Year 1 Annual Monitoring Report

Riparian Vegetation Enhancement at the Women's Faculty Club Reach of Strawberry Creek (2017)

University of California, Berkeley

Submitted December 2017

Berkeley EH&S

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I. Project Overview

A. Regulatory Background

On August 1, 2014, the San Francisco Regional Water Quality Control Board issued the Water Quality Certification for the University of California Berkeley Haas School of Business Expansion Project for Site No.: 02-01-C1181 (bkw). As part of the conditions outlined in the permit, the Riparian Vegetation Enhancement at the Women's Faculty Club Reach of Strawberry Creek (hereafter referred to as the Riparian Enhancement Project or simply the Project) was used as partial mitigation for impacts to waters of the State as a result of construction activities to expand the UC Berkeley Haas School of Business. This report is the first annual report for the Project as required in the permit conditions.

B. Project Location

The Riparian Enhancement Project is located in the Stawberry Creek south fork watershed on the east side of the central campus of the University of California, Berkeley (**Figure 1**). The project site has a surface area of about 30,000 square feet and extends from the outlet of the Little Inch Culvert just west of the Haas Business School expansion site to approximately 350 feet downstream to a small footbridge (**Figure 2**).

C. Project Background and Purpose

Over the years, several highly invasive species of non-native vines have dominated the forest floor and creek banks along this section of the Strawberry Creek South Fork. Two of these species, Algerian Ivy (*Helix hedera*) and Small Leaf Spiderwort (*Tradescantia fluminensis*), can suppress plant and animal biodiversity by virtually blanketing the riparian zone (and in the case of the ivy, climbing up tree trunks to seek sunlight for photosynthesis), retarding germination of native seed stock, competing with remnant native plants for soil moisture and nutrients, and providing a poor basis for the food web that existed prior to the introduction of these vining species.

From 2009 to 2011, student volunteers, working as part of the Strawberry Creek Restoration Program and under direction from Environmental Protection staff in the UC Berkeley Office of Environment, Health and Safety (EH&S), removed much of the ivy and spiderwort present in the Riparian Enhancement Project reach and planted several native species in the cleared riparian zone. However, the student volunteers lacked funds to obtain sufficient numbers of plants to achieve recommended planting densities for an effective restoration of a native plant community food web.

The Riparian Enhancement Project at this reach consists of removing any remnant or newly sprouted ivy and spiderwort and then extensively planting the creek banks from the wetted edge of the creek to the outer drip line of the riparian tree grove established along this reach of

Strawberry Creek. The native planting palette includes appropriate species for the location and is planted to a density that will provide optimal habitat and water quality function. Irrigation was installed to help establish plants during the first 2 to 3 years after planting. Once plants are established, summer irrigation water should not be necessary. The Riparian Enhancement Project will enhance the beneficial uses of wildlife habitat and non-contact water recreation at the mitigation project site. In addition, the site will provide learning opportunities for students and professors interested in native plant identification and propagation.

D. Timeline

The project commenced on May 2, 2016. Most of the clearing and planting occurred during the month of May, irrigation was installed in June, and plant substitutions and irrigation fine-tuning were finalized in July. The project was deemed complete on July 25, 2016.

E. Monitoring plan

The project monitoring period commenced July 25, 2016, the date of project completion. Monitoring will be conducted by UC Berkeley staff according to the methods and monitoring schedule outlined by the permit's certification conditions (as stated in pages 7&8 in **Attachment A**). Annual monitoring data will be gathered during the late spring or early summer of each monitoring year, and results will be analyzed to determine performance and success criteria as stipulated in the permit. Annual monitoring reports will be submitted to the Regional Water Quality Control Board by January 31 following each monitoring year.

II. Methods

This Annual Monitoring Report provides a description of the biological conditions of the Project site in the first spring/early summer following installation. The intent of the Annual Monitoring Report is to document the Project's ecological impacts over time and to determine the "success" of the Project.

A. Vegetation Assessment

The plant map from the As-Built Report (2016) was used as a reference to assess vegetation in the field on July 25, 2017 and August 8, 2017. Surviving plants were documented and the plant map was adjusted to reflect changes in vegetation (volunteer or dead plants). At the time of the field work, plants were assessed to determine their general health and vigor, including evidence of inadequate water, disease, wildlife browsing, and invasive species cover.

B. Percent Cover of Vegetation

In order to measure percent cover of vegetation, twelve 3x3 foot plots were selected randomly and visually assessed for percent cover of native species (planted and volunteer) and percent cover of invasive species. The southeast corner of each of the plots were marked with capped

rebar for future assessments (see **Figure 3** for locations of the plots). The permit requires 50% cover of native vegetation by year 5.

C. Plant Survival

Installed plants were inventoried using the map developed for the vegetation assessment. Each species was assessed for survivability to determine site suitability, and the survival of total plantings was assessed to document ongoing progress towards the five-year survival criterion of 80 percent (including volunteers).

D. Photo documentation

Ten photo-documentation points were established at the site prior to construction (see **Figure 4** for locations of the photo-points). Pre-construction photos were taken prior to construction activities on March 23, 2016. Post-construction photos were taken on August 23, 2016. The Year 1 annual photos were taken on July 26, 2017.

The method of re-aligning photo-points includes the following steps: 1) Use the photo-point map (**Figure 4**) for the general location of each photo-point, and 2) Bring a color copy of the original photos (and subsequent years) to align the current photo with the original frame for each photo-point.

III. Results and Discussion

A. Vegetation Assessment

The plants are mapped in **Figure 5**. All of the plants were doing well, with little to no evidence of inadequate water, disease, wildlife browsing, or invasive species cover. Some mortality was evident, as explained in Section C below.

B. Percent Cover of Vegetation

Twelve 3x3 foot plots were evaluated throughout the project extent to determine percent cover of vegetation. See **Attachment B** for photos and descriptions of each of the plots. **Table 1** displays the result of the percent cover estimation. On average, 50.8% of the sampled areas had native vegetative cover, with zero invasive cover.

Table 1: Percent Cover of Vegetation

Plot #	% Total Cover	% Native Planted Cover	% Native Volunteer Cover	% Invasive Cover
A	**70**	70	0	0
B	**75**	75	0	0
C	**80**	80	0	0
D	**30**	30	0	0
E	**50**	50	0	0
F	**20**	20	0	0
G	**25**	25	0	0
H	**80**	80	0	0
I	**50**	50	0	0
J	**20**	20	0	0
K	**50**	50	0	0
L	**60**	60	0	0
Average	**50.8**	50.8	0	0

C. Plant Survival

Most of the plants did well with an overall survival rate of 91% (see **Table 2** below). Due to the complexity of the site, some plants may have been over- or under-counted during the as-built and annual data gathering. In subsequent years, these numbers should stabilize as the site becomes better established and the plants mature. In general, the plants are doing very well, with minimal mortality.

Table 2: Plant Survival

Latin Name	Common Name	Year 1	As Built	% Survival
ACER MACROPHYLLUM	Big Leaf Maple	9	10	90%
AESCULUS CALIFORNICA	California Buckeye	6	5	120%
ARALIA CALIFORNICA	Elk Clover	(3) [c]	17	18%
ASARUM CAUDATUM	Wild Ginger	21	25	84%
CALAMAGROSTIS NUTKAENSIS	Pacific Reed Grass	(76)[a]	(84) [a]	90%
CAREX BARBARAE	Santa Barbara Sedge	31	31	100%
CAREX TUMULICOLA	Foothill Sedge	16	19	84%
CEANOTHUS G. 'ANCHOR BAY'	Wild Lilac	14	18	78%
CORNUS SERICEA	Red Twig Dogwood	10	8	125%
FRAGARIA VESCA CALIFORNICA	Wood Strawberry	25	38	66%
HERACLEUM MAXIMUM	Cow Parsnip	12	21	57%
HETEROMELES ARBUTIFOLIA	Toyon	6	6	100%
HEUCHERA MICRANTHA	Alum Root	12	10	120%
HOLODISCUS DISCOLOR	Creambush	11	10	110%
IRIS DOUGLASIANA	Douglas Iris	15	18	83%
JUNCUS PATENS	Common Rush	61	54	113%
LONICERA HISPIDULA	Pink Honeysuckle	5	8	63%
LONICERA INVOLUCRATA	Twinberry	5	5	100%
MIMULUS AURANTIACUS	Monkeyflower	18	20	90%
MUHLENBERGIA RIGENS	Deergrass	(76)[a]	(84) [a]	90%
MYRICA CALIFORNICA	Pacific Wax Myrtle	20	18	111%
NASELLA PULCHRA	Purple Needlegrass	(76)[a]	(84) [a]	90%
RHAMNUS CALIFORNICA	Coffeeberry	17	20	85%
RIBES SANGUINEUM	Red Flowering Currant	18	16	113%
ROSA CALIFORNICA	Wild Rose	19	20	95%
RUBUS PARVIFLORUS	Thimbleberry	26	26	100%
RUBUS URSINUS	California Blackberry	5	5	100%
SCROPHULARIA CALIFORNICA	Bee Plant	26	28	93%
STACHYS CHAMISONSSIS	Hedge Nettle	(15) [c]	8	188%
SYMPHORICARPOS ALBUS	Snowberry	25	21	119%
VACCINUM OVATUM	Huckleberry	14	19	74%
WOODWARDIA FIMBRIATA	Western Chain Fern	25	31	81%
	TOTAL PLANTS	**566**	**619**	**91%**

(a) All three grasses (deergrass, purple needlegrass, and pacific reed grass) were counted together due to difficulty in distinguishing between species while still young. In subsequent years, this data will improve with visual inspections and corrections to the underlying map.

(b) The survey was not able to capture every plant due to the complexity of site (lots of trees blocking sightlines). Even with follow-up visual inspections, some plants may have been missed. In some other cases, plant species may be over-counted due to misidentification during the survey. In subsequent years, survey data will improve with visual inspections and corrections to the underlying map.

(c) Hedge nettles were mistakenly input as elk clover for the as-built report. Year 1 annual data corrected this, resulting in a decrease in elk clover and an increase in hedge nettles.

D. Photo documentation

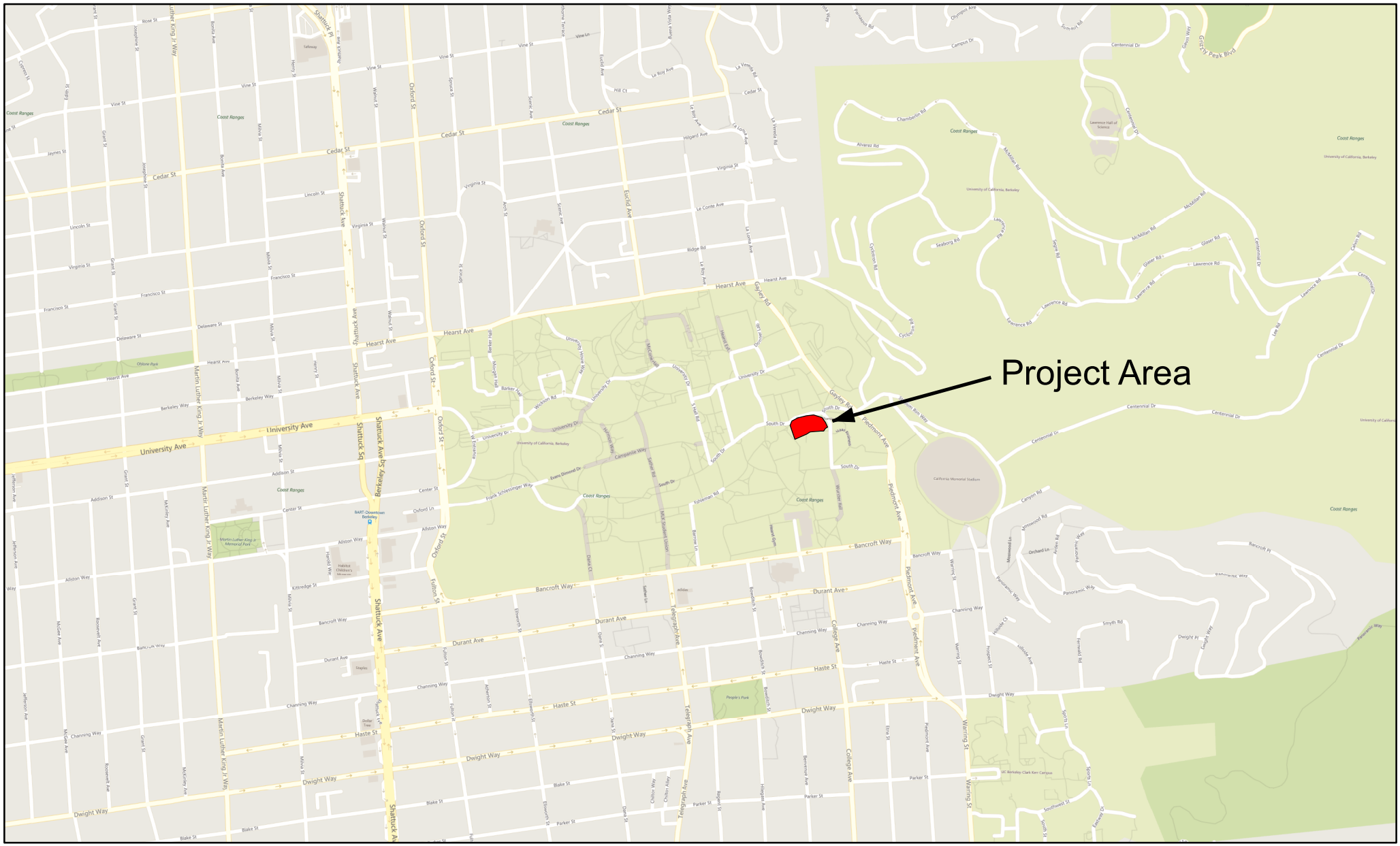
Ten photo-documentation points (PP) were established at the site prior to construction (**Figure 4**). Pre-construction photos were taken prior to construction activities and post-construction photos were taken just after the channel work, irrigation and planting were completed. Year 1 annual report photos were taken the one year after construction was completed (**Attachment C**).

IV. Conclusion

The Project is well on track to meet its permit-mandated conditions of percent cover and survival rates. The project has transformed a somewhat barren open space into a densely planted area with 30 species of native trees, shrubs, herbaceous perennials, and riparian plants. This site is already providing significant understory habitat and rich food sources for native fauna. Student interns for the Strawberry Creek Restoration Program developed a plant identification and propagation guide (**Attachment D**), focusing on the plants in this reach of the creek for the express purpose of using this area as plant stock for the student-run Native Plant Nursery.

Figures

Figure 1 - Project Area Map
Riparian Enhancement Project



Prepared by EH&S
September 2016 (AM)

Figure 2 - Site Map
Riparian Enhancement Project

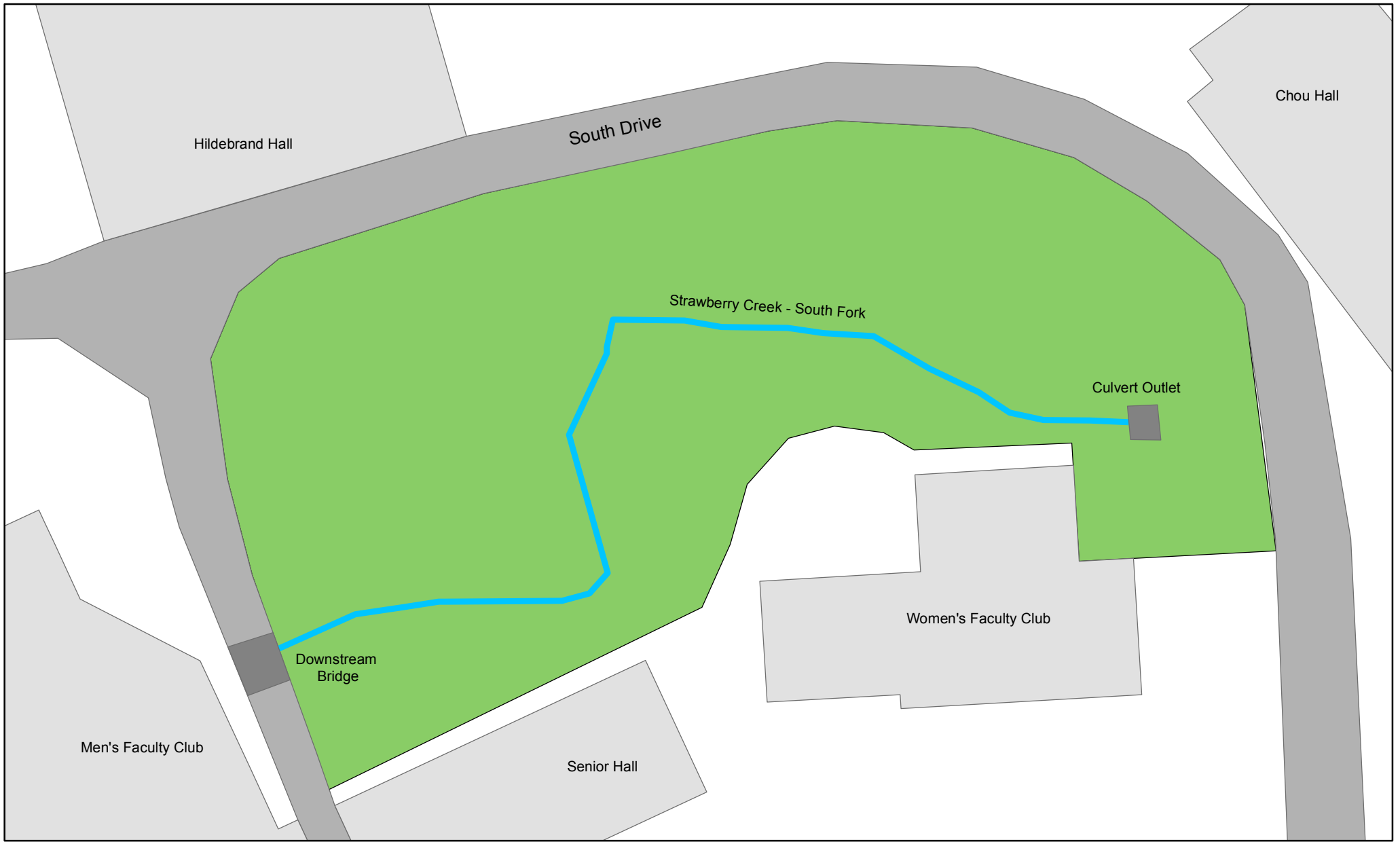
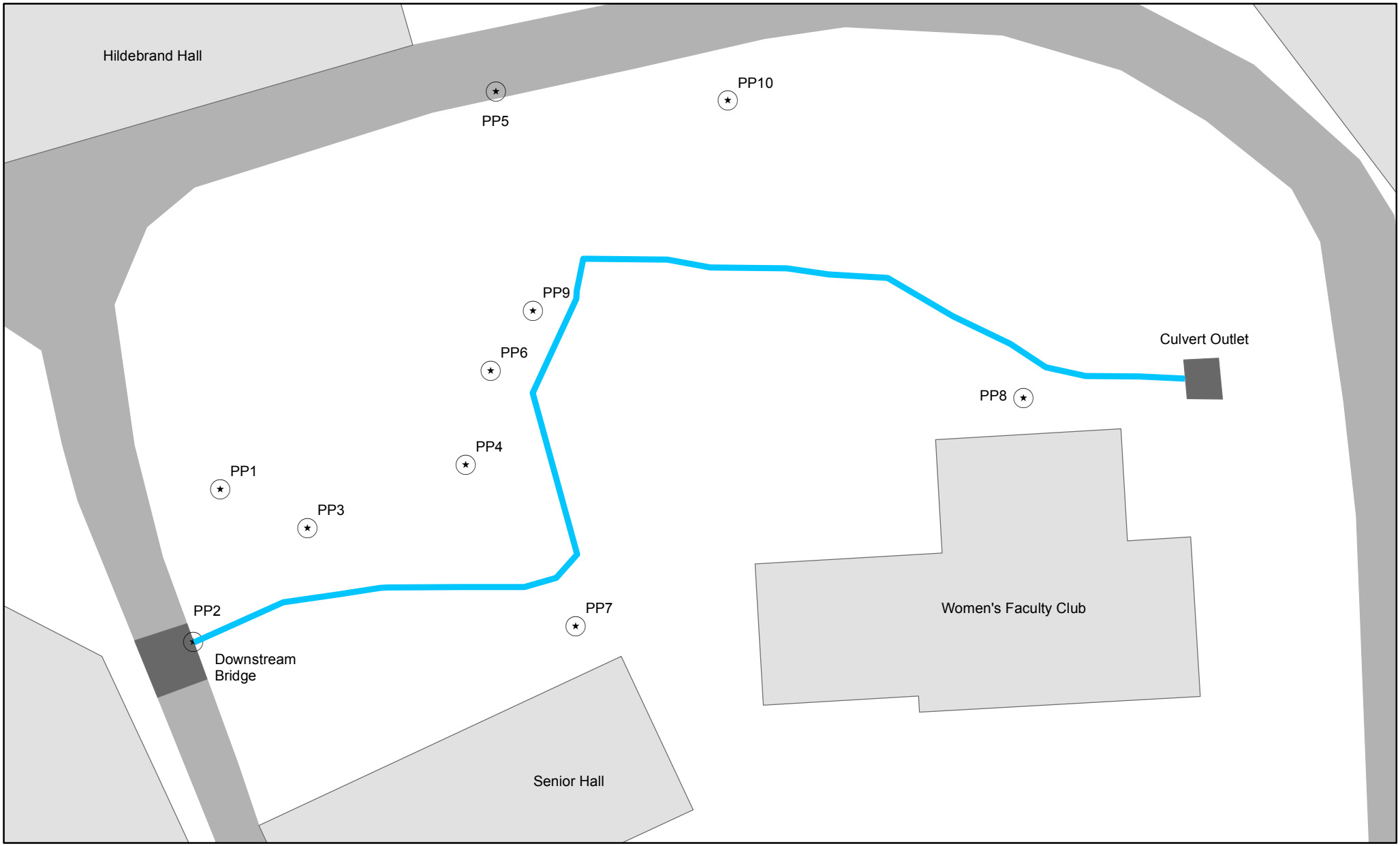


Figure 3 - Percent Cover Plot Locations
Riparian Enhancement Project

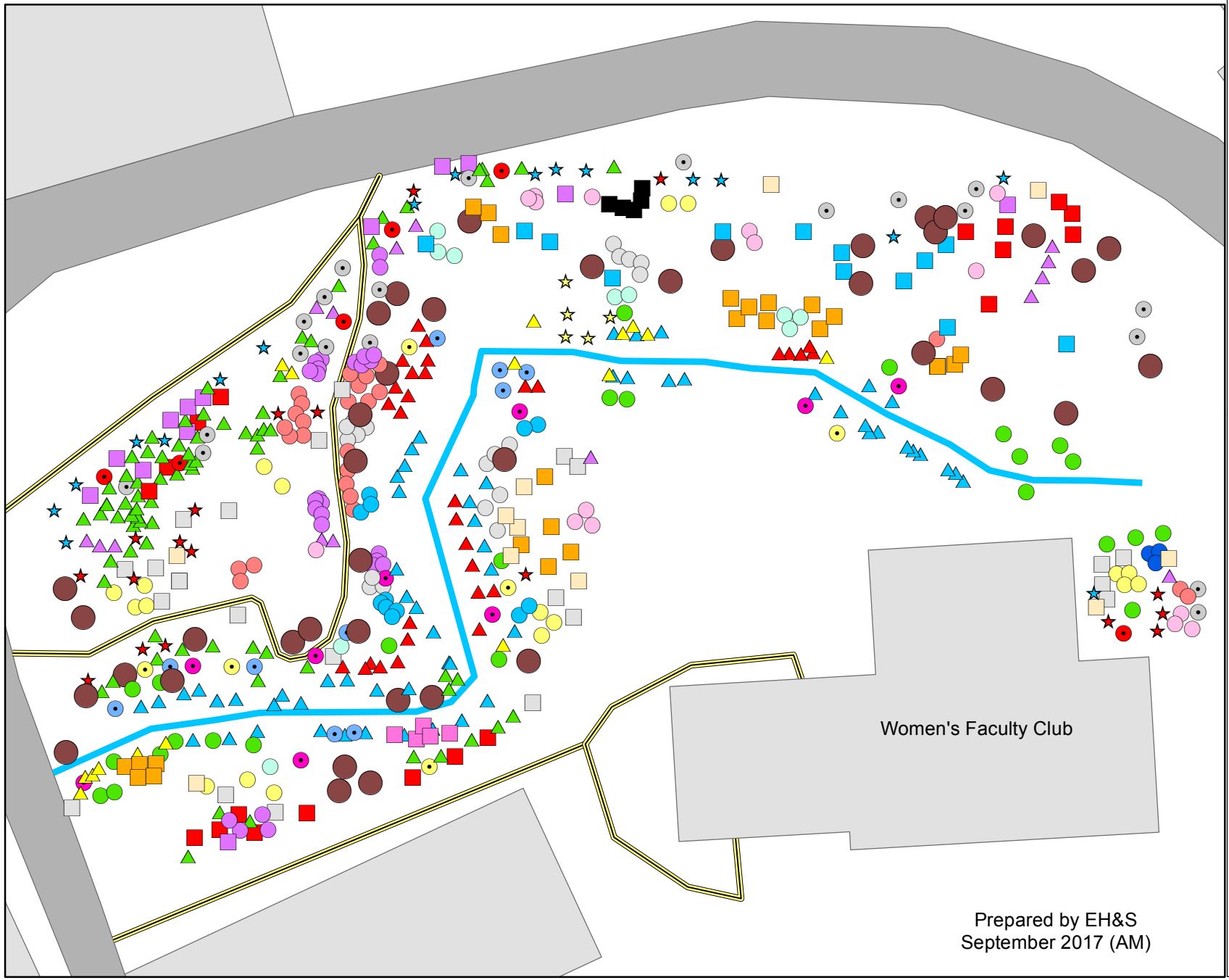
Prepared by EH&S
November 2017 (AM)

Figure 4 - Photo-Point Locations
Riparian Enhancement Project



Prepared by EH&S
November 2017 (AM)

Figure 5 - Plant Map with Legend
Riparian Enhancement Project



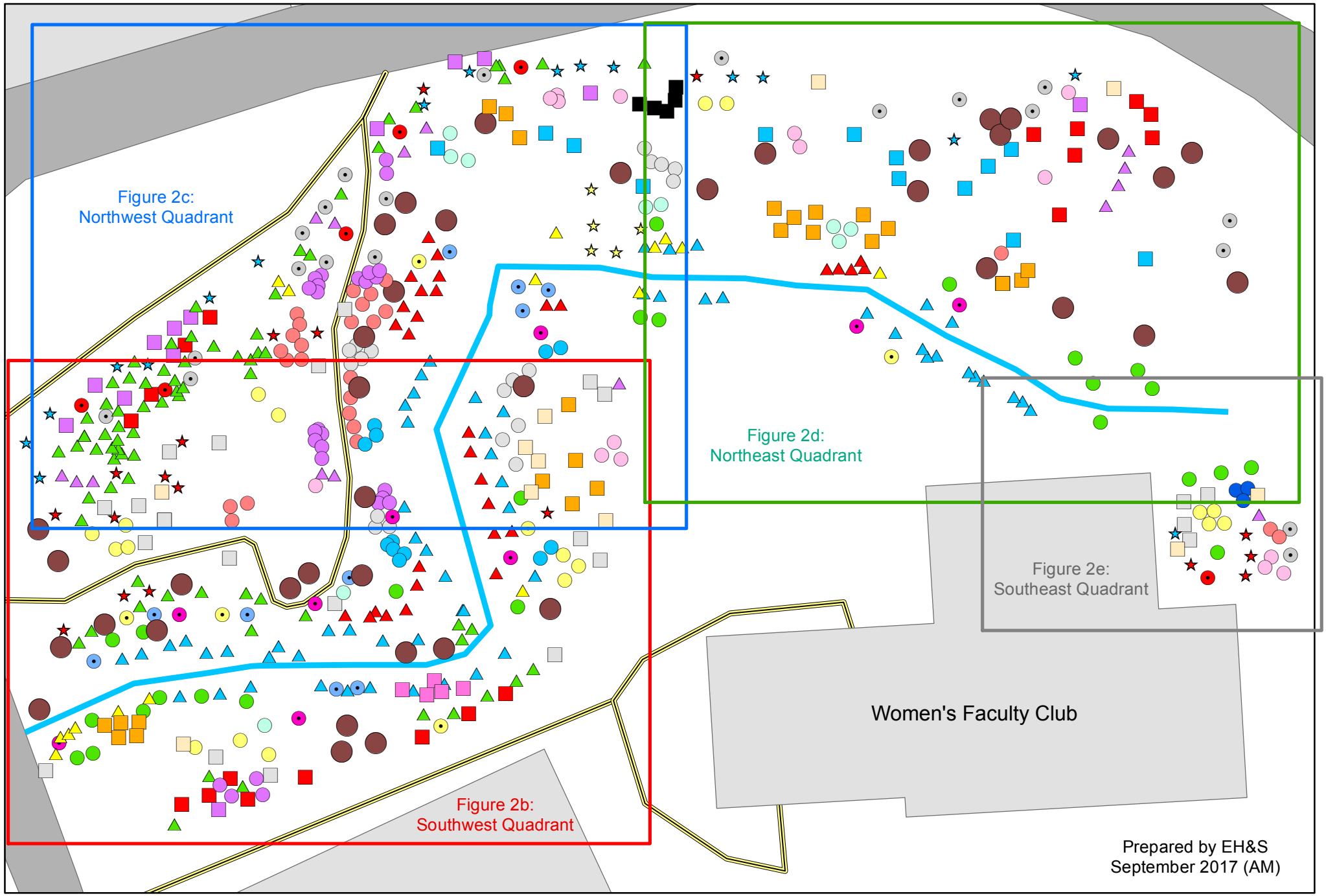
Legend

N

CODE

- Alum Root
- Bee Plant
- Big Leaf Maple
- Blackberry
- Buckeye
- Chain Fern
- Coffeeberry
- Cow Parsnip
- Creambush
- Dogwood
- Douglas Iris
- Elk Clover
- Existing Tree
- Flowering Currant
- Foothill Sedge
- Honeysuckle
- Huckleberry
- Juncus
- Monkeyflower
- Native Grass
- Nettles
- Rose
- Santa Barbara Sedge
- Snowberry
- Strawberry
- Thimbleberry
- Toyon
- Twinberry
- Wax Myrtle
- Wild Ginger
- Wild Lilac
- Creek Centerline
- Footpath
- road

Figure 5a: Quadrants Delineated
Riparian Enhancement Project



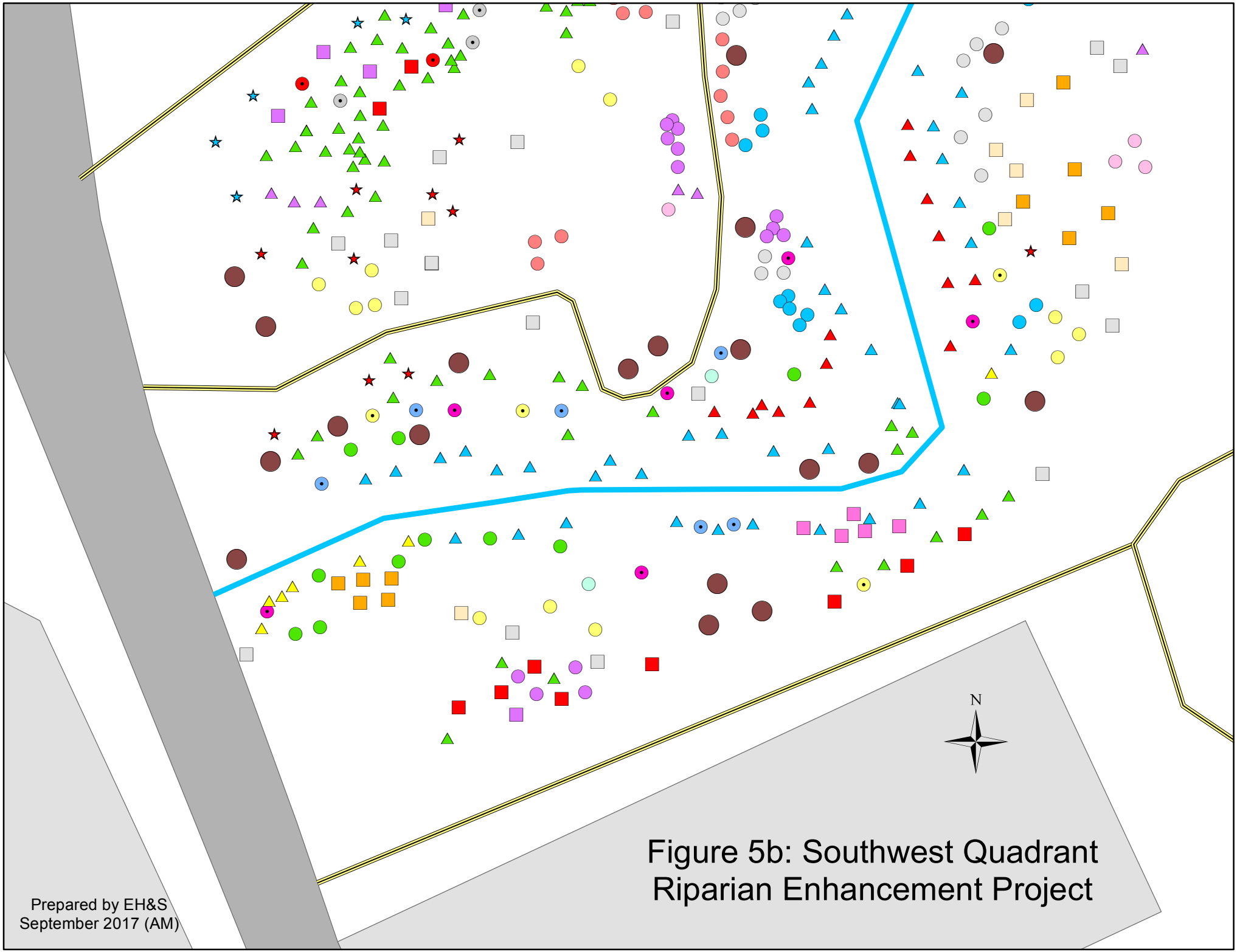


Figure 5b: Southwest Quadrant
Riparian Enhancement Project

Prepared by EH&S
September 2017 (AM)

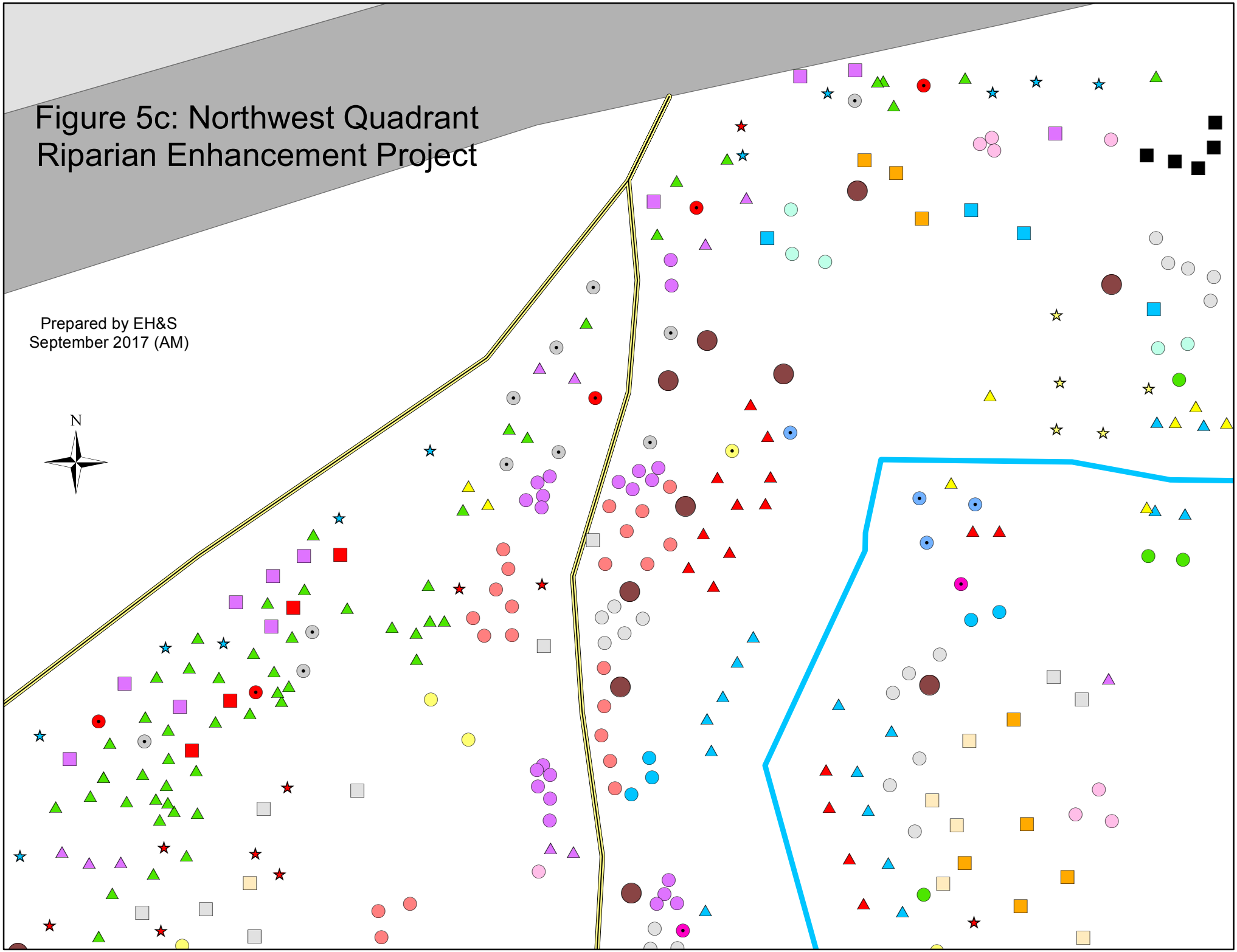


Figure 5c: Northwest Quadrant
Riparian Enhancement Project
Prepared by EH&S
September 2017 (AM)
N

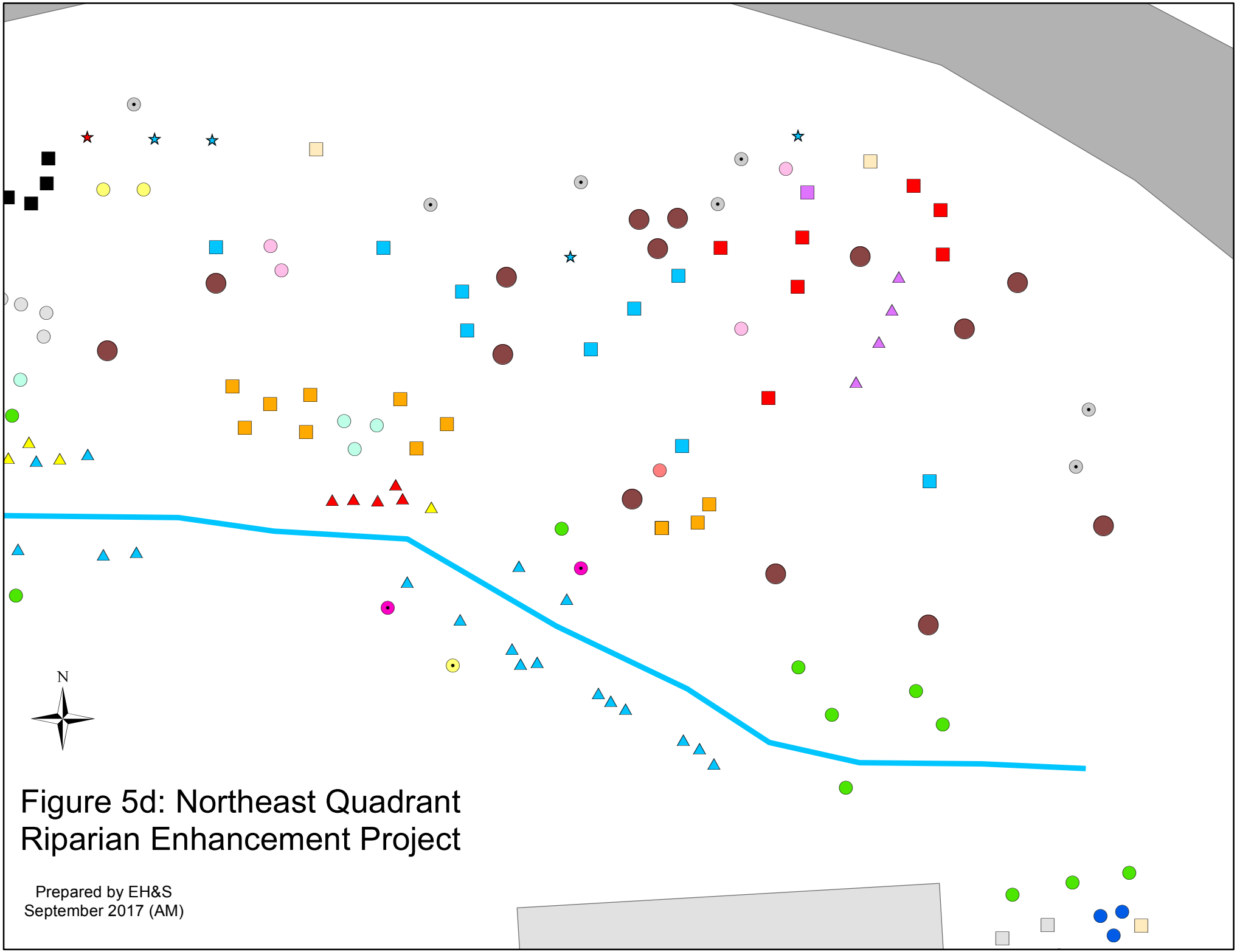
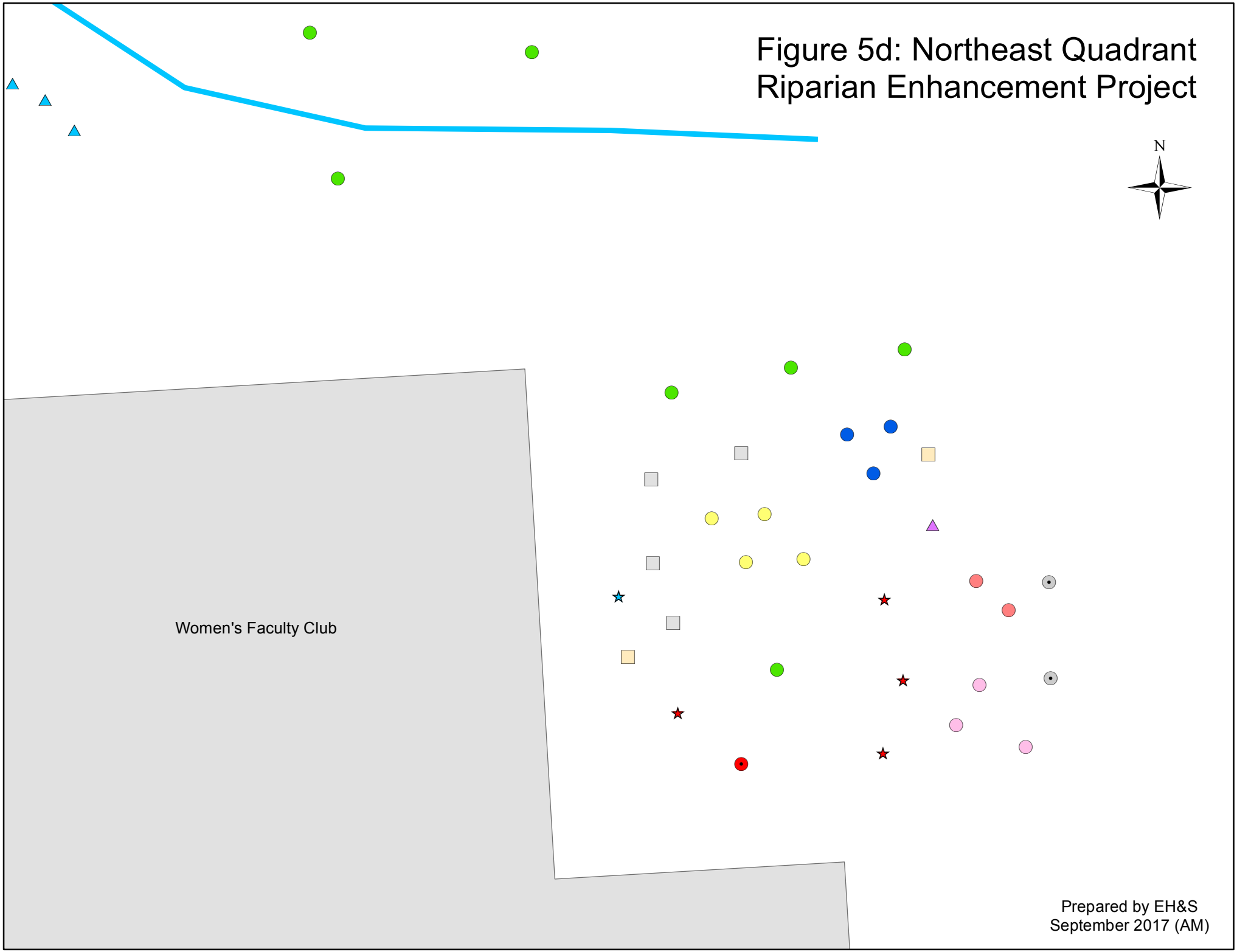


Figure 5d: Northeast Quadrant
Riparian Enhancement Project

Prepared by EH&S
September 2017 (AM)

Figure 5d: Northeast Quadrant Riparian Enhancement Project



Attachment A:

Water Quality Certification

August 1, 2014
Site No.: 02-01-C1181 (bkw)
ACOE File No. 2014-00051S
CIWQS Place ID No. 804886
CIWQS Reg. Meas. ID No. 395449

Sent via electronic mail: No hard copy to follow
University Of California Berkeley
Environment, Health & Safety, and Emergency Management
317 University Hall #1150
Berkeley, CA 94720

Attn.: Mark Freiberg (freiberg@berkeley.edu)

SUBJECT: Water Quality Certification for the University of California Berkeley Haas School Of Business Expansion Project in the City of Berkeley, Alameda County

Dear Mr. Freiberg:

San Francisco Bay Regional Water Quality Control Board (Water Board) staff has reviewed materials submitted by Environmental Science Associates (the Applicant's authorized agent) on behalf of the University of California Berkeley (UC Berkeley; the Applicant) for the University of California Berkeley Haas School of Business Expansion Project on the UC Berekley Campus, in the City of Berkeley in Alameda County (Project). The Project was authorized by the U.S. Army Corps of Engineers (ACOE) pursuant to Clean Water Act (CWA) Section 404 Nationwide Permit Number (NWP) No.12 (*Utility Line Activities*) on April 21, 2014. You have applied to the Water Board for CWA Section 401 water quality certification (Certification) verifying that the Project will not violate State water quality standards.

Project Description: The following Project description is derived from the application materials received by the Water Board on March 24, 2014, revised application materials received on June 13, 2014, and a May 7, 2014, meeting at the Water Board office. The Project purpose is to provide the Haas School of Business with expanded space necessary for its teaching and research functions. The Project includes moving Girton Hall from its current location to a new site in the Botanical Garden in Strawberry Canyon, relocating various utilities within the Project site, and constructing the North Addition to the existing Haas School complex on the current Girton Hall site. The Haas North Addition will provide a new, six-story, 73,185 gross square feet building to address the School's most critical space needs.

The Project is located in the City of Berkeley, Alameda County, on the UC Berkeley campus. The Project site is on the eastern edge of the Central Campus Park. The wedge-shaped site is bounded on the east side by Gayley Road/Piedmont Avenue, on the north by South Drive, on the west by College Way, and on the south by the existing buildings of the Haas School of Business

complex (See Figure 1 in Attachment A to this Certification). Figure 2 in Attachment A to this Certification shows the approximate boundary of the Strawberry Creek watershed and the approximate boundary of the Project site's watershed. The Project site consists of four features: Girton Hall, a 1911 wooden assembly hall constructed for the use of women students and converted into a campus childcare facility in 1970; the existing Haas School of Business; a mixed grove of coast live oak (*Quercus agrifolia*) and coast redwood (*Sequoia sempervirens*) trees; and a fenced, outdoor play yard associated with the child care center.

The south fork of Strawberry Creek originates in the Berkeley Hills east of the UC Berkeley campus and is a natural channel until it reaches an earthen detention basin located just west of the Lower Fire Trail access. An earthen dam within the detention basin controls flow and directs it into the Big Inch and Little Inch bypass culverts by means of a 48-inch by 42-inch hydraulically-operated slide gate. The bypass culverts were originally installed more than 50 years ago, to address flooding concerns. The Big Inch and Little Inch culverts pass under the Strawberry Canyon Recreation Area, California Memorial Stadium, Maxwell Family Field, Gayley Road, Girton Hall, and South Drive before the south fork of Strawberry Creek daylights outside of the Project site, just north of the Women's Faculty Club on the UC Berkeley Campus.

The Big Inch (Strawberry Creek culvert by-pass) and Little Inch (Strawberry Creek culvert) culverts, run east to west under the Project site. The Big Inch culvert, which is located north of the existing Haas Building complex and north of the existing Girton Hall, and the Little Inch culvert, which is located north of the existing Haas Building complex and south of the existing Girton Hall, tie into Strawberry Creek as part of the campus storm drain system (See Figure 3 in Attachment A to this Certification). The Big Inch culvert conveys upper watershed flows, and the Little Inch culvert drains the sub-watershed west of the Campus Fire Trail system entrance below the Botanical Garden. Big Inch is a 72-inch box culvert that is located approximately 7 feet below the existing ground surface, and Little Inch is a 42-inch box culvert that ranges between about 14 and 22 feet below ground surface across the site.

To construct the Haas North Addition, portions of the Big Inch and Little Inch culverts must be re-routed, because the existing culverts are located within the footprint of the lower portion of the new building (see Sheets C1.10 and C1.12 in Attachment A to this Certification). Geotechnical investigations and engineering studies indicated that seismic safety and the long term structural integrity of the building required the alignment of the existing culverts to be relocated outside the footprint and foundation of the new structure

Relocation of the Big Inch and Little Inch culverts will require excavation, temporary structural shoring, culvert construction, and back-fill. Standard excavation and construction equipment will be used for the Project. Re-routing of portions of the Big Inch and Little Inch culverts will include the creation of a new culvert alignment adjacent to each location, constructed "in the dry" and the installation of two by-pass structures (junction boxes; one upstream and one downstream) along each existing culvert, to re-route flows through the newly constructed alignments. After concrete in the new culverts has cured, water will be directed through the new culvert alignments and will no longer flow through the by-passed sections of culvert (see Sheet C7.3 in Attachment A to this Certification). The re-route will be implemented as follows:

1. Crews will walk up Little Inch and Big Inch culverts from a downstream entry point and bring sand bags up the culverts on dollies;

2. A sand bag dam will be built on the upstream end of each junction box and 8-inch diameter flexible pipe will be installed;
3. The downstream sand bag dam will be built at each junction box and the 8-inch diameter flexible pipe will be connect to this downstream dam;
4. The culverts will be broken into from above, at the junction boxes, and any debris/concrete between the two dams will be removed by buckets and a hoist from above;
5. Following water re-route into the new culverts, the old by-passed section of the Big Inch culvert will be almost entirely removed. Portions of the old by-passed culverts that directly conflict with the new building footprint will be removed, while portions that remain below the new building will be filled with slurry.

On the Big Inch culvert, two 270-square-foot by-pass structures will be installed, roughly below the eastern and western edges of the proposed Haas North Addition. A new segment of the Big Inch culvert will be installed in an arced alignment around the new Haas North Addition footprint, and will connect both the upstream and downstream by-pass structures, forming the new alignment (see Figure 4 and Sheet C13.4 in Attachment A to this Certification). The new, 92-linear foot arced culvert segment, which will be a 6-foot by 6-foot box culvert, will replace an approximately 66-linear foot segment of the existing Big Inch culvert.

For the Little Inch culvert, one 53-square-foot by-pass structure will be installed roughly below the western edge of the existing Haas building (on the downstream end), and one 108-square-foot by-pass structure will be installed roughly below the eastern edge of the proposed Haas North Addition (on the upstream end). The new Little Inch culvert segment will be installed in an alignment around the new building footprint and will connect to both the upstream and downstream by-pass structures (see Figure 4 and Sheet C7.2 in Attachment A to this Certification). The new, 166-linear foot re-routed culvert segment, which will be a 42-inch diameter reinforced concrete pipe (RCP), will replace an approximately 158-linear foot segment of the existing Little Inch culvert.

Impacts: Realignment of portions of the Big Inch and Little Inch culverts will impact about 1,350 square feet (0.03 acre) of waters of the State, extending along 300 linear feet of channel. Following Project completion, the re-routed segments will connect to the existing upstream and downstream reaches of the Big Inch and Little Inch culverts, and culvert capacities will not be affected. A geomorphic assessment, discussed below, concluded that the Project will not contribute to downstream channel destabilization in Strawberry Creek.

The beneficial uses of water bodies in the San Francisco Bay Area have been designated by the Water Board in the *Water Quality Control Plan for the San Francisco Bay Region* (Basin Plan). The beneficial uses provide the basis for determining appropriate water quality objectives that are needed to maintain the beneficial uses of these water bodies. The beneficial uses of Strawberry Creek are: warm freshwater habitat, wildlife habitat, water contact recreation, and noncontact water recreation. Potential impacts to beneficial uses are as follows:

- ***Warm Freshwater Habitat.*** Big Inch and Little Inch culverts within the Project site are fully lined underground concrete culverts that do not contain vegetation, and do not provide habitat for warm freshwater species. If these culverts were daylighted, they could provide habitat.

- ***Wildlife Habitat.*** Big Inch and Little Inch culverts within the project boundary do not currently contain wildlife habitat.
- ***Water Contact Recreation and Noncontact Water Recreation.*** The culverts within the project boundary are underground and inaccessible to the public, and therefore do not provide water contact recreation opportunities or noncontact water recreation opportunities in their current conditions. Strawberry Creek downstream of the project site provides aesthetic value to those walking within the UC Berkeley campus.

A total of 560 linear feet, corresponding to 0.059 acre, of waters of the State occur within the Big Inch and Little Inch culverts within the Project site. Big Inch culvert is 246 feet long (0.034 acre) and Little Inch Culvert is 314 linear feet long (0.025 acre). Table 1 summarizes waters of the State with the Project site. Figure 3 in Attachment A to this Certification shows the waters of the State at the Project site.

TABLE 1
WATERS OF THE STATE WITHIN THE PROJECT SITE

Feature type	Linear feet	Area (square feet)	Area (acres)
Waters of the U.S./Waters of the State			
Big Inch Culvert	246	1,476	0.034
Little Inch Culvert	314	1,099	0.025
Total	**560**	**2,575**	**0.059**

Project implementation will impact about 1,350 square feet (0.03 acre), extending along 300 linear feet, of waters of the State (See Table 2**)**. Figure 4 in Attachment A to this Certification shows the limits of impacts to waters of the State.

TABLE 2
IMPACTS TO WATERS OF THE STATE IN THE PROJECT SITE

Feature Type	Project Component	Impact	Impact (linear feet)
Waters of the U.S./Waters of the State			
Big Inch	New Haas North Addition	720 sq. ft. (0.02 acre)	120
Little Inch	New Haas North Addition	630 sq. ft. (0.01 acre)	180
Total		**1,350 (0.03 acre)**	**300**

The Project design team reviewed alternatives to the Project, including alternatives that daylighted a portion of Strawberry Creek within one of the two culverts. However, since the existing culverts are located between 15 feet and 26 feet below the surface, daylighting of the culverts would significantly reduce the available area for the Haas North Addition.

The Project design team analyzed an alternative that included daylighting the Little Inch culvert with 1.5:1 bank slopes. The alternative design that UC Berkeley analyzed is shown in the construction drawings in Attachment B to this Certification. *Figure 1: Daylighting Project Alternative* in Attachment B to this Certification shows the daylighting project alternative with the existing Haas Business Building, daylighted channel, utility corridor, 20-foot setback, and remaining developable area. *Figure 2: Existing Utility Lines* in Attachment B to this Certification shows the existing utility lines. Conceptual cross sections at the upstream and downstream end of the potential daylighted section are shown in the Figure entitled *Conceptual cross sections for Little Inch daylighted channel assuming 1.5:1 side slopes and 12 foot setback at top of bank.* As shown in the cross-section figure, with a 1.5:1 slope, the daylighted creek would range from a top of bank width of 50.8 feet at the downstream end to 88 feet at the upstream end. After a 12-foot top of bank setback is added to both sides of the creek to allow a safe distance between the building and creek, the creek width (including setbacks) would range between 74.8 feet and 112 feet wide. The daylighted portion would be about 280 linear feet and would extend from the upstream end at a new culvert under Girton Hall Road to the downstream end at a new culvert under College Avenue (the new culverts would be needed to direct flows away from the existing Haas Business building). Several existing utility lines (Telecom Duct, Sanitary Sewer, Fire Alarm, Fire Service, Gas, and Storm Drainage) that are currently located in the potential daylighted footprint would need to be rerouted into an approximately 30-foot wide utility corridor located between the daylighted culvert and the existing Haas Business School building. With this culvert daylighting scenario, a 4,000-square-foot area would remain at the Project site that could be developed, while the Haas North Addition building requires a developable area of 12,442 square feet in order to meet the Project objectives. Additionally, the re-routing of subsurface utility lines from the daylighted area would add an extra cost of about $15 million to the Project. Therefore, Water Board staff concurs that the current Project is the least environmentally damaging practical alternative for achieving the Project's goals.

The Applicant's agent evaluated the Project's potential impacts on the geomorphic stability of Strawberry Creek in the *Geomorphic Investigation of Little and Big Inch Culvert Modifications and Potential Effects on Strawberry Creek* (Dr. Andrew Collison, Fluvial Team Director, and Carlos Diaz, Hydraulic Engineer, Environmental Science Associates, March 13, 2014). The geomorphic investigation reached the following conclusions:

- Based on modeling of pre- and post-Project velocities in the culverts, the Project is unlikely to change existing geomorphic or sediment management conditions at the inlet of the Big Inch and Little Inch culverts, and the Project is not expected to result in increased sedimentation at the culvert inlets.
- The Project should maintain existing high levels of sediment conveyance within the culverts, because the modeled velocities are significantly higher than 3 three feet per second, which is the minimum velocity allowed by the Alameda County Flood Control District for flow in an enclosed culvert[1].

[1] *Hydrology and Hydraulics Criteria Summary for Western Alameda County* (Alameda County Public Works Agency, Revised August 7, 1989), Section 2.7.

- Based on modeling of pre- and post-Project velocities in the culverts, there will be a 13 percent reduction in velocity at the discharge point of the Little Inch culvert into Strawberry Creek.
- Based on modeling of pre- and post-Project velocities in the culverts, flow velocity will not increase at the point where the Big Inch culvert discharges into Strawberry Creek, and therefore there should be no increase in erosion. At the discharge point from the culverts, Strawberry Creek has a mix of hardened and un-hardened reaches, with extensive grade control structures incorporated into the channel bed.

Mitigation: The Project results in permanent impacts to waters of the State, by eliminating opportunities to restore the culverted segments of Strawberry Creek to viable habitat for the useful lifetime of the new building. The existing segments of the Big Inch and Little Inch culverts located within the project area are fully enclosed in concrete-lined culverts beneath the ground. If these segments were daylighted, they would be able to support warm freshwater habitat, wildlife habitat, non-contact water recreation, and contact water recreation. In addition, the interaction of sunlight with vegetation and fauna in the creek channel would provide enhanced pollutant removal through filtration, enhanced pollutant removal through bio-chemical reactions, and nutrient cycling within the creek channel.

Converting the existing culverts into open channels at the project site in order to enhance beneficial uses is impractical for the Project because of the physical site constraints discussed above. Therefore, the Project is providing mitigation for the deferred opportunity to enhance beneficial uses at the Project site with two creek improvement projects in the Strawberry Creek watershed on the UC Berkeley campus.

- Riparian vegetation enhancement at the Women's Faculty Club reach of Strawberry Creek.
- Strawberry Creek Ecological Stabilization Project in the North Fork of Strawberry Creek

Riparian Vegetation Enhancement at the Women's Faculty Club Reach of Strawberry Creek (Riparian Enhancement Project)

About 30 feet west of the Project's fence line, the Little Inch culvert discharges into a drop pool and flows in a meandering open channel under mature redwood and live oak over-story. See the Figure, *Attachment A: Project Site Map*, in Attachment C to this Certification for a site map of the Riparian Enhancement Project. Over the years, several highly invasive species of non-native vines have dominated the forest floor and creek banks along this section of the Strawberry Creek South Fork. Two of these species, Algerian Ivy (*Helix hedera*) and Small leaf spiderwort (*Tradescantia fluminensis*), can suppress plant and animal biodiversity by virtually blanketing the riparian zone (and in the case of the ivy, climbing up tree trunks to seek sunlight for photosynthesis), retarding germination of native seed stock, competing with remnant native plants for soil moisture and nutrients, and providing a poor basis for the food web that existed prior to the introduction of these vining species.

From 2009 to 2011, student volunteers, working as part of the 27-year old Strawberry Creek Restoration Program and under direction from staff in the UC Berkeley Office of Environment, Health and Safety (EH&S - Environmental Protection Group), removed much of the ivy and spiderwort present in the Riparian Enhancement Project reach and planted several native species in the cleared riparian zone. However, the student volunteers lacked funds to obtain sufficient

numbers of plants to achieve recommended planting densities for an effective restoration of a native plant community food web. See *Attachment B: Propose Restoration Site Photos*, in Attachment C to this Certification for a series of current site photos.

The mitigation project at this reach will consist of removing any remnant or newly sprouted ivy and spiderwort and then extensively planting the creek banks from the wetted edge of the creek to the outer drip line of the riparian tree grove established along this reach of Strawberry Creek. This Riparian Enhancement Project area has a surface area of about 35,000 square feet (0.80 acres), extending along 350 linear feet of creek channel. The native planting palette will include appropriate species for the location and will be planted to a density that will provide optimal habitat and water quality function. Irrigation will be installed to help establish plants during the first 2 to 3 years after planting. Once plants are established, summer irrigation water should not be necessary. The Riparian Enhancement Project should enhance the Beneficial Uses of wildlife habitat and non-contact water recreation at the mitigation project site.

Revegetation of the banks will consist of native plants installed as either plugs or container plants. Plug plantings will occur in random naturalistic clusters with an average plant spacing of 18-inches on center. Container plantings will be grouped in clusters of 2 to 6 plants to create a naturalistic mosaic of woody patches and open areas. Local and seasonal availability of plants will determine the final planting palette. Plantings may include, but are not limited to, the native plants listed in Table 3.

Table 3: Potential Revegetation Species at the Riparian Enhancement Project

Planting Location	Native Plant Species
Wetted bank	sedge, horsetail, rush
Middle bank	western sword fern, wild ginger, Douglas iris, California honeysuckle, black twinberry, thimbleberry, California rose, strawberry, California snowberry
Upper bank	alum root, western redbud, toyon, flowering currant

The following success criteria will be used to evaluate the performance of the Riparian Enhancement Project:

- Native cover at the site (including installed native species and recruited native species) should achieve a cover of at least 50 percent by the end of the initial 5-year monitoring period;
- Shrub and tree plantings shall achieve at least 80 percent survival by the end of the initial 5-year monitoring period, and;
- Invasive plant species[2] shall not make up more than 10 percent cover of the mitigation project area during each monitoring year.

[2] Invasive species include those listed as “high” or “moderate” on the California Invasive Plant Council’s California Invasive Plant Inventory (http://www.cal-ipc.org/paf/).

Annual Monitoring. Monitoring shall be conducted at the Riparian Enhancement Project site for a period of 5 years to document the success of the native riparian plantings. Monitoring shall be conducted in Years 1 through 5, during the late spring or summer when plants will be fully leafed-out, actively growing, and easily identifiable.

Vegetation Assessment. Native plantings shall be visually assessed each monitoring year to determine the plantings general health and vigor. Evidence of stress from inadequate water, disease, wildlife browsing, invasive species cover, or other factors shall be qualitatively described in annual monitoring reports submitted to the Water Board.

Percent Cover of Vegetation. The percent cover of native vegetation (including installed native species and recruited native species) and the percent cover of invasive species within the revegetation planting area shall be visually estimated. Invasive species include those listed as "high" or "moderate" on the California Invasive Plant Council's California Invasive Plant Inventory Database.

Plant Survival. Survival of installed shrubs and trees shall be documented annually, and assessed as a percentage of the total shrubs and trees installed in the restoration area. Shrubs and trees that were installed and volunteers will be counted toward the survival criterion of 80 percent at the end of year 5.

Photo-documentation. 8 photo-documentation points shall be established throughout the restoration site at the time of the South Fork Restoration Project implementation. Photos shall be taken at these points just prior to project implementation, immediately following project implementation, and during annual monitoring to document changes in vegetation cover over time. Photos from each monitoring event can be qualitatively compared with the baseline conditions and previous years.

*Reporting***.** Annual monitoring reports shall be submitted to the Water Board by January 31 following each monitoring year, for a minimum of five years. Annual reports shall include, at a minimum, the following information:

- A summary description of the monitoring methods, including data collection and analysis;
- An overview of the restoration effort, including a general discussion of site conditions, changes in site conditions since the previous report, and quantitative and qualitative comparisons of vegetation between monitoring years;
- An analysis of success in relation to performance standards;
- Color photographs of the revegetation areas taken from the photo-documentation points, and;
- A discussion of any corrective actions needed or undertaken (including weed control, replanting, or erosion control measures).

Strawberry Creek Ecological Stabilization Project in the North Fork of Strawberry Creek (North Fork Mitigation Project).

The Strawberry Creek Ecological Stabilization Project (North Fork Mitigation Project) is a student-initiated creek restoration effort to improve habitat for native fish and other aquatic

species by replacing concrete grade control structures with bio-engineered grade control structures and reducing bank erosion by laying back banks to stable slopes and planting the banks with native vegetation. The Project site is located in the Stawberry Creek watershed on the west side of the University of California, Berkeley campus (Latitude 37.871500; Longitude -122.26454) (See Sheet C.1 in Attachment D to this Certification). The drainage area upstream of the Project site encompasses approximately 1,147 acres (1.8 square miles).

The North Fork Mitigation Project will use bio-engineered grade control structures to introduce pool and riffle habitat for fish species into the creek channel, re-connect disconnected fish habitat by removing an impassible check dam, and reduce the amount of erosion along the stream banks. Implementation of the North Fork Mitigation Project is part of a long-term conservation goal to protect and enhance habitat for native riparian species, including three native fish species, the Sacramento sucker, the three-spined stickleback, and the California roach minnow. Implementation of the mitigation project will enhance the beneficial use of Warm Freshwater Habitat that is designated for Strawberry Creek in the Basin Plan.

The North Fork Mitigation Project site extends from the confluence of the North and South Forks of Strawberry Creek to 80 feet up the North Fork of Strawberry Creek. At the upstream end of the mitigation reach, flow enters the open channel via a 3.5-foot diameter culvert (Station 2+25). There are four grade control structures in vicinity of the work area (See Sheet C3 in Attachment D to this Certification):

1. Station 0+45. Just downstream of the confluence, an existing grade control is almost flush with the channel thalweg, with no signs of deterioration.

2. Station 0+65 A failed grade control structure (referenced as CD1), located just upstream of the confluence, with associated concrete debris in the creek.

3. Station 1+00. A failing grade control structure (referenced as CD2).

4. Station 1+45 An existing grade control structure with no signs of deterioration is located at this station.

CD1 is a decades-old check dam constructed on the north fork of Strawberry Creek, located immediately upstream of the confluence of the north and south forks. The failure of this check dam in 2002 caused the main concrete body of the dam to orient stream-wise in the center of the channel (See Photos 1 and 2 in Attachment D to this Certification). Additionally, remnants of CD1 deflect flow into the right bank at the confluence, causing the creation of a near vertical 6-foot tall scarp (See Photo 3 in Attachment D to this Certification). The failure of CD1 has caused the channel bed to incise upstream, undermining CD2 which is located 35 feet upstream of CD1 (See Photo 4 in Attachment D to this Certification). CD2 is at risk of failure due to undercutting of the support structure on the right bank (left side of Photo 4) and due to water piping through the dam.

The North Fork Mitigation Project will remove the remnants of CD1 and the failing check dam CD2. The failed check dams will be replaced with three bio-engineered grade control structures, two step-pool structures and one log drop structure. The step pools will be constructed of ungrouted rock and will be flexible to adjust to modest changes in channel conditions. Installing the bioengineered grade control structures and laying back over-steepened creek banks will

impact a total of 80 linear feet of channel bed and about 1600 square feet (0.037 acre) of channel and bank area.

The bio-engineered step-pool structures will consist of a crest, a cascading drop, and a pool feature that transitions into the channel design grade. Each step-pool structure will extend about 15 feet along the channel thallweg. The crests (measured at the low flow channel) will range from 5 to 8 feet wide, and will be keyed 4 to 5 feet into the adjacent channel banks to provide protection against flanking in larger storm events. Each rock structure will have a drop of about 1.5 feet (See Sheets C3, C4, and C5 in Attachment D to this Certification). A log grade control structure will be constructed at Station 1+15. A channel-spanning log, about 20 feet long, will be keyed into each bank a minimum of 2 feet. The total change in grade across the structure will be 1.0 foot. A 0.5-foot deep, rock-armored pool will be constructed immediately downstream of the log to dissipate energy.

Construction will include removing two concrete check dams (CD1 and CD2), excavating and removing material to achieve subgrade channel conditions and stable bank slopes, and placing rock fill and logs to achieve design elevations for the three bio-engineered grade control structures. 60 tons of concrete will be removed from the channel and 140 tons of sediment will be removed to achieve subgrade channel conditions and establish stable slopes for the creek banks. Following minor over-excavation and laying back of channel slopes to create a stable channel structure, about 120 tons of rock, ranging from cobbles to 1-ton boulders, will be placed in the channel to create the three bioengineered grade control structures. The mitigation project will still result in a net removal of material form the channel bed and banks (See Table 4).

Table 4. North Fork Mitigation Project, Fill and Removal Quantities			
Location on Stabilization Reach	**Activitiy**	**Fill and Excavation**	**Impact Area**
Station 0+65 to Station 1+00.	Remove failed check dam CD1 and failing check dam CD2.	Remove 30 CY concrete (60 tons).	30 LF 900 SF (0.02 acres)
Station 0+65 to Station 1+15.	Remove material to achieve subgrade channel conditions and stable bank slopes.	Remove 130 CY of channel and bank material (140 tons)	60 LF 1000 square feet (0.023 acres)
Station 0+65 to Station 0+95.	Construct two rock step pools.	Place 80 CY rock ranging from cobbles to 1-ton boulders (120 tons).	30 LF 500 square feet (0.011 acres)
Station 1+15.	Construct one log weir.	2 Logs spanning channel width and anchored into banks. 4.5 CY (2 tons)	15 LF 75 square feet (0.0017 acres)
Net Fill		Remove 75.5 CY (78 tons)	

CY = cubic yards; LF = linear feet

In addition to the installation of the bio-engineered grade control structures, steep adjacent creek banks will be laid back to a stable slope and planted with native vegetation. The creek banks will be revegetated with of native plants as plugs and container plants. Plug plantings will occur in random naturalistic clusters, with an average plant spacing of 18 inches on center. Container plantings will be grouped in clusters of 2 to 6 plants o create a naturualistic mosaic of woody patches and open areas. (See Sheet C6 in Attachment D to this Certification). A preliminary list of plantings is included in Table 5, the As-Built Report will include plant list and density actually implemented.

Table 5: Proposed Revegetation Species for the North Fork Mitigation Project

Common Name	Scientific Name	Container Size	Spacing OC(ft)
Maidenhair fern	*Adiantum jordanii*	Gallon	2
Western Wild Ginger	*Asarum caudatum*	Gallon	4
Torrent Sedge	*Carex nudata*	Plug	5
Alum Root	*Heuchera micrantha*	Gallon	2
Douglas Iris	*Iris douglasiana*	Gallon	4
Common Rush	*Juncus effusus*	Super Stubby (L6)	3
California Honeysuckle	*Lonicera hispidula*	Gallon	8
Black Twinberry	*Lonicera involucrata*	Tree pot 4	15
Wild Strawberry	*Fragaria californica*	Gallon	1
Western Swordfern	*Polystichum munitum*	5 Gallon	2
California Rose	*Rosa californica*	Tree pot 4	6-8
California Snowberry	*Symphoricarpos albus*	Gallon	5
Big Leaf Maple	*Acer macrophyllum*	Tree pot 4	18

OC = on center; ft = foot

Work in the channel will be conducted during the late summer dry season (September to October). It is anticipated that the mitigation project will be completed within three weeks. Prior to construction, fish (Sacramento Sucker, California Roach Minnow, Three Spined Stickleback) will be relocated downstream of the project site, after their spawning cycle is finished in early July. Flow in the creek will be diverted around the mitigation project reach with a coffer dam and a submersible pump. Details of the proposed dewatering plan are provided in the Figure, *Water Control System Suggested Layout Plan*, in Attachment D to this Certification.

The North Fork Mitigation Project site has significant riparian canopy on the channel's right bank, and an established Blue Gum Eucalyptus grove on the left bank. The shady nature of the site and the allelopathic effects of the Eucalyptus are expected to be challenges to the survivorship of plantings. Plantings will occur on the channel left bank (under the Eucalyptus) and on the right bank, however survivorship and cover will not be used to assess mitigation project success on the left bank, because of the influence of the existing Eucalyptus on vegetation. The following success criteria shall be used to evaluate the performance of the North Fork Mitigation Project:

- The Project reach (Station 0+45 to Station 1+45) will not show evidence of excessive channel destabilization, erosion, scour within the channel, bank undercutting, bank slumping, or rilling on the banks, and the grade control structures at Station 0+45 and Station 1+45 should remain at grade in the channel bed;
- Cover by native plant species on the channel right bank, including installed native species and recruited native species, should achieve be least 50 percent by the end of the initial 10-year monitoring period, and;

- Invasive plant species[3] shall not make up more than 10 percent cover of the mitigation project area during each monitoring year.

Annual Monitoring. Monitoring shall be conducted at the North Fork Mitigation Project site for a period of 10 years, to document post-construction stability of the bio-engineered structures and the success of the native riparian plantings. Monitoring shall be conducted in Years 1 through 5, 7, 9, and 10. Monitoring shall be conducted during the late spring or summer when plants will be fully leafed-out, actively growing, and easily identifiable.

Channel Stability. The mitigation site shall be visually assessed each monitoring year to determine the integrity of the rock step pools and log drop structure. Evidence of destabilization, erosion, or scour within, or downstream of, the stabilization site shall be qualitatively described in annual monitoring reports submitted to the Water Board.

Vegetation Assessment. Riparian plantings shall be visually assessed each monitoring year to determine the general health and vigor of the plantings. Evidence of stress from inadequate water, disease, wildlife browsing, invasive species cover, or other factors shall be qualitatively described in annual monitoring reports submitted to the Water Board.

Percent Cover of Vegetation. The percent cover of native vegetation (including installed native species and recruited native species) and the percent cover of invasive species within the revegetation planting area shall be visually estimated. Invasive species include those listed as "high" or "moderate" on the California Invasive Plant Council's California Invasive Plant Inventory Database.

Plant Survival. Survival of installed shrubs and trees shall be documented annually, and assessed as a percentage of the total shrubs and trees installed in the restoration area. Shrubs and trees that were installed and volunteers will be counted toward the survival criterion of 70 percent at the end of year five.

Photo-documentation. Six permanent photo-documentation points shall be established throughout the stabilization mitigation site prior to implementing the mitigation project. Photos shall be taken at these points just prior to project implementation, immediately following project implementation, and during annual monitoring to document changes in channel stability and vegetation cover over time. Photos from each monitoring event can be qualitatively compared with the baseline conditions and previous years.

*Reporting***.** Annual monitoring reports shall be submitted to the Water Board by January 31 following each monitoring year. Annual reports will include, at a minimum, the following information:

- A summary description of the monitoring methods, including data collection and analysis;
- An overview of the restoration effort, including a general discussion of site conditions, changes in site conditions since the previous report, and quantitative and qualitative comparisons of vegetation and channel stability between previous monitoring years;

[3] Invasive species include those listed as "high" or "moderate" on the California Invasive Plant Council's California Invasive Plant Inventory (http://www.cal-ipc.org/paf/).

- An analysis of success in relation to performance standards;
- Color photographs of the revegetation areas taken from the photo-documentation points, and;
- A discussion of any corrective actions needed or undertaken (including weed control, replanting, or erosion control measures).

Minimization Measures. To minimize potential impacts to waters of the State downstream of the Project site, the Applicant has developed the *East Campus Utility Improvements, University of California, Storm Water Pollution Prevention Plan* (SWPPP) (Ranger Pipelines, 2013). Since the Project will disturb less than one acre of soil, a Notice of Intent was not filed with the Water Board. However, the SWPPP was prepared, by a Qualified SWPPP Developer, consistent with the Water Board's General Construction Permit SWPPP requirements. The SWPPP identifies potential sources of pollution and describes best management practices (BMPs) the discharger is using to protect stormwater runoff and the placement of those BMPs. BMPs are measures that are undertaken to control degradation of surface water by preventing soil erosion or the discharge of pollutants from the construction area.

EcoAtlas: The Water Board tracks routine riparian repair and creek maintenance projects in an effort to detect potential systemic instabilities and document project performance in the creeks of the Bay Area. As such, the Applicant is required to submit a Riparian Repair and Maintenance (short) Form for the North Fork Mitigation Project, describing project size, type, and performance measures. An electronic copy of the short form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml.

Project information will be made available at the web link: http://ecoatlas.org.

CEQA: Components of the Project that impact waters of the State were reviewed in conformance with the requirements of the California Environmental Quality Act (CEQA) in the context of two projects at the UC Berkeley Campus; the East Campus Utility Improvement Project and the UC Berkeley Long Range Development Plan.

The University determined in August 2013 that the East Campus Utility Improvement Project (Utility Project) qualified for a CEQA class 2 categorical exemption because the Utility Project will result in new structures located on the same site as the structures replaced and will have the same purpose and capacity as the structures replaced (14 CCR § 15302). Class 2 exemptions are specifically allowed for "replacement or reconstruction of existing utility systems and/or facilities involving negligible or no expansion of capacity" (14 CCR § 15302(c)). The Utility Project consists of the replacement or reconstruction of existing utility systems. In addition, none of the exceptions to the categorical exemptions applies (i.e., the project location is not in a particularly sensitive environment; there is no significant individual or cumulative CEQA effect of the project; there will be no damage to scenic highways or historical resources; and the project is not located on a hazardous waste site (14 CCR § 15300.2)). As part of the Utility Project, the University planned to move one portion of the Little Inch Culvert, described in the categorical exemption documentation as the "storm sewer culvert." Within this categorical exemption determination, the University highlighted potentially applicable mitigation measures from the campus's Long Range Development Plan, including a measure that requires the University to coordinate with the US Army Corps of Engineers and the Water Board for any modifications to

Strawberry Creek. UC Berkeley recorded a Notice of Exemption for the Utility Project on August 1, 2013.

Around the same time as the Utility Project's CEQA review, the University prepared Addendum No. 10 to the UC Berkeley Long Range Development Plan EIR for construction of the Haas North Addition Project and the movement of Girton Hall (State Clearinghouse No. 2003082131). This addendum referenced the CEQA review for the Utility Project, including consideration of the Little Inch Culvert realignment. In finalizing the building's design after CEQA review, the University discovered that the Big Inch Culvert also requires realignment. While this does represent a change in the details of the project, it does not necessitate any additional CEQA review. Additional review is required only where: a new significant adverse impact (from the CEQA perspective) might occur; a substantial increase in the severity of a previously identified significant impact might take place; or the project proponent declines to adopt mitigation measures that would substantially reduce a significant effect of the project (14 CCR § 15162(a)). The realignment of Big Inch Culvert will not contribute to other previously identified significant impacts under CEQA, because the new culvert alignment will retain baseline conditions, and CEQA measures impacts from baseline conditions. UC Berkeley filed a Notice of Determination for Addendum No. 10 with the State Clearinghouse on September 16, 2013.

Certification: I hereby issue an order certifying that any discharge from the referenced Project will comply with the applicable provisions of Sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 303 (Water Quality Standards and Implementation Plans), 306 (National Standards of Performance), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act, and with other applicable requirements of State law. This discharge is also regulated under State Water Resources Control Board Order No. 2003- 0017-DWQ, "General Waste Discharge Requirements for Dredge and Fill Discharges That Have Received State Water Quality Certification", which require compliance with all conditions of this Water Quality Certification. The following conditions are associated with this certification:

1. No debris, rubbish, creosote-treated wood, soil, silt, sand, cement, concrete, or washings thereof, or other construction related materials or wastes, oil or petroleum products or other organic or earthen material shall be allowed to enter into, or be placed where it may be washed by rainfall or runoff into Strawberry Creek. Any of these materials placed within or where they may enter Strawberry Creek by the Applicant or any party working under contract, or with the permission of the Applicant shall be removed immediately. When operations are completed, any excess material shall be removed from the work area and any areas adjacent to the work area where such material may be washed into Strawberry Creek. During construction, the contractor shall not dump any litter or construction debris within the riparian/stream zone. All such debris and waste shall be picked up daily and properly disposed of at an appropriate site;
2. The Applicant shall adhere to the conditions imposed by Nationwide Permit No. 12 issued to the Applicant by the ACOE (File No 2014-00051S);
3. The Project shall be constructed in conformance with the revised Project description in the supplemental application materials received by the Water Board on June 13, 2014, and with the design sheets in Attachments A, C, and D to this Certification. In water work must be performed in conformance with Sheets C1.10, C1.12, C.7.2, C7.3, and

C13.4 in Attachment A to this Certification and the design sheets in Attachment D to this Certification;

4. Within 30 days of the first Project-related disturbance of waters of the State, the Applicant shall provide the Executive Officer of the Water Board with written notification that the Project has disturbed waters of the State;

5. Within 30 days of completing construction of any component of the Project that impacts waters of the State (e.g., completion of the new alignments of the Big Inch and Little Inch culverts), the Applicant shall provide the Executive Officer of the Water Board with written notification that construction of the Project component is complete;

6. No fueling, cleaning, or maintenance of vehicles or equipment shall take place within any areas where an accidental discharge to Strawberry Creek may occur;

7. Where areas of bare soil are exposed during the rainy season, silt control measures shall be used where silt and/or earthen fill threaten to enter waters of the State. Silt control structures shall be maintained for effectiveness within 2 business days before and after a rain event and shall be repaired or replaced as needed. Buildup of soil behind silt fences shall be removed and any breaches or undermined areas repaired immediately;

8. Prior to the start of the rainy season, and no later than 24 hours prior to a likely rain event, the Applicant shall ensure that disturbed areas that drain to waters of the State are protected with correctly installed erosion control measures (e.g., jute, straw, coconut fiber erosion control fabric, coir logs, etc.). The likely rain event is defined as any weather pattern that is forecast to have a 50 percent or greater probability of producing precipitation in the Project area. The Applicant shall obtain a printed copy of precipitation forecast information from the National Weather Service Forecast Office (e.g., by entering the zip code of the Project's location at http://www.srh.noaa.gov/forecast);

9. All work performed within Strawberry Creek shall be completed in a manner that minimizes impacts to beneficial uses and habitat; measures shall be employed to minimize disturbances along Strawberry Creek that will adversely impact the water quality of waters of the State. Disturbance or removal of vegetation shall not exceed the minimum necessary to complete Project implementation;

10. Prior to the start of Project construction, the Applicant shall provide a final dewatering plan for the Big Inch and Little Inch culverts, including the area to be dewatered, timing of dewatering, and method of dewatering to be implemented, to the Executive Officer of the Water Board for review and approval. All temporary dewatering methods shall be designed to have the minimum necessary impacts to waters of the State to isolate the immediate work area. All dewatering methods shall be installed such that natural flow is maintained upstream and downstream of the project area. Any temporary dams or diversions shall be installed such that the diversion does not cause sedimentation, siltation, or erosion upstream or downstream of the project area. All dewatering methods shall be removed immediately upon completion of Project activities;

11. Following curing of the concrete in the new culverts and the by-pass structures, water will be directed through the new culvert alignments (see Sheet C7.3 in Attachment A to

this Certification). Concrete will be considered cured when water poured over the surface of the concrete has a pH of less than 8.5;

12. At the Strawberry Creek Ecological Stabilization Project (North Fork Mitigation Project), flow in the creek shall be diverted around the mitigation project reach with a coffer dam and a submersible pump, prior to implementing the North Fork Mitigation Project. A *Draft Dewatering Plan for the Strawberry Creek Confluence Ecological Stabilization Project* (Environmental Science Associates, May 16, 2014) has been prepared for the North Fork Mitigation Project, and is illustrated in the Figure, *Water Control System Suggested Layout Plan*, in Attachment D to this Certification. No more than 30 days prior to dewatering the North Fork Mitigation Project reach of Strawberry Creek, the Applicant shall submit a final Dewatering Plan to the Water Board's Executive Officer for review and approval. The North Fork Mitigation Project reach shall not be dewatered until the Water Board's Executive Officer has approved the final Dewatering Plan. The Dewatering Plan shall include procedures for removing fish from the mitigation project reach prior to dewatering (e.g., the use of block nets to isolate the mitigation project reach). If pumps are to be used in dewatering the reach, they shall be provided with intake screens that are selected and installed in accordance with the National Marine Fisheries Service (NMFS) Fish Screening Criteria for Anadromous Salmonids (http://swr.nmfs.noaa.gov/hcd/fishscrn.pdf) and the Addendum for Juvenile Fish Screen Criteria for Pump Intakes (http://swr.nmfs.noaa.gov/hcd/pumpcrit.pdf);

13. The Strawberry Creek Women's Faculty Club Reach Riparian Enhancement Project (Riparian Enhancement Project) shall be implemented in the same year as the relocation of the Big Inch and Little Inch culverts. Implementation shall include the removal of invasive plants and replanting the riparian area with native riparian vegetation, as described in the body of this Certification and in Attachment C to this Certification. Any changes to the plans for the Riparian Enhancement Project in the body of this Certification and in Attachment C to this Certification must be submitted to the Water Board's Executive Officer for review and approval before they are implemented;

14. The North Fork Mitigation Project shall be implemented in the same year as the relocation of the Big Inch and Little Inch culverts. The North Fork Mitigation Project shall be implemented in conformance with the description in the body of this Certification and the plan sheets in Attachment D to this Certification. Implementation shall include the removal of failed and failing grade control structures, the construction of three bio-engineered grade control structures, laying back creek banks to stable slopes, and revegetation of the affected creek banks. Any changes to the plans for the North Fork Mitigation Project in the body of this Certification and in Attachment D to this Certification must be submitted to the Water Board's Executive Officer for review and approval before they are implemented;

15. The Applicant shall implement all mitigation measures presented in the *Strawberry Creek South Fork Restoration Project – Women's Faculty Club Reach Mitigation Monitoring Plan* (ESA, July 31, 2014) (South Fork MMP). Any changes to this MMP, including changes to the success criteria or timelines, must be submitted to the Water Board's Executive Officer for review and approval before it is implemented;

16. The Applicant shall implement all mitigation measures presented in the *Strawberry Creek Ecological Stabilization Project Mitigation Monitoring Plan* (ESA, July 31, 2014) (North Fork MMP). Any changes to the North Fork MMP, including changes to the success criteria or timelines, must be submitted to the Water Board's Executive Officer for review and approval before it is implemented;

17. The Applicant shall be responsible for funding and implementing all components of the South Fork MMP, including contracting directly for services necessary for site preparation, revegetation, monitoring, adaptive management, and contingency measures;

18. The Applicant shall be responsible for funding and implementing all components of the North Fork MMP, including contracting directly for services necessary for earthwork, site preparation, revegetation, monitoring, adaptive management, and contingency measures;

19. Plants installed at the Riparian Enhancement Project and the North Fork Mitigation Site shall be native riparian species that currently exist onsite or within the Strawberry Creek watershed, and shall be documented in the as-built reports for each mitigation project (See Conditions 22 and 23). Plant material shall be obtained from a native plant nursery, with emphasis on collection or propagation from local plant sources, or be grown by the Applicant from propagules collected from the Strawberry Creek watershed. A qualified restoration biologist or professional horticulturalist shall oversee the collecting and planting;

20. The Applicant shall establish a minimum of 8 photo-documentation points throughout the 350 LF length of the Riparian Enhancement Project. The photo-documentation sites shall be selected to document pre- and post-enhancement conditions of riparian habitat. The Applicant shall prepare a site map(s) with the photo-documentation points clearly marked. Prior to implementing the Project, the Applicant shall photographically document the condition of the riparian enhancement site. Following implementation of the Project, the Applicant shall photographically document the immediate post-construction condition of the riparian enhancement site and submit a report within 60 days from the completion of project construction to the Water Board including the pre-construction photographs, the post-construction photographs, and the map with the locations of the photo-documentation points;

21. The Applicant shall establish a minimum of 6 photo-documentation points throughout the 80 LF length of the North Fork Mitigation Project. The photo-documentation sites shall be selected to document pre- and post-stabilization conditions of riparian habitat, and to facilitate tracking the stability of the bio-engineered grade stabilization measures and the stability of the creek banks. The Applicant shall prepare a site map(s) with the photo-documentation points clearly marked. Prior to implementing the Project, the Applicant shall photographically document the condition of the riparian stabilization site. Following implementation of the North Fork Mitigation Project, the Applicant shall photographically document the immediate post-construction condition of the riparian stabilization site and submit a report within 60 days from the completion of project construction to the Water Board including the pre-construction photographs, the post-

construction photographs, and the map with the locations of the photo-documentation points;

22. Within 60 days of completing invasive plant removal and planting of riparian plants at the Riparian Enhancement Project site, the Applicant shall submit an as-built report and plan(s) to the water board. In addition to the information required in Condition 20, the as-built plan will show the actual planting that was implemented, with locations and numbers of each plant species;

23. Within 60 days of completing construction and mitigation planting activities at the North Fork Mitigation Project, the Applicant shall submit as-built plans(s) to the Water Board. In addition to the information required in Condition 21, the as-built plan shall compare the project plans with the actual locations and configurations of the bio-engineered grade control structures and laid back bank areas. As-built plans shall also include a qualitative assessment of creek channel stability between the grade control structure at Station 0+45 and the culvert at the upstream end of the North Fork Mitigation Project reach survey of the creek. The report shall provide revised Project plans, showing the actual planting that was implemented, with locations and numbers of each plant species;

24. Plantings at the Riparian Enhancement Project mitigation site shall be monitored for a minimum period of five years, until the success criteria in the South Fork MMP and the body of this Certification are achieved. Percent survival must be evaluated individually for each planted species. If these success criteria are not achieved, dead plants must be replaced in kind, unless the Applicant demonstrates that the site is not conducive to survival of a plant species, in which case alternate native riparian plant species may be used, with the concurrence of the Executive Officer of the Water Board. Replacement plantings must be made within one year of survival rates failing to meet the specified success criteria. Replacement plants shall be monitored for five years from the date of replanting. Replacement plants are subject to the same performance criteria as the initial plantings No more than 10 percent of the vegetation cover in the mitigation project area shall consist of species designated in Cal-IPC's California Invasive Plant Inventory Database as high or moderate during the initial 5 years of monitoring. If the presence of invasive species exceeds this threshold, the Applicant is responsible for conducting appropriate control activities;

25. Plantings at the North Fork Mitigation Project shall be monitored for a minimum period of five years, until the success criteria in the North Fork MMP and the body of this Certification are achieved. Percent survival must be evaluated individually for each planted species. If these success criteria are not achieved, dead plants must be replaced in kind, unless the Applicant demonstrates that the site is not conducive to survival of a plant species, in which case alternate native riparian plant species may be used, with the concurrence of the Executive Officer of the Water Board. Replacement plantings must be made within one year of survival rates failing to meet the specified success criteria. Replacement plants shall be monitored for five years from the date of replanting. Replacement plants are subject to the same performance criteria as the initial plantings. No more than 10 percent of the vegetation cover in the mitigation project area shall consist of species designated in Cal-IPC's California Invasive Plant Inventory Database as high or moderate during the initial 5 years of monitoring. If the presence of invasive

species exceeds this threshold, the Applicant is responsible for conducting appropriate control activities;

26. The Applicant shall water riparian plantings at both mitigation sites for a minimum of 3 years. The Applicant shall continue to water all plantings during all projected dry water years (defined as 75 percent of average annual rainfall) that occur during the first 10 years after construction. Any replacement plants (see previous Condition) shall be watered for a minimum of 3 years;

27. Annual reports for the Riparian Enhancement Project shall be submitted to the Water Board by January 31 following each year of the initial five year monitoring period, summarizing each year's monitoring results, including the need for any remedial actions (e.g., re-planting or invasive pant removal), and including all information specified in the South Fork MMP and the body of this Certification. The annual reports shall compare data to previous years and detail progress towards meeting success criteria. At the end of year 5, a comprehensive final report shall be prepared that includes summaries of the monitoring data, representative photos, and maps. Annual reports and the comprehensive final report shall include photographs from the photo-documentation points specified in Condition 20. The final report shall document if the site meets the success criteria in the South Fork MMP and the body of this Certification. If the criteria are not met, the report shall identify measures to be undertaken, including extension of the monitoring period until the criteria are met. Success of the mitigation program shall be determined by Water Board staff;

28. Annual reports for the North Fork Mitigation Project shall be submitted to the Water Board by January 31 following each year of the first five years of the initial ten year monitoring period, and in years seven, nine, and ten, summarizing each year's monitoring results, including the need for any remedial actions (e.g., re-planting or bank stabilization), and including all information specified in the North Fork MMP and the body of this Certification. If vegetation performance standards, including invasive species control, have been attained at the end of year 5, the remaining monitoring reports may only cover the geomorphic stability of the North Fork Mitigation Project. The annual reports shall compare data to previous years and describe progress towards meeting final success criteria. At the end of year 10, a comprehensive final report shall be prepared that includes summaries of the monitoring data, representative photos, and maps. Annual reports and the comprehensive final report shall include photographs from the photo-documentation points specified in Condition 21. The final report shall document if the site meets the final performance criteria in the North Fork MMP and the body of this Certification. If the criteria are not met, the report shall identify remedial measures to be undertaken, including extension of the monitoring period until the criteria are met. Success of the mitigation program shall be determined by Water Board staff;

29. Annual reports for the North Fork Mitigation Project shall include an evaluation of channel geomorphology and fish passage. The evaluation shall include an assessment of the stability of the channel banks, an assessment of any scour, rilling, or slumping visible on the creek banks, an assessment of the channel thalweg for any signs of head cuts or nick points, an assessment of any accumulation of sediment in the Project reach, an assessment of the stability of the three bio-engineered grade control structures, an

assessment of the stability of the grade control structure at Station 0+45, and an assessment of the stability of the grade control structure at Station 1+45. If the project reach is not geomorphically stable at the end of year 10, the Applicant shall work with the Water Board to prepare an analysis of the cause of the instability. If deemed necessary by the Water Board, remedial actions shall be implemented by the Applicant, which may include additional monitoring and maintenance;

30. The Applicant is required to use the Riparian Repair and Maintenance (short) Form to provide Project information for the North Fork Mitigation Project site within 14 days from the date of this certification. An electronic copy of the short form and instructions can be downloaded at: http://www.waterboards.ca.gov/sanfranciscobay/certs.shtml. The completed short form and map showing the project boundaries shall be submitted electronically to habitatdata@waterboards.ca.gov or shall be submitted as a hard copy to both: 1) the Water Board (see the address on the letterhead), to the attention of EcoAtlas; and 2) the San Francisco Estuary Institute, 4911 Central Avenue, Richmond, CA 94804, to the attention of EcoAtlas]
31. In accordance with CWC §13260, the Discharger shall file with the Board a report of any material change or proposed change in the ownership, character, location, or quantity of this waste discharge. Any proposed material change in operation shall be reported to the Executive Officer at least 30 days in advance of the proposed implementation of any change. This shall include, but not be limited to, all significant new soil disturbances, all proposed expansions of development, or any change in drainage characteristics at the Project site. For the purpose of this Order, this includes any proposed change in the boundaries of the area of wetland/waters of the State to be filled;
32. This certification action is subject to modification or revocation upon administrative or judicial review, including review and amendment pursuant to Section 13330 of the California Water Code (CWC) and Section 3867 of Title 23 of the California Code of Regulations (23 CCR);
33. This certification action does not apply to any discharge from any activity involving a hydroelectric facility requiring a Federal Energy Regulatory Commission (FERC) license or an amendment to a FERC license, unless the pertinent certification application was filed pursuant to California Code of Regulations (CCR) Title 23, Subsection 3855(b) and that application specifically identified that a FERC license or amendment to a FERC license for a hydroelectric facility was being sought; and
34. Certification is conditioned upon full payment of the required fee as set forth in 23 CCR Section 3833. Water Board staff received payment in full of $1,097.00 on March 24, 2014.

This certification applies to the Project as proposed in the application materials. Please be advised that failure to implement the Project as proposed is a violation of this water quality certification. Violation of water quality certification is a violation of State law and is subject to administrative civil liability pursuant to CWC Section 13350. Failure to meet any condition of a certification may subject you to civil liability imposed by the Water Board to a maximum of $5000 per day of violation or $10 for each gallon of waste discharged in violation of the certification. Any request for a report made as a condition to this action is a formal request

pursuant to CWC Section 13267 (e.g. Conditions 4, 5, 10, 12, 20, 21, 22, 23, 27, 28, 29, 30, and 31), and failure or refusal to provide, or falsification of such requested report is subject to civil liability as described in CWC Section 13268.

Should new information come to our attention that indicates a water quality problem with this Project, the Water Board may issue Waste Discharge Requirements pursuant to 23 CCR Section 3857. If you have any questions, please contact Brian Wines of my staff at (510) 622-5680, or by email at Brian.Wines@waterboards.ca.gov.

Sincerely,

Bruce Wolfe
Executive Officer

Attachments:

A. Project Location Maps and Design Sheets
B. Daylighting Alternative Figures
C. Location Map and Photographs of the Riparian Enhancement Project Mitigation
D. Design Sheets and Photographs of the North Fork Mitigation Project

Cc: State Board, 401 Certifications, Bill Orme, Stateboard401@waterboards.ca.gov
U.S. EPA Region 9, Jason Brush, R9-WTR8-Mailbox@epa.gov
USACE, SF Regulatory Branch, Holly Costa, holly.n.costa@usace.army.mil
CDFW, Marcia Grefsrud, marcia.grefsrud@wildlife.ca.gov
UC Berkeley, Greg Haet: gjhaet@berkeley.edu
UC Berkeley, Tom Leffler: tleffler@berkeley.edu
ESA Inc., Michelle Giolli, mgiolli@esassoc.com

Attachment B:

Percent Cover Field Data Descriptions

Year 1 Percent Cover of Vegetation

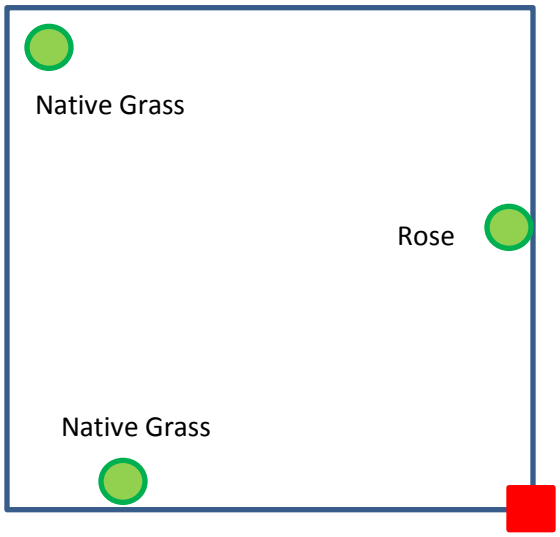
LEGEND

Plant

Southeast corner of plot

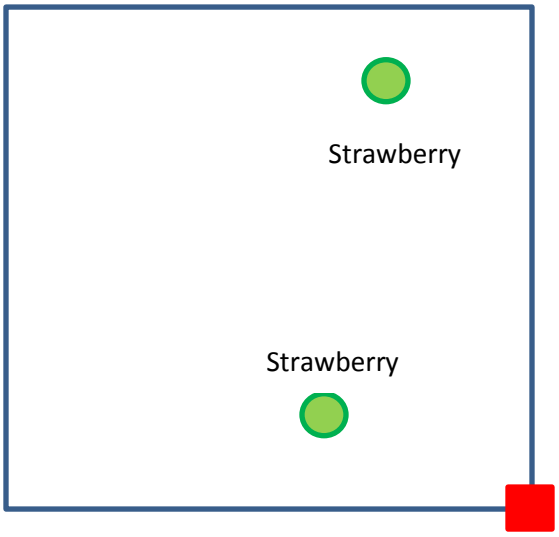
Plot A:

70% Cover - no invasives



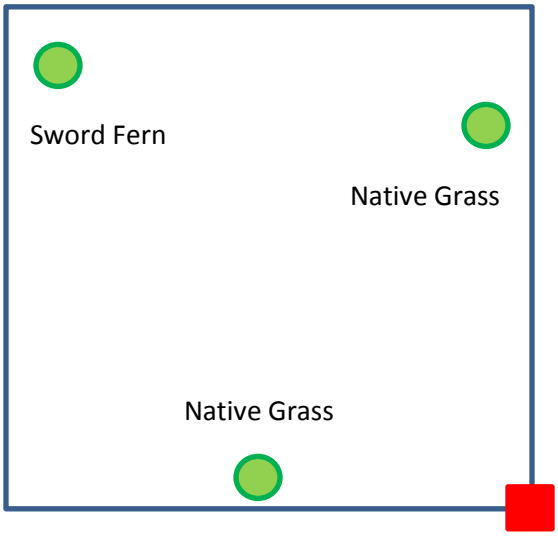
Plot B:

75% Cover – no invasives



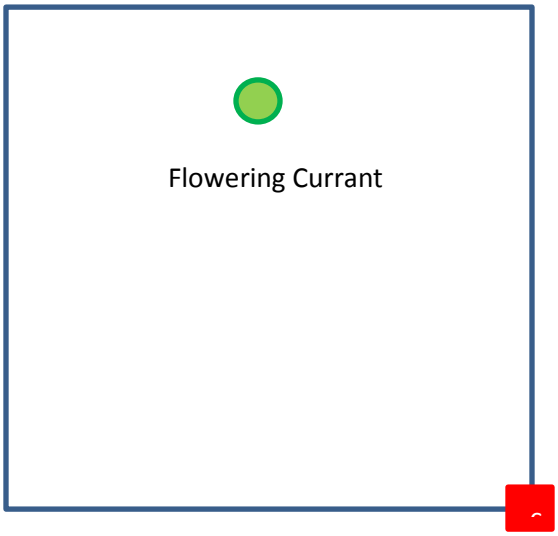
Plot C:

80% Cover – no invasives



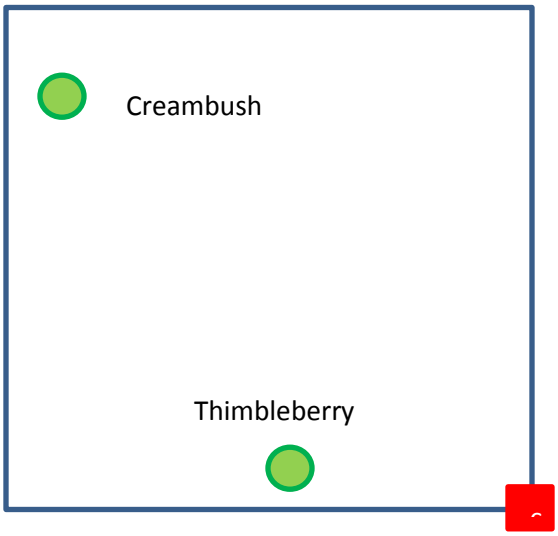
Plot D:

30% Cover – no invasives



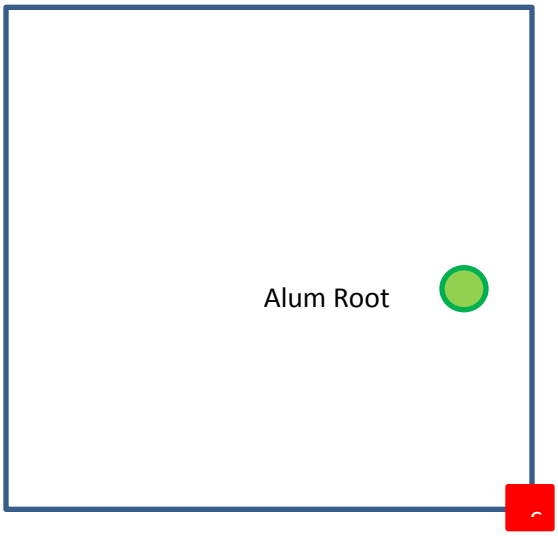
Plot E:

50% Cover – no invasives



Plot F:

20% Cover – no invasives

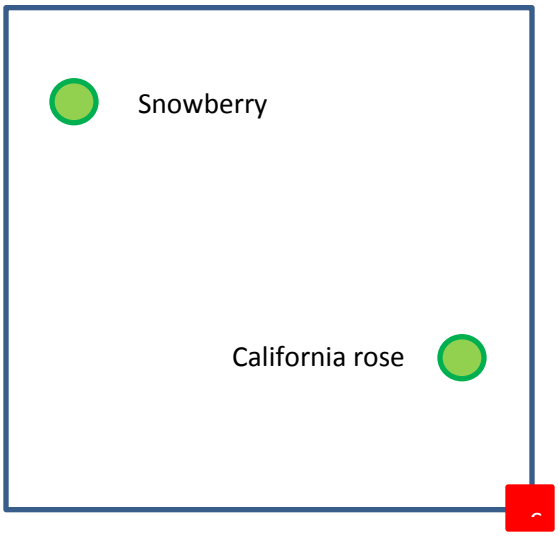


Plot G:

25% Cover – no invasives

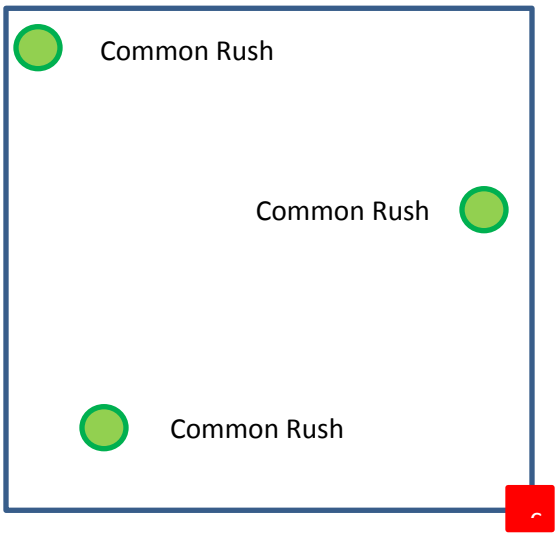
Plot H:

80% Cover – no invasives



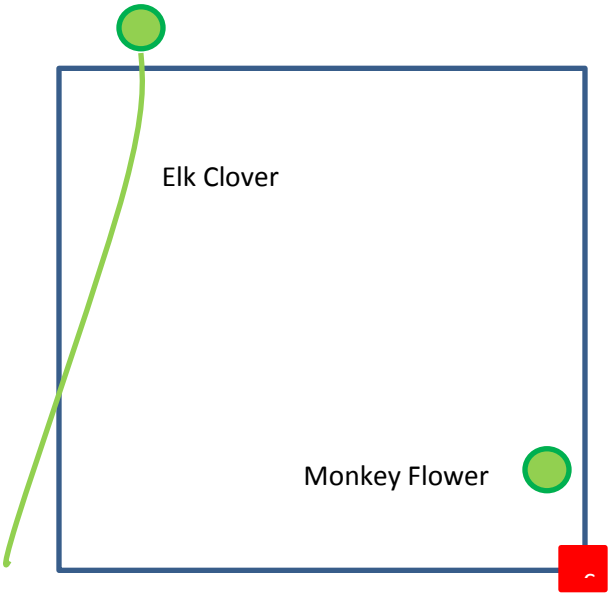
Plot I:

50% cover – no invasives



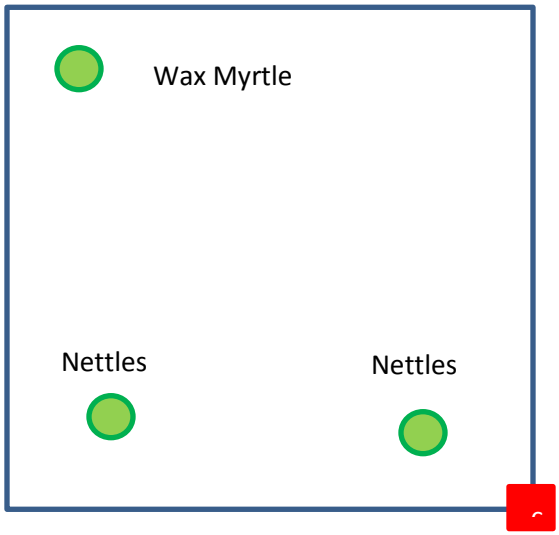
Plot J:

20% cover – no invasives



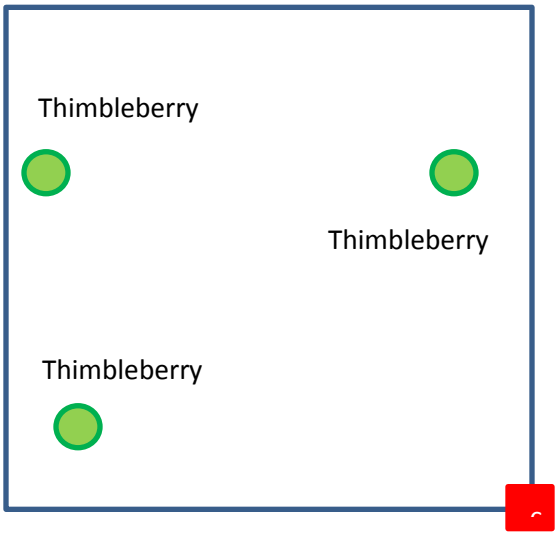
Plot K:

50% cover – no invasives



Plot L:

60% cover – no invasives



Attachment C:

Pre- and Post-Project Photographs

From left to right, photos were taken on the following dates:

March 23, 2016 (pre-construction)

August 23, 2016 (as-built report)

July 26, 2017 (first year annual report)

Photo Point 1



Photo Point 2



Photo Point 3



Photo Point 4



Photo Point 5



Photo Point 6



Photo Point 7



Photo Point 8



Photo Point 9



Photo Point 10



Attachment D:

Native Plant Identification and Propagation Guide

Native Plant Identification and Propagation Guide

UC Berkeley

Strawberry Creek Restoration Program

by Gino Gresh & Megan Bradley

Summer 2017

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Trailing Snowberry Symphoricarpos mollis 14

Creambush Holodiscus discolor 15

Pink honeysuckle Lonicera hispidula 15

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Coffeeberry Frangula californica (previously Rhamnus californica) 16

Thimbleberry Rubus parviflorus 17

California blackberry Rubus ursinus 17

Red flowering currant Ribes sanguineum 18

Twinberry Lonicera involucrata 18

Rose Rosa californica 19

LARGER SHRUBS/TREES **20**

Toyon Heteromeles arbutifolia 20

Pacific wax myrtle Myrica californica 20

Red twig dogwood Cornus sericea 21

Buckeye Aesculus californica 21

Big leaf Maple Acer macrophyllum 22

GRASSES, RUSHES, and SEDGES

"Sedges have edges, rushes are round, grasses have nodes from their tips to the ground."

Sedges have stems triangular in cross section, rushes STEMS are round in cross section, grasses are flat/oval in cross section and have hollows (STEM and LEAF).

Grass (nodes)

http://www.illinoiswildflowers.info/grasses/photos/rice_cutgrass2.jpg

Rush (round)

https://upload.wikimedia.org/wikipedia/commons/6/65/Juncus_effusus.jpeg

Sedge (edges)

http://science.halleyhosting.com/nature/cascade/mtadams/sedge/carex/stipata/stipata1d.jpg

Pacific reed grass *Calamagrostis nutkaensis*

IDENTIFICATION

- Up to 3 feet, evergreen, grow in clumps, leaves are tough and flat (1 cm wide)
- wet habitat, near beaches, woodland edges
- Alaska to San Luis Obispo, coasts.

PROPAGATION

- by seed does not require treatment. 8" plugs recommended with 4 seeds per tube. Peat moss, perlite, fir bark, sand.
- at maturity, seed is brown and can be collected May 1st – August 15th.
- strip by hand from inflorescence and keep dry and refrigerate.
- takes 21 days to germinate

https://courses.washington.edu/esrm412/protocols/CANU.pdf

Deergrass *Muhlenbergia rigens*

IDENTIFICATION

- leaves about 3 feet, evergreen, grows in clumps, narrow, pointed leaf blades
- flowers are silver and long about 2-3 feet
- Oregon-CA border to Mexico, east to Texas

PROPAGATION

- by seed (blooms June-September), no treatment
- start in flats in May, plant in Fall
- once established (2yrs) can be divided in winter with a sharp spade and transplanted.

FUN FACTS

- stems used by native Americans for coil baskets, seeds ground up for corn meal
- does not "seed around" and become invasive like pampas grass

http://calscape.cnps.org/Muhlenbergia-rigens-(Deergrass)

Purple Needlegrass *Nassella pulchra*

IDENTIFICATION

- occurs on west coast ranges and central valley foothills
- densely tufted, numerous basal leaves, leaf blades smooth to finely hairy
- conspicuous purple awns

PROPAGATION

- 2-4 week window for seed collection in mid- to late-Spring
- while getting established in first year, less competition is good because grows slow.
- Seeds

FUN FACTS

- grows well on disturbed soils, clay soils, “droughty” soils
- awns of the seed twist and untwist to drill seed into the soil

https://plants.usda.gov/plantguide/pdf/pg_napu4.pdf

Common Rush *Juncus patens*

IDENTIFICATION

- evergreen with a fountain-like form
- flower cluster on side of plant
- thin, grooved, and slightly waxy leaves
- what would be “blades” take the form of round brown sheaths near the base of the stems

PROPAGATION

- seed (blooms spring to fall) to be placed atop soil with a light covering of soil
- consistent soil moisture is key as well as sun
- once 4 inches high, can be transplanted

FUN FACTS

- tolerates no drainage and seasonal flooding, a variety of environments

http://www.outsidepride.com/seed/ornamental-grass/juncus/juncus-patens.html

Santa Barbara Sedge *Carex barbarae*

IDENTIFICATION

- basal sheaths are red-spotted to purple
- flower spikes that droop slightly and are about 2-4 inches long
- evergreen and grows in wet habitats
- longer than Foothill Sedge

PROPAGATION

- naturally propagation through rhizomes, can separate the plants between spring and early summer. Seeds are also produced.

FUN FACTS

- rarely fruits and most are sterile

http://calscape.org/Carex-barbarae-(Valley-Sedge)?srchcr=sc587d91bb18855

Foothill sedge *Carex tumulicola*

IDENTIFICATION

- shorter than the Santa Barbara Sedge
- flowers are cream colored

PROPAGATION

- division or seed. When flowers are brown in late summer or fall, collect seeds

FUN FACTS

- does better in well draining soils; can tolerate drought

http://calscape.org/Carex-tumulicola-(Foothill-Sedge)?srchcr=sc587d96749c468

https://courses.washington.edu/esrm412/protocols/CATU3.pdf

LOW GROWING HERBACEOUS PERENNIALS

Douglas Iris *Iris douglasiana*

IDENTIFICATION

- 1-2 ft long, flat evergreen leaves. Perennial
- flower is typically blue but can range to creamy white or yellow

PROPAGATION

- rhizome divisions in late fall/ early spring
- seeds (collected from large capsules) to be planted in early fall

FUN FACTS

- *Iris* is Greek for "rainbow," referring to the colors of the flower

http://www.wildflower.org/plants/result.php?id_plant=IRDO

Coral Bells *Heuchera*

IDENTIFICATION

- purple veined green leaves that are large and form a rosette pattern
- 2 ft long pinkish flower stalks that are shaped like bells

PROPAGATION

- seed or cuttings. For cuttings, cut an offshoot with a woody stem that has leaves growing off it. Remove part of the bottom of stem and the larger leaves at base. Plant in potting soil

FUN FACTS

- commonly planted for the leaves themselves!

http://www.wildflower.org/plants/result.php?id_plant=HEMA4,
http://tmousecmouse.blogspot.com/2010/10/propagation-for-incompetent.html

Wild ginger *Asarum*

IDENTIFICATION

- densely low-growing perennial
- shiny dark green leaves have a heart shape

PROPAGATION

- rhizome division in early spring or fall. Do so by uprooting root ball and slicing into two pieces, leaving some leaves attached.

FUN FACTS

- when leaves are crushed they emit a lemon fragrance

https://courses.washington.edu/esrm412/protocols/ASCA2.pdf

Elk clover *Aralia californica*

IDENTIFICATION

- green, compound leaves with 3-5 leaflets

PROPAGATION

- collect seeds in summer and sow in fall
- cuttings can be taken in summer of about 10 in, strip ⅓ of leaves and plant upright in soil

FUN FACTS

- belongs to Ginseng family and can be used as a tonic

http://homeguides.sfgate.com/propagate-aralia-25217.html

Hedge nettle *Stachys bullata*

IDENTIFICATION

- 1-2 ft flower stalk with pink flowers
- does not sting

PROPAGATION

- plant seeds in late spring or early summer.

FUN FACTS

- decoction of roots can be gargled to help a sore throat

http://www.pfaf.org/user/Plant.aspx?LatinName=Stachys+bullata

Bee plant *Scrophularia californica*

IDENTIFICATION

- leaves are triangular with toothed margins, opposite pairs on square stem
- pink mahogany small flowers

PROPAGATION

- Seeds in late spring to summer, plant in fall

FUN FACTS

- significantly attracts bees

http://calscape.org/Scrophularia-californica-()

Cow Parsnip *Heracleum lanatum*

IDENTIFICATION

- stem is around 6 ft tall with large white flowers in the form of umbels on top
- leaves take a rosette pattern
- thrives on stream banks

PROPAGATION

- collect seeds when fruit capsules turn tan in late summer
- seeds must be soaked to leach out chemical inhibitors
- outplant in early fall after 1.5 years

FUN FACTS

- this plant is part of the Carrot Family, Apiaceae

https://courses.washington.edu/esrm412/protocols/HEMA80.pdf

Woodland strawberry *Fragaria fresca*

IDENTIFICATION

- leaves are an inch or less long and have toothed margins
- produces small edible strawberries and small white flowers

PROPAGATION

- seeds mature in summer
- sow seeds in spring
- does best in shady, moist areas

FUN FACTS

- not only are the berries delicious, the leaves can be used fresh or dried to make tea

http://www.pfaf.org/user/plant.aspx?latinname=Fragaria+californica

Narrowleaf milkweed *Asclepias fascicularis*

IDENTIFICATION

- white flowers take an umbrella shape atop a 3-5 ft high stem.
- leaves are narrow arranged whorled

PROPAGATION

- seeds to be collected before the pods are split open in summer
- sow seeds in fall, with a higher germination probability the sooner they are planted

FUN FACTS

- the seed fibers can be made into yarn and woven into clothing
- monarch butterflies have co-evolved with milkweed as the plant produces toxins that are also present in the monarch caterpillar, making it unpalatable to predators

https://plants.usda.gov/plantguide/pdf/cs_asfa.pdf

Sticky Monkey Flower *Mimulus aurantiacus*

IDENTIFICATION

- as the name suggests, the stem and leaves are sticky
- flowers are trumpet shaped and golden

PROPAGATION

- seed or cuttings
- for softwood cuttings: gather non-flowering shoots at beginning of day
- cut a 4 in shoot from the base by a bud and remove lower leaves then plant and keep moist

https://www.anniesannuals.com/plants/view/?id=3737

Western chain fern *Woodwardia fimbriata*

IDENTIFICATION

- can grow 5-9 ft tall
- leaf form produces a chain-like appearance

PROPAGATION

- spores to be collected in summer, when planted will germinate in 3-4 weeks
- or rhizome division

FUN FACTS

- largest North American endemic fern

http://depts.washington.edu/propplnt/Plants/Woodwardia%20fimbriata.htm

SMALL/MEDIUM BUSHES

Ceanothus Anchor Bay
Ceanothus gloriosus

IDENTIFICATION

- in partial shade inland to full sun coastal
- lowering clusters of blue blossoms in spring with holly-like, toothed leaves
- dense ground cover that can reach 3 ft tall

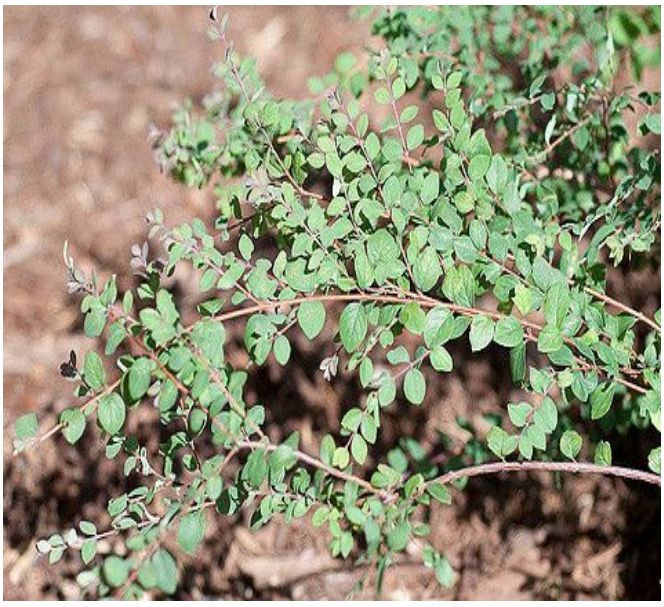
PROPAGATION

- by cutting or seed after a dry period.
- seed: hot water then 3 months stratification

FUN FACTS

- do not water or it will suffer greatly; needs well-draining soil
- do not pry or prune roots; will suffer if roots are handled

http://calscape.org/Ceanothus-gloriosus-(Point-Reyes-Ceanothus)?srchcr=sc581d203a1c0aa
http://www.smgrowers.com/products/plants/plantdisplay.asp?plant_id=1755



Trailing Snowberry
Symphoricarpos mollis

IDENTIFICATION

- spreading low shrub with pink flowers in June and white berries
- shade tolerant/intolerant
- found in meadows, grasslands, forests

PROPAGATION

- take hardwood cutting in late summer or early fall and put in soil. if seed, need two winters to germinate

https://c2.staticflickr.com/4/3453/3991651061_c79059e53f_z.jpg?zz=1

Creambush *Holodiscus discolor*

IDENTIFICATION

- deciduous shrub that grows to 4-5 ft and has cream colored clusters from May-July
- partial shade inland to full sun coastal

PROPAGATION

- September to October. Fruit should be collected while the flower clusters are dark brown. Seed must be either sown in the fall or undergo a cold, moist stratification for 15 to 18 weeks

FUN FACTS

- can tolerate wide range of moisture conditions

http://www.goert.ca/propagation_guidelines/shrubs/holodiscus_discolor

Pink honeysuckle *Lonicera hispidula*

IDENTIFICATION

- deciduous shrub with pink flowers
- grows in full sun to shade; grows sturdily in many places like a vine

PROPAGATION

- make approx. 4 inch cutting, keep it moist and cool

FUN FACTS

- makes great for a bird garden!

http://www.laspilitas.com/images/grid24_24/7515/s/images/plants/398/Lonicera_hispidula-3.jpg

Huckleberry *Vaccinium ovatum*

IDENTIFICATION

- likes moist shade
- grows 2-3 ft and has spring flowers, fall berries

PROPAGATION

- take cuttings in autumn. cut woody area and plant in soil with perlite mix

FUN FACTS

- can do well under redwood canopies
- edible fruit

http://www.laspilitas.com/images/grid24_24/5933/s/images/plants/683/Vaccinium_ovatum-2.jpg

Coffeeberry *Frangula californica (previously Rhamnus californica)*

IDENTIFICATION

- evergreen shrub that can grow to 8 ft with small spring flowers and red berries that later turn black
- sun or shade

PROPAGATION

- take cuttings and put in soil

FUN FACTS

- good landscaping plant because grows very neatly and sightly; super versatile overall in all soil types

https://upload.wikimedia.org/wikipedia/commons/thumb/9/91/Rhamnus_californica_californicaIMG_6024.jpg/280px-Rhamnus_californica_californicaIMG_6024.jpg

Thimbleberry *Rubus parviflorus*

IDENTIFICATION

- 1-2 ft shrub with maple like leaves and gray flaking bark
- flowers are white in late spring and fruits are like red raspberries in fall
- found in sun to partial shade near water

PROPAGATION

- follow general cutting methods

http://www.nwplants.com/business/catalog/rub_par.html

California blackberry *Rubus ursinus*

IDENTIFICATION

- found in sun to partial shade
- sets of three leaves, needle-like thorns; white flowers late spring and summer, fall berries

PROPAGATION

- follow general cutting methods

FUN FACTS

- irrigation: likes more water but can tolerate dry soils
- put in moist places such as stream banks, canyons, woodland understory

Red flowering currant *Ribes sanguineum*

IDENTIFICATION

- tolerates deep to partial shade; generally does well in most conditions
- early spring bloom of pinkish red flowers with dark fruit in fall
- maple like leaves and can grow to 6 ft

PROPAGATION

- take softwood cuttings; roots in 4-6 weeks

FUN FACTS

- although drought tolerant, plant near more moisture, and can grow in clay-dominant soil

http://www.goert.ca/propagation_guidelines/shrubs/ribes_sanguineum

Twinberry *Lonicera involucrata*

IDENTIFICATION

- tolerates full sun but better in shade; best in moist areas, great under wood canopy, in riparian zones, and bogs
- deciduous shrub that usually reaches 6 ft and has yellow flowers with berries ripening in July

PROPAGATION

- for winter, follow the protocol for hardwood cuttings; for spring, use softwood

FUN FACTS

- valuable shrub for streambank erosion control and restoration of riparian areas!

http://blackfootnativeplants.com/wp-content/uploads/2012/01/Twinberry-Honeysuckle.jpg

Rose *Rosa californica*

IDENTIFICATION

- prefers sun in Northern California
- grows about 4-5 ft, has thorny stems, and pink flowers all summer
- can do little to no irrigation

PROPAGATION

- select pencil thick shoots in early autumn that are about 20 - 25cm long and plant them in a sheltered position outdoors or in a cold frame

http://practicalplants.org/wiki/Rosa_californica

LARGER SHRUBS/TREES

Toyon *Heteromeles arbutifolia*

IDENTIFICATION

- can grow upwards of 10 ft in full soon but tolerates full shade
- has wide white flowers in the summer but red berries in the winter

PROPAGATION

- cut ~5 inch tips of semi ripe wood in the early summer, strip off lower half of leaves, and dip into a rooting hormone. Keep in pots, water often

FUN FACTS

- it is very drought tolerant and will do well in any soil

https://www.sanelijo.org/sites/sanelijo.org/files/images/plant_guide/Heteromeles/Heteromeles_arbutifolia9_0.jpg

Pacific wax myrtle *Myrica californica*

IDENTIFICATION

- can grow up to 30 ft in full sun to partial shade
- has waxy, shiny leaves and female flowers that will bear brown-purple berries in fall

PROPAGATION

- research from UC Davis shows that cuttings of wax myrtle are very hard to propagate

FUN FACTS

- Irrigation: quick draining soil; drought tolerant
- Sometimes also referred to as California Bayberry

https://ucanr.edu/repositoryfiles/ca1912p10-59175.pdf

Red twig dogwood *Cornus sericea*

IDENTIFICATION

- deciduous shrub that likes to spread out and can grow in partial shade 6-12 ft tall
- has noticeable red stems and white blossoms in May and June and pea-sized berries

PROPAGATION

- take hardwood cuttings

FUN FACTS

- irrigation: moister soil
- also referred to as red osier dogwood

http://goodnightdesign.com/wp-content/uploads/2013/04/Cornus_sericea_foliage.jpg

Buckeye *Aesculus californica*

- IDENTIFICATION
- it likes full sun to partial shade and blooms from March-May
- distinct cluster of 5 large leaves
- near rivers or creek for moisture in soil

PROPAGATION

- By seed, best sown outdoors or in a cold frame as soon as it is ripe. The seed germinates almost immediately. The seed must not be allowed to dry out. Stored seed should be soaked for 24 hours prior to sowing. It is best to sow the seed with its 'scar' downwards. Softwood cuttings take very easily

FUN FACTS

- great for butterfly gardens!

http://www.msnucleus.org/watersheds/mission/images/buckeye.jpg

Big leaf Maple *Acer macrophyllum*

IDENTIFICATION

- likes full sun to partial shade as it can grow to more than 50 ft tall
- blooms from April-May and has characteristic maple leaf shape
- good in serpentine and clay soils with moisture; can't do too much heat

PROPAGATION

- Collect seeds in fall, gather them as late in the season as possible but before the rains begin. Can sow seeds directly into a cold frame. Many seeds don't survive storage. Sow in February or March. Allow the seedlings to remain in their mulched beds for at least two years before attempting to transplant

http://www.nwplants.com/business/catalog/ace_mac.html