

**TECHNICAL MEMORANDUM**



DATE: July 31, 2018

Project No.: 755-10-17-01  
SENT VIA: EMAIL

TO: Angela Spain

FROM: Natalie Muradian, PE, RCE #84895

REVIEWED BY: Doug Moore, PE, RCE #58122

SUBJECT: Thirty Percent Design for Chapman Mulberry Project

**INTRODUCTION**

The purpose of this Technical Memorandum (TM) is to provide the following information for the 30% design for SWRP Project 85 - Chapman Mulberry Rain Garden:

- Project Description
- Rain Garden Sizing
- Cost Estimate
- A Thirty Percent Design (Attachment A)
- Planting Palette (Attachment B)

**PROJECT DESCRIPTION**

The Chapman Mulberry Rain Garden Project (Project) is the installation of a rain garden in the existing open space, located in the City of Chico (City), at the intersection of Cypress Street, Pine Street, and East 12<sup>th</sup> Street. The purpose of this project is to divert runoff from adjacent streets into the rain garden to restore the natural hydrograph, increase infiltration, and improve water quality through bioremediation. In addition, the project will also serve to reduce ponding in the adjacent streets. The Project location and elements are shown in a 30% design plan set in Attachment A. The projects elements included in this TM design are recommendations and suggestions, but do not constitute an exact standard that must be followed.

The Project includes the following elements:

- Two curb cuts will be created on Cypress Street and two on Pine Street.
- The area will be sculpted to enhance existing variation in the natural topography, i.e. low spots can be excavated and high spots can be built up. The primary purpose of earth moving will be to facilitate drainage from the curb cuts into the basins. The total volume of the rain garden will be at least 1,224 cubic feet, as described below. Excavated soil will be used on-site to shape the basins of the rain garden and any excess soil will be deposited and levelled in the northwest corner of the site for use as a future picnic area. Earthmoving will likely not exceed 150 cubic yards, and no soil will be hauled offsite. The bioretention area will be mulched with woodchips.
- Curb cuts will divert drainage from adjacent streets into the rain garden area. Curb cuts can be performed from the open space area and therefore, no lane closures will be required.
- The rain garden will be vegetated with California native plants to provide water quality improvement through bioremediation. Table 2 in Attachment B lists plants that can be used in the rain garden. The native California vegetation will be planted just prior to the first fall rains to maximize plant establishment and survival. The project includes a dense planting plan so that even with a natural plant attrition rate, the surviving vegetation will be appropriate for the project conditions. Consequently, no temporary or permanent irrigation facilities are needed.

Due to the limited scope of the project, these project elements can be implemented and installed in one weekend using donated materials and volunteer labor. The project elements will be phased in the following order:

1. Surveying, using simple instruments and stakes/flags/chalk,
2. Curb cuts,
3. Earthmoving, and
4. Planting of vegetation and mulching. These components could be phased separately depending on season and time constraints.

The Project was sited based on the following factors and constraints:

- Existing trees will be protected in place, and the rain garden and swales will be constructed around the trees.
- Excavation depths and locations will be adjusted to enhance and increase the existing variations in existing topography.

## **RAIN GARDEN SIZING**

A tributary watershed was estimated for the open space area, and consequentially, the Project. The tributary watershed is approximately 2.0 acres and is shown on sheet C01 of the plan set in Attachment A.

Because the primary purpose of this Project is to restore the natural hydrograph and improve water quality, the 85<sup>th</sup> percentile storm depth was used to estimate the required capture volume. Using the California Stormwater Quality Association (CASQA) *Handbook for New Development and Redevelopment* (2003) for a design of a volume-based best management practice (BMP), a required capture volume of 0.03 acre-feet (or 1,224 cubic feet) was estimated. This required capture volume is the volume that can provide water quality treatment for 85% of the annual average rainfall.

The footprint for the rain garden (including both basins and swales) was estimated around 10,500 square feet. To achieve the required capture volume of 1,224 cubic feet, the minimum depth of the swales and basin is approximately 0.12 feet, however, the depth can be increased as appropriate to facilitate drainage into the rain garden from both Pine Street and Cypress Street.

## **COST ESTIMATE**

Earthshed Solutions, the Project sponsor, intends to construct this project using volunteer labor and donated materials. Therefore, this preliminary cost estimate only includes some material costs and estimated equipment rental costs. Estimates of minor material and equipment costs allows Earthshed Solutions to fundraise appropriately. It was assumed that woodchips can be donated. The preliminary material/equipment cost for the Project is approximately \$2,000, see Table 1. If some of these vegetation were donated, this cost estimate would decrease further.

Although Earthshed Solutions is interested in being responsible for the Project, the annual operations and maintenance (O&M) costs have been estimated as though the City is responsible for O&M. Annual maintenance is estimated to occur twice per year at four hours per maintenance. Maintenance includes removing sediment and trash, performing landscaping care and some minor program management. Costs associated with sampling, lab costs for water quality testing are assumed to be covered by students and volunteers. The annual O&M cost is approximately \$1,400, see Table 2.

## **DISCLAIMER**

Funding has been provided in full or in part through an agreement with the State Water Resources Control Board, using funds from Proposition 1. The contents of this document do not necessarily reflect the views and policies of the foregoing, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use.

This work product is part of Task 5.0 of Grant Agreement No. D1612613 between the City of Chico and the California State Water Resource Control Board.

**Table 1. Cost Estimate for SWRP Project 85 - Chapman Mulberry Rain Garden**

Number	Bid Item	Units	Quantity	Unit Price, dollars	Total Price, dollars
<b>Rain Garden<sup>(a)</sup></b>					
1	Equipment for excavation and grading	DAY	1	500	500
2	Equipment for curb cuts	DAY	1	90	100
3	Educational Signage (or Website development)	LS	1	500	500
4	Vegetation - 1 Gallon Pots (every 4 feet)	EA	114	3.50	400
<b>Construction Costs</b>					<b>\$1,500</b>
<b>Engineering and Design Fees</b>					
5	City Administration	HR	3	120	360
<b>Total Estimated Capital Project Cost (Rounded)</b>					<b>\$2,000</b>
<small>(a) Construction cost estimate only includes material costs. Labor was not included in the estimate, assuming that volunteers will help construct the project.</small>					

**Table 2. Cost Estimate for Annual O&M for SWRP Project 85 - Chapman Mulberry Rain Garden**

Item No	Item Description	Units	Quantity	Unit Cost, dollars	Total Cost, dollars
1	2 Person Maintenance Crew - 2 times per year, 4 hours each	HR	8	100	800
2	Sampling - 2 samples per year, 2 hours per sample	HR	4	0	0
3	Lab Cost for Samples - 2 samples per year	EA	2	0	0
4	Program Oversight	HR	4	140	560
<b>Total Estimated Project Cost</b>					<b>\$1,400</b>

ATTACHMENT A

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Plan Set





educate - motivate - regenerate

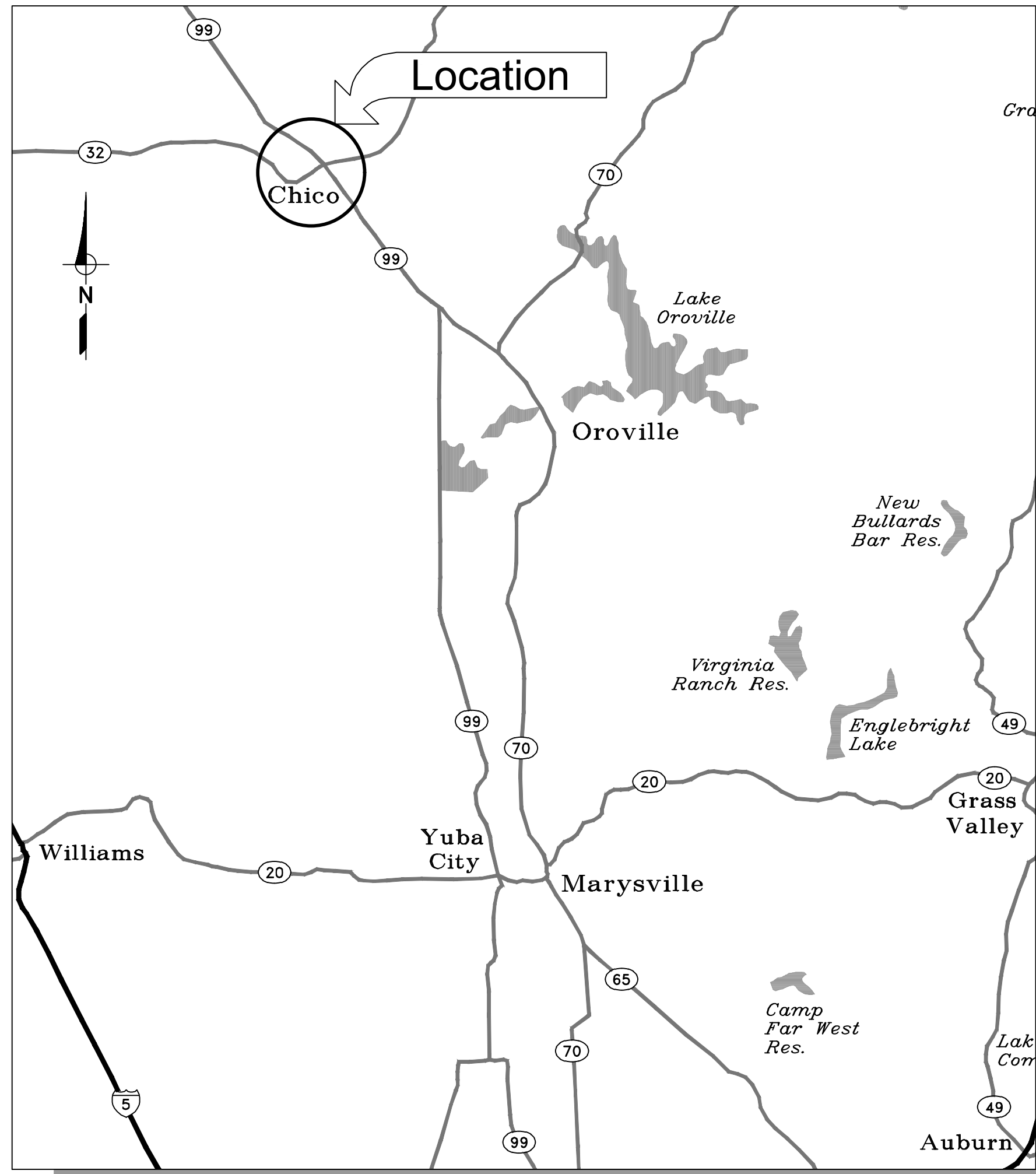


# EARTHSHED SOLUTIONS & CITY OF CHICO

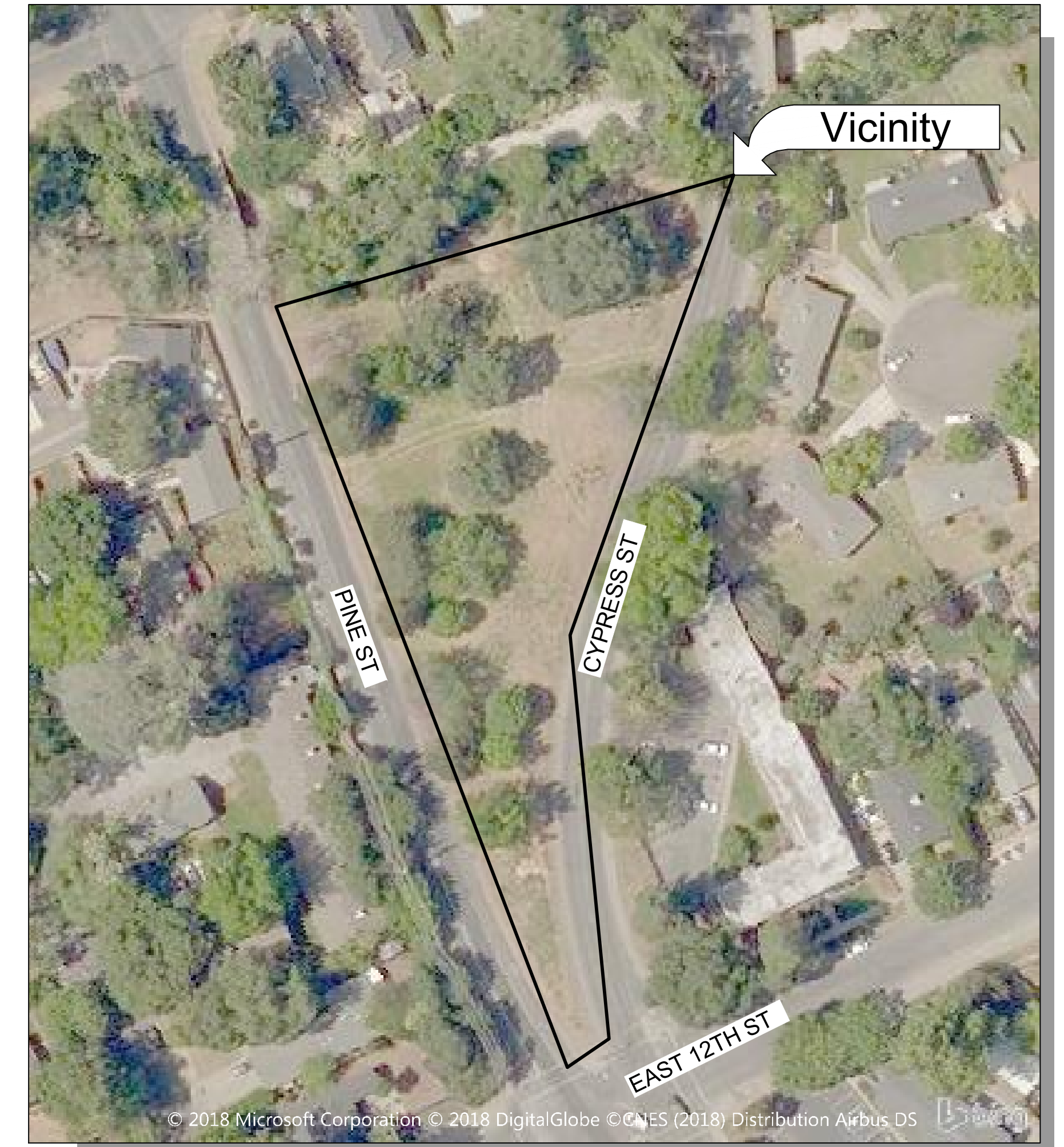
## BIG CHICO CREEK AND LITTLE CHICO CREEK STORM WATER RESOURCES PLAN

### CHAPMAN MULBERRY RAIN GARDEN PROJECT

AUGUST 2018



LOCATION MAP



VICINITY MAP

DRAWING INDEX

SHEET NO.	DRAWING NO.	DESCRIPTION
1	G01	TITLE SHEET, LOCATION & VICINITY MAPS, AND DRAWING INDEX
2	C01	PLAN VIEW OF CHAPMAN MULBERRY RAIN GARDEN
3	C02	CHAPMAN MULBERRY DETAILS AND SECTIONS

**30 PERCENT DESIGN  
NOT FOR CONSTRUCTION**

QC REVIEW: \_\_\_\_\_  
DATE: \_\_\_\_\_

THIS LINE IS 1 INCH  
AT FULL SCALE  
IF NOT SCALE ACCORDINGLY

SCALE : NONE  
DRAWN BY : \_\_\_\_\_  
DESIGNED BY : \_\_\_\_\_  
PROJ. MGR. : XXX

No.	ZONE	REVISIONS	BY	DATE

**WEST YOST ASSOCIATES**  
6800 Koll Center Parkway  
Suite 150  
Pleasanton, CA 94566  
(925) 426-2580  
FAX (530) 756-5991



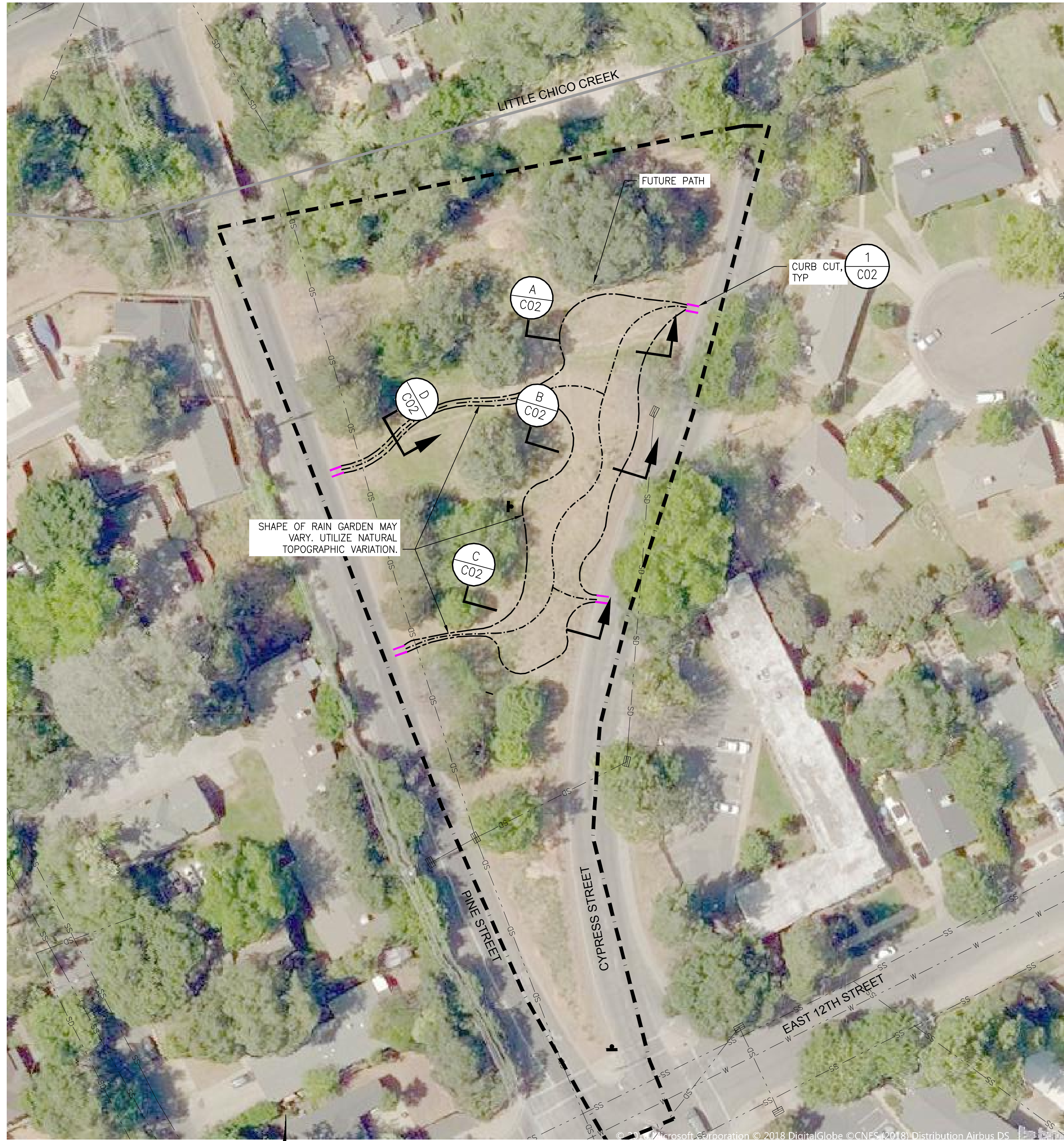
**BIG CHICO CREEK AND LITTLE CHICO CREEK STORM WATER RESOURCE PLAN  
30% DESIGN**  
TITLE SHEET, LOCATION & VICINITY MAPS,  
AND DRAWING INDEX

JOB NUMBER  
755-10-17-01  
DRAWING NUMBER  
**G01**  
SHEET NUMBER  
1 OF 3  
REVISION

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CHAPMAN MULBERRY RAIN GARDEN PROJECT  
NOT TO SCALE

- LEGEND:**
- D--- EXISTING STORM DRAIN LINE
  - SS--- EXISTING SANITARY SEWER LINE
  - W--- EXISTING WATER LINE
  - CURB CUT
  - TOP OF BANK
  - FLOW LINE
  - ↑ EDUCATIONAL SIGNAGE
  - ≡ EXISTING STORM DRAIN INLET

**NOTES:**

- BASIN AND SWALE LOCATIONS WILL VARY BASED ON EXISTING NATURAL TOPOGRAPHY

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**Earthshed Solutions**

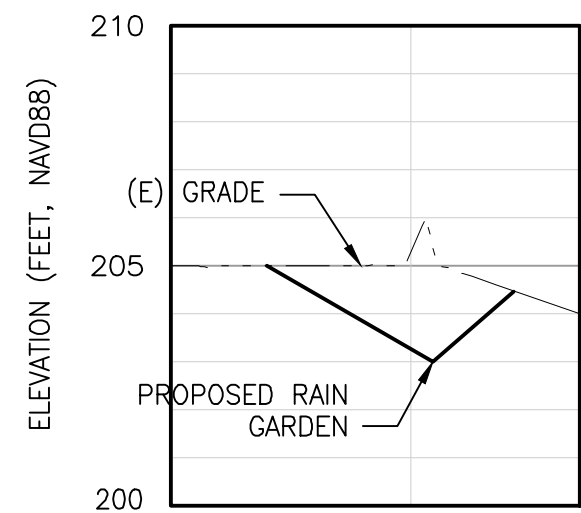
educate - motivate - regenerate



**BIG CHICO CREEK AND LITTLE CHICO CREEK  
STORM WATER RESOURCE PLAN  
30% DESIGN  
PLAN VIEW  
CHAPMAN MULBERRY RAIN GARDEN**

JOB NUMBER 755-10-17-01
DRAWING NUMBER <b>C01</b>
SHEET NUMBER 2 OF 3
REVISION

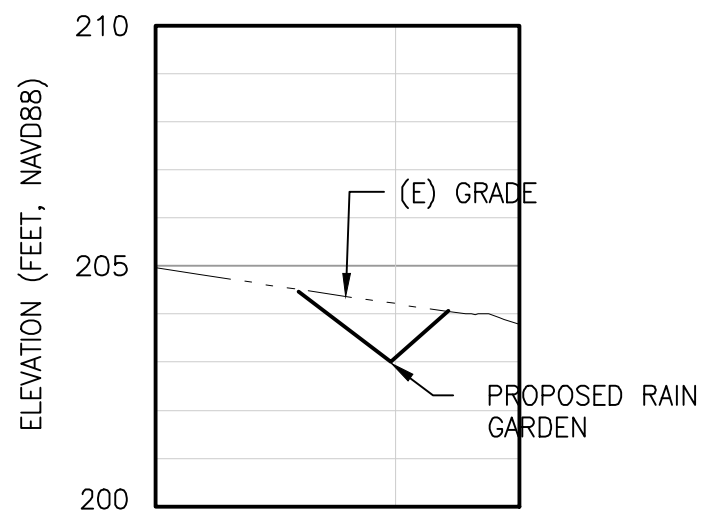




RAIN GARDEN SECTION CUT

SECTION A  
C01

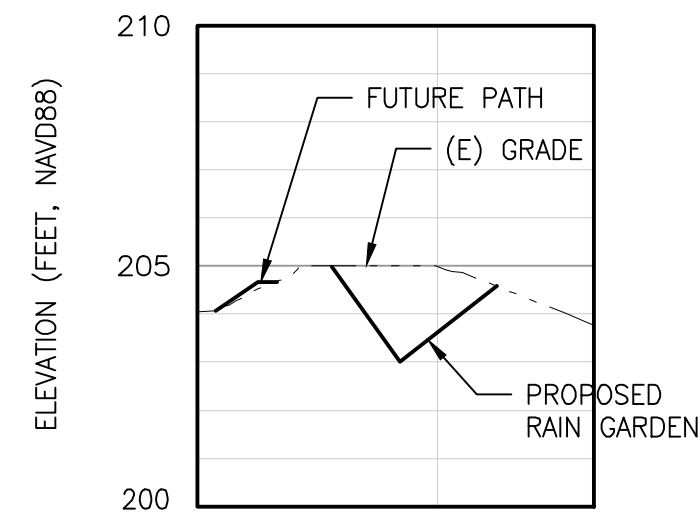
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RAIN GARDEN SECTION CUT

SECTION B  
C01

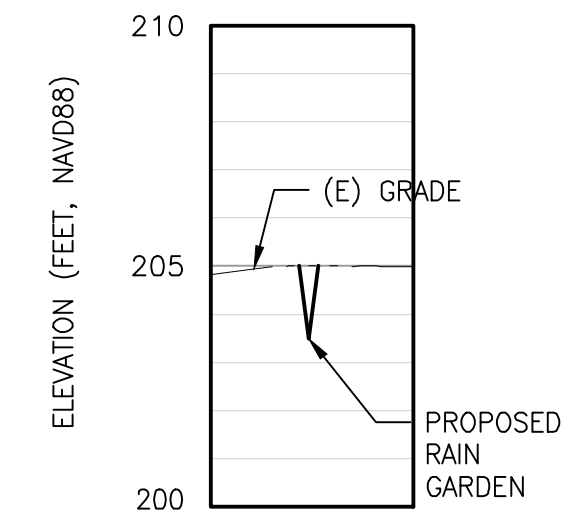
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RAIN GARDEN SECTION CUT

SECTION C  
C01

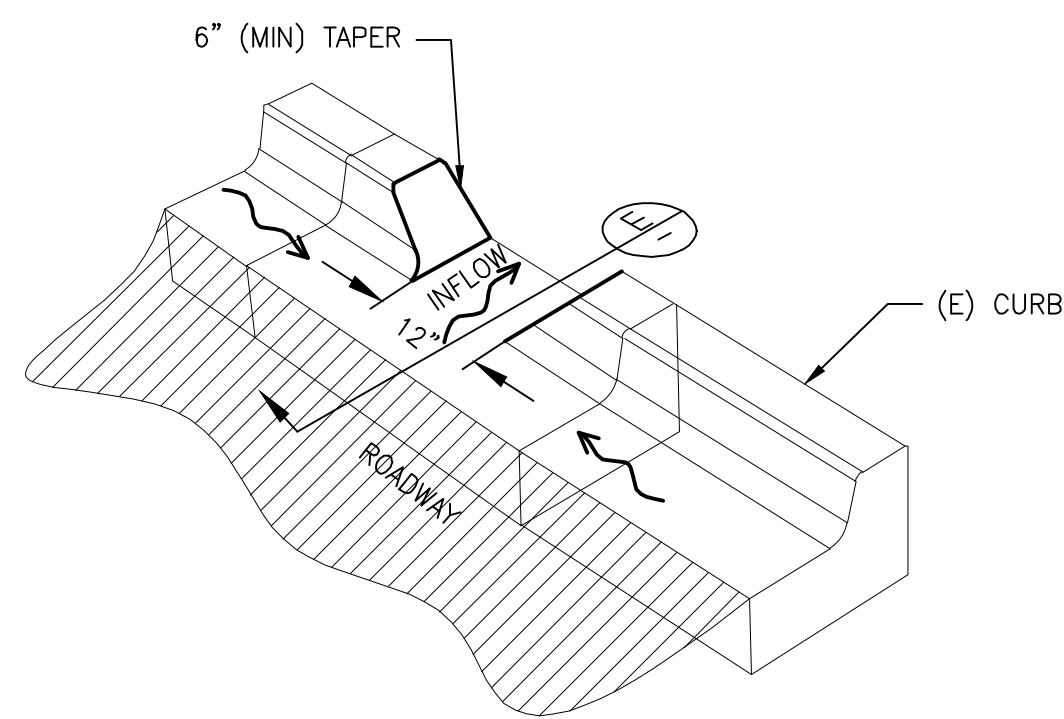
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RAIN GARDEN SECTION CUT

SECTION D  
C01

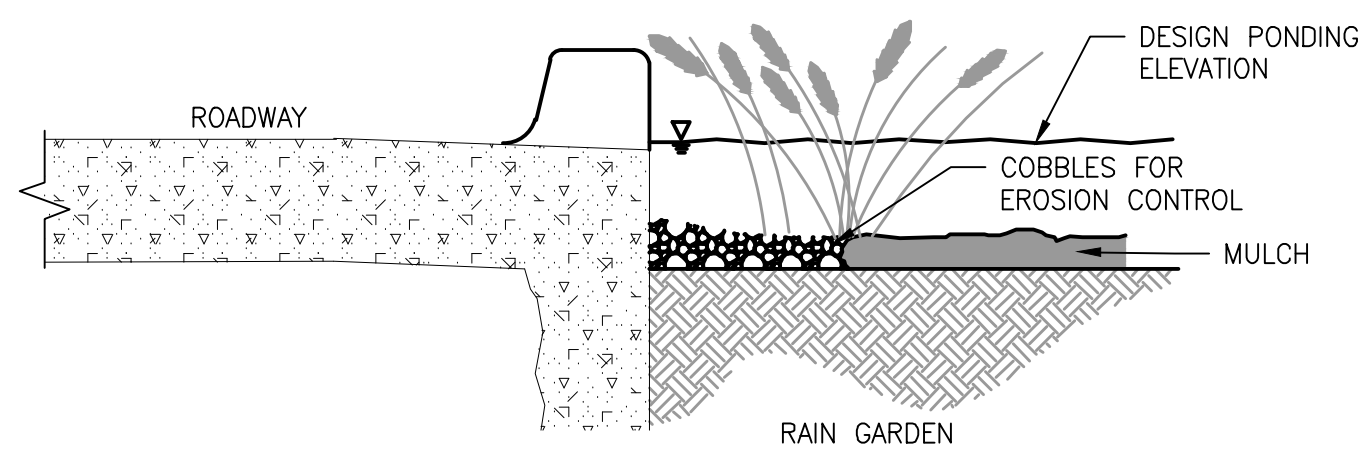
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CURB CUT ISOMETRIC VIEW

DETAIL 1  
C01

NOT TO SCALE



CURB CUT

SECTION E  
-

NOT TO SCALE

NOTES:

1. BASIN AND SWALE LOCATIONS WILL VARY BASED ON EXISTING NATURAL TOPOGRAPHY
2. DETAILS ARE RECOMMENDATIONS ONLY.

**30 PERCENT DESIGN  
NOT FOR CONSTRUCTION**

QC REVIEW: \_\_\_\_\_  
DATE: \_\_\_\_\_

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**Earthshed Solutions**  
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**BIG CHICO CREEK AND LITTLE CHICO CREEK  
STORM WATER RESOURCE PLAN  
30% DESIGN  
CHAPMAN MULBERRY  
DETAILS AND SECTIONS**

JOB NUMBER  
755-10-17-01  
DRAWING NUMBER  
**C02**  
SHEET NUMBER  
3 OF 3  
REVISION

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# ATTACHMENT B

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Planting Palette

# Chico SWRP Plant Lists

Prepared by Foothill Associates

**Table 1 — Bioretention Basin Channel Bottom Seed Mix**

Scientific Name	Common Name	County of Seed Origin	Pounds of Live Seed Per Acre	Plugs
<i>Carex barbarae</i>	Santa Barbara sedge	Yolo Bypass, Yolo Co.	-	24" O.C.
<i>Carex praegracilis</i>	cluster field sedge	Tiburon, Marin Co.	-	24" O.C.
<i>Elymus glaucus</i>	blue wildrye	Yolo Bypass, Yolo Co.	6	-
<i>Elymus triticoides</i>	creeping wildrye	Yolo Bypass, Yolo Co.	6	-
<i>Hordeum brachyantherum</i>	meadow barley	Yolo Bypass, Yolo Co.	8	-
<i>Juncus effusus</i>	common rush	Placer Co.	-	24" O.C.
<i>Juncus patens</i>	grey rush	Cache Creek Watershed, Yolo Co.	-	24" O.C.
<b>Total:</b>			<b>20</b>	

**Channel Basin Planting Notes:**

1. Plugs are recommended for those plants which typically propagate vegetatively in the wild. The success of plugs is significantly higher than seed as seeds can be very difficult to germinate in natural conditions and seeds can be prohibitively expensive to acquire.
2. It is recommended that seeding and planting be performed between October and December, after first significant rain event, to allow establishment during winter wet season.
3. Seeds and plugs can be acquired through hedgerow farms. Contact:

21905 County Road 88  
Winters, CA 95694  
530-662-6847

**Table 2 — Grasses and Plants for Channel Banks**

<b>Scientific Name</b>	<b>Common Name</b>	<b>County of Seed Origin</b>	<b>Pounds of Live Seed/Acre</b>
<i>Achillea millefolium</i>	yarrow	Cache Creek Watershed, Lake Co.	0.25
<i>Artemisia douglasiana</i>	mugwort	West Sacramento, Yolo Co.	0.25
<i>Bromus carinatus</i>	California brome	Arastradero Preserve, Santa Clara Co.	3
<i>Clarkia unguiculata</i>	elegant clarkia	Rumsey Canyon, Yolo Co.	0.5
<i>Elymus glaucus</i>	blue wildrye	Llano Seco Ranch, Butte Co.	5
<i>Elymus triticoides</i>	creeping wildrye	Yolo Bypass, Yolo Co.	3
<i>Eschscholzia californica</i>	California poppy	Lodoga Hills, Colusa Co.	0.5
<i>Festuca microstachys</i>	three weeks fescue	Vina Plains Preserve, Tehama Co.	4
<i>Grindelia camporum</i>	gum plant	Yolo Bypass, Yolo Co.	1
<i>Hordeum brachyantherum</i>	meadow barley	Yolo Bypass, Yolo Co.	3
<i>Hordeum brachyantherum ssp. californicum</i>	California barley	Hwy 20, Colusa Co.	3
<i>Layia platyglossa</i>	tidy tips	Bear Valley Road, Colusa Co.	0.5
<i>Lupinus microcarpus var. densiflorus</i>	golden lupine	North of Winters, Yolo Co.	2
<i>Lupinus succulentus</i>	arroyo lupine	North of Winters, Yolo Co.	2
<i>Nemophila menziesii</i>	baby blue eyes	Commercial	2
<i>Stipa pulchra</i>	purple needlegrass	Llano Seco Ranch, Butte Co.	7
<i>Trifolium willdenovii</i>	tomcat clover	North of Winters, Yolo Co.	2
<b>Total:</b>			<b>39</b>

**Channel Bank Planting Notes:**

1. It is recommended that seeding be performed between October and December, after first significant rain event, to allow establishment during winter wet season.
2. Seeds can be acquired through hedgerow farms. Contact:  
21905 County Road 88  
Winters, CA 95694  
530-662-6847