
	Total PLS lbs/acre	**47.0**

*NOTE: PLS % = % Purity X % Germination.

Area 1 Seed Mixture

SPECIES	COMMON NAME	*PLS lbs/acre
Bromus carinatus 'Cucamonga'	Cucamonga Brome	10
Bromus carinatus	California Brome	10
Festuca microstachys	Small Fescue	6
Trifolium ciliolatum	Foothill Clover	3
	Total PLS lbs/acre	**29**

*NOTE: PLS % = % Purity X % Germination.

2.5 *Hydroseed*

A. Hydroseed shall be applied using the following materials and application rates per the Construction Drawings:

Vegetated Access Road Hydroseed Application Rates:

MATERIAL	APPLICATION RATE (lbs/acres)
Wood Fiber Mulch	500
Vegetated Access Road Seed Mixture	53 PLS
Biosol Forte 7-2-1 Fertilizer or Equivalent	600
AM 120 Mycorrhizal Inoculum or Equivalent	60
Ecology Controls M-Binder or Equivalent	150

PLS = Pure Live Seed

Vegetated Swale Hydroseed Application Rates:

MATERIAL	APPLICATION RATE (lbs/acres)
Flexterra HP-FGM or Equivalent	500
Vegetated Swale Seed Mixture	47 PLS
Biosol Forte 7-2-1 Fertilizer or Equivalent	600
Ecology Controls M-Binder or Equivalent	60

PLS = Pure Live Seed

Area 1 Seed Mixture Hydroseed Application Rates

MATERIAL	APPLICATION RATE (lbs/acres)
Wood fiber mulch	500
Area 1 Seed Mixture	29 PLS
Guar Type Tackifier	200

PLS = Pure Live Seed

2.6 *HYDRAULIC MULCH*

A. Hydraulic Mulch shall be applied using the following materials and application rates per the Construction Drawings:

Vegetated Access Road Hydraulic Mulch Application Rates:

MATERIAL	APPLICATION RATE (lbs/acres)
Wood fiber mulch	2000
Ecology Controls M-Binder or Equivalent	150

Vegetated Swale Hydraulic Mulch Application Rates:

MATERIAL	APPLICATION RATE (lbs/acres)
Flexterra HP-FGM or Equivalent	3000

Area 1 Hydraulic Mulch Application Rates

MATERIAL	APPLICATION RATE (lbs/acres)
Wood fiber mulch	2,500
Guar type tackifier	125

PART 3 - EXECUTION

3.1 *Vegetated access road (Sheets C-1 through C- 15)*

A. Apply water prior to roughening to facilitate de-compaction of soil.

B. Roughen soil surface no more than 3-inches to loosen surface compaction within limits (width) of access road as shown on Plans

C. Apply two (2) inches of 0.25-inch to 0.50-inch sized West Miramar Landfill-produced compost on roughened soil surface and incorporate compost into the soil by tilling or disking to a maximum depth of four (4) inches.

D. Following soil tilling or disking, the road area shall be hydroseeded.

E. Following hydroseeding, the area shall be capped with hydromulch. Hydromulch shall be hydraulically sprayed from multiple directions to eliminate "shadowing" and to accomplish complete soil coverage.

3.2 *Vegetated SWALES (Sheets C-10 through C-12) (Detail 9)*

A. Apply water prior to roughening to facilitate de-compaction of soil.

B. Roughen soil surface no more than 3-inches to loosen surface compaction within limits (width) of vegetated swale as shown on Plans

C. Apply two (2) inches of 0.25-inch to 0.50-inch sized West Miramar Landfill-produced compost on roughened soil surface and incorporate compost into the soil by tilling or disking to a maximum depth of four (4) inches.

D. Install nine (9) inch diameter straw wattles per manufacturers' specifications across width of swale along contour at forty (40) foot intervals. Wattles shall be composed of 100% weed-free agricultural straw encased in a biodegradable burlap.

E. Following straw wattle installation, the swale area shall be hydroseeded.

F. Following hydroseeding, the swale area shall be capped with hydromulch. Hydromulch shall be hydraulically sprayed from multiple directions to eliminate "shadowing" and to accomplish complete soil coverage.

3.3 *Erosion control area 1 (Sheet C-5)*

A. Grade soil surface to eliminate existing erosional features (i.e. rills).

B. Apply water prior to roughening to facilitate de-compaction of soil.

C. Roughen soil surface no more than 3-inches to loosen existing surface compaction.

D. Apply two (2) inches of 0.25-inch to 0.50-inch sized West Miramar Landfill-produced compost on roughened soil surface and incorporate compost into the soil by tilling or disking to a maximum depth of four (4) inches.

E. Following placement of compost, track walk up and down slopes with bulldozer such that the tracks are perpendicular to slope.

F. Install nine (9) inch diameter straw wattles per manufacturers' specifications across contour at forty (40) foot intervals. Wattles shall be composed of 100% weed-free agricultural straw encased in a biodegradable burlap.

G. Following straw wattle installation, the swale area shall be hydroseeded.

H. Following hydroseeding, the swale area shall be capped with hydromulch. Hydromulch shall be hydraulically sprayed from multiple directions to eliminate "shadowing" and to accomplish complete soil coverage.

PART 4 - MEASUREMENT AND PAYMENT

4.1 *Contract Unit Price Completeness*

A. The contract unit price for each of the following civil improvements shall include full compensation for all labor, material and equipment required to construct the improvements in accordance with the Contract Documents, Construction Drawings, Specifications, and manufacturer's recommendations. Quantities installed beyond the limits indicated on the drawings will not be compensated unless previously authorized by the Engineer.

4.2 *Vegetated access road (Sheets C-1 through C-15)*

A. The unit price for "Vegetated Access Road" shall include costs for site preparation and furnish/install of all materials required to fully complete the installation per the Construction Drawings.

B. Payment for "Vegetated Access Road" shall be determined by multiplying the accepted number of acres of the improvement completed by the unit price in the contract.

4.3 *Vegetated SWALES (Sheets C-10 through C-12) (DETAIL 9)*

A. The unit price for "Vegetated Swales" shall include costs for site preparation and furnish/install of all materials required to fully complete the installation per the Plan Detail and Construction Drawings.

B. Payment for "Vegetated Swales" shall be determined by multiplying the accepted number of acres of the improvement completed by the unit price in the contract.

4.4 *Erosion control area 1 (Sheet C-5)*

A. The unit price for "Erosion Control Area 1" shall include costs for site preparation and furnish/install of all materials required to fully complete the installation per the Construction Drawings.

B. Payment for "Erosion Control Area 1" shall be determined by multiplying the accepted number of acres of the improvement completed by the unit price in the contract.

END SECTION

Section 33 40 00
Drainage

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the installation of drainage systems, including sediment traps, coarse aggregate channels, low flow crossings, energy dissipaters, down drain termination, inlet protection, headwall improvements, down drain installation and re-alignment, and sediment basin modification. The work shall be carried out as specified herein and in accordance with the Construction Drawings.

B. The work shall include, but not be limited to, delivery, storage, and placement of the various drainage components of the project.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. *Section 01 30 00 Submittals*
2. *Section 01 57 23 Temporary Storm Water Pollution Controls*
3. *Section 01 56 00 Environmental Protection*
4. *Section 03 10 00 Concrete Formwork*
5. *Section 03 20 00 Reinforcement Steel*
6. *Section 03 29 00 Joints in Concrete Structures*
7. *Section 03 30 00 Cast-In-Place Concrete*
8. *Section 31 05 13 Soils for Earthwork*
9. *Section 31 05 16 Aggregates*
10. *Section 31 05 19.13 Geotextiles*
11. *Section 31 25 14 Erosion and Sedimentation Control*
12. *Section 34 71 00 Roadway Construction*

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

A. Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC)["Greenbook"] together with the latest adopted editions of the City of San Diego Supplemental Amendments ("Whitebook").

B. Drivable Grass (Articulated Concrete Block)

1. *ASTM D-422 - Particle Size Analysis*
2. *ASTM D-698 - Laboratory Compaction Characteristics of Soil - Standard Proctor*
3. *ASTM D-1557 - Laboratory Compaction Characteristics of Soil – Modified Proctor*

4. *ASTM C-39/39M – Std. Test Method for Compressive Strength of Cylindrical Concrete Specimens*
5. *ASTM C-33 Std. Spec. for Concrete Aggregates*
6. *ASTM C31/ C31M Standard Practice for Making and Curing Concrete Test Specimens in the Field*
7. *ASTM C 150 Std. Spec for Portland Cement*
8. *ASTM C94 / C94M Std. Spec. for Ready – Mixed Concrete*
9. *ASTM C 1157 Std. Performance Specification for Hydraulic Cement*
10. *ASTM C595 Std. Spec. for Blended Hydraulic Cement*
11. *ASTM C618 Std. Spec. for Coal Fly Ash and Raw or Calcined Natural Pozzolan for use in Concrete**
12. *ASTM C1611 / C1611M Std. Test Method for Slump Flow of Self-Consolidating Concrete*
13. *ASTM C989 Std. Spec. for Ground Granulated Blast-Furnace Slag for use in Concrete and Mortars **
14. *ASTM C979 Std. Spec. for Pigment for Integrally Colored Concrete*
15. *ACI 201 - Report on Durability*
16. *ACI 211 - Std. Practice for Selecting Proportions for Normal, Heavy Weight, and Mass Concrete*

*Denotes regional applicability

C. Gabion Basket and Reno Mattress

1. *ASTM A975-97 Standard Specification for Double-Twisted Hexagonal Mesh Gabions and Revet Mattresses (Metallic-Coasted Steel Wire or Metallic-Coated Steel Wire with Polyvinyl Chloride (PVC) Coating)*
2. *ASTM A641/A641M-03 Specification for Zinc Coated (Galvanized) Carbon Steel Wire*
3. *ASTM A370-97a Test Methods and Definitions for Mechanical Testing of Steel Products.*
4. *ASTM A90/A90M-01 Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coating*
5. *ASTM A313/A313M-98 Specification for Chromium-Nickel Stainless and Heat-Resisting Steel Spring Wire*
6. *ASTM A764-95(2001) Specification for Steel Wire, Carbon, Drawn Galvanized and Galvanized at Size for Mechanical Springs*
7. *ASTM B117-97 Standard Practice for Operating Salt Spray (Fog) Apparatus*
8. *ASTM D1242-95a Standard Test Methods for Resistance of Plastic Materials to Abrasion*
9. *ASTM D1499-99 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Plastics*
10. *ASTM D2240-04 Standard Test Method for Rubber Property – Durometer Hardness*
11. *AST D412-98a Standard Test Methods for Volcanized Rubber and Thermoplastic Elastomers-Tension*
12. *ASTM D746-04 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact*

13. *ASTM D792-00 Standard Practice for Operating Open Flame Carbon Arc Light Apparatus for Exposure on Non-Metallic Materials*
14. *UL 746B Polymeric Materials-Long Term Property Evaluation*
15. *Plastic (HDPE) Storm Drain Pipe and Ancillary Fittings*
16. *AASHTO M294 Standard Specification for Corrugated Polyethylene Pipe, 300- to 1500-mm (12- to 60-in.) Diameter*
17. *ASTM D1056 Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber*
18. *ASTM D3350 Standard Specification for Polyethylene Plastics Pipe and Fittings Materials*
19. *ASTM D2321 Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications*

1.4 *Contractor SUBMITTALS*

A. The Contractor shall submit, in writing, materials testing reports, job-mix formulas, and other pertinent information satisfactory to the Engineer, demonstrating that materials and methods Contractor proposes to use will comply with the provisions of this Section. Submittals shall be in accordance with the requirements of Section 01 33 00 - Submittals.

B. Suitability Tests of Proposed Materials: For materials not produced by a supplier currently authorized by the City Materials and Testing Lab, tests for conformance with the Specifications shall be performed before start of the Work. The samples shall be identified to show the name of the material, aggregate source, name of the supplier, contract number, and the segment of the Work where the material represented by the sample is to be used. Results of all tests shall be submitted to the Construction Manager for approval. Materials to be tested shall include concrete.

C. The Contractor shall submit certification and test records of all proposed materials showing that they meet the applicable requirements.

D. *Quality Assurance*

1. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

E. Drivable Grass (Articulated Concrete Block) Installer Qualifications: An experienced installer who has successfully completed installations of pavers or other pavement systems on projects of similar or larger scope and magnitude.

Part 2 Materials

2.1 *WOVEN GEOTEXTILE MAT (HIGH TENSILE STRENGTH)*

A. Woven geotextile mat (high tensile strength) shall conform to the requirements of Section 31 05 19.13 of this document.

2.2 *RIP-RAP*

A. Materials for rip-rap shall conform to the requirements of Section 31 05 16 of this document.

2.3 *CUT OFF WALL*

A. Cut off walls shall conform with City of San Diego Standard Drawing D-72.

2.4 *HDPE PIPE ANCHOR SYSTEM*

A. Materials for pipe anchors shall conform with Caltrans Standard Plan D87A and D87B as modified to fit 36-inch diameter pipe.

2.5 *TAPERED INLET AND DOWN DRAIN FLUME*

B. Materials for tapered inlet and down drain flume shall conform with City of San Diego Standard Drawing D-23 modified with manufacturer applied Trenchcoat™ coating, or an equivalent coating.

2.6 *SEDIMENT TRAP LINER (SEDIMENT TRAPS 1 and 2)*

A. Materials for reinforced concrete shall conform to the requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document.

2.7 *HEADWALL (DOWN DRAIN 7 and 8)*

A. Materials for reinforced concrete shall conform to the requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document.

2.8 *Anchor Asessmbley (DOWN DRAIN 14)*

A. Materials for anchor assembly shall conform to the requirements of Caltrans Standard Plan D87B – Plastic Pipe Down Drain Detail (and by reference D87A) modified as necessary to fit 36" diameter pipe and per the requirements of Section of 3.15.B of this Section.

2.9 *STORMDRAIN PIPE (DOWN DRAIN 15)*

A. 36-inch diameter smooth interior and annular exterior corrugated High-Density Polyethylene (HDPE) pipe.

B. Materials for anchor assembly shall conform to the requirements of Caltrans Standard Plan D87B – Plastic Pipe Down Drain Detail (and by reference D87A) modified as necessary to fit 36" diameter pipe and per the requirements of Section of 3.16.D of this Section.

2.10 *DOWN DRAIN TERMINATION*

A. 36-inch diameter smooth interior and annular exterior corrugated High-Density Polyethylene (HDPE) pipe pre-fabricated "T" end section or 36-inch diameter Corrugated Metal Pipe (CMP) pre-fabricated "T" end section.

2.11 *DRIVABLE GRASS ® (ARTICULATED CONCRETE BLOCK)*

A. Permeable, Flexible, Plantable Pavement System: Drivable Grass®

1.	Nominal Dimensions in inches (l x w x h)	24 x 24 x 1.5
2.	Gross Area of Each Mat in square feet	4
3.	Weight of Each Mat in pounds	45
4.	Mats per pallet (each)	60
5.	Area Covered per Pallet in square feet	240

C. Color Buff/Tan, Grey**

1.	Flexibility (minimum radius of curvature in inches)	12
2.	Concrete Compressive Strength @ 28 days in pounds per square in (psi)	5000
3.	Propriety Grid Reinforcement	Engineered Plastic

****Other colors available for special order**

D. Woven Geotextile Mat – Materials for woven geotextile mat shall conform to the requirements of Section 31 05 19.13 of this document.

2.12 *GABION BASKET*

A. Woven Wire Mesh

1. Dimensions in feet (l x w x h) [3′ or 9′ or 12′] x 3′ x [1.5′ or 3′]
2. Minimum nine (9) Gauge Wire (Zinc Coated)
3. All tests on the wire must be performed prior to manufacturing the mesh.
    - *Tensile strength: both the wire used for the manufacture of gabions and the lacing wire, shall have a maximum tensile strength of 75,000 psi (515 MPa), in accordance with ASTM A641/A641M-03.*
    - *Elongation: the test must be carried out on a sample at least 12-inch (30 cm) long. Elongation shall not be less than 12%, in accordance with ASTM A370-97a.*
    - *Zinc coating: minimum quantities of zinc according to ASTM A641/A641M-03, Class III soft temper coating.*
    - *Adhesion of zinc coating: the adhesion of the zinc coating to the wire shall be such that, when the wire is wrapped six turns around a mandrel having four times the diameter of the wire, it does not flake or crack when rubbing it with the bare fingers, in accordance with ASTM 641/A641M-03.*
4. Galvanized (zinc coated) woven wire mesh gabions (8 x 10 mesh type):
    - *Wire mesh: Diameter- 0.120 inch (3.05 mm)*
    - *Selvedge wire: Diameter – 0.153 inch (3.90 mm)*
    - *Mesh opening: Nominal Dimension D = 3.25 in (83 mm), as per Fig. 1*

5. Galvanized (zinc coated) lacing wire and internal stiffeners:
    - *Lacing wire: Diameter – 0.087 inch (2.20 mm)*
    - *Cross tie/stiffener wire: Diameter – 0.087 inch (2.20 mm)*
    - *Performed Stiffener: Diameter – 0.153 inch (3.9 mm) internal*
6. Steel Mesh Properties
    - *Mesh Tensile Strength shall have a minimum strength of 3500 lb/ft (51.1 kN/m) when tested in accordance with ASTM A975 section 13.1.1*
    - *Punch Test Resistance shall have a minimum resistance of 6000 lb (26.7 kN) when tested in accordance with ASTM A975 section 13.1.4.*
    - *Connection to selvedges shall have a minimum resistance of 1400 lb/ft (20.4 kN/m) when tested in accordance with ASTM A975.*
7. Spenax Fasteners (Overlapping Fasteners):
    - *Overlapping fasteners may be used in lieu of, or to complement, lacing wire for basket assembly and installation. The spacing of the fasteners during all phases of assembly and installation shall be in accordance with spacing based on 1,400 lb/ft (20.4 kN/m) pull apart resistance for galvanized mesh when tested in accordance with ASTM A 975 section 13.1.2, with a nominal spacing of 4 inches (100 mm), and not to exceed 6 in (150 mm).*
    - *Galvanized Fasteners: Diameter = 0.120 in (3.05 mm), according to ASTM A313/A313M-98, Type 302, Class I.*
    - *Tensile strength: 230,000 to 273,000 psi (1586-1882 MPa) in accordance with ASTM A764-95(2001)*
    - *Proper installation of rings: A properly formed Spenax fastener shall have a nominal overlap of one in after closure (Fig. 2)*

E. Tolerances

1. Wire: Zinc coating, in accordance with ASTM A64/A641M-03, Class III soft temper coating.
2. Gabion sizes: +/- 5% on the length, width, and height.
3. Mesh opening: Tolerances on the hexagonal, double twisted wire mesh opening shall not exceed +/- 10% on the nominal dimension D values (see Fig. 1):

F. Standard Unit Size

Fig. 1

Mesh Type	Nominal Dimension D
8 x 10	3.25 in. (83 mm)

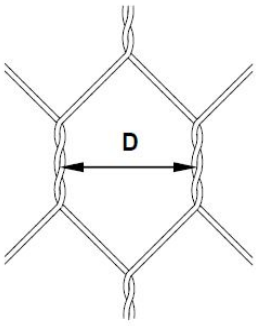


Fig. 2

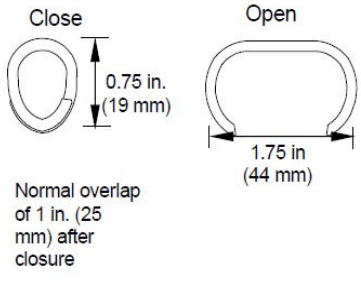
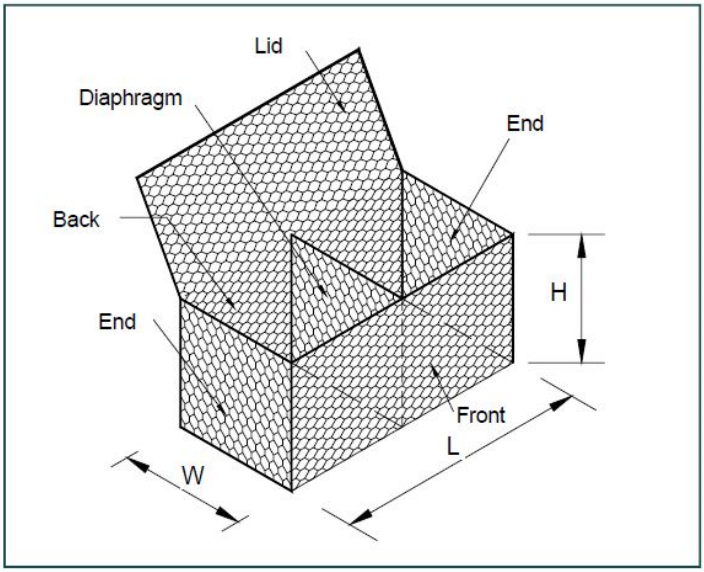


Table of sizes for gabions			
L=Length ft (m)	W=Width ft (m)	H=Height ft (m)	# of cells
6 (1.8)	3 (0.9)	3 (0.9)	2
9 (2.7)	3 (0.9)	3 (0.9)	3
12 (3.6)	3 (0.9)	3 (0.9)	4
6 (1.8)	3 (0.9)	1.5 (0.45)	2
9 (2.7)	3 (0.9)	1.5 (0.45)	3
12 (3.6)	3 (0.9)	1.5 (0.45)	4
6 (1.8)	3 (0.9)	1 (0.3)	2
9 (2.7)	3 (0.9)	1 (0.3)	3
12 (3.6)	3 (0.9)	1 (0.3)	4
4.5 (1.4)	3 (0.9)	3 (0.9)	1

All sizes and dimensions are nominal. Tolerances of ± 5% of the width, and length height, of the gabions shall be permitted.

G. Fabrication

1. Gabions shall be manufactured and shipped with all components mechanically connected at the production facility. The front, base, back and lid of the gabions shall be woven into a single unit. The ends and diaphragm(s) shall be factory connected to the base. All perimeter edges of the mesh forming the basket and top, or lid, shall be selvedged with wire having a larger diameter. The gabion is divided into cells by means of diaphragms positioned at approximately 3 feet (1 m) centers. The diaphragms shall be secured in position to the base so that no additional lacing is necessary at the jobsite.



H. Aggregate

1. The aggregate for gabions shall comply with Caltrans Rip Rap No. 2 in accordance with Section 31 05 16. The aggregate shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure.

2.13 *RENO MATTRESS*

A. Woven Wire Mesh Reno Mattress

1. Dimensions in feet (l x w x h) 12' x 1.5' x 3'

2. Wire mesh (zinc coated). All tests on the wire mesh must be performed prior to manufacturing the mesh.

   - *Tensile strength: both the wire used for the manufacture of gabions and the lacing wire shall have a maximum tensile strength of 75,000 lb/ft (515 MPa), in accordance with ASTM A641/A641M-03.*
   - *Elongation: the test must be carried out on a sample at least 12 in (30 cm) long. Elongation shall not be less than 12%, in accordance with ASTM A370-97a.*
   - *Zinc coating: minimum quantities of zinc according to ASTM A641/A641M-03, Class III soft temper coating.*
   - *Adhesion of zinc coating: the adhesion of the zinc coating to the wire shall be such that, when the wire is wrapped six turns around a mandrel having four times the diameter of the wire, it does not flake or crack when rubbing it with the bare fingers, in accordance with ASTM A641/A641M-03.*

3. PVC (Polyvinyl Chloride) Coating.

   - *Tensile strength: not less than 2,985 psi (20.6 MPa), according to ASTM D412-98a.*
   - *Specific Gravity: 81 – 84 pfc (1.30-1.35 kg/dm3) in accordance with ASTM D792-00, Table 1.*
   - *Hardness: between 50 and 60 Shore D, according to ASTM D 2240-04.*
   - *Modulus of elasticity: not less than 2,700 psi (18.6 MPa), according to ASTM D412-98a.*
   - *Abrasion Resistance: the percentage of weight loss shall be less than 12%, according to ASTM D1242-95a.*
   - *Heat aging test: prior to UV and Abrasion degradation, the PVC polymer coating shall have a projected durability life of 60 years when tested in accordance with UL 746B.*
   - *The accelerated aging tests are:*
     - Salt spray test: test period 3,000 hours, test method ASTM B117-97.
     - Exposure to UV rays: test period 3,000 hours at 145o F (63^{o}C), test method ASTM D1499-99 and ASTM G152-00;
     - Brittleness temperature: no higher than 15oF (-9oC), or lower temperature when specified by the purchaser, when tested in accordance with ASTM D746-04.
   - *The properties after ageing test shall be as follows:*
     - Appearance of coated mesh: no cracking, stripping or air bubbles, and no appreciable variation in color;
     - Specific Gravity: variations shall not exceed 6%.
     - Hardness: variations shall not exceed 10%.
     - Tensile strength: variations shall not exceed 25%.

- Modulus of elasticity: variations shall not exceed 25%.
- Abrasion resistance: variations shall not exceed 10%.
- Brittleness temperature: shall not exceed + 64o (+18oC).

4. Galvanized and PVC coated wire mesh (6 x 8 mesh type).
   - *PVC Coating thickness: Nominal - 0.02 in (0.5 mm), Minimum 0.015 in (0.38 mm)*
   - *Lacing Wire: Diameter- 0.087 inch (2.20 mm) internal, 0.127 inch (3.20 mm) external.*
   - *Stiffener Wire: Diameter 0.087 inch (2.20 mm) internal, 0.127 inch (3.20 mm) external.*
   - *Mesh opening: Nominal Dimension D = 2.5 inch (63.5 mm), as per Fig. 1.*
5. Steel Mesh Properties
   - *Mesh Tensile Strength shall have a minimum strength of 2300 lb/ft (33.6 kN/m) when tested in accordance with ASTM A975 section 13.1.1*
   - *Punch Test Resistance shall have a minimum resistance of 4000 lbs (17.8 kN) when tested in accordance with ASTM A975 section 13.1.4.*
   - *Connection to selvedges shall have a minimum resistance of 700 lb/ft (10.2 kN/m) when tested in accordance with ASTM A975.*
6. Spenax Fasteners (Overlapping Fasteners):
   - *Overlapping stainless steel fasteners may be used in lieu of, or to complement, lacing wire for basket assembly and installation. The spacing of the fasteners during all phases of assembly and installation shall be in accordance with spacing based on 700 lb/ft (10.2 kN/m) pull apart resistance for galvanized mesh when tested in accordance with ASTM A975 section 13.1.2, with a nominal spacing of 6 inches (150 mm), and not to exceed 8 inches (200 mm).*
   - *Stainless Steel Fasteners: Diameter = 0.120 inch (3.05 mm), according to ASTM A313/A313M-98, Type 302, Class I.*
   - *Tensile strength: 222,000 to 253,000 psi (1530-1744 MPa) in accordance with ASTM A313/A303M-98.*
   - *Proper installation of rings: A properly formed Spenax fastener shall have a nominal overlap of one in after closure (Fig. 2)*

I. Tolerances

1. Wire: Zinc coating, in accordance with ASTM A641/A641M-03, Class III soft temper coating.
2. Reno mattress sizes: +/- 5% on the length, width, and 10% on the height.
3. Mesh opening: Tolerances on the hexagonal, double twisted wire mesh opening shall not exceed +/- 10% on the nominal dimension D values (see Figure 1).

Fig. 1

Mesh Type	Nominal Dimension D
6 x 8	2.50 in. (64 mm)

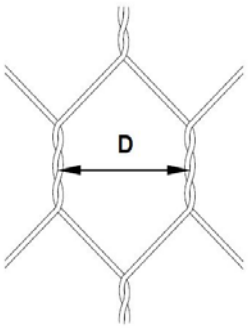
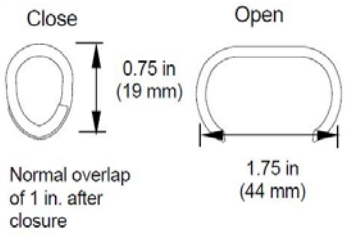


Fig. 2

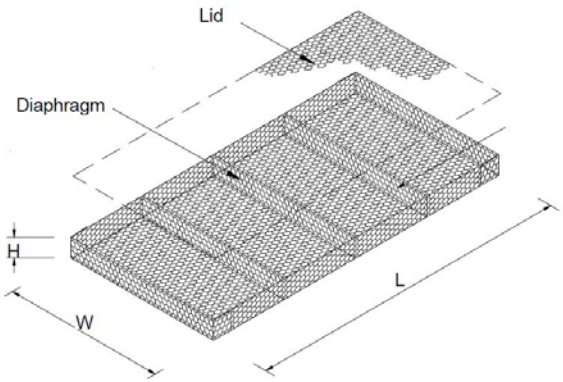


J. Standard Unit Size

Table of sizes for Reno mattresses			
L=Length ft (m)	W=Width ft (m)	H=Height in (mm)	# of cells
9 (2.7)	6 (1.8)	6 (150)	3
12 (3.6)	6 (1.8)	6 (150)	4
9 (2.7)	6 (1.8)	9 (230)	3
12 (3.6)	6 (1.8)	9 (230)	4
12 (3.6)	6 (1.8)	12 (300)	4

K. Fabrication

1. Reno mattresses shall be manufactured and shipped with all components mechanically connected at the production facility, except for the mattress lid, which is produced separately from the base. The ends and diaphragm(s) shall be formed in conjunction with the base. The lid shall be a separate piece made of the same type mesh as the basket. All perimeter edges of the mesh forming the basket and top, or lid, shall be selvedged with wire having a larger diameter. The Reno mattress is uniformly partitioned into internal cells. The diaphragms shall be secured in position to the base so that no additional tying is necessary at the jobsite.



L. Aggregate

Mattress aggregate shall comply with Caltrans Rip Rap No. 3 in accordance with Section 31 05 16. The aggregate shall be hard, angular to round, durable and of such quality that they shall not disintegrate on exposure to water or weathering during the life of the structure.

2.14 *TEMPORARY RAIL (TYPE K)*

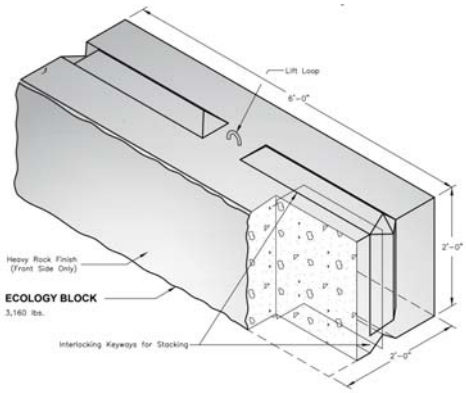
M. Temporary Rail (Type K) shall consist of 10-foot Type II Portland Cement ASTM C 150 and Federal Specifications on Cement, SS-C-1960/3, Type I/II Low Alkali, minimum compressive strength 4000 psi at 28 days.

N. Reinforcing Bar: ASTM A 615, Grade 40

O. Secondary Reinforcing: Polypropylene fibers shall be added to the concrete and improve durability.

2.15 *Eco Blocks*

A. Eco Block shall consist of 6’ L x 2’ W x 2’ H concrete blocks with a lifting loop and interlocking keyway for stacking.



Part 3: EXECUTION

3.1 *Woven Geotextile Mat*

A. Installation of woven geotextile mat (high tensile strength) shall conform to the requirements of Section 31 05 19.13 of this document and as shown on the Construction Drawings.

3.2 *Rip Rap*

B. Installation of rip-rap shall conform to the requirements of Section 31 05 16 of this document and as shown on the Construction Drawings.

3.3 *Gabion Basket*

A. Assembly

1. *Gabions are supplied folded flat and packed in bundles. The units are assembled individually by erecting the sides, ends, and diaphragms, ensuring that all panels are in the correct position, and the tops of all sides are aligned. The four corners shall be connected first, followed by the internal diaphragms to the outside walls. All connections should use lacing wire or fasteners as previously described in Section 2.9.A.3 and 2.9.A.5.*
2. *The procedure for using lacing wire consists of cutting a sufficient length of wire, and first looping and/or twisting to secure the lacing wire to the wire mesh. Proceed to lace with alternating double and single loops through every mesh opening approximately every 6-inch pulling each loop tight and finally securing the end of the laving wire to the wire mesh by looping and/or twisting.*
3. *The use of fasteners shall be in accordance with the manufacturer's recommendations as specified in Section 2.9.A.5 through 2.9.A.7.*

P. Excavation

1. *Excavation for the embedment of the gabion baskets shall conform to the requirements of Section 31 05 13 of this document and as shown on the Construction Drawings.*
2. *Excavation of the sediment trap in which the gabion baskets are placed shall conform to the requirements of Section 31 05 13 of this document and as shown on the Construction Drawings.*

Q. Installation

1. *After assembly, the gabion baskets are set in their final position and are securely joined together along the vertical and top edges of their contact surfaces using the connecting procedure(s) described in Section 3.3.A.*

R. Filling

1. *Baskets shall be filled with rock as specified in Section 31 05 16 of this document. During the filling operation, some manual stone placement is required to minimize voids. It is also recommended to slightly overfill the baskets by 1 to 2 inches to allow for settlement of the rock. The cells shall be filled in stages so that local deformation may be avoided. That is, at no time shall any cell be filled to depth exceeding 1-foot higher than the adjoining cell.*

S. Internal Connecting Wires

1. Internal Connecting Wires with lacing wire shall connect the exposed face of a cell to the adjacent side of the cell. Preformed stiffeners are installed at 45° to the face/side of the unit, extending an equal distance along each side being braced (approximately 1 ft). An exposed face is any side of a gabion cell that will be exposed or unsupported after the structure is completed.

T. Lid Closing

1. Once the gabion baskets are completely full, the lids are pulled tight until the lid meets the perimeter edges of the basket. A tool such as a lid closer can be used. The lid must then be tightly laced and/or fastened along all edges, ends and tops of diaphragm(s) in the same manner as described in Section 3.3.A.

U. Mesh Cutting and Folding

1. Where shown on the drawings or otherwise directed by the engineer, the basket mesh shall be cut, folded and fastened together to suit existing site conditions. The mesh must be cleanly cut and surplus mesh either folded back or overlapped so that it can be securely fastened together with lacing wire or fasteners in the manner described in Section 3.3.A. Any reshaped gabions shall be assembled, installed, filled and closed as specified in the previous sections.

3.4 *Reno Mattress*

A. Assembly

Reno mattress are supplied folded flat and packed in bundles. The units shall be assembled individually by erecting the sides, ends, and diaphragms, ensuring that all panels are in the correct position. All connections should be accomplished using lacing wire or fasteners as described in Section 2.10.4 through 2.10.6 above. The procedure for using lacing wire consist of cutting a sufficient length of work and first looping and/or twisting to secure the lacing wire to the wire mesh. Proceed to lace with alternating double and single loops through every mesh opening approximately every 5 inches (150 mm) pulling each loop tight and finally securing the end of the lacing wire to the wire mesh by looping and/or twisting. The use of fasteners shall be in accordance with the manufacturer's recommendations as described above in Section 2.10.

B. Excavation

1. Excavation for the embedment of the Reno mattress shall conform to the requirements of Section 31 05 13 of this document and as shown on the Construction Drawings.

C. Installation

1. After assembly, the Reno mattresses are set in their final position and are securely joined together along the vertical and top edges of their contact surfaces using the same connecting procedure(s) described in Section 3.4.A.

D. Filling

1. Mattresses shall be filled with rock as specified in Section 31 05 16 of this document. During the filling operation, some manual stone placement is required to minimize voids. It is also recommended to slightly overfill the mattress by 1 inch (25 mm) to allow for settlement and so that the rock is tightly confined by the Reno mattress lid, thereby minimizing any movement of the rock under hydraulic load. Care shall be taken when placing fill material to ensure that the sheathing on the PVC coated baskets is not damaged.

E. Lid Closing

1. Once the Reno mattresses are completely full, the lids are pulled tight until the lid meets the perimeter edges of the basket. A tool such as a lid closer can be used. The lid must then be tightly laced and/or fastened along all edges, ends and tops of diaphragm(s) in the same manner as described in Section 3.4.A.

F. Mesh Cutting and Folding

1. Where shown on the drawings or otherwise directed by the Engineer, the mattress mesh shall be cut, folded and neatly wired to an adjacent mattress face. The cut edges of the mesh shall be securely fastened together with lacing wire or fasteners in the manner described in Section 3.5.A. Any reshaped gabions shall be assembled, installed, filled and closed as specified in the previous sections.

3.5 *Temporary Rail (TYPE K)*

A. K-rails installed as thrust blocks below "T" fitting down drain termination devices per Plan Detail. No. 3

1. Embed K-rail on footing in subgrade as shown on the Plan Detail.

B. K-rails installed along toe of West Basin Access Road.

1. Install and secure K-rails end-to-end along toe of slope. Place K-rail so it does not impede traffic.

3.6 *Eco Block*

A. Eco Blocks installed adjacent to Reno mattresses for Energy Dissipater Devices per Plan Detail No. 8.

1. Embed Eco Block in subgrade as shown on the Plan Detail.

2. Stack Eco Block two blocks high as shown on the Plan Detail and ensure stacked blocks are interlocked with keyways.

3.7 *Sediment Trap 1 and 2 (Sheet C-8) (Details 5, 7, 12, 15 and 16)*

A. Excavate, grade and prepare subgrade soil surface to the limits indicated on Construction Drawings and Plan Details 15 and 16 per the requirements of Specification 31 05 13 of this document.

B. Installation of cut-off walls at upgradient and downgradient limits of Sediment Trap per San Diego Standard Drawing D-72 and as shown on Plan Details and Construction Drawings.

C. Installation of geotextile mat in Sediment Trap Gabion Weir excavations shall conform with the requirements of Section 31 05 19.13 of this document and as shown on the Plan Detail and Construction Drawings.

D. Assembly and installation of gabion baskets (Gabion Weir Structures) per Section 3.3 and as shown on the Plan Detail and Construction Drawings.

E. Forming and installation of concrete sediment trap liner shall conform with requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document and as shown on the Plan Details and Construction Drawings.

F. Installation of Articulated Concrete Block

1. Install Articulated Concrete Block at locations indicated on the Construction Drawings on top of geotextile mat per Plan Details.
2. Anchor concrete mats in place with four (4) 8-inch galvanized ring shank in per mat per Plan Details.
3. The surface elevation of the concrete mats shall be 1/8 inch to ¼ inch above adjacent drainage inlets, concrete collars or inlets, if present.
4. Lippage: No greater than 1/8-inch difference in height between concrete mats.

3.8 *Coarse aggregate channels (Sheets C-1 AND C-2) (Detail 11)*

A. Excavate, grade and prepare subgrade soil surface to the limits indicated on Construction Drawings and Plan Detail 11 per the requirements of Specification 31 05 13 of this document.

B. Installation of geotextile mat in channel excavations shall conform with the requirements of Section 31 05 19.13 of this document and as shown on the Plan Detail and Construction Drawings.

C. Placement of aggregate in channels shall conform to the requirements of Section 31 05 16 of this document and as shown on the Plan Detail and Construction Drawings.

3.9 *Low Flow Crossings (Sheets C-1, C-2, C-5 Through C-9, C-11, C-13, C-14) (Details 6 AND 7)*

A. Subgrade Preparation

1. Vertical depth to accommodate Articulated Concrete Block thickness and cut-off walls.
2. Excavate, grade and prepare subgrade soil surface to the limits indicated in Construction Documents and Plan Detail Nos. 6 and 7 per the requirements of Specification 31 05 13 of this document.
3. Smooth subgrade surface prior to installation of woven geotextile fabric.

B. Installation of Cut-Off-Walls

1. Install Cut-off-walls as shown on Construction Drawings and per City of San Diego Standard Drawing D-72.

C. Installation of geotextile mat shall conform with the requirements of Section 31 05 19.13 of this document and as shown on the Plan Detail and Construction Drawings.

D. Installation of Articulated Concrete Block

1. Install Articulated Concrete Block at locations indicated on the Construction Drawings on top of geotextile mat per Plan Details.
2. Anchor concrete mats in place with four (4) 8-inch galvanized ring shank in per mat per Plan Details.
3. The surface elevation of the concrete mats shall be 1/8 inch to ¼ inch above adjacent drainage inlets, concrete collars or inlets, if present.
4. Lippage: No greater than 1/8-inch difference in height between concrete mats.

3.10 *Energy Dissipater (Sheets C-5, C-8, C-9, C-11, C-13 and C-14) (Detail 8)*

A. Excavation for the placement of geotextile mat, embedment of the Reno mattress and Eco Blocks shall conform to the requirements of Section 31 05 13 of this document and as shown on Plan Detail No. 8 and Construction Drawings.

B. Installation of geotextile mat at Energy Dissipater excavations shall conform with the requirements of Section 31 05 19.13 of this document and as shown on the Plan Detail.

C. Assembly of Reno mattress per Section 3.4 and as shown on the Plan Detail and Construction Drawings.

D. Installation of Eco Blocks adjacent to Reno mattresses per Section 3.6 and as shown on the Plan Detail and Construction Drawings.

E. Installation of riprap adjacent to Reno mattresses and storm drain shall conform with the requirements of Section 31 05 16 of this document, Section and as shown on the Plan Detail and Construction Drawings.

3.11 *Down Drain Termination (Sheets C-2, C-4, C-7 and C-13) (Detail 3)*

A. Excavation for the placement of concrete footing, K-rail, and "T" down drain terminator shall conform to the requirements of Section 31 05 13 of this document and as shown on Plan Detail No. 3 and Construction Drawings.

B. Forming and installation of concrete footing shall conform with requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document and as shown on the Plan Details and Construction Drawings.

C. Forming and installation of cut-off wall shall conform with the requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document, City of San Diego Standard Drawing D-72, and as shown on the Plan Details and Construction Drawings.

D. Installation of K-rail thrust block per Section 3.5.A.

Installation of 36" HDPE or CMP Pipe "T" fitting at drain pipe outfall as shown on the Plan Details and Construction Drawings. "T" fitting shall abut K-rail thrust block as shown the Plan Details. "T" fitting shall be secured to 36" pipe per manufacturer's recommendations.

3.12 *Inlet Protection (Sheets C-2, C-4, C-5 and C-11) (Detail 4)*

A. Excavate, grade and prepare subgrade soil surface to the limits indicated on Construction Drawings and Plan Detail 4 per the requirements of Specification 31 05 13 of this document.

B. Installation of geotextile mat shall conform with the requirements of Section 31 05 19.13 of this document and as shown on the Plan Detail and Construction Drawings.

C. Placement of aggregate shall conform to the requirements of Section 31 05 16 of this document and as shown on the Plan Detail and Construction Drawings.

3.13 *Down Drain 7 headwall improvement (Sheets C-7 and C-8) (Detail 13)*

A. Excavation for the placement of concrete headwall shall conform to the requirements of Section 31 05 13 of this document and as shown on Plan Detail No. 13 and Construction Drawings.

B. Prepare existing concrete surface by cleaning dirt, debris and removing any loose/broken sections of concrete.

C. Forming and installation of concrete headwall shall conform with requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document, and as shown on the Plan Details and Construction Drawings.

3.14 *Down Drain 8 headwall improvement (Sheet C-8) (Detail 14)*

A. Excavation for the placement of concrete headwall shall conform to the requirements of Section 31 05 13 of this document and as shown on Plan Detail No. 13 and Construction Drawings.

B. Prepare existing concrete surface by cleaning dirt, debris and removing any loose/broken sections of concrete.

C. Forming and installation of concrete headwall shall conform with requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00of this document, Modified City of San Diego Standard Detail D-30, and as shown on the Plan Details and Construction Drawings.

3.15 *Down Drain 14 (Sheet C-7)*

A. Relocation and installation of existing 36" diameter HDPE smooth-wall corrugated pipe as shown on the Construction Drawings

B. Anchor on-grade installation of 36" diameter HDPE pipe to ground surface per Caltrans Standard Plan D87B – Plastic Pipe Down Drain Detail (and by reference D87A) modified as necessary to fit 36" diameter pipe, at 15-foot spacing intervals with pipe stake embedment depth of at least 18" unless waste encountered, for which the Engineer of Work shall be notified before proceeding with installation.

C. Installation of Down Drain Termination Structure as indicated on the Construction Drawings and per requirements of Section 3.11.

D. Installation of the Energy Dissipater as indicated on the Construction Drawings and per the requirements of Section 3.10.

3.16 *Down Drain 15 (Sheet C-11) (Detail 19)*

A. Removal and disposal of existing Reno Mats and associated degraded BMP materials per the requirements of Section 31 05 13 of this document and as shown on Plan Detail No. 19 and the Construction Drawings.

B. Fill placement and grading of removed Reno mats area per the requirements of Section 31 05 13 of this document and as shown on Plan Detail and Construction Drawings.

C. Furnish and install 36" diameter HDPE smooth-wall corrugated pipe as shown on the Plan Detail and Construction Drawings.

D. Anchor on-grade installation of 36" diameter HDPE pipe to ground surface per Caltrans Standard Plan D87B – Plastic Pipe Downdrain Detail (and by reference D87A) modified as necessary to fit 36" diameter pipe, at 15-foot spacing intervals with pipe stake embedment depth of at least 18" unless waste encountered, for which the Engineer of Work shall be notified before proceeding with installation.

E. Excavation for the placement of concrete headwall shall conform to the requirements of Section 31 05 13 of this document and as shown on Plan Detail and Construction Drawings.

F. Forming and installation of concrete headwall shall conform with requirements of Sections 03 10 00, 03 20 00, 03 29 00, and 03 30 00 of this document, City of San Diego Standard Detail D-34, and as shown on the Plan Detail and Construction Drawings.

G. Installation of the Energy Dissipater as indicated on the Construction Drawings and per the requirements of Section 3.10.

3.17 *Tapered flume and Down Drain*

A. Excavation for the placement of tapered flume and down drain shall conform to the requirements of Section 31 05 13 of this document and as shown on the Construction Drawings.

B. Install tapered flume and down drain per City of San Diego Standard Detail No. D-23.

3.18 *West sediment basin modification (Sheet C-8)*

A. Excavate and grade basin to the limits indicated on Construction Drawings and Plan Detail per the requirements of Specification 31 05 13 of this document.

3.19 *West basin access road k rail (Sheet C-8)*

A. Installation of K-rail along toe of slope of West Basin Access Road per Section 3.5.B and as shown on the Construction Drawings.

Par 4 MEASUREMENT AND PAYMENT

4.1 *Contract Unit Price Completeness The contract unit price for each of the following civil improvements shall include full compensation for all labor, material and equipment required to construct the improvements in accordance with the Contract Documents, Construction Drawings, Specifications, and manufacturer's recommendations. Quantities installed beyond the limits indicated on the drawings will not be compensated unless previously authorized by the Engineer.*

4.2 *Sediment trap (Sheet C-8) (Details 5, 12, 14 and 15)*

A. The unit price for "Sediment Trap 1" and "Sediment Trap 2" shall include cost for grading, subgrade preparation, and furnish/install of all materials to fully construct the sediment traps per the Plan Details. No separate payment will be made for sediment trap liner, cut off wall, geotextile mat, gabions, , etc.

B. Payment for "Sediment Trap 1" and "Sediment Trap 2" shall be determined by totaling the unit price calculated for acceptable completion of "Sediment Trap 1" and "Sediment Trap 2."

4.3 *Coarse aggregate channel (Sheets C-1 and C-2) (Detail 11)*

A. The unit price for "Coarse Aggregate Channel" shall include cost for grading, subgrade preparation, and furnish/install of all materials required to fully construct the coarse aggregate channel per the Plan Detail. No separate payment will be made for geotextile mat, coarse aggregate, etc.

B. Payment for "Coarse Aggregate Channel" shall be determined by multiplying the accepted number of square feet of the completed improvements by the unit price in the contract.

4.4 *Low Flow Crossing (Sheets C-1, C-2, C-5 through C-9, C-11, C-13, C-14) (Details 6 and 7)*

A. The unit price for each "Low Flow Crossing" shall include cost for grading, subgrade preparation, and furnish/install of all materials required to fully construct the crossings per the Plan Detail. No separate payment will be made for geotextile mat, articulated concrete block, etc.

B. Payment for "Low Flow Crossings" shall be for each completed "Low Flow Crossing" at the unit price in the contract.

4.5 *Energy dissipater (Sheets C-5, C-8, C-9, C-11, C-13 and C-14) (Detail 8)*

A. The unit price for "Energy Dissipater" shall include cost for grading, subgrade preparation, and furnish/install of all materials required to fully construct the energy dissipater per the Plan Detail. No separate payment will be made for geotextile mat, Eco Block, Reno mattress, etc.

B. Payment for "Energy Dissipater" shall be determined by multiplying the accepted number of installations completed by the unit price in the contract.

4.6 *Down Drain Termination (Sheets C-2, C-3, C-7 and C-13) (Detail 3)*

A. The unit price for "Down Drain Termination" shall include cost for grading, subgrade preparation, and furnish/install of all materials required to fully construct the down drain

termination per the Plan Detail. No separate payment will be made for concrete footing, cut-off wall, HDPE Tee, CMP Tee, HDPE connector pipe, CMP connector pipe, K rail, etc.

B. Payment for "Down Drain Termination" shall be determined by multiplying the accepted number of installations completed by the unit price in the contract.

4.7 *Inlet Protection (Sheets C-2, C-4, C-5 and C-11) (Detail 4)*

A. The unit price for "Inlet Protection" shall include cost for grading, subgrade preparation, and furnish/install of all materials required to fully construct the inlet protection per the Plan Detail. No separate payment will be made for geotextile mat, rip rap, etc.

B. Payment for "Inlet Protection" shall be determined by multiplying the accepted number of installations completed by the unit price in the contract.

4.8 *Down Drain 7 headwall improvement (Sheets C-7 and C-18) (Detail 13)*

A. The unit price for "Down Drain 7 Headwall Improvement" shall include cost for concrete forming and placement and furnish/install of all materials required to fully construct the headwall improvement per the Plan Detail. No separate payment will be made for concrete, rebar etc.

B. Payment for "Down Drain 7 Headwall Improvement" shall be determined by the accepted installation completed by the unit price in the contract.

4.9 *Down Drain 8 headwall improvement (Sheets C-8 and C-18) (Detail 14)*

A. The unit price for "Down Drain 8 Headwall Improvement" shall include cost for concrete forming and placement and furnish/install of all materials required to fully construct the headwall improvement per the Plan Detail. No separate payment will be made for concrete, rebar etc.

B. Payment for "Down Drain 8 Headwall Improvement" shall be determined by the accepted installation completed by the unit price in the contract.

4.10 *Down Drain 14 Re-Alignment (Sheet C-7)*

A. The unit price for "Down Drain 14 Re-Alignment" shall include labor cost and furnish/install of all materials (i.e. new anchor system) required to fully construct the realigned down drain per the Construction Plans. It is assumed the existing down drain pipe will be reused and no separate payment will be made for HDPE pipe material.

B. Payment for "Down Drain 14 Re-Alignment" shall be determined by the accepted installation completed by the unit price in the contract.

4.11 *Down Drain 15 installation (Sheets C-11 and C-19) (Detail 19)*

A. The unit price for "Down Drain 15 Installation" shall include cost for removing existing Reno Mattress, grading, compaction, installation of new drown drain, and headwall, and furnish/install of all materials required to fully construct the down drain per the Plan Detail. No separate payment will be made for HDPE pipe, anchor systems, concrete, rebar etc.

B. Payment for "Down Drain 15 Installation" shall be determined by the accepted installation completed by the unit price in the contract.

4.12 *West sediment basin modification (Sheet C-8)*

A. Full compensation for all labor, material, and equipment required to perform excavation and fills including transport, placement, and compaction of the material in designated fills as indicated on the Plan Detail and Construction Drawings shall be included in the Contractor's unit price.

B. Final pay quantities shall be determined by comparing the volumetric difference between the pre-construction and post-construction topographic surveys of the excavated and fill areas. The pre- and post-construction topographic surveys will be commissioned by the

C. City at no cost to the Contractor. Fill placed beyond the limits indicated on the drawings will not be compensated unless previously approved by the Engineer.

4.13 *West basin access road k rail (Sheet C-8)*

A. The unit price for "West Basin Access Road K rail" shall include cost for installation of K rail and furnish/install of all materials and equipment required to fully install K rail per the Construction Drawings. No separate payment will be made for excavation for embedment of the K rail.

B. Payment for "West Basin Access Road K rail" shall be determined by the accepted number of K rails installed multiplied by the unit price in the contract.

4.14 *TYPE 2 ENERGYDISSIPATERS*

A. The unit price for "Type 2 Energy Dissipaters" shall include costs for grading, subgrade preparation, and furnish/install of all materials required to fully construct the structures per the standard detail. No separate payment will be made for geotextile, aggregate, etc.

B. Payment for "Type 2 Energy Dissipaters" shall be determined by multiplying the accepted number of installations completed by the unit price in the contract.

4.15 *Tapered inlet and down drain Flume*

A. Installation of the tapered inlet and down drain flume as indicated on the Construction Drawings and per City of San Diego Standard Detail D-23, and as shown on the Plan Details and Construction Drawings.

END OF SECTION

Section 34 71 00
Roadway Construction

PART 1 - GENERAL

1.1 *WORK OF THIS SECTION*

A. The Contractor shall furnish all labor, materials, tools, supervision, transportation, equipment, and incidentals necessary for the construction of roadways, including Graded Gravel Roads with Drainage Ditches and Gravel Surfacing. The work shall be carried out as specified herein and in accordance with the Construction Drawings.

B. The work shall include, but not be limited to, delivery, storage, and placement of the various road construction components of the project.

1.2 *RELATED SECTIONS*

A. The Work of the following Sections applies to the Work of this Section. Other Sections, not referenced below, shall also apply to the extent required for proper performance of this Work.

1. Section 01 33 00 Submittals
2. Section 01 55 26 Traffic Control
3. Section 01 57 26 Site Watering for Dust Control
4. Section 01 57 23 Temporary Storm Water Pollution Controls
5. Section 01 56 00 Environmental Protection
6. Section 31 05 13 Soils for Earthwork
7. Section 31 05 16 Aggregates for Earthwork
8. Section 31 05 19.13 Geotextiles
9. Section 31 14 13.16 Soil Stockpiling
10. Section 31 22 16.13 Subgrade Reshaping
11. Section 31 25 14 Erosion and Sedimentation Control

1.3 *REFERENCE SPECIFICATIONS, CODES AND STANDARDS*

Except as otherwise indicated in this Section, the Contractor shall comply with the latest adopted edition of the Standard Specifications for Public Works Construction (SSPWC)["Greenbook"] together with the latest adopted editions of the City of San Diego Supplemental Amendments ("Whitebook").

1.4 *Contractor SUBMITTALS*

A. The Contractor shall submit, in writing, materials testing reports, job-mix formulas, and other pertinent information satisfactory to the Engineer, demonstrating that materials and methods

Contractor proposes to use will comply with the provisions of this Section. Submittals shall be in accordance with the requirements of Section 01 33 00 - Submittals.

B. Suitability Tests of Proposed Materials: For materials not produced by a supplier currently authorized by the City Materials and Testing Lab, tests for conformance with the Specifications shall be performed before start of the Work. The samples shall be identified to show the name of the material, aggregate source, name of the supplier, contract number, and the segment of the Work where the material represented by the sample is to be used. Results of all tests shall be submitted to the Construction Manager for approval. Materials to be tested shall include concrete.

C. The Contractor shall submit certification and test records of all proposed materials showing that they meet the applicable requirements.

1.5 *QUALITY ASSURANCE*

A. Quality assurance testing will be provided by the City Materials and Testing Lab. This does not relieve the Contractor from securing the necessary construction control testing during construction when required by the contract documents.

PART 2 - Materials

2.1 *WOVEN GEOTEXTILE MAT (HIGH TENSILE STRENGTH)*

A. Woven geotextile mat (high tensile strength) shall conform to the requirements of Section 31 05 19.13 of this document.

2.2 *Aggregate*

A. Aggregate shall conform to the requirements of Section 31 05 16 of this document.

PART 3 - EXECUTION

3.1 *Soil for Earthwork*

A. Soil for Earthwork shall conform to the requirements of Section 31 05 13 of this document.

3.2 *Roadway Subgrade Reshaping*

A. Roadway subgrade reshaping shall conform to the requirements of Section 31 05 13 of this document.

3.3 *Woven Geotextile Mat (HIGH TENSILE STRENGTH)*

A. Installation of woven geotextile mat (high tensile strength) shall conform to the requirements of Section 31 05 19.13 of this document and as shown on the Construction Drawings.

3.4 *Aggregate*

A. Installation of aggregate shall conform to the requirements of Section 31 05 16 of this document and as shown on the Construction Drawings.

PART 4 - MEASUREMENT AND PAYMENT

4.1 *Contract Unit Price Completeness*

A. The contract unit price for each of the following civil improvements shall include full compensation for all labor, material and equipment required to construct the improvements in accordance with the Contract Documents, Construction Drawings, Specifications, and manufacturer's recommendations. Quantities installed beyond the limits indicated on the drawings will not be compensated unless previously authorized by the Engineer.

4.2 *Graded Gravel Roads with roadside Ditches (Detail 1)*

A. Full compensation for all labor, material, and equipment required to construct the "Graded Gravel Roads with Roadside Ditches" including grading (cut and fill), subgrade preparation, and placement of geotextile and aggregate as indicated on the Plan Detail and Construction Drawings shall be included in the Contractor's unit price.

B. Payment for "Graded Gravel Roads with Roadside Ditches" shall be determined by multiplying the accepted number of square feet of the completed improvements by the unit price in the contract.

C. Final pay quantities shall be determined by the completed square footage as determined by the pre-construction and post-construction topographic surveys of the graded gravel roads and roadside ditches. The pre- and post-construction topographic surveys will be commissioned by the City at no cost to the Contractor. Materials placed beyond the limits indicated on the drawings will not be compensated unless previously approved by the Engineer.

4.3 *Gravel Surfacing (Detail 2)*

A. Full compensation for all labor, material, and equipment required to construct the "Gravel Surfaces" including subgrade preparation, and placement of geotextile and aggregate as indicated on the Plan Detail and Construction Drawings shall be included in the Contractor's unit price.

B. Payment for "Gravel Surfaces" shall be determined by multiplying the accepted number of square feet of the completed improvements by the unit price in the contract.

C. Final pay quantities shall be determined by the completed square footage as determined by the pre-construction and post-construction topographic surveys of the gravel surfaces. The pre- and post-construction topographic surveys will be commissioned by the City at no cost to the Contractor. Materials placed beyond the limits indicated on the drawings will not be compensated unless previously approved by the Engineer.

END OF SECTION

SUPPLEMENTARY SPECIAL PROVISIONS

APPENDICES

APPENDIX A

CEQA SECTION 15162 CONSISTENCY EVALUATION

THE CITY OF SAN DIEGO

MEMORANDUM

DATE: March 6, 2018

TO: Craig Fergusson, Senior Civil Engineer, Environmental Services Department

FROM: Elena Pascual, Junior Planner, Planning Department

SUBJECT: Miramar Landfill Storm Water Conveyance Improvements Project - 15162 Evaluation

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The CEQA Section of the Environmental & Policy Analysis Division of the Planning Department has completed a California Environmental Quality Act (CEQA) Section 15162 consistency evaluation for the Miramar Landfill Storm Water Improvements project by the City of San Diego's Environmental Services Department (ESD), which is described in greater detail as follows.

Previously Certified CEQA Document

On July 13, 2007, the San Diego City Council certified a Final Environmental Impact Report (FEIR) for the Miramar Service Life Extension / Height Increase project (Project No. 122833 / SCH No. 2006051004).

Background

On July 13, 2007, the San Diego City Council certified the Final Environmental Impact Report (FEIR) for the Miramar Service Life Extension / Height Increase project (Project No. 122833 / SCH No. 2006051004). The FEIR, which analyzed the environmental effects associated with increasing the permitted height of the West Miramar Landfill, also addressed the modifications and maintenance that would need to be made to the existing drainage control system to accommodate the landfill's vertical expansion.

Scope of Proposed Activity

The proposed project is a Best Management Practices (BMP) implementation project. The project includes the design and implementation of source control BMPs to reduce sediment and other pollutants in storm water discharges at the West Miramar Waste Disposal Facility. Implemented BMPs will include improving storm water conveyance, construction of storm drain modifications at sediment basin inlets, stabilization of access roads, and additional erosion, sediment, and run-off controls within the existing, disturbed landfill footprint.

CEQA Guidelines Section 15162 Consistency Evaluation

The CEQA Section of the Environment & Policy Analysis Division of the Planning Department

has reviewed the proposed Best Management Practices (BMP) implementation project and has found that the project is consistent with the proposed project analyzed in the 2007 FEIR. Implementation of the proposed project, which includes designing and implementing source control BMPs to reduce sediment and other pollutants in storm water discharge, lists improvements to the existing drainage system consistent with those analyzed in the 2007 FEIR. Thus, the proposed project would be consistent with the 2007 FEIR in accordance with CEQA Guidelines Section 15162 and Public Resources Code Section 21166.

Section 15162 Criteria

When an EIR has been certified or a negative declaration adopted for a project, no subsequent EIR shall be prepared for that project unless the lead agency determines, on the basis of substantial evidence in the light of the whole record, one or more of the following:

(1) Substantial changes are proposed in the project which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

(2) Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR or negative declaration due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects; or

(3) New information of substantial importance, which was not known and could not have been known with the exercise of reasonable diligence at the time the previous EIR was certified as complete or the negative declaration was adopted, shows any of the following:

(A) The project will have one or more significant effects not discussed in the previous EIR or negative declaration;

(B) Significant effects previously examined will be substantially more severe than shown in the previous EIR;

(C) Mitigation measures or alternatives previously found not to be feasible would in fact be feasible and would substantially reduce one or more significant effects of the project, but the project proponents decline to adopt the mitigation measure or alternative; or

(D) Mitigation measures or alternatives which are considerably different from those analyzed in the previous EIR would substantially reduce one or more significant effects on the environment, but the project proponents decline to adopt the mitigation measure or alternative.

None of the three criteria listed above has occurred, therefore the CEQA Section of the Environmental & Policy Analysis Division of the Planning Department determined there is no need to prepare subsequent or supplemental environmental documents for the proposed project.

CEQA 15162 Consistency Evaluation

The CEQA Section of the Environmental & Policy Analysis Division of the Planning Department reviewed the proposed project and conducted a CEQA Section 15162 consistency evaluation pursuant to Public Resources Code 21166 and CEQA Guidelines Section 15162. The proposed project would not result in new significant direct, indirect, or cumulative impacts over and above those disclosed in the previously certified 2007 FEIR.

Elena Pascual

_____

Elena Pascual
Junior Planner
Planning Department

cc: Rebecca Malone, Senior Planner, Planning Department

APPENDIX B

FIRE HYDRANT METER PROGRAM

CITY OF SAN DIEGO CALIFORNIA DEPARTMENT INSTRUCTIONS	NUMBER DI 55.27	DEPARTMENT Water Department
SUBJECT FIRE HYDRANT METER PROGRAM (FORMERLY: CONSTRUCTION METER PROGRAM)	PAGE 1 OF 10	EFFECTIVE DATE October 15, 2002
	SUPERSEDES DI 55.27	DATED April 21, 2000

1. **PURPOSE**

1.1 To establish a Departmental policy and procedure for issuance, proper usage and charges for fire hydrant meters.

2. **AUTHORITY**

2.1 All authorities and references shall be current versions and revisions.

2.2 San Diego Municipal Code (NC) Chapter VI, Article 7, Sections 67.14 and 67.15

2.3 Code of Federal Regulations, Safe Drinking Water Act of 1986

2.4 California Code of Regulations, Titles 17 and 22

2.5 California State Penal Code, Section 498B.0

2.6 State of California Water Code, Section 110, 500-6, and 520-23

2.7 Water Department Director

Reference

2.8 State of California Guidance Manual for Cross Connection Programs

2.9 American Water Works Association Manual M-14, Recommended Practice for Backflow Prevention

2.10 American Water Works Association Standards for Water Meters

2.11 U.S.C. Foundation for Cross Connection Control and Hydraulic Research Manual

3. **DEFINITIONS**

3.1 **Fire Hydrant Meter:** A portable water meter which is connected to a fire hydrant for the purpose of temporary use. (These meters are sometimes referred to as Construction Meters.)

3.2 **Temporary Water Use:** Water provided to the customer for no longer than twelve (12) months.

3.3 **Backflow Preventor:** A Reduced Pressure Principal Assembly connected to the outlet side of a Fire Hydrant Meter.

4. POLICY

4.1 The Water Department shall collect a deposit from every customer requiring a fire hydrant meter and appurtenances prior to providing the meter and appurtenances (see Section 7.1 regarding the Fees and Deposit Schedule). The deposit is refundable upon the termination of use and return of equipment and appurtenances in good working condition.

4.2 Fire hydrant meters will have a 2 ½" swivel connection between the meter and fire hydrant. The meter shall not be connected to the 4" port on the hydrant. All Fire Hydrant Meters issued shall have a Reduced Pressure Principle Assembly (RP) as part of the installation. Spanner wrenches are the only tool allowed to turn on water at the fire hydrant.

4.3 The use of private hydrant meters on City hydrants is prohibited, with exceptions as noted below. All private fire hydrant meters are to be phased out of the City of San Diego. All customers who wish to continue to use their own fire hydrant meters must adhere to the following conditions:

a. Meters shall meet all City specifications and American Water Works Association (AWWA) standards.

b. Customers currently using private fire hydrant meters in the City of San Diego water system will be allowed to continue using the meter under the following conditions:

1. The customer must submit a current certificate of accuracy and calibration results for private meters and private backflows annually to the City of San Diego, Water Department, Meter Shop.

2. The meter must be properly identifiable with a clearly labeled serial number on the body of the fire hydrant meter. The serial number shall be plainly stamped on the register lid and the main casing. Serial numbers shall be visible from the top of the meter casing and the numbers shall be stamped on the top of the inlet casing flange.

3. All meters shall be locked to the fire hydrant by the Water Department, Meter Section (see Section 4.7).

4. All meters shall be read by the Water Department, Meter Section (see Section 4.7).

5. All meters shall be relocated by the Water Department, Meter Section (see Section 4.7).

6. These meters shall be tested on the anniversary of the original test date and proof of testing will be submitted to the Water Department, Meter Shop, on a yearly basis. If not tested, the meter will not be allowed for use in the City of San Diego.

7. All private fire hydrant meters shall have backflow devices attached when installed.

8. The customer must maintain and repair their own private meters and private backflows.

9. The customer must provide current test and calibration results to the Water Department, Meter Shop after any repairs.

10. When private meters are damaged beyond repair, these private meters will be replaced by City owned fire hydrant meters.

11. When a private meter malfunctions, the customer will be notified and the meter will be removed by the City and returned to the customer for repairs. Testing and calibration results shall be given to the City prior to any re-installation.

12. The register shall be hermetically sealed straight reading and shall be readable from the inlet side. Registration shall be in hundred cubic feet.

13. The outlet shall have a 2 ½ "National Standards Tested (NST) fire hydrant male coupling.

14. Private fire hydrant meters shall not be transferable from one contracting company to another (i.e. if a company goes out of business or is bought out by another company).

4.4 All fire hydrant meters and appurtenances shall be installed, relocated and removed by the City of San Diego, Water Department. All City owned fire hydrant meters and appurtenances shall be maintained by the City of San Diego, Water Department, Meter Services.

4.5 If any fire hydrant meter is used in violation of this Department Instruction, the violation will be reported to the Code Compliance Section for investigation and appropriate action. Any customer using a fire hydrant meter in violation of the requirements set forth above is subject to fines or penalties pursuant to the Municipal Code, Section 67.15 and Section 67.37.

4.6 **Conditions and Processes for Issuance of a Fire Hydrant Meter**

Process for Issuance

a. Fire hydrant meters shall only be used for the following purposes:

1. Temporary irrigation purposes not to exceed one year.

2. Construction and maintenance related activities (see Tab 2).

b. No customer inside or outside the boundaries of the City of San Diego Water Department shall resell any portion of the water delivered through a fire hydrant by the City of San Diego Water Department.

c. The City of San Diego allows for the issuance of a temporary fire hydrant meter for a period not to exceed 12 months (365 days). An extension can only be granted in writing from the Water Department Director for up to 90 additional days. A written request for an extension by the consumer must be submitted at least 30 days prior to the 12 month period ending. No extension shall be granted to any customer with a delinquent account with the Water Department. No further extensions shall be granted.

d. Any customer requesting the issuance of a fire hydrant meter shall file an application with the Meter Section. The customer must complete a "Fire Hydrant Meter Application" (Tab 1) which includes the name of the company, the party responsible for payment, Social Security number and/or California ID, requested location of the meter (a detailed map signifying an exact location), local contact person, local phone number, a contractor's license (or a business license), description of specific water use, duration of use at the site and full name and address of the person responsible for payment.

e. At the time of the application the customer will pay their fees according to the schedule set forth in the Rate Book of Fees and Charges, located in the City Clerk's Office. All fees must be paid by check, money order or cashiers check, made payable to the City Treasurer. Cash will not be accepted.

f. No fire hydrant meters shall be furnished or relocated for any customer with a delinquent account with the Water Department.

g. After the fees have been paid and an account has been created, the

meter shall be installed within 48 hours (by the second business day). For an additional fee, at overtime rates, meters can be installed within 24 hours (within one business day).

4.7 **Relocation of Existing Fire Hydrant Meters**

a. The customer shall call the Fire Hydrant Meter Hotline (herein referred to as "Hotline"), a minimum of 24 hours in advance, to request the relocation of a meter. A fee will be charged to the existing account, which must be current before a work order is generated for the meter's relocation.

b. The customer will supply in writing the address where the meter is to be relocated (map page, cross street, etc). The customer must update the original Fire Hydrant Meter Application with any changes as it applies to the new location.

c. Fire hydrant meters shall be read on a monthly basis. While fire hydrant meters and backflow devices are in service, commodity, base fee and damage charges, if applicable, will be billed to the customer on a monthly basis. If the account becomes delinquent, the meter will be removed.

4.8 **Disconnection of Fire Hydrant Meter**

a. After ten (10) months a "Notice of Discontinuation of Service" (Tab 3) will be issued to the site and the address of record to notify the customer of the date of discontinuance of service. An extension can only be granted in writing from the Water Department Director for up to 90 additional days (as stated in Section 4.6C) and a copy of the extension shall be forwarded to the Meter Shop Supervisor. If an extension has not been approved, the meter will be removed after twelve (12) months of use.

b. Upon completion of the project the customer will notify the Meter Services office via the Hotline to request the removal of the fire hydrant meter and appurtenances. A work order will be generated

for removal of the meter.

c. Meter Section staff will remove the meter and backflow prevention assembly and return it to the Meter Shop. Once returned to the Meter Shop the meter and backflow will be tested for accuracy and functionality.

d. Meter Section Staff will contact and notify Customer Services of the final read and any charges resulting from damages to the meter and backflow or its appurtenance. These charges will be added on the customer's final bill and will be sent to the address of record. Any customer who has an outstanding balance will not receive additional meters.

e. Outstanding balances due may be deducted from deposits and any balances refunded to the customer. Any outstanding balances will be turned over to the City Treasurer for collection. Outstanding balances may also be transferred to any other existing accounts.

5. EXCEPTIONS

5.1 Any request for exceptions to this policy shall be presented, in writing, to the Customer Support Deputy Director, or his/her designee for consideration.

6. MOBILE METER

6.1 Mobile meters will be allowed on a case by case basis. All mobile meters will be protected by an approved backflow assembly and the minimum requirement will be a Reduced Pressure Principal Assembly. The two types of Mobile Meters are vehicle mounted and floating meters. Each style of meters has separate guidelines that shall be followed for the customer to retain service and are described below:

a) **Vehicle Mounted Meters**: Customer applies for and receives a City owned Fire Hydrant Meter from the Meter Shop. The customer mounts the meter on the vehicle and brings it to the Meter Shop for

inspection. After installation is approved by the Meter Shop the vehicle and meter shall be brought to the Meter Shop on a monthly basis for meter reading and on a quarterly basis for testing of the backflow assembly. Meters mounted at the owner's expense shall have the one year contract expiration waived and shall have meter or backflow changed if either fails.

b) **Floating Meters**: Floating Meters are meters that are not mounted to a vehicle. **(Note: All floating meters shall have an approved backflow assembly attached.)** The customer shall submit an application and a letter explaining the need for a floating meter to the Meter Shop. The Fire Hydrant Meter Administrator, after a thorough review of the needs of the customer, (i.e. number of jobsites per day, City contract work, lack of mounting area on work vehicle, etc.), may issue a floating meter. At the time of issue, it will be necessary for the customer to complete and sign the "Floating Fire Hydrant Meter Agreement" which states the following:

    1) The meter will be brought to the Meter Shop at 2797 Caminito Chollas, San Diego on the third week of each month for the monthly read by Meter Shop personnel.

    2) Every other month the meter will be read and the backflow will be tested. This date will be determined by the start date of the agreement.

If any of the conditions stated above are not met the Meter Shop has the right to cancel the contract for floating meter use and close the account associated with the meter. The Meter Shop will also exercise the right to refuse the issuance of another floating meter to the company in question.

Any Fire Hydrant Meter using reclaimed water shall not be allowed use again with any potable water supply. The customer shall incur the cost of replacing the meter and backflow device in this instance.

7. FEE AND DEPOSIT SCHEDULES

7.1 **Fees and Deposit Schedules:** The fees and deposits, as listed in the Rate Book of Fees and Charges, on file with the Office of the City Clerk, are based on actual reimbursement of costs of services performed, equipment and materials. Theses deposits and fees will be amended, as needed, based on actual costs. Deposits, will be refunded at the end of the use of the fire hydrant meter, upon return of equipment in good working condition and all outstanding balances on account are paid. Deposits can also be used to cover outstanding balances.

All fees for equipment, installation, testing, relocation and other costs related to this program are subject to change without prior notification. The Mayor and Council will be notified of any future changes.

8. UNAUTHORIZED USE OF WATER FROM A HYDRANT

8.1 Use of water from any fire hydrant without a properly issued and installed fire hydrant meter is theft of City property. Customers who use water for unauthorized purposes or without a City of San Diego issued meter will be prosecuted.

8.2 If any unauthorized connection, disconnection or relocation of a fire hydrant meter, or other connection device is made by anyone other than authorized Water Department personnel, the person making the connection will be prosecuted for a violation of San Diego Municipal Code, Section 67.15. In the case of a second offense, the customer's fire hydrant meter shall be confiscated and/or the deposit will be forfeited.

8.3 Unauthorized water use shall be billed to the responsible party. Water use charges shall be based on meter readings, or estimates when meter readings are not available.

8.4 In case of unauthorized water use, the customer shall be billed for all applicable charges as if proper authorization for the water use had been obtained, including but not limited to bi-monthly service charges, installation charges and removal charges.

8.5 If damage occurs to Water Department property (i.e. fire hydrant meter, backflow, various appurtenances), the cost of repairs or replacements will be charged to the customer of record (applicant).

Water Department Director

Tabs: 1. Fire Hydrant Meter Application
2. Construction & Maintenance Related Activities With No Return To Sewer
3. Notice of Discontinuation of Service

APPENDIX

Administering Division: Customer Support Division

Subject Index:
Construction Meters
Fire Hydrant
Fire Hydrant Meter Program
Meters, Floating or Vehicle Mounted
Mobile Meter
Program, Fire Hydrant Meter

Distribution: DI Manual Holders

Application for Fire Hydrant Meter (EXHIBIT A)

City of San Diego PUBLIC UTILITIES Water & Wastewater

(For Office Use Only)

NS REQ	FAC#
DATE	BY

METER SHOP (619) 527-7449

Application Date	Requested Install Date:

Meter Information

Fire Hydrant Location: (Attach Detailed Map//Thomas Bros. Map Location or Construction drawing.) Zip:	T.B.	G.B. (CITY USE)
Specific Use of Water:		
Any Return to Sewer or Storm Drain, If so , explain:		
Estimated Duration of Meter Use:	☐	Check Box if Reclaimed Water

Company Information

Company Name:			
Mailing Address:			
City:	State:	Zip:	Phone: ( )
*Business license#	*Contractor license#		
A Copy of the Contractor's license OR Business License is required at the time of meter issuance.			
Name and Title of Billing Agent: (PERSON IN ACCOUNTS PAYABLE)			Phone: ( )
Site Contact Name and Title:			Phone: ( )
Responsible Party Name:			Title:
Cal ID#			Phone: ( )
Signature:		Date:	

Guarantees Payment of all Charges Resulting from the use of this Meter. Insures that employees of this Organization understand the proper use of Fire Hydrant Meter

☐ Fire Hydrant Meter Removal Request		Requested Removal Date:
Provide Current Meter Location if Different from Above:		
Signature:	Title:	Date:
Phone: ( )	Pager: ( )	

☐ City Meter	☐ Private Meter	
Contract Acct #:	Deposit Amount: $ 936.00	Fees Amount: $ 62.00
Meter Serial #	Meter Size: 05	Meter Make and Style: 6-7
Backflow #	Backflow Size:	Backflow Make and Style:
Name:	Signature:	Date:

WATER USES WITHOUT ANTICIPATED CHARGES FOR RETURN TO SEWER

Auto Detailing
Backfilling
Combination Cleaners (Vactors)
Compaction
Concrete Cutters
Construction Trailers
Cross Connection Testing
Dust Control
Flushing Water Mains
Hydro Blasting
Hydro Seeing
Irrigation (for establishing irrigation only; not continuing irrigation)
Mixing Concrete
Mobile Car Washing
Special Events
Street Sweeping
Water Tanks
Water Trucks
Window Washing

Note:

1. If there is any return to sewer or storm drain, then sewer and/or storm drain fees will be charges.

Date

Name of Responsible Party
Company Name and Address
Account Number:_____

Subject: Discontinuation of Fire Hydrant Meter Service

Dear Water Department Customer:

The authorization for use of Fire Hydrant Meter #_____, located at *(Meter Location Address)* ends in 60 days and will be removed on or after *(Date Authorization Expires)*. Extension requests for an additional 90 days must be submitted in writing for consideration 30 days prior to the discontinuation date. If you require an extension, please contact the Water Department, or mail your request for an extension to:

City of San Diego
Water Department
Attention: Meter Services
2797 Caminito Chollas
San Diego, CA 92105-5097

Should you have any questions regarding this matter, please call the Fire Hydrant Hotline at (619)_____-_____.

Sincerely,

Water Department

APPENDIX C

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

MATERIALS TYPICALLY ACCEPTED BY CERTIFICATE OF COMPLIANCE

1. Soil amendment
2. Fiber mulch
3. PVC or PE pipe up to 16 inch diameter
4. Stabilizing emulsion
5. Lime
6. Preformed elastomeric joint seal
7. Plain and fabric reinforced elastomeric bearing pads
8. Steel reinforced elastomeric bearing pads
9. Waterstops (Special Condition)
10. Epoxy coated bar reinforcement
11. Plain and reinforcing steel
12. Structural steel
13. Structural timber and lumber
14. Treated timber and lumber
15. Lumber and timber
16. Aluminum pipe and aluminum pipe arch
17. Corrugated steel pipe and corrugated steel pipe arch
18. Structural metal plate pipe arches and pipe arches
19. Perforated steel pipe
20. Aluminum underdrain pipe
21. Aluminum or steel entrance tapers, pipe downdrains, reducers, coupling bands and slip joints
22. Metal target plates
23. Paint (traffic striping)
24. Conductors
25. Painting of electrical equipment
26. Electrical components
27. Engineering fabric
28. Portland Cement
29. PCC admixtures
30. Minor concrete, asphalt
31. Asphalt (oil)
32. Liquid asphalt emulsion
33. Epoxy

APPENDIX D

SAMPLE CITY INVOICE WITH SPEND CURVE

City of San Diego, CM&FS Div., 9753 Chesapeake Drive, SD CA 92123

Project Name:

Work Order No or Job Order No.

City Purchase Order No.

Resident Engineer (RE):

RE Phone#: Fax#:

Contractor's Name:

Contractor's Address:

Contractor's Phone #:

Contractor's fax #:

Contact Name:

Invoice No.

Invoice Date:

Billing Period: (To)

Item #	Item Description	Contract Authorization				Previous Totals To Date		This Estimate		Totals to Date	
		Unit	Price	Qty	Extension	%/QTY	Amount	% / QTY	Amount	% / QTY	Amount
1					$ -		$ -		$ -	0.00	$ -
2					$ -		$ -		$ -	0.00%	$ -
3					$ -		$ -		$ -	0.00%	$ -
4					$ -		$ -		$ -	0.00%	$ -
5					$ -		$ -		$ -	0.00%	$ -
6					$ -		$ -		$ -	0.00%	$ -
7					$ -		$ -		$ -	0.00%	$ -
8					$ -		$ -		$ -	0.00%	$ -
5					$ -		$ -		$ -	0.00%	$ -
6					$ -		$ -		$ -	0.00%	$ -
7					$ -		$ -		$ -	0.00%	$ -
8					$ -		$ -		$ -	0.00%	$ -
9					$ -		$ -		$ -	0.00%	$ -
10					$ -		$ -		$ -	0.00%	$ -
11					$ -		$ -		$ -	0.00%	$ -
12					$ -		$ -		$ -	0.00%	$ -
13					$ -		$ -		$ -	0.00%	$ -
14					$ -		$ -		$ -	0.00%	$ -
15					$ -		$ -		$ -	0.00%	$ -
16					$ -		$ -		$ -	0.00%	$ -
17	**Field Orders**				$ -		$ -		$ -	0.00%	$ -
					$ -		$ -		$ -	0.00%	$ -
	CHANGE ORDER No.				$ -		$ -		$ -	0.00%	$ -
					$ -		$ -		$ -	0.00%	$ -
	Total Authorized Amount (including approved Change Order)				**$ -**		**$ -**		$ -	**Total Billed**	$ -

SUMMARY

A. Original Contract Amount	$	-
B. Approved Change Order #00 Thru #00	$	-
C. Total Authorized Amount (A+B)	$	-
D. Total Billed to Date	$	-
E. Less Total Retention (5% of D)	$	-
F. Less Total Previous Payments	$	-
G. Payment Due Less Retention		**$0.00**
H. Remaining Authorized Amount		$0.00

I certify that the materials have been received by me in the quality and quantity specified

_____

Resident Engineer

_____

Construction Engineer

Retention and/or Escrow Payment Schedule

Total Retention Required as of this billing (Item E)	$0.00
Previous Retention Withheld in PO or in Escrow	$0.00
Add'l Amt to Withhold in PO/Transfer in Escrow:	***$0.00***
Amt to Release to Contractor from PO/Escrow:	

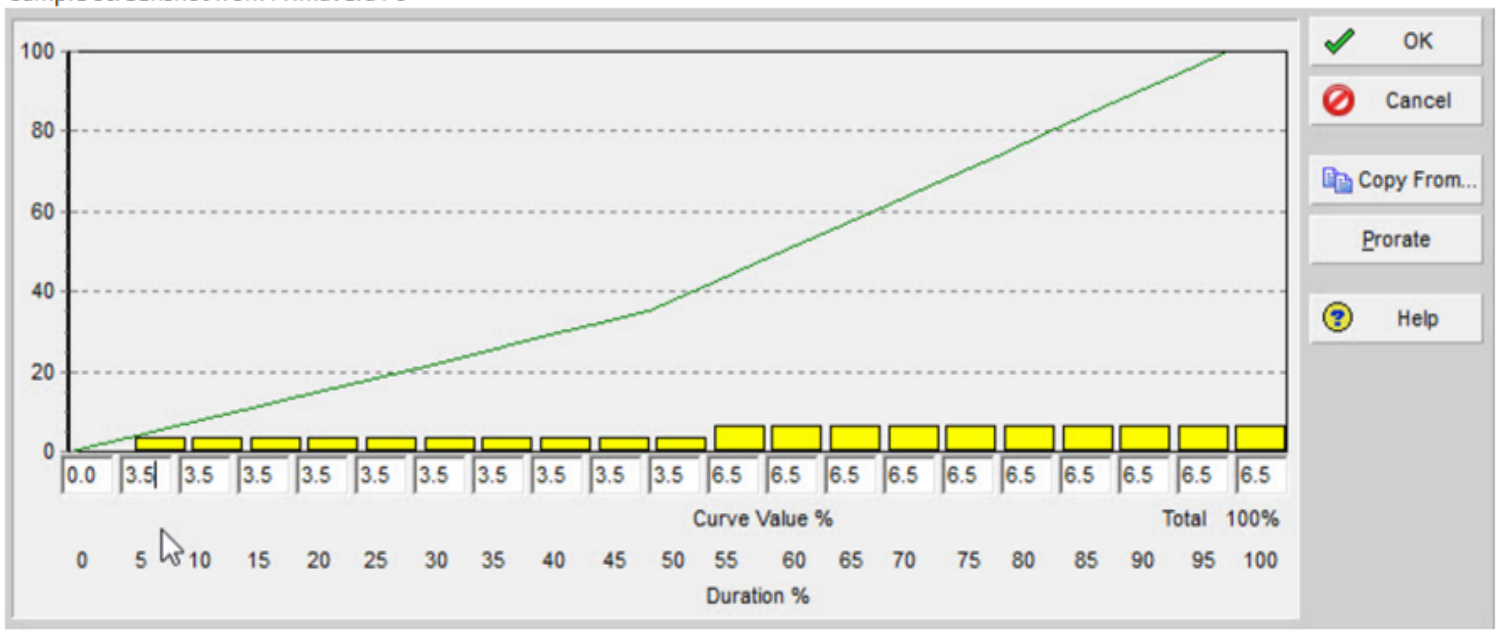
Contractor Signature and Date: _____

Sample Project Spend Curve

Sample Date Entries Required

Incremental Curve Value	0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%	6.5%
Duration % Increment	0%	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%	55%	60%	65%	70%	75%	80%	85%	90%	95%	100%

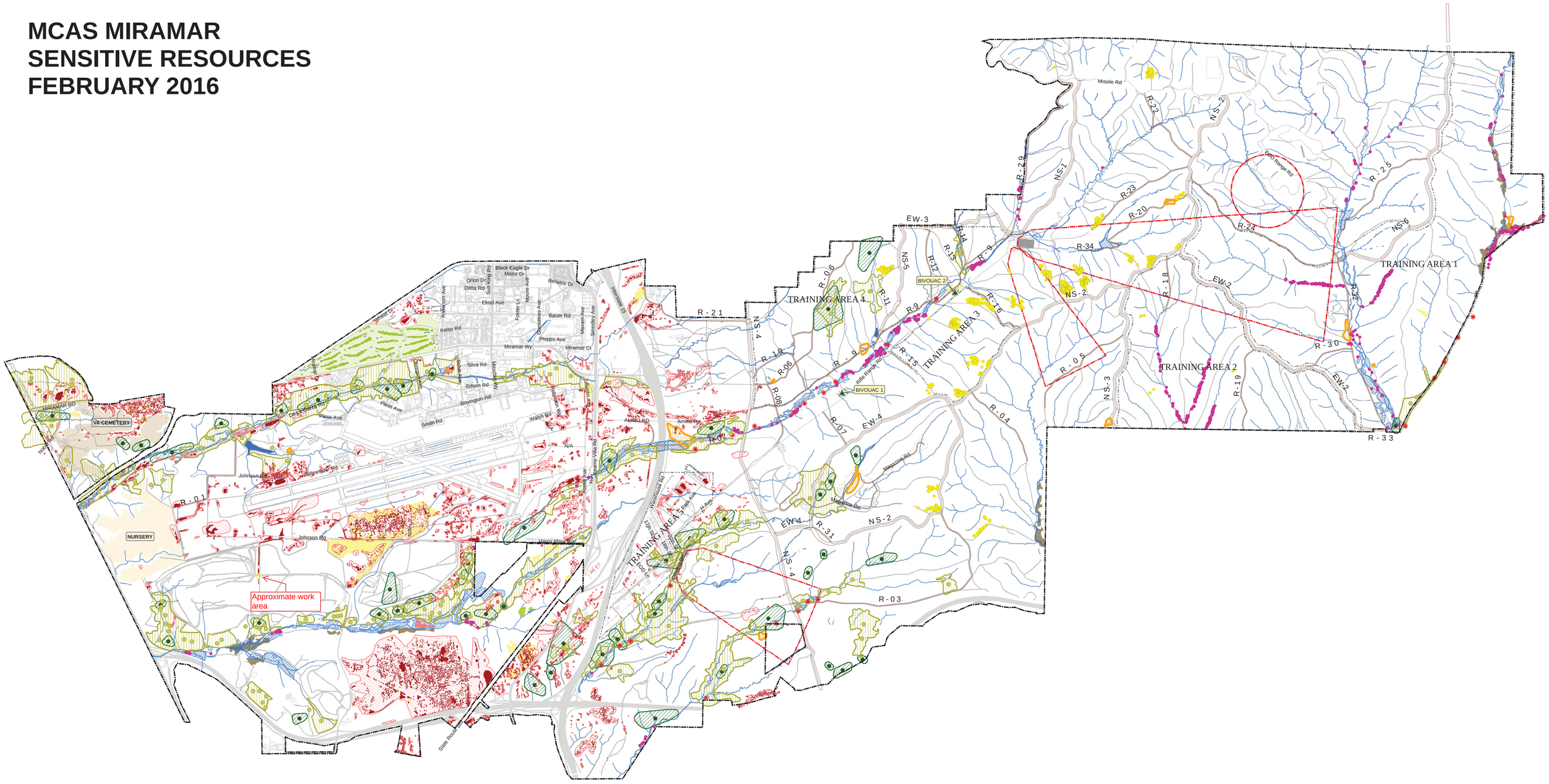
Sample Screenshot from Primavera P6

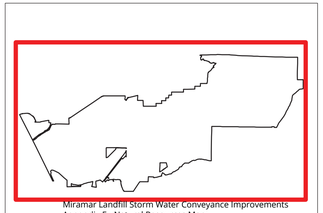


APPENDIX E

NATURAL RESOURCES MAP

MCAS MIRAMAR
SENSITIVE RESOURCES
FEBRUARY 2016





Miramar Landfill Storm Water Conveyance Improvements
Appendix E - Natural Resources Map

MARINE CORPS AIR STATION MIRAMAR

Marine Corps Air Station Miramar
Environmental Management Department
Natural Resources Division POC: David Boyer
Phone: 858.577.1125/4088

Map Publication Date: FEBRUARY 3, 2016

THE NORTH AMERICAN DATUM 1983 (NAD 83) AND THE WORLD GEODETIC SYSTEM 1984 DATUM (WGS 84) ARE EQUIVALENT FOR MAPPING, CHARTING AND NAVIGATION AT THIS SCALE.

NAD 83 / WGS 84

SCALE 1:24,000

Feet: 0 — 5,000 — 10,000 — 15,000

Miles: 0 — 0.9 — 1.8 — 2.7

Meters: 0 — 1,100 — 2,200 — 3,300

ELLIPSOID . . . . . GEODETIC REFERENCE SYSTEM 1980
PROJECTION . . . . . CA STATE PLANE ZONE VI
HORIZONTAL DATUM . . . NORTH AMERICAN DATUM 1983 / WORLD GEODETIC SYSTEM 1984

NOTES

BOUNDARIES SHOULD NOT BE CONSIDERED AUTHORITATIVE.
TELEPHONE AND ELECTRIC SERVICE LINES ARE NOT SHOWN.
IN DEVELOPED AREAS ONLY THROUGH ROADS ARE CLASSIFIED.
ROAD CLASSIFICATION SHOULD BE REFERRED TO WITH CAUTION.
THERE MAY BE PRIVATE INHOLDINGS WITHIN THE BOUNDARIES OF THE NATIONAL OR STATE RESERVATIONS SHOWN ON THIS MAP.

ALTHOUGH EVERY EFFORT HAS BEEN MADE TO ENSURE THE ACCURACY OF THE INFORMATION, ERRORS AND CONDITIONS ORIGINATING FROM PHYSICAL SOURCES TO DEVELOP THE DATABASE MAY BE REFLECTED IN THE DATA SUPPLIED THE USER MUST BE AWARE OF DATA CONDITIONS AND ULTIMATELY BEAR RESPONSIBILITY FOR THE APPROPRIATE USE OF THE INFORMATION WITH RESPECT TO POSSIBLE ERRORS, ORIGINAL MAP SCALE, COLLECTION METHODOLOGY, CURRENCY OF THE DATA, AND OTHER CONDITIONS SPECIFIC TO CERTAIN DATA. THIS INFORMATION DOES NOT DEPICT ALL POSSIBLE RESOURCES. FIELD VERIFICATION OF ALL DATA IS REQUIRED FOR SITE-SPECIFIC PROJECTS. THIS INFORMATION IS DEEMED RELIABLE, BUT NOT GUARANTEED.

Surveyed Endangered Species

- WILLOWY MONARDELLA (2012 CENSUS)
- DEL MAR MANZANITA (2006 CENSUS)
- 2013 CA GNATCATCHER SIGHTINGS
- HISTORICAL CA GNATCATCHER SIGHTINGS (2004, 2007, 2009)
- LEAST BELL'S VIREO TERRITORIES (2011, 2014)
- 2013 CA GNATCATCHER USE AREAS
- HISTORICAL CA GNATCATCHER USE AREAS (2004, 2007, 2009)

Areas Surveyed for Vernal Pool Resources

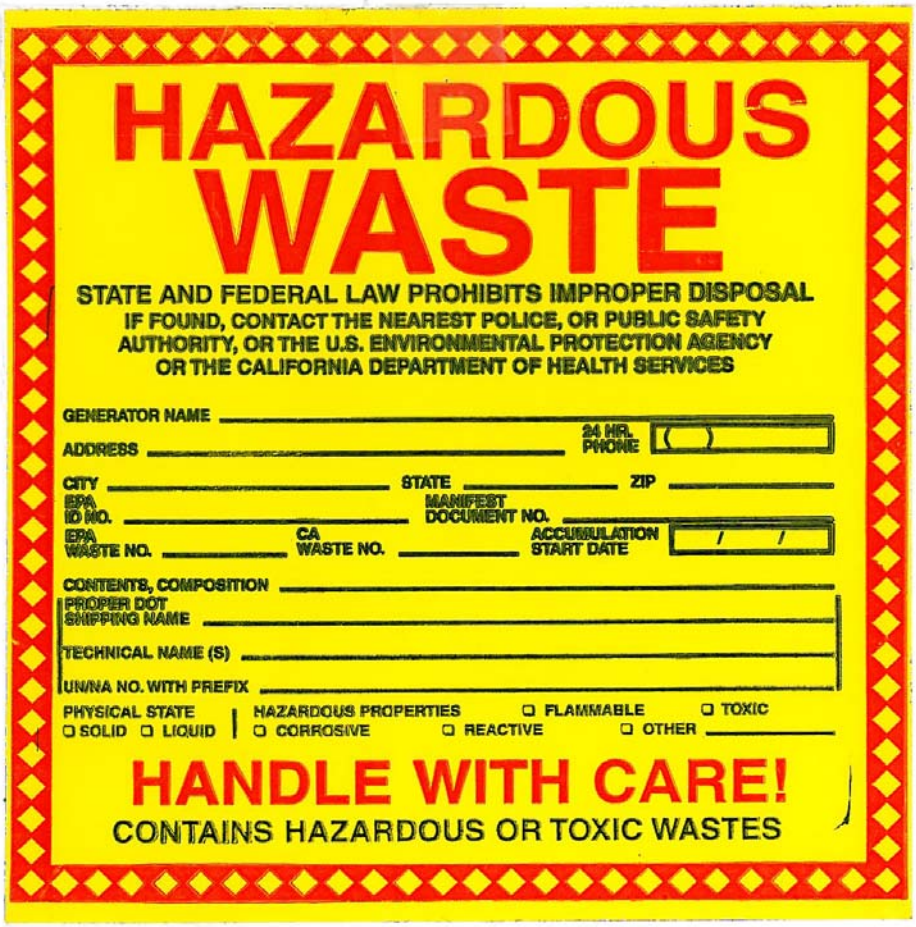
- VERNAL POOLS / PONDED SITES WITH ENDANGERED SPECIES
- VERNAL POOLS / PONDED SITES SURVEYED (NO ENDANGERED SPECIES)
- VERNAL POOL SURVEY WATERSHEDS

Other Sensitive Areas

- ADDITIONAL SENSITIVE RESOURCES
- POSSIBLE WATERS OF THE U.S.
- NATIVE GRASSLAND
- OAK WOODLAND
- RARE OTAY CEANOTHUS

APPENDIX F

HAZARDOUS LABEL/FORMS


HAZARDOUS
WASTE
STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY
AUTHORITY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY
OR THE CALIFORNIA DEPARTMENT OF HEALTH SERVICES
GENERATOR NAME
ADDRESS
24 HR. PHONE
CITY
STATE
ZIP
EPA ID NO.
MANIFEST DOCUMENT NO.
EPA WASTE NO.
CA WASTE NO.
ACCUMULATION START DATE
CONTENTS, COMPOSITION
PROPER DOT SHIPPING NAME
TECHNICAL NAME (S)
UN/NA NO. WITH PREFIX
PHYSICAL STATE
SOLID LIQUID
HAZARDOUS PROPERTIES
CORROSIVE
REACTIVE
FLAMMABLE
TOXIC
OTHER
HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES

INCIDENT/RELEASE ASSESSMENT FORM [1]

If you have an emergency, Call 911

Handlers of hazardous materials are required to report releases. The following is a tool to be used for assessing if a release is reportable. Additionally, a non-reportable release incident form is provided to document why a release is not reported (see back).

Questions for Incident Assessment:		YES	NO
1.	Was anyone killed or injured, or did they require medical care or admitted to a hospital for observation?	❒	❒
2.	Did anyone, other than employees in the immediate area of the release, evacuate?	❒	❒
3.	Did the release cause off-site damage to public or private property?	❒	❒
4.	Is the release greater than or equal to a reportable quantity (RQ)?	❒	❒
5.	Was there an uncontrolled or unpermitted release to the air?	❒	❒
6.	Did an uncontrolled or unpermitted release escape secondary containment, or extend into any sewers, storm water conveyance systems, utility vaults and conduits, wetlands, waterways, public roads, or off site?	❒	❒
7.	Will control, containment, decontamination, and/or clean up require the assistance of federal, state, county, or municipal response elements?	❒	❒
8.	Was the release or threatened release involving an unknown material or contains an unknown hazardous constituent?	❒	❒
9.	Is the incident a threatened release (a condition creating a substantial probability of harm that requires immediate action to prevent, reduce, or mitigate damages to persons, property, or the environment)?	❒	❒
10.	Is there an increased potential for secondary effects including fire, explosion, line rupture, equipment failure, or other outcomes that may endanger or cause exposure to employees, the general public, or the environment?	❒	❒

If the answer is YES to any of the above questions – report the release to the California Office of Emergency Services at 800-852-7550 and the local CUPA daytime: (619) 338-2284, after hours: (858) 565-5255. Note: other state and federal agencies may require notification depending on the circumstances.

Call 911 in an emergency

If all answers are NO, complete a Non Reportable Release Incident Form (page 2 of 2) and keep readily available. Documenting why a "no" response was made to each question will serve useful in the event questions are asked in the future, and to justify not reporting to an outside regulatory agency.

If in doubt, report the release.

[1] This document is a guide for accessing when hazardous materials release reporting is required by Chapter 6.95 of the California Health and Safety Code. It does not replace good judgment, Chapter 6.95, or other state or federal release reporting requirements.

NON REPORTABLE RELEASE INCIDENT FORM

1. RELEASE AND RESPONSE DESCRIPTION Incident #_____

Date/Time Discovered	Date/Time Discharge	Discharge Stopped ☐ Yes ☐ No
Incident Date / Time:		
Incident Business / Site Name:		
Incident Address:		
Other Locators (Bldg, Room, Oil Field, Lease, Well #, GIS)		
Please describe the incident and indicate specific causes and area affected. Photos Attached?: ☐Yes ☐No		
Indicate actions to be taken to prevent similar releases from occurring in the future.		

2. ADMINISTRATIVE INFORMATION

Supervisor in charge at time of incident:	Phone:
Contact Person:	Phone:

3. CHEMICAL INFORMATION

Chemical	Quantity ☐ GAL ☐ LBS ☐ FT^3
Chemical	Quantity ☐ GAL ☐ LBS ☐ FT^3
Chemical	Quantity ☐ GAL ☐ LBS ☐ FT^3
Clean-Up Procedures & Timeline:	
Completed By:	Phone:
Print Name:	Title:

EMERGENCY RELEASE FOLLOW - UP NOTICE REPORTING FORM

A

BUSINESS NAME	FACILITY EMERGENCY CONTACT & PHONE NUMBER ( ) -

B

INCIDENT DATE MO DAY YR	TIME OES NOTIFIED (use 24 hr time)	OES CONTROL NO.

C

INCIDENT ADDRESS LOCATION	CITY / COMMUNITY	COUNTY ZIP

D

CHEMICAL OR TRADE NAME (print or type)	CAS Number

CHECK IF CHEMICAL IS LISTED IN 40 CFR 355, APPENDIX A ☐	CHECK IF RELEASE REQUIRES NOTIFI - CATION UNDER 42 U.S.C. Section 9603 (a) ☐

PHYSICAL STATE CONTAINED ☐ SOLID ☐ LIQUID ☐ GAS	PHYSICAL STATE RELEASED ☐ SOLID ☐ LIQUID ☐ GAS	QUANTITY RELEASED

ENVIRONMENTAL CONTAMINATION ☐ AIR ☐ WATER ☐ GROUND ☐ OTHER	TIME OF RELEASE	DURATION OF RELEASE ___DAYS ___HOURS ___MINUTES

E

ACTIONS TAKEN

F

KNOWN OR ANTICIPATED HEALTH EFFECTS (Use the comments section for addition information)

☐ ACUTE OR IMMEDIATE (explain) _____

☐ CHRONIC OR DELAYED (explain) _____

☐ NOTKNOWN (explain)

G

ADVICE REGARDING MEDICAL ATTENTION NECESSARY FOR EXPOSED INDIVIDUALS

H

COMMENTS (INDICATE SECTION (A - G) AND ITEM WITH COMMENTS OR ADDITIONAL INFORMATION)

I

CERTIFICATION: I certify under penalty of law that I have personally examined and I am familiar with the information submitted and believe the submitted information is true, accurate, and complete.

REPORTING FACILITY REPRESENTATIVE (print or type) _____

SIGNATURE OF REPORTING FACILITY REPRESENTATIVE _____ DATE: _____

EMERGENCY RELEASE FOLLOW-UP NOTICE
REPORTING FORM INSTRUCTIONS

GENERAL INFORMATION:

Chapter 6.95 of Division 20 of the California Health and Safety Code requires that written emergency release follow-up notices prepared pursuant to 42 U.S.C. § 11004, be submitted using this reporting form. Non-permitted releases of reportable quantities of Extremely Hazardous Substances (listed in 40 CFR 355, appendix A) or of chemicals that require release reporting under section 103(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 [42 U.S.C. § 9603(a)] must be reported on the form, as soon as practicable, but no later than 30 days, following a release. The written follow-up report is required in addition to the verbal notification.

BASIC INSTRUCTIONS:

- The form, when filled out, reports follow-up information required by 42 U.S.C § 11004. Ensure that all information requested by the form is provided as completely as possible.
- If the incident involves reportable releases of more than one chemical, prepare one report form for each chemical released.
- If the incident involves a series of separate releases of chemical(s) at different times, the releases should be reported on separate reporting forms.

SPECIFIC INSTRUCTIONS:

Block A: Enter the name of the business and the name and phone number of a contact person who can provide detailed facility information concerning the release.

Block B: Enter the date of the incident and the time that verbal notification was made to OES. The OES control number is provided to the caller by OES at the time verbal notification is made. Enter this control number in the space provided.

Block C: Provide information pertaining to the location where the release occurred. Include the street address, the city or community, the county and the zip code.

Block D: Provide information concerning the specific chemical that was released. Include the chemical or trade name and the Chemical Abstract Service (CAS) number. Check all categories that apply. Provide best available information on quantity, time and duration of the release.

Block E: Indicate all actions taken to respond to and contain the release as specified in 42 U.S.C. § 11004(c).

Block F: Check the categories that apply to the health effects that occurred or could result from the release. Provide an explanation or description of the effects in the space provided. Use Block H for additional comments/information if necessary to meet requirements specified in 42 U.S.C. § 11004(c).

Block G: Include information on the type of medical attention required for exposure to the chemical released. Indicate when and how this information was made available to individuals exposed and to medical personnel, if appropriate for the incident, as specified in 42 U.S.C. § 11004(c).

Block H: List any additional pertinent information.

Block I: Print or type the name of the facility representative submitting the report. Include the official signature and the date that the form was prepared.

MAIL THE COMPLETED REPORT TO:

State Emergency Response Commission (SERC)
Attn: Section 304 Reports
Hazardous Materials Unit
3650 Schriever Avenue
Mather, CA 95655

NOTE: Authority cited: Sections 25503, 25503.1 and 25507.1, Health and Safety Code. Reference: Sections 25503(b)(4), 25503.1, 25507.1, 25518 and 25520, Health and Safety Code.

APPENDIX G

SAMPLE OF PUBLIC NOTICE

The City of SAN DIEGO

CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

The work will consist of:

- Saw-cutting and trench work on Ingulf Street from Morena Boulevard to Galveston Street to install new water mains, water laterals and fire hydrants.
- Streets where trenching takes place will be resurfaced and curb ramps will be upgraded to facilitate access for persons with disabilities where required.
- This work is anticipated to be complete in your community by December 2016.

How your neighborhood may be impacted:

- Water service to some properties during construction will be provided by a two-inch highline pipe that will run along the curb. To report a highline leak call 619-515-3525.
- Temporary water service disruptions are planned. If planned disruptions impact your property, you will receive advance notice.
- Parking restrictions will exist because of the presence of construction equipment and materials.
- "No Parking" signs will be displayed 72 hours in advance of the work.
- Cars parked in violation of signs will be TOWED.

Hours and Days of Operation:
Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:
Company Name, XXX-XXX-XXXX

To contact the City of San Diego: SD Public Works
619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

This information is available in alternative formats upon request.

The City of SAN DIEGO

CONSTRUCTION NOTICE

PROJECT TITLE

Work on your street will begin within one week to replace the existing water mains servicing your community.

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Monday through Friday X:XX AM to X:XX PM.

City of San Diego Contractor:
Company Name, XXX-XXX-XXXX

To contact the City of San Diego: SD Public Works
619-533-4207 | engineering@sandiego.gov | sandiego.gov/CIP

This information is available in alternative formats upon request.

APPENDIX H

ADVANCED METERING INFRASTRUCTURE (AMI) DEVICE PROTECTION

Protecting AMI Devices in Meter Boxes and on Street Lights

The Public Utilities Department (PUD) has begun the installation of the Advanced Metering Infrastructure (AMI) technology as a new tool to enhance water meter reading accuracy and efficiency, customer service and billing, and to be used by individual accounts to better manage the efficient use of water. **All AMI devices shall be protected per Section 5-2, "Protection", of the 2015 Whitebook.**

AMI technology allows water meters to be read electronically rather than through direct visual inspection by PUD field staff. This will assist PUD staff and customers in managing unusual consumption patterns which could indicate leaks or meter tampering on a customer's property.

Three of the main components of an AMI system are the:

A. Endpoints, see Photo 1:

Photo 1

B. AMI Antenna attached to Endpoint (antenna not always required), see Photo 2:

Photo 2

Network Devices, see Photo 3:

Photo 3

AMI endpoints transmit meter information to the AMI system and will soon be on the vast majority of meters in San Diego. These AMI devices provide interval consumption data to the PUD's Customer Support Division. If these devices are damaged or communication is interrupted, this Division will be alerted of the situation. The endpoints are installed in water meter boxes, coffins, and vaults adjacent to the meter. A separate flat round antenna may also be installed through the meter box lid. This antenna is connected to the endpoint via cable. The following proper installation shall be implemented when removing the lid to avoid damaging the antenna, cable, and/or endpoint. Photo 4 below demonstrates a diagram of the connection:

Photo 4

The AMI device ERT/Endpoint/Transmitter shall be positioned and installed as discussed in this Appendix. If the ERT/Endpoint/Transmitter is disturbed, it shall be re-installed and returned to its original installation with the end points pointed upwards as shown below in Photo 5.

The PUD's code compliance staff will issue citations and invoices to you for any damaged AMI devices that are not re-installed as discussed in the Contract Document
Photo 5 below shows a typical installation of an AMI endpoint on a water meter.

Photo 5

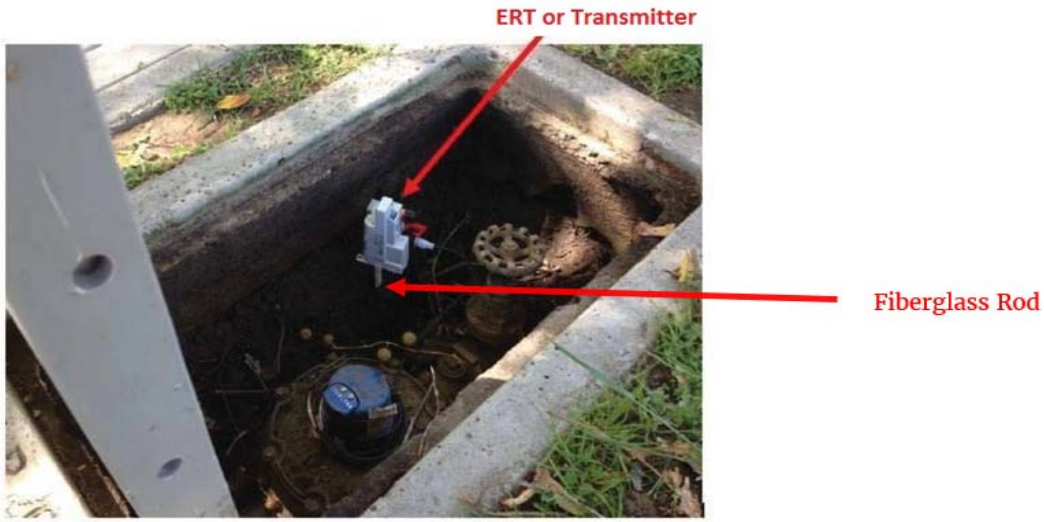


Photo 6 below is an example of disturbance that shall be avoided:

Photo 6

You are responsible when working in and around meter boxes. If you encounter these endpoints, use proper care and do not disconnect them from the registers on top of the water meter. If the lid has an antenna drilled through, do not change or tamper with the lid and inform the Resident Engineer immediately about the location of that lid. Refer to Photo 7 below:

Photo 7

Another component of the AMI system are the Network Devices. The Network Devices are strategically placed units (mainly on street light poles) that collect interval meter reading data from multiple meters for transmission to the Department Control Computer. **If you come across any of these devices on street lights that will be removed or replaced (refer to Photos 8 and 9 below), notify AMI Project Manager Arwa Sayed at (619) 362-0121 immediately.**

Photo 8 shows an installed network device on a street light. On the back of each Network Device is a sticker with contact information. See Photo 9. **Call PUD Water Emergency Repairs at 619-515-3525 if your work will impact these street lights.** These are assets that belong to the City of San Diego and you shall be responsible for any costs of disruption of this network.

Photo 8

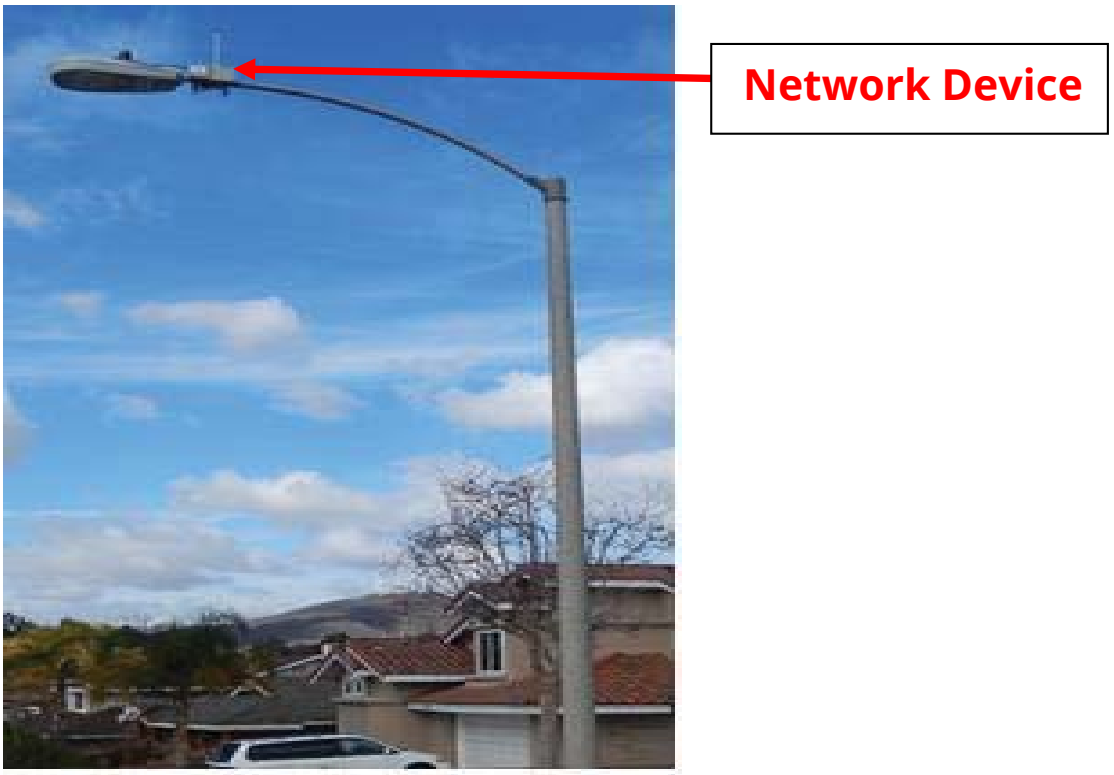


Photo 9

If you encounter any bad installations, disconnected/broken/buried endpoints, or inadvertently damage any AMI devices or cables, notify the Resident Engineer immediately. The Resident Engineer will then immediately contact the AMI Project Manager, Arwa Sayed, at (619) 362-0121.

APPENDIX I

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS HYDROLOGY AND HYDRAULIC CALCULATIONS (DRAINAGE/HYDROLOGY)

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS
HYDROLOGY AND HYDRAULIC CALCULATIONS
CITY OF SAN DIEGO, CALIFORNIA

1. PURPOSE

This drainage study package was prepared in support of the Miramar Landfill Storm Water Conveyance Improvements construction plans for the West Miramar Landfill (Facility). Supporting detailed hydrologic and hydraulic calculations for the design of storm drains, drainage channels, low flow crossings, energy dissipaters, and sediment basins are included in this report. The calculation package was prepared on behalf of the City of San Diego (City) Environmental Services Department (ESD).

2. BACKGROUND

The Facility is enrolled for coverage under the State Water Resource Control Board's (SWRCB) Storm Water Industrial General Permit (IGP) (Order 2014-005-DWQ) (WDID #9 37I005556). The City is responsible for implementing the seven IGP-required minimum BMPs, including erosion and sediment controls, to reduce pollutants in industrial storm water discharges. The Facility implements a number of erosion and sediment control BMPs, which include dust control, inlet and outlet protection, energy dissipation, roadway stabilization, slope stabilization (mulch application), and sediment basins. However, concentrations of total suspended solids (TSS) and metals (aluminum (Al), total iron (Fe) and total zinc (Zn)) possibly associated with sediment, are present in storm water discharges in amounts that exceed the IGP's Numeric Action Levels (NALs). Elevated concentrations of Chemical Oxygen Demand (COD) and total Phosphorus (P) are also present at concentrations that exceed the IGP's NALs that may be associated with compost or waste materials. Based on the storm water data collected during the 2016-2017 reporting year, the Facility has become a Level 2 Discharger for Al, Fe, and TSS and remains a Level 1 Discharger for Zn, COD and P as of July 1st 2017 and more robust BMPs (advanced and treatment control BMPs) will be needed to address the Level 2 Requirement. The City is evaluating storm water treatment options; however, opportunities to minimize mobilization of sediment and other pollutants through source and run-off control BMPs are needed in conjunction with storm water treatment to control pollutant discharges.

This calculation package provides supporting calculations for storm water runoff control BMPs as part of the Miramar Landfill Storm Water Conveyance Improvements construction plans.

3. HYDROLOGIC ANALYSIS

The hydrologic analysis calculations have been prepared using the Rational Method (RM) and Modified Rational Method (MRM) in accordance with the City of San Diego Drainage Design Manual (Drainage Manual, 2017). According to the Drainage Manual (2017) the RM is the recommended method for analyzing the runoff response from watershed areas less than 0.5

square miles (320 acres), and the MRM is the recommended method for watershed areas between 0.5 and 1.0 square miles (640 acres) for junction analysis. Note that the Drainage Manual (2017) does not restrict the application of the MRM on watershed areas less than 0.5 square miles. The project's watershed area is approximately 384 acres. The watershed is subdivided into three drainage areas: the West Sediment Basin, the Main Drain, and the East Sediment basin, and they are approximately 261 acres, 61 acres, and 62 acres, respectively. Therefore, both the RM and MRM are applicable.

The 100-year storm event was selected for the design storm return interval for this hydrologic analysis. The peak storm runoff flow rate was calculated for each independent drainage area of the watershed at junction points using the RM. The independent drainage areas were then combined using the MRM. After the independent drainage areas were combined, the RM calculations were continued to the next point of interest.

3.1 RATIONAL METHOD FORMULA

The RM formula estimates the peak rate of runoff at any location in a watershed as a function of the drainage area (A), runoff coefficient (C), and rainfall intensity (I) for a duration equal to the time of concentration (Tc), which is the time required to flow from the most remote point of the basin to the location being analyzed. The RM formula is expressed as follows:

Q = C I A		
where:		
Q	=	discharge in cubic feet per second (cfs),
C	=	runoff coefficient expressed as that percentage of rainfall which becomes surface runoff (no units)
I	=	average rainfall intensity for a storm duration equal to the time of concentration (Tc) of the contributing drainage area, in inches per hour,
A	=	drainage area contributing to the design location, in acres.

3.2 DRAINAGE AREA (A), FLOW PATH LENGTHS, AND RUNOFF COEFFICIENT (C)

Drainage areas (A) and flow path lengths were determined using existing topographic contours provided by City (dated 2014 and 2016). Delineations for the drainage areas and associated longest flow paths are shown on the attached Hydrology Workmap, **Exhibit A**. Drainage area acreage and length of flow path are summarized in **Table 1**.

Table 1. Drainage Area and Longest Flow Path		
Drainage Area ID	**Area (Ac)**	**Flow Path Length (ft)**
West Sediment Basin Drainage Areas		
1	4.84	635
2	2.12	39

Table 1. Drainage Area and Longest Flow Path		
Drainage Area ID	**Area (Ac)**	**Flow Path Length (ft)**
3	3.28	677
4	5.59	425
5	17.20	1581
6	30.43	2622
7	4.90	1518
8	14.41	1421
9	2.36	792
10	4.72	1011
11	3.43	2071
12	13.03	1279
13	6.81	1044
14	4.32	1729
15	2.65	1508
16	20.09	1529
17	2.18	1322
18	10.61	814
19	0.55	294
20	0.57	411
21	2.04	591
22	2.70	844
23	1.54	454
24	0.83	175
25	3.60	789
28	1.30	368
29	17.50	1639
30	19.36	1604
31	2.65	1437
32	35.00	1821
32A	2.60	850
33	6.25	1663
34	0.61	241
35	6.49	1078
36	4.02	537
Main Drain Drainage Areas		
37	20.36	1396
38	7.33	1064
39	18.59	1492
40	4.27	589
41	10.24	2312

Table 1. Drainage Area and Longest Flow Path		
Drainage Area ID	**Area (Ac)**	**Flow Path Length (ft)**
East Sediment Basin Drainage Areas		
42	24.28	1497
43	1.69	574
44	1.77	657
45	14.74	1998
46	5.31	1712
47	1.65	475
48	2.88	232
49	0.78	301
50	1.50	296
51	2.48	773
52	2.31	866
53	2.88	618
54	3.20	1248

A uniform runoff coefficient (C) of 0.45 was used throughout the entire watershed based on the following assumptions in accordance with the Drainage Manual (2017):

- Soil type “D”,
- Non-urban land use in accordance with Table A-1 of the Drainage Manual (2017), and;
- The current land use for the entire watershed (natural/non-urbanized) is assumed to remain constant and will not change.

3.3 RAINFALL INTENSITY AND TIME OF CONCENTRATION (Tc)

The Rainfall Intensity (I) and Time of Concentration (Tc) calculations were semi-automated using Microsoft’s Excel in accordance with Appendices A.1.3 and A.1.4, and Figures A-1 and A-2 of the Drainage Manual (2017) assuming a natural watershed (non-urbanized) land use. Figures A-1 and A-2 are included in **Attachment A**.

3.4 HYDROLOGIC ANALYSIS RESULTS

The RM hydrologic analysis calculations and results are included in **Table 2**. The results included in Table 2 were then used in the hydraulic analysis and design of the low flow crossings, roadway ditches, down drains, energy dissipaters, and sediment trap weirs.

The tables and figures from the Drainage Manual (2017) used in the hydrologic analysis are included in **Attachment A**, and the Hydrology Workmap is included as **Exhibit A**.

Table 2. Rational Method Hydrologic Analysis Results Summary																			
Drainage Area ID	Flow Process Type	U/S Node	D/S Node	U/S Elev. (ft)	D/S Elev. (ft)	Elev. Change (ft)	Length (ft)	Length (mi)	Slope (ft/ft)	Runoff Coefficient	Area (Ac)	CA	ΣA (Ac)	ΣCA (Ac)	ΣTi (min)	ΣTt (min)	ΣTc (min)	I (in/hr)	Q (cfs)
1	INITIAL SUBAREA	101	102	465.2	432.9	32.3	634.7	0.120	0.051	0.45	4.84	2.18	4.84	2.18	13.54	0.00	13.54	3.041	6.6
1	PIPE FLOW	102	102.1	432.9	429.3	3.6	34.0	0.006	0.106				4.84	2.18	0.00	0.03	13.57	3.038	6.6
2	CHANNEL FLOW + SUBAREA	102.1	103	429.3	422.0	7.3	39.1	0.007	0.187	0.45	2.12	0.95	6.96	3.13	0.00	0.09	13.66	3.027	9.5
3	CHANNEL FLOW + SUBAREA	103	104	422.0	403.4	18.6	677.4	0.128	0.027	0.45	3.28	1.48	10.24	4.61	0.00	3.08	16.74	2.720	12.5
4	CHANNEL FLOW + SUBAREA	104	105	403.4	396.0	7.4	425.0	0.080	0.017	0.45	5.59	2.52	15.83	7.12	0.00	1.51	18.25	2.622	18.7
5	INITIAL SUBAREA	106	107	460.2	418.3	41.9	1581.0	0.299	0.027	0.45	17.20	7.74	17.20	7.74	19.18	0.00	19.18	2.557	19.8
6	INITIAL SUBAREA	108	107	454.3	418.3	36.0	2622.2	0.497	0.014	0.45	30.43	13.69	30.43	13.69	27.46	0.00	27.46	2.107	28.8
5+6	CONFLUENCE 5 & 6	107	107										47.63	21.43			27.46	2.107	45.1
5+6	PIPE FLOW	107	105	418.3	396.0	22.3	63.0	0.012	0.354				47.63	21.43	0.00	0.04	27.50	2.105	45.1
1-4 + 5-6	CONFLUENCE 1-4 & 5-6	105	105										63.46	28.56			27.50	2.105	60.2
7	CHANNEL FLOW + SUBAREA	105	109	396.0	385.9	10.1	1518.2	0.288	0.007	0.45	4.90	2.21	68.36	30.76	0.00	6.49	33.99	1.864	64.3
8	INITIAL SUBAREA	110	111	456.4	416.0	40.4	1421.0	0.269	0.028	0.45	14.41	6.48	14.41	6.48	18.23	0.00	18.23	2.624	17.0
8	PIPE FLOW	111	109	416.0	385.9	30.1	56.4	0.011	0.534				14.41	6.48	0.00	0.04	18.27	2.621	17.0
7 + 8	CONFLUENCE 7 & 8	109	109										82.77	37.25			33.99	1.864	76.4
9	CHANNEL FLOW + SUBAREA	109	112	385.9	381.8	4.1	791.8	0.150	0.005	0.45	2.36	1.06	85.13	38.31	0.00	3.57	37.56	1.764	78.2
10	CHANNEL FLOW + SUBAREA	112	113	381.8	375.5	6.3	1010.8	0.191	0.006	0.45	4.72	2.12	89.85	40.43	0.00	4.24	41.80	1.657	81.8
11	CHANNEL FLOW + SUBAREA	113	114	375.5	364.0	11.5	2071.0	0.392	0.006	0.45	3.43	1.54	93.28	41.98	0.00	8.22	50.02	1.470	84.0
12	INITIAL SUBAREA	115	116	460.0	438.0	22.0	1278.7	0.242	0.017	0.45	13.03	5.86	13.03	5.86	19.21	0.00	19.21	2.556	15.0
12	PIPE FLOW	116	117	438.0	413.0	25.0	74.0	0.014	0.338				13.03	5.86	0.00	0.07	19.28	2.551	15.0
13	INITIAL SUBAREA	118	117	434.3	407.2	27.1	1044.1	0.198	0.026	0.45	6.81	3.06	6.81	3.06	16.72	0.00	16.72	2.722	8.3
12 + 13	CONFLUENCE 12 & 13	117	117										19.84	8.93			19.28	2.550	22.8
14	CHANNEL FLOW + SUBAREA	117	119	407.2	372.5	34.7	1729.2	0.328	0.020	0.45	4.32	1.94	24.16	10.87	0.00	5.21	24.49	2.239	24.3
1-11 + 12-14	CONFLUENCE 1-11 & 12-14	119	114										117.44	52.85			50.02	1.470	100.0
	PIPE FLOW	114	WB	360.2	263.3	96.9	612.0	0.116	0.158						0.00	0.34	50.36	1.464	100.0
15	INITIAL SUBAREA	120	209	443.0	372.5	70.5	1507.7	0.286	0.047	0.45	2.65	1.19	2.65	1.19	17.11	0.00	17.11	2.693	3.2
15 + 28	CHANNEL FLOW + SUBAREA	209	211	364.0	293.4	70.6	367.6	0.070	0.192	0.45	1.30	0.59	3.95	1.78	0.00	0.78	17.89	2.646	4.7
16	INITIAL SUBAREA	121	122	458.7	423.9	34.8	1529.1	0.290	0.023	0.45	20.09	9.04	20.09	9.04	19.49	0.00	19.49	2.536	22.9
16	PIPE FLOW	122	123	423.9	406.0	17.9	129.0	0.024	0.139				20.09	9.04	0.00	0.15	19.63	2.526	22.8
17	INITIAL SUBAREA	120	123	443.0	406.0	37.0	1322.4	0.250	0.028	0.45	2.18	0.98	2.18	0.98	17.83	0.00	17.83	2.650	2.6
16 + 17	CONFLUENCE 16 & 17	123	123										22.27	10.02			19.60	2.528	25.3
16 + 17	PIPE FLOW	123	206	406.0	372.5	33.5	140.0	0.027	0.239				22.27	10.02	0.00	0.13	19.73	2.519	25.3
16-17 + 21	CHANNEL FLOW + SUBAREA	206	205	375	370.7	4.3	591.2	0.112	0.007	0.45	2.04	0.92	24.31	10.94	0.00	2.26	21.99	2.385	26.09
18	INITIAL SUBAREA	200	201	450.8	426.8	24.0	814.3	0.154	0.029	0.45	10.61	4.77	10.61	4.77	15.29	0.00	15.29	2.851	13.6
18	PIPE FLOW	201	202	426.8	410.0	16.8	45.0	0.009	0.373				10.61	4.77	0.00	0.03	15.31	2.849	13.6
19	INITIAL SUBAREA	203	202	411.6	410.0	1.6	293.2	0.056	0.005	0.45	0.55	0.25	0.55	0.25	14.61	0.00	14.61	2.923	0.7
20	INITIAL SUBAREA	204	202	410.3	410.0	0.3	411.4	0.078	0.001	0.45	0.57	0.26	0.57	0.26	22.98	0.00	22.98	2.327	0.6

Table 2. Rational Method Hydrologic Analysis Results Summary																			
Drainage Area ID	Flow Process Type	U/S Node	D/S Node	U/S Elev. (ft)	D/S Elev. (ft)	Elev. Change (ft)	Length (ft)	Length (mi)	Slope (ft/ft)	Runoff Coefficient	Area (Ac)	CA	ΣA (Ac)	ΣCA (Ac)	ΣTi (min)	ΣTt (min)	ΣTc (min)	I (in/hr)	Q (cfs)
18 + 19 + 20	CONFLUENCE 18 & 19 & 20	202	202										11.73	5.28			15.30	2.850	14.7
18+19+20	PIPE FLOW	202	205	410.0	370.7	39.3	116.0	0.022	0.339	0.45			11.73	5.28	0.00	0.07	15.37	2.843	14.7
22	INITIAL SUBAREA	207	205	378.5	370.7	7.8	844.0	0.160	0.009	0.45	2.70	1.22	2.70	1.22	18.49	0.00	18.49	2.605	3.2
16 - 22	CONFLUENCE 16 - 22	205	205							0.45			38.74	17.43			21.99	2.385	41.3
16 - 22	PIPE FLOW	205	208	369.9	331.9	37.9	117.0	0.022	0.324				38.74	17.43	0.00	0.05	22.04	2.385	41.3
24	INITIAL SUBAREA	210	208	332.5	331.6	0.9	175.4	0.033	0.005	0.45	0.83	0.37	0.83	0.37	13.18	0.00	13.18	3.080	1.2
23	INITIAL SUBAREA	208.1	208	364	331.6	32.4	454.4	0.086	0.071	0.45	1.54	0.69	1.54	0.69	12.40	0.00	12.40	3.160	2.2
16 - 24	CONFLUENCE 16 - 24	208	208										41.11	18.50			22.04	2.385	43.9
	PIPE FLOW	208	211	331.0	296.1	34.9	115.0	0.022	0.303				41.11	18.50	0.00	0.05	22.09	2.379	43.9
25	INITIAL SUBAREA	210	211	378.5	293.4	85.1	516.6	0.098	0.165	0.45	3.60	1.62	3.60	1.62	11.92	0.00	11.92	3.209	5.2
15+28 + 16-24	CONFLUENCE 15+28 & 16-24	211	WB										48.66				22.09	2.379	52.0
29	INITIAL SUBAREA	300	301	456.7	412.8	43.9	1638.9	0.310	0.027	0.45	17.50	7.88	17.50	7.875	19.40	0.00	19.40	2.542	20.0
	PIPE FLOW	301	302	412.8	398.0	14.8	120.0	0.023	0.123	0.45	17.50	7.88	17.50	7.875	0.00	0.09	19.49	2.542	20.0
30	INITIAL SUBAREA	303	302	456.7	398.3	58.4	1604.0	0.304	0.036	0.45	19.36	8.71	19.36	8.712	18.21	0.00	18.21	2.625	22.9
31	INITIAL SUBAREA	304	302	420.5	398.0	22.5	1436.8	0.272	0.016	0.45	2.65	1.19	2.65	1.19	20.44	0.00	20.44	2.474	3.0
29 + 30 + 31	CONFLUENCE 29 & 30 & 31	302	302							0.45			39.51	17.78			19.50	2.542	45.0
	PIPE FLOW	302	305	398.0	371.0	27.0	120.0	0.023	0.225	0.45			39.51	17.78	0.00	0.06	19.56	2.542	45.0
32	INITIAL SUBAREA	306	307	460.2	425.6	34.6	1821.2	0.345	0.019	0.45	35.00	15.75	35	15.75	21.63	0.00	21.63	2.405	37.9
	PIPE FLOW	307	307.1	424.0	412.3	11.7	148.8	0.028	0.079	0.45	35.00	15.75	35	15.75	0.00	0.11	21.75	2.405	37.9
32A	INITIAL SUBAREA	500	307.2	430.1	418.0	12.1	849.5	0.161	0.014	0.45	2.60	1.17	2.6	1.17	17.23		17.23	2.686	3.1
	PIPE FLOW	307.2	307.1	414.0	412.3	1.7	111.8	0.021	0.016	0.45			2.6	1.17	0.00	0.29	17.51	2.686	3.1
32 + 32A	CONFLUENCE 32 & 32A	307.2	307.2							0.45			37.6	16.92			21.75	2.405	40.7
	PIPE FLOW	307.2	308	410.1	410.0	0.1	24.3	0.005	0.005	0.45	37.60	16.92	37.6	16.92	0.00	0.05	21.80	2.405	40.7
33	CHANNEL FLOW + SUBAREA	308	309	410.0	370.2	39.8	1662.7	0.315	0.024	0.45	6.25	2.81	43.85	19.73	0.00	3.94	25.74	2.179	43.0
29-31 + 32-33	CONFLUENCE 29-31 & 32-33	309	309							0.45			83.36	37.51			25.74	2.179	81.6
34	CHANNEL FLOW + SUBAREA	309	310	370.2	366.0	4.2	241.0	0.046	0.017	0.45	0.61	0.275	83.97	37.79	0.00	0.72	26.46	2.149	82.2
	PIPE FLOW	310	WB	360.0	250.0	110.0	408.7	0.077	0.269	0.45	83.97	37.79	83.97	37.79	0.00	0.27	26.73	2.137	82.2
35	INTIAL SUBAREA	400	401	465.0	417.5	47.5	1078.3	0.204	0.044	0.45	6.49	2.92	6.49	2.92	15.62	0.00	15.62	2.818	8.2
36	INTIAL SUBAREA	500	501	430.1	425.5	4.6	536.8	0.102	0.009	0.45	4.02	1.81	4.02	1.81	16.17	0.00	16.17	2.766	5.0
37	INITIAL SUBAREA	600	601	467.5	436.0	31.5	1396.0	0.264	0.023	0.45	20.36	9.16	20.36	9.16	18.87	0.00	18.87	2.579	23.6
38	CHANNEL FLOW + SUBAREA	601	602	436.0	417.5	18.5	1063.7	0.201	0.017	0.45	7.33	3.30	27.69	12.46	0.00	3.31	22.18	2.374	29.6
39	INITIAL SUBAREA	603	604	467.0	437.0	30.0	1491.9	0.283	0.020	0.45	18.59	8.37	18.59	8.37	19.76	0.00	19.76	2.517	21.1
	PIPE FLOW	604	602	433.0	418.0	15.0	115.0	0.022	0.130						0.00	0.14	19.90	2.507	21.1
37-38 + 39	CONFLUENCE 37-38 & 39	602	602							0.45			46.28	20.83			22.18	2.374	49.6
40	CHANNEL FLOW + SUBAREA	602	605	417.5	409.0	8.5	588.5	0.111	0.014	0.45	4.27	1.92	50.55	22.75	0.00	2.05	24.23	2.255	51.3
	PIPE FLOW	605	607	408.8	408.0	0.8	60.0	0.011	0.014						0.00	0.10	24.33	2.249	51.3
41	INITIAL SUBAREA	600	606	467.5	410.9	56.6	2312.0	0.438	0.024	0.45	10.24	4.61	10.24	4.61	12.68	0.00	12.68	3.132	14.4

Table 2. Rational Method Hydrologic Analysis Results Summary																			
Drainage Area ID	Flow Process Type	U/S Node	D/S Node	U/S Elev. (ft)	D/S Elev. (ft)	Elev. Change (ft)	Length (ft)	Length (mi)	Slope (ft/ft)	Runoff Coefficient	Area (Ac)	CA	ΣA (Ac)	ΣCA (Ac)	ΣTi (min)	ΣTt (min)	ΣTc (min)	I (in/hr)	Q (cfs)
37-40 + 41	CONFLUENCE 37-40 & 41	607	607							0.45			60.79	27.36			24.33	2.249	61.6
42	INITIAL SUBAREA	700	701	482.0	464.0	18.0	1497.0	0.284	0.012	0.45	24.28	10.93	24.28	10.93	21.93	0.00	21.93	2.388	26.1
	PIPE FLOW	701	702	463.5	433.4	30.2	89.2	0.017	0.338						0.00	0.07	22.01	2.384	26.1
43	INITIAL SUBAREA	703	702	440.1	433.4	6.7	574.0	0.109	0.012	0.45	1.69	0.76	1.69	0.76	15.77	0.00	15.77	2.803	2.1
42 + 43	CONFLUENCE 42 & 43	702	702										25.97	11.69			22.00	2.384	27.9
44	CHANNEL FLOW + SUBAREA	702	704	433.4	427.0	6.4	657.4	0.125	0.010	0.45	1.77	0.80	27.74	12.48	0.00	2.45	24.45	2.242	28.0
45	INITIAL SUBAREA	705	704	483.0	427.0	56.0	1998.3	0.378	0.028	0.45	14.74	6.63	14.74	6.63	20.76	0.00	20.76	2.456	16.3
42-44 + 45	CONFLUENCE 42-44 & 45	704	704							0.45			42.48	19.12			24.40	2.242	42.9
	PIPE FLOW	704	706	426.3	400.1	26.2	130.6	0.025	0.201	0.45			42.48	19.12	0.00	0.07	24.47	2.241	42.9
46	INITIAL SUBAREA	707	708	469.3	420.0	49.3	1711.8	0.324	0.029	0.45	5.31	2.39	5.31	2.39	19.45	0.00	19.45	2.538	6.1
47	CHANNEL FLOW + SUBAREA	708	709	420.0	406.0	14.0	474.8	0.090	0.029	0.58	1.65	0.96	6.96	3.35	0.00	1.97	21.42	2.418	8.1
48	CHANNEL FLOW + SUBAREA	709	710	406.0	401.5	4.5	231.5	0.044	0.019	0.68	2.88	1.96	9.84	5.30	0.00	1.19	22.61	2.348	12.5
49	INITIAL SUBAREA	711	710	410.0	401.5	8.5	301.0	0.057	0.028	0.45	0.78	0.35	0.78	0.35	12.50	0.00	12.50	3.150	1.1
46-48 + 49	CONFLUENCE 46-48 & 49	710	710							0.45			10.62	5.66			22.60	2.348	13.3
50	CHANNEL FLOW + SUBAREA	710	706	401.5	399.0	2.5	295.9	0.056	0.008	0.45	1.50	0.68	12.12	6.33	0.00	1.44	24.04	2.266	14.3
42-45 + 46-50	CONFLUENCE 42-45 & 46-50	706	706										54.6	25.45			24.47	2.241	57.0
	CHANNEL FLOW	706	712	399.0	396.0	3.0	52.0	0.010	0.058						0.00	0.13	24.60	2.233	57.0
	CHANNEL FLOW	712	713	396.0	358.8	37.2	421.2	0.080	0.088						0.00	0.48	25.09	2.206	57.0
51	INITIAL SUBAREA	714	715	401.6	394.0	7.6	773.3	0.146	0.010	0.45	2.48	1.12	2.48	1.12	17.75	0.00	17.75	2.655	3.0
52	INITIAL SUBAREA	716	715	399.0	394.0	5.0	866.0	0.164	0.006	0.45	2.31	1.04	2.31	1.04	20.38	0.00	20.38	2.478	2.6
51 + 52	CONFLUENCE 51 & 52	715	715										4.79	2.16			20.40	2.478	5.4
53	PIPE FLOW + SUBAREA	715	715.1	393.2	363.0	30.2	617.8	0.117	0.049	0.45	2.88	1.30	2.88	1.30	0.00	1.60	22.00	2.384	8.5
42-50 + 51-53	CONFLUENCE 42-50 & 51-53	713	713										62.27	28.90			25.10	2.206	64.9
	CHANNEL FLOW	713	717	358.5	315.0	43.5	163.6	0.031	0.266						0.00	0.13	25.23	2.200	64.9
54	INITIAL SUBAREA	714	720	401.6	390	11.6	1248.0	0.236	0.009	0.45	3.20	1.44	3.20	1.44	21.45	0.00	21.45	2.416	3.5

4. HYDRAULIC ANALYSIS

The 100-year storm event hydrologic analysis results summarized in Table 2 were used in the hydraulic analysis and design of the proposed storm drainage improvements.

The proposed drainage improvements include the following:

- Drainage channel and roadway stabilization,
- Down drain improvements
- Outlet energy dissipaters at various existing and proposed down drains and culverts,
- Low flow crossings.
- Sediment trap weirs

4.1 Roadway and Drainage Channel Normal Velocity and Normal Depth

Normal velocities (V_n) and normal depths (D_n) were performed for the roadway stabilization and drainage channel design using the public domain computer software Hydraulic Toolbox, Version 4.2 developed by the Federal Highway Administration (FHWA). The methods and techniques used by the software draw heavily from materials and documents published by the FHWA (HEC-14, HEC-15, HEC-18, HEC-20, HEC-21, HEC-22, HEC-23, HDS-2).

The roadway and drainage channel cross sections were designed to maintain V_n within the maximum permissible velocities as shown in Table 7-1 of the Drainage Manual (2017) (included in **Attachment B)**. The V_n and D_n for the roadway/drainage channel improvements are summarized in **Table 3**. The detailed Hydraulic Toolbox computer outputs for the roadway/drainage channels are included in **Attachment B**.

Table 3. Roadway and Drainage Channel V_n and D_n Hydraulic Analysis Results Summary										
		Inputs						Results		
Drainage Channel ID	Nodes	U/S Invert Elevation (ft)	D/S Invert Elevation (ft)	Length (ft)	Average Slope (ft/ft)	Channel Shape	Design Flow (cfs)	Flow Depth (ft)	Top Width of Flow (ft)	Average Flow Velocity (ft/s)
1	102.1-104	430.69	400.40	730	0.041	Triangular	12.6	1.17	3.5	6.2
2	105.1-105	424.23	394.17	1615	0.019	Triangular	6.2	1.03	3.1	3.9
3	105-112	394.17	379.96	2336	0.006	Triangular	78.2	2.66	32.5	3.5
4	112-113	379.93	373.58	1076	0.006	Triangular	81.8	2.82	27.6	3.9
5	113-114	373.20	365.13	2028	0.004	Triangular	84	2.95	23.4	3.7
6	206-205	376.57	373.51	495	0.006	Triangular	26.1	2.15	12.9	3.5
7	207-205	378.15	373.46	782	0.006	Triangular	3.2	1.00	3.0	2.1
8	208.1-208	369.06	334.24	449	0.078	Triangular	2.2	0.54	1.6	5.1
9	210-208	335.29	334.14	159	0.007	Triangular	1.2	0.67	2.0	1.8
10	209-211	364.91	294.44	362	0.195	Irregular	4.7	0.13	12.2	5.5
11	210-211	332.31	294.05	660	0.058	Irregular	5.2	0.13	12.1	4.0
12	308-309	404.52	370.12	1550	0.022	Triangular	43.0	2.07	7.8	6.7
13	602-605	417.30	409.32	604	0.013	Irregular	51.3	0.64	32.7	4.2
14	601-602	437.67	417.30	1086	0.019	Irregular	29.6	0.65	32.3	3.1
15	702-704	432.01	428.75	556	0.006	Irregular	28	0.72	19.4	3.1
16	705-704	442.00	427.48	626	0.023	Irregular	16.3	0.41	17.8	3.7
18	710-706	401.52	400.01	195	0.008	Irregular	14.3	0.64	15.9	2.3

4.2 Down Drain/Culvert Inlet and Outlet Energy Dissipators

There are 17 existing down drains, one proposed down drain, and three existing culverts throughout the project site. The outlet velocities for most down drains (Down Drain 1-10 and 13 -18) and culverts (Culverts 2 - 3) were calculated using the HY-8 computer software. HY-8 was developed by the FHWA, and WSPG2010 was developed by the Los Angeles County Public Works Department in collaboration with XP Software. The methods and techniques used by HY-8 are based on the Hydraulic Design Series Number 5 (HDS-5), Hydraulic Engineering Circular Number 14 (HEC-14), and Hydraulic Engineering Circular Number 26 (HEC-26) documents published by the FHWA.

Three locations (Down Drain 11, 12, and Culvert 1) required the use of the WSPG2010 computer software. The WSPG2010 software computes uniform and non-uniform steady flow water surface profiles and pressure gradients in open channels and closed conduits with irregular or regular sections. The computational procedure is based on solving Bernoulli's equation for the total energy at each section and Manning's formula for friction loss between the sections in a reach. The detailed HY-8 and WSPG2010 computer output calculations are included in **Attachment C**. The down drain and culvert outlet velocities are summarized in **Table 4**.

The down drain/culvert energy dissipators were designed following the permissible velocity methodology in accordance with the City's standard drawing SDD-104 and Table 200-1.7 of the City of San Diego Whitebook. Due to the high outlet velocities at Down Drains 1, 2, 14, and 16, use a termination structure that is shown on the construction plans in lieu of the traditional riprap pad energy dissipaters. Similarly, due to the high outlet velocities at Down Drains 3, 8, and 14 and Culvert 1, a reno mattress energy dissipater will be used and are shown on the construction plans as well.

Table 4. Down Drain and Culvert Outlet Velocity Summary														
				Inputs							Results			
Down Drain or Culvert ID	Nodes	Notes	Material	Diameter (ft)	Manning's n	U/S Invert Elevation (ft)	D/S Invert Elevation (ft)	Length (ft)	Slope (ft/ft)	Design Flow (cfs)	Flow Capacity (cfs)	Depth of Flow (ft)	Average Flow Velocity (ft/s)	
Down Drain 1	111-109	Existing Down Drain	CMP	3.0	0.024	400.76	381.76	56.4	0.337	17.0	23.0	0.56	18.0	
Down Drain 2	107-105	Existing Down Drain	CMP	3.0	0.024	417.89	396.11	63.0	0.346	45.1	52.6	0.95	22.6	
Down Drain 3	116-117	Existing Down Drain	CMP	3.0	0.024	437.98	410.92	74.0	0.366	15.0	26.2	0.52	17.8	
Down Drain 4	201-202	Existing Down Drain	HDPE	3.0	0.012	422.73	410.44	33.0	0.372	13.6	45.2	0.41	22.8	
Down Drain 5	202-205	Existing Down Drain	HDPE	3.0	0.012	406.8	370.74	118.1	0.305	14.7	63.1	0.38	26.9	
Down Drain 6	205-208	Existing Down Drain	HDPE	3.0	0.012	367.56	331.88	112.8	0.316	41.3	46.4	0.68	33.1	
Down Drain 7	208-211	Existing Down Drain	HDPE	3.0	0.012	327.92	294.49	105.2	0.318	43.9	67.7	0.89	36.5	
Down Drain 8	211-WB	Existing Down Drain	CMP	3.0	0.024	288.26	259.52	152.2	0.189	52.0	72.4	1.4	19.7	
Down Drain 9	301-302	Existing Down Drain	HDPE	3.5	0.012	409.6	398.74	31.8	0.342	20.0	68.6	0.50	23.2	
Down Drain 10	302-305	Existing Down Drain	HDPE	3.0	0.012	395.86	370.84	121.0	0.207	45.0	85.0	0.78	29.6	
Down Drain 11	310-WB	Proposed Down Drain	HDPE	3.0	0.012	365.13	265.32	408.7	0.244	82.2	82.2	1.2	37.3	
Down Drain 12	114-WB	Proposed Down Drain	HDPE	3.5	0.012	360.22	263.33	612.0	0.158	84.0	84.0	1.1	32.9	
Down Drain 13	122-123	Existing Down Drain	HDPE	3.0	0.012	421.64	407.4	51.8	0.275	22.8	81.8	0.55	24.9	
Down Drain 14	123-206	Existing Down Drain (re-aligned)	HDPE	3.0	0.012	406.84	376.57	94.0	0.354	25.2	56.9	0.48	33.5	
Down Drain 15	604-602	Proposed Down Drain	HDPE	3.0	0.012	437.87	420.97	81.0	0.209	21.1	56.9	0.54	23.6	
Down Drain 16	701-702	Existing Down Drain	CMP	3.0	0.024	461.67	433.51	94.1	0.299	26.1	50.1	0.72	19.5	
Down Drain 17	704-706	Existing Down Drain	HDPE	3.0	0.012	424.88	400.12	121.6	0.204	42.9	80.0	0.77	28.7	
Down Drain 18	715-715	Existing Down Drain	CMP	3.0	0.024	393.78	362.32	579.0	0.054	5.4	46.9	0.50	6.8	
Culvert 1	307-308	Existing Culvert	CMP	3.0	0.024	422.08	409.37	166.3	0.076	40.7	90.0	2.1	13.4	
Culvert 2	607	Existing Culvert	CMP	3.0	0.024	405.07	403.91	20.5	0.057	61.6	31.3	1.3	10.4	
Culvert 3	605-607	Existing Culvert	HDPE	2 x 1.67	0.011	408.47	407.24	50.1	0.025	51.3	30.7	1.0	10.3	

Notes:

1. Flow capacity was calculated assuming that the maximum headwater elevation equals the top of berm/top of headwall over the pipe inlet, i.e., IE + pipe diameter + 0.25', and no free board.

4.3 Low Flow Crossings

Low flow crossings (LFC) will be constructed at 19 locations. The LFCs will consist of a drivable articulated concrete block (ACB) section which will be placed at the outlets of the proposed channel crossings, down drains, and culverts. The underlying design assumption is that the energy dissipator upstream of the ACB will dissipate most of the energy imposed by the storm flow discharged by the down drains or culverts. Due to the energy dissipation, the storm flow velocity in the low flow crossing is assumed to be approximately the normal velocity, V_n.

The V_n, and normal depth, Dn, calculations were performed for the LFC design using the public domain computer software Hydraulic Toolbox for a typical trapezoidal cross section with a 10 foot wide bottom, 10 to 1 side slopes, and a maximum depth of 1 foot. The longitudinal slopes of the low flow crossings were assumed to be 0.02 ft/ft. .

The V_n and D_n for the LFC improvements are summarized in **Table 5**. The detailed Hydraulic Toolbox computer outputs are included in **Attachment D**, the LFC locations are indicated on Exhibit A, and the typical LFC details and dimensions are shown on the construction plans.

Table 5. Low Flow Crossing V_n and D_n Summary

Low Flow Crossing ID	Node	Slope (ft/ft)	Q100 (cfs)	V_n (ft/s)	D_n (ft)
1	102	0.02	6.6	2.3	0.23
2	u/s of 105	0.02	6.2	2.3	0.22
2A	u/s of 104	0.02	12.5	2.9	0.33
3	113	0.02	81.8	5.0	0.88
4	u/s of 114	0.02	84.0	5.0	0.89
5	202	0.02	14.7	3.0	0.36
5A	201	0.02	13.6	2.9	0.34
6	123	0.02	22.8	3.5	0.45
6A	122	0.02	22.8	3.5	0.45
7	u/s of 114	0.02	84.0	5.0	0.89
8	211	0.02	52.0	4.4	0.70
9	302	0.02	45.0	4.2	0.65
9A	301	0.02	20	3.3	0.42
10	309	0.02	45.0	4.2	0.65
11	308	0.02	40.7	4.9	0.62
12	720	0.02	3.5	1.9	0.16
13	715	0.02	3.0	1.8	0.15
14	715.1	0.02	8.5	2.5	0.27
15	706	0.02	57.0	4.5	0.73
16	704	0.02	42.9	4.1	0.63

4.4 Sediment Trap Weirs

Two sediment traps will be constructed as shown on the construction plans. Sediment Trap 1 will be constructed upstream of Down Drain 12, and Sediment Trap 2 will constructed upstream of Down Drain 11.

To control the flow into the sediment traps, weirs will be constructed at their downstream ends adjacent to the existing inlet structures for the down drains. To determine the head over the proposed weirs, *Equation 8-10 Broad-Crested Weir Calculation*, in accordance with the Drainage Manual (2017) was used. Equation 8-10 is expressed as follows:

$Q = C_{BCW} LH^{3/2}$		
where:		
Q	=	discharge over the weir (cfs)
C_{BCW}	=	broad-crested weir discharge coefficient
L	=	length of weir crest (ft)
H	=	Head above of weir crest, excluding velocity head (ft)

The Drainage Manual (2017) states that "…*A typical roadway crossing can be modeled as a broad-crested weir with a weir coefficient C_{BCW}=2.6; for other applications, a broad-crested weir coefficient of C_{BCW}=3.0 is usually appropriate*…" Therefore, a C_{BCW}=3.0 was used in the calculations.

The proprietary computer software Hydraflow Express was used to calculate the head over the weirs. The Hydraflow Express computer software allows the user to apply Equation 8-10 directly after defining the weir type and weir coefficient.

The sediment trap locations are shown on **Exhibit A**, and the detailed weir calculations are included in **Attachment E,** and the construction details are shown on the construction plans.

Table 7. Sediment Trap Weir Flow Calculations

Sediment Trap ID	Node	Q100 (cfs)	Width (ft)	Head (ft)
1	114	84.0	9	2.39
2	310	82.2	18	1.32

ATTACHMENT A

EXCERPTS FROM APPENDIX A OF THE CITY OF SAN DIEGO
DRAINAGE DESIGN MANUAL

Table A-1. Runoff Coefficients for Rational Method

Land Use	Runoff Coefficient (C)
	Soil Type [1]
Residential:	
Single Family	0.55
Multi-Units	0.70
Mobile Homes	0.65
Rural (lots greater than ½ acre)	0.45
Commercial [2]	
80% Impervious	0.85
Industrial [2]	
90% Impervious	0.95

Note:
[1] Type D soil to be used for all areas.
[2] Where actual conditions deviate significantly from the tabulated imperviousness values of 80% or 90%, the values given for coefficient C, may be revised by multiplying 80% or 90% by the ratio of actual imperviousness to the tabulated imperviousness. However, in case shall the final coefficient be less than 0.50. For example: Consider commercial property on D soil.

Actual imperviousness = 50%
Tabulated imperviousness = 80%
Revised C = (50/80) x 0.85 = 0.53

The values in Table A–1 are typical for urban areas. However, if the basin contains rural or agricultural land use, parks, golf courses, or other types of nonurban land use that are expected to be permanent, the appropriate value should be selected based upon the soil and cover and approved by the City.

A.1.3. Rainfall Intensity

The rainfall intensity (I) is the rainfall in inches per hour (in/hr.) for a duration equal to the T_C for a selected storm frequency. Once a particular storm frequency has been selected for design and a T_C calculated for the drainage area, the rainfall intensity can be determined from the Intensity-Duration-Frequency Design Chart (Figure A-1).

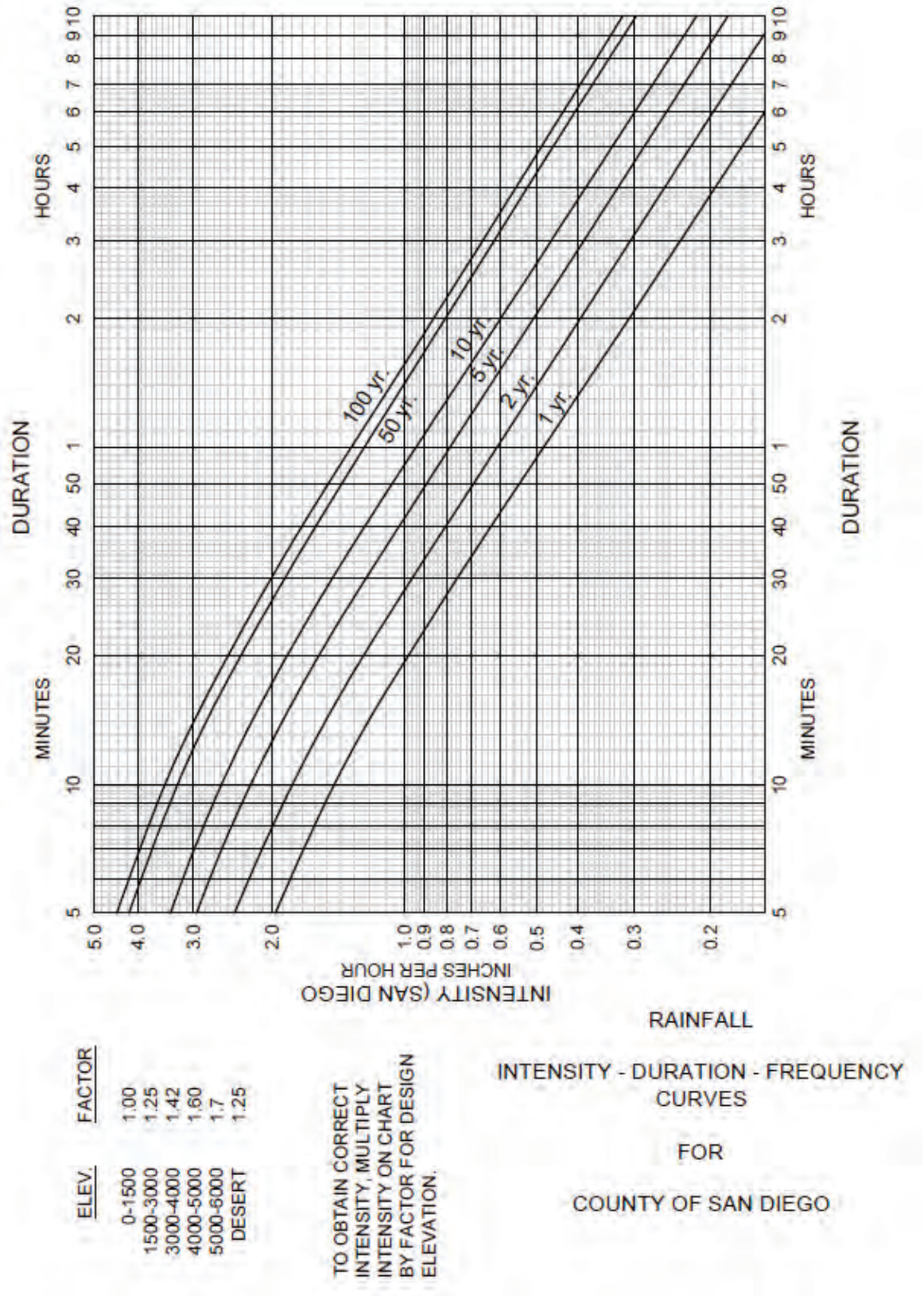


Figure A-1. Intensity-Duration-Frequency Design Chart

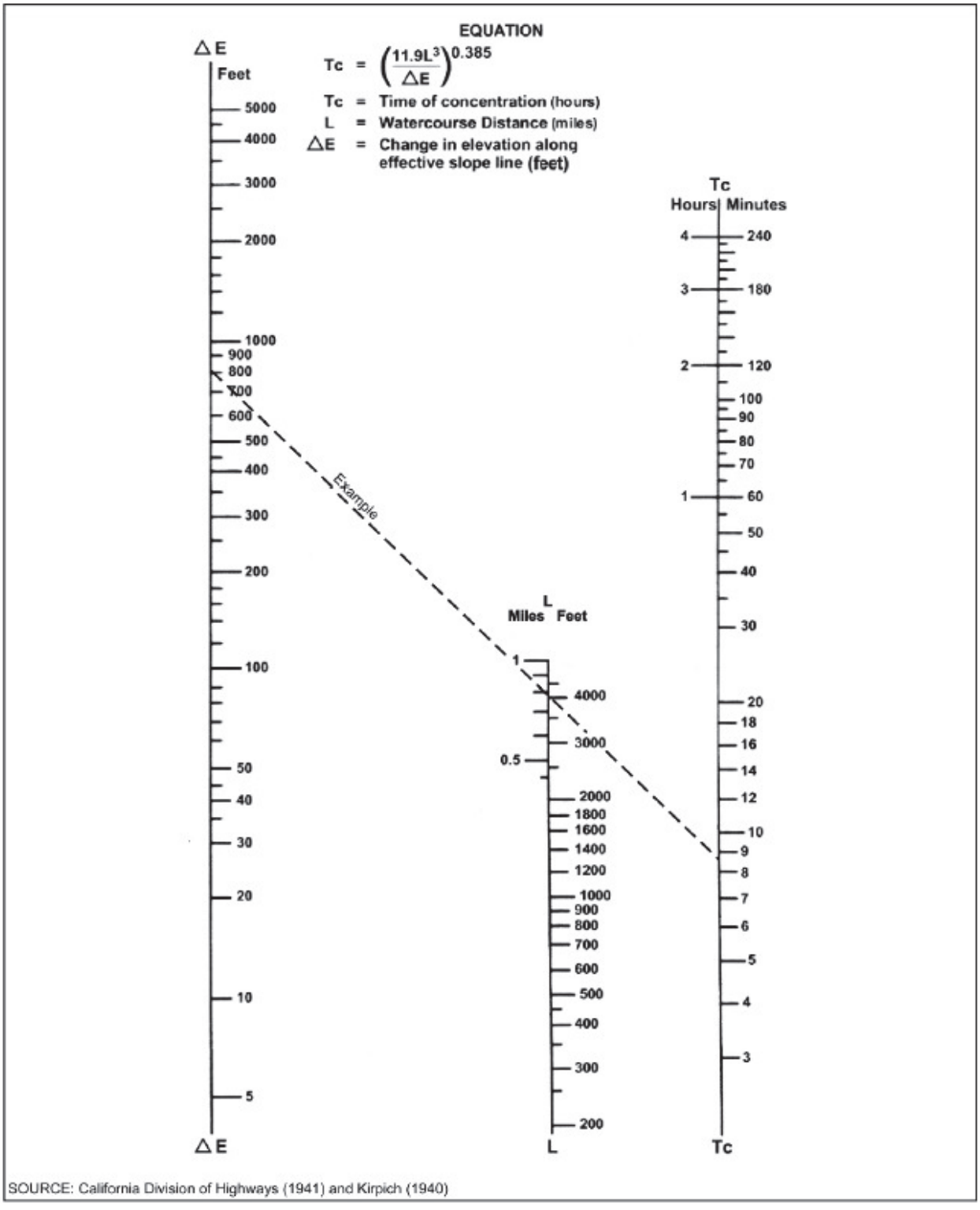


Figure A-2. Nomograph for Determination of T_c for Natural Watersheds

Note: Add ten minutes to the computed time of concentration from Figure A-2.

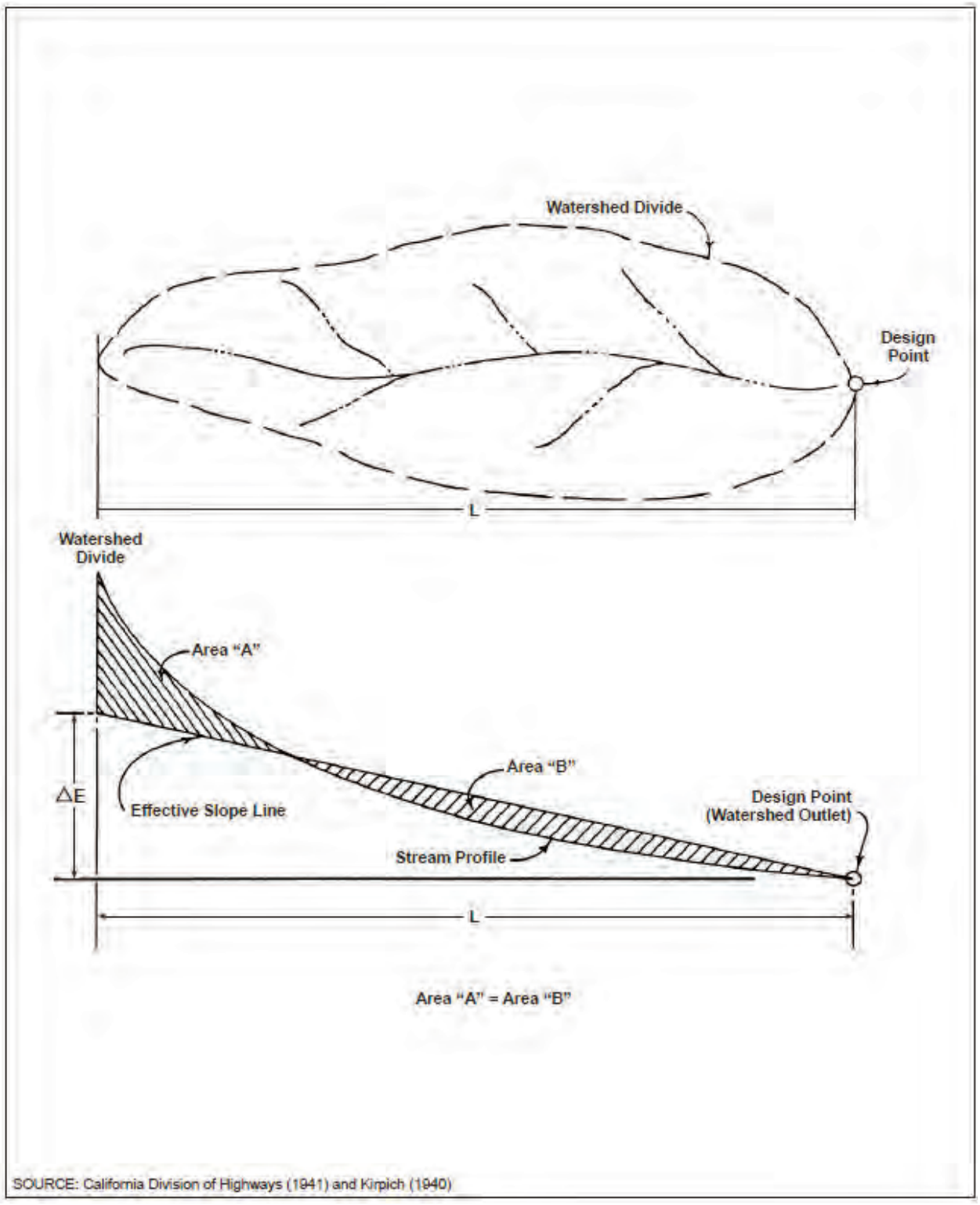


Figure A-3. Computation of Effective Slope for Natural Watersheds

ATTACHMENT B

TABLE 7-1 FROM THE CITY OF SAN DIEGO DRAINAGE DESIGN MANUAL

HYDRAULIC TOOLBOX COMPUTER OUTPUTS FOR THE ROADWAY/DRAINAGE CHANNEL HYDRAULIC CALCULATIONS

Spiral transition curves shall be used upstream and downstream of curves for supercritical channel designs with reverse curves or horizontal alignments with consecutive circular curves. Spiral curves may also be used to reduce required superelevation allowances and cross-wave disturbances.

7.2.5 Maximum Permissible Velocity

The design of open channels shall be governed by maximum permissible velocity. This design method assumes that a given channel section will remain stable up to a maximum permissible velocity, provided that the channel is designed in accordance with the standards presented in this Manual. Table 7–1 presents the maximum permissible velocities for several types of natural, improved, unlined, and lined channels.

Table 7-1. Maximum Permissible Velocities for Lined and Unlined Channels

Material or Lining	Maximum Permissible Average Velocity* (ft/sec)
Natural and Improved Unlined Channels	
Fine Sand, Colloidal	1.50
Sandy Loam, Noncolloidal	1.75
Silt Loam, Noncolloidal	2.00
Alluvial Silts, Noncolloidal	2.00
Ordinary Firm Loam	2.50
Volcanic Ash	2.50
Stiff Clay, Very Colloidal	3.75
Alluvial Silts, Colloidal	3.75
Shales and Hardpans	6.00
Fine Gravel	2.50
Graded Loam to Cobbles when Noncolloidal	3.75
Graded Silts to Cobbles when Colloidal	4.00
Coarse Gravel, Noncolloidal	4.00
Cobbles and Shingles	5.00
Sandy Silt	2.00
Silty Clay	2.50
Clay	6.00
Poor Sedimentary Rock	10.0
Fully-Lined Channels	
Unreinforced Vegetation	5.0
Reinforced Turf	10.0
Loose Riprap	per Table 7-3
Grouted Riprap	25.0
Gabions	15.0
Soil Cement	15.0
Concrete	35.0

*Maximum permissible velocity listed here is basic guideline; higher design velocities may be used, provided appropriate technical documentation from manufacturer.

Regardless of these maximum permissible velocities, the channel section shall be designed to remain stable at the final design discharge and velocity. The design flow may not always yield the highest flow velocity. Therefore, best practice is to confirm channel section stability during events

Hydraulic Analysis Report

Project Data

Project Title: Miramar Landfill Storm Water Conveyance Improvements

Designer: D-Max Engineering, Inc.

Project Date: Monday, June 11, 2018

Project Units: U.S. Customary Units

Notes: Drainage Channel Normal Velocity and Normal Depth Calculations.

The label after the “Channel Analysis:” header indicates Drainage Channel Number, and Rational Method from-to Node numbers, i.e., DC-1_102.1 – 104 indicates Drainage Channel 1, from Node 102.1 to Node 104 as labeled on Exhibit A, Hydrology Workmap.

Channel Analysis: DC-1_102.1 - 104
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	413.97	0.0200
8.87	413.95	0.0200
8.99	413.95	0.0200
11.23	413.95	0.0200
12.18	413.95	0.0200
13.10	413.95	0.0200
15.37	413.95	0.0200
29.33	413.92	0.0200
30.52	413.93	0.0300
30.90	413.93	0.0300
31.26	413.69	0.0300
33.91	411.92	0.0300
36.88	413.90	0.0200
36.91	413.92	0.0200
36.99	413.92	0.0200
39.18	413.92	0.0200
40.31	413.98	0.0200
40.60	414.00	0.0200
44.17	414.32	0.0200
51.14	414.50	0.0200
59.92	414.78	0.0200
65.85	414.94	0.0200
69.12	415.07	-----

Longitudinal Slope: 0.0410 ft/ft

Flow: 12.5800 cfs

Result Parameters

Depth: 1.1648 ft

Area of Flow: 2.0334 ft^2

Wetted Perimeter: 4.1972 ft

Hydraulic Radius: 0.4845 ft

Average Velocity: 6.1868 ft/s

Top Width: 3.4912 ft

Froude Number: 1.4286

Critical Depth: 1.3435 ft

Critical Velocity: 4.6509 ft/s

Critical Slope: 0.0192 ft/ft

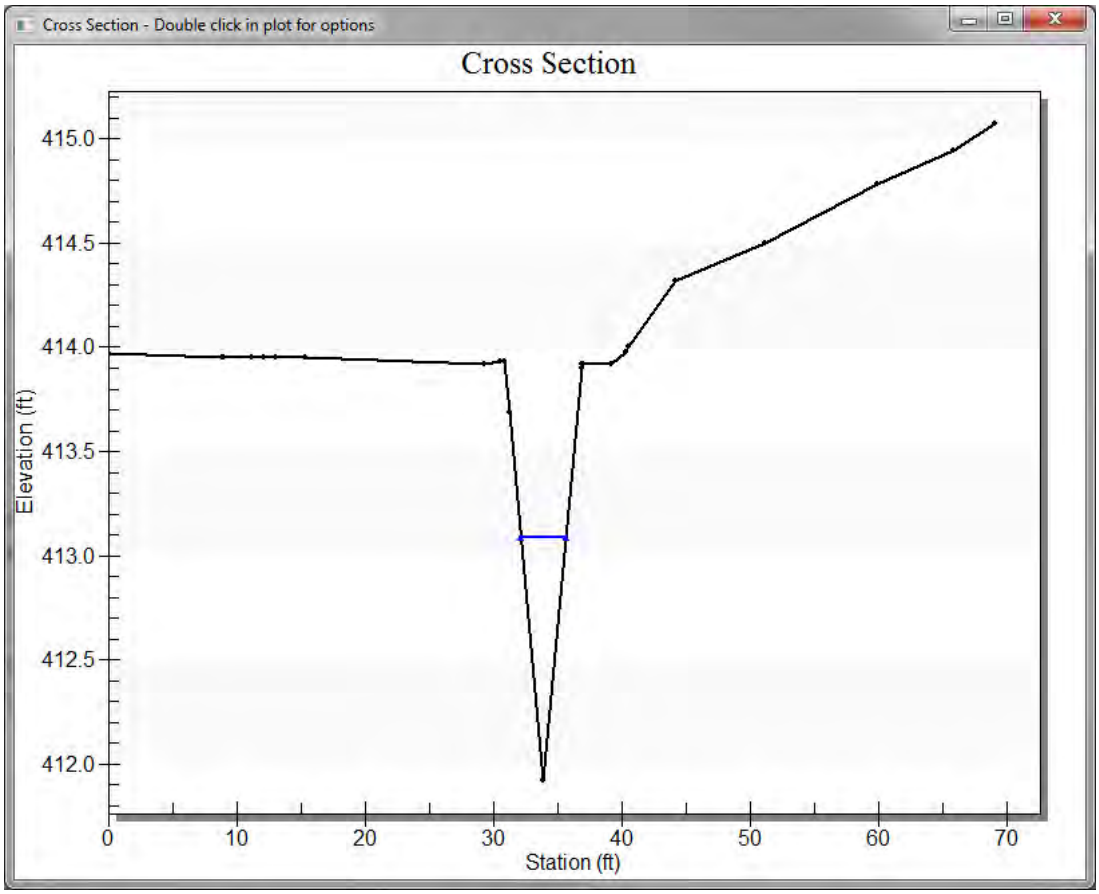
Critical Top Width: 4.03 ft

Calculated Max Shear Stress: 2.9801 lb/ft^2

Calculated Avg Shear Stress: 1.2395 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300


Cross Section - Double click in plot for options
Cross Section
415.0
414.5
414.0
413.5
413.0
412.5
412.0
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)

Channel Analysis: DC-2_105.1 - 105
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	402.89	0.0200
13.77	402.30	0.0200
17.35	401.96	0.0200
34.35	400.15	0.0200
35.70	399.89	0.0200
37.50	399.86	0.0200
38.94	399.83	0.0300
41.76	397.83	0.0300
44.94	399.83	0.0200
56.21	400.05	0.0200
68.94	400.31	0.0200
70.59	401.13	0.0200
72.06	401.87	0.0200
73.72	401.79	0.0200
77.00	400.49	0.0200
79.54	399.50	-----

Longitudinal Slope: 0.0190 ft/ft

Flow: 6.2000 cfs

Result Parameters

Depth: 1.0316 ft

Area of Flow: 1.5964 ft^2

Wetted Perimeter: 3.7210 ft

Hydraulic Radius: 0.4290 ft

Average Velocity: 3.8838 ft/s

Top Width: 3.0949 ft

Froude Number: 0.9530

Critical Depth: 1.0119 ft

Critical Velocity: 4.0364 ft/s

Critical Slope: 0.0211 ft/ft

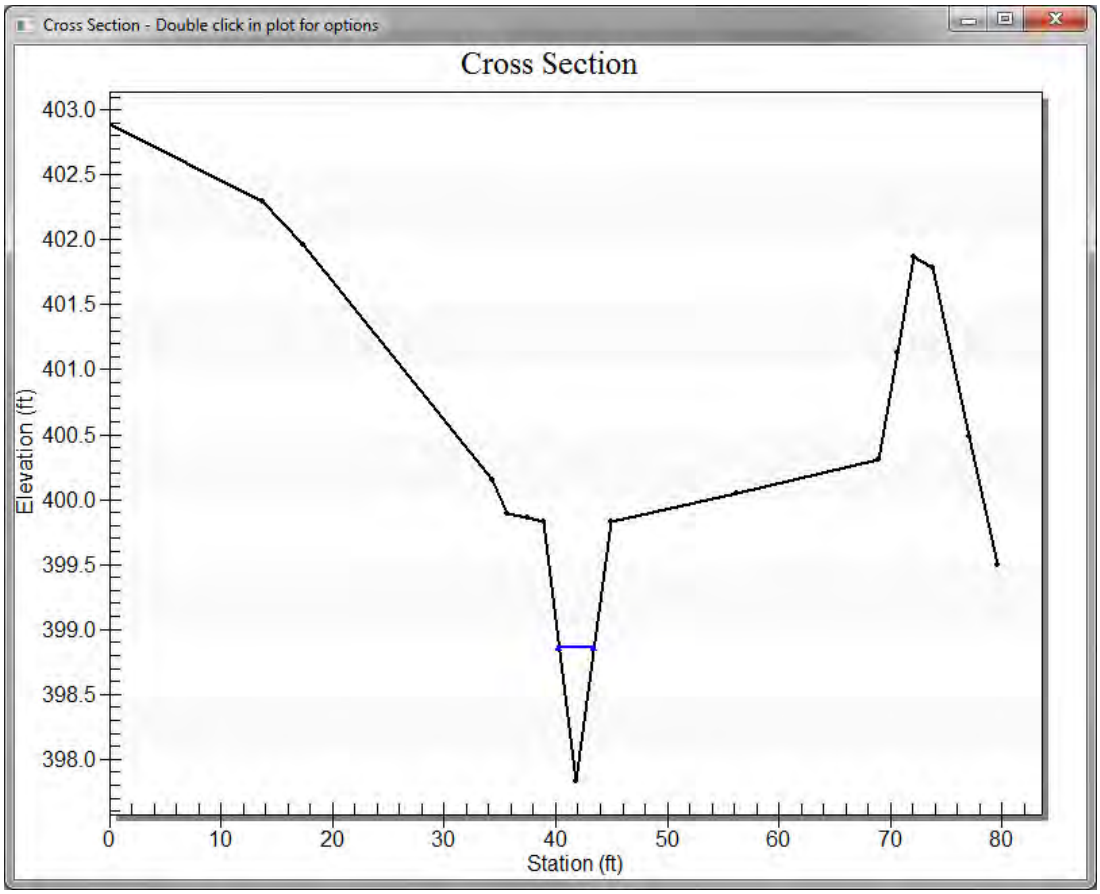
Critical Top Width: 3.04 ft

Calculated Max Shear Stress: 1.2231 lb/ft^2

Calculated Avg Shear Stress: 0.5086 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300


Cross Section - Double click in plot for options
Cross Section
403.0
402.5
402.0
401.5
401.0
400.5
400.0
399.5
399.0
398.5
398.0
Elevation (ft)
0
10
20
30
40
50
60
70
80
Station (ft)

Channel Analysis: DC-3_105 - 112
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	397.43	0.0300
6.45	395.26	0.0300
11.56	393.52	0.0300
16.83	391.73	0.0300
17.03	391.75	0.0300
17.08	391.73	0.0300
20.08	389.73	0.0200
23.08	391.73	0.0200
45.50	392.18	0.0200
47.08	392.21	0.0200
47.21	392.27	0.0200
49.10	393.22	0.0200
49.87	392.85	0.0200
55.72	392.70	-----

Longitudinal Slope: 0.0060 ft/ft

Flow: 78.2000 cfs

Result Parameters

Depth: 2.6546 ft

Area of Flow: 20.6822 ft^2

Wetted Perimeter: 33.9044 ft

Hydraulic Radius: 0.6100 ft

Average Velocity: 3.7810 ft/s

Top Width: 32.5352 ft

Froude Number: 0.8357

Critical Depth: 2.5804 ft

Critical Velocity: 4.2777 ft/s

Critical Slope: 0.0088 ft/ft

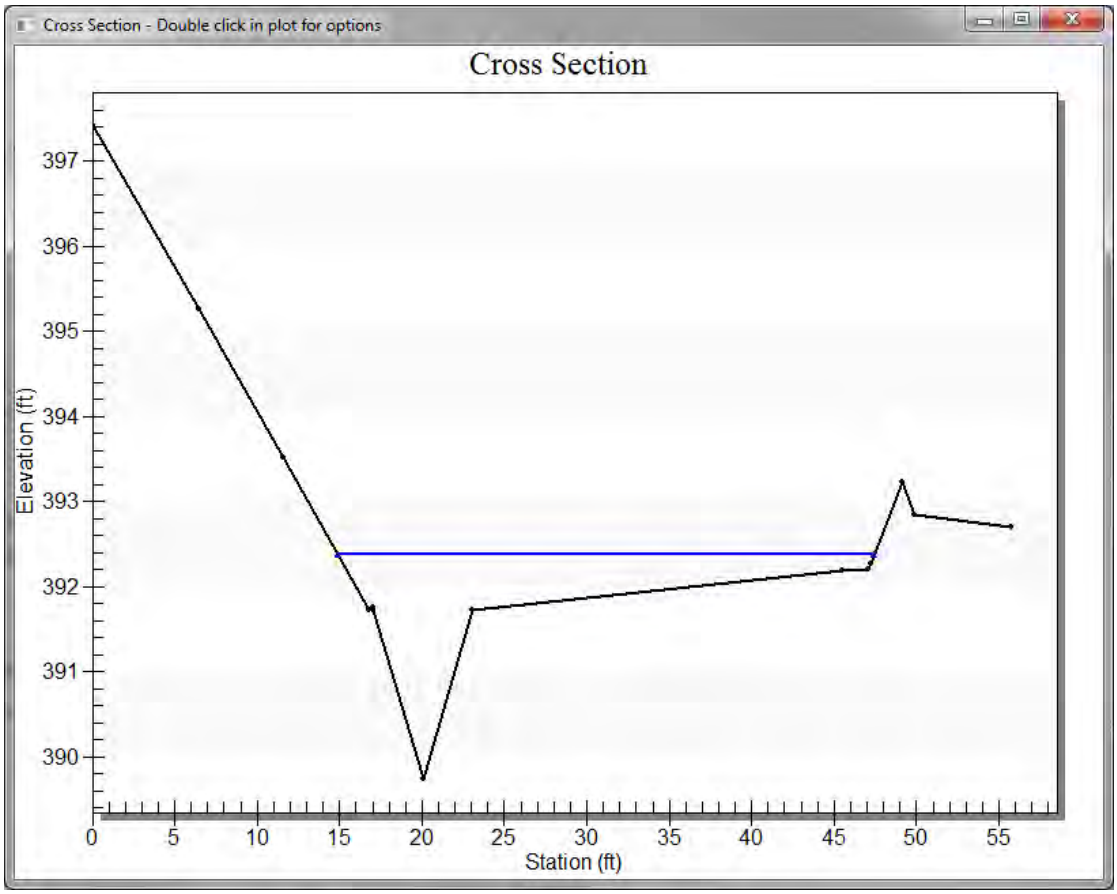
Critical Top Width: 32.17 ft

Calculated Max Shear Stress: 0.9939 lb/ft^2

Calculated Avg Shear Stress: 0.2284 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0219


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
397
396
395
394
393
392
391
390
0
5
10
15
20
25
30
35
40
45
50
55
Station (ft)

Channel Analysis: DC-4_112 - 113
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.74	377.04	0.0200
3.27	377.10	0.0200
3.98	377.12	0.0200
3.98	377.12	0.0200
4.00	377.11	0.0200
4.18	377.02	0.0200
4.82	376.69	0.0200
5.71	376.40	0.0200
7.27	376.33	0.0200
8.46	376.29	0.0200
15.70	376.00	0.0200
22.46	375.73	0.0300
25.56	373.73	0.0300
28.46	375.73	0.0300
28.52	375.73	0.0300
28.75	375.73	0.0300
30.32	376.03	0.0300
34.81	376.98	0.0300
36.18	377.26	0.0300
38.22	377.63	0.0300
50.92	383.13	-----

Longitudinal Slope: 0.0060 ft/ft

Flow: 81.8000 cfs

Result Parameters

Depth: 2.8231 ft

Area of Flow: 21.1068 ft^2

Wetted Perimeter: 28.8854 ft

Hydraulic Radius: 0.7307 ft

Average Velocity: 3.8755 ft/s

Top Width: 27.5525 ft

Froude Number: 0.7803

Critical Depth: 2.6962 ft

Critical Velocity: 4.6285 ft/s

Critical Slope: 0.0099 ft/ft

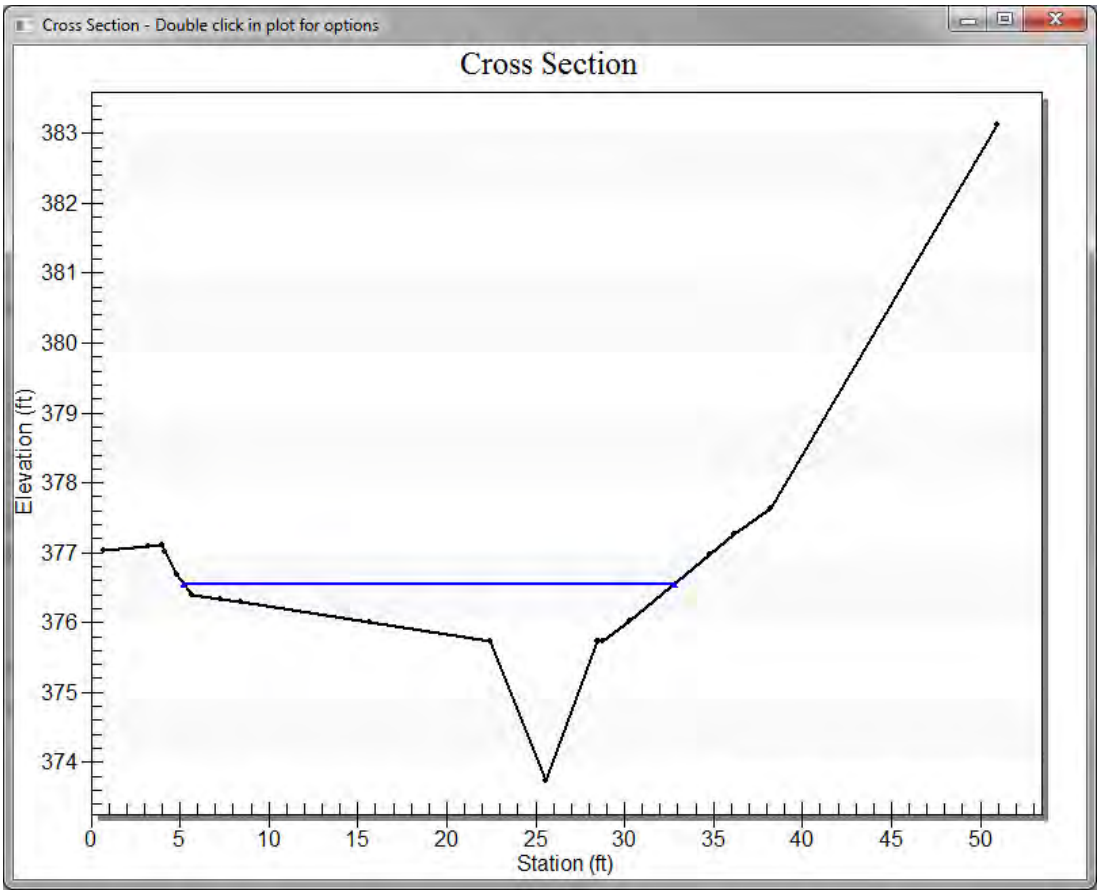
Critical Top Width: 26.56 ft

Calculated Max Shear Stress: 1.0570 lb/ft^2

Calculated Avg Shear Stress: 0.2736 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0241


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
383
382
381
380
379
378
377
376
375
374
0
5
10
15
20
25
30
35
40
45
50
Station (ft)

Channel Analysis: DC-5_113 - 114
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
25.70	370.74	0.0300
25.91	370.83	0.0300
26.34	370.85	0.0300
31.00	371.08	0.0300
32.04	370.61	0.0300
35.45	369.10	0.0300
35.91	369.08	0.0300
36.14	369.07	0.0300
39.14	367.07	0.0300
42.14	369.07	0.0200
47.21	369.27	0.0200
55.14	369.59	0.0200
55.50	369.61	0.0200
56.16	369.63	0.0300
59.74	371.99	0.0300
60.53	372.49	0.0300
61.15	372.96	0.0300
68.92	379.05	-----

Longitudinal Slope: 0.0040 ft/ft

Flow: 84.0000 cfs

Result Parameters

Depth: 2.9518 ft

Area of Flow: 22.8610 ft^2

Wetted Perimeter: 24.9214 ft

Hydraulic Radius: 0.9173 ft

Average Velocity: 3.6744 ft/s

Top Width: 23.3859 ft

Froude Number: 0.6549

Critical Depth: 2.6959 ft

Critical Velocity: 4.9413 ft/s

Critical Slope: 0.0097 ft/ft

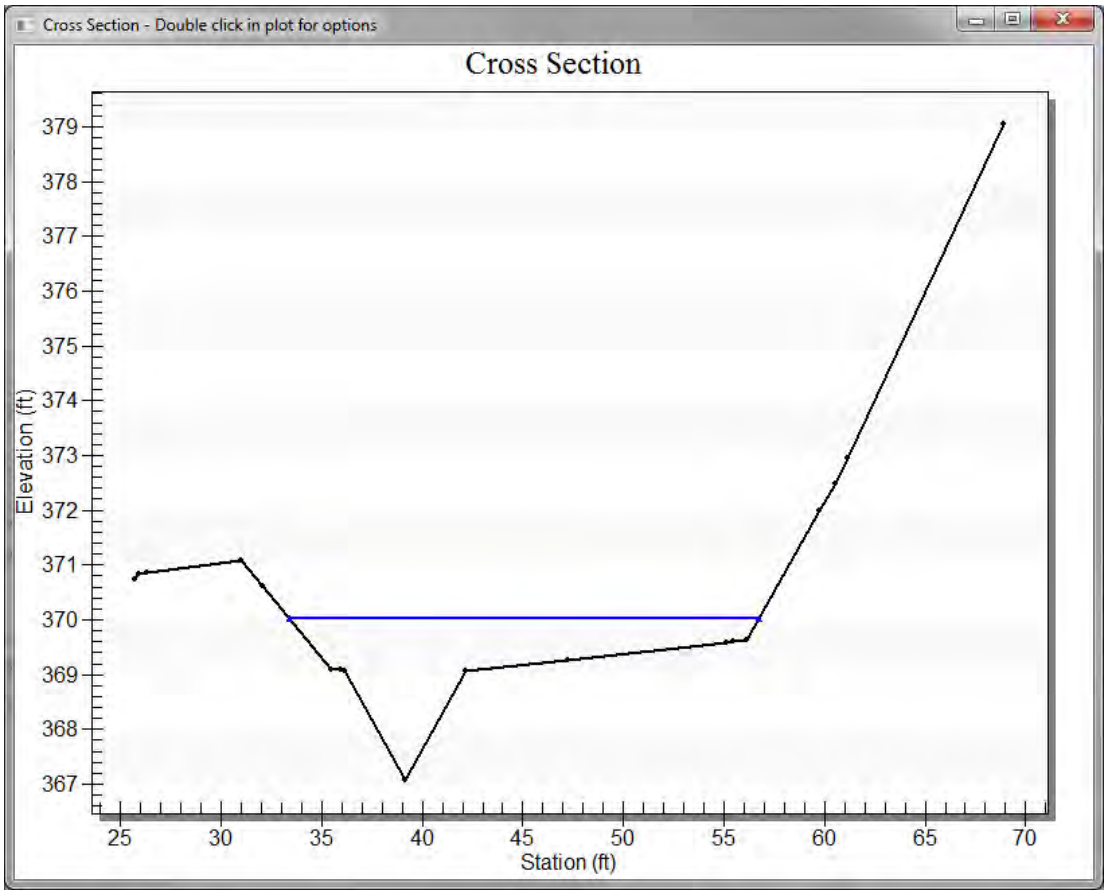
Critical Top Width: 22.42 ft

Calculated Max Shear Stress: 0.7368 lb/ft^2

Calculated Avg Shear Stress: 0.2290 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0241


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
379
378
377
376
375
374
373
372
371
370
369
368
367
25
30
35
40
45
50
55
60
65
70
Station (ft)

Channel Analysis: DC-6_206 - 205
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	382.96	0.0300
0.41	382.81	0.0300
2.80	381.98	0.0300
6.26	380.85	0.0300
6.44	380.80	0.0300
6.74	380.70	0.0300
10.08	379.66	0.0300
12.11	378.99	0.0300
13.72	378.45	0.0300
16.36	377.51	0.0300
17.36	377.14	0.0300
17.96	376.92	0.0300
20.45	375.90	0.0300
21.97	375.35	0.0200
25.23	375.22	0.0200
27.00	375.14	0.0300
30.00	373.14	0.0300
33.00	375.14	0.0200
36.51	375.29	0.0200
43.05	375.55	-----

Longitudinal Slope: 0.0060 ft/ft

Flow: 26.0900 cfs

Result Parameters

Depth: 2.1469 ft

Area of Flow: 7.3796 ft^2

Wetted Perimeter: 14.1038 ft

Hydraulic Radius: 0.5232 ft

Average Velocity: 3.5354 ft/s

Top Width: 12.8864 ft

Froude Number: 0.8233

Critical Depth: 1.7980 ft

Critical Velocity: 5.3803 ft/s

Critical Slope: 0.0174 ft/ft

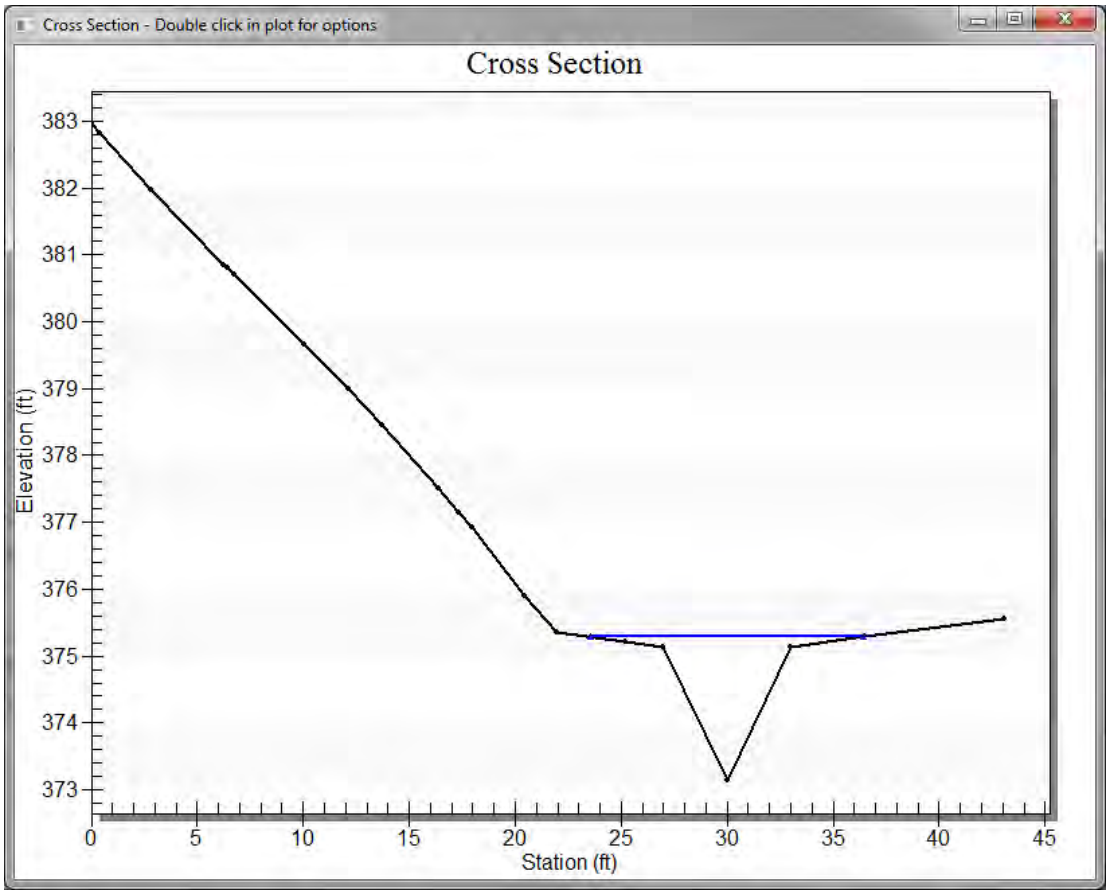
Critical Top Width: 5.39 ft

Calculated Max Shear Stress: 0.8038 lb/ft^2

Calculated Avg Shear Stress: 0.1959 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0211


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
383
382
381
380
379
378
377
376
375
374
373
0
5
10
15
20
25
30
35
40
45
Station (ft)

Channel Analysis: DC-7_207 - 205
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
16.22	375.11	0.0200
27.85	374.64	0.0200
37.65	374.25	0.0300
40.65	372.25	0.0300
43.65	374.25	0.0200
47.08	374.39	0.0200
51.43	374.56	0.0300
53.29	375.00	0.0300
54.34	375.33	0.0300
54.69	375.44	0.0300
55.42	375.71	0.0300
58.43	376.86	0.0300
59.90	377.38	0.0300
62.17	378.25	0.0300
65.47	379.28	0.0300
66.79	379.72	0.0300
70.65	381.02	-----

Longitudinal Slope: 0.0060 ft/ft

Flow: 3.2000 cfs

Result Parameters

Depth: 0.9991 ft

Area of Flow: 1.4974 ft^2

Wetted Perimeter: 3.6025 ft

Hydraulic Radius: 0.4157 ft

Average Velocity: 2.1370 ft/s

Top Width: 2.9974 ft

Froude Number: 0.5328

Critical Depth: 0.7767 ft

Critical Velocity: 3.5363 ft/s

Critical Slope: 0.0230 ft/ft

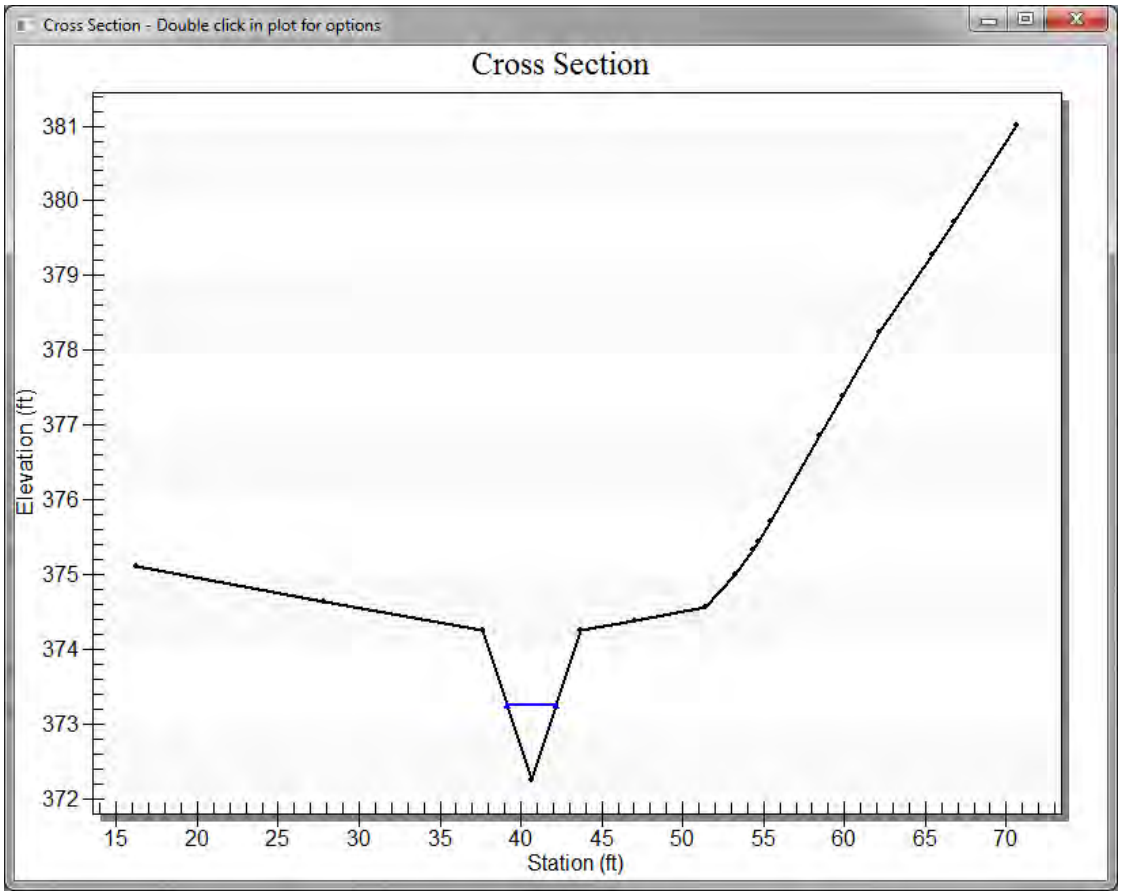
Critical Top Width: 2.33 ft

Calculated Max Shear Stress: 0.3741 lb/ft^2

Calculated Avg Shear Stress: 0.1556 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
381
380
379
378
377
376
375
374
373
372
15
20
25
30
35
40
45
50
55
60
65
70
Station (ft)

Channel Analysis: DC-8_208.1 - 208
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	343.21	0.0300
1.12	342.87	0.0300
1.41	342.77	0.0300
7.33	340.88	0.0300
8.40	340.55	0.0300
9.84	340.00	0.0300
11.97	339.20	0.0300
13.55	338.63	0.0300
15.55	337.89	0.0300
17.25	337.31	0.0200
23.89	337.05	0.0200
27.00	336.92	0.0300
30.00	334.93	0.0300
33.00	336.93	0.0200
49.81	337.63	0.0200
51.57	337.70	0.0200
55.77	337.86	0.0200
58.39	337.96	-----

Longitudinal Slope: 0.0780 ft/ft

Flow: 2.2000 cfs

Result Parameters

Depth: 0.5361 ft

Area of Flow: 0.4322 ft^2

Wetted Perimeter: 1.9363 ft

Hydraulic Radius: 0.2232 ft

Average Velocity: 5.0903 ft/s

Top Width: 1.6123 ft

Froude Number: 1.7326

Critical Depth: 0.6679 ft

Critical Velocity: 3.2795 ft/s

Critical Slope: 0.0241 ft/ft

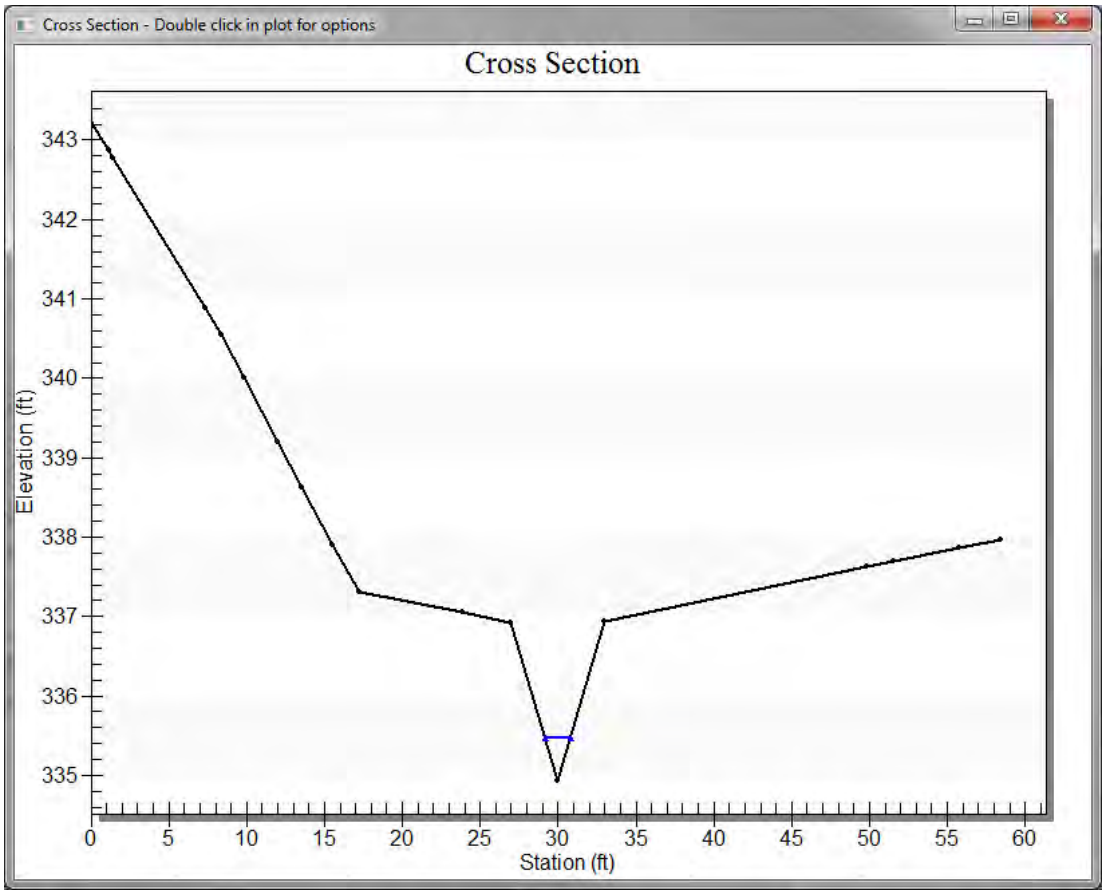
Critical Top Width: 2.01 ft

Calculated Max Shear Stress: 2.6093 lb/ft^2

Calculated Avg Shear Stress: 1.0864 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
343
342
341
340
339
338
337
336
335
0
5
10
15
20
25
30
35
40
45
50
55
60
Station (ft)

Channel Analysis: DC-9_210 - 208
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	342.33	0.0300
0.17	342.28	0.0300
5.19	340.71	0.0300
5.39	340.65	0.0300
9.37	339.34	0.0300
10.60	338.94	0.0300
12.86	338.22	0.0300
15.81	337.26	0.0300
20.26	335.96	0.0300
21.03	335.73	0.0300
22.29	335.35	0.0200
25.48	335.22	0.0200
27.00	335.16	0.0300
30.00	333.16	0.0300
33.00	335.16	0.0200
48.63	335.79	0.0200
56.44	336.10	-----

Longitudinal Slope: 0.0070 ft/ft

Flow: 1.2000 cfs

Result Parameters

Depth: 0.6719 ft

Area of Flow: 0.6773 ft^2

Wetted Perimeter: 2.4227 ft

Hydraulic Radius: 0.2795 ft

Average Velocity: 1.7718 ft/s

Top Width: 2.0158 ft

Froude Number: 0.5387

Critical Depth: 0.5246 ft

Critical Velocity: 2.9066 ft/s

Critical Slope: 0.0262 ft/ft

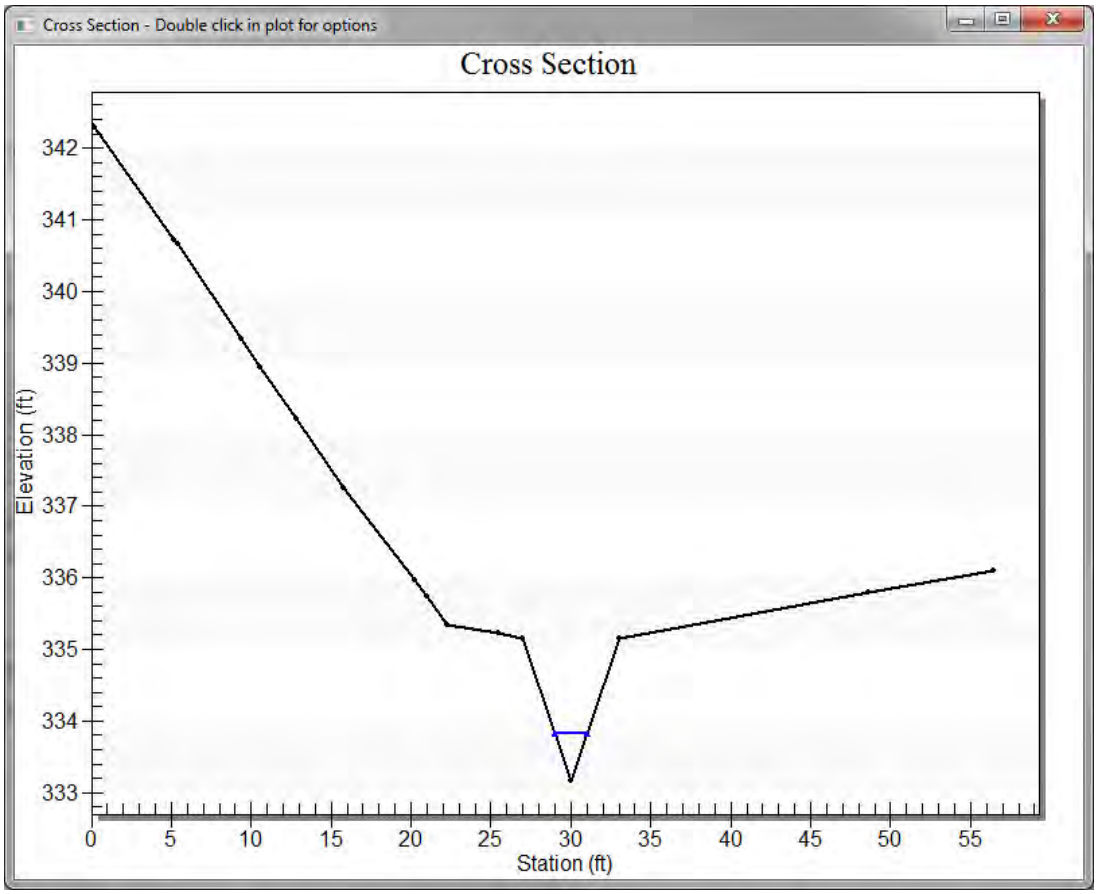
Critical Top Width: 1.57 ft

Calculated Max Shear Stress: 0.2935 lb/ft^2

Calculated Avg Shear Stress: 0.1221 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
342
341
340
339
338
337
336
335
334
333
0
5
10
15
20
25
30
35
40
45
50
55
Station (ft)

Channel Analysis: DC-10_209 - 211
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
19.19	304.99	0.0200
21.83	304.58	0.0200
24.86	304.08	0.0200
27.50	303.41	0.0200
30.53	302.60	0.0200
31.19	302.45	0.0200
32.45	302.29	0.0200
34.89	301.92	0.0200
36.19	301.87	0.0200
38.58	301.92	0.0200
41.86	301.97	0.0200
42.28	301.96	0.0200
43.06	301.98	0.0200
45.97	301.92	0.0200
47.53	302.14	0.0200
48.87	302.45	0.0200
49.18	302.60	0.0200
52.56	304.24	-----

Longitudinal Slope: 0.1950 ft/ft

Flow: 4.7000 cfs

Result Parameters

Depth: 0.1344 ft

Area of Flow: 0.8490 ft^2

Wetted Perimeter: 12.2503 ft

Hydraulic Radius: 0.0693 ft

Average Velocity: 5.5359 ft/s

Top Width: 12.2351 ft

Froude Number: 3.7034

Critical Depth: 0.2316 ft

Critical Velocity: 2.2347 ft/s

Critical Slope: 0.0109 ft/ft

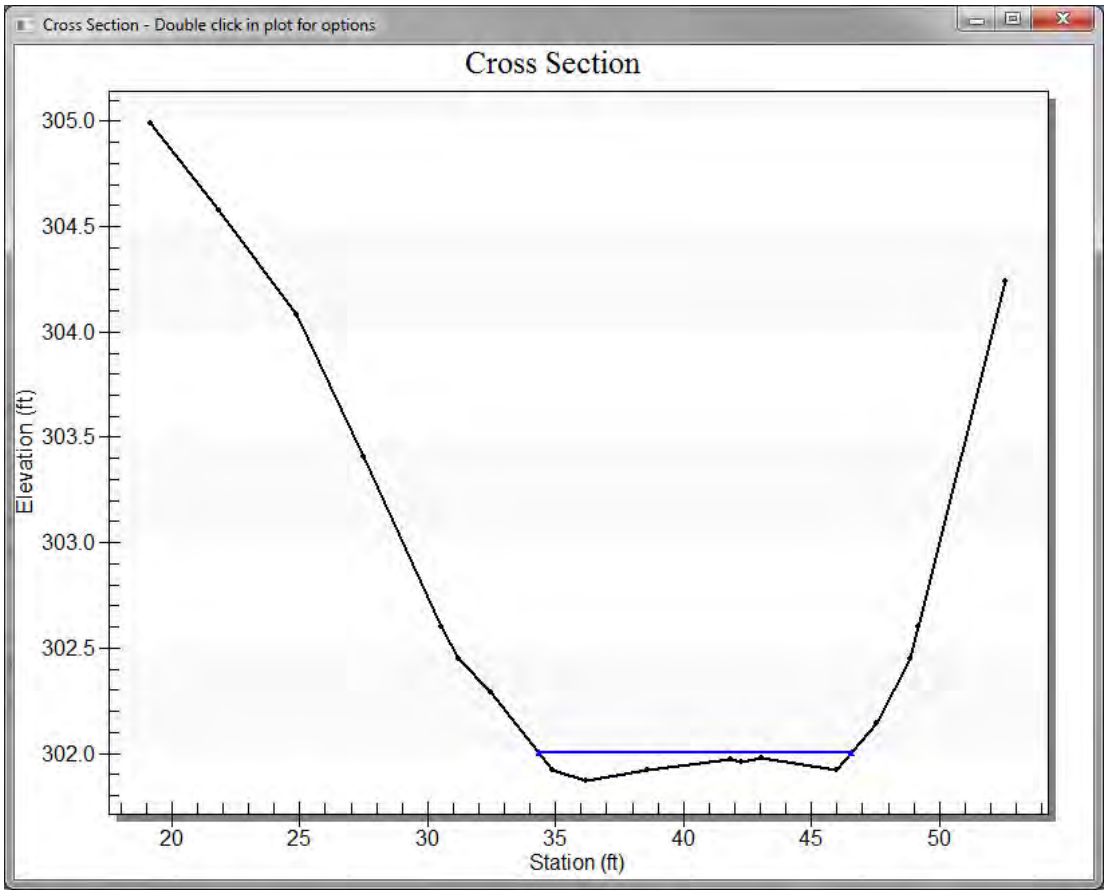
Critical Top Width: 13.57 ft

Calculated Max Shear Stress: 1.6354 lb/ft^2

Calculated Avg Shear Stress: 0.8433 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0200


Cross Section - Double click in plot for options
Cross Section
305.0
304.5
304.0
303.5
303.0
302.5
302.0
Elevation (ft)
20
25
30
35
40
45
50
Station (ft)

.

Channel Analysis: DC-11_210 - 211
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
9.52	328.29	0.0200
10.01	328.12	0.0200
12.05	327.34	0.0200
14.34	326.71	0.0200
15.59	326.61	0.0200
19.01	325.92	0.0200
19.97	325.88	0.0200
20.99	325.85	0.0200
21.50	325.84	0.0200
22.01	325.83	0.0200
22.51	325.82	0.0200
28.54	325.82	0.0200
29.00	325.82	0.0200
29.45	325.83	0.0200
29.87	325.85	0.0200
32.16	326.06	0.0200
32.39	326.10	0.0200
32.66	326.14	0.0200
32.98	326.18	0.0200
33.37	326.23	0.0200
33.68	326.25	0.0200
33.97	326.26	0.0200
34.24	326.28	0.0200
34.49	326.30	0.0200
34.72	326.32	0.0300
34.93	326.34	0.0200
35.12	326.36	0.0200
35.28	326.37	0.0200
35.43	326.39	0.0200
35.80	326.44	0.0200
37.25	326.54	0.0200
37.58	326.59	0.0200
37.99	326.64	0.0200
38.50	326.70	0.0200
39.10	326.75	0.0200
39.77	326.81	0.0200
40.51	326.85	0.0200
41.27	326.88	0.0200
42.03	326.89	0.0200
42.37	326.81	0.0200
42.39	326.81	0.0200
42.42	326.80	-----

Longitudinal Slope: 0.0580 ft/ft

Flow: 5.2000 cfs

Result Parameters

Depth: 0.1284 ft

Area of Flow: 1.2913 ft^2

Wetted Perimeter: 12.0944 ft

Hydraulic Radius: 0.1068 ft

Average Velocity: 4.0271 ft/s

Top Width: 12.0850 ft

Froude Number: 2.1711

Critical Depth: 0.2027 ft

Critical Velocity: 2.3289 ft/s

Critical Slope: 0.0106 ft/ft

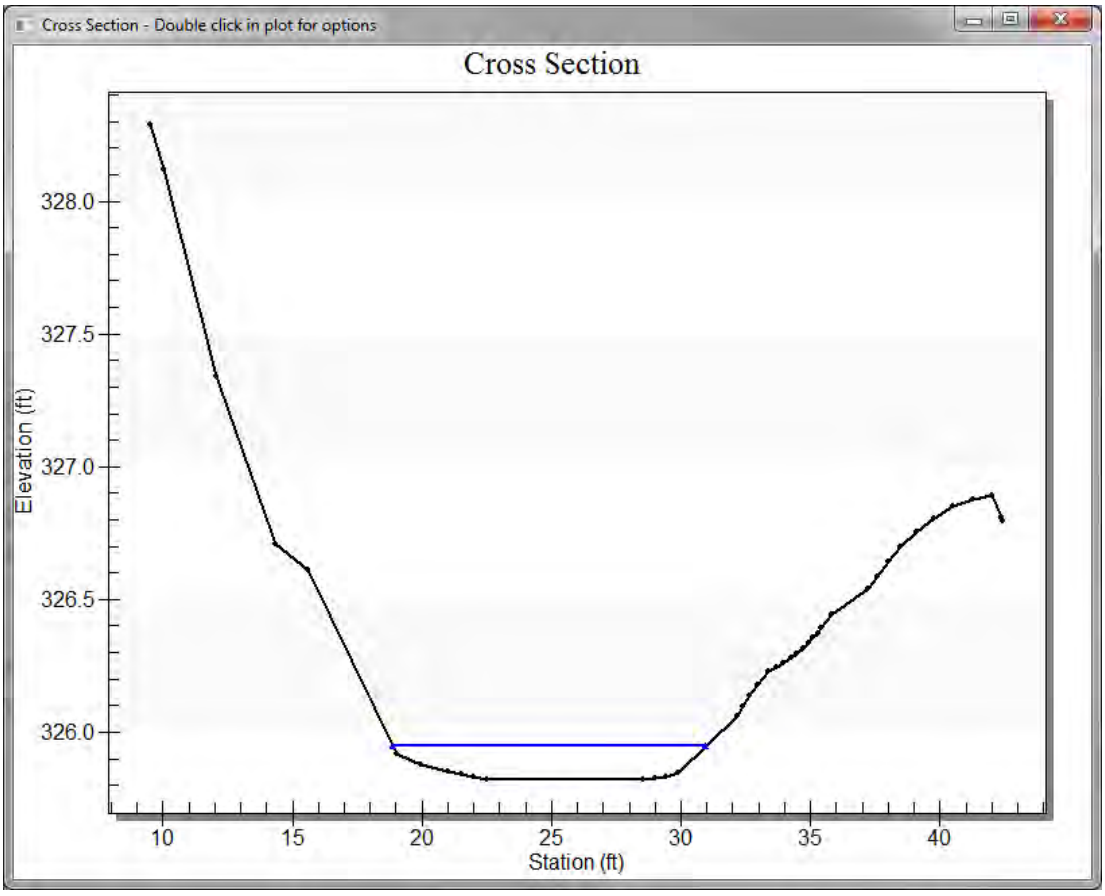
Critical Top Width: 13.26 ft

Calculated Max Shear Stress: 0.4646 lb/ft^2

Calculated Avg Shear Stress: 0.3864 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0200



Channel Analysis: DC-12_308 - 309
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	383.18	0.0300
1.04	383.19	0.0300
3.04	383.26	0.0300
6.34	383.24	0.0300
6.97	383.22	0.0300
8.78	383.05	0.0300
10.89	382.87	0.0300
11.63	382.74	0.0300
14.82	381.76	0.0300
16.93	380.97	0.0300
18.66	380.20	0.0300
20.59	378.91	0.0300
25.91	375.37	0.0300
28.91	373.36	0.0300
31.91	375.36	0.0200
33.38	375.42	0.0200
50.10	376.09	0.0200
50.59	376.11	0.0300
54.00	377.26	0.0300
54.25	377.36	0.0300
59.30	379.30	0.0300
61.92	380.22	0.0300
64.60	381.14	0.0300
65.84	381.59	-----

Longitudinal Slope: 0.0220 ft/ft

Flow: 43.0000 cfs

Result Parameters

Depth: 2.0679 ft

Area of Flow: 6.4518 ft^2

Wetted Perimeter: 8.9909 ft

Hydraulic Radius: 0.7176 ft

Average Velocity: 6.6648 ft/s

Top Width: 7.7554 ft

Froude Number: 1.2877

Critical Depth: 2.3359 ft

Critical Velocity: 4.5358 ft/s

Critical Slope: 0.0095 ft/ft

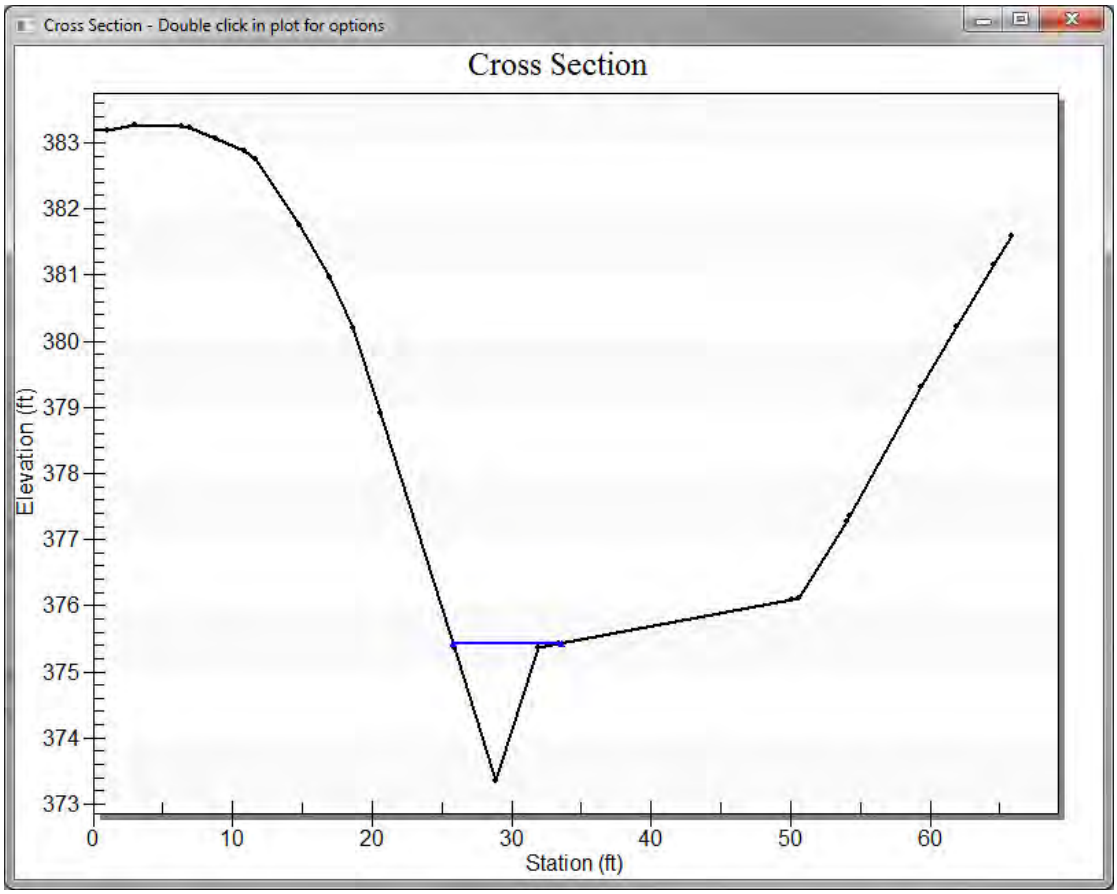
Critical Top Width: 14.85 ft

Calculated Max Shear Stress: 2.8389 lb/ft^2

Calculated Avg Shear Stress: 0.9851 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0265


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
383
382
381
380
379
378
377
376
375
374
373
0
10
20
30
40
50
60
Station (ft)

Channel Analysis: DC-13_602 - 605
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	415.15	0.0300
1.15	415.64	0.0300
1.77	415.55	0.0300
4.03	415.13	0.0300
4.19	415.10	0.0300
4.25	415.09	0.0300
6.60	414.85	0.0300
6.83	414.74	0.0300
8.19	414.72	0.0300
12.70	414.68	0.0200
31.53	413.94	0.0200
37.71	413.69	0.0200
42.54	413.63	0.0200
43.93	413.60	0.0200
48.26	413.76	0.0300
55.20	414.12	0.0300
60.65	414.63	0.0300
61.44	414.70	0.0300
67.04	415.26	0.0300
67.10	415.27	-----

Longitudinal Slope: 0.0130 ft/ft

Flow: 51.3000 cfs

Result Parameters

Depth: 0.6431 ft

Area of Flow: 12.1270 ft^2

Wetted Perimeter: 32.7283 ft

Hydraulic Radius: 0.3705 ft

Average Velocity: 4.2302 ft/s

Top Width: 32.6985 ft

Froude Number: 1.2241

Critical Depth: 0.7039 ft

Critical Velocity: 3.6175 ft/s

Critical Slope: 0.0086 ft/ft

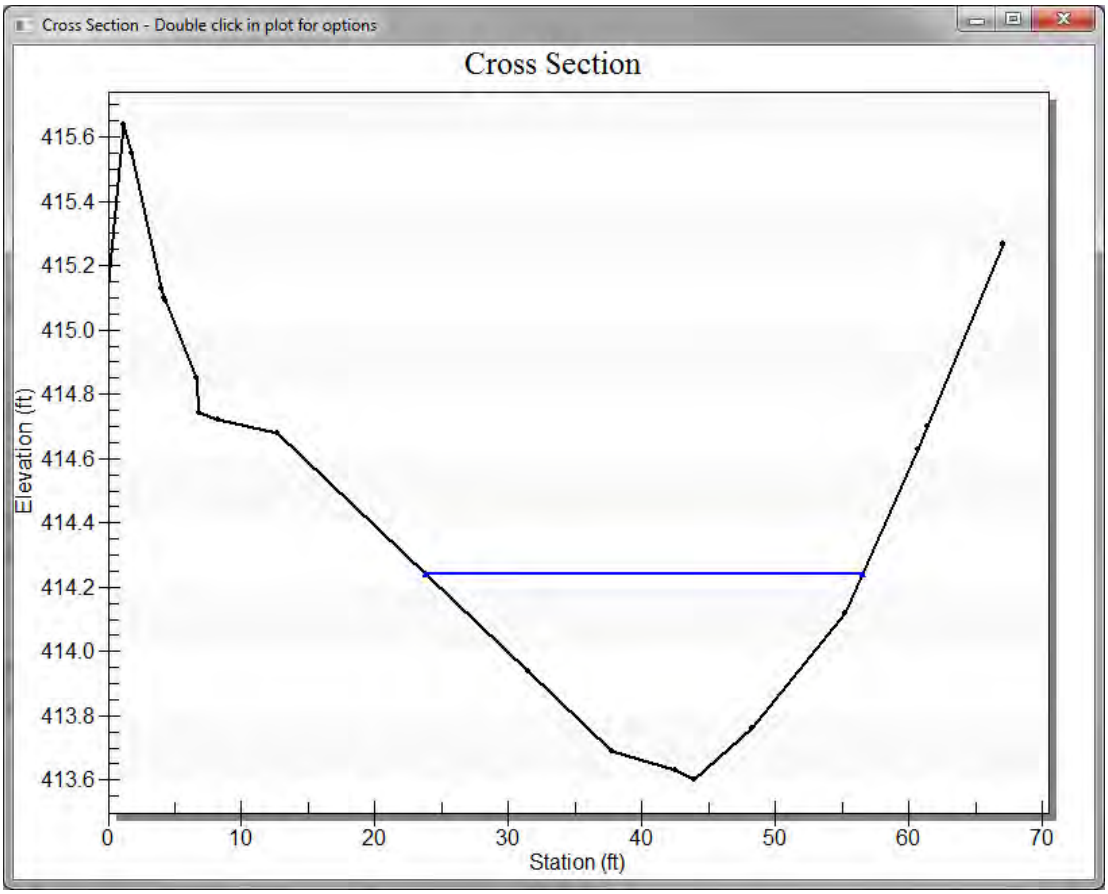
Critical Top Width: 34.89 ft

Calculated Max Shear Stress: 0.5217 lb/ft^2

Calculated Avg Shear Stress: 0.3006 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0207


Cross Section - Double click in plot for options
Cross Section
415.6
415.4
415.2
415.0
414.8
414.6
414.4
414.2
414.0
413.8
413.6
Elevation (ft)
0
10
20
30
40
50
60
70
Station (ft)

Channel Analysis: DC-14_601 - 602
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	426.84	0.0300
0.18	426.94	0.0300
1.36	427.52	0.0300
3.32	428.41	0.0300
3.53	428.51	0.0300
3.99	428.30	0.0300
5.81	427.45	0.0200
44.76	427.00	0.0200
77.21	426.65	0.0300
90.57	426.10	0.0300
102.25	425.62	0.0300
109.85	425.58	0.0300
109.86	425.58	0.0300
109.89	425.58	0.0300
112.12	425.27	0.0300
120.14	425.58	0.0300
123.48	425.74	0.0300
124.63	425.79	0.0300
138.10	426.40	0.0200
141.35	426.38	0.0200
142.64	426.41	0.0200
146.31	426.66	0.0200
147.95	426.80	0.0200
148.45	426.82	0.0200
148.95	426.85	-----

Longitudinal Slope: 0.0190 ft/ft

Flow: 29.6000 cfs

Result Parameters

Depth: 0.6451 ft

Area of Flow: 9.6904 ft^2

Wetted Perimeter: 32.3836 ft

Hydraulic Radius: 0.2992 ft

Average Velocity: 3.0546 ft/s

Top Width: 32.3423 ft

Froude Number: 0.9834

Critical Depth: 0.6412 ft

Critical Velocity: 3.0947 ft/s

Critical Slope: 0.0197 ft/ft

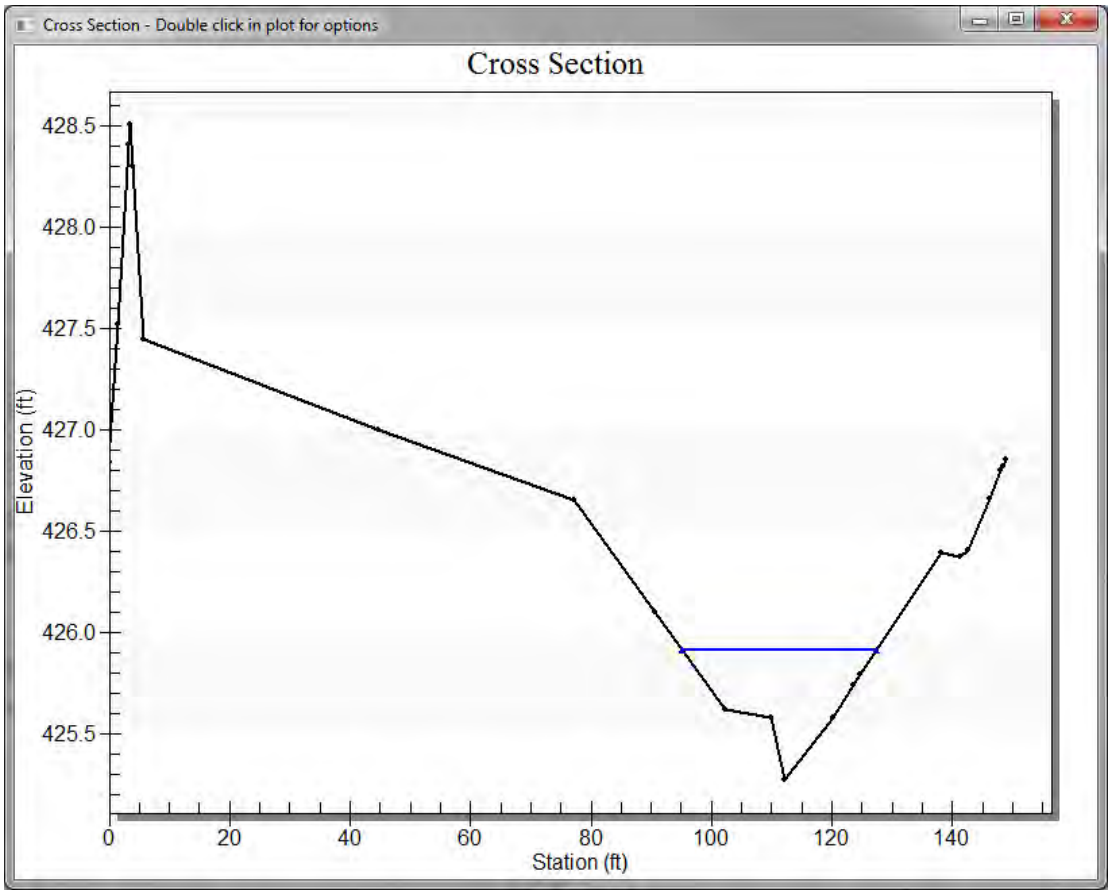
Critical Top Width: 32.16 ft

Calculated Max Shear Stress: 0.7649 lb/ft^2

Calculated Avg Shear Stress: 0.3548 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300



Channel Analysis: DC-15_702 - 704
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	436.38	0.0300
1.61	435.73	0.0300
2.88	435.10	0.0300
7.84	433.23	0.0300
18.96	430.14	0.0300
20.03	430.11	0.0300
22.01	430.07	0.0200
30.86	430.42	0.0200
35.66	430.61	0.0200
38.25	431.99	0.0200
39.57	432.63	-----

Longitudinal Slope: 0.0060 ft/ft

Flow: 28.0000 cfs

Result Parameters

Depth: 0.7237 ft

Area of Flow: 9.1035 ft^2

Wetted Perimeter: 19.5439 ft

Hydraulic Radius: 0.4658 ft

Average Velocity: 3.0758 ft/s

Top Width: 19.3973 ft

Froude Number: 0.7912

Critical Depth: 0.6524 ft

Critical Velocity: 3.6199 ft/s

Critical Slope: 0.0101 ft/ft

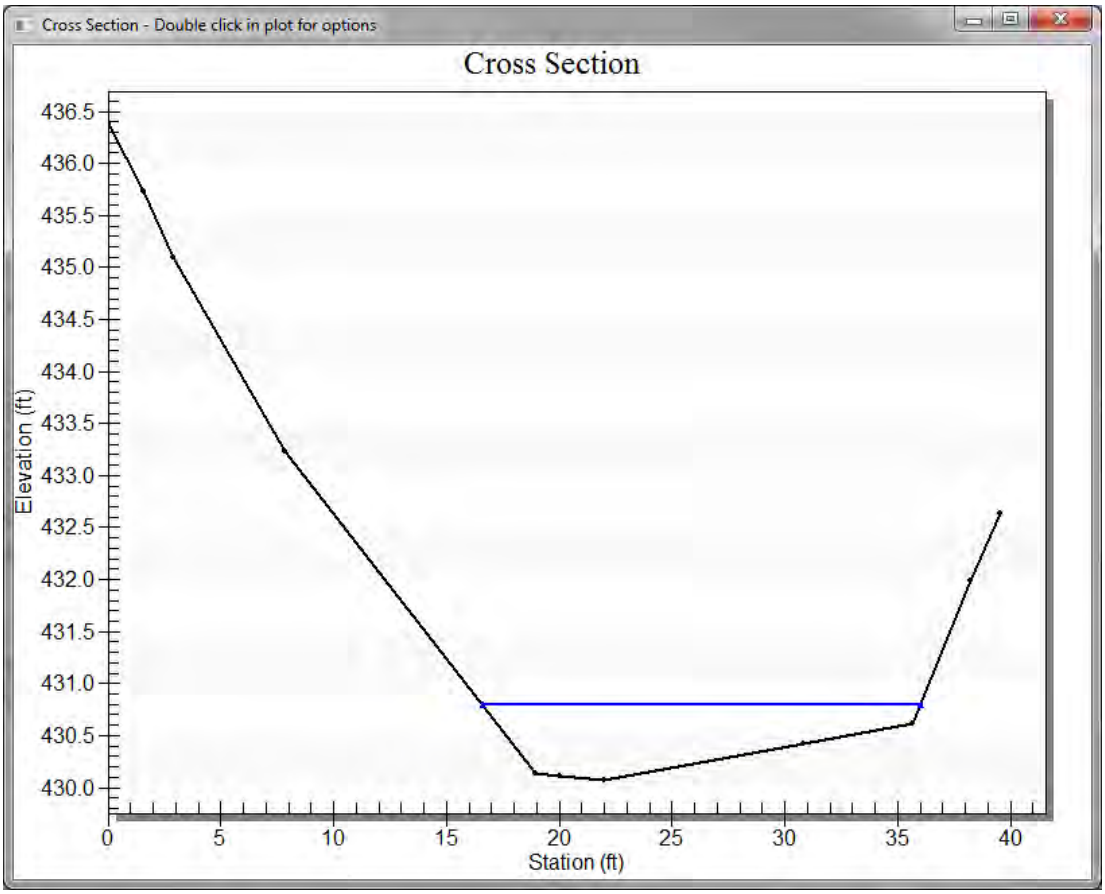
Critical Top Width: 19.01 ft

Calculated Max Shear Stress: 0.2710 lb/ft^2

Calculated Avg Shear Stress: 0.1744 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0225


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
436.5
436.0
435.5
435.0
434.5
434.0
433.5
433.0
432.5
432.0
431.5
431.0
430.5
430.0
0
5
10
15
20
25
30
35
40
Station (ft)

Channel Analysis: DC-16_705 - 704
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	433.21	0.0300
3.52	432.52	0.0300
4.05	432.43	0.0300
6.98	431.48	0.0300
10.06	430.88	0.0300
11.76	430.63	0.0300
14.47	430.12	0.0300
17.54	429.67	0.0300
22.06	428.76	0.0300
22.57	428.75	0.0300
23.86	428.72	0.0300
26.88	428.66	0.0300
26.98	428.66	0.0300
28.23	428.64	0.0200
45.09	429.31	0.0200
52.99	429.62	0.0200
53.48	429.86	0.0300
54.16	430.21	-----

Longitudinal Slope: 0.0230 ft/ft

Flow: 16.3000 cfs

Result Parameters

Depth: 0.4072 ft

Area of Flow: 4.4562 ft^2

Wetted Perimeter: 17.8803 ft

Hydraulic Radius: 0.2492 ft

Average Velocity: 3.6578 ft/s

Top Width: 17.8423 ft

Froude Number: 1.2898

Critical Depth: 0.4595 ft

Critical Velocity: 3.0011 ft/s

Critical Slope: 0.0131 ft/ft

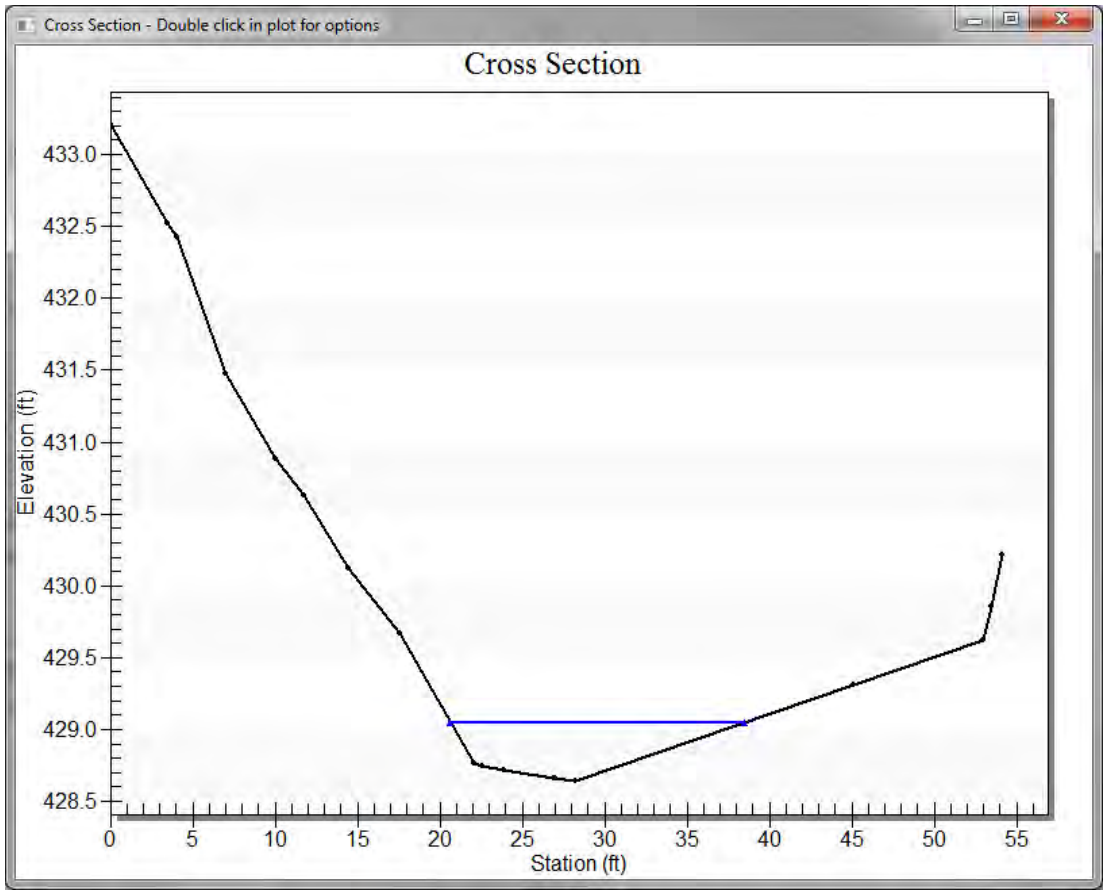
Critical Top Width: 19.42 ft

Calculated Max Shear Stress: 0.5844 lb/ft^2

Calculated Avg Shear Stress: 0.3577 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0244


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
433.0
432.5
432.0
431.5
431.0
430.5
430.0
429.5
429.0
428.5
0
5
10
15
20
25
30
35
40
45
50
55
Station (ft)

Channel Analysis: DC-18_710 - 706
Cross Section Data

Elevation (ft)	Elevation (ft)	Manning's n
0.00	400.33	0.0200
1.32	400.69	0.0200
2.80	401.13	0.0200
5.83	401.54	0.0200
8.97	401.02	0.0200
9.29	400.96	0.0200
10.04	400.86	0.0200
12.28	400.41	0.0300
18.48	399.09	0.0300
18.73	399.04	0.0300
18.77	399.03	0.0300
22.92	398.95	0.0300
37.46	399.96	0.0200
40.29	400.16	0.0200
40.43	400.19	0.0200
42.60	400.67	0.0200
43.59	400.56	0.0200
44.17	400.36	0.0200
45.83	400.82	0.0200
45.97	400.86	0.0200
46.62	401.00	0.0200
52.18	402.24	0.0200
57.62	403.49	0.0200
63.73	405.14	-----

Longitudinal Slope: 0.0080 ft/ft

Flow: 14.3000 cfs

Result Parameters

Depth: 0.6367 ft

Area of Flow: 6.1264 ft^2

Wetted Perimeter: 16.0206 ft

Hydraulic Radius: 0.3824 ft

Average Velocity: 2.3341 ft/s

Top Width: 15.9392 ft

Froude Number: 0.6635

Critical Depth: 0.5231 ft

Critical Velocity: 3.2217 ft/s

Critical Slope: 0.0193 ft/ft

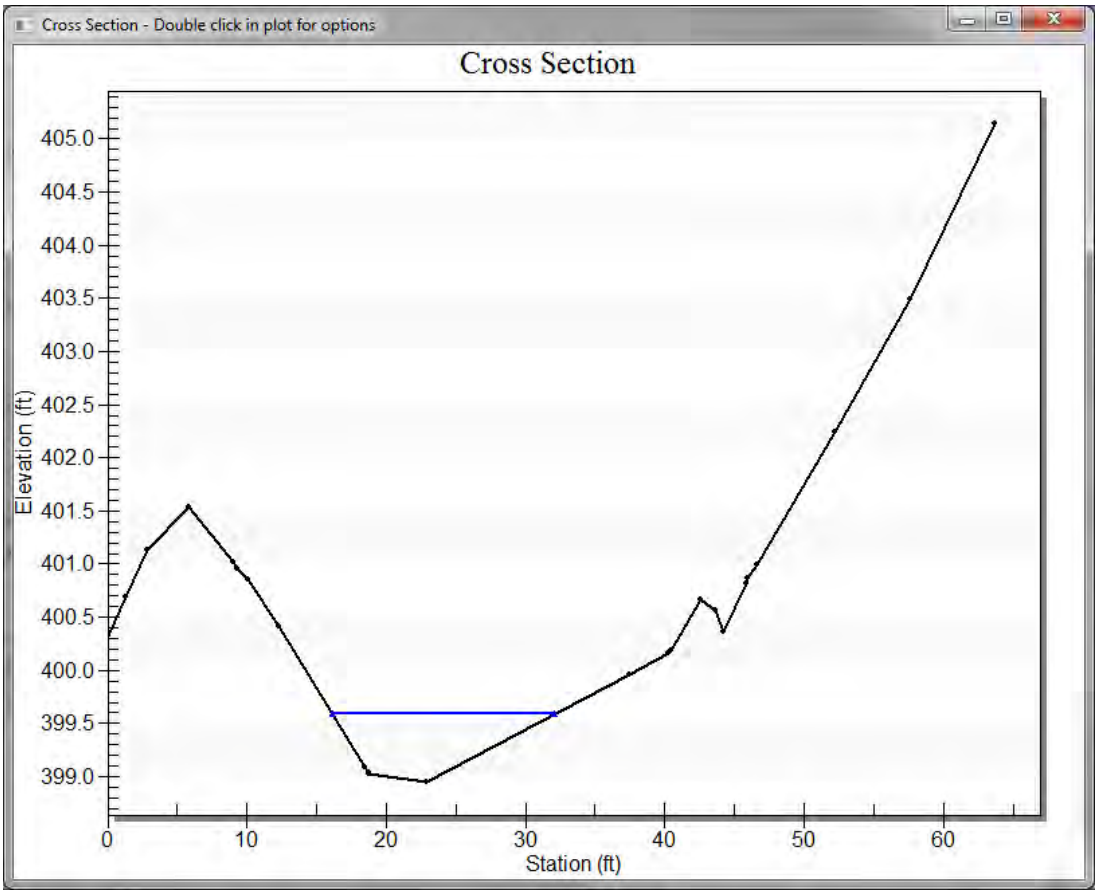
Critical Top Width: 13.77 ft

Calculated Max Shear Stress: 0.3178 lb/ft^2

Calculated Avg Shear Stress: 0.1909 lb/ft^2

Composite Manning's n Equation: Lotter method

Manning's n: 0.0300


Cross Section - Double click in plot for options
Cross Section
Elevation (ft)
405.0
404.5
404.0
403.5
403.0
402.5
402.0
401.5
401.0
400.5
400.0
399.5
399.0
0
10
20
30
40
50
60
Station (ft)

ATTACHMENT C

DOWN DRAIN AND CULVERT CALCULATIONS:

- HY-8 COMPUTER CALCULATION OUTPUTS
- WSPG2010 COMPUTER OUTPUT CALCULATION OUTPUTS

HY-8 Culvert Analysis Report

Project Data

Project Title: Miramar Landfill Storm Water Conveyance Improvements

Designer: D-Max Engineering, Inc.

Project Date: April, 2018

Project Units: U.S. Customary Units

Notes: Down Drain and Culvert Hydraulic Analysis Calculations

Down Drain 1

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10 cfs

Design Flow: 17 cfs

Maximum Flow: 20 cfs

Table 1 - Summary of Culvert Flows at Crossing: Down Drain 1 (111-109)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 1 (111-109) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
402.89	10.00	10.00	0.00	1
402.97	11.00	11.00	0.00	1
403.05	12.00	12.00	0.00	1
403.12	13.00	13.00	0.00	1
403.19	14.00	14.00	0.00	1
403.26	15.00	15.00	0.00	1
403.33	16.00	16.00	0.00	1
403.39	17.00	17.00	0.00	1
403.46	18.00	18.00	0.00	1
403.52	19.00	19.00	0.00	1
403.58	20.00	20.00	0.00	1
403.76	23.01	23.01	0.00	Overtopping

Table 2 - Culvert Summary Table: Down Drain 1 (111-109)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.00	10.00	402.89	2.131	0.0*	1-S2n	0.432	0.997	0.432	1.488	15.515	3.010
11.00	11.00	402.97	2.212	0.0*	1-S2n	0.454	1.049	0.478	1.542	14.613	3.083
12.00	12.00	403.05	2.289	0.0*	1-S2n	0.473	1.095	0.473	1.593	16.178	3.151
13.00	13.00	403.12	2.363	0.0*	1-S2n	0.492	1.143	0.499	1.642	16.314	3.214
14.00	14.00	403.19	2.434	0.0*	1-S2n	0.510	1.189	0.510	1.688	17.058	3.275
15.00	15.00	403.26	2.503	0.0*	1-S2n	0.528	1.231	0.535	1.733	16.923	3.332
16.00	16.00	403.33	2.569	0.0*	1-S2n	0.545	1.275	0.545	1.775	17.576	3.386
17.00	17.00	403.39	2.634	0.0*	1-S2n	0.561	1.317	0.561	1.816	17.948	3.437
18.00	18.00	403.46	2.697	0.0*	1-S2n	0.577	1.358	0.577	1.855	18.293	3.487
19.00	19.00	403.52	2.759	0.0*	1-S2n	0.593	1.397	0.612	1.893	17.694	3.534
20.00	20.00	403.58	2.820	0.0*	1-S2n	0.609	1.436	0.609	1.930	18.744	3.580

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 400.76 ft, Outlet Elevation (invert): 381.76 ft

Culvert Length: 59.51 ft, Culvert Slope: 0.3369

****

Site Data - Down Drain 1 (111-109)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 400.76 ft

Outlet Station: 56.40 ft

Outlet Elevation: 381.76 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 1 (111-109)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 3 - Downstream Channel Rating Curve (Crossing: Down Drain 1 (111-109))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10.00	381.25	1.49	3.01	0.65	0.62
11.00	381.30	1.54	3.08	0.67	0.62
12.00	381.35	1.59	3.15	0.70	0.62
13.00	381.40	1.64	3.21	0.72	0.63
14.00	381.45	1.69	3.27	0.74	0.63
15.00	381.49	1.73	3.33	0.76	0.63
16.00	381.53	1.77	3.39	0.78	0.63
17.00	381.58	1.82	3.44	0.79	0.64
18.00	381.62	1.86	3.49	0.81	0.64
19.00	381.65	1.89	3.53	0.83	0.64
20.00	381.69	1.93	3.58	0.84	0.64

Tailwater Channel Data - Down Drain 1 (111-109)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0300

Channel Invert Elevation: 379.76 ft

Roadway Data for Crossing: Down Drain 1 (111-109)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 403.76 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

Down Drain 2

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 45.1 cfs

Maximum Flow: 50 cfs

Table 4 - Summary of Culvert Flows at Crossing: Down Drain 2 (107-105)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 2 (107-105) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
419.41	20.00	20.00	0.00	1
419.58	23.00	23.00	0.00	1
419.75	26.00	26.00	0.00	1
419.90	29.00	29.00	0.00	1
420.05	32.00	32.00	0.00	1
420.20	35.00	35.00	0.00	1
420.35	38.00	38.00	0.00	1
420.50	41.00	41.00	0.00	1
420.66	44.00	44.00	0.00	1
420.72	45.10	45.10	0.00	1
420.99	50.00	50.00	0.00	1
421.14	52.64	52.64	0.00	Overtopping

Table 5 - Culvert Summary Table: Down Drain 2 (107-105)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	419.41	1.519	0.0*	1-S2n	0.605	1.436	0.605	1.930	18.922	3.580
23.00	23.00	419.58	1.693	0.0*	1-S2n	0.648	1.543	0.648	2.034	19.786	3.707
26.00	26.00	419.75	1.855	0.0*	1-S2n	0.690	1.641	0.725	2.129	19.059	3.823
29.00	29.00	419.90	2.010	0.0*	1-S2n	0.728	1.739	0.751	2.218	20.187	3.928
32.00	32.00	420.05	2.161	0.0*	1-S2n	0.766	1.832	0.783	2.302	21.037	4.026
35.00	35.00	420.20	2.310	0.0*	1-S2n	0.801	1.919	0.825	2.381	21.349	4.118
38.00	38.00	420.35	2.460	0.0*	1-S2n	0.836	2.001	0.870	2.455	21.559	4.203
41.00	41.00	420.50	2.612	0.0*	1-S2n	0.869	2.083	0.910	2.526	21.843	4.284
44.00	44.00	420.66	2.768	0.0*	1-S2n	0.901	2.158	0.951	2.594	22.063	4.360
45.10	45.10	420.72	2.826	0.0*	1-S2n	0.913	2.185	0.951	2.618	22.612	4.387
50.00	50.00	420.99	3.097	0.0*	5-S2n	0.963	2.298	0.963	2.721	24.644	4.502

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 417.89 ft, Outlet Elevation (invert): 396.11 ft

Culvert Length: 66.66 ft, Culvert Slope: 0.3457

****

Site Data - Down Drain 2 (107-105)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 417.89 ft

Outlet Station: 63.00 ft

Outlet Elevation: 396.11 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 2 (107-105)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 6 - Downstream Channel Rating Curve (Crossing: Down Drain 2 (107-105))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	396.04	1.93	3.58	0.84	0.64
23.00	396.14	2.03	3.71	0.89	0.65
26.00	396.24	2.13	3.82	0.93	0.65
29.00	396.33	2.22	3.93	0.97	0.66
32.00	396.41	2.30	4.03	1.01	0.66
35.00	396.49	2.38	4.12	1.04	0.67
38.00	396.57	2.46	4.20	1.07	0.67
41.00	396.64	2.53	4.28	1.10	0.67
44.00	396.70	2.59	4.36	1.13	0.67
45.10	396.73	2.62	4.39	1.14	0.68
50.00	396.83	2.72	4.50	1.19	0.68

Tailwater Channel Data - Down Drain 2 (107-105)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0070

Channel Manning's n: 0.0300

Channel Invert Elevation: 394.11 ft

Roadway Data for Crossing: Down Drain 2 (107-105)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 421.14 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

Down Drain 3

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10 cfs

Design Flow: 15 cfs

Maximum Flow: 20 cfs

Table 7 - Summary of Culvert Flows at Crossing: Down Drain 3 (116-117)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 3 (116-117) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
440.17	10.00	10.00	0.00	1
440.25	11.00	11.00	0.00	1
440.33	12.00	12.00	0.00	1
440.40	13.00	13.00	0.00	1
440.47	14.00	14.00	0.00	1
440.54	15.00	15.00	0.00	1
440.61	16.00	16.00	0.00	1
440.67	17.00	17.00	0.00	1
440.74	18.00	18.00	0.00	1
440.80	19.00	19.00	0.00	1
440.86	20.00	20.00	0.00	1
441.23	26.18	26.18	0.00	Overtopping

Table 8 - Culvert Summary Table: Down Drain 3 (116-117)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.00	10.00	440.17	2.191	0.0*	1-S2n	0.424	0.997	0.424	1.222	15.942	4.463
11.00	11.00	440.25	2.272	0.0*	1-S2n	0.444	1.049	0.444	1.267	16.199	4.570
12.00	12.00	440.33	2.349	0.0*	1-S2n	0.465	1.095	0.465	1.309	16.605	4.671
13.00	13.00	440.40	2.423	0.0*	1-S2n	0.482	1.143	0.482	1.349	17.092	4.765
14.00	14.00	440.47	2.495	0.0*	1-S2n	0.500	1.189	0.500	1.387	17.532	4.854
15.00	15.00	440.54	2.563	0.0*	1-S2n	0.517	1.231	0.517	1.423	17.753	4.939
16.00	16.00	440.61	2.630	0.0*	1-S2n	0.535	1.275	0.535	1.458	18.069	5.019
17.00	17.00	440.67	2.694	0.0*	1-S2n	0.550	1.317	0.550	1.491	18.438	5.096
18.00	18.00	440.74	2.758	0.0*	1-S2n	0.566	1.358	0.566	1.524	18.802	5.169
19.00	19.00	440.80	2.819	0.0*	1-S2n	0.581	1.397	0.581	1.555	19.139	5.239
20.00	20.00	440.86	2.880	0.0*	1-S2n	0.596	1.436	0.596	1.585	19.311	5.307

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 437.98 ft, Outlet Elevation (invert): 410.92 ft

Culvert Length: 78.79 ft, Culvert Slope: 0.3657

****

Site Data - Down Drain 3 (116-117)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 437.98 ft

Outlet Station: 74.00 ft

Outlet Elevation: 410.92 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 3 (116-117)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 9 - Downstream Channel Rating Curve (Crossing: Down Drain 3 (116-117))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10.00	410.14	1.22	4.46	1.53	1.01
11.00	410.19	1.27	4.57	1.58	1.01
12.00	410.23	1.31	4.67	1.63	1.02
13.00	410.27	1.35	4.77	1.68	1.02
14.00	410.31	1.39	4.85	1.73	1.03
15.00	410.34	1.42	4.94	1.78	1.03
16.00	410.38	1.46	5.02	1.82	1.04
17.00	410.41	1.49	5.10	1.86	1.04
18.00	410.44	1.52	5.17	1.90	1.04
19.00	410.47	1.55	5.24	1.94	1.05
20.00	410.51	1.59	5.31	1.98	1.05

Tailwater Channel Data - Down Drain 3 (116-117)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 408.92 ft

Roadway Data for Crossing: Down Drain 3 (116-117)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 441.23 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

Down Drain 4

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10 cfs

Design Flow: 13.6 cfs

Maximum Flow: 15 cfs

Table 10 - Summary of Culvert Flows at Crossing: Down Drain 4 (201-202)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain (201-202) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
423.79	10.00	10.00	0.00	1
423.82	10.50	10.50	0.00	1
423.84	11.00	11.00	0.00	1
423.87	11.50	11.50	0.00	1
423.89	12.00	12.00	0.00	1
423.92	12.50	12.50	0.00	1
423.94	13.00	13.00	0.00	1
423.97	13.50	13.50	0.00	1
423.97	13.60	13.60	0.00	1
424.01	14.50	14.50	0.00	1
424.04	15.00	15.00	0.00	1
425.82	45.18	45.18	0.00	Overtopping

Table 11 - Culvert Summary Table: Down Drain (201-202)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.00	10.00	423.79	1.058	0.0*	1-S2n	0.303	0.997	0.345	0.043	21.565	22.385
10.50	10.50	423.82	1.086	0.0*	1-S2n	0.311	1.023	0.356	0.044	21.765	22.777
11.00	11.00	423.84	1.113	0.0*	1-S2n	0.317	1.049	0.357	0.045	22.671	23.243
11.50	11.50	423.87	1.136	0.0*	1-S2n	0.323	1.070	0.369	0.047	22.194	23.585
12.00	12.00	423.89	1.163	0.0*	1-S2n	0.330	1.095	0.382	0.048	22.035	24.004
12.50	12.50	423.92	1.189	0.0*	1-S2n	0.336	1.119	0.387	0.049	22.519	24.401
13.00	13.00	423.94	1.214	0.0*	1-S2n	0.342	1.143	0.392	0.050	23.032	24.779
13.50	13.50	423.97	1.239	0.0*	1-S2n	0.348	1.166	0.407	0.051	22.759	25.138
13.60	13.60	423.97	1.244	0.0*	1-S2n	0.350	1.171	0.409	0.051	22.774	25.131
14.50	14.50	424.01	1.284	0.0*	1-S2n	0.361	1.208	0.419	0.053	23.466	25.805
15.00	15.00	424.04	1.308	0.0*	1-S2n	0.367	1.231	0.428	0.054	23.615	26.116

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 422.73 ft, Outlet Elevation (invert): 410.44 ft

Culvert Length: 35.24 ft, Culvert Slope: 0.3721

****

Site Data - Down Drain (201-202)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 422.73 ft

Outlet Station: 33.03 ft

Outlet Elevation: 410.44 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain (201-202)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Square Edge with Headwall

Inlet Depression: None

Table 12 - Downstream Channel Rating Curve (Crossing: Down Drain 4 (201-202))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10.00	410.48	0.04	22.39	26.73	19.45
10.50	410.48	0.04	22.78	27.55	19.50
11.00	410.49	0.05	23.24	28.25	19.66
11.50	410.49	0.05	23.58	29.07	19.68
12.00	410.49	0.05	24.00	29.77	19.80
12.50	410.49	0.05	24.40	30.48	19.91
13.00	410.49	0.05	24.78	31.18	19.99
13.50	410.49	0.05	25.14	31.88	20.07
13.60	410.49	0.05	25.13	32.12	19.99
14.50	410.49	0.05	25.81	33.29	20.18
15.00	410.49	0.05	26.12	33.99	20.22

Tailwater Channel Data - Down Drain 4 (201-202)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 10.0000

Channel Manning's n: 0.0250

Channel Invert Elevation: 410.44 ft

Roadway Data for Crossing: Down Drain 4 (201-202)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 425.82 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

Down Drain 5

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10 cfs

Design Flow: 14.7 cfs

Maximum Flow: 20 cfs

Table 13 - Summary of Culvert Flows at Crossing: Down Drain 5 (202-205)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 5 (202-205) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
407.88	10.00	10.00	0.00	1
407.93	11.00	11.00	0.00	1
407.98	12.00	12.00	0.00	1
408.03	13.00	13.00	0.00	1
408.08	14.00	14.00	0.00	1
408.12	14.70	14.70	0.00	1
408.18	16.00	16.00	0.00	1
408.23	17.00	17.00	0.00	1
408.27	18.00	18.00	0.00	1
408.32	19.00	19.00	0.00	1
408.38	20.00	20.00	0.00	1
410.78	63.13	63.13	0.00	Overtopping

Table 14 - Culvert Summary Table: Down Drain 5 (202-205)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.00	10.00	407.88	1.076	0.0*	1-S2n	0.317	0.997	0.317	0.262	24.159	3.029
11.00	11.00	407.93	1.132	0.0*	1-S2n	0.331	1.049	0.331	0.276	25.074	3.124
12.00	12.00	407.98	1.183	0.0*	1-S2n	0.345	1.095	0.360	0.290	23.975	3.211
13.00	13.00	408.03	1.235	0.0*	1-S2n	0.359	1.143	0.359	0.303	26.049	3.295
14.00	14.00	408.08	1.285	0.0*	1-S2n	0.373	1.189	0.373	0.316	26.577	3.371
14.70	14.70	408.12	1.317	0.0*	1-S2n	0.383	1.217	0.383	0.324	26.915	3.423
16.00	16.00	408.18	1.379	0.0*	1-S2n	0.398	1.275	0.398	0.340	27.774	3.515
17.00	17.00	408.23	1.425	0.0*	1-S2n	0.409	1.317	0.409	0.351	28.400	3.582
18.00	18.00	408.27	1.470	0.0*	1-S2n	0.421	1.358	0.421	0.362	28.981	3.646
19.00	19.00	408.32	1.519	0.0*	1-S2n	0.432	1.397	0.432	0.373	29.520	3.706
20.00	20.00	408.38	1.580	0.0*	1-S2n	0.443	1.436	0.485	0.384	26.101	3.766

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 406.80 ft, Outlet Elevation (invert): 370.74 ft

Culvert Length: 123.49 ft, Culvert Slope: 0.3053

****

Site Data - Down Drain 5 (202-205)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 406.80 ft

Outlet Station: 118.11 ft

Outlet Elevation: 370.74 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 5 (202-205)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 15 - Downstream Channel Rating Curve (Crossing: Down Drain 5 (202-205))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10.00	371.00	0.26	3.03	0.33	1.15
11.00	371.02	0.28	3.12	0.34	1.16
12.00	371.03	0.29	3.21	0.36	1.16
13.00	371.04	0.30	3.29	0.38	1.17
14.00	371.06	0.32	3.37	0.39	1.18
14.70	371.06	0.32	3.42	0.40	1.18
16.00	371.08	0.34	3.51	0.42	1.19
17.00	371.09	0.35	3.58	0.44	1.20
18.00	371.10	0.36	3.65	0.45	1.20
19.00	371.11	0.37	3.71	0.47	1.21
20.00	371.12	0.38	3.77	0.48	1.21

Tailwater Channel Data - Down Drain 5 (202-205)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0250

Channel Invert Elevation: 370.74 ft

Roadway Data for Crossing: Down Drain 5 (202-205)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 410.78 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

Down Drain 6

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 41.3 cfs

Maximum Flow: 45 cfs

Table 16 - Summary of Culvert Flows at Crossing: Down Drain 6 (205-208)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 6 (205-208) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
369.12	20.00	20.00	0.00	1
369.27	22.50	22.50	0.00	1
369.41	25.00	25.00	0.00	1
369.54	27.50	27.50	0.00	1
369.66	30.00	30.00	0.00	1
369.79	32.50	32.50	0.00	1
369.91	35.00	35.00	0.00	1
370.04	37.50	37.50	0.00	1
370.16	40.00	40.00	0.00	1
370.23	41.30	41.30	0.00	1
370.42	45.00	45.00	0.00	1
370.50	46.38	46.38	0.00	Overtopping

Table 17 - Culvert Summary Table: Down Drain 6 (205-208)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	369.12	1.563	0.0*	1-S2n	0.439	1.436	0.477	0.384	26.705	3.766
22.50	22.50	369.27	1.709	0.0*	1-S2n	0.466	1.526	0.488	0.409	29.111	3.903
25.00	25.00	369.41	1.846	0.0*	1-S2n	0.490	1.609	0.490	0.433	32.168	4.028
27.50	27.50	369.54	1.978	0.0*	1-S2n	0.513	1.692	0.513	0.456	32.894	4.146
30.00	30.00	369.66	2.105	0.0*	1-S2n	0.537	1.769	0.537	0.477	33.687	4.253
32.50	32.50	369.79	2.230	0.0*	1-S2n	0.557	1.847	0.557	0.498	34.627	4.354
35.00	35.00	369.91	2.354	0.0*	1-S2n	0.578	1.919	0.578	0.518	35.495	4.451
37.50	37.50	370.04	2.479	0.0*	1-S2n	0.598	1.987	0.598	0.537	36.006	4.541
40.00	40.00	370.16	2.605	0.0*	1-S2n	0.619	2.057	0.619	0.556	36.672	4.628
41.30	41.30	370.23	2.671	0.0*	1-S2n	0.628	2.091	0.680	0.565	33.077	4.670
45.00	45.00	370.42	2.865	0.0*	1-S2n	0.655	2.183	0.710	0.591	33.919	4.787

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 367.56 ft, Outlet Elevation (invert): 331.88 ft

Culvert Length: 118.26 ft, Culvert Slope: 0.3165

****

Site Data - Down Drain 6 (205-208)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 367.56 ft

Outlet Station: 112.75 ft

Outlet Elevation: 331.88 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 6 (205-208)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 18 - Downstream Channel Rating Curve (Crossing: Down Drain 6 (205-208))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	332.26	0.38	3.77	0.48	1.21
22.50	332.29	0.41	3.90	0.51	1.22
25.00	332.31	0.43	4.03	0.54	1.23
27.50	332.34	0.46	4.15	0.57	1.24
30.00	332.36	0.48	4.25	0.60	1.25
32.50	332.38	0.50	4.35	0.62	1.26
35.00	332.40	0.52	4.45	0.65	1.26
37.50	332.42	0.54	4.54	0.67	1.27
40.00	332.44	0.56	4.63	0.69	1.27
41.30	332.45	0.57	4.67	0.71	1.28
45.00	332.47	0.59	4.79	0.74	1.29

Tailwater Channel Data - Down Drain 6 (205-208)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0250

Channel Invert Elevation: 331.88 ft

Roadway Data for Crossing: Down Drain 6 (205-208)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 370.50 ft

Roadway Surface: Gravel

Roadway Top Width: 10.00 ft

Down Drain 7

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 40 cfs

Design Flow: 43.9 cfs

Maximum Flow: 60 cfs

Table 19 - Summary of Culvert Flows at Crossing: Down Drain 7 (208-211)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 7 (208-211) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
330.52	40.00	40.00	0.00	1
330.62	42.00	42.00	0.00	1
330.72	43.90	43.90	0.00	1
330.84	46.00	46.00	0.00	1
330.95	48.00	48.00	0.00	1
331.06	50.00	50.00	0.00	1
331.17	52.00	52.00	0.00	1
331.29	54.00	54.00	0.00	1
331.42	56.00	56.00	0.00	1
331.54	58.00	58.00	0.00	1
331.67	60.00	60.00	0.00	1
332.20	67.65	67.65	0.00	Overtopping

Table 20 – Culvert Summary Table: Down Drain 7 (208-211)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
40.00	40.00	330.52	2.602	0.0*	1-S2n	0.618	2.057	0.663	0.097	33.375	37.519
42.00	42.00	330.62	2.705	0.0*	1-S2n	0.632	2.109	0.688	0.100	33.089	38.208
43.90	43.90	330.72	2.804	0.0*	1-S2n	0.646	2.156	0.703	0.103	33.601	38.808
46.00	46.00	330.84	2.916	0.0*	1-S2n	0.662	2.207	0.719	0.105	34.103	39.454
48.00	48.00	330.95	3.026	0.0*	5-S2n	0.676	2.253	0.740	0.108	34.194	40.060
50.00	50.00	331.06	3.138	0.0*	5-S2n	0.691	2.298	0.750	0.111	34.837	40.673
52.00	52.00	331.17	3.254	0.0*	5-S2n	0.704	2.342	0.774	0.113	34.703	41.251
54.00	54.00	331.29	3.373	0.0*	5-S2n	0.717	2.384	0.784	0.116	35.421	41.797
56.00	56.00	331.42	3.495	0.0*	5-S2n	0.730	2.424	0.807	0.118	35.298	42.313
58.00	58.00	331.54	3.621	0.0*	5-S2n	0.744	2.463	0.819	0.121	35.834	42.842
60.00	60.00	331.67	3.751	0.0*	5-S2n	0.757	2.500	0.839	0.123	35.768	43.386

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 327.92 ft, Outlet Elevation (invert): 294.49 ft

Culvert Length: 110.34 ft, Culvert Slope: 0.3179

****

Site Data - Down Drain 7 (208-211)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 327.92 ft

Outlet Station: 105.15 ft

Outlet Elevation: 294.49 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 7 (208-211)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 21 - Downstream Channel Rating Curve (Crossing: Down Drain 7 (208-211))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
40.00	294.59	0.10	37.52	60.63	22.13
42.00	294.59	0.10	38.21	62.36	22.25
43.90	294.59	0.10	38.81	64.02	22.32
46.00	294.60	0.11	39.45	65.81	22.41
48.00	294.60	0.11	40.06	67.47	22.49
50.00	294.60	0.11	40.67	69.07	22.59
52.00	294.60	0.11	41.25	70.66	22.67
54.00	294.61	0.12	41.80	72.25	22.74
56.00	294.61	0.12	42.31	73.85	22.79
58.00	294.61	0.12	42.84	75.37	22.86
60.00	294.61	0.12	43.39	76.83	22.95

Tailwater Channel Data - Down Drain 7 (208-211)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 10.0000

Channel Manning's n: 0.0250

Channel Invert Elevation: 294.49 ft

Roadway Data for Crossing: Down Drain 7 (208-211)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 332.20 ft

Roadway Surface: Paved

Roadway Top Width: 5.00 ft

Down Drain 8

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 30 cfs

Design Flow: 52 cfs

Maximum Flow: 55 cfs

Table 22 - Summary of Culvert Flows at Crossing: Down Drain 8 (211-WB)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 8 (211-WB) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
289.57	30.00	30.00	0.00	1
289.69	32.50	32.50	0.00	1
289.82	35.00	35.00	0.00	1
289.94	37.50	37.50	0.00	1
290.07	40.00	40.00	0.00	1
290.19	42.50	42.50	0.00	1
290.33	45.00	45.00	0.00	1
290.46	47.50	47.50	0.00	1
290.60	50.00	50.00	0.00	1
290.72	52.00	52.00	0.00	1
290.90	55.00	55.00	0.00	1
292.10	72.42	72.42	0.00	Overtopping

Table 23 - Culvert Summary Table: Down Drain 8 (211-WB)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
30.00	30.00	289.57	2.306	0.0*	1-S2n	0.872	1.769	0.872	0.103	16.956	7.261
32.50	32.50	289.69	2.431	0.0*	1-S2n	0.910	1.847	0.910	0.108	17.321	7.494
35.00	35.00	289.82	2.555	0.0*	1-S2n	0.945	1.919	0.945	0.113	17.700	7.720
37.50	37.50	289.94	2.680	0.0*	1-S2n	0.980	1.987	1.016	0.117	17.166	7.935
40.00	40.00	290.07	2.806	0.0*	1-S2n	1.014	2.057	1.014	0.122	18.362	8.139
42.50	42.50	290.19	2.934	0.0*	1-S2n	1.047	2.121	1.047	0.127	18.689	8.336
45.00	45.00	290.33	3.066	0.0*	5-S2n	1.080	2.183	1.080	0.131	18.959	8.525
47.50	47.50	290.46	3.202	0.0*	5-S2n	1.112	2.242	1.112	0.135	19.257	8.716
50.00	50.00	290.60	3.342	0.0*	5-S2n	1.143	2.298	1.143	0.140	19.512	8.894
52.00	52.00	290.72	3.458	0.0*	5-S2n	1.168	2.342	1.168	0.143	19.724	9.030
55.00	55.00	290.90	3.637	0.0*	5-S2n	1.204	2.404	1.204	0.148	20.021	9.234

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 287.26 ft, Outlet Elevation (invert): 259.52 ft

Culvert Length: 154.71 ft, Culvert Slope: 0.1823

****

Site Data - Down Drain 8 (211-WB)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 287.26 ft

Outlet Station: 152.20 ft

Outlet Elevation: 259.52 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 8 (211-WB)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 24 - Downstream Channel Rating Curve (Crossing: Down Drain 8 (211-WB))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
30.00	259.62	0.10	7.26	1.28	4.00
32.50	259.63	0.11	7.49	1.35	4.03
35.00	259.63	0.11	7.72	1.41	4.06
37.50	259.64	0.12	7.93	1.47	4.09
40.00	259.64	0.12	8.14	1.52	4.12
42.50	259.65	0.13	8.34	1.58	4.14
45.00	259.65	0.13	8.53	1.64	4.16
47.50	259.66	0.14	8.72	1.69	4.19
50.00	259.66	0.14	8.89	1.74	4.21
52.00	259.66	0.14	9.03	1.78	4.22
55.00	259.67	0.15	9.23	1.84	4.25

Tailwater Channel Data - Down Drain 8 (211-WB)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 40.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.2000

Channel Manning's n: 0.0200

Channel Invert Elevation: 259.52 ft

Roadway Data for Crossing: Down Drain 8 (211-WB)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 292.10 ft

Roadway Surface: Gravel

Roadway Top Width: 5.00 ft

Down Drain 9

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 10 cfs

Design Flow: 20 cfs

Maximum Flow: 25 cfs

Table 25 - Summary of Culvert Flows at Crossing: Down Drain 9 (301-302)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 9 (301-302) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
410.60	10.00	10.00	0.00	1
410.68	11.50	11.50	0.00	1
410.75	13.00	13.00	0.00	1
410.82	14.50	14.50	0.00	1
410.88	16.00	16.00	0.00	1
410.94	17.50	17.50	0.00	1
411.00	19.00	19.00	0.00	1
411.04	20.00	20.00	0.00	1
411.11	22.00	22.00	0.00	1
411.17	23.50	23.50	0.00	1
411.22	25.00	25.00	0.00	1
413.00	68.55	68.55	0.00	Overtopping

Table 26 - Culvert Summary Table: Down Drain 9 (301-302)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
10.00	10.00	410.60	1.003	0.0*	1-S2n	0.294	0.954	0.341	0.246	19.866	3.267
11.50	11.50	410.68	1.079	0.0*	1-S2n	0.314	1.026	0.366	0.266	20.704	3.418
13.00	13.00	410.75	1.148	0.0*	1-S2n	0.334	1.091	0.388	0.285	21.686	3.554
14.50	14.50	410.82	1.216	0.0*	1-S2n	0.354	1.155	0.408	0.303	22.590	3.680
16.00	16.00	410.88	1.281	0.0*	1-S2n	0.371	1.217	0.437	0.319	22.191	3.796
17.50	17.50	410.94	1.340	0.0*	1-S2n	0.386	1.272	0.461	0.336	22.558	3.904
19.00	19.00	411.00	1.401	0.0*	1-S2n	0.401	1.329	0.478	0.351	23.265	4.005
20.00	20.00	411.04	1.440	0.0*	1-S2n	0.411	1.366	0.498	0.361	23.194	4.068
22.00	22.00	411.11	1.513	0.0*	1-S2n	0.432	1.434	0.525	0.380	23.366	4.190
23.50	23.50	411.17	1.568	0.0*	1-S2n	0.447	1.486	0.545	0.394	23.726	4.274
25.00	25.00	411.22	1.621	0.0*	1-S2n	0.460	1.537	0.568	0.408	23.833	4.355

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 409.60 ft, Outlet Elevation (invert): 398.74 ft

Culvert Length: 33.56 ft, Culvert Slope: 0.3420

****

Site Data - Down Drain 9 (301-302)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 409.60 ft

Outlet Station: 31.75 ft

Outlet Elevation: 398.74 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 9 (301-302)

Barrel Shape: Circular

Barrel Diameter: 3.50 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 27 - Downstream Channel Rating Curve (Crossing: Down Drain 9 (301-302))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
10.00	398.99	0.25	3.27	0.38	1.27
11.50	399.01	0.27	3.42	0.41	1.28
13.00	399.02	0.28	3.55	0.44	1.30
14.50	399.04	0.30	3.68	0.47	1.31
16.00	399.06	0.32	3.80	0.50	1.32
17.50	399.08	0.34	3.90	0.52	1.33
19.00	399.09	0.35	4.01	0.55	1.34
20.00	399.10	0.36	4.07	0.56	1.34
22.00	399.12	0.38	4.19	0.59	1.35
23.50	399.13	0.39	4.27	0.62	1.36
25.00	399.15	0.41	4.35	0.64	1.36

Tailwater Channel Data - Down Drain 9 (301-302)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0250

Channel Manning's n: 0.0250

Channel Invert Elevation: 398.74 ft

Roadway Data for Crossing: Down Drain 9 (301-302)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 413.00 ft

Roadway Surface: Paved

Roadway Top Width: 5.00 ft

Down Drain 10

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 45 cfs

Maximum Flow: 50 cfs

Table 28 - Summary of Culvert Flows at Crossing: Down Drain 10 (302-305)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 10 (302-305) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
397.59	20.00	20.00	0.00	1
397.76	23.00	23.00	0.00	1
397.92	26.00	26.00	0.00	1
398.08	29.00	29.00	0.00	1
398.23	32.00	32.00	0.00	1
398.38	35.00	35.00	0.00	1
398.53	38.00	38.00	0.00	1
398.68	41.00	41.00	0.00	1
398.84	44.00	44.00	0.00	1
398.89	45.00	45.00	0.00	1
399.17	50.00	50.00	0.00	1
401.70	85.04	85.04	0.00	Overtopping

Table 29 - Culvert Summary Table: Down Drain 10 (302-305)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	397.59	1.728	0.0*	1-S2n	0.487	1.436	0.526	0.361	23.116	4.068
23.00	23.00	397.76	1.901	0.0*	1-S2n	0.522	1.543	0.522	0.390	26.841	4.246
26.00	26.00	397.92	2.064	0.0*	1-S2n	0.555	1.641	0.555	0.416	27.889	4.408
29.00	29.00	398.08	2.219	0.0*	1-S2n	0.585	1.739	0.630	0.442	25.911	4.554
32.00	32.00	398.23	2.370	0.0*	1-S2n	0.616	1.832	0.658	0.466	26.930	4.690
35.00	35.00	398.38	2.519	0.0*	1-S2n	0.643	1.919	0.688	0.488	27.573	4.816
38.00	38.00	398.53	2.668	0.0*	1-S2n	0.670	2.001	0.719	0.510	28.180	4.934
41.00	41.00	398.68	2.820	0.0*	1-S2n	0.696	2.083	0.749	0.531	28.661	5.045
44.00	44.00	398.84	2.976	0.0*	1-S2n	0.721	2.158	0.780	0.551	29.047	5.148
45.00	45.00	398.89	3.029	0.0*	5-S2n	0.729	2.183	0.783	0.557	29.550	5.183
50.00	50.00	399.17	3.305	0.0*	5-S2n	0.770	2.298	0.839	0.589	29.818	5.343

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 395.86 ft, Outlet Elevation (invert): 370.84 ft

Culvert Length: 123.59 ft, Culvert Slope: 0.2067

****

Site Data - Down Drain 10 (302-305)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 395.86 ft

Outlet Station: 121.03 ft

Outlet Elevation: 370.84 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 10 (302-305)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 30 - Downstream Channel Rating Curve (Crossing: Down Drain 10 (302-305))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	371.20	0.36	4.07	0.56	1.34
23.00	371.23	0.39	4.25	0.61	1.36
26.00	371.26	0.42	4.41	0.65	1.37
29.00	371.28	0.44	4.55	0.69	1.38
32.00	371.31	0.47	4.69	0.73	1.39
35.00	371.33	0.49	4.82	0.76	1.40
38.00	371.35	0.51	4.93	0.80	1.41
41.00	371.37	0.53	5.04	0.83	1.42
44.00	371.39	0.55	5.15	0.86	1.42
45.00	371.40	0.56	5.18	0.87	1.43
50.00	371.43	0.59	5.34	0.92	1.44

Tailwater Channel Data - Down Drain 10 (302-305)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0250

Channel Manning's n: 0.0250

Channel Invert Elevation: 370.84 ft

Roadway Data for Crossing: Down Drain 10 (302-305)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 401.70 ft

Roadway Surface: Paved

Roadway Top Width: 5.00 ft

Down Drain 13

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 15 cfs

Design Flow: 22.8 cfs

Maximum Flow: 25 cfs

Table 31 - Summary of Culvert Flows at Crossing: Down Drain 13 (122-123)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 13 (122-123) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
423.00	15.00	15.00	0.00	1
423.05	16.00	16.00	0.00	1
423.10	17.00	17.00	0.00	1
423.14	18.00	18.00	0.00	1
423.20	19.00	19.00	0.00	1
423.27	20.00	20.00	0.00	1
423.32	21.00	21.00	0.00	1
423.38	22.00	22.00	0.00	1
423.43	22.80	22.80	0.00	1
423.49	24.00	24.00	0.00	1
423.55	25.00	25.00	0.00	1
427.10	81.82	81.82	0.00	Overtopping

Table 32 - Culvert Summary Table: Down Drain 13 (122-123)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
15.00	15.00	423.00	1.359	0.0*	1-S2n	0.396	1.231	0.396	0.061	26.234	23.313
16.00	16.00	423.05	1.408	0.0*	1-S2n	0.408	1.275	0.457	0.063	22.650	23.851
17.00	17.00	423.10	1.455	0.0*	1-S2n	0.420	1.317	0.466	0.065	23.399	24.417
18.00	18.00	423.14	1.502	0.0*	1-S2n	0.432	1.358	0.486	0.068	23.403	24.940
19.00	19.00	423.20	1.565	0.0*	1-S2n	0.444	1.397	0.496	0.070	24.033	25.423
20.00	20.00	423.27	1.625	0.0*	1-S2n	0.455	1.436	0.515	0.072	23.808	25.943
21.00	21.00	423.32	1.685	0.0*	1-S2n	0.466	1.472	0.522	0.074	24.516	26.429
22.00	22.00	423.38	1.743	0.0*	1-S2n	0.477	1.508	0.543	0.076	24.304	26.885
22.80	22.80	423.43	1.788	0.0*	1-S2n	0.485	1.536	0.552	0.078	24.648	27.214
24.00	24.00	423.49	1.854	0.0*	1-S2n	0.497	1.577	0.569	0.080	24.865	27.713
25.00	25.00	423.55	1.908	0.0*	1-S2n	0.507	1.609	0.583	0.082	25.054	28.155

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 421.64 ft, Outlet Elevation (invert): 407.40 ft

Culvert Length: 53.73 ft, Culvert Slope: 0.2749

****

Site Data - Down Drain 13 (122-123)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 421.64 ft

Outlet Station: 51.81 ft

Outlet Elevation: 407.40 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 13 (122-123)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 33 - Downstream Channel Rating Curve (Crossing: Down Drain 13 (122-123))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.00	407.46	0.06	23.31	37.85	17.15
16.00	407.46	0.06	23.85	39.37	17.22
17.00	407.47	0.07	24.42	40.78	17.34
18.00	407.47	0.07	24.94	42.18	17.43
19.00	407.47	0.07	25.42	43.59	17.50
20.00	407.47	0.07	25.94	44.88	17.61
21.00	407.47	0.07	26.43	46.17	17.70
22.00	407.48	0.08	26.88	47.45	17.78
22.80	407.48	0.08	27.21	48.51	17.81
24.00	407.48	0.08	27.71	50.03	17.88
25.00	407.48	0.08	28.15	51.21	17.96

Tailwater Channel Data - Down Drain 13 (122-123)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 10.0000

Channel Manning's n: 0.0300

Channel Invert Elevation: 407.40 ft

Roadway Data for Crossing: Down Drain 13 (122-123)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 427.10 ft

Roadway Surface: Paved

Roadway Top Width: 5.00 ft

Down Drain 14

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 25.2 cfs

Maximum Flow: 30 cfs

Table 34 - Summary of Culvert Flows at Crossing: Down Drain 14 (123-119)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 14 (123-119) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
405.49	20.00	20.00	0.00	1
405.55	21.00	21.00	0.00	1
405.61	22.00	22.00	0.00	1
405.66	23.00	23.00	0.00	1
405.72	24.00	24.00	0.00	1
405.77	25.00	25.00	0.00	1
405.78	25.20	25.20	0.00	1
405.88	27.00	27.00	0.00	1
405.93	28.00	28.00	0.00	1
405.98	29.00	29.00	0.00	1
406.03	30.00	30.00	0.00	1
406.47	38.80	38.80	0.00	Overtopping

Table 35 - Culvert Summary Table: Down Drain 14 (123-119)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	405.49	1.708	0.0*	1-S2n	0.480	1.436	0.503	0.424	24.847	3.317
21.00	21.00	405.55	1.768	0.0*	1-S2n	0.492	1.472	0.492	0.435	26.873	3.366
22.00	22.00	405.61	1.826	0.0*	1-S2n	0.503	1.508	0.531	0.446	25.064	3.412
23.00	23.00	405.66	1.882	0.0*	1-S2n	0.514	1.543	0.514	0.457	27.433	3.458
24.00	24.00	405.72	1.937	0.0*	1-S2n	0.526	1.577	0.561	0.467	25.332	3.501
25.00	25.00	405.77	1.991	0.0*	1-S2n	0.537	1.609	0.537	0.477	28.065	3.544
25.20	25.20	405.78	2.002	0.0*	1-S2n	0.539	1.616	0.539	0.479	28.130	3.553
27.00	27.00	405.88	2.097	0.0*	1-S2n	0.557	1.677	0.557	0.497	28.819	3.626
28.00	28.00	405.93	2.149	0.0*	1-S2n	0.567	1.708	0.567	0.507	29.176	3.664
29.00	29.00	405.98	2.200	0.0*	1-S2n	0.576	1.739	0.609	0.516	27.162	3.702
30.00	30.00	406.03	2.250	0.0*	1-S2n	0.586	1.769	0.586	0.526	29.841	3.740

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 403.78 ft, Outlet Elevation (invert): 373.61 ft

Culvert Length: 140.66 ft, Culvert Slope: 0.2196

****

Site Data - Down Drain 14 (123-119)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 403.78 ft

Outlet Station: 137.39 ft

Outlet Elevation: 373.61 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 14 (123-119)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 36 - Downstream Channel Rating Curve (Crossing: Down Drain 14 (123-119))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	374.03	0.42	3.32	0.53	1.02
21.00	374.04	0.43	3.37	0.54	1.03
22.00	374.06	0.45	3.41	0.56	1.03
23.00	374.07	0.46	3.46	0.57	1.03
24.00	374.08	0.47	3.50	0.58	1.04
25.00	374.09	0.48	3.54	0.60	1.04
25.20	374.09	0.48	3.55	0.60	1.04
27.00	374.11	0.50	3.63	0.62	1.05
28.00	374.12	0.51	3.66	0.63	1.05
29.00	374.13	0.52	3.70	0.64	1.05
30.00	374.14	0.53	3.74	0.66	1.05

Tailwater Channel Data - Down Drain 14 (123-119)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 373.61 ft

Roadway Data for Crossing: Down Drain 14 (123-119)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 406.47 ft

Roadway Surface: Paved

Roadway Top Width: 5.00 ft

Down Drain 15

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 15 cfs

Design Flow: 21.1 cfs

Maximum Flow: 25 cfs

Table 37 - Summary of Culvert Flows at Crossing: Down Drain 15 (604-602)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 15 (604-602) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
439.31	15.00	15.00	0.00	1
439.36	16.00	16.00	0.00	1
439.43	17.00	17.00	0.00	1
439.49	18.00	18.00	0.00	1
439.56	19.00	19.00	0.00	1
439.62	20.00	20.00	0.00	1
439.68	21.00	21.00	0.00	1
439.68	21.10	21.10	0.00	1
439.79	23.00	23.00	0.00	1
439.84	24.00	24.00	0.00	1
439.90	25.00	25.00	0.00	1
441.87	56.91	56.91	0.00	Overtopping

Table 38 - Culvert Summary Table: Down Drain 15 (604-602)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
15.00	15.00	439.31	1.442	0.0*	1-S2n	0.422	1.231	0.455	1.521	21.339	4.320
16.00	16.00	439.36	1.493	0.0*	1-S2n	0.436	1.275	0.436	1.559	24.216	4.391
17.00	17.00	439.43	1.558	0.0*	1-S2n	0.450	1.317	0.480	1.594	22.505	4.458
18.00	18.00	439.49	1.623	0.0*	1-S2n	0.463	1.358	0.505	1.629	22.213	4.522
19.00	19.00	439.56	1.686	0.0*	1-S2n	0.475	1.397	0.508	1.662	23.267	4.583
20.00	20.00	439.62	1.746	0.0*	1-S2n	0.486	1.436	0.531	1.695	22.777	4.643
21.00	21.00	439.68	1.805	0.0*	1-S2n	0.498	1.472	0.538	1.726	23.486	4.700
21.10	21.10	439.68	1.811	0.0*	1-S2n	0.499	1.476	0.538	1.729	23.610	4.705
23.00	23.00	439.79	1.919	0.0*	1-S2n	0.521	1.543	0.569	1.786	23.855	4.808
24.00	24.00	439.84	1.974	0.0*	1-S2n	0.533	1.577	0.576	1.815	24.425	4.859
25.00	25.00	439.90	2.029	0.0*	1-S2n	0.543	1.609	0.596	1.843	24.138	4.909

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 437.87 ft, Outlet Elevation (invert): 420.97 ft

Culvert Length: 82.74 ft, Culvert Slope: 0.2086

****

Site Data - Down Drain 15 (604-602)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 437.87 ft

Outlet Station: 81.00 ft

Outlet Elevation: 420.97 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 15 (604-602)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: None

Table 39 - Downstream Channel Rating Curve (Crossing: Down Drain 15 (604-602))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
15.00	417.02	1.52	4.32	1.33	0.87
16.00	417.06	1.56	4.39	1.36	0.88
17.00	417.09	1.59	4.46	1.39	0.88
18.00	417.13	1.63	4.52	1.42	0.88
19.00	417.16	1.66	4.58	1.45	0.89
20.00	417.19	1.69	4.64	1.48	0.89
21.00	417.23	1.73	4.70	1.51	0.89
21.10	417.23	1.73	4.71	1.51	0.89
23.00	417.29	1.79	4.81	1.56	0.90
24.00	417.31	1.81	4.86	1.59	0.90
25.00	417.34	1.84	4.91	1.61	0.90

Tailwater Channel Data - Down Drain 15 (604-602)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0140

Channel Manning's n: 0.0300

Channel Invert Elevation: 415.50 ft

Roadway Data for Crossing: Down Drain 15 (604-602)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 441.87 ft

Roadway Surface: Gravel

Roadway Top Width: 5.00 ft

Down Drain 16

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 26.1 cfs

Maximum Flow: 30 cfs

Table 40 - Summary of Culvert Flows at Crossing: Down Drain 16 (701-702)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 16 (701-702) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
463.28	20.00	20.00	0.00	1
463.34	21.00	21.00	0.00	1
463.40	22.00	22.00	0.00	1
463.45	23.00	23.00	0.00	1
463.51	24.00	24.00	0.00	1
463.56	25.00	25.00	0.00	1
463.62	26.00	26.00	0.00	1
463.62	26.10	26.10	0.00	1
463.72	28.00	28.00	0.00	1
463.78	29.00	29.00	0.00	1
463.83	30.00	30.00	0.00	1
465.02	50.13	50.13	0.00	Overtopping

Table 41 - Culvert Summary Table: Down Drain 16 (701-702)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	463.28	1.610	0.0*	1-S2n	0.627	1.436	0.627	1.805	18.000	4.092
21.00	21.00	463.34	1.669	0.0*	1-S2n	0.642	1.472	0.642	1.838	18.295	4.143
22.00	22.00	463.40	1.727	0.0*	1-S2n	0.657	1.508	0.679	1.871	17.643	4.191
23.00	23.00	463.45	1.783	0.0*	1-S2n	0.672	1.543	0.672	1.902	18.731	4.238
24.00	24.00	463.51	1.839	0.0*	1-S2n	0.687	1.577	0.687	1.933	18.951	4.283
25.00	25.00	463.56	1.893	0.0*	1-S2n	0.701	1.609	0.701	1.963	19.192	4.327
26.00	26.00	463.62	1.947	0.0*	1-S2n	0.715	1.641	0.715	1.992	19.440	4.370
26.10	26.10	463.62	1.952	0.0*	1-S2n	0.716	1.644	0.716	1.995	19.464	4.374
28.00	28.00	463.72	2.053	0.0*	1-S2n	0.742	1.708	0.742	2.048	19.897	4.451
29.00	29.00	463.78	2.105	0.0*	1-S2n	0.755	1.739	0.755	2.075	20.022	4.491
30.00	30.00	463.83	2.157	0.0*	1-S2n	0.769	1.769	0.809	2.101	18.849	4.529

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 461.67 ft, Outlet Elevation (invert): 433.51 ft

Culvert Length: 98.24 ft, Culvert Slope: 0.2992

****

Site Data - Down Drain 16 (701-702)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 461.67 ft

Outlet Station: 94.12 ft

Outlet Elevation: 433.51 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 16 (701-702)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1:1)

Inlet Depression: None

Table 42 - Downstream Channel Rating Curve (Crossing: Down Drain 16 (701-702))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	435.32	1.81	4.09	1.13	0.76
21.00	435.35	1.84	4.14	1.15	0.76
22.00	435.38	1.87	4.19	1.17	0.76
23.00	435.41	1.90	4.24	1.19	0.77
24.00	435.44	1.93	4.28	1.21	0.77
25.00	435.47	1.96	4.33	1.22	0.77
26.00	435.50	1.99	4.37	1.24	0.77
26.10	435.50	1.99	4.37	1.24	0.77
28.00	435.56	2.05	4.45	1.28	0.78
29.00	435.58	2.07	4.49	1.29	0.78
30.00	435.61	2.10	4.53	1.31	0.78

Tailwater Channel Data - Down Drain 16 (701-702)

Tailwater Channel Option: Triangular Channel

Side Slope (H:V): 1.50 (_:1)

Channel Slope: 0.0100

Channel Manning's n: 0.0300

Channel Invert Elevation: 433.51 ft

Roadway Data for Crossing: Down Drain 16 (701-702)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 465.02 ft

Roadway Surface: Gravel

Roadway Top Width: 5.00 ft

Down Drain 17

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 42.9 cfs

Maximum Flow: 45 cfs

Table 43 - Summary of Culvert Flows at Crossing: Down Drain 17 (704-706)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 17 (704-706) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
426.61	20.00	20.00	0.00	1
426.76	22.50	22.50	0.00	1
426.90	25.00	25.00	0.00	1
427.03	27.50	27.50	0.00	1
427.15	30.00	30.00	0.00	1
427.28	32.50	32.50	0.00	1
427.40	35.00	35.00	0.00	1
427.53	37.50	37.50	0.00	1
427.65	40.00	40.00	0.00	1
427.78	42.50	42.50	0.00	1
427.80	42.90	42.90	0.00	1
430.30	80.07	80.07	0.00	Overtopping

Table 44 - Culvert Summary Table: Down Drain 17 (704-706)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	426.61	1.732	0.0*	1-S2n	0.489	1.436	0.529	0.424	22.903	3.317
22.50	22.50	426.76	1.878	0.0*	1-S2n	0.518	1.526	0.551	0.451	24.345	3.436
25.00	25.00	426.90	2.015	0.0*	1-S2n	0.547	1.609	0.578	0.477	25.351	3.544
27.50	27.50	427.03	2.147	0.0*	1-S2n	0.572	1.692	0.604	0.502	26.075	3.645
30.00	30.00	427.15	2.274	0.0*	1-S2n	0.598	1.769	0.634	0.526	26.577	3.740
32.50	32.50	427.28	2.399	0.0*	1-S2n	0.622	1.847	0.662	0.548	27.163	3.827
35.00	35.00	427.40	2.523	0.0*	1-S2n	0.645	1.919	0.692	0.570	27.364	3.911
37.50	37.50	427.53	2.648	0.0*	1-S2n	0.668	1.987	0.720	0.591	27.738	3.989
40.00	40.00	427.65	2.774	0.0*	1-S2n	0.691	2.057	0.746	0.611	28.112	4.064
42.50	42.50	427.78	2.902	0.0*	1-S2n	0.711	2.121	0.768	0.630	28.687	4.135
42.90	42.90	427.80	2.923	0.0*	1-S2n	0.715	2.131	0.774	0.634	28.654	4.145

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 424.88 ft, Outlet Elevation (invert): 400.12 ft

Culvert Length: 124.06 ft, Culvert Slope: 0.2037

****

Site Data - Down Drain 17 (704-706)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 424.88 ft

Outlet Station: 121.56 ft

Outlet Elevation: 400.12 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 17 (704-706)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Smooth HDPE

Embedment: 0.00 in

Barrel Manning's n: 0.0120

Culvert Type: Straight

Inlet Configuration: Beveled Edge (1.5:1)

Inlet Depression: None

Table 45 - Downstream Channel Rating Curve (Crossing: Down Drain 17 (704-706))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	400.54	0.42	3.32	0.53	1.02
22.50	400.57	0.45	3.44	0.56	1.03
25.00	400.60	0.48	3.54	0.60	1.04
27.50	400.62	0.50	3.65	0.63	1.05
30.00	400.65	0.53	3.74	0.66	1.05
32.50	400.67	0.55	3.83	0.68	1.06
35.00	400.69	0.57	3.91	0.71	1.07
37.50	400.71	0.59	3.99	0.74	1.07
40.00	400.73	0.61	4.06	0.76	1.08
42.50	400.75	0.63	4.13	0.79	1.08
42.90	400.75	0.63	4.15	0.79	1.08

Tailwater Channel Data - Down Drain 17 (704-706)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 10.00 (_:1)

Channel Slope: 0.0200

Channel Manning's n: 0.0300

Channel Invert Elevation: 400.12 ft

Roadway Data for Crossing: Down Drain 17 (704-706)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 430.30 ft

Roadway Surface: Gravel

Roadway Top Width: 5.00 ft

Down Drain 18

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 3 cfs

Design Flow: 5.4 cfs

Maximum Flow: 10 cfs

Table 46 - Summary of Culvert Flows at Crossing: Down Drain 18 (715-715)

Headwater Elevation (ft)	Total Discharge (cfs)	Down Drain 18 (715-715) Discharge (cfs)	Roadway Discharge (cfs)	Iterations
394.59	3.00	3.00	0.00	1
394.69	3.70	3.70	0.00	1
394.78	4.40	4.40	0.00	1
394.86	5.10	5.10	0.00	1
394.89	5.40	5.40	0.00	1
395.00	6.50	6.50	0.00	1
395.07	7.20	7.20	0.00	1
395.14	7.90	7.90	0.00	1
395.20	8.60	8.60	0.00	1
395.26	9.30	9.30	0.00	1
395.32	10.00	10.00	0.00	1
397.94	46.90	46.90	0.00	Overtopping

Table 47 - Culvert Summary Table: Down Drain 18 (715-715)

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
3.00	3.00	394.59	0.815	0.0*	1-S2n	0.376	0.537	0.376	0.139	5.629	2.802
3.70	3.70	394.69	0.909	0.0*	1-S2n	0.415	0.595	0.415	0.157	6.058	3.018
4.40	4.40	394.78	0.997	0.0*	1-S2n	0.453	0.652	0.453	0.174	6.307	3.213
5.10	5.10	394.86	1.075	0.0*	1-S2n	0.486	0.704	0.486	0.190	6.629	3.383
5.40	5.40	394.89	1.109	0.0*	1-S2n	0.500	0.725	0.500	0.196	6.760	3.450
6.50	6.50	395.00	1.222	0.0*	1-S2n	0.548	0.799	0.548	0.218	7.087	3.678
7.20	7.20	395.07	1.290	0.0*	1-S2n	0.576	0.839	0.576	0.232	7.337	3.809
7.90	7.90	395.14	1.357	0.0*	1-S2n	0.604	0.881	0.604	0.244	7.494	3.932
8.60	8.60	395.20	1.418	0.0*	1-S2n	0.630	0.921	0.630	0.257	7.694	4.047
9.30	9.30	395.26	1.480	0.0*	1-S2n	0.654	0.960	0.654	0.268	7.894	4.155
10.00	10.00	395.32	1.537	0.0*	1-S2n	0.679	0.997	0.679	0.280	8.027	4.259

* Full Flow Headwater elevation is below inlet invert.

****

Straight Culvert

Inlet Elevation (invert): 393.78 ft, Outlet Elevation (invert): 362.32 ft

Culvert Length: 579.85 ft, Culvert Slope: 0.0543

****

Site Data - Down Drain 18 (715-715)

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 393.78 ft

Outlet Station: 579.00 ft

Outlet Elevation: 362.32 ft

Number of Barrels: 1

Culvert Data Summary - Down Drain 18 (715-715)

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 48 - Downstream Channel Rating Curve (Crossing: Down Drain 18 (715-715))

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
3.00	362.46	0.14	2.80	0.43	1.38
3.70	362.48	0.16	3.02	0.49	1.41
4.40	362.49	0.17	3.21	0.54	1.43
5.10	362.51	0.19	3.38	0.59	1.45
5.40	362.52	0.20	3.45	0.61	1.45
6.50	362.54	0.22	3.68	0.68	1.48
7.20	362.55	0.23	3.81	0.72	1.49
7.90	362.56	0.24	3.93	0.76	1.50
8.60	362.58	0.26	4.05	0.80	1.51
9.30	362.59	0.27	4.15	0.84	1.52
10.00	362.60	0.28	4.26	0.87	1.53

Tailwater Channel Data - Down Drain 18 (715-715)

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 7.00 ft

Side Slope (H:V): 5.00 (_:1)

Channel Slope: 0.0500

Channel Manning's n: 0.0300

Channel Invert Elevation: 362.32 ft

Roadway Data for Crossing: Down Drain 18 (715-715)

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 25.00 ft

Crest Elevation: 397.94 ft

Roadway Surface: Paved

Roadway Top Width: 5.00 ft

Culvert 2

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 30 cfs

Design Flow: 61.6 cfs

Maximum Flow: 65 cfs

Table 49 - Summary of Culvert Flows at Crossing: Culvert 2

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 3 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
407.91	30.00	30.00	0.00	1
408.06	33.50	32.18	1.23	10
408.13	37.00	33.12	3.79	6
408.19	40.50	33.89	6.52	5
408.24	44.00	34.58	9.37	5
408.29	47.50	35.18	12.21	4
408.33	51.00	35.75	15.17	4
408.37	54.50	36.28	18.16	4
408.41	58.00	36.77	21.18	4
408.45	61.50	37.24	24.22	4
408.45	61.60	37.25	24.29	2
408.00	31.30	31.30	0.00	Overtopping

Table 50 - Culvert Summary Table: Culvert 2

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
30.00	30.00	407.91	2.837	1.281	1-S2n	1.190	1.769	1.300	0.099	9.874	14.930
33.50	32.18	408.06	2.994	1.451	1-S2n	1.237	1.838	1.353	0.106	10.056	15.588
37.00	33.12	408.13	3.064	1.525	5-S2n	1.257	1.865	1.375	0.113	10.132	16.211
40.50	33.89	408.19	3.121	1.585	5-S2n	1.273	1.887	1.393	0.119	10.195	16.788
44.00	34.58	408.24	3.173	1.640	5-S2n	1.288	1.907	1.409	0.125	10.252	17.350
47.50	35.18	408.29	3.218	1.688	5-S2n	1.301	1.924	1.423	0.131	10.297	17.881
51.00	35.75	408.33	3.262	1.734	5-S2n	1.312	1.940	1.438	0.137	10.329	18.388
54.50	36.28	408.37	3.303	1.777	5-S2n	1.323	1.954	1.451	0.142	10.360	18.880
58.00	36.77	408.41	3.342	1.817	5-S2n	1.333	1.968	1.463	0.148	10.389	19.341
61.50	37.24	408.45	3.379	1.856	5-S2n	1.343	1.980	1.475	0.153	10.418	19.795
61.60	37.25	408.45	3.380	1.857	5-S2n	1.343	1.981	1.475	0.153	10.418	19.801

****

Straight Culvert

Inlet Elevation (invert): 405.07 ft, Outlet Elevation (invert): 403.91 ft

Culvert Length: 20.51 ft, Culvert Slope: 0.0566

****

Site Data - Culvert 2

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 405.07 ft

Outlet Station: 20.48 ft

Outlet Elevation: 403.91 ft

Number of Barrels: 1

Culvert Data Summary - Culvert 2

Barrel Shape: Circular

Barrel Diameter: 3.00 ft

Barrel Material: Corrugated Steel

Embedment: 0.00 in

Barrel Manning's n: 0.0240

Culvert Type: Straight

Inlet Configuration: Thin Edge Projecting

Inlet Depression: None

Table 51 - Downstream Channel Rating Curve (Crossing: Culvert 2)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
30.00	404.01	0.10	14.93	12.41	8.38
33.50	404.02	0.11	15.59	13.27	8.47
37.00	404.02	0.11	16.21	14.08	8.55
40.50	404.03	0.12	16.79	14.88	8.62
44.00	404.04	0.13	17.35	15.63	8.69
47.50	404.04	0.13	17.88	16.36	8.76
51.00	404.05	0.14	18.39	17.07	8.82
54.50	404.05	0.14	18.88	17.76	8.88
58.00	404.06	0.15	19.34	18.44	8.93
61.50	404.06	0.15	19.80	19.09	8.99
61.60	404.06	0.15	19.80	19.12	8.98

Tailwater Channel Data - Culvert 2

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 20.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 2.0000

Channel Manning's n: 0.0300

Channel Invert Elevation: 403.91 ft

Roadway Data for Crossing: Culvert 2

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 30.00 ft

Crest Elevation: 408.00 ft

Roadway Surface: Gravel

Roadway Top Width: 5.00 ft

Culvert 3

Crossing Discharge Data

Discharge Selection Method: Specify Minimum, Design, and Maximum Flow

Minimum Flow: 20 cfs

Design Flow: 51.3 cfs

Maximum Flow: 60 cfs

Table 52 - Summary of Culvert Flows at Crossing: Culvert 3

Headwater Elevation (ft)	Total Discharge (cfs)	Culvert 2 Discharge (cfs)	Roadway Discharge (cfs)	Iterations
410.56	20.00	20.00	0.00	1
411.03	24.00	24.00	0.00	1
411.59	28.00	28.00	0.00	1
412.04	32.00	30.89	1.03	23
412.10	36.00	31.28	4.64	6
412.15	40.00	31.57	8.37	5
412.19	44.00	31.82	12.08	4
412.23	48.00	32.04	15.90	4
412.25	51.30	32.21	18.94	3
412.29	56.00	32.44	23.41	3
412.32	60.00	32.62	27.29	3
412.00	30.66	30.66	0.00	Overtopping

Table 53 - Culvert Summary Table: Culvert 3

Total Discharge (cfs)	Culvert Discharge (cfs)	Headwater Elevation (ft)	Inlet Control Depth (ft)	Outlet Control Depth (ft)	Flow Type	Normal Depth (ft)	Critical Depth (ft)	Outlet Depth (ft)	Tailwater Depth (ft)	Outlet Velocity (ft/s)	Tailwater Velocity (ft/s)
20.00	20.00	410.56	2.094	0.691	5-S2n	0.701	1.189	0.786	0.699	9.546	2.511
24.00	24.00	411.03	2.563	1.311	5-S2n	0.777	1.303	0.881	0.777	9.905	2.672
28.00	28.00	411.59	3.119	1.740	5-S2n	0.851	1.397	0.970	0.850	10.285	2.815
32.00	30.89	412.04	3.567	2.080	5-S2n	0.904	1.454	1.032	0.918	10.539	2.944
36.00	31.28	412.10	3.630	2.128	5-S2n	0.911	1.461	1.040	0.983	10.579	3.061
40.00	31.57	412.15	3.678	2.164	5-S2n	0.916	1.466	1.046	1.044	10.605	3.169
44.00	31.82	412.19	3.718	2.195	5-S2n	0.921	1.470	1.051	1.103	10.626	3.268
48.00	32.04	412.23	3.755	2.223	5-S2n	0.925	1.474	1.056	1.159	10.646	3.362
51.30	32.21	412.25	3.783	2.244	5-S2n	0.928	1.477	1.059	1.204	10.661	3.434
56.00	32.44	412.29	3.821	2.273	5-S2n	0.932	1.480	1.064	1.265	10.680	3.532
60.00	32.62	412.32	3.851	2.296	5-S2n	0.935	1.483	1.068	1.316	10.697	3.610

****

Straight Culvert

Inlet Elevation (invert): 408.47 ft, Outlet Elevation (invert): 407.24 ft

Culvert Length: 50.14 ft, Culvert Slope: 0.0245

****

Site Data - Culvert 3

Site Data Option: Culvert Invert Data

Inlet Station: 0.00 ft

Inlet Elevation: 408.47 ft

Outlet Station: 50.12 ft

Outlet Elevation: 407.24 ft

Number of Barrels: 2

Culvert Data Summary - Culvert 3

Barrel Shape: Circular

Barrel Diameter: 1.67 ft

Barrel Material: PVC

Embedment: 0.00 in

Barrel Manning's n: 0.0110

Culvert Type: Straight

Inlet Configuration: Mitered to Conform to Slope

Inlet Depression: None

Table 54 - Downstream Channel Rating Curve (Crossing: Culvert 3)

Flow (cfs)	Water Surface Elev (ft)	Depth (ft)	Velocity (ft/s)	Shear (psf)	Froude Number
20.00	407.94	0.70	2.51	0.22	0.56
24.00	408.02	0.78	2.67	0.24	0.57
28.00	408.09	0.85	2.82	0.27	0.58
32.00	408.16	0.92	2.94	0.29	0.58
36.00	408.22	0.98	3.06	0.31	0.59
40.00	408.28	1.04	3.17	0.33	0.59
44.00	408.34	1.10	3.27	0.34	0.60
48.00	408.40	1.16	3.36	0.36	0.60
51.30	408.44	1.20	3.43	0.38	0.60
56.00	408.51	1.27	3.53	0.39	0.61
60.00	408.56	1.32	3.61	0.41	0.61

Tailwater Channel Data - Culvert 3

Tailwater Channel Option: Trapezoidal Channel

Bottom Width: 10.00 ft

Side Slope (H:V): 2.00 (_:1)

Channel Slope: 0.0050

Channel Manning's n: 0.0300

Channel Invert Elevation: 407.24 ft

Roadway Data for Crossing: Culvert 3

Roadway Profile Shape: Constant Roadway Elevation

Crest Length: 50.00 ft

Crest Elevation: 412.00 ft

Roadway Surface: Paved

Roadway Top Width: 30.00 ft

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 Water Surface Profile Gradient (WSPG)
 XP WSPG
 Engine Version 1.3         06/09/2010
 XP Software        www.xpsoftware.com
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  MIRAMAR LANDFILL STORM WATER IMPROVEMENTS, PHASE 2
  CITY OF SAN DIEGO, CA - PROPOSED CONDITIONS HYDRAULIC ANALYSIS
```

DOWN DRAIN 11 - 100-YR STORM EVENT

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============================================================
   Main Line
============================================================
 Composite Profile:
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ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																
"Node14"	Outlet	0.00	265.32	270.00	266.370	1.050	82.20	37.26	21.56	287.93	0.000	2.790	0.000	0.00000	0.000	Pipe
	"i.p."	96.93	282.99	287.67	284.019	1.031	82.20	38.24	22.71	306.72	0.000	2.790	7.758	0.18229	1.057	Pipe
	"i.p."	165.30	295.45	300.13	296.447	0.995	82.20	40.11	24.98	321.42	0.000	2.790	8.298	0.18229	1.057	Pipe
"Link10"	Reach	204.35	302.57	308.37	303.532	0.962	82.20	42.06	27.47	331.01	0.000	2.790	8.873	0.18229	1.057	Pipe
"Node13"	Junction	208.35	302.57	308.37	303.513	0.943	82.20	43.19	28.97	332.48	0.000	2.790	0.000	0.00000	0.000	Pipe
	"i.p."	265.69	320.12	325.92	321.097	0.972	82.20	41.43	26.66	347.75	0.000	2.790	8.687	0.30614	0.923	Pipe
	"i.p."	299.43	330.45	336.25	331.458	1.006	82.20	39.51	24.23	355.69	0.000	2.790	8.123	0.30614	0.923	Pipe
	"i.p."	321.11	337.09	342.89	338.132	1.042	82.20	37.67	22.03	360.16	0.000	2.790	7.595	0.30614	0.923	Pipe
	"i.p."	336.78	341.89	347.69	342.967	1.079	82.20	35.91	20.03	362.99	0.000	2.790	7.099	0.30614	0.923	Pipe
	"i.p."	348.84	345.58	351.38	346.699	1.118	82.20	34.24	18.21	364.91	0.000	2.790	6.634	0.30614	0.923	Pipe
	"i.p."	358.50	348.54	354.34	349.696	1.158	82.20	32.65	16.55	366.25	0.000	2.790	6.197	0.30614	0.923	Pipe
	"i.p."	366.44	350.97	356.77	352.168	1.200	82.20	31.13	15.05	367.22	0.000	2.790	5.788	0.30614	0.923	Pipe
	"i.p."	373.09	353.00	358.80	354.247	1.244	82.20	29.68	13.68	367.93	0.000	2.790	5.404	0.30614	0.923	Pipe
	"i.p."	378.73	354.73	360.53	356.021	1.289	82.20	28.30	12.44	368.46	0.000	2.790	5.043	0.30614	0.923	Pipe
	"i.p."	383.58	356.21	362.01	357.551	1.337	82.20	26.98	11.31	368.86	0.000	2.790	4.705	0.30614	0.923	Pipe
	"i.p."	387.76	357.50	363.30	358.883	1.387	82.20	25.73	10.28	369.16	0.000	2.790	4.387	0.30614	0.923	Pipe
	"i.p."	391.40	358.61	364.41	360.049	1.439	82.20	24.53	9.34	369.39	0.000	2.790	4.088	0.30614	0.923	Pipe
	"i.p."	394.58	359.58	365.38	361.077	1.493	82.20	23.39	8.49	369.57	0.000	2.790	3.808	0.30614	0.923	Pipe
	"i.p."	397.37	360.44	366.24	361.987	1.551	82.20	22.30	7.72	369.71	0.000	2.790	3.544	0.30614	0.923	Pipe
	"i.p."	399.81	361.18	366.98	362.795	1.611	82.20	21.26	7.02	369.81	0.000	2.790	3.296	0.30614	0.923	Pipe
	"i.p."	401.96	361.84	367.64	363.516	1.674	82.20	20.27	6.38	369.90	0.000	2.790	3.063	0.30614	0.923	Pipe
	"i.p."	403.85	362.42	368.22	364.160	1.741	82.20	19.33	5.80	369.96	0.000	2.790	2.842	0.30614	0.923	Pipe
	"i.p."	405.50	362.93	368.73	364.737	1.811	82.20	18.43	5.27	370.01	0.000	2.790	2.635	0.30614	0.923	Pipe
	"i.p."	406.95	363.37	369.17	365.255	1.886	82.20	17.57	4.79	370.05	0.000	2.790	2.438	0.30614	0.923	Pipe
	"i.p."	408.21	363.76	369.56	365.720	1.965	82.20	16.75	4.36	370.08	0.000	2.790	2.251	0.30614	0.923	Pipe
	"i.p."	409.30	364.09	369.89	366.139	2.050	82.20	15.97	3.96	370.10	0.000	2.790	2.073	0.30614	0.923	Pipe
	"i.p."	410.24	364.38	370.18	366.517	2.141	82.20	15.23	3.60	370.12	0.000	2.790	1.903	0.30614	0.923	Pipe
	"i.p."	411.03	364.62	370.42	366.858	2.240	82.20	14.52	3.27	370.13	0.000	2.790	1.738	0.30614	0.923	Pipe
	"i.p."	411.68	364.82	370.62	367.165	2.348	82.20	13.85	2.98	370.14	0.000	2.790	1.575	0.30614	0.923	Pipe
	"i.p."	412.19	364.97	370.77	367.443	2.470	82.20	13.20	2.71	370.15	0.000	2.790	1.410	0.30614	0.923	Pipe
	"i.p."	412.54	365.08	370.88	367.693	2.611	82.20	12.59	2.46	370.15	0.000	2.790	1.233	0.30614	0.923	Pipe
"Link9"	Reach	412.70	365.13	371.00	367.919	2.789	82.20	12.00	2.24	370.16	0.000	2.790	1.001	0.30614	0.923	Pipe
"Node12"	WallEnt	412.70	365.13	371.00	370.460	5.330	82.20	3.08	0.15	370.61	0.000	2.032	0.000	0.00000	0.000	Tr./Rect.closed
"Node11"	Headwrk	412.70	365.13	371.00	370.460	5.330	82.20	3.08	0.15	370.61	0.000	2.032	0.000	0.00000	0.000	Tr./Rect.closed

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  *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
     i.p. = intermediate point processing results for reaches
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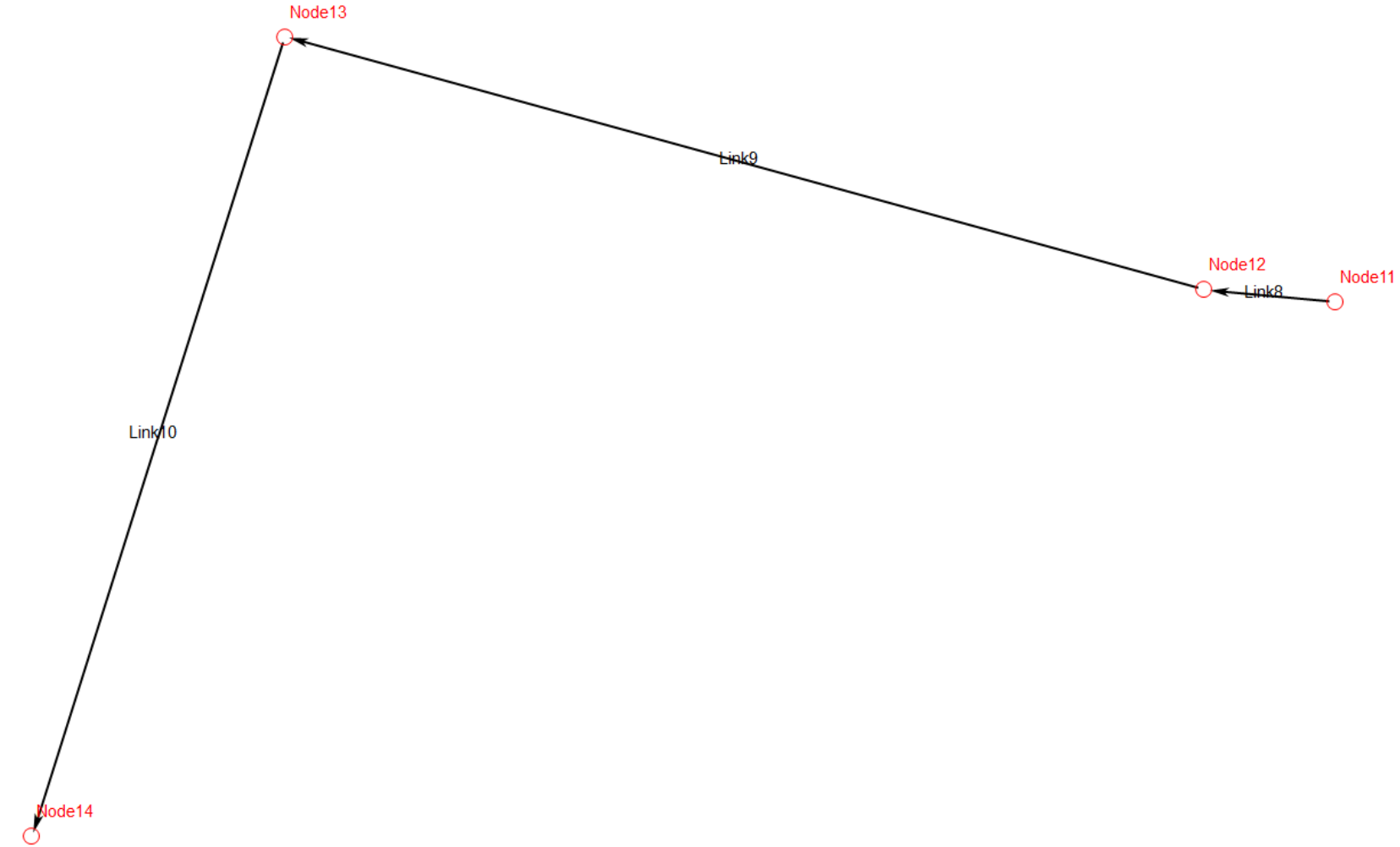
MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS

WSPG HYDRAULIC MAP FOR DOWN DRAIN 11



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XP WSPG
Engine Version 1.3         06/09/2010
XP Software        www.xpsoftware.com
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TITLE INFORMATION
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 MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVMENTS, PHASE 2
 CITY OF SAN DIEGO, CA - PROPOSED CONDITIONS HYDRAULIC ANALYSIS
 DOWN DRAIN 12 - 100-YR STORM EVENT

============================================================
   Main Line
============================================================

 Composite Profile:
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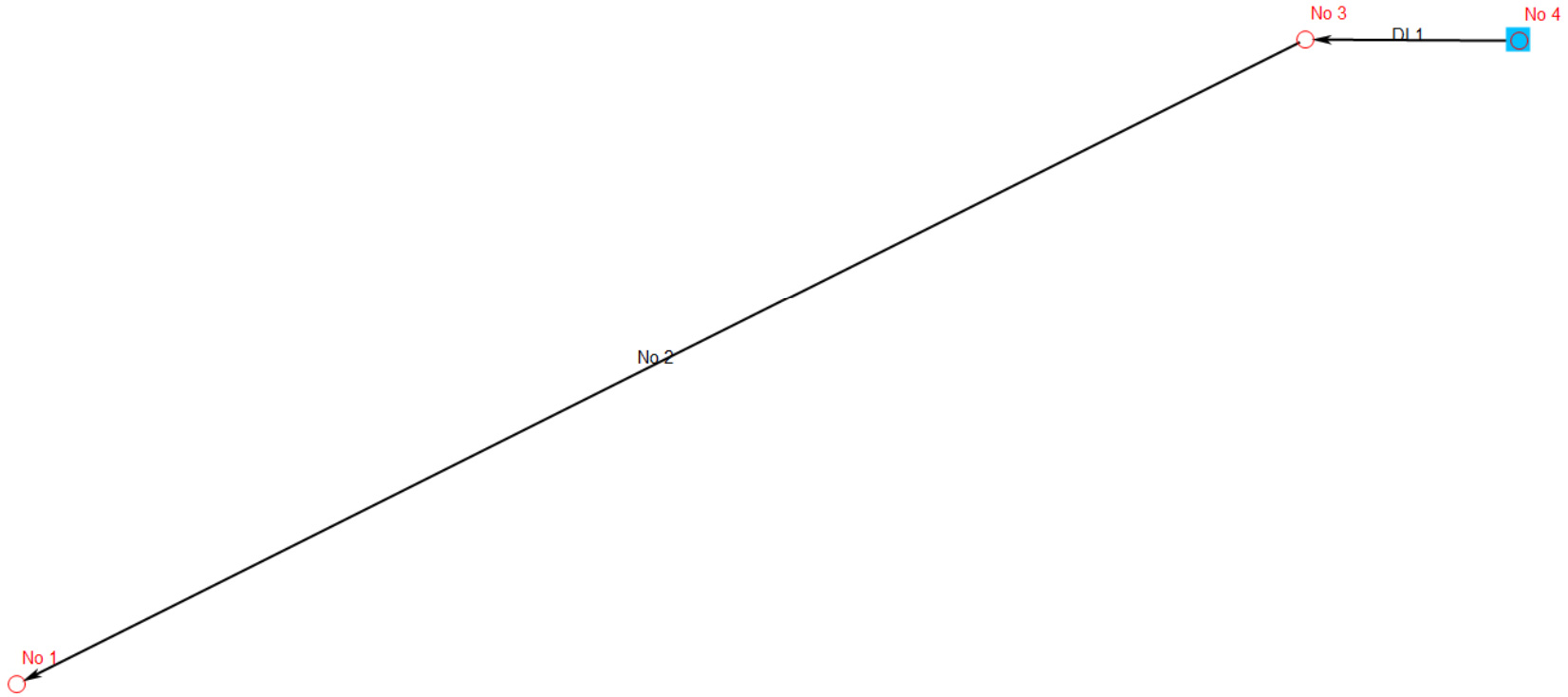
ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																
"No 1"	Outlet	1000.00	263.33	268.00	264.522	1.192	100.00	34.58	18.57	283.09	0.000	3.069	0.000	0.00000	0.000	Pipe
	"i.p."	1223.07	298.65	303.32	299.838	1.192	100.00	34.58	18.57	318.41	0.000	3.069	6.527	0.15832	1.192	Pipe
	"i.p."	1390.64	325.18	329.85	326.396	1.221	100.00	33.48	17.40	343.80	0.000	3.069	6.235	0.15832	1.192	Pipe
	"i.p."	1458.99	336.00	340.67	337.260	1.264	100.00	31.92	15.82	353.08	0.000	3.069	5.827	0.15832	1.192	Pipe
	"i.p."	1494.48	341.61	346.28	342.924	1.310	100.00	30.43	14.38	357.31	0.000	3.069	5.445	0.15832	1.192	Pipe
	"i.p."	1517.86	345.32	349.99	346.673	1.357	100.00	29.02	13.07	359.75	0.000	3.069	5.087	0.15832	1.192	Pipe
	"i.p."	1534.94	348.02	352.69	349.427	1.406	100.00	27.67	11.89	361.31	0.000	3.069	4.751	0.15832	1.192	Pipe
	"i.p."	1548.16	350.11	354.78	351.570	1.457	100.00	26.38	10.81	362.38	0.000	3.069	4.435	0.15832	1.192	Pipe
	"i.p."	1558.75	351.79	356.46	353.300	1.511	100.00	25.15	9.82	363.12	0.000	3.069	4.139	0.15832	1.192	Pipe
	"i.p."	1567.44	353.17	357.84	354.732	1.567	100.00	23.98	8.93	363.66	0.000	3.069	3.861	0.15832	1.192	Pipe
	"i.p."	1574.70	354.31	358.98	355.940	1.625	100.00	22.87	8.12	364.06	0.000	3.069	3.600	0.15832	1.192	Pipe
	"i.p."	1580.83	355.29	359.96	356.972	1.686	100.00	21.80	7.38	364.35	0.000	3.069	3.355	0.15832	1.192	Pipe
	"i.p."	1586.06	356.11	360.78	357.863	1.750	100.00	20.79	6.71	364.57	0.000	3.069	3.124	0.15832	1.192	Pipe
	"i.p."	1590.54	356.82	361.49	358.640	1.817	100.00	19.82	6.10	364.74	0.000	3.069	2.908	0.15832	1.192	Pipe
	"i.p."	1594.39	357.43	362.10	359.320	1.888	100.00	18.90	5.54	364.87	0.000	3.069	2.704	0.15832	1.192	Pipe
	"i.p."	1597.72	357.96	362.63	359.920	1.962	100.00	18.02	5.04	364.96	0.000	3.069	2.512	0.15832	1.192	Pipe
	"i.p."	1600.58	358.41	363.08	360.452	2.040	100.00	17.18	4.58	365.03	0.000	3.069	2.331	0.15832	1.192	Pipe
	"i.p."	1603.04	358.80	363.47	360.924	2.123	100.00	16.38	4.17	365.09	0.000	3.069	2.160	0.15832	1.192	Pipe
	"i.p."	1605.14	359.13	363.80	361.344	2.210	100.00	15.62	3.79	365.13	0.000	3.069	1.999	0.15832	1.192	Pipe
	"i.p."	1606.93	359.42	364.09	361.720	2.304	100.00	14.89	3.44	365.16	0.000	3.069	1.845	0.15832	1.192	Pipe
	"i.p."	1608.42	359.65	364.32	362.057	2.404	100.00	14.20	3.13	365.19	0.000	3.069	1.699	0.15832	1.192	Pipe
	"i.p."	1609.65	359.85	364.52	362.359	2.511	100.00	13.54	2.85	365.20	0.000	3.069	1.558	0.15832	1.192	Pipe
	"i.p."	1610.62	360.00	364.67	362.630	2.628	100.00	12.91	2.59	365.22	0.000	3.069	1.422	0.15832	1.192	Pipe
	"i.p."	1611.35	360.12	364.79	362.873	2.756	100.00	12.31	2.35	365.22	0.000	3.069	1.288	0.15832	1.192	Pipe
	"i.p."	1611.82	360.19	364.86	363.092	2.900	100.00	11.73	2.14	365.23	0.000	3.069	1.151	0.15832	1.192	Pipe
"No 2"	Reach	1612.00	360.22	366.00	363.288	3.068	100.00	11.19	1.94	365.23	0.000	3.069	1.001	0.15832	1.192	Pipe
"No 3"	WallEnt	1612.00	360.22	366.43	365.321	5.101	100.00	3.92	0.24	365.56	0.000	2.316	0.000	0.00000	0.000	Rect.open
"No 4"	Headwrk	1612.00	360.22	366.43	365.321	5.101	100.00	3.92	0.24	365.56	0.000	2.316	0.000	0.00000	0.000	Rect.open

```
 *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
    i.p. = intermediate point processing results for reaches
```

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS

WSPG HYDRAULIC MAP FOR DOWN DRAIN 12



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************************************
Water Surface Profile Gradient (WSPG)
XP WSPG
Engine Version 1.3         06/09/2010
XP Software        www.xpsoftware.com
************************************

INPUT FILE
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Computed  04/24/18  19:01:57

TITLE INFORMATION
************************************
 MIRAMAR LANDFILL STORM WATER IMPROVEMENTS, PHASE 2
 CITY OF SAN DIEGO, CA - PROPOSED CONDITIONS HYDRAULIC ANALYSIS
 EXISTING CULVERT 1 - 100-YR STORM EVENT

============================================================
   Main Line
============================================================

 Composite Profile:
```
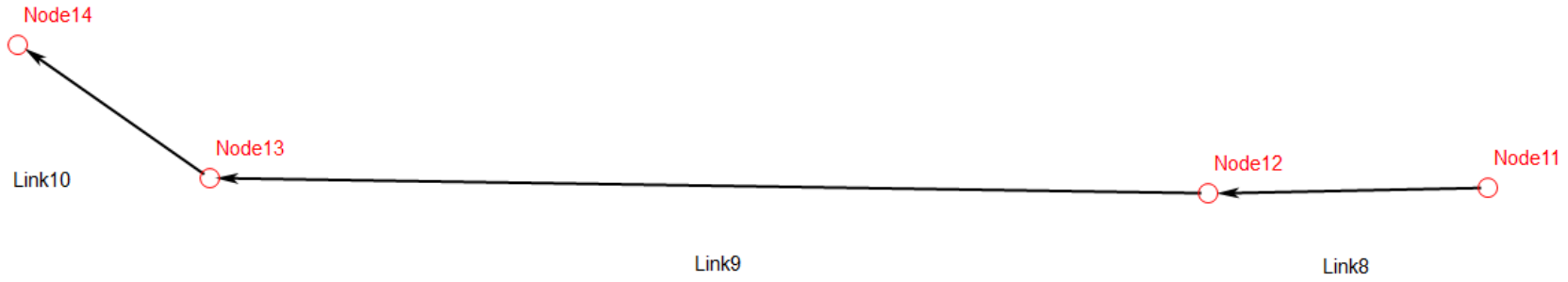

ELEMENT NAME	TYPE	STATION	INVERT ELEV	GROUND ELEV	W.S. ELEV	DEPTH	Q	VELOC.	VELOC. HEAD	ENERGY GRADE LN	SUPER ELEV	CRITICAL DEPTH	FROUDE NUMBER	SLOPE	NORMAL DEPTH	CROSS SECTION
###																
"Node14"	Outlet	0.00	409.37	413.00	410.704	1.334	40.70	13.40	2.79	413.49	0.000	2.078	0.000	0.00000	0.000	Pipe
"Link10"	Reach	20.07	410.90	415.00	412.233	1.333	40.70	13.41	2.79	415.03	0.000	2.078	2.342	0.07623	1.334	Pipe
	"i.p."	67.81	414.55	418.65	415.883	1.333	40.70	13.41	2.79	418.68	0.000	2.078	2.342	0.07645	1.333	Pipe
	"i.p."	112.05	417.93	422.03	419.284	1.352	40.70	13.17	2.69	421.98	0.000	2.078	2.281	0.07645	1.333	Pipe
	"i.p."	136.19	419.78	423.88	421.181	1.402	40.70	12.56	2.45	423.63	0.000	2.078	2.127	0.07645	1.333	Pipe
	"i.p."	146.62	420.58	424.68	422.030	1.455	40.70	11.97	2.23	424.26	0.000	2.078	1.981	0.07645	1.333	Pipe
	"i.p."	152.87	421.05	425.15	422.564	1.510	40.70	11.41	2.02	424.59	0.000	2.078	1.845	0.07645	1.333	Pipe
	"i.p."	157.10	421.38	425.48	422.945	1.568	40.70	10.88	1.84	424.78	0.000	2.078	1.717	0.07645	1.333	Pipe
	"i.p."	160.10	421.61	425.71	423.236	1.629	40.70	10.38	1.67	424.91	0.000	2.078	1.596	0.07645	1.333	Pipe
	"i.p."	162.29	421.77	425.87	423.467	1.694	40.70	9.89	1.52	424.99	0.000	2.078	1.483	0.07645	1.333	Pipe
	"i.p."	163.88	421.89	425.99	423.656	1.761	40.70	9.43	1.38	425.04	0.000	2.078	1.376	0.07645	1.333	Pipe
	"i.p."	165.00	421.98	426.08	423.813	1.833	40.70	8.99	1.26	425.07	0.000	2.078	1.274	0.07645	1.333	Pipe
	"i.p."	165.74	422.04	426.14	423.946	1.909	40.70	8.58	1.14	425.09	0.000	2.078	1.179	0.07645	1.333	Pipe
	"i.p."	166.16	422.07	426.17	424.059	1.990	40.70	8.18	1.04	425.10	0.000	2.078	1.088	0.07645	1.333	Pipe
"Link9"	Reach	166.30	422.08	428.32	424.157	2.077	40.70	7.80	0.94	425.10	0.000	2.078	1.001	0.07645	1.333	Pipe
"Node12"	WallEnt	166.30	422.08	428.32	425.471	3.391	40.70	2.40	0.09	425.56	0.000	1.272	0.000	0.00000	0.000	Tr./Rect.closed
"Node11"	Headwrk	166.30	422.08	428.32	425.471	3.391	40.70	2.40	0.09	425.56	0.000	1.272	0.000	0.00000	0.000	Tr./Rect.closed

```
 *) in the W.S.ELEV column indicates flooding, it is set whenever W.S.ELEV > GROUND ELEV
    i.p. = intermediate point processing results for reaches
```

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS

WSPG2010 HYDRAULIC MAP FOR CULVERT 1



ATTACHMENT D

HYDRAULIC TOOLBOX LOW FLOW CROSSING HYDRAULIC CALCULATION COMPUTER OUTPUTS

Hydraulic Analysis Report

Project Data

Project Title: Miramar Landfill Storm Water Conveyance Improvements

Designer: D-Max Engineering, Inc.

Project Date: June, 2018

Project Units: U.S. Customary Units

Notes: Low Flow Crossing (LFC) Normal Velocity and Normal Depth Detailed Calculations

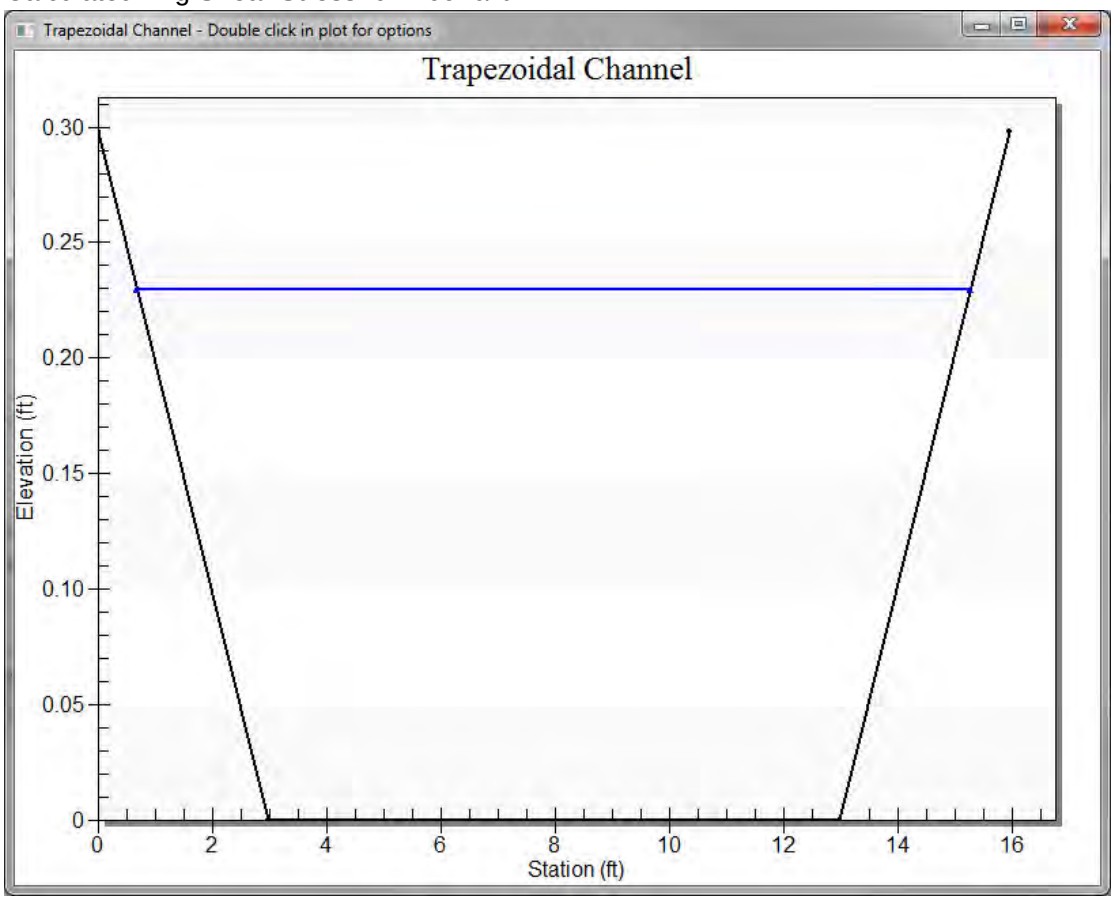
Channel Analysis: LFC-1

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 6.6000 cfs

Result Parameters

Depth: 0.2294 ft
Area of Flow: 2.8197 ft^2
Wetted Perimeter: 14.6102 ft
Hydraulic Radius: 0.1930 ft
Average Velocity: 2.3406 ft/s
Top Width: 14.5873 ft
Froude Number: 0.9382
Critical Depth: 0.2205 ft
Critical Velocity: 2.4527 ft/s
Critical Slope: 0.0230 ft/ft
Critical Top Width: 14.41 ft
Calculated Max Shear Stress: 0.2862 lb/ft^2
Calculated Avg Shear Stress: 0.2409 lb/ft^2



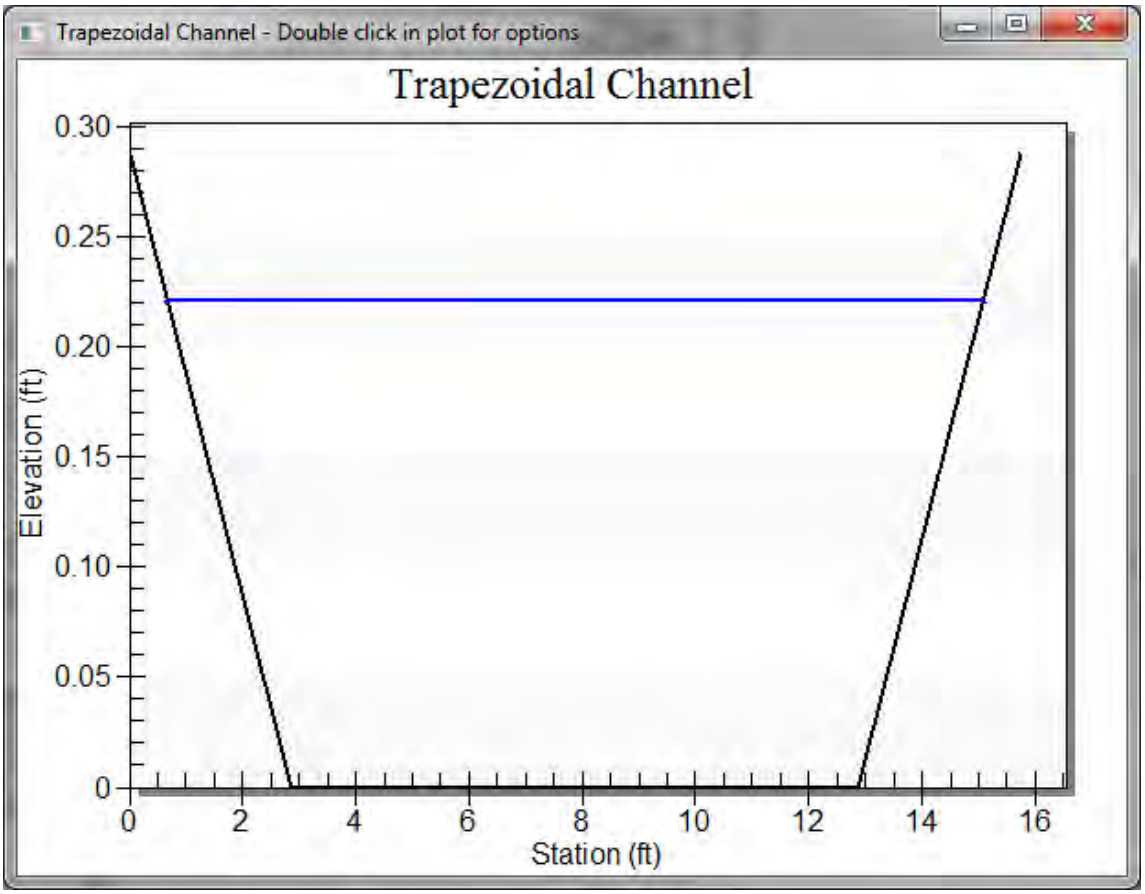
Channel Analysis: LFC-2

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 6.2000 cfs

Result Parameters

Depth: 0.2212 ft
Area of Flow: 2.7010 ft^2
Wetted Perimeter: 14.4456 ft
Hydraulic Radius: 0.1870 ft
Average Velocity: 2.2955 ft/s
Top Width: 14.4235 ft
Froude Number: 0.9348
Critical Depth: 0.2121 ft
Critical Velocity: 2.4115 ft/s
Critical Slope: 0.0233 ft/ft
Critical Top Width: 14.24 ft
Calculated Max Shear Stress: 0.2760 lb/ft^2
Calculated Avg Shear Stress: 0.2333 lb/ft^2



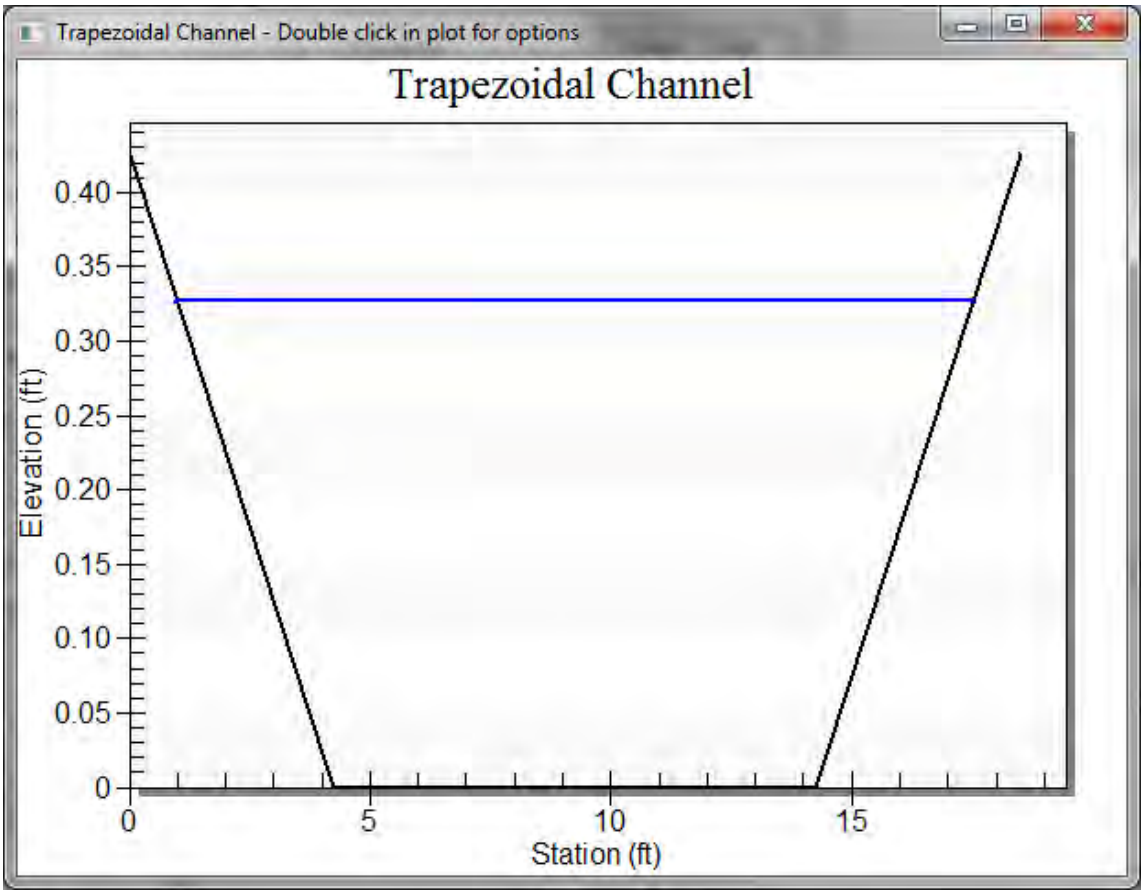
Channel Analysis: LFC-2A

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 12.5000 cfs

Result Parameters

Depth: 0.3276 ft
Area of Flow: 4.3493 ft^2
Wetted Perimeter: 16.5848 ft
Hydraulic Radius: 0.2622 ft
Average Velocity: 2.8740 ft/s
Top Width: 16.5521 ft
Froude Number: 0.9881
Critical Depth: 0.3251 ft
Critical Velocity: 2.9020 ft/s
Critical Slope: 0.0206 ft/ft
Critical Top Width: 16.50 ft
Calculated Max Shear Stress: 0.4088 lb/ft^2
Calculated Avg Shear Stress: 0.3273 lb/ft^2



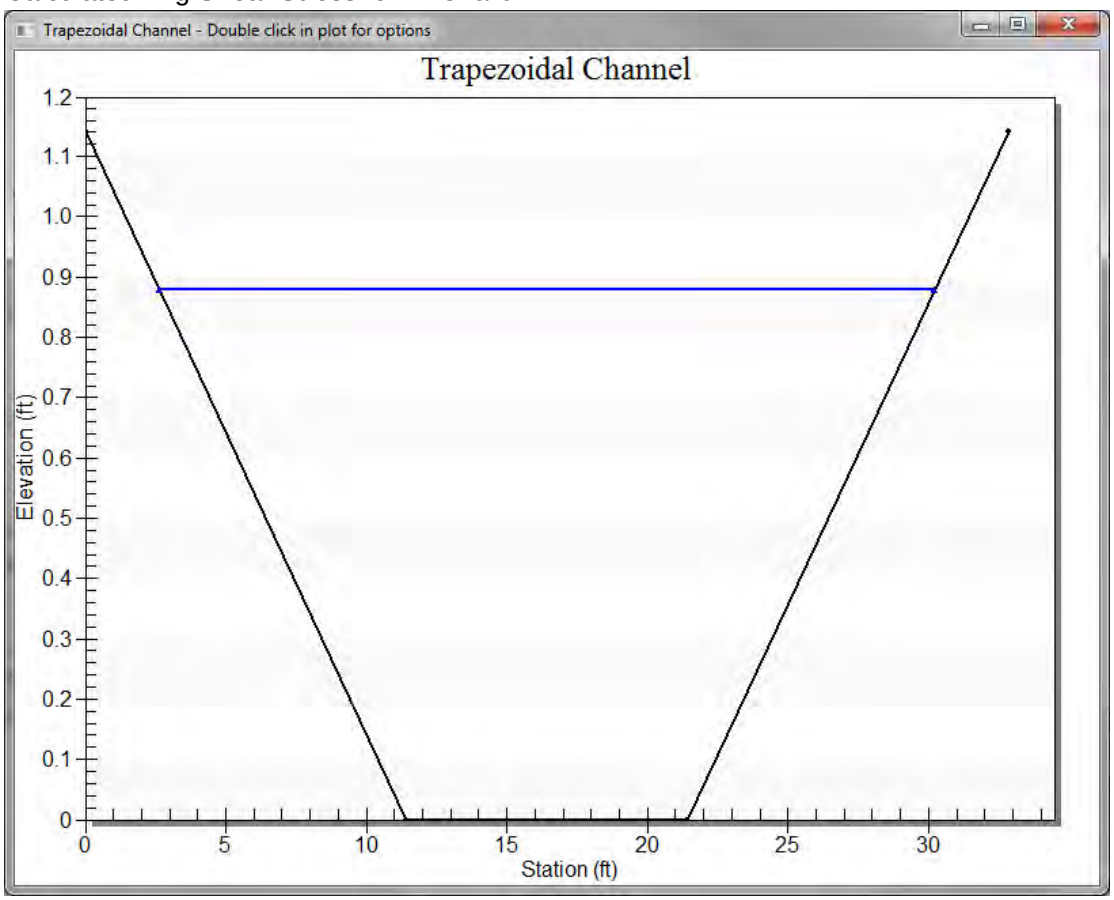
Channel Analysis: LFC-3

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 81.8000 cfs

Result Parameters

Depth: 0.8780 ft
Area of Flow: 16.4896 ft^2
Wetted Perimeter: 27.6482 ft
Hydraulic Radius: 0.5964 ft
Average Velocity: 4.9607 ft/s
Top Width: 27.5606 ft
Froude Number: 1.1302
Critical Depth: 0.9368 ft
Critical Velocity: 4.5086 ft/s
Critical Slope: 0.0154 ft/ft
Critical Top Width: 28.74 ft
Calculated Max Shear Stress: 1.0958 lb/ft^2
Calculated Avg Shear Stress: 0.7443 lb/ft^2



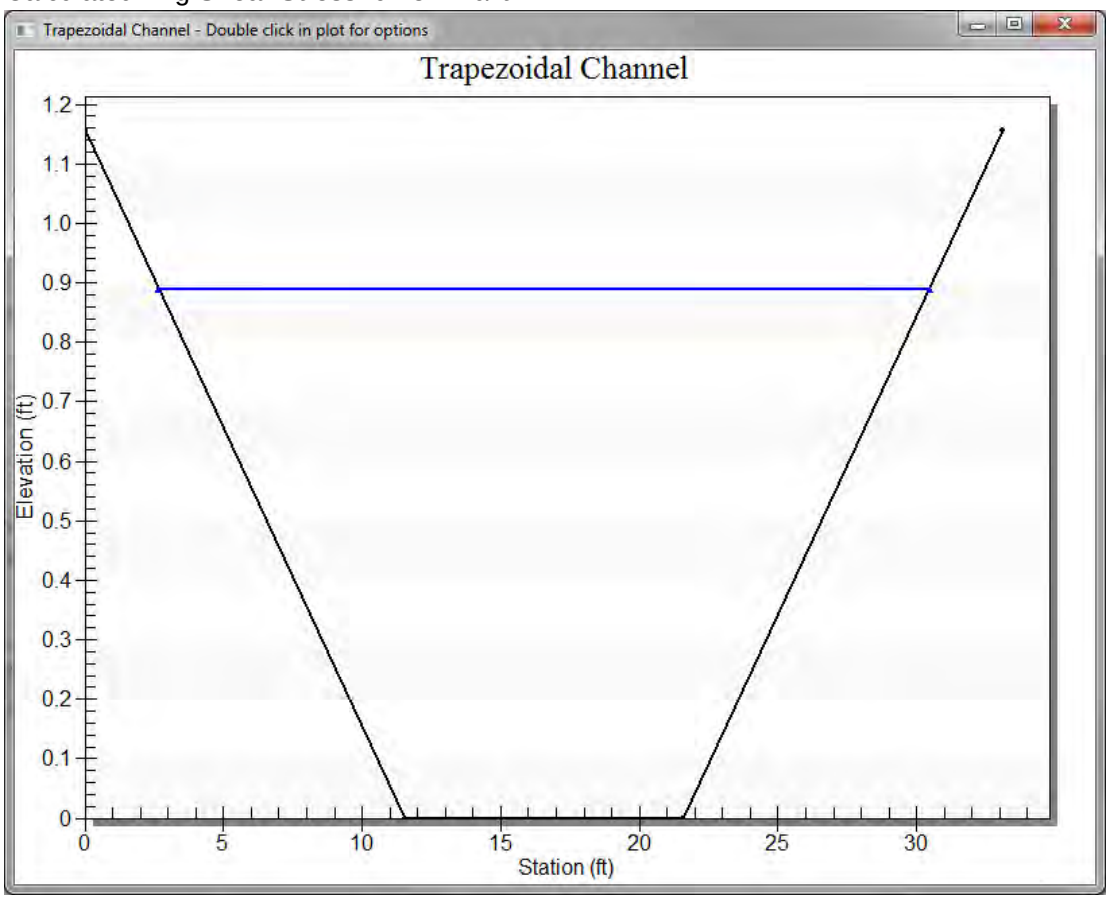
Channel Analysis: LFC-4

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 84.0000 cfs

Result Parameters

Depth: 0.8893 ft
Area of Flow: 16.8019 ft^2
Wetted Perimeter: 27.8750 ft
Hydraulic Radius: 0.6028 ft
Average Velocity: 4.9994 ft/s
Top Width: 27.7863 ft
Froude Number: 1.1330
Critical Depth: 0.9499 ft
Critical Velocity: 4.5349 ft/s
Critical Slope: 0.0153 ft/ft
Critical Top Width: 29.00 ft
Calculated Max Shear Stress: 1.1099 lb/ft^2
Calculated Avg Shear Stress: 0.7522 lb/ft^2



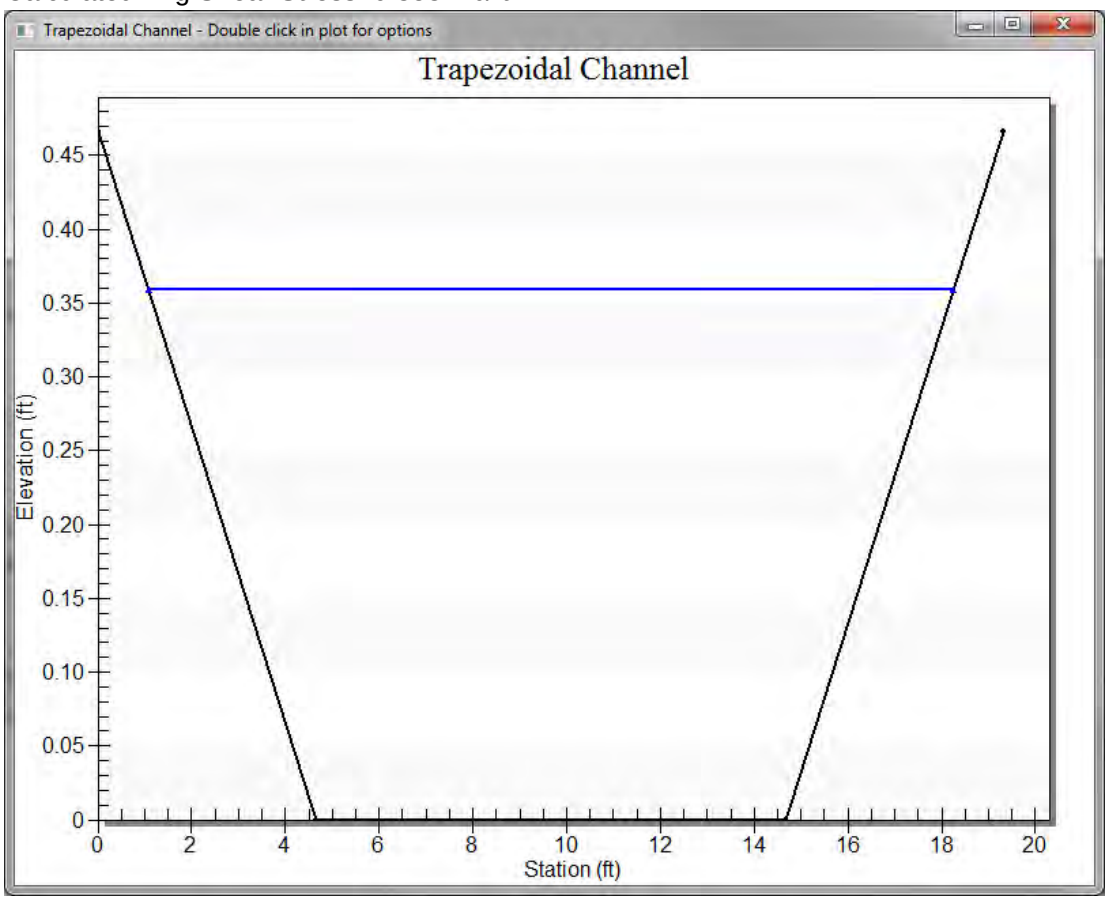
Channel Analysis: LFC-5

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 14.7000 cfs

Result Parameters

Depth: 0.3587 ft
Area of Flow: 4.8734 ft^2
Wetted Perimeter: 17.2095 ft
Hydraulic Radius: 0.2832 ft
Average Velocity: 3.0164 ft/s
Top Width: 17.1737 ft
Froude Number: 0.9979
Critical Depth: 0.3581 ft
Critical Velocity: 3.0230 ft/s
Critical Slope: 0.0201 ft/ft
Critical Top Width: 17.16 ft
Calculated Max Shear Stress: 0.4476 lb/ft^2
Calculated Avg Shear Stress: 0.3534 lb/ft^2



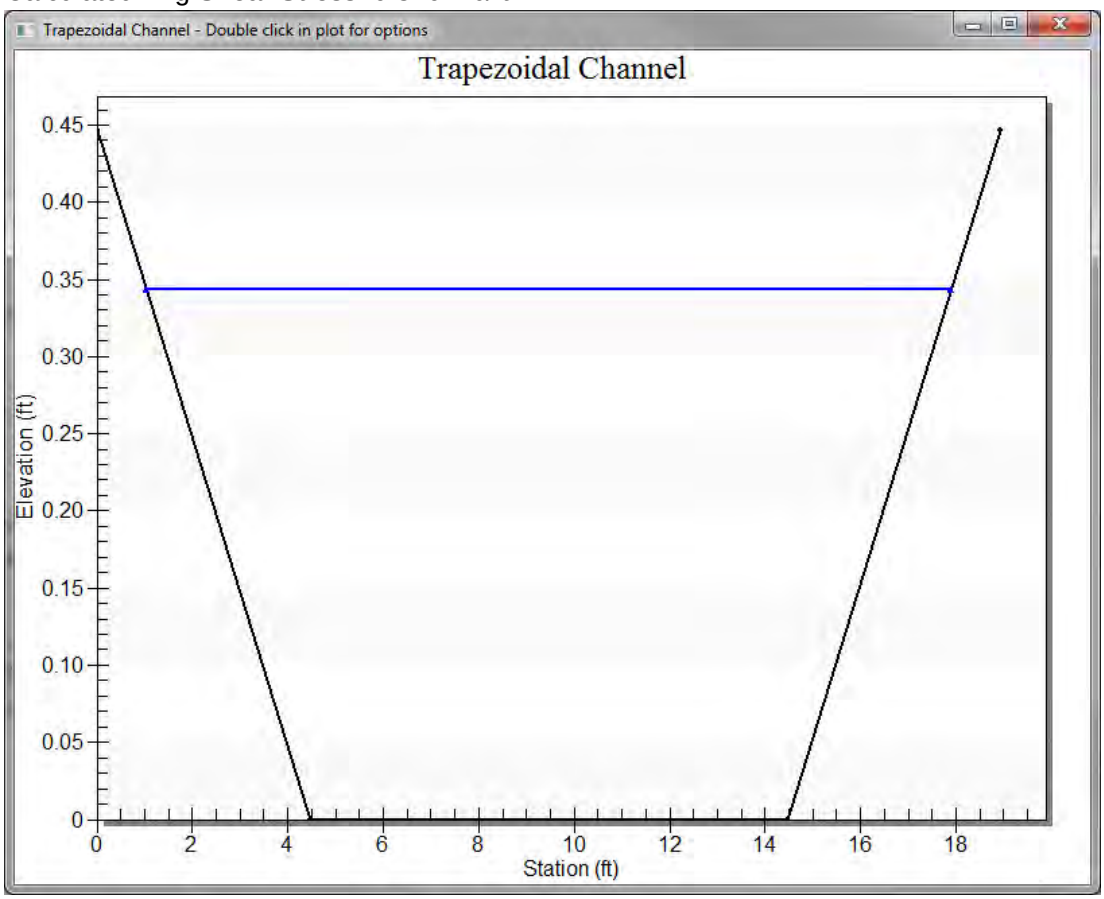
Channel Analysis: LFC-5A

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 13.6000 cfs

Result Parameters

Depth: 0.3434 ft
Area of Flow: 4.6141 ft^2
Wetted Perimeter: 16.9033 ft
Hydraulic Radius: 0.2730 ft
Average Velocity: 2.9475 ft/s
Top Width: 16.8690 ft
Froude Number: 0.9932
Critical Depth: 0.3419 ft
Critical Velocity: 2.9646 ft/s
Critical Slope: 0.0203 ft/ft
Critical Top Width: 16.84 ft
Calculated Max Shear Stress: 0.4286 lb/ft^2
Calculated Avg Shear Stress: 0.3407 lb/ft^2



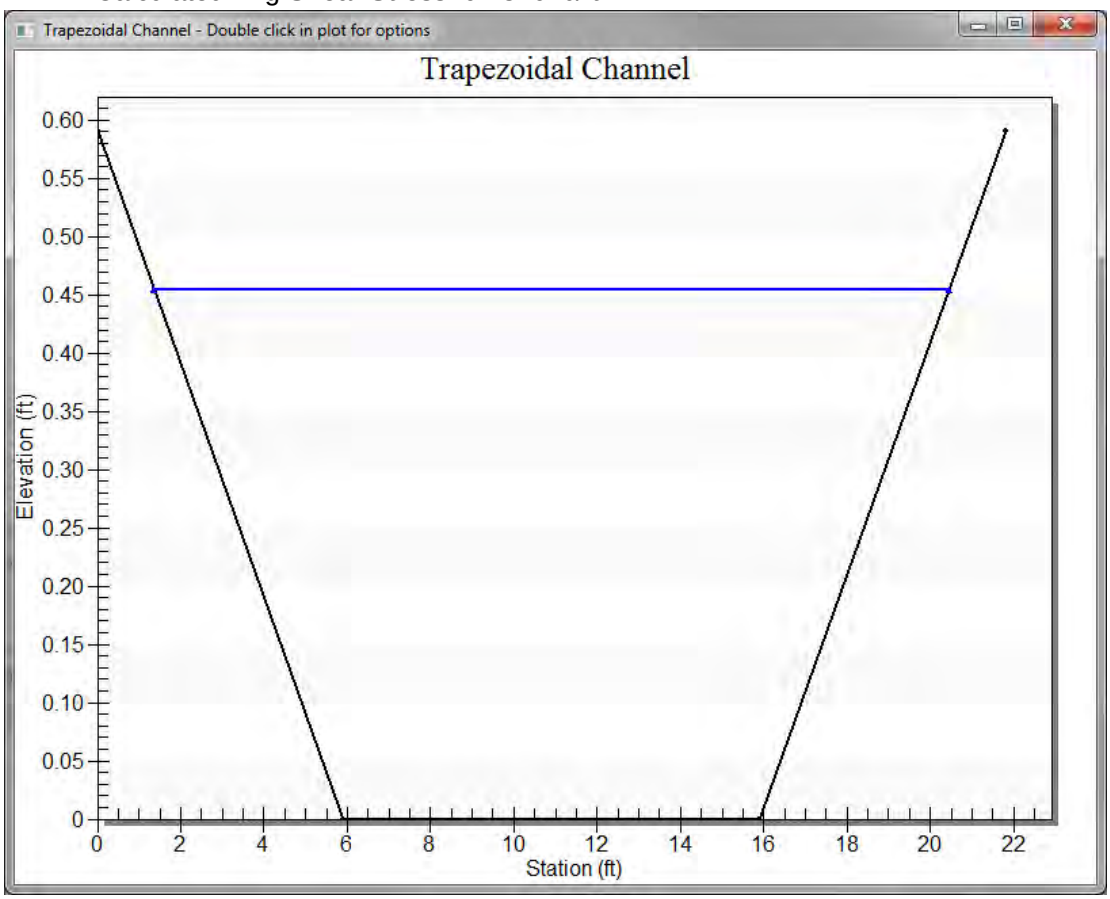
Channel Analysis: LFC-6

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 22.8000 cfs

Result Parameters

Depth: 0.4544 ft
Area of Flow: 6.6083 ft^2
Wetted Perimeter: 19.1328 ft
Hydraulic Radius: 0.3454 ft
Average Velocity: 3.4502 ft/s
Top Width: 19.0874 ft
Froude Number: 1.0334
Critical Depth: 0.4630 ft
Critical Velocity: 3.3659 ft/s
Critical Slope: 0.0187 ft/ft
Critical Top Width: 19.26 ft
Calculated Max Shear Stress: 0.5671 lb/ft^2
Calculated Avg Shear Stress: 0.4310 lb/ft^2



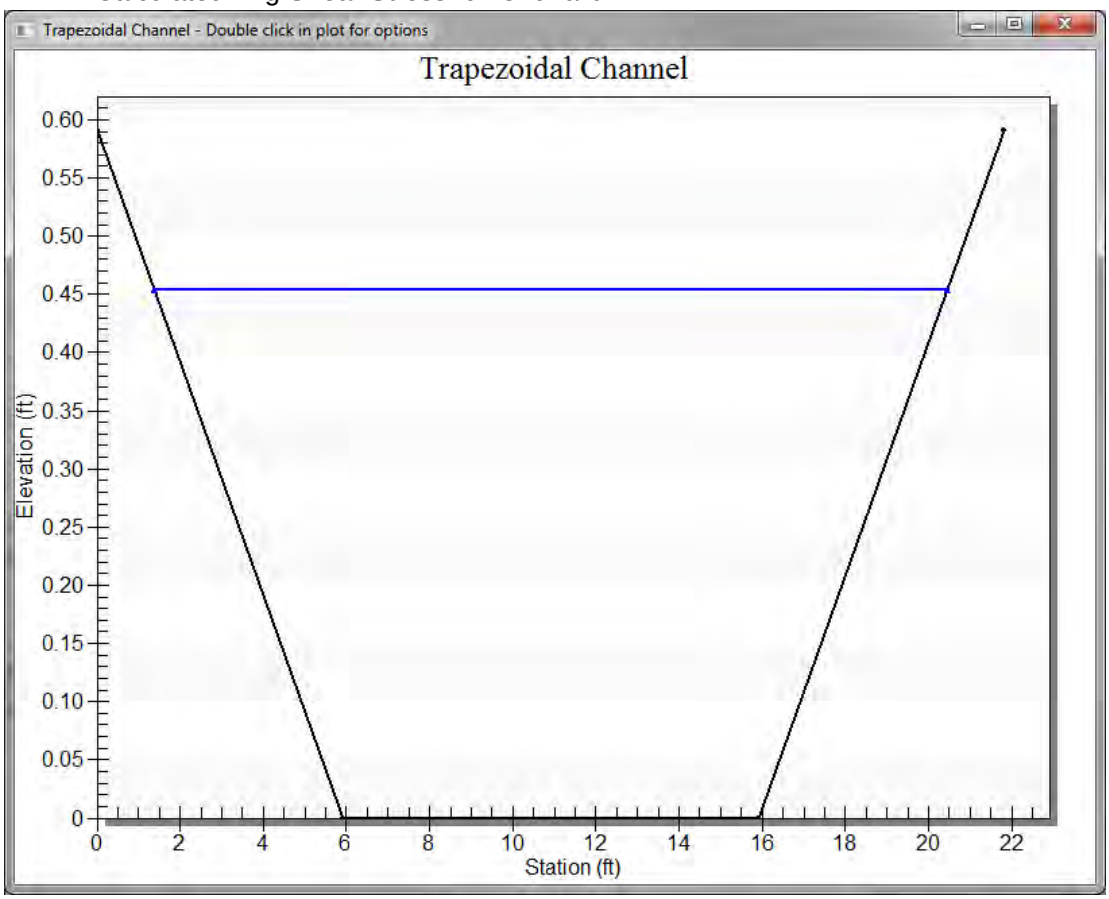
Channel Analysis: LFC-6A

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 22.8000 cfs

Result Parameters

Depth: 0.4544 ft
Area of Flow: 6.6083 ft^2
Wetted Perimeter: 19.1328 ft
Hydraulic Radius: 0.3454 ft
Average Velocity: 3.4502 ft/s
Top Width: 19.0874 ft
Froude Number: 1.0334
Critical Depth: 0.4630 ft
Critical Velocity: 3.3659 ft/s
Critical Slope: 0.0187 ft/ft
Critical Top Width: 19.26 ft
Calculated Max Shear Stress: 0.5671 lb/ft^2
Calculated Avg Shear Stress: 0.4310 lb/ft^2



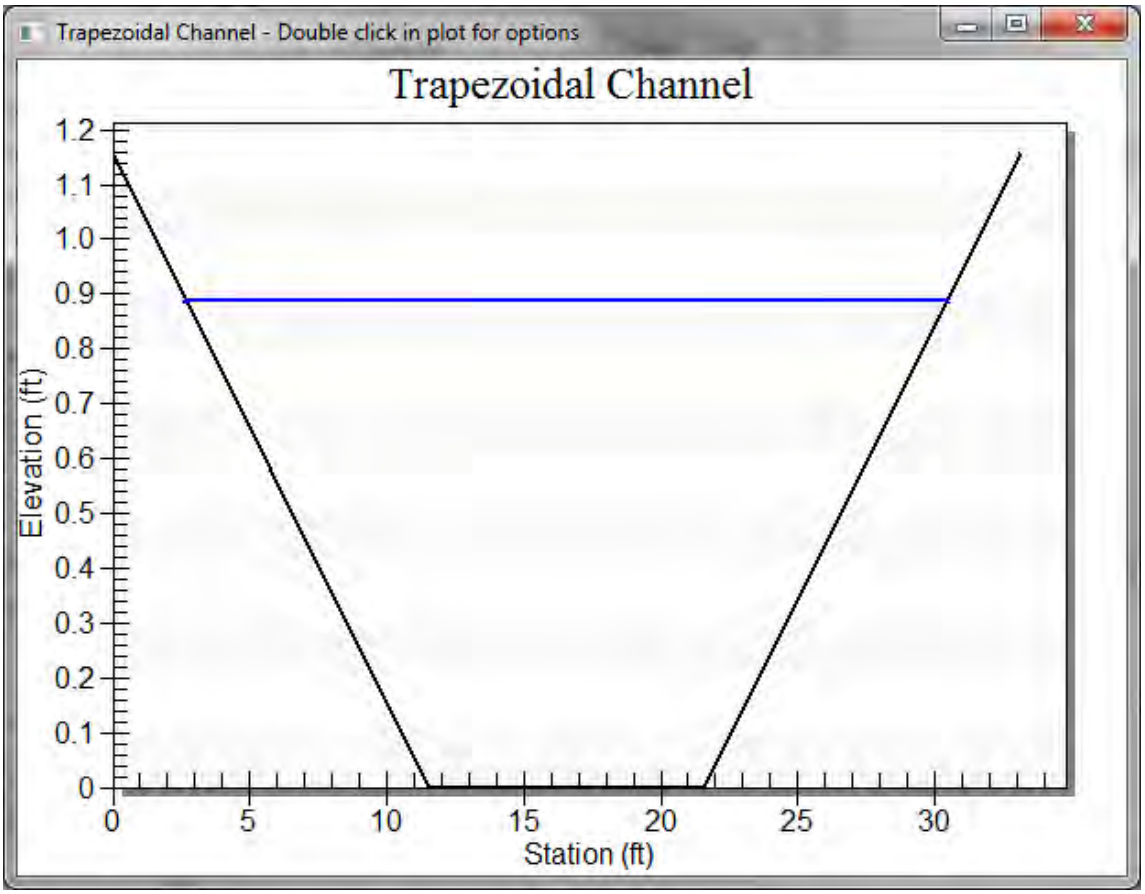
Channel Analysis: LFC-7

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 84.0000 cfs

Result Parameters

Depth: 0.8893 ft
Area of Flow: 16.8019 ft^2
Wetted Perimeter: 27.8750 ft
Hydraulic Radius: 0.6028 ft
Average Velocity: 4.9994 ft/s
Top Width: 27.7863 ft
Froude Number: 1.1330
Critical Depth: 0.9499 ft
Critical Velocity: 4.5349 ft/s
Critical Slope: 0.0153 ft/ft
Critical Top Width: 29.00 ft
Calculated Max Shear Stress: 1.1099 lb/ft^2
Calculated Avg Shear Stress: 0.7522 lb/ft^2



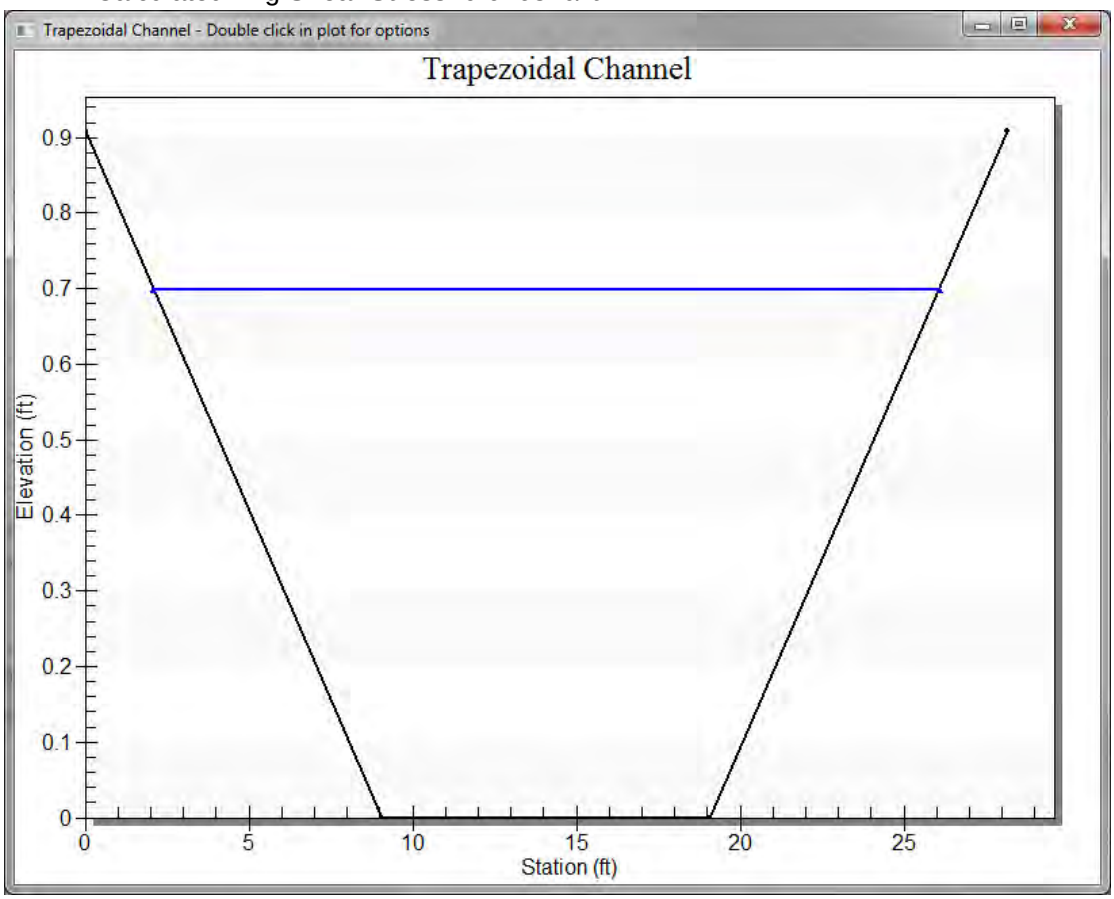
Channel Analysis: LFC-8

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 52.0000 cfs

Result Parameters

Depth: 0.6991 ft
Area of Flow: 11.8781 ft^2
Wetted Perimeter: 24.0515 ft
Hydraulic Radius: 0.4939 ft
Average Velocity: 4.3778 ft/s
Top Width: 23.9818 ft
Froude Number: 1.0962
Critical Depth: 0.7354 ft
Critical Velocity: 4.0744 ft/s
Critical Slope: 0.0164 ft/ft
Critical Top Width: 24.71 ft
Calculated Max Shear Stress: 0.8725 lb/ft^2
Calculated Avg Shear Stress: 0.6163 lb/ft^2



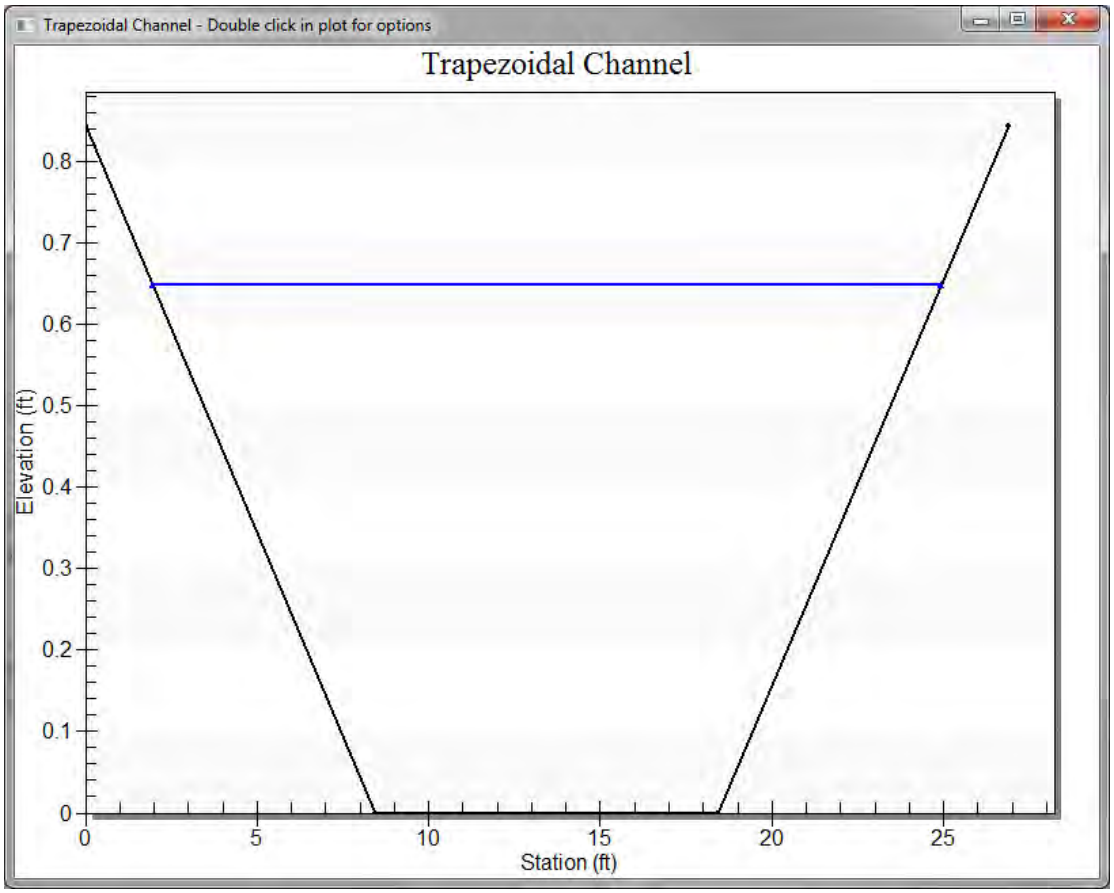
Channel Analysis: LFC-9

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 45.0000 cfs

Result Parameters

Depth: 0.6491 ft
Area of Flow: 10.7046 ft^2
Wetted Perimeter: 23.0470 ft
Hydraulic Radius: 0.4645 ft
Average Velocity: 4.2038 ft/s
Top Width: 22.9823 ft
Froude Number: 1.0855
Critical Depth: 0.6794 ft
Critical Velocity: 3.9437 ft/s
Critical Slope: 0.0168 ft/ft
Critical Top Width: 23.59 ft
Calculated Max Shear Stress: 0.8101 lb/ft^2
Calculated Avg Shear Stress: 0.5797 lb/ft^2



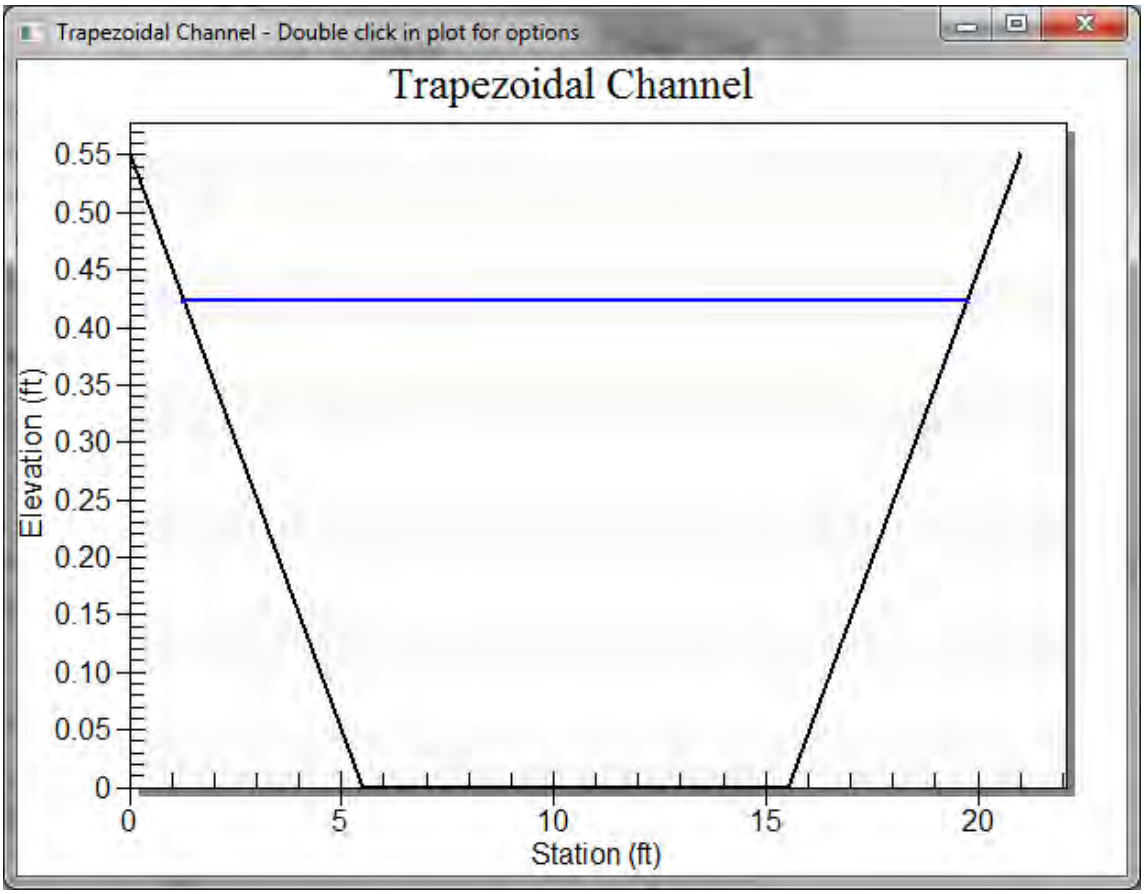
Channel Analysis: LFC-9A

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 20.0000 cfs

Result Parameters

Depth: 0.4239 ft
Area of Flow: 6.0359 ft^2
Wetted Perimeter: 18.5203 ft
Hydraulic Radius: 0.3259 ft
Average Velocity: 3.3135 ft/s
Top Width: 18.4780 ft
Froude Number: 1.0217
Critical Depth: 0.4291 ft
Critical Velocity: 3.2611 ft/s
Critical Slope: 0.0191 ft/ft
Critical Top Width: 18.58 ft
Calculated Max Shear Stress: 0.5290 lb/ft^2
Calculated Avg Shear Stress: 0.4067 lb/ft^2



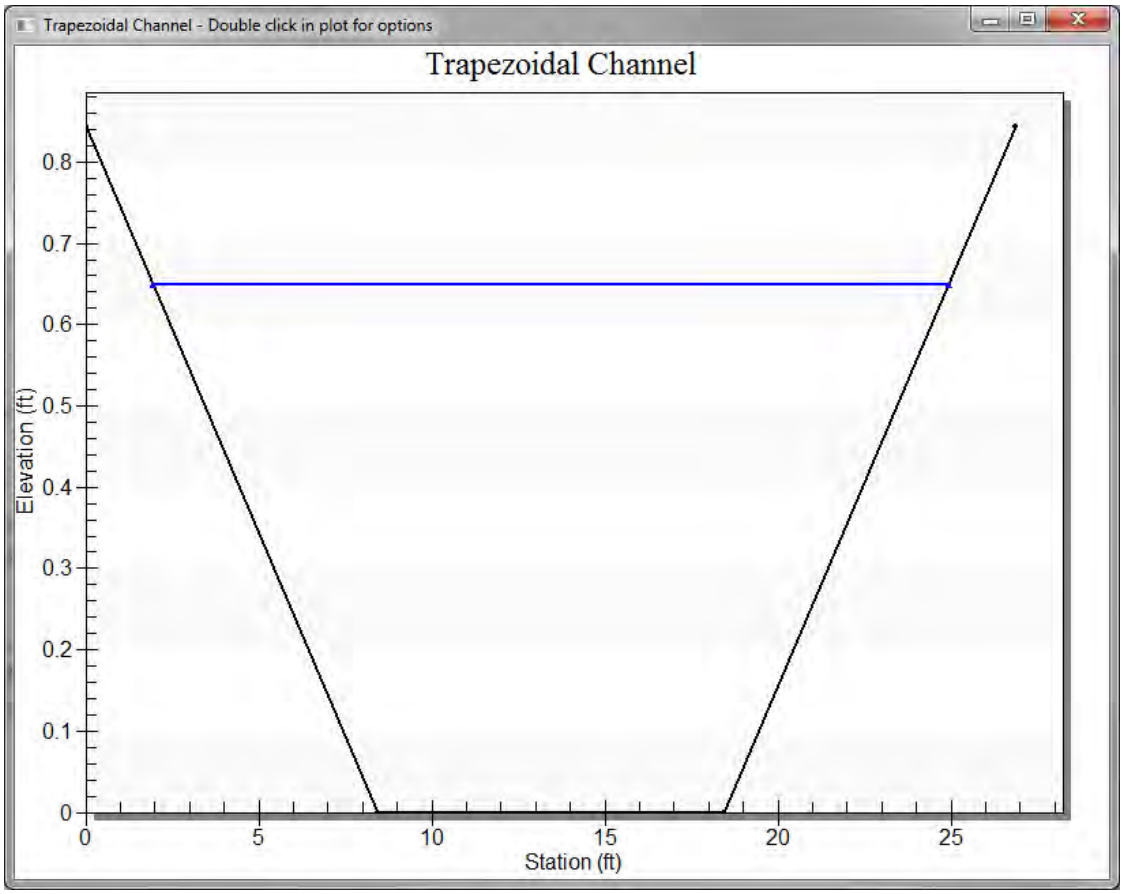
Channel Analysis: LFC-10

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 45.0000 cfs

Result Parameters

Depth: 0.6491 ft
Area of Flow: 10.7046 ft^2
Wetted Perimeter: 23.0470 ft
Hydraulic Radius: 0.4645 ft
Average Velocity: 4.2038 ft/s
Top Width: 22.9823 ft
Froude Number: 1.0855
Critical Depth: 0.6794 ft
Critical Velocity: 3.9437 ft/s
Critical Slope: 0.0168 ft/ft
Critical Top Width: 23.59 ft
Calculated Max Shear Stress: 0.8101 lb/ft^2
Calculated Avg Shear Stress: 0.5797 lb/ft^2



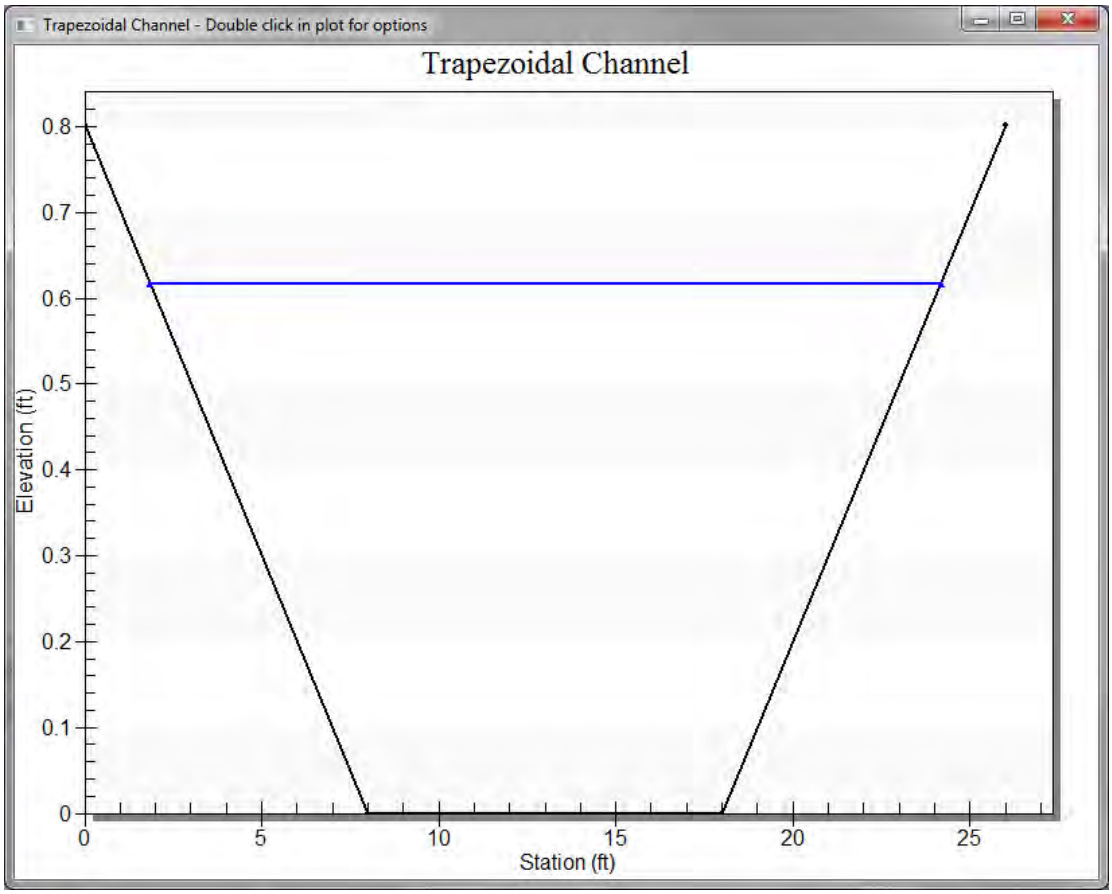
Channel Analysis: LFC-11

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 40.7000 cfs

Result Parameters

Depth: 0.6163 ft
Area of Flow: 9.9620 ft^2
Wetted Perimeter: 22.3882 ft
Hydraulic Radius: 0.4450 ft
Average Velocity: 4.0855 ft/s
Top Width: 22.3267 ft
Froude Number: 1.0778
Critical Depth: 0.6428 ft
Critical Velocity: 3.8545 ft/s
Critical Slope: 0.0170 ft/ft
Critical Top Width: 22.86 ft
Calculated Max Shear Stress: 0.7692 lb/ft^2
Calculated Avg Shear Stress: 0.5553 lb/ft^2



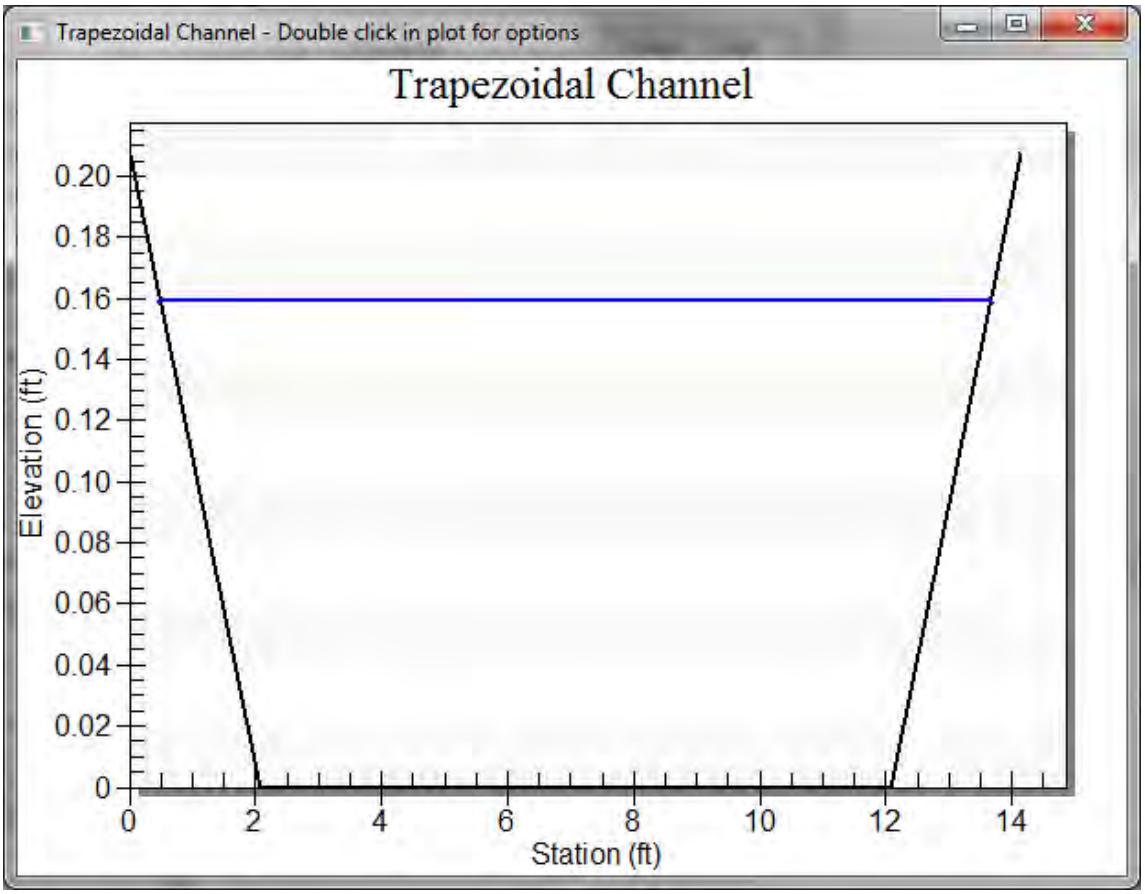
Channel Analysis: LFC-12

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 3.5000 cfs

Result Parameters

Depth: 0.1595 ft
Area of Flow: 1.8488 ft^2
Wetted Perimeter: 13.2050 ft
Hydraulic Radius: 0.1400 ft
Average Velocity: 1.8931 ft/s
Top Width: 13.1891 ft
Froude Number: 0.8911
Critical Depth: 0.1483 ft
Critical Velocity: 2.0553 ft/s
Critical Slope: 0.0258 ft/ft
Critical Top Width: 12.97 ft
Calculated Max Shear Stress: 0.1990 lb/ft^2
Calculated Avg Shear Stress: 0.1747 lb/ft^2



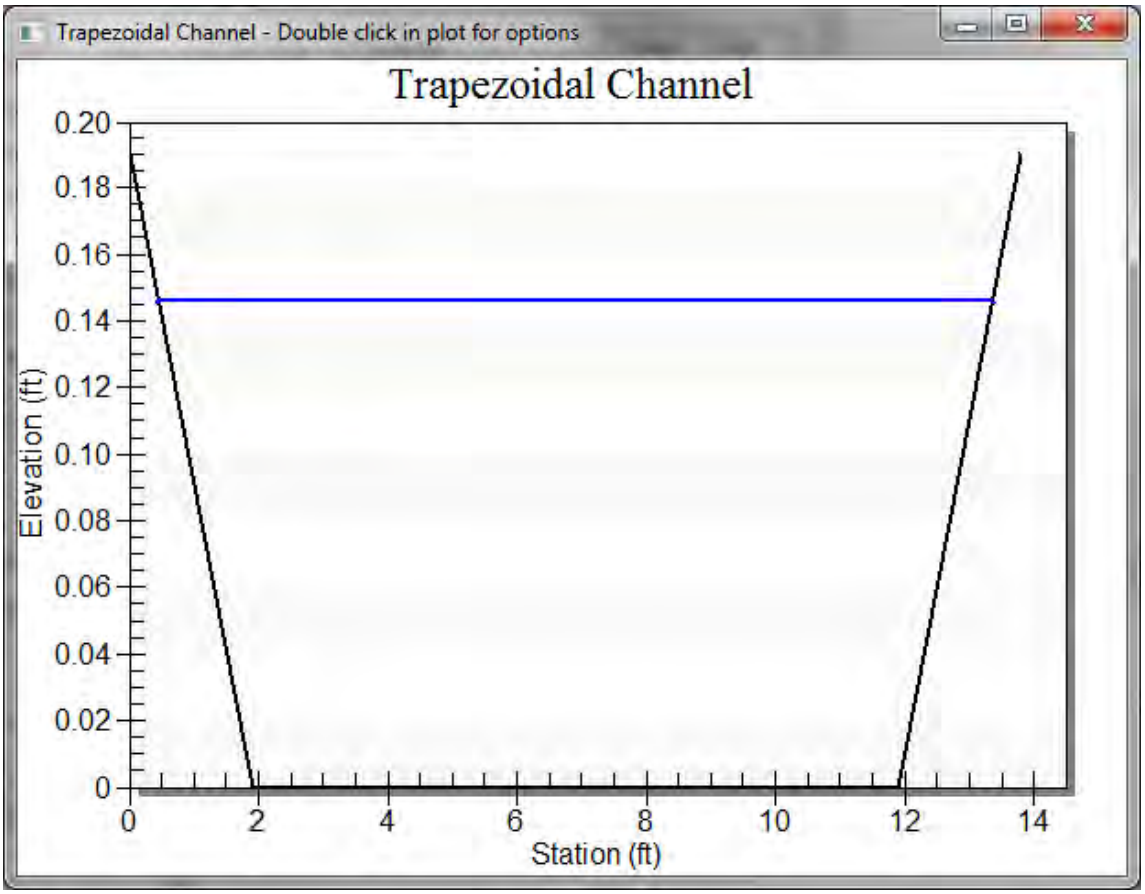
Channel Analysis: LFC-13

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 3.0000 cfs

Result Parameters

Depth: 0.1462 ft
Area of Flow: 1.6761 ft^2
Wetted Perimeter: 12.9392 ft
Hydraulic Radius: 0.1295 ft
Average Velocity: 1.7898 ft/s
Top Width: 12.9246 ft
Froude Number: 0.8759
Critical Depth: 0.1345 ft
Critical Velocity: 1.9662 ft/s
Critical Slope: 0.0266 ft/ft
Critical Top Width: 12.69 ft
Calculated Max Shear Stress: 0.1825 lb/ft^2
Calculated Avg Shear Stress: 0.1617 lb/ft^2



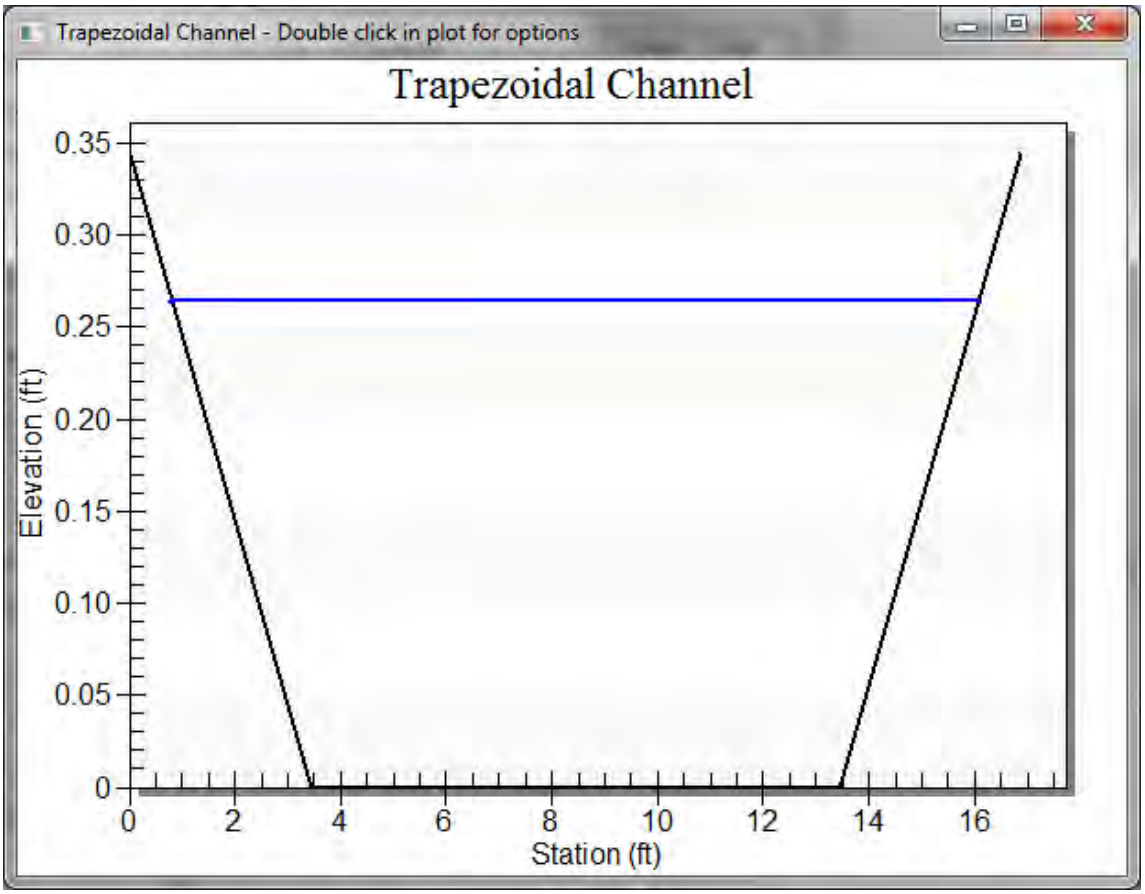
Channel Analysis: LFC-14

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 8.5000 cfs

Result Parameters

Depth: 0.2646 ft
Area of Flow: 3.3467 ft^2
Wetted Perimeter: 15.3191 ft
Hydraulic Radius: 0.2185 ft
Average Velocity: 2.5398 ft/s
Top Width: 15.2927 ft
Froude Number: 0.9568
Critical Depth: 0.2576 ft
Critical Velocity: 2.6242 ft/s
Critical Slope: 0.0220 ft/ft
Critical Top Width: 15.15 ft
Calculated Max Shear Stress: 0.3303 lb/ft^2
Calculated Avg Shear Stress: 0.2726 lb/ft^2



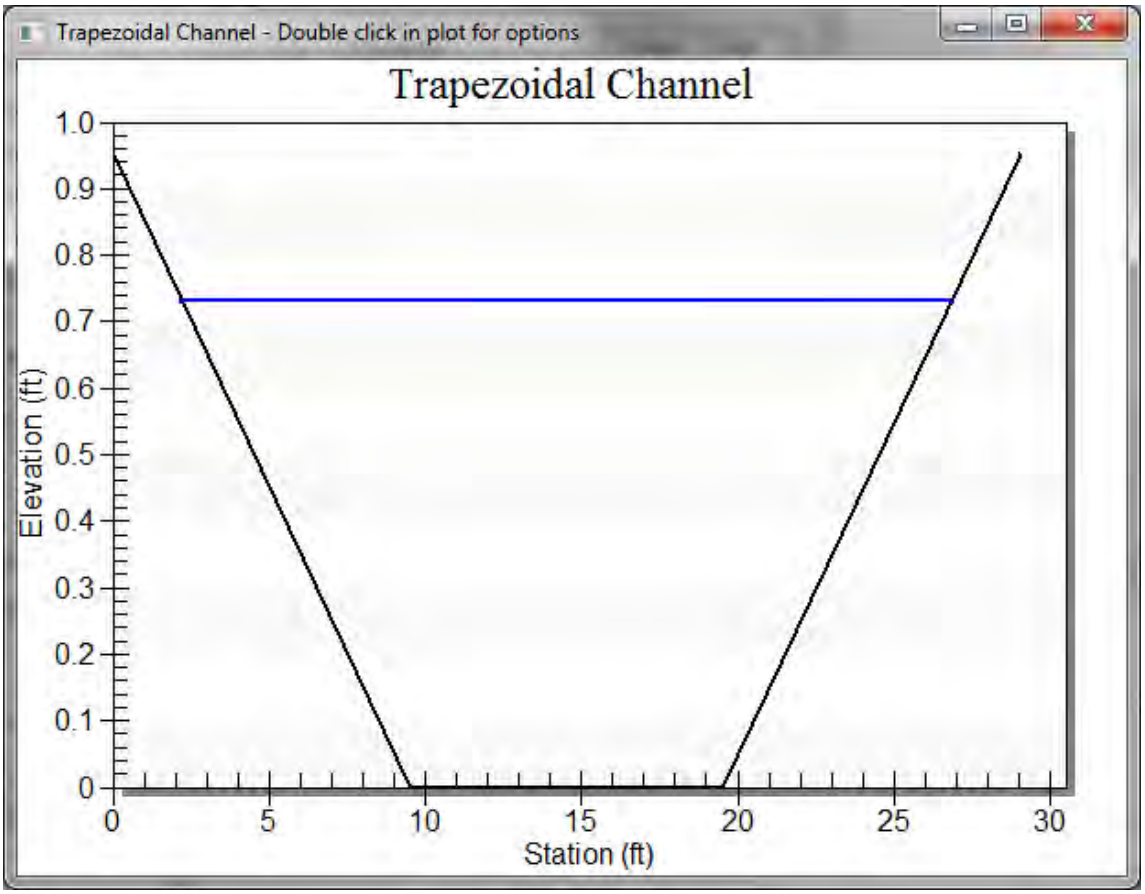
Channel Analysis: LFC-15

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 57.0000 cfs

Result Parameters

Depth: 0.7324 ft
Area of Flow: 12.6882 ft^2
Wetted Perimeter: 24.7211 ft
Hydraulic Radius: 0.5133 ft
Average Velocity: 4.4924 ft/s
Top Width: 24.6481 ft
Froude Number: 1.1034
Critical Depth: 0.7726 ft
Critical Velocity: 4.1621 ft/s
Critical Slope: 0.0162 ft/ft
Critical Top Width: 25.45 ft
Calculated Max Shear Stress: 0.9140 lb/ft^2
Calculated Avg Shear Stress: 0.6405 lb/ft^2



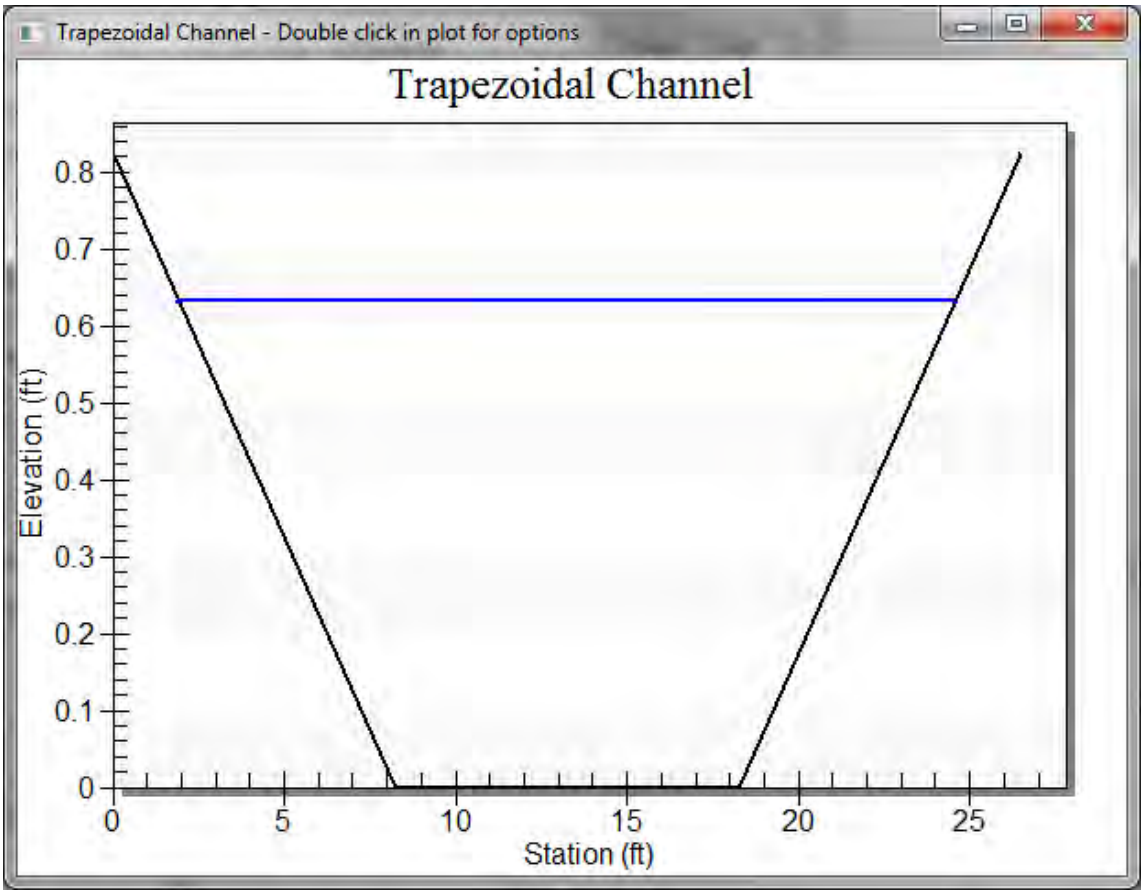
Channel Analysis: LFC-16

Input Parameters

Channel Type: Trapezoidal
Side Slope 1 (Z1): 10.0000 ft/ft
Side Slope 2 (Z2): 10.0000 ft/ft
Channel Width: 10.0000 ft
Longitudinal Slope: 0.0200 ft/ft
Manning's n: 0.0300
Flow: 42.9000 cfs

Result Parameters

Depth: 0.6335 ft
Area of Flow: 10.3489 ft^2
Wetted Perimeter: 22.7338 ft
Hydraulic Radius: 0.4552 ft
Average Velocity: 4.1454 ft/s
Top Width: 22.6706 ft
Froude Number: 1.0812
Critical Depth: 0.6618 ft
Critical Velocity: 3.9011 ft/s
Critical Slope: 0.0169 ft/ft
Critical Top Width: 23.24 ft
Calculated Max Shear Stress: 0.7906 lb/ft^2
Calculated Avg Shear Stress: 0.5681 lb/ft^2



ATTACHMENT E

HYDRAFLOW EXPRESS WEIR CALCULATION COMPUTER OUTPUTS

Weir Report

Hydraflow Express by Intelisolve | Thursday, Jun 14 2018, 12:39 PM

Sediment Trap 1 - Node 114 - 9ft Long Weir

Rectangular Weir

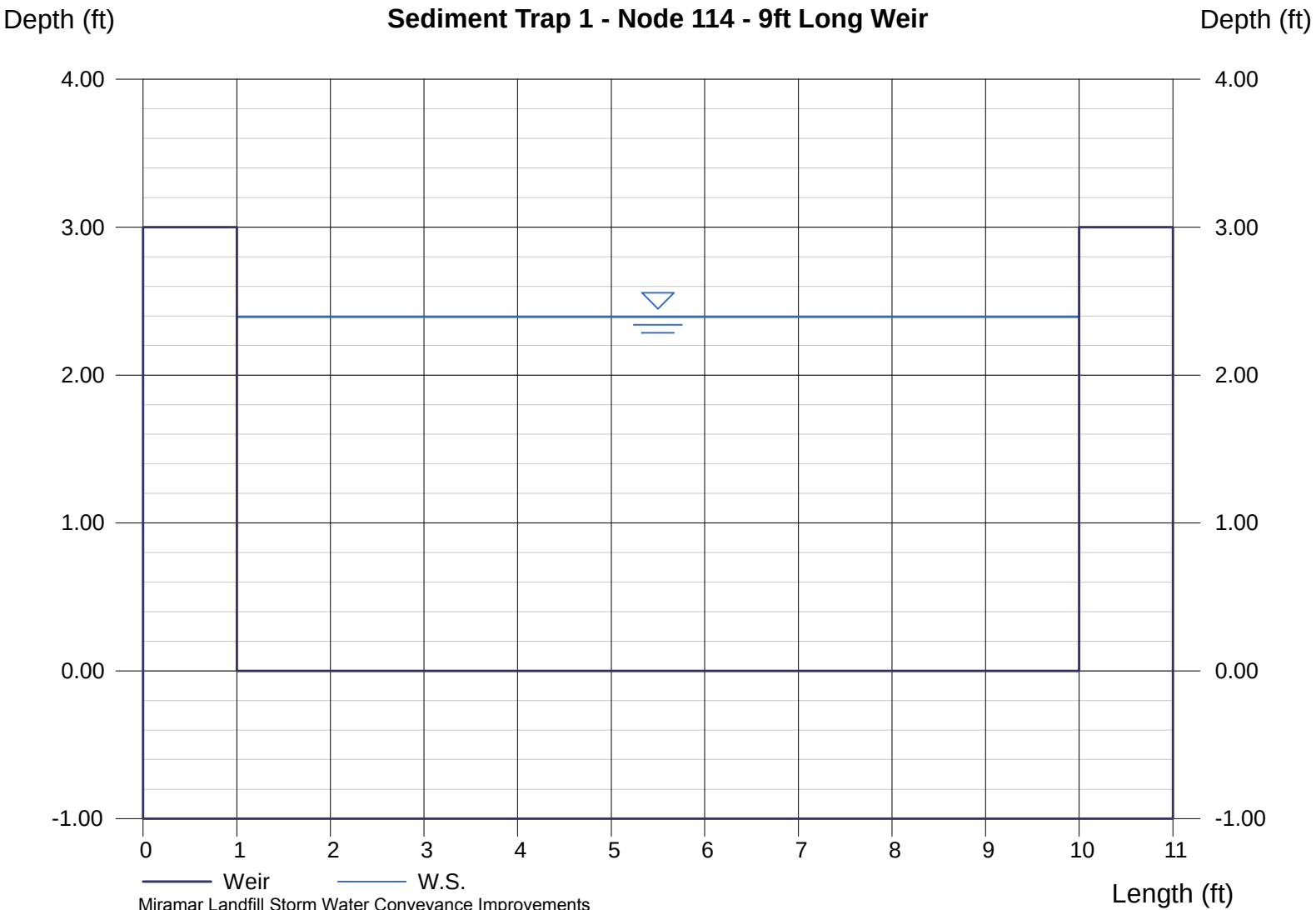
Crest	= Broad
Bottom Length (ft)	= 9.00
Total Depth (ft)	= 3.00

Calculations

Weir Coeff. Cw	= 3.00
Compute by:	Known Q
Known Q (cfs)	= 100.00

Highlighted

Depth (ft)	= 2.39
Q (cfs)	= 100.00
Area (sqft)	= 21.55
Velocity (ft/s)	= 4.64
Top Width (ft)	= 9.00



Weir Report

Hydraflow Express by Intelisolve | Friday, Apr 27 2018, 1:8 PM

Sediment Trap 2 - Node 310 - 18ft Long Weir

Rectangular Weir

Crest	= Broad
Bottom Length (ft)	= 18.00
Total Depth (ft)	= 1.50

Calculations

Weir Coeff. Cw	= 3.00
Compute by:	Known Q
Known Q (cfs)	= 82.20

Highlighted

Depth (ft)	= 1.32
Q (cfs)	= 82.20
Area (sqft)	= 23.82
Velocity (ft/s)	= 3.45
Top Width (ft)	= 18.00

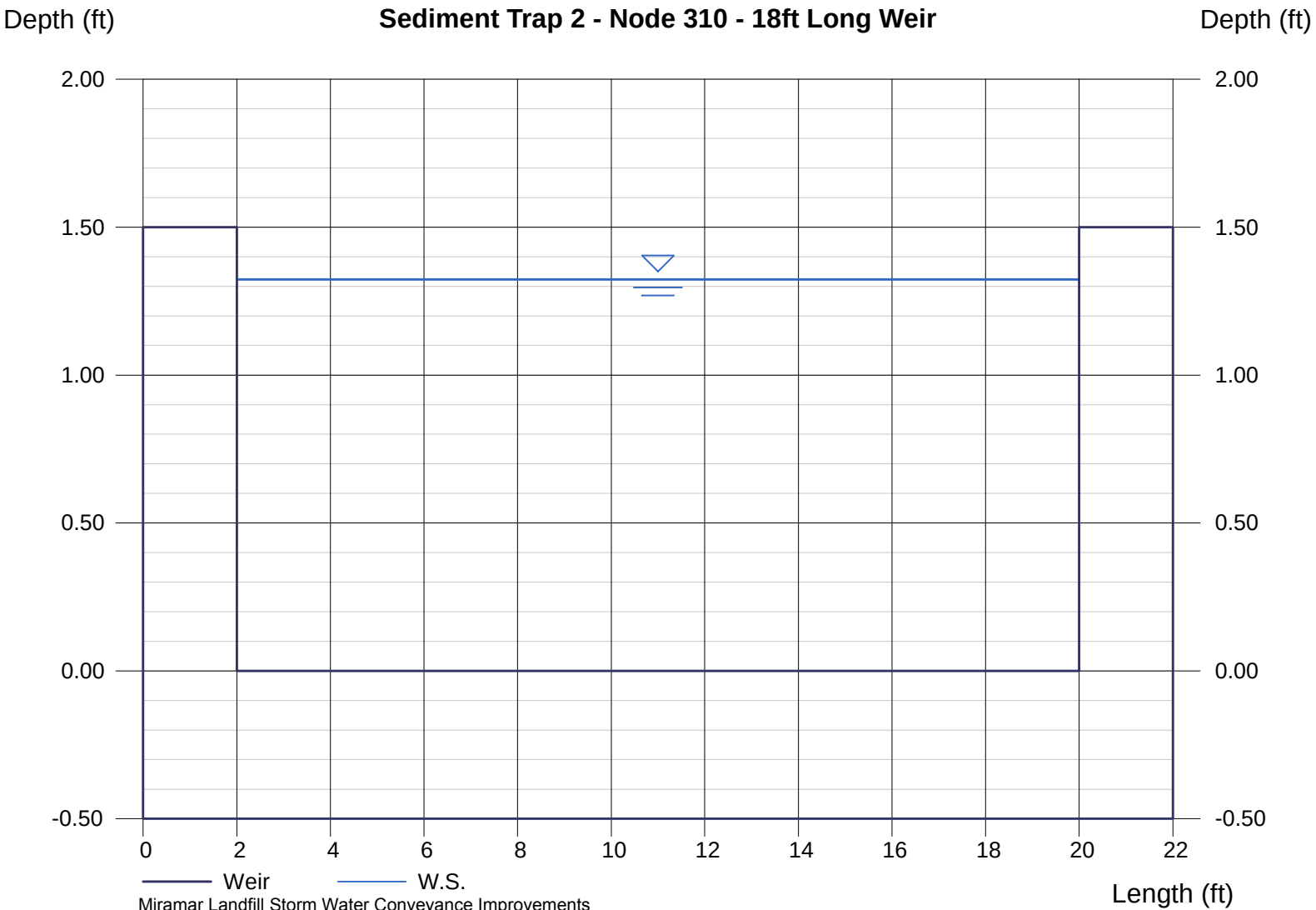


EXHIBIT A

HYDROLOGY WORKMAP

HYDROLOGY WORKMAP

WEST SEDIMENT BASIN

MIRAMAR LANDFILL IMPROVEMENTS

- 101 — Rational Method Node Number
- Contour (2 ft)
- Contour (10 ft)
- DD-01 — Down Drain/Culvert
- DC-3 (105-112) — Drainage Channel
- Flowpath
- LFC-3 — Low Flow Crossing
- Phase 1 road improvements
- ST-4 — Sediment Trap
- 1 — Drainage Area Boundary and ID

Drainage Area ID	Area (Ac)	Flow Path Length (ft)
West Sediment Basin Drainage Areas		
1	4.84	635
2	2.12	39
3	3.28	677
4	5.59	425
5	17.20	1581
6	30.43	2622
7	4.90	1518
8	14.41	1421
9	2.36	792
10	4.72	1011
11	3.43	2071
12	13.03	1279
13	6.81	1044
14	4.32	1729
15	2.65	1508
16	20.09	1529
17	2.18	1322
18	10.61	814
19	0.55	294
20	0.57	411
21	2.04	591
22	2.70	844
23	1.54	454
24	0.83	175
25	3.60	789
28	1.30	368
29	17.50	1639
30	19.36	1604
31	2.65	1437
32	35.00	1821
32A	2.60	850
33	6.25	1663
34	0.61	241
35	6.49	1078
36	4.02	537
Main Drain Drainage Areas		
37	20.36	1396
38	7.33	1064
39	18.59	1492
40	4.27	589
41	10.24	2312
East Sediment Basin Drainage Areas		
42	24.28	1497
43	1.69	574
44	1.77	657
45	14.74	1998
46	5.31	1712
47	1.65	475
48	2.88	232
49	0.78	301
50	1.50	296
51	2.48	773
52	2.31	866
53	2.88	618
54	3.20	1248

Note: Sub-basin numbers 26 and 27 were not used.

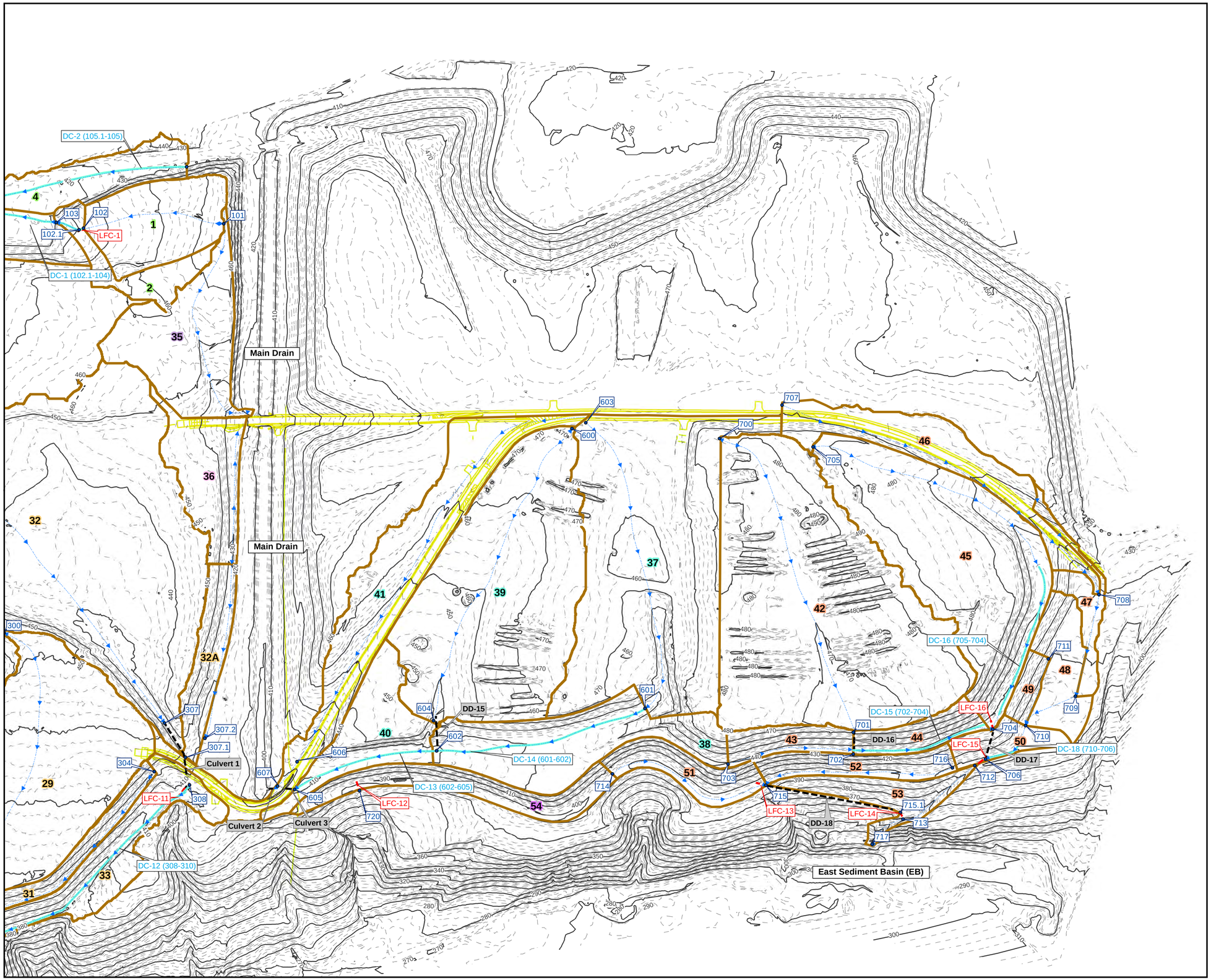
0 100 200 400 Feet

1 inch = 200 feet

N

DMAX ENGINEERING, INC.

EXHIBIT A: SHEET 1 OF 2



HYDROLOGY WORKMAP

MAIN DRAIN/EAST SEDIMENT BASIN

MIRAMAR LANDFILL

- 101 — Rational Method Node Number
- Contour (2 ft)
- Contour (10 ft)
- DD-01 — Down Drain/Culvert
- DC-3 (105-112) — Drainage Channel
- Flowpath
- LFC-3 — Low Flow Crossing
- Phase 1 road improvements
- ST-4 — Sediment Trap
- 1 — Drainage Area Boundary and ID

Drainage Area ID	Area (Ac)	Flow Path Length (ft)
West Sediment Basin Drainage Areas		
1	4.84	635
2	2.12	39
3	3.28	677
4	5.59	425
5	17.20	1581
6	30.43	2622
7	4.90	1518
8	14.41	1421
9	2.36	792
10	4.72	1011
11	3.43	2071
12	13.03	1279
13	6.81	1044
14	4.32	1729
15	2.65	1508
16	20.09	1529
17	2.18	1322
18	10.61	814
19	0.55	294
20	0.57	411
21	2.04	591
22	2.70	844
23	1.54	454
24	0.83	175
25	3.60	789
28	1.30	368
29	17.50	1639
30	19.36	1604
31	2.65	1437
32	35.00	1821
32A	2.60	850
33	6.25	1663
34	0.61	241
35	6.49	1078
36	4.02	537
Main Drain Drainage Areas		
37	20.36	1396
38	7.33	1064
39	18.59	1492
40	4.27	589
41	10.24	2312
East Sediment Basin Drainage Areas		
42	24.28	1497
43	1.69	574
44	1.77	657
45	14.74	1998
46	5.31	1712
47	1.65	475
48	2.88	232
49	0.78	301
50	1.50	296
51	2.48	773
52	2.31	866
53	2.88	618
54	3.20	1248

Note: Sub-basin numbers 26 and 27 were not used.

0 100 200 400 Feet

1 inch = 200 feet

N

DMAX ENGINEERING, INC.

EXHIBIT A: SHEET 2 OF 2

APPENDIX J

WEST BASIN SLOPE STABILITY ANALYSIS, MEMORANDUM

Geosyntec consultants

16644 West Bernardo Drive, Suite 301
San Diego, CA 92127
PH 858.674.6559
FAX 858.674.6586
www.geosyntec.com

Memorandum

Date: 30 May 2018

To: Craig Fergusson, P.E., City of San Diego,
Environmental Services Department,
Waste Reduction and Disposal Division

From: Mahdi Khalilzad, Ph.D., P.E., Geosyntec Consultants
Ron Johnson, P.E., G.E., Geosyntec Consultants
Kathleen Harrison, P.G., Geosyntec Consultants
Miguel Parames, P.E., QSD/P, Geosyntec Consultants

Subject: West Basin Slope Stability Analysis
Miramar Landfill Storm Water Conveyance Improvement
Geosyntec Project: SW023134

Geosyntec Consultants, Inc. (Geosyntec) has prepared this memorandum to summarize the results of our limited slope stability analysis for the west basin site (Site) at the Miramar Landfill located north of Highway 52 in San Diego, CA. This memo was prepared for submittal to the City of San Diego, Environmental Services Department (City) as part of the Contract No. H146064, Task Order No. 101, Miramar Landfill Storm Water Conveyance Improvement.

PROJECT BACKGROUND

The west basin was constructed within a valley on the southwestern portion of the Miramar Landfill to capture the storm water runoff from the Miramar Landfill site and has a storage capacity of approximately 2.3 million gallons (MG). A pump house is located on a platform on the western slope of the basin at an elevation of approximately 262.3 feet above mean seal level (ft MSL) measured at the top of slope. The pump house is used to pump leachate from the leachate collection and recovery system for offsite disposal.

As part of the Miramar Landfill Storm Water Conveyance Improvement, Geosyntec evaluated opportunities to increase the capacity of the west basin through excavating the bottom of the basin and/or through raising the elevation of the existing spillway. The existing spillway elevation is 259 feet above MSL. Due to limitations associated with raising the pump house, it was identified the spillway could be raised 1.3 feet to maintain a 2-foot separation between the pad's top of slope

and the maximum water elevation in the basin. It was calculated that raising the spillway by 1.3-feet would increase the basin capacity by approximately 200,000 gallons to about 2.5 MG.

The average depth of the basin is currently approximately 247 ft MSL. The basin has low infiltration and following storm events standing water typically remains until the water is drawn down for use as dust control or evaporates. It was assessed the basin could be excavated to 242 ft MSL on the northern side of the basin sloping to elevation 237.6 ft MSL (with a 0.5% grade) on the southern portion of the basin to maintain separation with the average mean seasonal high groundwater and the bottom of the basin. The proposed excavation will be performed with 1:1 to 2:1 [horizontal : vertical] slopes. The proposed excavation would increase the basin capacity by approximately 1 MG to about 3.3 MG.

Existing Conditions

Bottom of the basin is currently at an average elevation of 247 ft MSL. The existing cut slopes are steeper on the northeast side of the basin (approximately 60 degrees from horizontal) and milder in other segments of the basin. From observation of the exposed soil on the existing cut slopes, it seems that the upper portions of the slopes consist of the Stadium Conglomerate formation, while the lower portions are within the Friars formation. Cementation of the soil matrix in these two formations increases the strength and has provided stability with relatively steep angles. With the typical near horizontal deposition of sediments in these geological units, it is assumed that stratigraphy of the eastern and western slopes of the basin are consistent.

PROCEDURE

Geosyntec employed a simple approach to back-calculate soil strength parameters from the slope stability analysis of the existing slopes. A simplified model was developed using the computer program SLOPE/W^{TM}. Geometry of the model reflected the existing ground surface at a cross section adjacent to the pump house. Figures 1 and 2 respectively show the plan view of the west basin and the cross-section A-A' used in the slope stability analysis. Figure 2 illustrates the existing and proposed basin depth at the cross-section location.

A uniform soil was assigned to the entire model including the side slopes and the foundation. Soil strength properties were estimated such that a factor of safety (FOS) of one was reached for the steepest slope (eastern slope). Water level in the basin was assumed at elevation 259 ft MSL (corresponding to the elevation of the top of spillway). Then, the back-calculated strength parameters were used to analyze the stability of the western slope, adjacent to the pump house, using the proposed grades with the deeper basin and the raised spillway.

ANALYSIS RESULTS

Results of the slope stability analysis for the eastern slope provided soil strength parameters where the friction angle of 36 degrees and cohesion of 395 pounds per square provided a FOS of unity. (Figure 3). The back-calculated strength parameters were then used to evaluate the stability of the western slope, adjacent to the pump house, after basin expansion. A factor of safety of 1.74 was obtained for this case which is greater than industry-accepted FOS of 1.5 for the static conditions (Figure 4).

CONCLUSION

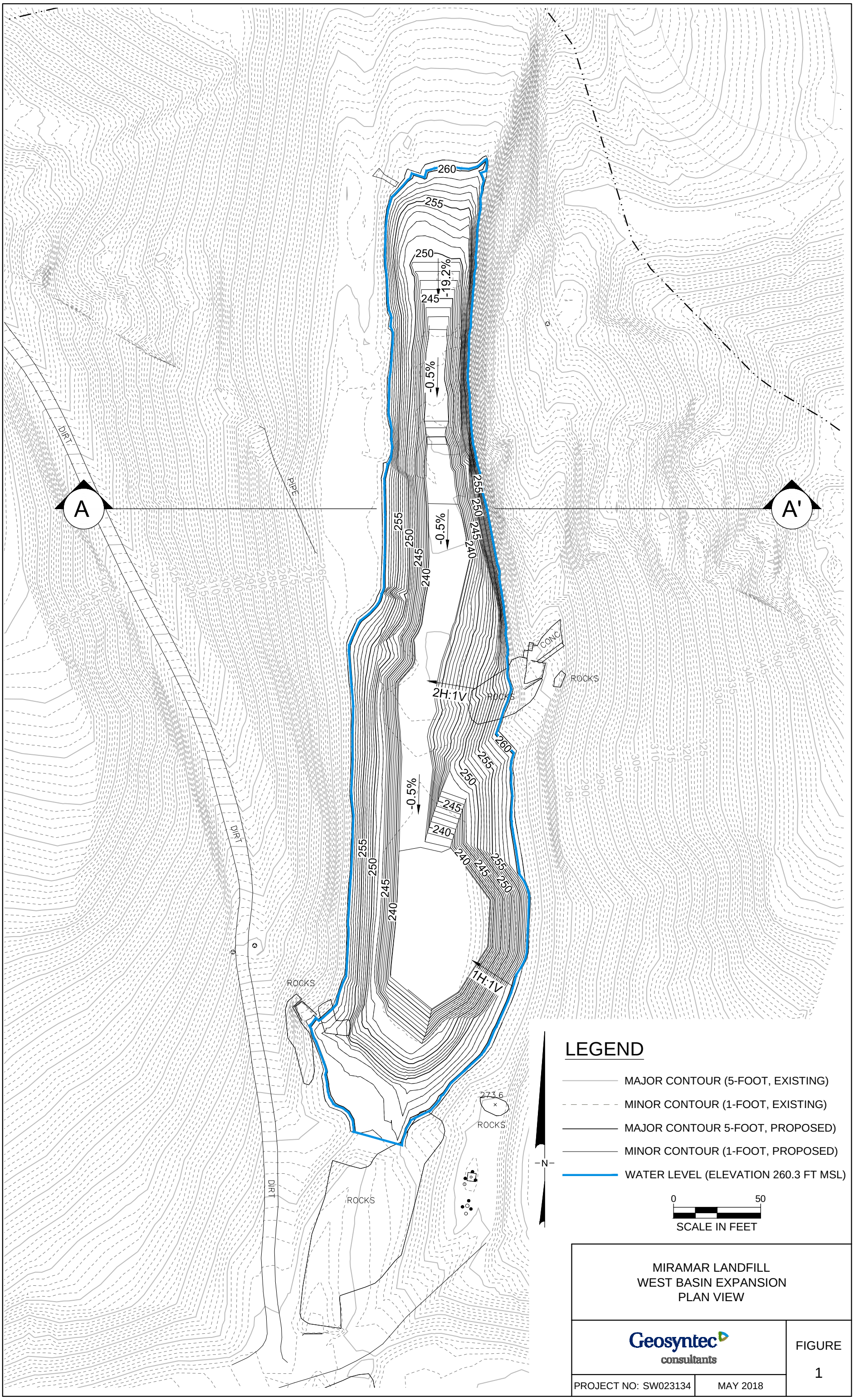
Based on the simplified approach described above, the basin slope adjacent to the pump house has an adequate factor of safety in static conditions after the basin expansion.

LIMITATIONS

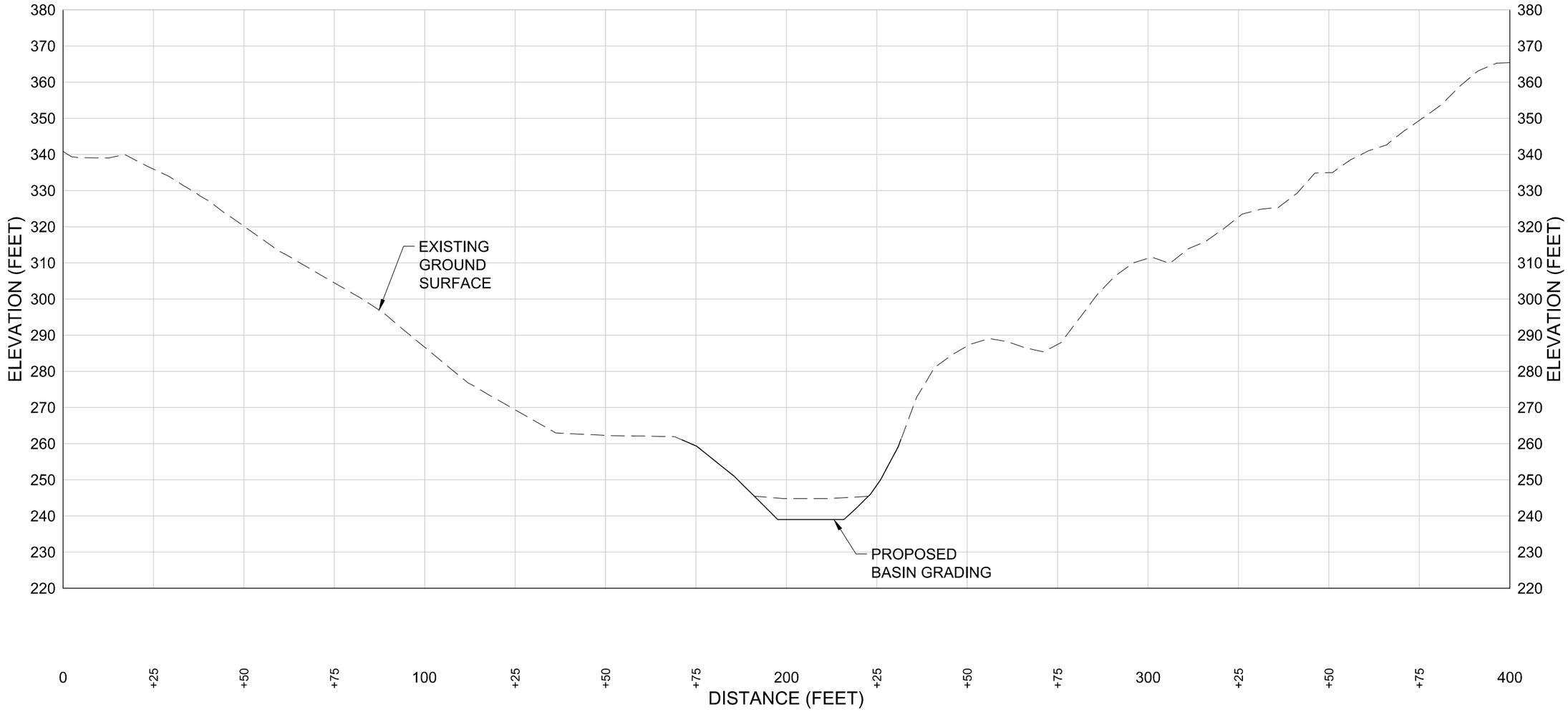
The soil parameters used in this report are estimated based on a simplified methodology considering the stable nature of the existing ground at the Site. No subsurface exploration was conducted adjacent to the west basin side slopes to identify the stratigraphy and consequently, no laboratory or field testing was performed to estimate the soil engineering properties. Stability of other slopes, such as the eastern slope, were not addressed as the consequence of a slope failure is less critical.

* * * * *

Figures



P:\CAD\SW023134 - MIRAMAR PH 2\FIGURES\WEST BASIN EXPANSION - Last Saved By: ADominguez on 5/30/18



WEST BASIN
CROSS SECTION A-A'

MIRAMAR LANDFILL
WEST BASIN EXPANSION
SECTION A-A'

Geosyntec consultants

PROJECT NO: SW023134 | MAY 2018

FIGURE 2

P:\CAD\SW023134 - MIRAMAR PH 2\FIGURES\WEST BASIN EXPANSION - Last Saved by: ADominguez on 5/23/18

Project: Miramar Landfill - West Basin Expansion
Slope Stability
Analyis: 1. Existing Conditions | Eastern Slope | GW @ EL259 ft

Geosyntec consultants

Name: Soil (F.S. = 1)
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 36 °

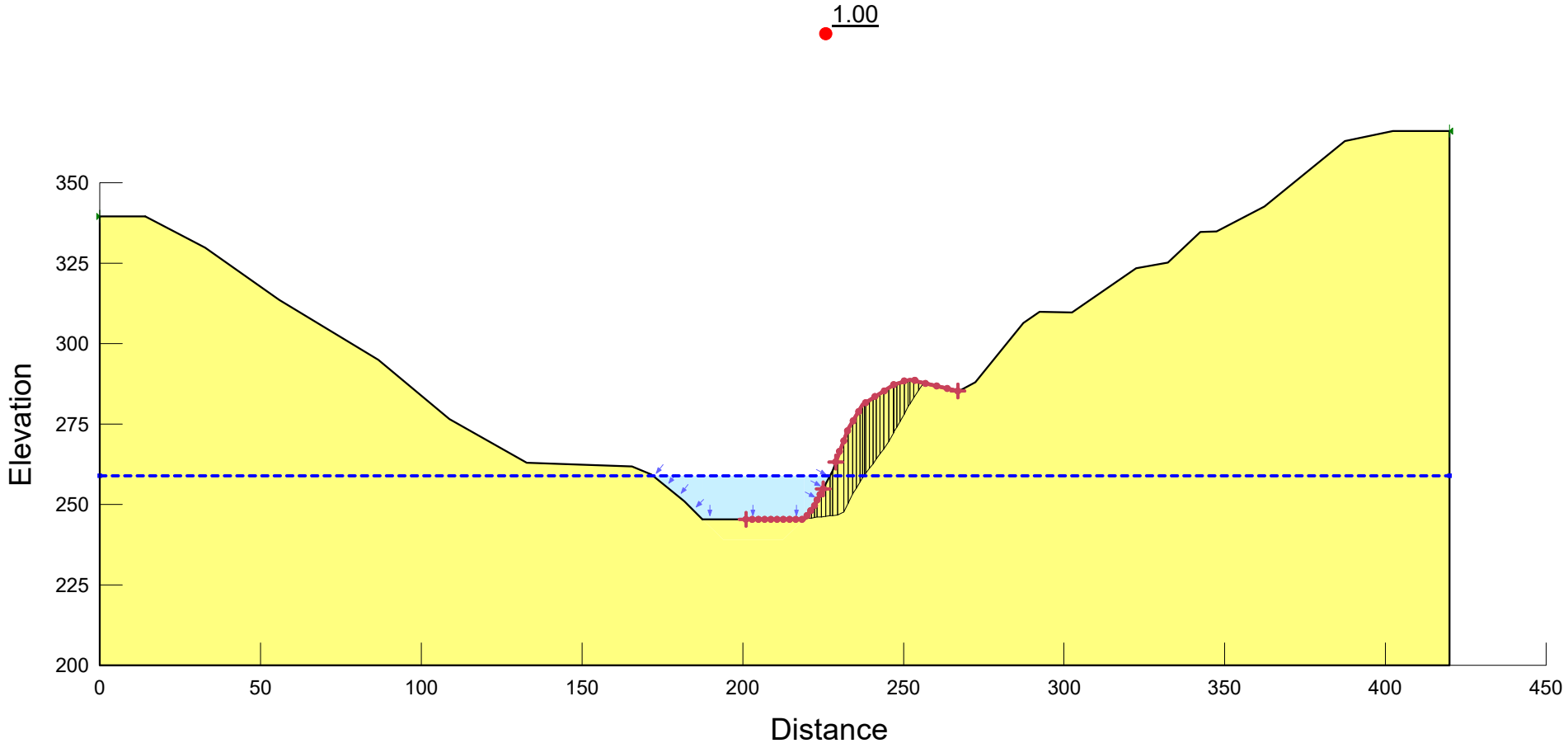


Figure 3

Project: Miramar Landfill - West Basin Expansion
Slope Stability
Analyis: 2. Extended Basin | Western Slope | GW @ EL260.3 ft

Geosyntec consultants

Name: Soil (F.S. = 1)
Unit Weight: 125 pcf
Cohesion': 395 psf
Phi': 36 °

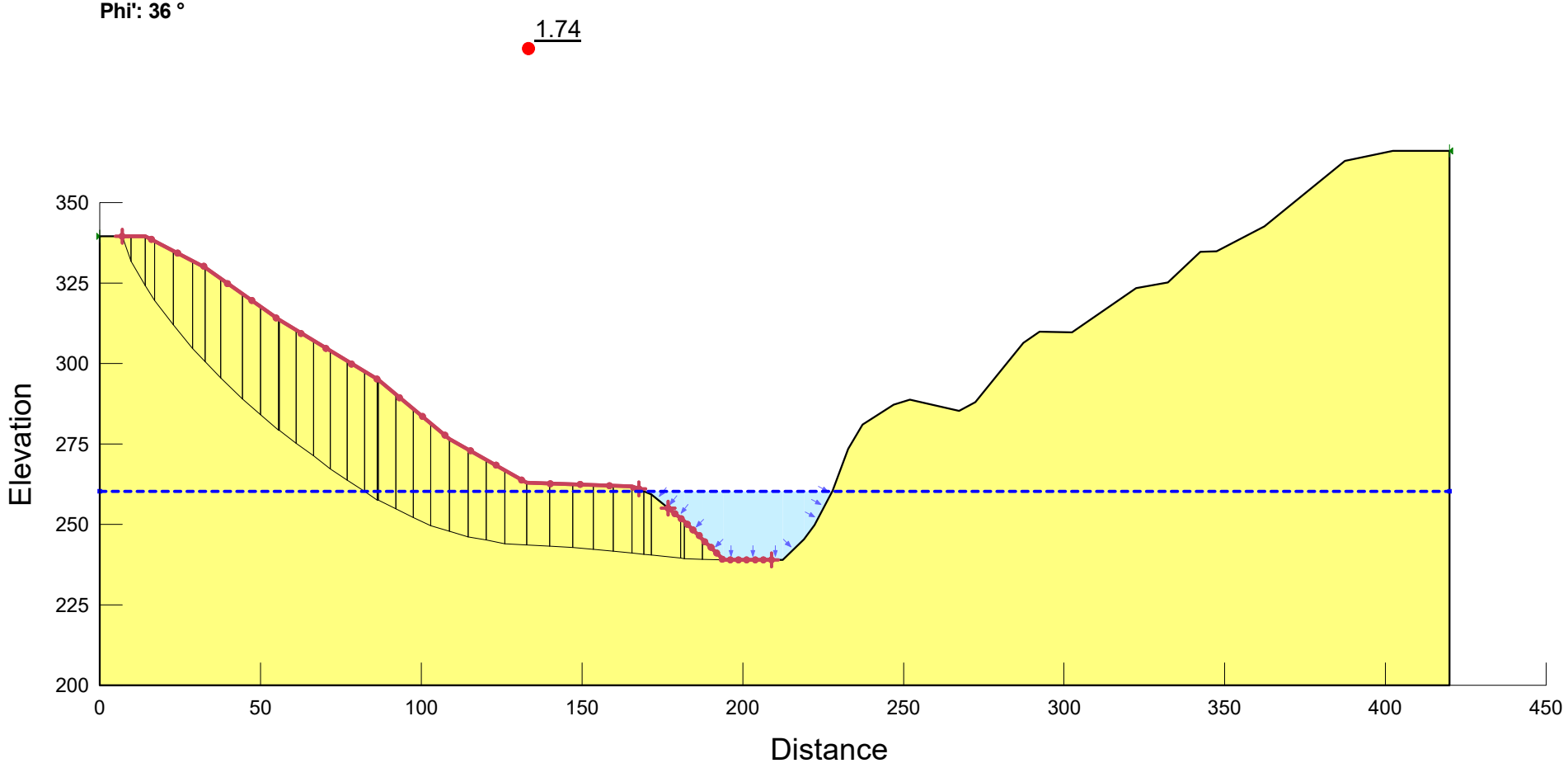


Figure 4

ATTACHMENT F

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ATTACHMENT G

CONTRACT AGREEMENT

CONTRACT AGREEMENT

CONSTRUCTION CONTRACT

This contract is made and entered into between THE CITY OF SAN DIEGO, a municipal corporation, herein called "City", and **Dick Miller Inc.,** herein called "Contractor" for construction of **Miramar Landfill Storm Water Conveyance Improvements**; Bid No. **K-19-1780-DBB-3**; in the amount of **TWO MILLION THIRTY THOUSAND FOUR HUNDRED FIVE DOLLARS AND SIX CENTS ($2,030,405.06)**, which is comprised of the Base Bid alone.

IN CONSIDERATION of the payments to be made hereunder and the mutual undertakings of the parties hereto, City and Contractor agree as follows:

1. The following are incorporated into this contract as though fully set forth herein:

   (a) The attached Faithful Performance and Payment Bonds.

   (b) The attached Proposal included in the Bid documents by the Contractor.

   (c) Reference Standards listed in the Instruction to Bidders and the Supplementary Special Provisions (SSP).

   (d) That certain documents entitled **Miramar Landfill Storm Water Conveyance Improvements**, on file in the office of the Public Works Department as Document No. **L-18002.2**, as well as all matters referenced therein.

2. The Contractor shall perform and be bound by all the terms and conditions of this contract and in strict conformity therewith shall perform and complete in a good and workmanlike manner **Miramar Landfill Storm Water Conveyance Improvements,** Bid Number **K-19-1780-DBB-3,** San Diego, California.

3. For such performances, the City shall pay to Contractor the amounts set forth at the times and in the manner and with such additions or deductions as are provided for in this contract, and the Contractor shall accept such payment in full satisfaction of all claims incident to such performances.

4. No claim or suit whatsoever shall be made or brought by Contractor against any officer, agent, or employee of the City for or on account of anything done or omitted to be done in connection with this contract, nor shall any such officer, agent, or employee be liable hereunder.

5. This contract is effective as of the date that the Mayor or designee signs the agreement.

CONTRACT AGREEMENT (continued)

IN WITNESS WHEREOF, this Agreement is signed by the City of San Diego, acting by and through its Mayor or designee, pursuant to Municipal Code **§22.3102** authorizing such execution.

THE CITY OF SAN DIEGO

By _____

Print Name: Stephen Samara
Principal Contract Specialist
Public Works Department

Date: 1/2/2019

APPROVED AS TO FORM

Mara W. Elliott, City Attorney

By _____

Print Name: Davin A. Widgerow
Deputy City Attorney

Date: 2-1-2019

CONTRACTOR

By Dick Miller Inc. _____

Print Name: Glen F. Bullock

Title: President

Date: 12/07/2018

City of San Diego License No.: B2012015447 / B2014004558

State Contractor's License No.: 380204

DEPARTMENT OF INDUSTRIAL RELATIONS (DIR) REGISTRATION NUMBER: 1000004547

CERTIFICATIONS AND FORMS

The Bidder / Proposer, by submitting its electronic bid or proposal, agrees to and certifies under penalty of perjury under the laws of the State of California, that the certifications, forms and affidavits submitted as part of this submission are true and correct.

BIDDER'S GENERAL INFORMATION

To the City of San Diego:

Pursuant to "Notice Inviting Bids", specifications, and requirements on file with the City Clerk, and subject to all provisions of the Charter and Ordinances of the City of San Diego and applicable laws and regulations of the United States and the State of California, the undersigned hereby proposes to furnish to the City of San Diego, complete at the prices stated herein, the items or services hereinafter mentioned. The undersigned further warrants that this bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and, further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

The undersigned bidder(s) further warrants that bidder(s) has thoroughly examined and understands the entire Contract Documents (plans and specifications) and the Bidding Documents therefore, and that by submitting said Bidding Documents as its bid proposal, bidder(s) acknowledges and is bound by the entire Contract Documents, including any addenda issued thereto, as such Contract Documents incorporated by reference in the Bidding Documents.

NON-COLLUSION AFFIDAVIT TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID UNDER 23 UNITED STATES CODE 112 AND PUBLIC CONTRACT CODE 7106

State of California

County of San Diego

The bidder, being first duly sworn, deposes and says that he or she is authorized by the party making the foregoing bid that the bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation; that the bid is genuine and not collusive or sham; that the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid, and has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or that anyone shall refrain from bidding; that the bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder, or to secure any advantage against the public body awarding the contract of anyone interested in the proposed contract; that all statements contained in the bid are true; and further, that the bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, or paid, and will not pay, any fee to any corporation, partnership, company association, organization, bid depository, or to any member or agent thereof to effectuate a collusive or sham bid.

CONTRACTOR CERTIFICATION

DRUG-FREE WORKPLACE

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-17 regarding Drug-Free Workplace as outlined in the WHITEBOOK, Section 7-13.3, "Drug-Free Workplace", of the project specifications, and that;

This company has in place a drug-free workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of subdivisions a) through c) of the policy as outlined.

CONTRACTOR CERTIFICATION

AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANCE CERTIFICATION

I hereby certify that I am familiar with the requirements of San Diego City Council Policy No. 100-4 regarding the Americans With Disabilities Act (ADA) outlined in the WHITEBOOK, Section 7-13.2, "Americans With Disabilities Act", of the project specifications, and that:

This company has in place workplace program that complies with said policy. I further certify that each subcontract agreement for this project contains language which indicates the subcontractor's agreement to abide by the provisions of the policy as outlined.

CONTRACTOR CERTIFICATION

CONTRACTOR STANDARDS – PLEDGE OF COMPLIANCE

I declare under penalty of perjury that I am authorized to make this certification on behalf of the company submitting this bid/proposal, that as Contractor, I am familiar with the requirements of City of San Diego Municipal Code § 22.3004 regarding Contractor Standards as outlined in the WHITEBOOK, Section 7-13.4, ("Contractor Standards"), of the project specifications, and that Contractor has complied with those requirements.

I further certify that each of the Contractor's subcontractors has completed a Pledge of Compliance attesting under penalty of perjury of having complied with City of San Diego Municipal Code § 22.3004.

CONTRACTOR CERTIFICATION

EQUAL BENEFITS ORDINANCE CERTIFICATION

I declare under penalty of perjury that I am familiar with the requirements of and in compliance with the City of San Diego Municipal Code § 22.4300 regarding Equal Benefits Ordinance.

CONTRACTOR CERTIFICATION

EQUAL PAY ORDINANCE CERTIFICATION

Contractor shall comply with the Equal Pay Ordinance (EPO) codified in the San Diego Municipal Code (SDMC) at section 22.4801 through 22.4809, unless compliance is not required based on an exception listed in SDMC section 22.4804.

Contractor shall require all of its subcontractors to certify compliance with the EPO in their written subcontracts.

Contractor must post a notice informing its employees of their rights under the EPO in the workplace or job site.

By signing this Contract with the City of San Diego, Contractor acknowledges the EPO requirements and pledges ongoing compliance with the requirements of SDMC Division 48, section 22.4801 et seq., throughout the duration of this Contract.

AFFIDAVIT OF DISPOSAL

(To be submitted upon completion of Construction pursuant to the contracts Certificate of Completion)

WHEREAS, on the _____ DAY OF _____, 2_____ the undersigned entered into and executed a contract with the City of San Diego, a municipal corporation, for:

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS
(Project Title)

as particularly described in said contract and identified as Bid No. **K-19-1780-DBB-3**; SAP No. (WBS/IO/CC) **L-18002.2**; and **WHEREAS**, the specification of said contract requires the Contractor to affirm that "all brush, trash, debris, and surplus materials resulting from this project have been disposed of in a legal manner"; and **WHEREAS**, said contract has been completed and all surplus materials disposed of:

_____

_____

NOW, THEREFORE, in consideration of the final payment by the City of San Diego to said Contractor under the terms of said contract, the undersigned Contractor, does hereby affirm that all surplus materials as described in said contract have been disposed of at the following location(s)

_____

_____

and that they have been disposed of according to all applicable laws and regulations.

Dated this _____ DAY OF _____, _____.

By:_____
Contractor

ATTEST:

State of _____ County of _____

On this_____ DAY OF _____, 2_____, before the undersigned, a Notary Public in and for said County and State, duly commissioned and sworn, personally appeared_____ known to me to be the _____ Contractor named in the foregoing Release, and whose name is subscribed thereto, and acknowledged to me that said Contractor executed the said Release.

Notary Public in and for said County and State

LIST OF SUBCONTRACTORS

***** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY *** SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION**

In accordance with the requirements of the "Subletting and Subcontracting Fair Practices Act", Section 4100, of the California Public Contract Code (PCC), the Bidder is to list below the name, address and license number of each Subcontractor who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement, in an amount of or in excess of 0.5% of the Contractor's total Bid. Failure to comply with this requirement may result in the Bid being rejected as non-responsive. The Contractor is to list only one Subcontractor for each portion of the Work. The Bidder's attention is directed to the Special Provisions - General; Paragraph 2-3 Subcontracts, which stipulates the percentage of the Work to be performed with the Bidder's own forces. The Bidder is to also list all SLBE, ELBE, DBE, DVBE, MBE, WBE, OBE, SDB, WoSB, HUBZone, and SDVOSB Subcontractors for which the Bidders are seeking recognition towards achieving any mandatory, voluntary, or both subcontracting participation percentages.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	DIR Registration Number	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK	DOLLAR VALUE OF SUBCONTRACT	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED ②	CHECK IF JOINT VENTURE PARTNERSHIP
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____								
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____								

① As appropriate, Bidder shall identify Subcontractor as one of the following and shall include a valid proof of certification (except for OBE, SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Subcontractor is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC		
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

NAMED EQUIPMENT/MATERIAL SUPPLIER LIST

***** PROVIDED FOR ILLUSTRATIVE PURPOSES ONLY *** TO BE SUBMITTED IN ELECTRONIC FORMAT ONLY *** SEE INSTRUCTIONS TO BIDDERS FOR FURTHER INFORMATION**

NAME, ADDRESS AND TELEPHONE NUMBER OF VENDOR/SUPPLIER	MATERIALS OR SUPPLIES	DIR Registration Number	DOLLAR VALUE OF MATERIAL OR SUPPLIES	SUPPLIER (Yes/No)	MANUFACTURER (Yes/No)	MBE, WBE, DBE, DVBE, OBE, ELBE, SLBE, SDB, WoSB, HUBZone, OR SDVOSB①	WHERE CERTIFIED②
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____							
Name:_____ Address:_____ City:_____ State:_____ Zip:_____ Phone:_____ Email:_____							

① As appropriate, Bidder shall identify Vendor/Supplier as one of the following and shall include a valid proof of certification (except for OBE,SLBE and ELBE):

Certified Minority Business Enterprise	MBE	Certified Woman Business Enterprise	WBE
Certified Disadvantaged Business Enterprise	DBE	Certified Disabled Veteran Business Enterprise	DVBE
Other Business Enterprise	OBE	Certified Emerging Local Business Enterprise	ELBE
Certified Small Local Business Enterprise	SLBE	Small Disadvantaged Business	SDB
Woman-Owned Small Business	WoSB	HUBZone Business	HUBZone
Service-Disabled Veteran Owned Small Business	SDVOSB		

② As appropriate, Bidder shall indicate if Vendor/Supplier is certified by:

City of San Diego	CITY	State of California Department of Transportation	CALTRANS
California Public Utilities Commission	CPUC		
State of California's Department of General Services	CADoGS	City of Los Angeles	LA
State of California	CA	U.S. Small Business Administration	SBA

The Bidder will not receive any subcontracting participation percentages if the Bidder fails to submit the required proof of certification.

ELECTRONICALLY SUBMITTED FORMS

THE FOLLOWING FORMS MUST BE SUBMITTED IN PDF FORMAT WITH BID SUBMISSION

The following forms are to be completed by the bidder and submitted (uploaded) electronically with the bid in PlanetBids.

A. **BID BOND – See Instructions to Bidders, Bidders Guarantee of Good Faith (Bid Security) for further instructions**

B. **CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS**

C. **MANDATORY DISCLOSURE OF BUSINESS INTERESTS FORM**

D. **SUBCONTRACTOR LISTING (OTHER THAN FIRST TIER)**

Bids will not be accepted until ALL the above-named forms are submitted as part of the bid submittal

BID BOND

See Instructions to Bidders, Bidder Guarantee of Good Faith (Bid Security)

KNOW ALL MEN BY THESE PRESENTS,

That Dick Miller, Inc. as Principal, and The Ohio Casualty Insurance Company as Surety, are held and firmly bound unto The City of San Diego hereinafter called "OWNER," in the sum of **10% OF THE TOTAL BID AMOUNT** 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, said Principal has submitted a Bid to said OWNER to perform the WORK required under the bidding schedule(s) of the OWNER's Contract Documents entitled

Miramar Landfill Storm Water Conveyance Improvements / K-19-1780-DBB-3

NOW THEREFORE, if said Principal is awarded a contract by said OWNER and, within the time and in the manner required in the "Notice Inviting Bids" enters into a written Agreement on the form of agreement bound with said Contract Documents, furnishes the required certificates of insurance, and furnishes the required Performance Bond and Payment Bond, then this obligation shall be null and void, otherwise it shall remain in full force and effect. In the event suit is brought upon this bond by said OWNER and OWNER prevails, said Surety shall pay all costs incurred by said OWNER in such suit, including a reasonable attorney's fee to be fixed by the court.

SIGNED AND SEALED, this 8th day of October, 20 18

Dick Miller, Inc. (SEAL)
(Principal)

By: _____
(Signature) Glen F. Bullock, President

The Ohio Casualty Insurance Company (SEAL)
(Surety)

By: _____
(Signature) Bart Stewart, Attorney-in-Fact

(SEAL AND NOTARIAL ACKNOWLEDGEMENT OF SURETY)

THIS POWER OF ATTORNEY IS NOT VALID UNLESS IT IS PRINTED ON RED BACKGROUND.
This Power of Attorney limits the acts of those named herein, and they have no authority to bind the Company except in the manner and to the extent herein stated.

Certificate No. 8090305

Liberty Mutual Insurance Company
The Ohio Casualty Insurance Company West American Insurance Company

POWER OF ATTORNEY

KNOWN ALL PERSONS BY THESE PRESENTS: That The Ohio Casualty Insurance Company is a corporation duly organized under the laws of the State of New Hampshire, that Liberty Mutual Insurance Company is a corporation duly organized under the laws of the State of Massachusetts, and West American Insurance Company is a corporation duly organized under the laws of the State of Indiana (herein collectively called the "Companies"), pursuant to and by authority herein set forth, does hereby name, constitute and appoint,

Molly Cashman; Bart Stewart

all of the city of Encinitas, state of CA each individually if there be more than one named, its true and lawful attorney-in-fact to make, execute, seal, acknowledge and deliver, for and on its behalf as surety and as its act and deed, any and all undertakings, bonds, recognizances and other surety obligations, in pursuance of these presents and shall be as binding upon the Companies as if they have been duly signed by the president and attested by the secretary of the Companies in their own proper persons.

IN WITNESS WHEREOF, this Power of Attorney has been subscribed by an authorized officer or official of the Companies and the corporate seals of the Companies have been affixed thereto this 9th day of May, 2018.

The Ohio Casualty Insurance Company
Liberty Mutual Insurance Company
West American Insurance Company

By: _____
David M. Carey, Assistant Secretary

STATE OF PENNSYLVANIA ss
COUNTY OF MONTGOMERY

On this 9th day of May, 2018, before me personally appeared David M. Carey, who acknowledged himself to be the Assistant Secretary of Liberty Mutual Insurance Company, The Ohio Casualty Company, and West American Insurance Company, and that he, as such, being authorized so to do, execute the foregoing instrument for the purposes therein contained by signing on behalf of the corporations by himself as a duly authorized officer.

IN WITNESS WHEREOF, I have hereunto subscribed my name and affixed my notarial seal at King of Prussia, Pennsylvania, on the day and year first above written.

COMMONWEALTH OF PENNSYLVANIA
Notarial Seal
Teresa Pastella, Notary Public
Upper Merion Twp., Montgomery County
My Commission Expires March 28, 2021
Member, Pennsylvania Association of Notaries

By: _____
Teresa Pastella, Notary Public

This Power of Attorney is made and executed pursuant to and by authority of the following By-laws and Authorizations of The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company which resolutions are now in full force and effect reading as follows:

ARTICLE IV – OFFICERS – Section 12. Power of Attorney. Any officer or other official of the Corporation authorized for that purpose in writing by the Chairman or the President, and subject to such limitation as the Chairman or the President may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Corporation to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact, subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Corporation by their signature and execution of any such instruments and to attach thereto the seal of the Corporation. When so executed, such instruments shall be as binding as if signed by the President and attested to by the Secretary. Any power or authority granted to any representative or attorney-in-fact under the provisions of this article may be revoked at any time by the Board, the Chairman, the President or by the officer or officers granting such power or authority.

ARTICLE XIII – Execution of Contracts – SECTION 5. Surety Bonds and Undertakings. Any officer of the Company authorized for that purpose in writing by the chairman or the president, and subject to such limitations as the chairman or the president may prescribe, shall appoint such attorneys-in-fact, as may be necessary to act in behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations. Such attorneys-in-fact subject to the limitations set forth in their respective powers of attorney, shall have full power to bind the Company by their signature and execution of any such instruments and to attach thereto the seal of the Company. When so executed such instruments shall be as binding as if signed by the president and attested by the secretary.

Certificate of Designation – The President of the Company, acting pursuant to the Bylaws of the Company, authorizes David M. Carey, Assistant Secretary to appoint such attorneys-in-fact as may be necessary to act on behalf of the Company to make, execute, seal, acknowledge and deliver as surety any and all undertakings, bonds, recognizances and other surety obligations.

Authorization – By unanimous consent of the Company's Board of Directors, the Company consents that facsimile or mechanically reproduced signature of any assistant secretary of the Company, wherever appearing upon a certified copy of any power of attorney issued by the Company in connection with surety bonds, shall be valid and binding upon the Company with the same force and effect as though manually affixed.

I, Renee C. Llewellyn, the undersigned, Assistant Secretary, The Ohio Casualty Insurance Company, Liberty Mutual Insurance Company, and West American Insurance Company do hereby certify that the original power of attorney of which the foregoing is a full, true and correct copy of the Power of Attorney executed by said Companies, is in full force and effect and has not been revoked.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed the seals of said Companies this 8th day of October, 2018.

By: _____
Renee C. Llewellyn, Assistant Secretary

Not valid for mortgage, note, loan, letter of credit, currency rate, interest rate or residual value guarantees.

To confirm the validity of this Power of Attorney call 1-610-832-8240 between 9:00 am and 4:30 pm EST on any business day.

LMS_12873_022017

ALL- PURPOSE
CERTIFICATE OF ACKNOWLEDGMENT

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California }

County of San Diego }

On 10/08/2018 before me, Erin Elyse Haugh, Notary Public
(Here insert name and title of the officer),

personally appeared Bart Stewart,
who proved to me on the basis of satisfactory evidence to be the person(~~s~~) whose name(~~s~~)(is)/are subscribed to the within instrument and acknowledged to me that (he)/she/they executed the same in (his)/her/their authorized capacity(~~ies~~), and that by (his)/her/their signature(~~s~~) on the instrument the person(~~s~~), or the entity upon behalf of which the person(~~s~~) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Notary Public Signature (Notary Public Seal)

ERIN ELYSE HAUGH
Commission No. 2227679
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
Commission Expires January 6, 2022

ADDITIONAL OPTIONAL INFORMATION

DESCRIPTION OF THE ATTACHED DOCUMENT

(Title or description of attached document)

(Title or description of attached document continued)

Number of Pages ____ Document Date_____

CAPACITY CLAIMED BY THE SIGNER

- ☐ Individual (s)
- ☐ Corporate Officer
  (Title)
- ☐ Partner(s)
- ☐ Attorney-in-Fact
- ☐ Trustee(s)
- ☐ Other _____

2015 Version www.NotaryClasses.com 800-873-9865

INSTRUCTIONS FOR COMPLETING THIS FORM

This form complies with current California statutes regarding notary wording and, if needed, should be completed and attached to the document. Acknolwedgents from other states may be completed for documents being sent to that state so long as the wording does not require the California notary to violate California notary law.

- State and County information must be the State and County where the document signer(s) personally appeared before the notary public for acknowledgment.
- Date of notarization must be the date that the signer(s) personally appeared which must also be the same date the acknowledgment is completed.
- The notary public must print his or her name as it appears within his or her commission followed by a comma and then your title (notary public).
- Print the name(s) of document signer(s) who personally appear at the time of notarization.
- Indicate the correct singular or plural forms by crossing off incorrect forms (i.e. ~~he~~/she/~~they,~~ is /~~are~~) or circling the correct forms. Failure to correctly indicate this information may lead to rejection of document recording.
- The notary seal impression must be clear and photographically reproducible. Impression must not cover text or lines. If seal impression smudges, re-seal if a sufficient area permits, otherwise complete a different acknowledgment form.
- Signature of the notary public must match the signature on file with the office of the county clerk.
  - Additional information is not required but could help to ensure this acknowledgment is not misused or attached to a different document.
  - Indicate title or type of attached document, number of pages and date.
  - Indicate the capacity claimed by the signer. If the claimed capacity is a corporate officer, indicate the title (i.e. CEO, CFO, Secretary).
- Securely attach this document to the signed document with a staple.

CONTRACTOR'S CERTIFICATION OF PENDING ACTIONS

As part of its bid or proposal (Non-Price Proposal in the case of Design-Build contracts), the Bidder shall provide to the City a list of all instances within the past 10 years where a complaint was filed or pending against the Bidder in a legal or administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers, and a description of the status or resolution of that complaint, including any remedial action taken.

CHECK ONE BOX ONLY.

☒ The undersigned certifies that within the past 10 years the Bidder has NOT been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers.

☐ The undersigned certifies that within the past 10 years the Bidder has been the subject of a complaint or pending action in a legal administrative proceeding alleging that Bidder discriminated against its employees, subcontractors, vendors or suppliers. A description of the status or resolution of that complaint, including any remedial action taken and the applicable dates is as follows:

DATE OF CLAIM	LOCATION	DESCRIPTION OF CLAIM	LITIGATION (Y/N)	STATUS	RESOLUTION/REMEDIAL ACTION TAKEN

Contractor Name: Dick Miller Inc.

Certified By Glen F. Bullock Title President

Name

Signature Date 10/17/2018

USE ADDITIONAL FORMS AS NECESSARY

Mandatory Disclosure of Business Interests Form

BIDDER/PROPOSER INFORMATION

Legal Name		DBA	
Dick Miller Inc.			
Street Address	**City**	**State**	**Zip**
930 Boardwalk Suite H	San Marcos	CA	92078
Contact Person, Title	**Phone**	**Fax**	
Glen F. Bullock, President	(760) 471-6842	(760) 471-6178	

Provide the name, identity, and precise nature of the interest* of all persons who are directly or indirectly involved** in this proposed transaction (SDMC § 21.0103).

* The precise nature of the interest includes:

- the percentage ownership interest in a party to the transaction,
- the percentage ownership interest in any firm, corporation, or partnership that will receive funds from the transaction,
- the value of any financial interest in the transaction,
- any contingent interest in the transaction and the value of such interest should the contingency be satisfied, and
- any philanthropic, scientific, artistic, or property interest in the transaction.

** Directly or indirectly involved means pursuing the transaction by:

- communicating or negotiating with City officers or employees,
- submitting or preparing applications, bids, proposals or other documents for purposes of contracting with the City, or
- directing or supervising the actions of persons engaged in the above activity.

Name	Title/Position
Glen F. Bullock	President / Owner
City and State of Residence	**Employer (if different than Bidder/Proposer)**
San Marcos, CA	
Interest in the transaction	
General Contractor	
Name	**Title/Position**
City and State of Residence	**Employer (if different than Bidder/Proposer)**
Interest in the transaction	

*** Use Additional Pages if Necessary ***

Under penalty of perjury under the laws of the State of California, I certify that I am responsible for the completeness and accuracy of the responses contained herein, and that all information provided is true, full and complete to the best of my knowledge and belief. I agree to provide written notice to the Mayor or Designee within five (5) business days if, at any time, I learn that any portion of this Mandatory Disclosure of Business Interests Form requires an updated response. Failure to timely provide the Purchasing Agent with written notice is grounds for Contract termination.

Glen F. Bullock, President		10/17/2018
Print Name, Title	Signature	Date

Failure to sign and submit this form with the bid/proposal shall make the bid/proposal non-responsive. In the case of an informal solicitation, the contract will not be awarded unless a signed and completed Mandatory Disclosure of Business Interests Form is submitted.

SUBCONTRACTOR LISTING

(OTHER THAN FIRST TIER)

Pursuant to California Senate Bill 96 and in accordance with the requirements of Labor Code sections 1771.1 and 1725.5, by submitting a bid or proposal to the City, Contractor is certifying that he or she has verified that all subcontractors used on this public work project are registered with the California Department of Industrial Relations (DIR**). The Bidder is to list below the name, address, license number, DIR registration number of any Subcontractor – regardless of tier** - who will perform work, labor, render services or specially fabricate and install a portion [type] of the work or improvement pursuant to the contract.

NAME, ADDRESS AND TELEPHONE NUMBER OF SUBCONTRACTOR	CONSTRUCTOR OR DESIGNER	DIR REGISTRATION NUMBER	SUBCONTRACTOR LICENSE NUMBER	TYPE OF WORK
Name: Acacia Environmental Address: 604 S. San Marcos Road City: San Marcos State: CA Zip: 92078 Phone: 805-964-2585 Email: estimating@acaciaec.com	Constructor	1000002540	813236	Hydroseeding
Name: Address: City: State: Zip: Phone: Email:				
Name: Address: City: State: Zip: Phone: Email:				
Name: Address: City: State: Zip: Phone: Email:				

**** USE ADDITIONAL FORMS AS NECESSARY ****

City of San Diego

CITY CONTACT: Ronald McMinn Jr., **Contract Specialist, Email**: RMcMinn@sandiego.gov
Phone No. (619) 533-4618

ADDENDUM A

e - Bidding

FOR

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS

BID NO.: **K-19-1780-DBB-3**
SAP NO. (WBS/IO/CC): **L-18002.2**
CLIENT DEPARTMENT: **2115**
COUNCIL DISTRICT: **6**
PROJECT TYPE: **FA**

BID DUE DATE:

2:00 PM
OCTOBER 17, 2018

CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS

http://www.sandiego.gov/cip/bidopps/index.shtml

ENGINEER OF WORK

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

10-5-2018

1) Registered Engineer — Date

Seal:

10-5-18

2) For City Engineer — Date

Seal:

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

B. BIDDER's QUESTIONS

Q1. Section 31 05 19.13, Sub-section 3.5 PLACEMENT OF OVERLYING MATERIALS, Part C states*: "Equipment shall not be driven directly on the geotextile.*" Since most of the proposed roadway that take the geotextile material is as narrow as 15 feet, there will not be a possible way to place the geotextile and not driver on it when placing gravel or fill.
The Mirafi 500 is strong enough to withstand being driven on it. In fact, during a site visit, we saw that there is a contractor performing similar work at the landfill and driving on similar geotextile. As far as movement of the Geotextile if driven on it, that can be resolved with nails. Can the city remove that restriction so that the work can be performed per the plans and specs?

A1. The manufacturer does not recommend vehicles drive on Mirafi X-series geotextiles. We will keep this restriction in the specifications.

Q2. Section 31 05 13 Soils for Earthwork, Sub-section 1.3 Introduction/Special Conditions A. Construction Drawing, Part 2 states: "Field modifications of subgrade, and excavation and fill volumes for earthwork, may result in an adjustment of Contract Bid Quantities. Such modifications do not constitute a change in the "character" of the work, as these adjustments are anticipated, and are typical of landfill surface improvement construction." There is no bid items of volume for excavation and fill in the Bid Schedule. If there is no volume bid items of excavation and Fill such as CY units, how would the city quantify Field Modifications of Sub-grade? Also, how would all bidders bid the project equally if there is no grading bid items in CY?

A2. Please see attachment on page 5 of this addendum that summarizes the cut and fill quantities associated with each of the applicable West Miramar Conveyance Project bid items. The total volume of cut is 14,415.8 yd^3 and fill is 9,590 yd^3.

Q3. Can the City provide plans with much more existing/proposed elevation data? We are trying to calculate how much material we will be moving, and the data is sparse to non- existent for existing and proposed elevations. If the City can provide CADD files, it will help to clear this issue up.

A3. Please see A2 as part of this addendum.

James Nagelvoort, Director
Public Works Department

Dated: *October 8, 2018*
San Diego, California

JN/RWB/ss

West Miramar Landfill - Storm Water Conveyance Project

Descripton	cut (yd^3)	fill (yd3)
Graded gravel road with roadside ditch	8400	8800
Sediment Trap 1	165	45
Sediment Trap 2	45	5
coarse aggregate channel	406	
Low flow crossing 1	24	
Low flow crossing 2	59	
Low flow crossing 2a	40	
Low flow crossing 3	23	
Low flow crossing 4	222	
Low flow crossing 5	14	
Low flow crossing 5a	10	
Low flow crossing 6	28	
Low flow crossing 6a	14	
Low flow crossing 7	15	
Low flow crossing 8	14	
Low flow crossing 9	22	
Low flow crossing 9a	24	
Low flow crossing 10	8	
Low flow crossing 11	30	
Low flow crossing 12	17	
Low flow crossing 13	14	
Low flow crossing 14	17	
Low flow crossing 15	14	
Low flow crossing 16	25	
Energy Dissipator (6 locations - total)	180	
Down Drain Termination (4 locations - total)	66.8	
Inlet Protection (4 locations - total)	48	
Down Drain 15 Installation	10	740
West Sediment Basin	4280	
Tapered Inlet and Downdrain Flume	181	
Total	**14415.8**	**9590**

City of San Diego

CITY CONTACT: Ronald McMinn Jr., **Contract Specialist, Email**: RMcMinn@sandiego.gov
Phone No. (619) 533-4618

ADDENDUM B

e - Bidding

FOR

MIRAMAR LANDFILL STORM WATER CONVEYANCE IMPROVEMENTS

BID NO.: **K-19-1780-DBB-3**
SAP NO. (WBS/IO/CC): **L-18002.2**
CLIENT DEPARTMENT: **2115**
COUNCIL DISTRICT: **6**
PROJECT TYPE: **FA**

BID DUE DATE:

2:00 PM
OCTOBER 25, 2018

CITY OF SAN DIEGO'S ELECTRONIC BIDDING SITE, PLANETBIDS

http://www.sandiego.gov/cip/bidopps/index.shtml

ENGINEER OF WORK

The engineering Specifications and Special Provisions contained herein have been prepared by or under the direction of the following Registered Engineer:

1) Registered Engineer — Date: 10/11/2018 — Seal:

2) For City Engineer — Date: 10-11-18 — Seal:

A. CHANGES TO CONTRACT DOCUMENTS

The following changes to the Contract Documents are hereby made effective as though originally issued with the bid package. Bidders are reminded that all previous requirements to this solicitation remain in full force and effect.

THE SUBMITTAL DATE FOR THIS PROJECT HAS BEEN **EXTENDED AS STATED ON THE COVER PAGE.**

B. BIDDER's QUESTIONS

Q1. Is aggregate base required for the low water crossings that are subject to vehicle traffic? Please specify location and depth.

A1. No. Per Detail 6 on Sheet C-16 there is no aggregate base specified require for the low flow crossings. Section 33 40 00, Part 3.9.A.2 states: "Excavate, grade and prepare subgrade soil surface to the limits indicated in Construction Documents and Plan Detail Nos. 6 and 7 per the requirements of Specification 31 05 13 of this document." Also refer to Section 31 22 16.13 Part 3.1 for Subgrade preparation.

Q2. We also want to know if the product shown detail 7 of page C-16 is an equal to the course aggregate channel shown on detail 1 on page C-16.

A2. No. Detail 7 on Sheet C-16 references the Articulated Concrete Block. The coarse aggregate channel shown on Detail 1 on Sheet C-16 specifies Caltrans #3 aggregate. The articulated concrete block (Detail 7) is not equal to the Caltrans #3 aggregate specified on Detail 1.

Q3. Detail 7 on Sheet C-16 for the Articulated Concrete Block does not make reference to any infill requirements for the articulated concrete blocks. Is infill required in between the concrete cells? If so, what is the material requirement for the infill?

A3. Aggregate in-fill is not required.

Q4. With regard to the City's answer to Question 1 in Addendum A:

a) Comment #1: Section 31 05 06 (Aggregates for Earthwork), Paragraph C: "Aggregate placed on roadway surfaces in "Gravel Surfaces" and "Graded Gravel Roads with Roadside Ditches" shall be placed in 2 lifts not to exceed 8 inches thick of uncompacted

material. Preferred method of placement is through a paver. Set Paver adjustments on application thickness and width to avoid the need for grader.

Pavers are heavy pieces of construction equipment. The specification call out for this piece of equipment to be utilized for the placement of aggregate materials on grade with geotextile. Pavers are fed by trucks through the hopper at the front end of the unit.

b) Comment #2: Section 00 31 13.6 Paragraph B "Grading, placement of geotextile mat, and aggregate shall be limited to a single drive lane. Contractor shall provide signage within work areas and continuous traffic control utilizing flag persons with 2 way radios to ensure proper control and flow of traffic."

The specification calls for this roadway work to be performed under a flagging operation to allow traffic access. The road can't be blocked by trucks unloading adjacent to the geotextile in order to feed the paver from a piece of equipment off the geotextile. The project will require approximately 20,000 tons of the aggregate material to be placed of several lane miles. It is not feasible for the project to be completed on time without allowing trucks and equipment to operate on the geotextile.

Please reconsider the City's answer to Question 1

A4. City Response:

a) Pavers were the preferred method for placement, however our intent is not to dictate means and methods for aggregate placement. See revision to Section 31 05 16 (Aggregates for Earthwork) of this Addendum B.

b) Section 31 05 19.13 (Geotextile) Part 3.5.C states: "Equipment shall not be driven directly on the geotextile." This was based on the manufacturer's recommendation. However, see revision to Section 31 05 19.13 (Geotextile) of this Addendum B. Additionally, please note Section 31 05 19.13 (Geotextile) Part 2.4A which states: "The Contractor shall be liable for any damage to the materials incurred prior to final acceptance by the Engineer."

C. SUPPLEMENTARY SPECIAL PROVISIONS

1. To Attachment E, Technical, Section 00 31 13.16 Construction Schedule, page 56, Part 3 – Execution, Item 3.1, Work on Roadways, letter B, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   B. Grading, placement of geotextile mat, and aggregate shall be limited to a single drive lane, where directed by the City to prevent operational delays. Contractor shall provide signage within work zones and continuous traffic control utilizing flag persons with 2-way radios to ensure proper control and flow of traffic, where directed by the City.

2. To Attachment E, Technical, Section 00 31 13.16, Construction Schedule, page 56, Part 3 – Execution, Item 3.1 Work on Roadways, letter C, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   C. Work along shoulders for grading and placement aggregate in drainage ditches and channel with coarse aggregate shall be performed in a manner that ensures bi-directional traffic flow is maintained at all times, where directed by the City. Signage and flag persons shall be utilized in immediate work zones where materials are being placed to ensure proper control and flow of traffic, where directed by the City.

3. To Attachment E, Technical, Section 31 05 16, Aggregates for Earthwork, page 143, Part 3 – Execution, Item 3.1 Placement, letter C, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   C. Aggregate placed on roadway surfaces in "Gravel Surfaces" and "Graded Gravel Roads with Roadside Ditches" shall be spread and compacted in 1 layer, where compacted aggregated thickness is 0.5 feet or less. Where compacted aggregate thickness is greater than 0.5 feet, aggregate shall be placed in approximately equal lifts. Aggregate shall be tied in to adjacent road surfaces per "Gravel Road Tie-In" per Detail 10 in Construction Drawings. Aggregate shall be moistened in place with a water truck and rolled or vibratory compacted. If edge of placed aggregate is supported – first pass roll shall be slow in static mode on the outside edge of the placed aggregate. If edge of aggregate is unsupported – first pass roll shall be slow in static mode near, but

not over unsupported outside edge. Once aggregate is firm, move progressively closer to outside edge with static passes until unsupported edge is firm. Initial pass over aggregate shall be completed in static mode. All successive passes shall be in vibratory mode. The final pass shall be in static mode. Adequate compaction is indicated when no further depressions are created with a roller or loaded dump truck.

4. To Attachment E, Technical, Section 31 05 19.13, Geotextile, page 149, Part 3 – Execution, Item 3.5, Placement of Overlying Materials, letter C, **DELETE** in its entirety and **SUBSTITUTE** with the following:

   C. Contractor shall minimize wheeled vehicle or equipment traffic on the geotextile. Turning of wheeled vehicles or equipment should be kept to a minimum to prevent wheels from damaging the geotextile. Tracked construction equipment shall not be operated directly on the geotextile without appropriate measures to prevent damage to geotextile. A minimum aggregate or soil thickness of 6 inches is required prior to operation of tracked vehicles over the geotextile. Turning of tracked vehicles should be kept to a minimum to prevent tracks from displacing the fill and damaging the geotextile.

James Nagelvoort, Director
Public Works Department

Dated: *October 15, 2018*
San Diego, California

JN/RWB/Lad

Bid Results

Bidder Details

Vendor Name Dick Miller Inc.
Address 930 Boardwalk, Suite H
San Marcos, CA 92078
United States

Respondee Jeanalyn Grace
Respondee Title General Manager
Phone 760-471-6842 Ext. 13
Email jgrace@DMIUSA.net
Vendor Type CAU,MALE,PQUAL,SLBE,DVBE,CADIR,Local
License # 380204
CADIR 1000004547

Bid Detail

Bid Format Electronic
Submitted October 25, 2018 1:56:09 PM (Pacific)
Delivery Method
Bid Responsive
Bid Status Submitted
Confirmation # 155686
Ranking 0

Respondee Comment

Buyer Comment

Attachments

File Title	File Name	File Type
Bid Bond	Bid Bond.pdf	Contractor's Cert of Pending Actions (Page 412)
Contractor's Certification of Pending Actions	Contractor's Certification of Pending Actions.pdf	Mandatory Disclosure of Business Interests (Page 413)
Mandatory Disclosure of Business Interests Form	Mandatory Disclosure of Business Interests Form.pdf	Subcontractor Listing Other than 1st Tier (Page 414)
Subcontractor Listing	Subcontractor Listing.pdf	Subcontractor Listing Other than 1st Tier (Page 414)

Line Items

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
	Main Bid					
1	Bonds (Payment and Performance)					
	524126	LS	1	$27,820.04	$27,820.04	
2	SWPPP Development					
	541330	LS	1	$4,950.00	$4,950.00	
3	SWPPP Implementation					
	237310	LS	1	$29,250.00	$29,250.00	

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
4	SWPPP Permit Fee (EOC Type I)					
	541330	AL	1	$6,000.00	$6,000.00	
5	Mobilization					
	237310	LS	1	$84,985.16	$84,985.16	
6	Field Orders (EOC Type II)					
		AL	1	$200,000.00	$200,000.00	
7	Graded Gravel Road with Roadside Ditch (Sheets C-1 Through C-9, C-11 and C-12, Detail 1 [Excludes Vegetative Access Road in Detail 1])					
	237310	SF	329490	$1.92	$632,620.80	
8	Gravel Surfacing, (Sheets C-1, C-2, C-5 Through C-9, and C-11 Through C-14, Detail 2)					
	237110	SF	263630	$1.25	$329,537.50	
9	Vegetated Access Roads (Sheets C-1 Through C-15)					
	561730	ACRE	12.5	$11,343.20	$141,790.00	
10	Vegetated Swales (Sheets C-10 through C-12, Detail 9)					
	561730	ACRE	1.2	$17,856.30	$21,427.56	
11	Erosion Control Area 1 (Sheets C-5 and C-11)					
	561730	ACRE	2.8	$10,921.90	$30,581.32	
12	Sediment Trap 1 (Sheet 8, Detail 5, 12, and 14)					
	237110	LS	1	$30,800.00	$30,800.00	
13	Sediment Trap 2 (Sheet 8, Detail 5, 12, and 15)					
	237110	LS	1	$34,485.00	$34,485.00	
14	Coarse Aggregate Channel (Sheets C-1 and C-2, Detail 11)					
	237110	SF	3680	$4.93	$18,142.40	
15	Low Flow Crossing 1 (Sheet C-1, Detail 6 and 7)					
	237110	LS	1	$11,330.00	$11,330.00	
16	Low Flow Crossing 2 (Sheet C-2, Detail 6 and 7)					
	237110	LS	1	$24,530.00	$24,530.00	
17	Low Flow Crossing 2A (Sheet C-2, Detail 6 and 7)					
	237110	LS	1	$17,305.20	$17,305.20	
18	Low Flow Crossing 3 (Sheet C-5, Detail 6 and 7)					
	237110	LS	1	$10,993.40	$10,993.40	
19	Low Flow Crossing 4 (Sheet C-6, Detail 6 and 7)					
	237110	LS	1	$7,474.00	$7,474.00	

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
20	Low Flow Crossing 5 (Sheet C-7, Detail 6 and 7)					
	237110	LS	1	$7,686.80	$7,686.80	
21	Low Flow Crossing 5A (Sheet C-7, Detail 6 and 7)					
	237110	LS	1	$6,138.00	$6,138.00	
22	Low Flow Crossing 6 (Sheet C-7, Detail 6 and 7)					
	237110	LS	1	$8,177.40	$8,177.40	
23	Low Flow Crossing 6A (Sheet C-7, Detail 6 and 7)					
	237110	LS	1	$7,476.70	$7,476.70	
24	Low Flow Crossing 7 (Sheet C-8, Detail 6 and 7)					
	237110	LS	1	$8,177.40	$8,177.40	
25	Low Flow Crossing 8 (Sheet C-8, Detail 6 and 7)					
	237110	LS	1	$7,648.30	$7,648.30	
26	Low Flow Crossing 9 (Sheet C-8, Detail 6 and 7)					
	237110	LS	1	$10,470.90	$10,470.90	
27	Low Flow Crossing 9A (Sheet C-8, Detail 6 and 7)					
	237110	LS	1	$10,461.00	$10,461.00	
28	Low Flow Crossing 10 (Sheet C-8, Detail 6 and 7)					
	237110	LS	1	$7,474.00	$7,474.00	
29	Low Flow Crossing 11 (Sheet C-9, Detail 6 and 7)					
	237110	LS	1	$14,619.00	$14,619.00	
30	Low Flow Crossing 12 (Sheet C-11, Detail 6 and 7)					
	237110	LS	1	$8,607.50	$8,607.50	
31	Low Flow Crossing 13 (Sheet C-13, Detail 6 and 7)					
	237110	LS	1	$7,557.00	$7,557.00	
32	Low Flow Crossing 14 (Sheet C-13, Detail 6 and 7)					
	237110	LS	1	$8,683.40	$8,683.40	
33	Low Flow Crossing 15 (Sheet C-14, Detail 6 and 7)					
	237110	LS	1	$7,768.20	$7,768.20	
34	Low Flow Crossing 16 (Sheet C-14, Detail 6 and 7)					
	237110	LS	1	$11,698.50	$11,698.50	
35	Energy Dissipator (Sheets C-5, C-8, C-9, C-11, C-13, and C-14, Details 8)					
	237110	EA	6	$9,813.10	$58,878.60	

Bid Results

Type	Item Code	UOM	Qty	Unit Price	Line Total	Comment
36	Down Drain Termination (Sheets C-2, C-3, C-7, and C-13, Detail 3)					
	237110	EA	4	$9,328.00	$37,312.00	
37	Inlet Protection (Sheets C-2, C-4, C-5, and C-11, Detail 4)					
	237110	EA	4	$1,725.00	$6,900.00	
38	Down Drain 7 Headwall Improvement (Sheets C-7 and C-18, Detail 13)					
	237110	LS	1	$12,490.00	$12,490.00	
39	Down Drain 8 Headwall Improvement (Sheets C-8 and C-18, Detail 14)					
	237110	LS	1	$16,270.00	$16,270.00	
40	Down Drain 14 Re-alignment (Sheet C-7)					
	237110	LS	1	$6,410.80	$6,410.80	
41	Down Drain 15 Installation (Sheets C-11 and C-19, Detail 19)					
	237110	LS	1	$25,740.00	$25,740.00	
42	West Sediment Basin Modfication (Sheet C-8)					
	237110	CY	4280	$7.87	$33,683.60	
43	West Basin Access Road K-rail (Sheet C-8)					
	237110	EA	31	$834.58	$25,871.98	
44	Type 2 Energy Dissipater (Sheet C-13)					
	237110	LS	1	$2,591.60	$2,591.60	
45	Tapered Inlet and Downdrain Flume (Sheet C-13)					
	237110	LS	1	$4,290.00	$4,290.00	
46	Over Excavation of Waste Material and Clean Fill Placement					
	237310	CY	100	$33.00	$3,300.00	
				Subtotal	**$2,030,405.06**	
				Total	**$2,030,405.06**	

Subcontractors

Name & Address	Description	License Num	CADIR	Amount	Type

Line Totals (Unit Price * Quantity)

Item Num	Section	Item Code	Description	Reference	Unit of Measure	Quantity	Dick Miller Inc. - Unit Price	Dick Miller Inc. - Line Total
1	Main Bid	524126	Bonds (Payment and Performance)	**2-4.1**	LS	1	$27,820.04	$27,820.04
2	Main Bid	541330	SWPPP Development	**7-8.6.3.7**	LS	1	$4,950.00	$4,950.00
3	Main Bid	237310	SWPPP Implementation	**7-8.6.3.7**	LS	1	$29,250.00	$29,250.00
4	Main Bid	541330	SWPPP Permit Fee (EOC Type I)	**7-8.6.3.7**	AL	1	$6,000.00	$6,000.00
5	Main Bid	237310	Mobilization	**9-3.4.1**	LS	1	$84,985.16	$84,985.16
6	Main Bid		Field Orders (EOC Type II)	**9-3.5**	AL	1	$200,000.00	$200,000.00
7	Main Bid	237310	9, C-11 and C-12, Detail 1 [Excludes Vegetative Access Road in	**34 71 00 4.2**	SF	329490	$1.92	$632,620.80
8	Main Bid	237110	Through C-14, Detail 2)	**34 71 00 4.3**	SF	263630	$1.25	$329,537.50
9	Main Bid	561730	Vegetated Access Roads (Sheets C-1 Through C-15)	**31 25 14 4.2**	ACRE	12.5	$11,343.20	$141,790.00
10	Main Bid	561730	Vegetated Swales (Sheets C-10 through C-12, Detail 9)	**31 25 14 4.3**	ACRE	1.2	$17,856.30	$21,427.56
11	Main Bid	561730	Erosion Control Area 1 (Sheets C-5 and C-11)	**31 25 14 4.4**	ACRE	2.8	$10,921.90	$30,581.32
12	Main Bid	237110	Sediment Trap 1 (Sheet 8, Detail 5, 12, and 14)	**33 40 00 4.2**	LS	1	$30,800.00	$30,800.00
13	Main Bid	237110	Sediment Trap 2 (Sheet 8, Detail 5, 12, andÂ 15)	**33 40 00 4.2**	LS	1	$34,485.00	$34,485.00
14	Main Bid	237110	Coarse Aggregate Channel (Sheets C-1 and C-2, Detail 11)	**33 40 00 4.3**	SF	3680	$4.93	$18,142.40
15	Main Bid	237110	Low Flow Crossing 1 (Sheet C-1, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$11,330.00	$11,330.00
16	Main Bid	237110	Low Flow Crossing 2 (Sheet C-2, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$24,530.00	$24,530.00
17	Main Bid	237110	Low Flow Crossing 2A (Sheet C-2, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$17,305.20	$17,305.20
18	Main Bid	237110	Low Flow Crossing 3 (Sheet C-5, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$10,993.40	$10,993.40
19	Main Bid	237110	Low Flow Crossing 4 (Sheet C-6, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,474.00	$7,474.00
20	Main Bid	237110	Low Flow Crossing 5 (Sheet C-7, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,686.80	$7,686.80
21	Main Bid	237110	Low Flow Crossing 5A (Sheet C-7, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$6,138.00	$6,138.00
22	Main Bid	237110	Low Flow Crossing 6 (Sheet C-7, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$8,177.40	$8,177.40
23	Main Bid	237110	Low Flow Crossing 6A (Sheet C-7, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,476.70	$7,476.70
24	Main Bid	237110	Low Flow Crossing 7 (Sheet C-8, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$8,177.40	$8,177.40
25	Main Bid	237110	Low Flow Crossing 8 (Sheet C-8, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,648.30	$7,648.30
26	Main Bid	237110	Low Flow Crossing 9 (Sheet C-8, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$10,470.90	$10,470.90
27	Main Bid	237110	Low Flow Crossing 9A (Sheet C-8, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$10,461.00	$10,461.00
28	Main Bid	237110	Low Flow Crossing 10 (Sheet C-8, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,474.00	$7,474.00
29	Main Bid	237110	Low Flow Crossing 11 (Sheet C-9, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$14,619.00	$14,619.00
30	Main Bid	237110	Low Flow Crossing 12 (Sheet C-11, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$8,607.50	$8,607.50
31	Main Bid	237110	Low Flow Crossing 13 (Sheet C-13, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,557.00	$7,557.00
32	Main Bid	237110	Low Flow Crossing 14 (Sheet C-13, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$8,683.40	$8,683.40
33	Main Bid	237110	Low Flow Crossing 15 (Sheet C-14, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$7,768.20	$7,768.20
34	Main Bid	237110	Low Flow Crossing 16 (Sheet C-14, Detail 6 and 7)	**33 40 00 4.4**	LS	1	$11,698.50	$11,698.50
35	Main Bid	237110	Details 8)	**33 40 00 4.5**	EA	6	$9,813.10	$58,878.60
36	Main Bid	237110	Down Drain Termination (Sheets C-2, C-3, C-7, and C-13, Detail 3)	**33 40 00 4.6**	EA	4	$9,328.00	$37,312.00
37	Main Bid	237110	Inlet Protection (Sheets C-2, C-4, C-5, and C-11, Detail 4)	**33 40 00 4.7**	EA	4	$1,725.00	$6,900.00
38	Main Bid	237110	Detail 13)	**33 40 00 4.8**	LS	1	$12,490.00	$12,490.00
39	Main Bid	237110	Detail 14)	**33 40 00 4.9**	LS	1	$16,270.00	$16,270.00
40	Main Bid	237110	Down Drain 14 Re-alignment (Sheet C-7)	**33 40 00 4.10**	LS	1	$6,410.80	$6,410.80
41	Main Bid	237110	Down Drain 15 Installation (Sheets C-11 and C-19, Detail 19)	**33 40 00 4.11**	LS	1	$25,740.00	$25,740.00
42	Main Bid	237110	West Sediment Basin Modfication (Sheet C-8)	**33 40 00 4.12**	CY	4280	$7.87	$33,683.60
43	Main Bid	237110	West Basin Access Road K-rail (Sheet C-8)	**33 40 00 4.13**	EA	31	$834.58	$25,871.98
44	Main Bid	237110	Type 2 Energy Dissipater (Sheet C-13)	**34 40 00 4.14**	LS	1	$2,591.60	$2,591.60
45	Main Bid	237110	Tapered Inlet and Downdrain Flume (Sheet C-13)	**34 40 00 4.15**	LS	1	$4,290.00	$4,290.00
46	Main Bid	237310	Over Excavation of Waste Material and Clean Fill Placement	**7-10.4.2.3**	CY	100	$33.00	$3,300.00
							Subtotal	$2,030,405.06
							Total	**$2,030,405.06**