**Water Board Staff Review of the Proposed Codornices Creek Supplemental Planting Plan for the Lower Codornices Creek Restoration Phase III Reach between 6th Street and 8th Street.**

August 7, 2012

San Francisco Bay Regional Water Quality Control Board (Water Board) staff have reviewed the supplemental *Lower Codornices Creek - Phase III, Creek Restoration & Site Improvements Plan, Revegetation Plan* (Revegetation Plan) submitted by Restoration Design Group (RDG) for the reach of Codornices Creek between 6th and 8th Streets. The Water Board received the Plan, which is a revision of a plan dated March 5, 2010, on Friday, April 20. The Plan proposes to supplement riparian plantings along this reach of Codornices Creek with the following additional plants: 4 live oaks; 10 alders; 2 box elders; replacement planting of some dogwood cuttings to take the place of failed dogwood cuttings; and the installation of between 80 and 100 willow posts.

Please note that the March 5, 2010, Revegetation Plan deviated from the approved approach to planting and the planting palette that was approved in the 2004 Water Quality Certification, which was extended in January of 2010. The March 5, 2010, Revegetation Plan should have been submitted to the Water Board for review and approval before it was implemented. Water Board staff have no record of such a request for approval, or that the Water Board granted approval for the March 5, 2010, Revegetation Plan.

***Current Condition of the Lower Codornices Creek Riparian Corridor***. On May 10, 2012, Water Board staff reviewed the current condition of the Lower Codornices Creek restoration project and noted several deviations from approved conditions.

In the reach between 6th Street and 5th Street, hundreds of linear feet of willows along the right bank of the creek have been limbed up to about six feet above the ground. This has compromised the integrity of the riparian vegetation to provide shade to the creek channel, and impacted valuable steelhead habitat that the Water Board has requested that the permit holders maintain. The Water Board typically works collaboratively with local, state, and federal agencies to manage steelhead habitat; this is particularly true when creek restoration projects are supported by federal or state funding resources. Much of the grant funding that has been provided to the various restoration phases along lower Codornices Creek has been awarded, in part, to sustain the population of threatened steelhead trout that resides in the creek. Management actions that compromise the ability of the creek to sustain a viable population of steelhead are not consistent with the goals of the restoration project.

Any proposed thinning or limbing of riparian vegetation is subject to the jurisdiction of the California Department of Fish and Game (CDFG), depending on the amount of canopy removed and the time of year (trees should be surveyed prior to trimming or removal within nesting bird season). Any party thinning riparian vegetation should request approval of riparian vegetation thinning from the CDFG in a Streambed Alteration Agreement, prior to thinning the vegetation.

The 6th to 8th Street reach of Codornices Creek lacks significant shade vegetation. While this is not unusual in the first years following the implementation of a major restoration project, the density of young trees and willow stakes does not appear to be consistent with the quick development of shaded riparian habitat, which did occur within one or two years in the first (downstream) reaches of the restoration project. At the downstream end of the Phase III reach, immediately upstream of 6th Street, the channel has become dominated by shade intolerant watercress. The watercress is present in thick growths that are about 10 feet wide and extend about 100 feet up the channel. The thick vegetation has contributed to the conversion of the channel of Codornices Creek, in this location, from a single channel to a shallow braided channel. The braided channel is significantly wider and shallower than a single channel and is likely to create a barrier to fish passage in lower flow regimes. The creation of a shallow, braided channel can occur in newly graded channels, upstream of culverts, but this braided channel will become a permanent condition if the channel boundaries are not planted with shade providing vegetation in this reach of the creek.

The creek channel immediately upstream of the new (circa 2004) UPRR culverts had similar geomorphic difficulties because of thick stands of cattails that grew in the channel for about 100 feet upstream of the new culverts. The first phase of the Lower Codornices Creek Restoration Project planted willows up to the culvert entrances, but UPRR maintenance crews thinned those willows for the first few seasons after the culverts were installed. During those years, the creek channel upstream of the UPRR culverts was choked with cattails. In 2012, a thick stand of willows has developed almost all the way to the culverts, there is no sign of cattails in the creek, and the creek has a single, well-defined channel. Dense willow plantings should be planted between 6th Street and 8th Street to shade out the watercress and allow the channel form to recover to a single channel.

***Survival Rates of Previously Installed Plants***. Water Board staff have learned from other creek restoration practitioners that dogwood cuttings tend to have a 50 percent survival rate, while dogwood container stock has much higher survival rates. We encourage RDG to either invest in container stock for better success rates for replanted dogwoods or to plant much higher numbers of dogwood stakes. Dogwood stakes installed by RDG as part of the Phase III Project experienced high rates of mortality associated with vandalism. In addition, about 75 percent of the willow stakes that were planted in early March of 2012 were pulled out, possibly by children resident at nearby U.C. Village. Vandalism has been an ongoing issue at lower Codornices Creek since the project first began, so strategies need to be devised to reduce these high losses in order to achieve reasonable survival rates of dogwoods and willows planted along the creek corridor. Temporary fencing (orange plastic fencing, for example) and some signage should be put along the creek corridor to at least reduce the extent of vandalism. Since rates of loss from vandalism are expected to be high, it is prudent to plant higher numbers of willow posts and dogwood in order to compensate for the numbers of these trees that we can anticipate being lost. We also suggest and encourage the City of Albany to contact the U.C. Village and request that a notice be distributed to parents at the Village to alert them of the need to talk with their children about not hurting the creek vegetation. In addition to notifying local parents about the need to preserve riparian vegetation, it may be useful to develop a community stewardship program that enlists the participation

of neighborhood children in the maintenance of the restoration project. If the neighborhood is invested in the restoration project, there may be less of a chance that vandalism will occur at the site.

***Planting Design - Mixing Aesthetics and Function.*** At Reach III of the Codornices Creek restoration project, there appears to be a conflict between aesthetics and habitat function. The Phase III planting program implemented between 6th Street and 8th Street provides a better view of the creek channel and a more diverse selection of plants than the dense willow thickets in Reaches I and II of the restoration program. While this may provide a more open viewing experience for people in the vicinity of the creek, it compromises the value of the creek as habitat for the endangered central California coast (CCC) steelhead trout, as well as birds and other wildlife.

The proposed addition of more trees in the floodplain is a positive change. But the proposed level of planting in the April 2012 Revegetation Plan revision only adds about 16 canopy trees to an 800-foot long stream corridor. This small increase in planting density is insufficient to achieve enough shade for a functional stream environment. In addition, the proposed number of willow stakes in the April 2012 proposal seems to be restricted to several locations along the channel. It was the Water Board's expectation when the water quality certification was issued in 2004 for the Lower Codornices Creek Restoration Project that willows would be planted along the bankfull channel margins for the entire length of the project on each bank and that willow posts would be planted throughout the floodplain as shown in the planting specifications that are part of the certification. The certification also designated willow posts throughout the floodplain. The expectation for this reach, based on prior phases of restoration vegetation along Codornices Creek, would have resulted in a willow corridor about 10 feet wide, or more, in addition to floodplain trees about 10 to 15 feet apart. Based on the previous phases of the Codornices Creek restoration project, and the specifications in the planting plans referenced in the certification, there should have been between 5,000 and 6,000 willow stakes would be planted between 6th Street and 8th Street, as described in the certification specifications submitted to the Water Board.

We are concerned that the most recently implemented phase of the restoration was designed by parties that were not aware of the requirements imposed by the original water quality certification for the restoration project, and the legal obligations imposed on the project by the water quality certification. Because of this, the number of willows planted along the creek channel between 6th Street and 8th Street has been reduced from the number of willows that were required by the certification. If these parties are opposed to elements of the approved planting plan, they should work with the City to submit a request for a modification of the 2004 water quality certification. Such a request should include consultation with an accepted authority on steelhead biology and habitat needs in order to support the assertion that modification to the approved planting plan would not jeopardize the viability of the steelhead population in Codornices Creek. In addition, this request may trigger the need to re-initiate consultation with the National Marine Fisheries Service (NMFS), in the context of modifying the permit issued by the Army Corps of Engineers for the restoration project.

***Requested Changes to Plantings between 6th Street and 8th Street***. We request that the City prepare a revised Revegetation Plan that incorporates a double line of willows along

the stream channel to assure a minimum of desired in stream shade conditions. This represents a compromise from the approved plans referenced in the certification.

The current planting that uses pots of riparian plants near the outdoor classroom at 8th Street, which was funded in part by a Coastal Conservancy grant, attempts to create a late seral stage riparian community, using native riparian species that may be appropriate to the larger watershed, but may not be appropriate to the lowest reach of the watershed. This approach to establishing riparian vegetation often results in high failure rates of the late seral stage plants, such as understory shrubs, within five to 10 years after planting. This is because later seral stage species and understory shrubs usually require the shade and micro-climate modification provided by the early seral stage species in order to thrive without significant, long-term human intervention.

Monitoring results from the first phases of the Codornices Creek restoration project confirm that the survival rates of understory species planted from container stock are low; these monitoring results are consistent with observations at other restoration sites. Therefore, planting understory plants after the establishment of a shaded riparian corridor may represent a more effective use of restoration funding.

Installing the amount of willows that Water Board staff are requesting may aid the riparian pot plantings. This is because the rapid growth of willows will modify the microclimate at the site, which may aid the successful establishment of the other understory riparian tree species. However, there will still be some uncertainty associated with the long-term survival of the potted species that were planted near 8th Street. Recent historical ecology studies indicate that lower Codornices Creek was a willow sausal prior to the urban development of the region. Therefore, this location may lack appropriate soil types and hydrology to support the long-term survival of the recent plantings near 8th Street.

Our goal at this site is to achieve a "functional "riparian corridor, by planting vegetation on the site with the location, density and species necessary to accomplish the following goals: provide functional habitat for a CCC steelhead stream; provide functional habitat for birds and other wildlife; and provide habitat that enhances water quality in the creek.

*Functioning Habitat for a CCC Steelhead Stream.* Steelhead streams require vegetation that provides the following functions (Note: Most of these functional goals are also included in the 2004 NMFS Biological Opinion (BO) for the Project[1]):

- Provide direct shade to the stream channel to moderate temperatures needed to reduce stress on the fish, and prevent thermal barriers to movement through the channel.
- Underbrush habitat along the stream channel margins for fish to hide from predators (Note: Egrets are common fishers in area of the restoration site.).
- A connected corridor of vegetation that provides leaf drop in the creek, which supports benthic insect populations, the food for fish.

[1] Section III.B of the BO includes the following text. "In-stream cover such as water depth and turbulence, overhanging riparian vegetation, undercut banks, woody debris, large-particle substrates, and aquatic vegetation has been correlated with fish distribution and abundance."

- Stream bank vegetation that provides the roots and structure for creating irregular, undercut banks, supports the formation of pools, and assists sediment transport and deposition.
- Vegetation also moderates the degree of unplanned channel meandering, which reduces the need for rocked channels.

Recent NMFS BO's for projects in Bay Area CCC steelhead habitat include the following text about the habitat needs of CCC steelhead.

> Juvenile steelhead fry rear in edgewater habitats and move gradually into pools and riffles as they grow larger. Cover is an important habitat component for juvenile steelhead, both as a velocity refuge and as a means of avoiding predation (Shirvell 1990[2], Meehan and Bjornn 1991[3]). Steelhead juveniles tend to use riffles and other habitats not strongly associated with other cover types during summer rearing more so than coho and Chinook salmon juveniles. Young steelhead feed on a wide variety of aquatic and terrestrial insects, and emerging fry are sometimes preyed upon by older juveniles.
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> Rearing steelhead juveniles prefer water temperatures of 7.2 to 14.4 Celsius (°C) (Barnhart 1986[4], Bjornn and Reiser 1991[5]). They can survive in water up to 27 °C with saturated dissolved oxygen conditions and a plentiful food supply. Fluctuating diurnal water temperatures (Busby *et al*. 1996[6]) and cold groundwater inflows also aid in survivability of steelhead juveniles in Mediterranean locales.

The current planting in Reach III is not likely to produce some of these essential elements of steelhead habitat within the next 3 to 5 years. Dense willow plantings will provide shoreline cover for young steelhead, as well as a source of abundant terrestrial insects within 2 to 3 years.

Based on the size distribution of steelhead found during the 2004 de-watering of Codornices Creek for Phase I of the restoration project, Codornices Creek between San Pablo Avenue and Instate 880 appears to provide rearing habitat for steelhead. A September 9, 2004, article in the San Francisco Chronicle noted that, of the more than 100 steelhead found in the Phase I reach of the creek, "about half of the fish removed

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[2] Shirvell, C.S. 1990. Role of instream rootwads as juvenile coho salmon (*Oncorhynchus kisutch*) and steelhead trout (*O. mykiss*) cover habitat under varying stream flows. Canadian Journal of Fisheries and Aquatic Sciences 47:852-860.

[3] Meehan, W.R., and T.C. Bjornn. 1991. Salmonid distribution and life histories. Pages 47-82 *in* Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. W.R. Meehan, editor. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland.

[4] Barnhart, R.A. 1986. Species profiles: life histories and environmental requirements of coastal fishes and invertebrates (Pacific Southwest), steelhead. United States Fish and Wildlife Service Biological Report 82 (11.60).

[5] Bjornn, T.C., and D.W. Reiser. 1991. Habitat requirements of salmonids in streams. Pages 83-138 *in* W.R. Meehan, editor. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. American Fisheries Society Special Publication 19. American Fisheries Society. Bethesda, Maryland.

[6] Busby, P.J., T.C. Wainwright, G.J. Bryant., L. Lierheimer, R.S. Waples, F.W. Waknitz, and I.V. Lagomarsino. 1996. Status review of west coast steelhead from Washington, Idaho, Oregon, and California. United States Department of Commerce, National Oceanic and Atmospheric Administration Technical Memorandum NOAA Fisheries-NWFSC-27.

from the creek were found in a 270-foot long, 3 ½ -foot-deep concrete sluice that was completely overgrown with willows and nonnative blackberry bushes." This observation is consistent with the importance of a dense riparian canopy to steelhead habitat. Water Board staff who were familiar with this sluice, which was removed during the Phase I restoration project, noted that the banks below the concrete walls had become undercut, which added some complexity to the creek channel at this location. Establishing dense tree root networks along the channel is important to the development of undercut banks, which provide refuge from predation for juvenile steelhead.

While some stakeholders may wish to introduce more variety into the planting palette at the restoration site or to provide more opportunities for unobstructed views of the creek channel, Water Board staff encourage the City and other stakeholders to exercise caution in implementing planting plans that may result in increased stress on the native steelhead population. It is rare to find successful steelhead rearing habitat in close proximity to functioning spawning habitat in the urbanized creek habitats of the East Bay. Therefore, Water Board staff encourage an emphasis on providing habitat elements that were used by steelhead prior to the implementation of the restoration project (i.e., dense vegetation and undercut banks). Any future modifications to riparian vegetation should be conducted in conjunction with site-specific studies of the impacts of such changes on the quality of steelhead habitat in the creek channel.

*Functioning Habitat for a Birds and Other Wildlife Species.* The grouping of multiple layers of dense understory, combined with canopy trees arranged in interconnected clusters, provides the vegetated thickets that are necessary for:

- Insects the birds eat (willows are the most productive trees for insects).
- Areas for song birds to hide from predators within a multi layered environment.
- Secluded, very dense vegetated environments to encourage nesting
- Seed and nesting material producing plants (cottonwoods, alders, willow and sycamores are recommended).
- Canopy cover that generates the allochthonous detritus[i] that is a major source of food and habitat for aquatic ecosystems.

*Functioning Habitat for Water Quality Benefits.* In an urbanized environment in which much of the flow to creek systems consists of contaminated urban runoff, the water quality of the receiving waters is best enhanced by vegetation that meets the following specifications.

- Plantings that are densely placed along the active channel margin to uptake nutrients.
- Plantings that provide a vegetated riparian corridor width that is sufficient for effective sediment and nutrient filtration of runoff prior to its discharge to the creek channel. Estimates of effective buffer distances for sediment and nutrient filtration vary, but many scientific studies suggest distances between 50 and 100 feet for this purpose[7].
- Plantings that are capable of preventing "thermal pollution" or undue stress on fish populations. Restoration projects that have an objective to sustain

[7] Jones & Stokes. October 18, 2002. *Stream Setback Technical Memorandum.*

populations of anadromous fish should include a continuous corridor of shade to provide optimum year around temperature ranges for anadromous fish.[8]

RDG's April 2012 Revegetation Plan uses native California species, but the design does not position the plants so that they perform the essential functions described above. The plants are spaced far apart, the trees and shrubs are not grouped in layers typical of natural riparian habitats, and significant reaches of the steam margins remain unvegetated and will remain unshaded for the life of the project.

Experience at Bay Area stream restoration sites indicates that willows, alders, dogwood, and cottonwoods are the species that sustain riparian corridors over time. This is our short term experience along Codornices Creek. In addition, we now have better information that this creek was historically a typical bayside "sausal" composed of willows. A willow corridor along the margin of the creek is an insurance policy that creek side vegetation will survive as a part of this environment five to 10 years from now, without the need for extensive human intervention. At a minimum, a willow post must be installed every five feet along both the south and north banks of the creek, in double rows.

We regret that this input was not accomplished through a typical consultation process that would have occurred before the project was designed and constructed, and we will be glad to assist the City and its consultants by inviting the other federal and state agencies to meet with the project sponsors in the field.

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[i] Allochthonous detritus is undissolved organic matter resulting from decomposition of a parent material that was generated outside the aquatic ecosystem (e.g., fragments of organic matter less than 1 mm in diameter that were generated from the breakdown of a willow leaf that fell into a creek).

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[8] [8] Section III.B of the BO includes the following text. "In many streams of the Central California coast, water temperature during the summer rearing phase may be limiting steelhead . . . temperatures for steelhead rearing range from 54 degrees Fahrenheit to 64 degrees, with an upper lethal limit of approximately 77 degrees." Water temperatures in, and downstream of, the Phase III project reach were measured on May 13, 2011 between 3 and 4 pm. Water temperatures ranged between 64 and 70 degrees Fahrenheit. While these were one time measurements, they strongly suggest that further monitoring of stream temperatures is needed in the Phase III reach to ensure that in-stream temperatures remain in the proper range for steelhead rearing throughout the warmer summer months.

**Water Board Staff Comments on Proposed Changes to the Originally Approved Planting Plan for the Lower Codornices Creek Restoration**

The original application materials for the Lower Codornices Creek Restoration Project, Berkeley/Albany, California, were submitted by Waterways Restoration Institute under a cover letter dated March 24, 2004. The application materials indicated that the Restoration Project was to be implemented in two phases: UPRR tracks to Sixth Avenue and Sixth Avenue to San Pablo Avenue. A single set of planting plans were submitted as attachments to the application (Figures 16 – 18) and the table titled, *Lower Codornices Creek Restoration Project, Estimated Fill Table, March 22, 2004*, specified 2600 linear feet of willow plantings in Phase I and 3,200 linear feet of willow plantings in Phase II, as well as the planting of willows in the floodplain throughout the entire length of the complete project. The Water Board issued a Clean Water Act Section 401 Water Quality Certification (Certification) to the Project on July 23, 2004 (Site No. 02-01-C0763). Condition 3 of the Certification specified that, "the Project shall be constructed as described in the Project plans prepared by Waterway's Restoration Institute, dated April 26, 2004." Condition 12 of the Certification specified that "the Project site shall be planted with native plants specified in Attachment 1 to this Certification." Although the Project was later subdivided into at least four phases, our expectation was that the Project would adhere to the originally approved planting plan described in the application materials and Attachment 1 to the Certification. The modification of the planting plan in Phase III of the implemented project was not consistent with the application materials or Attachment 1 to the Certification.

The Certification references the *Codornices Creek Improvements Plan Initial Study/Mitigation Negative Declaration* (State Clearinghouse Number 2004032051) (ISMND). In Section VII., *Mitigation Measures*, the following mitigation measure is required for the benefit of steelhead habitat:

> The proposed *Lower Codornices Creek Improvements Plan* should be revised to ensure that suitable habitat for steelhead is created in reaches to be improved. These affected reaches should provide for continuous vegetative cover to prevent water temperatures from exceeding 65 degrees Fahrenheit and for construction of additional scour pools (3-5 feet deep) spaced between 25-50 feet apart to increase the amount of high quality steelhead habitat.

The *Lower Codornices Creek Improvements Plan Berkeley / Albany, California* (The Waterways Restoration Institute and FarWest Restoration Engineering, May 1, 2001) is referenced by the ISMND. Text on page 59 of this Plan states:

> Second phase planting, vegetation monitoring and management achieves three basic objectives. The first is to determine whether there is an acceptable level of survival of planted species, which should be an 80-85% survival rate given a highly dense planting design. The second objective is to assure that a second tier or later succession –species which grow up under the shade of the pioneer species are planted. The third objective is to assure irrigation systems are operating. Some popular riparian species such as ferns, irises and flowering herbaceous plants will

not survive unless they are planted in a second planting after a shading canopy has developed.

The planting palette that was installed in Phase III was not consistent with the ISMND or the Plan referenced by the ISMND.

***Results of Creek Monitoring, Codornices Creek Restoration Project, Berkeley / Albany, California*** (FarWest Restoration Engineering, January 22, 2010).
The discussion of *Aquatic Habitat Conditions* in Section 3.2.4, noted that benthic macro-invertebrate (BMI) surveys were originally performed in the creek and temperature surveys of creek water were being conducted by the Urban Creek Council. However, by 2010, funding for BMI surveys and creek temperature monitoring was no longer available. Therefore, two critical parameters for assessing the quality of the creek for steelhead habitat were no longer being assessed.

Section 4.2.5, *Adaptive Management Measures*, contains the following statement.

> The extensive willow plantings were partly the result of the need to stabilize and restore a completely barren site quickly and before on-set of winter rains cause erosion of the constructed channel and features. As for impacts to species, the primary goal of the Codornices Creek Restoration Project was to improve conditions for fish and other aquatic species and willow regrowth has improved creek temperatures and conditions for these species. It was always the intent to focus Phase I of the project on habitat restoration while other goals such as public access which may benefit from less willows is a greater focus of the other phases of the restoration project.

While Water Board staff concur that the primary goal of the Restoration Project was to improve habitat for fish and other aquatic species (especially for steelhead, as noted in the ISMND), the Project record does not support the statement "other goals such as public access which may benefit from less willows is a greater focus of the other phases of the restoration project." The original application materials and the Certification only anticipated two project phases and make no mention of other goals beyond "expansion of creek right of way, establishment of creek meanders and habitat, removal of invasive plants and revegetation with native plants." The construction of a public trail is mentioned, but there is no discussion of thinning willow plantings to enhance views of the creek from the public trail.

Section 4.2.5 also contains this text.

> Acknowledging the greater emphasis on public access, Phase III (and eventually Phase IV) of the project has reduced the willow to just high scour areas and has focused floodplain planting in an effort to improve the diversity of native plant cover in these areas. . . . Limiting willow for Phase III is not without risk however. In addition to reduced stability, lack of shade will limit the projects ability to moderate stream temperature as well as limit the colonization of aquatic and emergent vegetation. Both cattails and watercress are nuisance species that have a profound effect on channel capacity and sediment transport and they are prolific in streams receiving direct sunlight.

As was noted above, the application materials and Certification make no reference to a changing emphasis in favor of public access over aquatic species habitat quality in later project phases, which are not even anticipated in the application and Certification. Since it is acknowledged that the reduction in willow density could have a negative impact on creek temperatures, it was not prudent to reduce the amount of willows without implementing a thorough temperature monitoring program to assess the extent of negative impacts on creek temperature as a result of planting fewer willows.

Appendix B consists of the *Hagar Associates Habitat Assessment Memorandum* (October 26, 2009). The discussion on page 5 of Appendix B, notes that "low levels of canopy cover, high percentages of fine sediment, and entrenched channels" are "known to limit diversity of BMIs by reducing allochthonous food supply and habitat complexity, and by increasing direct impacts from high-flow events". Dense willows are a source of allochthonous food supply. Also the roots of the willows provide habitat complexity and help to stabilize the creek banks from the impacts of high-flow events. Since BMI surveys are no longer being performed, it was probably not prudent to change the planting palette in Phase III in a way that may inhibit the growth of BMIs.