Comprehensive Operational Evaluation of Fairview Park Wetlands and Riparian Habitat

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October 2020

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1 Introduction

Dudek was hired by the City of Costa Mesa (City) to complete a comprehensive operational evaluation over the approximately 43-acre area (referred to hereinafter as "the study area") of the ponds, channels, wetlands and riparian habitat within Fairview Park that serve as mitigation for previous project impacts and a treatment system for urban runoff. The study area included Phase I (i.e., Phase 1A in previous planning documents) which was expanded from 17 acres of riparian habitat to 20 acres to include two wetland ponds and the associated conveyance systems and Phase II which included 23 acres of mitigation and restoration area. Specific focus was directed towards investigating potential vector control problems reported to the City by adjacent landowners in the neighborhood referred to as the "Lower Birds". A vicinity map and location map are provided as Figures 1.1 and 1.2.

The goal of the evaluation was to document and analyze the existing condition of the study area, identify any issues in the hydrologic and/or operational function of these areas, and provide recommended improvements to address identified issues, potential safety concerns and on-going public concerns related to potential vector control problems. To provide a full comprehensive evaluation of the health of the system, the evaluation focused on three categories: engineering, biological resources and mitigation and restoration.

The study will conclude with recommended improvements broken into two levels of prioritization:

- Priority A recommended improvements are measures that are recommended to be implemented immediately.
- Priority B recommended improvements are measures that are recommended to be implemented after Priority A measures have been addressed.
- Recommended improvements related to wildlife resources are intended as supporting recommended improvements to ensure no impacts to wildlife resources occur during the implementation of Priority A and B recommended improvements. Also provided are recommended improvements as it relates to the on-going maintenance and success of the habitats within the mitigation and restoration areas.

1.1 Study Area and Existing Conditions

1.1.1 Study Area

The study area is made up of six ponds, three channels and riparian habitat. The study area is located near the northerly boundary of the park immediately south of the reach of the Fairview Channel extending across the park from Placentia Drive to the Santa Ana River. Fairview Park is approximately 208 acres in size consisting of approximately 195 acres of natural area/open space and approximately 13 acres of developed programmed recreational park use. See Figures 1.1 and 1.2 for the project vicinity and location.

The 43-acre study area is comprised of riparian and wetland habitat, ponds, trails and upland habitat and was constructed in two phases, 20-acres in Phase I and 23-acres in Phase II. All areas were constructed to serve as mitigation for various projects implemented by the United States Army Corps of Engineers (USACOE) and the Orange County Transportation Authority (OCTA) in coordination with the City. The project phasing is discussed further in Section 3.3 Mitigation and Restoration. Primary funding for the first phase was provided by the ACOE and primary funding for the second phase was provided by OCTA. Further discussion of permitting can be found in Section 1.2 Existing Easements and Restrictions of this report.

1.1.2 Existing Conditions

The six ponds within the study area are named Pond A through F, with Pond A being the upstream most pond located on the southeasterly side of the study area and Pond F being the downstream most pond located on the southwesterly side of the study area. The three channels are named Channel 1 through 3, with Channel 1 being the southernmost channel and Channel 3 being the northernmost channel. There are also channels that link Ponds A through F consecutively. The channels were intended to infiltrate some portion of the water into the willow riparian forest vegetation that makes up the central portion of the study area. *Exhibit 1* shows the names and locations of the ponds and channels within the study area.

Table 1-1 provides the approximate surface area (in acres) and the approximate depth (in feet) of each of the ponds based upon a desktop review of available data. Further discussion of the documents Dudek reviewed can be found in Section 2.

Table 1-1: Approximate Pond Dimensions

Pond Name	Approximate Pond Surface Area (acre)	Approximate Pond Depth (feet)
Pond A	0.75	6.5
Pond B	0.8	5.5
Pond C	1.1	5.5
Pond D	0.9	5.5
Pond E	2.0	4.0
Pond F	0.1	Varies 2 - 8.5

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Fairview Park Riparian and Wetlands Mitigation Project

City of Costa Mesa

Vicinity Map

Figure 1.1

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Fairview Park Riparian and Wetlands Mitigation Project

Project Location Map

CIty of Costa Mesa

Figure 1.2

1.2 Existing Easements and Restrictions

1.2.1 Easements

The wetlands, ponds and riparian habitat were constructed as a result of agreements with the USACOE, the County of Orange, and the City to provide mitigation for certain impacts created by the Santa Ana Reach-2 Channel Excavation Project in 2004. A conservation easement (CE) was granted to the County of Orange by the City over approximately 20-acres of Fairview Park for the establishment of wetlands and riparian habitat. The USACOE constructed the Phase I wetlands and riparian habitat in 2008. The City is responsible for maintenance, monitoring, and rehabilitation of the easement area in accordance with the Fairview Park Phase-1A Habitat Mitigation and Monitoring Plan (HMMP) established in March 2008. See Figure 1.3 for an aerial view of the completed Phase I improvements.

Figure 1.3: A View of the Completed Phase I of the Study Area

In February of 2011 an agreement was created between the City and the OCTA which would be approved by the wildlife agencies, California Department of Fish and Wildlife (CDFW) and US Fish and Wildlife Service (USFWS), to establish a CE over a 23-acre portion of Fairview Park including the wetlands and riparian habitat for mitigation of Measure-M projects by restoring native habitat, including creation of wetland ponds and installing a water delivery system for irrigation to establish native habitat. In 2012 the wetlands and riparian habitat were modified and improved to include ponds, a water delivery system, and an irrigation system in accordance with the OCTA agreement. The OCTA CE has not been finalized or recorded to date. See Figure 1.4 for an aerial view of the completed Phase II improvements.

Figure 1.4: A View of the Completed Phase II of the Study Area

Exhibit 2b shows the study area delineated between the two phases.

1.2.1.1 Mitigation Area/Conservation Easement Constraints

The Phase I mitigation areas serve as mitigation for impacts to wetlands and waters incurred from the Santa Ana River Mainstem Flood Control Project, 2004/2005 Reach 2 dredging. A total of 17 acres of mitigation were required for this project, which were to be composed of riparian habitat including willows, mulefat, cottonwoods and sycamores. This was later refined into specific habitat areas. This area is referred to herein as Phase I (i.e., Phase 1A in previous planning documents). This area was later expanded to 20 acres including, the 17 acres of riparian habitat, as well as two wetland ponds and associated conveyance streams.

Figure 1.5: A View of a Channel from Phase I of the Channels Designed to Water the Mitigation Area

Phase II included an additional 23 acres of mitigation and restoration, established under an agreement between the City and the OCTA. As part of the mitigation program the City, within one year of project commencement, was to obtain an appropriate CE, or deed restriction, governing the perpetual use and protection of the mitigation and restoration area. The CE or deed restriction, was to be approved by OTCA, the Wildlife agencies and the USACOE. To meet this requirement, the City was to amend the original CE, or implement a new CE, deed restriction, for the 23 acres covered by the City/OCTA agreement. The CE for this portion of the project has not been completed to date pending the completion of the biological monitoring.

The Phase I mitigation areas, which are included in the original CE, are intended to be preserved and protected in perpetuity and are to serve as mitigation for the project for which it was intended and to function as native habitat, with little to no interference. Provided below is a list of major constraints identified in the Phase I CE document. This is not an exhaustive list. The full language and intent of these items should be verified through further technical and legal review of the actual CE document (i.e., CE between the City and the Orange County Flood Control District, dated 6-4-08).

Figure 1.6: A View of a Pond from Phase 2 Constructed Wetland

- The Easement Area will remain in a Natural Condition as defined in the easement document and is intended to be preserved in its natural, scenic, open condition to maintain its historical, visual, and educational values (collectively, "Conservation Values").
- To ensure Project commitments and conservation and conservation measures are carried out, USACOE is a third party beneficiary of the CE.
- The County of Orange is granted the right to remove trash and debris, excavate and regrade the surface as appropriate for detention and flow of water for riparian

habitat, eradicate weeds and remove non-native plants using industry standard methods, products, and practices.

- Prohibited activities include: unseasonable supplemental watering, use of herbicides, biocides, fertilizers or other agricultural chemicals or weed abatement activities, except abatement activities necessary to remove invasive or exotic plant species.
- Planting, introduction or dispersal of non-native plant and animal species.
- Removing, cutting, destroying trees, shrubs, or vegetation, except for emergency fire breaks, prevention or treatment of diseases, control of invasive species.
- City of Costa Mesa to maintain, monitor and rehab easement area in accordance with Fairview Park Phase 1A HMMP (March 2008).
- Riparian habitat creation in Fairview Park to be governed by 1997 Fairview Park Master Plan.
- During the establishment period of the mitigation area, the first five years after construction, the city is responsible to maintain, monitor and report as described in the HMMP. The establishment period ends when USACOE confirms that maintenance and monitoring is complete.
- Long-term maintenance responsibilities, which occur following the completion of the maintenance and monitoring period, of the City consist of:
    - Annual removal of trash or man-made debris.
    - Annual maintenance of signage and fencing.
    - Removing and controlling invasive and non-native weeds and exotic vegetation.
    - Providing water sufficient for the long-term survivability of mitigated areas.
    - It was noted in the HMMP that it was expected to take minimal effort on the City's part to maintain the easement area after the establishment period was over.

1.2.2 Regulatory Permits

Regulatory permits addressing the original impacts from the associated projects and the mitigation and restoration requirements for the onsite mitigation project from the resource agencies (i.e,. USACOE, the wildlife agencies and the Regional Water Quality Control Board) were not available for review as part of our analysis. However, the conditions were incorporated in the conceptual HMMPs, the revegetation construction documents and the CE and joint party agreement documents and reflect input that was required by the resource agencies. Therefore Dudek's analysis and recommended improvements are based upon those documents.

1.2.3 Local Ordinance Measure AA

In 2016, the residents of the City passed Measure AA to establish city ordinances to govern the land use and activities that will be allowed at Fairview Park. Measure AA was passed to keep Fairview Park as a natural and open space as documented in the 2008 Fairview Park Masterplan to give the citizens of the Costa Mesa a voice in determining whether the development of a project beyond the as-built condition of Fairview Park shall be allowed and to ensure that City of Costa Mesa officials provide timely, accurate, and unbiased review of any proposed development or change to Fairview Park. In addition, the measure is intended to ensure that the citizens of Costa Mesa receive all necessary and relevant accurate environmental information needed to cast an informed vote on proposed development or change to the park. Measure AA requires a vote of the public before certain improvements to Fairview Park can be made. This may impact the timing and perhaps the ability to implement some of the larger improvements recommended in this report.

1.3 Primary Concerns and Issues

1.3.1 Public Concerns

In 2018 the City began a comprehensive work effort to improve maintenance practices and to document reported increased mosquito breeding, associated with the wetlands habitat at the Fairview Park wetlands in response to complaints from residents whose backyards are adjacent to the Fairview Park wetlands. The City partnered with the Orange County Vector Control District (OCVD) to conduct a 'Mosquito Trapping Program' in the "Lower Birds" neighborhood located between Placentia Ave., Adams, the Santa Ana River, and Fairview Park. The local residents reported that since installation of the wetland mitigation project in 2012, the wetland ponds and associated emergent vegetation are responsible for an increased number of mosquitos present in the area, resulting in their backyards being "unusable." The City trapped mosquitos in CO2 traps over a 21-week period then counted the number of mosquitos weekly and identified trapped species. The OCVD threshold for high mosquito activity is greater than 75 mosquitos trapped per night. The threshold was exceeded once during the trapping program. Less than 75 mosquitos per trap night is not considered to be an actionable matter based on the OCVD guidance. The results of the study may have been affected by OCVD spraying mosquito suppressant at Fairview Park wetlands during the 21-week study. The City recommended that the study be extended for a 2nd season of trapping to draw more robust conclusions.

1.3.2 Identified Systemic Issues

The document research and field investigations conducted as a part of this study identified several issues in the study area that are not in alignment with typical good manmade pond and wetland design, construction, operation, or management practices. The conditions which were identified as problematic or potentially problematic can be generally categorized in one of the following deficiency categories:

1. safety concerns
2. vector control issues
3. water quality issues

The existing issues identified should be addressed as they are either likely currently contributing to identified complaints and problems with the ponds and wetlands or they may result in problems in the future. In many cases, safety concerns, vector issues, and water quality issues are interrelated. Further information on the evaluation performed, the observations and the resulting recommended improvements can be found in Sections 2, 3 and 4 respectively.

Figure 1.7: Emergent Vegetation and Stagnate Water in Shallow Areas

Safety Concerns / Safety Issues

The City must take reasonable and ordinary protective measures to protect against reasonably foreseeable risks of injury to any person in the area.

In addition, there are safety issues relevant to maintenance personnel that should be resolved to create a safer work area. The following issues present potential safety hazards to the public and/or maintenance personnel.

Figure 1.8: Channel without Maintenance Access Provided on Either Side of the Channel or a Defined and Hardened Edge

a. Vegetation growing over pond edge obscuring pond edge – This is a potential safety hazard because the rooting of some of the vegetation is so aggressive and dense that it has formed dense mats that extend over the pond edge into the pond. An unwary child or maintenance worker may have some difficulty discerning where the pond edge is located and may actually be walking on the unsupported root mats over the pond rather than on the land side of the pond edge. The unsupported root mats could fail underfoot and the person could fall into the pond. This condition is most evident on the northerly edge of Pond-B.

b. No discernible pond edge in multiple locations- This is a potential safety hazard because dense tree litter has built up around some of the ponds and obscured the pond edge. A maintenance worker may not be able to discern where the pond edge is located and may actually be walking on the unsupported deleterious tree droppings in the pond rather than on the land side of the pond edge. The person could fall into the pond. This condition is most evident on Pond-F.

c. Landscape netting around perimeter of ponds – Exposed landscape netting is a potential trip hazard. Tripping could result in serious injuries to a trespassing child/adult and/or personnel and could result in the same falling into the pond.

d. Utility vault(s) within pond limits – Pond-F was originally designed and constructed as an infiltration basin in the Phase-1 mitigation area construction. As a part of the Phase-2 site modifications it was transformed to a pond. It appears that the Phase-2 modification may have resulted in utility vaults actually being within the pond water surface area. It is not known if there are electrical wires in the vault.

e. Lack of dedicated pond and channel perimeter access paths – There are no dedicated maintenance paths around the ponds or wetlands as shown in Figure 1.8. The area is densely vegetated and is known to have rattlesnakes that reside in the wetland/pond area. Some pathways have been established by maintenance personnel by trampling vegetation. This does not provide stable footing and could obscure view of a snake or other hazard(s) which could lead to a maintenance worker being bitten.

f. Steep slopes above water surface at pond edge – In some locations the ground slope above the water surface is steep, approximately 3:1 (Horizontal: Vertical), as shown in Figure 1.9. This is not a safe slope to traverse. It may create a slip and fall hazard that could result in maintenance personnel being injured and/or falling into the pond.

Figure 1.9: Pond with 3:1 Sloped Edges, Large Clusters of Emergent Vegetation and Emergent Vegetation in Shallow Stagnate Water

Vector Control Issues

a. Emergent vegetation in shallow water – Mosquitos readily breed and hatch larvae in water that is less than 2-ft deep. Larvae cannot survive to maturity in water that is greater than 1-2 feet in depth. The 2015 Vector Control Plan recommends that emergent vegetation be confined to areas where water is greater than 2-feet in depth to control mosquito populations. Currently emergent vegetation is growing in areas where water is less than 6 inches deep, as shown in Figure 1.7. Such areas are ideal for breeding of mosquitos and hosting larvae to maturity.

b. Dense emergent vegetation - Dense clusters of emergent vegetation provide habitat for mosquito breeding and development of larvae. The higher the density of the emergent vegetation the more it provides protection and refuge for mosquitos and their larvae. It makes it more difficult for their natural predators (birds, bats, fish, amphibians) to find them. In addition, higher density emergent vegetation renders application of OC Vector Control District mosquito control measures (sprays and Bacillus thuringiensis subspecies israelensis bacteria pellets; also known as Bti pellets) less effective and more difficult to apply. The 2015 Vector Control Plan recommends that emergent vegetation tillerage (number of leaves per unit pond surface area) be limited to 30 to 40% of the total surface area of the planting structure.

c. Large clusters of emergent vegetation - Large clusters of dense emergent vegetation provide habitat for mosquito breeding and development of larvae. The 2015 Vector Control Plan recommends that emergent vegetation be limited to clusters that are 50-75-feet in width, to allow for effective application of mosquito control spray or dispersal of mosquito control Bti pellets. Review of an April 2018 aerial image of the study area revealed emergent vegetation clusters spanning over 1,000-ft in length.

d. Sloped pond edge – The ponds have edges that are sloped at approximately a 3(H):1(V) ratio, as shown in Figure 1.9. The area extending from the interface of the water surface and the pond edge slope to the point where the pond depth is 2-ft provides a wedge around the entire perimeter of the pond that is suitable habitat for mosquito larvae. At a 3:1 edge slope the minimum depth of 2ft occurs 6-feet away from the water surface edge interface. The total shallow edge regions on ponds A-F provides approximately 36,000 square-feet of suitable habitat for development of mosquito larvae.

e. Shallow stagnant water in channels - The wetland channels interconnecting the ponds do not convey sufficient flow. The water in the channels was observed to be stagnant. In some reaches of the channel the water is flowing very slowly that is suitable habitat for mosquito larvae. The water in the channels is less than 2-ft deep and provides suitable habitat for mosquito breeding and larvae development. The channels provide approximately 17,500 square-feet of suitable habitat for development of mosquito larvae.

f. Lack of dedicated pond and channel perimeter access paths – There are not dedicated and well established maintenance paths around the ponds or wetlands. The area is densely vegetated and does not provide planned maintained suitable access for maintenance and vector control measures.

g. Uncontrolled algae growth – There are large areas of Pond-E covered with filamentous algae blooms. Each of the ponds have a green tint to the water which is indicative of microscopic algae. Extensive algae growth was observed in the wetland channels and in the Placentia Drain downstream of Pond-F. Algae is necessary for a healthy pond system, but algae overgrowth is an indicator of excess nutrients in the water and leads to poor water quality. Filamentous algae provides suitable habitat for breeding of mosquitos.

h. Stagnant water in the Orange County Flood Control District (OCFCD) owned/managed Greenville-Banning Channel (GBC) and Fairview Channel – During the duration of this study, stagnant water was observed in the GBC, located outside of study area, on numerous occasions. Observation of historic aerial images dating back to 2012 also indicate standing water in the GBC extending from the inflatable dam almost to Adams Avenue and the Fairview Channel, also outside of study area, follows the northern perimeter of the study area. See *Exhibit 3* to view a map of the offsite water features including the GBC and Fairview Channel. Due to the slope of the channel invert, the water stored in the channel behind the inflatable dam is stored in a wedge that is deepest at the dam and shallowest at the upstream end near Placentia Avenue. There are no water quality provisions to maintain water quality in the channel impoundment area. It is not known if OCVCD routinely applies vector control measures to this portion of the channel. The portion of the water observed in the Fairview Channel (owned/operated by OCFCD) at the upstream end of the impoundment area that is less than 2-ft deep occurs adjacent to the residential homes along Swan Drive. Stagnant untreated water less than 2-ft deep standing for more than 48-hours provides suitable habitat for mosquito breeding and larvae development. See *Exhibit 4* for a view of the typical Fairview Channel water level.

i. Stagnant water in the Placentia Drain – During the duration of this study, stagnant water was observed in the Placentia Drain on numerous occasions and for 5 to 6 days of the week for a 3-week period from February 15, 2019 through March 6, 2019. Observation of historic aerial images dating back to March of 2015 also indicate standing water in the Placentia Drain, located outside of the study area, just downstream of the Pond-F outlet. Review of historical aerial photographs appear to indicate that a gradual eroding and failing of the bluff slope approximately 1,100 feet downstream of the Pond-F has blocked the Placentia Drain and impedes flow in the channel between the blockage and Pond-F. There are no water quality provisions to maintain water quality in the Placentia Drain impoundment area. It is not known if OCVCD routinely applies vector control measures to this portion of the drain. The stagnant water in the Placentia Drain is less than 0.5 mile from the residential homes on Swan Drive. This water also has extensive seasonal filamentous algae growth and emergent vegetation as seen in Figure 1.10. Stagnant untreated water less than 2-ft deep, with algae blooms, and emergent vegetation, standing for more than 48-hours provides suitable habitat for mosquito breeding and larvae development. See *Exhibit 3* to view a map of the offsite water features including the Placentia Drain.

Figure 1.10: Ideal Mosquito Breeding Grounds in the Placentia Drain

j. Insufficient bat population present in wetland area – Based upon discussion with the Biologists responsible for maintaining the study area Dudek understands that there are no known bats residing in the study area. Bats are active during warm evening hours when mosquitoes are active and when insect eating birds are less active, bats are an effective complement to a mosquito control program.

k. Insufficient fish population and lack of diversity in fish species - Based upon discussions with Biologists responsible for maintaining the study area Dudek understands that fish kill(s) due to poor water quality have decimated the fish population in the ponds. During our site observations a small school of perch were observed in Pond-A and small population of mosquito fish were observed in Pond-C. Many fish species feed on mosquito larvae. Fish are a major part of an effective mosquito control program for ponds. In addition, fish as well as other aquatic animals play a major role in maintaining water quality in a pond.

l. Lack of mosquito fish stocking program – Since mosquito fish were noticeably absent from all ponds except Pond-C it appears there is no regular stocking of mosquito fish to each pond. Mosquito fish have a major role in an effective mosquito control program for ponds.

3. Water Delivery System Issues

a. No active aeration of ponds – The ponds do not have an active aeration system. There is marginal amount of aeration that occurs as water flows from one pond to the next. Water quality samples were acquired as a part of this study in February 2019. Dissolved oxygen varies in ponds throughout the day and seasonally. The dissolved oxygen levels were good, but Dudek believes that can be attributed to the time of year, as there had been recent rainfall and recent climactic temperature. It is necessary to maintain dissolved oxygen in relatively stable range in artificial ponds to support aquatic animals and good water quality. The pond systems respond to low dissolved oxygen content with blooms of algae which in turn create oxygen while they are living, but increase oxygen consumption when they decompose.

b. No active water quality treatment system - The ponds do not have an active water quality control system. Water quality samples were acquired as a part of this study in February 2019. Test results indicate high levels of nitrate-nitrogen (3-6 mg/L) and very high levels of phosphorus (1-3 mg/L). This indicates that the ponds have an abundance of nutrients and will readily form algae and other plants and can become eutrophic leading to a sharp decline in dissolved oxygen and fish kills. The BOD level in the ponds is relatively low (3-6 ml/L). This is likely due to the chlorine in the reclaimed water makeup water source.

c. Non-Operational water recirculation system – The Phase-I wetland mitigation area was originally designed for full containment of inflow water so that there would be zero discharge under normal non-storm operating conditions. It was designed this way to avoid water quality permitting requirements associated with discharge from the wetland. The original design included an infiltration basin at the downstream end to percolate water that was conveyed through the wetland and to have a recirculation pump installed at Pond-E. The Phase-2 modification changed the function of the infiltration basin and converted it to a pond (Pond-F). Currently the wetland pond system normally discharges flow from the system to the Placentia Drain. Placentia Drain conveyance has been blocked or restricted due to slope failures of the bluff. Thus there is ponded water with very poor water quality currently in the Placentia Drain due to the normal discharge from the wetland/ponds. Based upon field observations Dudek believes that the recirculation pump is non-operational. A functional recirculation pump could prevent uncontrolled discharge out of the study area into the Placentia Drain.

d. Insufficient flowrate through system –The wetland channels generally have ponded, become stagnant, or contain very slow moving water. The flow depth in the channels is less than 2-feet and provides sufficient habitat for breeding of mosquitos and development of larvae.

e. Temporarily blocked transfer weirs between ponds and channels – For the duration of this study, some of the transfer weirs between the ponds and channels were temporarily partially blocked by items moved by trespassers (rocks, sandbags, tree branches, etc.) requiring daily monitoring . The partial blockages are contributing to the low water conditions and poor water quality in the channels and contributing to the creation of favorable mosquito habitat.

f. Deciduous trees adjacent to ponds – There are numerous Black Willow trees that were planted as a part of the Phase-1 mitigation project along with other vegetation. Black Willow are deciduous. The leaf, flower, and bark litter from the trees provides large amounts of organic material to the ponds and channels and is a major contributor to the biological oxygen demand of the ponds. If there is an imbalance between organic material decomposing and bacteria and animals, then breakdown anoxic benthic conditions can develop in the pond resulting in fish kills, bad odors, algae blooms, and conditions favorable to mosquito larvae development. Pond-F appears to have approximately 5-ft of organic matter built up in the pond based on comparing the design drawings to conditions observed in the field.

g. Lack of control over makeup water volume, source, and quality – The current GBC pump station facility is equipped with a salinity probe sensor in the wet well that is not working properly and cannot be serviced. This is the only water quality sensor installed in the pump station wet well. The water captured in the GBC to be pumped to the wetland ponds is urban storm runoff and non-storm runoff. There is no ability to detect the presence or concentration of toxic pollutants such as hydrocarbons, radiator fluid, hydraulic fluids, pesticides, fertilizers, etc. When a sufficient volume is impounded behind the inflatable dam in the channel, the water that is captured in the channel is pumped into Pond-A without knowing what potential affects or impacts the slug of water could have on the wetland/pond ecosystem.

h. Ponds less than 8-ft deep – Ponds that are less than 8-ft deep in Southern California are susceptible to large seasonal water temperature variations. Many biological functions in the pond ecosystem are temperature dependent. One of the most temperature dependent biological functions in dissolved oxygen content and saturation. Generally as water temperature increases, dissolved oxygen content decreases. This is why lakes and ponds exhibit the worst annual water quality in July, August, and September. Most dissolved oxygen related fish kills happen between July and September in Southern California. Generally, the sun rays do not penetrate deep enough into the water column to heat the water significantly below 8-feet. See *Table 1-1* for a list of the ponds' areas and depths.

i. Insufficient bottom feeding animals – During the duration of this study no bottom feeding animals such as worms, mussels, crayfish, snails, catfish, grass carp, etc. were observed in the ponds and channels. A few Red Ear Slider turtles were observed. Bottom feeding animals play a very important role in the pond ecosystem by eating organic matter on the bottom of the pond and decreasing the biological oxygen demand created by decomposing organic material. Bottom feeding animals assist the natural beneficial bacteria in the pond by breaking down large organic components.

j. Uncontrolled direct connection to Placentia Drain – The Placentia Drain outlet from Pond-F is submerged in Pond-F and partially submerged by the pool in the Placentia Drain. The water ponded in the Placentia Drain is of exceptionally poor quality. The submerged interconnection between Pond-F and Placentia Drain provides a pathway to further degrade the water quality in Pond-F and also creates stagnate water in Pond-F.

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2 Evaluation Methods

Dudek conducted a series of site observation visits to collect data, measurements, samples, and photographs of the existing site. Evaluation of the existing conditions of the study area included:

1. Discussions with Fairview Park Manager.
2. Discussions with the study area Landscape Manager and Biologist.
3. Discussions with City and County Operations staff.
4. Observation of the operation and function of the ponds and wetlands.
5. Observation of wetland infrastructure.
6. Observation of the pump station vault and equipment.
7. Observation of ponds.
8. Observation of wetland channels.
9. Evaluation of wetland and riparian vegetation.
10. Evaluation of observable pest and or disease problems within the native vegetation.
11. Evaluation of the health and vigor of the vegetation within the wetland and upland mitigation and restoration areas.
12. Evaluation of the current native species present within the mitigation and restoration areas, measured against the original revegetation plant palettes.
13. Documentation of existing biological resources, including sensitive plant and wildlife species and habitat types.
14. Obtaining water quality samples and conducting detailed water quality testing.

The following subsections break down the evaluation of the study area into three categories: Engineering, Biological Resources and Mitigation and Restoration.

2.1 Engineering

Dudek evaluated the function of the ponds, channels and pump station within the study area. The following subsections detail the methods for the engineering evaluation.

2.1.1 Literature Review

Before evaluating the site conditions of the ponds and channels, Dudek performed a desktop study of the available documents that described the design intent of the ponds, the wetland and upland mitigation and restoration areas, channels and pump station. To evaluate the existing condition of the study area, Dudek reviewed various project design supporting documents provided by the City. The following documents were reviewed, with a brief summary of the main issues addressed in each document.

30% Deliverable Hydrologic/Hydraulics Calculations Letter Report (Dec. 2005) – Moffat Nichol

- This document provided the basis of design for the Channels and Ponds E and F which was Phase I of the construction of the study area.

30% Design Memorandum Constructed Treatment Wetlands (Dec. 2005) – Geosyntec

- This document provided the basis of design for Ponds A through D which was Phase II of the construction of the study area.

Geotechnical Evaluation Fairview Park Monitoring Wells (April 2009) – Ninyo & Moore

- This document provided a summary of the geotechnical evaluation performed on the study area prior to construction. This included data from four groundwater monitoring wells which were studied between December of 2008 and February of 2009.

Vector Management Guidelines (2015) – Vector Management Technical Services, Meyer

- This document provided guidelines for proper vector management within the study area.

Phase I As-Built Construction Documents (2009) - USACOE

- Construction documents that show how the Phase I design was built.

Phase II Design Drawings (2011) – Moffat & Nichol

- Design drawings that show how the Phase II design was proposed to be built.

2.1.2 Field Evaluation

Once the Dudek team reviewed the theory of the design, the Dudek team went into the field to observe how the design had been constructed and was functioning. Dudek's engineering team went into the field the following times to observe existing conditions: Initial Site Visit on November 16, 2018, Weir Measurements and Water Quality Sampling on January 15, 2019 and Pump Station Inspection on March 12, 2019.

2.1.3 Ponds

The ponds were intended to be composed of a mixture of open water and clusters of wetland plants to clean urban run-off as it slowly works its way through the series of ponds and channels. To evaluate the functionality of the design, water quality samples from each pond were taken at an approximate upstream and downstream location. By taking multiple samples from each pond Dudek was able to not only capture whether the system is working to clean the water but to also observe whether each pond itself is healthy and supportive of the wildlife and vegetation in and around it.

Dudek completed a number of tests on each sample. A list of the tests performed for each sample taken can be found below:

- Ammonia
- Biochemical Oxygen Demand
- Color
- Specific Conductance
- Dissolved Oxygen
- Nitrate as N
- pH
- Phosphorous

- Salinity
- Total Dissolved Solids
- Turbidity
- Redox Potential
- Hardness

2.1.4 Channels

The channels were designed to provide sufficient water to sustain the willow tree forest and mulefat community that lies in the center of the study area. As a practical measure to make sure channels exist long-term and maintain a healthy system, the channels were also designed to prevent scour and convey water with a high enough flow rate to prevent stagnation that would encourage vector breeding. Field observations included measuring weirs and flow depths to estimate flowrates within the channels as well as a visual inspection of the channel water health, water condition and mosquito larvae presence. *Exhibit 5* shows the weir dimensions that were measured.

2.1.5 Pump Station

Urban runoff (water) is impounded by a rubber dam within the GBC and provides water to the pump station (station). The pump station is operated by both Orange County and the City, and the primary purpose of the station is to convey the water to several prioritized locations. The top priority is Pond A. If Pond A does not need water, then flows are conveyed to Orange County Sanitation District (OCSD) for treatment and recycling.

An evaluation of the pump station facility was conducted by Dudek on March 12, 2019 which included interviewing operators from Orange County and the City. The results and recommended improvements of this evaluation are contained in Sections 3 and 4 respectively.

2.1.6 Mosquito Breeding

Dudek performed a desktop study of the current *Fairview Park Vector (Mosquito) Management Guidelines for Constructed/Treatment Wetlands and Associated Wetlands Features* produced by Vector Management Technical Services for the City in 2015, herein called "Vector Management Plan". After the desk study was complete, Dudek performed field observations to observe mosquito larvae populations within the wetlands. The Vector Management Plan served as the guideline for how Dudek evaluated the mosquito populations and the factors that might contribute to their size.

Dudek also spoke with OCVCD about how frequently OCVCD team members inspect and treat the study area and the surrounding water bodies. Dudek was told that OCVCD visits every 14-days and treats the areas as needed based on field observations.

The Vector Management Plan highlights a few key factors for managing mosquito populations in wetland areas. Those factors include:

Vegetation Growth: Vegetation should begin 4' away from any shoreline at a water depth of 2'. This shallow "vegetation free zone" would allow mosquito fish access to mosquito larvae and pupae as well as give staff the ability to freely assess vector populations and respond with necessary measures. There should be no emergent vegetation in shoreline, channels and canals at depths of less than two feet because that is mosquito larvae habitat and protects them from the mosquito fish. Cells of the vegetation within the ponds should only be 50'-75' in width with paths on both sides that run the entire extent to allow for vector control access.

Water: Open water that remains on the surface and does not infiltrate in seven to ten days will be prone to supporting mosquitoes.

Integrated Pest Management (IPM): IPM as prescribed for the study area in the Vector Management Plan is comprised of three aspects: natural control, biological control and insecticide. Natural controls include mosquitofish, vegetation management and periodic removal as well as a stable water level. A stable water level is especially important because it maintains the vegetation's distance from the shallow portion of the shoreline. Biological controls are bacteria pellets (Bti) that target mosquito larvae. Bti creates minimal environmental impact, leaving no residual presence and has high target specificity. According to the vector management plan, Bti is the public health pesticide of choice used at Fairview Park. Applications of Bti are performed by OCVCD. Insecticide is the final aspect of IPM. The Vector Management Plan recommends using a spray that targets adult mosquitoes as a last resort if conventional control (natural and bacterial) fail. OCVCD can perform this spraying if necessary.

Dudek's goals for the field observations in relation to mosquito breeding were to evaluate how the study area compared to the prescribed key factors from the Vector Management Plan. The primary focus was vegetation growth and water in relation to their functionality within an IPM. Dudek also observed if and where there was a presence of mosquito larvae within the study area.

2.2 Biological Resources

2.2.1 Literature Review

Evaluation of the study area began with a review of relevant literature on the biological resources previously documented within the study area. These documents were provided to Dudek by the City during the initial phase of the evaluation and included Fairview Park Biological Constrains Analysis (LSA 2007), Annual Mitigation Monitoring Reports (EES 2017, 2018), Annual Mitigation Maintenance Reports (EES 2018), and various nesting bird survey result reports (EES 2016-2017).

2.2.2 Field Evaluation

A general biological survey and vegetation mapping was conducted by Dudek biologists on January 15, 2019. During the field visit, the biologists assessed the existing habitats and mapped vegetation communities within the study area. The biologists paid special attention to vegetation communities that appeared to provide suitable habitat for special status plant and wildlife species. An inventory of wildlife species observed was also conducted during the survey. Aerial photographs and maps were used to assist in the delineation of plant community boundaries. (See *Exhibit 2a & 2b* and *Table 3-3*) No focused surveys were conducted as part of this evaluation.

2.2.3 Vegetation Community Mapping

Vegetation communities were mapped in the field directly onto a 200-scale (1" = 200') aerial field map, focusing on dominant plant species. Results of the field mapping are shown in *Exhibit 2a & 2b* and *Table 3-3*. Latin and common names for plant species with a California Rare Plant Rank (CRPR) follow the CNPS Inventory of Rare and Endangered Plants (CNPS 2016). For plant species without a California Rare Plant Rank, Latin names follow the Jepson Interchange List of Currently Accepted Names of Native and Naturalized Plants of California (Jepson Flora Project 2016). Common names follow the United States Department of Agriculture (USDA) Natural Resources Conservation Service Plants Database (USDA 2016). Plant community classifications follow Gray and Bramlet (1992).

Modifications were made by Dudek biologists where appropriate (ie. some vegetation communities that were not part of the Gray & Bramlet (1992) classification system were included in the maps, based on observations of plan t species composition and dominance at the time of the survey, and some of the classifications used during the p revious biological assessments and annual mitigation monitoring reports from 2007-2018). After completing the fieldwork, the vegetation community polygons were digitized using Geographic Information System (GIS) technolo gy to calculate acreages. Vegetation/land cover categories are shown on Figure 2b.

2.2.4 Sensitive Habitats

Sensitive habitats are listed by CDFW on their Vegetation and Classification and Mapping Program (VegCAMP) (CDFW 2010). Sensitive habitats were identified based on the natural communities mapped within the study area.

2.2.5 Sensitive Plant Species

The presence of sensitive plant species was based on direct field observations during the field evaluation conducted by Dudek biologists and information obtained during the literature review. No focused sensitive plant surveys were conducted as part of this evaluation.

2.2.6 General Wildlife Inventory

All wildlife species observed within the study area, as well as any diagnostic sign (call, tracks, nests, scat, remains, or other sign), were recorded in field notes. Binoculars and regional field guides were utilized for the identification of wildlife, as necessary. Latin and common names of animals follow Crother (2008) for reptiles and amphibians, American Ornithologists' Union (AOU 2016) for birds, Wilson and Reeder (2005) for mammals, North American Butterfly Association (NABA) (2016) or San Diego Natural History Museum (SDNHM) for butterflies (SDNHM 2002), and Moyle (2002) for fish.

2.2.7 Sensitive Wildlife Species

The presence of sensitive wildlife species was based on direct field observations during the field evaluation conducted by Dudek biologists and information obtained during the literature review. No focused sensitive wildlife surveys were conducted as part of this evaluation.

2.3 Mitigation and Restoration

2.3.1 Project Documents Reviewed

In evaluation of the existing wetland/riparian areas within Fairview Park, and assessment of the original design intent for the mitigation and restoration areas and their current status, Dudek reviewed various project documents provided by the City. The following documents were reviewed, with a brief summary provided herein describing the main issues addressed in each document.

Fairview Park Wetlands and Riparian Habitat Project Restoration Plan (Nov. 3, 2010) – City of Costa Mesa

This report for the Phase II mitigation area described the goals and objectives for the restoration program including, success standards that were to be achieved throughout the five-year maintenance and monitoring period. Guidelines were provided describing the maintenance and monitoring programs requirements.

Update to the Biological Constraints and Information for the Fairview Park Master Plan, City of Costa Mesa, County of Orange, California (Jun. 28, 2007) – LSA

This report documented the biological resources within Fairview Park. Report serves as baseline conditions analysis that was conducted prior to the wetland mitigation/revegetation areas being implemented. Included an Appendix A Vascular Plant Species Observed, and Appendix B animal Species Present. This document focused on surveys for: southern tarplant (*Centromadia parryi* var. *australis*), burrowing owl (*Athene cunicularia*), and coastal California gnatcatcher (*Polioptila californica californica*). All 3 species were observed during focused surveys in 2005 and 2006, suitable habitat was still present at that time, and all 3 species were believed to potentially still occur in the park. Focused survey reports were included to append the original biological resources report. Maps were included documenting the vegetation observed, as well as the size and locations of vernal pools on site. The report contained a full list of plant and wildlife species observed, including special-status species.

Fairview Park Phase II: Year 6 Maintenance Report (Sept. 2018) – Endemic Environmental Services, Inc. (EES)

This report addressed the status of the Phase II wetland mitigation and pond areas, as of the date of inspection, September 27, 2018 (Year Six). The report provided a brief overview of the planting, seeding, natural native plant recruitment, wildlife species use of the site and habitat regeneration that has occurred and is still occurring onsite.

Fairview Park Phase II: Year 5 Maintenance Report (2017) – Endemic Environmental Services, Inc.

This report addressed the status of the Phase II wetland mitigation and pond areas, as of the date of inspection, September 22, 2017 (Year Five). The report provides a brief overview of the container plant growth, establishment from seed, natural native plant recruitment, wildlife species use of the site and habitat regeneration that has occurred and is occurring onsite. Both wetland habitat and upland coastal sage scrub habitats are addressed in the report.

Fairview Park Riparian Mitigation Project Phase II: Annual Report (2017) – Endemic Environmental Services, Inc.

This annual report addressed project success during years four and five. Container plant survival was noted a 95% with less than 5% non-native cover. The report also discussed the original planting and seeding of the project with representative species indicted. Other maintenance items identified in the Year 5 maintenance report were summarized.

Additional results from qualitative and quantitative monitoring were discussed. Qualitative monitoring included vegetation surveys to estimate species diversity, percent composition, native cover and exotic cover. Quantitative monitoring included line intercept transects as well as one meter square quadrats. Native cover was estimated at 68%, non-native cover at 9%, bare ground 23% and organic matter 5%, as an average throughout the Phase II mitigation areas (i.e., including riparian and grassland). Coastal Sage Scrub areas were not measured but were assumed to be at 95% cover based upon previous year's measurements.

Conclusions and recommendations presented in the 2017 report included:

- The limiting factor on success is the perennial growth of non-native species and some non-native annuals. Target species were identified. Recommendation for continued weeding and invasive species removal in grassland areas
- EES and the City are updating a wetland vegetation management program as a mosquito control measure.
- A growing problem with Polyphagus shot Hole Borer infesting willows was noted. It was noted that UC COOP is currently conducting county-wide investigations.

Vector Management Guidelines (2015) – Vector Management Technical Services, Meyer

This report documented that the largest cause of mosquito problems within the site appears to be too much vegetation, which is making vector control measure difficult to conduct, if not impossible in some areas. The report also addressed the following issues:

- Vegetation Density Issues
- Water Issues, including water depth, water quality and aeration.
- Integrated Pest Management Approach
- OCVCD Department. Report describes methods implemented by OCVCD to manage vector control issues within Fairview Park.

Fairview Park Riparian and Wetlands Mitigation Project, Final Report 2018, Endemic Environmental Science, Nerhus

This report documented the status and condition of the riparian and wetland mitigation areas at the end of 2018 and the evaluation of achievement of the final project success criteria. Report stated that the site is meeting the minimum requirements for success and that the project be considered complete with the exception of some remedial oak trees that were planted within the site.

Conservation Easement Document (CE between the City and the OCFCD, dated 6-4-08) (Note see section 1.2.1.1 for a summary of the conditions and restrictions imposed by the CE)

The CE document (i.e., CE between the City and the OCFCD, dated 6-4-08), includes restrictions and provisions for the protection and management of the Phase 1 area. The Phase I mitigation areas serve as mitigation for impacts to wetlands and waters incurred from the Santa Ana River Mainstem Flood Control Project, 2004/2005 Reach 2 dredging. This was a USACOE project. The Phase I mitigation areas, which are included in the original CE, are intended to be preserved and protected in perpetuity and are to serve as mitigation for the project for which it was intended and to function as native habitat, with little to no interference. The following key items are excerpts from the Phase I CE document.

- Conservation Easement (CE) covers 20.0269-acre area.
- Covers area associated with mitigation for Santa Ana River Mainstem Project, Reach 2 Channel Excavation (USACOE). Referred to elsewhere as Phase 1a (USACOE Mitigation Area), Parcel A. (Includes Pond E and channels from other ponds.)
- The CE is based upon the requirements outlined in the document, Fairview Park Wetlands and Riparian Habitat Plan, dated March 2008, referred to as the "Mitigation Plan". (Exhibit C)

Purpose of the CE - To preserve the easement area to prevent impairment or interference with the conservation values of the easement area. Confines use of the area to preservation and enhancement of native species and their habitat consistent with the purposes of the easement.

- Identifies uses that are prohibited.
- Identifies Grantor's Duties.
- Describes Reserved Rights.
- Enforcement.
- Amendments.
- Long-term Maintenance.
- Other technical items.

Joint Party Agreement (City/OCTA)

The second phase of the mitigation program, referred to herein as Phase II (i.e., Phases 1B, 2 & 3 in previous planning documents), included an additional 23 acres of mitigation and restoration, established under an agreement between the City and the OCTA. This work served as mitigation for the M2 Environmental Mitigation Program (EMP), covering grant funded transportation (i.e., freeway) related improvement projects. For the Phase II areas, a CE, or deed restriction, governing the perpetual use and protection of the mitigation and restoration area, was to be established and approved by OTCA, the Wildlife agencies [i.e., USFWS and the CDFW and the USACOE]. Upon completion of the Phase II mitigation program the original CE was to be amended, or a new CE/deed restriction was to be established for the additional 23 acres covered by the City/OCTA agreement.

2.3.2 Field Investigations Conducted

Dudek biologists and habitat restoration staff visited the site on two occasions to investigate the existing conditions and to evaluate the current status, overall health and functionality of the mitigation/revegetation areas. The following visits were conducted.

Nov. 16, 2018, Project Meeting and Field Visit.

Present: Cynthia D'Agosta, Jonis Smith, Jennifer O'Brien, Tommy Molioo, Ryan Henry, John Minchin and Barry Nerhus. The Dudek team conducted a general orientation site visit with Cynthia D'Agosta (City) and Barry Nerhus (Endemic Environmental Services, Inc.) to obtain a general overview of the site and to investigate the current condition of the ponds, pumps and pipeline systems feeding the ponds, channels and mitigation/ revegetation areas. At the time of this visit observations were made and existing conditions were documented, including a basic list of plant species observed, the status of existing maintenance activities, measures being implemented for vegetation clearing/thinning for vector (i.e., mosquito) control, and the general status of the native vegetation and exotic/non-native species present within the mitigation/ revegetation areas. Also evaluated at this time were several locations where the potential exists for the establishment (i.e., creation) of additional wetland and/or transitional vegetation if necessary to provide additional mitigation that might be needed to compensate for future maintenance that could potentially impact the mitigated habitat.

Jan. 15, 2019, Field Investigation by Dudek Biologists (Tommy Molioo, Crysta Dickson, Chris Oesch)

Dudek biologists conducted a thorough site investigation to evaluate existing conditions of the biological resources onsite, the health of the system (i.e., water resources, vegetation establishment and vigor, and pest/disease problems present) and the current status/condition of the wetland/riparian mitigation areas. Also conducted at that time was a more thorough analysis and documentation of vascular plant and wildlife species observed, and those having the potential to occur within the site. Also documented were non-native weed and exotic/invasive plant species presence within the site. Staff also observed and documented the existing vegetation communities within the site and the dominant species present.
Staff also documented existing conditions that may need to be remedied, or steps taken to modify areas, to address observed issues of concern.

3 Observations

This section will detail the results of Dudek's evaluation of the study area.

3.1 Engineering

Dudek evaluated the function of the ponds, channels, and pump station within the study area. The following subsections detail the results of the evaluation. For further details on the engineering evaluation procedures refer to Section 2.1.

3.1.1 Water Quality

As described in Section 2.1, water quality samples were taken from the upstream and downstream sides of each pond as well as the inlet that releases imported water into Pond A and the system's outlet at the Placentia Drain. Refer to *Exhibit 1* for all water quality sample locations. Refer to *Appendix C* for raw water quality results. Refer to *Exhibit 1* for all water quality sample locations.

3.1.1.1 Ponds

A summary of the water quality test results for each pond sample as well as the inlet and outlet samples can be found below in *Table 3-1*. Refer to *Exhibit 1* for all water quality sample locations.

Table 3-1: Pond Water Quality Results

ID	Ammo-nia (mg/L)	BOD (mg/L)	Color (CU)	Conduc-tance (umhos/cm)	DO (mg/L)	Nitrate (mg/L)	pH (pH units)	Phosp-horous	Salinity (PPT)	TDS (mg/L)	Turbi-dity (NTU)	ORP (mV)	Hard-ness (mg/L)
Acceptable Level	1.9	<5	15	4,000-7,000	4	<75	6.5-9	0.025	<1000	<1000	25-50	<200	75-300
I-1	0.98	4.2	18	1060	6.32	8.6	7.25	3.4	ND	675	1.24	94	151
A-1	0.62	3.8	4	1090	6.56	8.5	7.44	3.15	ND	690	1.16	110	171
A-2	0.33	3.4	2	1070	6.42	7.7	7.48	3.4	ND	680	1.4	110	155
B-1	0.17	2.9	5	1110	6.29	5.7	7.44	2.7	ND	700	3.38	110	171
B-2	0.36	2.7	7	1100	6.39	6.2	7.58	2.55	ND	690	1.96	110	173
C-1	0.5	3.1	6	1080	6.07	4.7	7.41	2.15	ND	685	2.12	110	172
C-2	0.41	2.1	8	1090	6.08	5.1	7.38	2.1	ND	680	1.93	110	157
D-1	0.19	3.9	21	1080	6.46	3.9	7.45	1.55	ND	670	4.19	110	158
D-2	0.27	2.9	20	1080	6.34	4.3	7.36	1.7	ND	675	2.06	100	167
E-1	0.54	5.1	17	1070	6.29	3	7.08	1	ND	684	1.72	110	167
E-2	0.43	6.1	14	1110	6.33	6.5	7.73	2.25	ND	710	6.43	86	168
F-1	0.38	6.4	12	1120	5.98	4.2	7.76	1.95	ND	716	7.36	85	176
F-2	0.65	5.2	10	1120	6.15	4	7.71	1.8	ND	720	6.07	74	172
PC-1	4.2	6.15	19	1120	6.2	4.2	7.8	1.9	ND	712	4.97	84	176

3.1.1.2 Channels

A summary of the water quality test results for each channel sample can be found below in *Table 3-2*. Refer to *Exhibit 1* for all water quality sample locations.

Table 3-2: Channel Water Quality Results

ID	Ammo-nia (mg/L)	BOD (mg/L)	Color (CU)	Conduc-tance (umhos/cm	DO (mg/L)	Nitrate (mg/L)	pH (pH units)	Phosp-horous (	Salinity (PPT)	TDS (mg/L)	Turbi-dity (NTU)	ORP (mV)	Hard-ness (mg/L)
Acceptable Level	1.9	<5	15	4,000-7,000	4	<75	6.5-9	0.025	<1000	<1000	25-50	<200	75-300
C1-1	0.52	5.1	17	1120	6.04	6.8	7.78	2.75	ND	712	3.53	78	175
C1-2	0.54	5.95	13	1100	6.19	6.9	7.54	3	ND	700	3.62	85	164
C3-1	0.77	8.9	10	1120	5.88	6.3	7.73	2.5	ND	715	21.5	82	177
C3-2	0.85	5.9	8	1100	6.07	7.8	7.77	2.75	ND	705	5.23	85	168

Section 2.1 explains how water samples were taken and evaluated. Analysis of the sample results shown above can be found below.

Ammonia: Ammonia is a common nutrient found in ponds that is primarily produced by the decomposition of plants and animals as well as excrement from animals and pollution. Ammonia is toxic to fish and other aquatic life, but promotes plant growth because it can converted to nitrate and nitrite. Ammonia toxicity for fish and other aquatic life is related to water temperature and pH, but in general 1.9mg /L is considered to be the maximum limit for chronic exposure (30-day rolling average).

The majority of samples had ammonia levels well below the 1.9 mg/L maximum. In addition, the general trend of ammonia levels goes down throughout the system. This indicates that the system is working as a biological filter and ammonia is being taken out of the system through plants. In areas where ammonia levels do increase, plant decomposition may be higher.

Biochemical Oxygen Demand (BOD): BOD measures the amount of biodegradable organic chemicals in water. Biodegradable organic chemicals in water are a food source for bacteria and reduce the amount of dissolved oxygen present in the water in the process. Low amounts of dissolved oxygen in the water will cause die off of wildlife in the water. Typically an unpolluted natural water has BOD levels below 5 mg/L. If BOD exceeds 5 mg/L, the water is considered organically rich.

BOD levels indicate that the water becomes more organically rich as it moves through the system. While some samples place the BOD at higher than what is considered an unpolluted natural water, BOD levels do not appear to be affecting DO levels to a point where they test below minimum recommended levels. BOD levels do indicate that vegetation decomposition is high in Ponds E and F as well as the channels.

Color: Color is a component of water quality that reflects the presence of organic molecules in the water. In most cases high amounts of color is an aesthetic issue not a health one and is a symptom for other issues such as excess algae, tannins or iron in the system. Drinking water secondary standard for color is 15 Color Units.

Color does not directly impact health and therefore only serves as an indicator of potential problems as well as a measure of an aesthetic feature.

Most samples tested under the drinking water standard for color, 15 CU, and the samples that have color levels higher than that are from areas suspected to be organically rich. Drinking water standards are much higher standards than would be expected of water features.

Specific Conductance: Specific conductance measures water's ability to conduct electricity and therefore indicates the presence of mineral salt in the water. This measurement helps determine where in the range of hardness and alkalinity the water sample falls into. Specific Conductance levels for a natural water body typically are between 4,000-7,000 umhos/cm).

Specific Conductance levels for all samples taken are lower than the range for a natural water body which indicates low amounts of dissolved ions in the water. This is not problematic for ecosystem health and is consistent with the lack of salinity found in any sample.

Dissolved Oxygen (DO): Dissolved oxygen measures the amount of soluble oxygen in water. Soluble oxygen is critical for sustaining aquatic life in a water body. Often fish kills are directly related to dissolved oxygen levels rapidly declining. Typically 4 mg/l is considered to be the critical minimum dissolved oxygen concentration level to sustain aquatic life. Below that threshold it would be expected that normal behaviors would be altered and in some cases up to 50% of the more sensitive species would be expected to die. For example, it would be expected that 50% of the trout population and other salmonids would die when dissolved oxygen is at that level for several days.

All samples taken were above the 4 mg/L critical minimum threshold.

Nitrate: Nitrate is an ion that is created when nitrogen and oxygen are combined, also known as oxidized nitrogen. Nitrogen, a mineral component of nitrate, is critical for plant growth, but high levels of nitrogen/nitrates can be detrimental to the aquatic environment because it will cause excess algae and vegetation to grow. Excess algae and vegetation growth uses up dissolved oxygen in the water as they decompose and can lead to fish kills when fish populations do not have enough dissolved oxygen to survive. So, nitrate in effect is secondary indicator of potential problems in a body of water. A normal level of nitrate in a lake is less than 75 mg/L. Chronic exposure above 80.0 mg/L it is considered toxic to aquatic life with measurable effects.

Nitrate levels in all samples taken were well below the toxic level of nitrate. Excessive levels of nitrate can lead to excessive algae and vegetation growth as well as fish kills. Nitrate levels appear to trend down throughout the system indicating that the treatment function of the system is working.

pH: pH is a measure of the hydroxide ion in water that indicates acidity/alkalinity. pH measurements range from 0 to 14, with 7 being termed "neutral". A pH of below 7 will indicates an acid and pH above 7 indicates a base. pH can affect the toxicity or availability of different ions and metals. For instance, metals are typically more toxic at a lower pH. Due to pH's influence on chemical compounds in the water changes of pH can affect aquatic life reproduction and development. Generally pH between 6.5-9.0 is considered optimal or harmless to aquatic life. pH between 6.0- 6.5 in the presence of free carbon dioxide less than 100 ppm is still considered harmless; above 100ppm free carbon dioxide would be harmful. pH between 5.0-6.0 is harmless also unless the free carbon dioxide concentration is greater than 20 ppm or there are iron salts in the water.

pH stayed stable throughout all the samples and remained well within the harmless range.

Phosphorous: Phosphorous is a mineral commonly found in fertilizers and recycled water. Phosphorous is critical for plant growth but as in the case of nitrates, can cause excess plant and algae growth which can lead to a depletion of dissolved oxygen and potentially fish kills. The EPA recommendations for phosphate-phosphorous in

lakes and ponds is 25 ug/L. If phosphorous levels exceed such levels it can lead to biological nuisances associated with excessive plant growth and eutrophication of the lake/pond.

Phosphorous levels in all samples were well above that recommended level indicating that phosphorous levels in the imported water that feeds the system are high. Phosphorous levels trend down as water passes through the system indicating that the system is cleaning the water.

Salinity: Salinity is the measurement of the amount of dissolved salts, usually sodium and chloride ions, in water. Salinity can vary during the year due to precipitation diluting the salt in the water. Salinity ranges from fresh to hyper-saline. Fresh water levels range 0-1,000 mg/L.

ND in the table means salinity was "not detected" in any of the samples. When salinity levels rise too much ecosystems become forced to shift and adapt, which can lead to changes in the types of vegetation and wildlife that can exist in the ecosystem. Prior to Dudek's water quality testing the City had performed its own salinity testing and found high saline levels. City staff have linked their test results to a King Tide that occurred in the same time frame. Per City staff, the tide overtopped the inflatable dam in the GBC and saline water from the channel was incidentally pumped via the pump station into the ponds and streams system due to the pump station lacking proper testing equipment to not permit saline water from being pumped into the system. During Dudek's testing, normal tidal patterns and an uncommonly wet spring was occurring. This could have flushed the streams and ponds of any saline that may have been detected at other times.

Total Dissolved Solids (TDS): Total dissolved solids measures the amount of filterable solids in the water sample consisting primarily of inorganic salts and small amounts of organic matter. TDS is related to salinity. Freshwater fish are generally unaffected by TDS below 15,000 mg/L. Wildlife and vegetation may be affected at concentration greater than 1,000 mg/L.

All samples were under 1000 mg/L – the concentration of TDS that is designated to have negative effects on vegetation and wildlife.

Turbidity: Turbidity measures the amount of suspended solids in the water which are not filterable, in comparison to Total Dissolved Solids which is the measurement of the amount of filterable solids. Many states have developed recommended turbidity limits for inland surface water bodies. The recommended threshold for most states is between 25-50 NTU.

Turbidity levels were all comfortably below recommended thresholds for turbidity.

Oxidation Reduction Potential (ORP): ORP measures the ability of a lake or pond to cleanse itself or break down waste products, contaminants, viruses, and dead plants and animals. When the ORP value is high, there is lots of oxygen present in the water. This means that bacteria that decompose dead tissue and contaminants can work more efficiently. In general, the higher the ORP value, the healthier the lake or river is. ORP can be used with other indicators to determine the amount of time required to kill pathogenic bacteria such as e. coli, salmonella, listeria, etc. For example, an ORP value of 650 mV may kill pathogens in 30 seconds, but when the ORP is below 480 mV it would take over 300 seconds. In healthy lakes and rivers, there is less oxygen (and therefore lower ORP values) as you get closer to the bottom sediments. This is because there are many bacteria working hard in the sediments to decompose dead tissue, and they use up a lot of the available oxygen. This is especially important for wetlands where vegetation roots are expected to treat waters and produce oxygen for the water. ORP levels below 200 mV are typically considered low.

ORP levels trend down as water passes through the system indicating that the system is cleaning the water.

Hardness: Hardness measures the amount of dissolved minerals, calcium and magnesium, in the water. When water is "hard" that means it is high in dissolved minerals and it when is "soft" it is low in dissolved minerals.

Hard water ranges from 75-300 mg/L CaCO3 and soft water ranges from 0-75 mg/L. Hardness affects the toxicity of metals by making them more or less available in water which can have an impact on aquatic life. Typically harder water lowers the availability of metals and is better for aquatic life.

All water samples taken sit comfortably within the hard water range.

From field evaluations and discussions with park maintenance staff, plant growth has been determined to be excessive. It is likely this is caused by the excess nutrients, such as nitrate and phosphorous, that are commonly prevalent in urban runoff and recycled water – the two water sources for the study area. The design intent of the study area was to pull nutrients from urban runoff out of the water, and it appears that the system is working for that function. The drawback to that function is prominent plant growth that requires regular maintenance including removal to maintain proper water flow through the system.

3.1.2 Channels

All weirs and channels appeared to be in good structural condition and in some locations, sedimentation occurred obstructing flows through the weirs and channels.

Figure 3.1: Channel 2 with stagnate water blocked by sand bags.

During the desktop study described in Section 2.1, Dudek observed that the design team for the study area had sized the channels and weirs to have the ability to convey large amounts of runoff that could come during large storms where water might run onto the study area from surrounding areas including the adjacent canyon that is also part of Fairview Park. This is common practice for stormwater engineering. Due to the channels and weirs being designed for large storm events, observed normal depths of water for the system are shallow and slow. Shallow and slow water creates ideal conditions for mosquitos, algae and plant growth.

3.1.3 Greenville-Banning Channel Water Quality Pump Station

Figure 3.2: Exterior of Pump Station

The existing GBC water quality pump station was visually inspected on March 12, 2019 with City employees and Orange County Pump Station Operator, Marvin Moscoso. Observations from the pump station inspection were generally broken down into three categories: Site, Mechanical, and Electrical/Instrumentation. The observations from the pump station inspection included: mechanical components including piping and valves; electrical/instrumentation components including the control system, salinity probe; and ability to monitor of the pump station systems.

3.1.4 Vector Management

Dudek evaluated the existing management of the mosquito populations and potential breeding grounds within the study area as discussed in Section 2. Dudek observed vegetation to be plentiful and overgrown, with substantial plant growth along large portions of the ponds' edges where water is less than 2-feet in depth. Pond E was the most notable example of vegetation being allowed to grow around the edges of the pond, but Pond B, C and D also had large portions of vegetation growing around the edges of the ponds. Similarly, vegetation has taken over some sections of the channels which are quite shallow and were not designed to house vegetation. Ponds B, C, D and E all have vegetation at different points that span the entire width of the ponds and which reach between 85' and 130' in width. Pond F has an excessive amount of vegetation waste.

Based on the design documents titled *30% Deliverable Hydrologic/Hydraulics Calculations Letter Report* (Moffat Nichol 2005) and *30% Design Memorandum Constructed Treatment Wetlands* (Geosyntec 2005), both summarized in Section 2.1.1.1, it can be expected that the travel time for water moving through the channels from Pond A to Pond E is approximately 8 days and for water traveling through the system in the ponds the residence time is 30 days.

3.2 Biological Resources

The following subsections detail the results of the evaluation performed within the context of biological resources. For further details on the biological resources evaluation procedures refer to Section 2.2.2.

3.2.1 Vegetation Communities/Land Covers

The study area supports a variety of vegetation communities, including native wetland habitats [mulefat scrub/sandbar willow (13.00 acres) southern willow scrub (5.63 acres), fresh water marsh (pond) (1.21 acres)], open water (4.88 acres), native upland habitats [coastal sage scrub (6.11 acres)], and unvegetated areas [earthen bank (1.89 acres), disturbed habitat (riprap) (1.09 acres)], and developed (i.e., trails, maintenance paths, concrete-lined) (1.18 acres)] (see *Exhibit 2a* & *2b* and *Table 3-3*).

Table 3-3: Vegetation Communities

Vegetation Community	Acreage
Native Wetland Habitats	
Mulefat scrub/sandbar willow	13.00
Southern willow scrub	5.63
Fresh water marsh (pond)	1.21
Native Upland Habitats	
Coastal Sage Scrub	6.11
Open Water	
Open water (ponds)	4.88
Unvegetated Areas	
Earthen bank	1.89
Disturbed Habitat (riprap)	1.09
Developed (trails, maintenance paths, concrete-lined)	1.18
Total	**34.99**

Source: Dudek, 2019

The following biological observations were recorded within the study area during Dudek site evaluation.

1. Some dead willows were observed throughout the mitigation and restoration native habitat areas, however with winter dormancy, it was difficult to distinguish to what extent this was occurring on a landscape scale. Other Dudek biologists that conducted previous site surveys noted that the majority of the willows were alive during the past growing season, and not many dead individuals were observed at that time.
2. Plastic erosion control mesh matting should be removed and other steps taken to preclude natural expansion of vegetation into maintenance access pathways.
3. The vegetation species composition throughout the majority of the site is dominated by a mixture of sandbar willow (*Salix exigua*), mulefat (*Baccharis salicifolia*) and coyote bush (*Baccharis pilularis*). Common dominant understory species include tarragon (*Artemisia dracunculus*), mugwort (*Artemisia douglasiana*), and others species that are present in lesser numbers. Other vegetation observations include the following:
    - Along the serpentine constructed channels/waterways, through the central portion of the site, a mature riparian over-story canopy is present, primarily consisting of arroyo willows (*Salix lasiolepis*). This provides some shade for the open water areas where the trees are present. The understory for these zones is consistent with the aforementioned vegetation found throughout the majority of the site.
    - Freshwater marsh is present immediately surrounding, and within some locations of the constructed ponds, and at the terminus points of some of the channels where they enter the ponds. This vegetation species composition in these areas is dominated by cattail (*Typha latifolia*) and bullrush (*Schoenoplectus californicus*). Open water is present within the ponds and within the constructed channels where freshwater marsh vegetation is not occurring.
    - From information provided by the maintenance crew and direct observations, it is apparent that over the last couple of years there have been substantial/intensive maintenance efforts to remove and thin cattails from many areas along pond and channel edges, to open up water flow, and to help reduce mosquito breeding areas.
    - Along the northern side of the site, a row of cottonwood (*Populus fremontii*), with the same aforementioned understory is present.

- Along the southwestern corner of the site, coastal sage scrub is present. This community is dominated by California sagebrush (*Artemisia californica*), tarragon, bush sunflower (*Encelia californica*), coyote bush and coast goldenbush (*Isocoma menziesii*).

4. Overall, non-native weed cover remains low throughout the site. Dudek did observe some annual weeds germinating in more open areas, such as wild radish (*Raphanus sativus*) and black mustard (*Brassica nigra*). Perennial non-native species observed included a few salt cedar (*Tamarix ramosissima*) and a few locations where there was evidence of Pampas grass (*Cortadera selloana*) that had been removed (but was not present at the time of the site visit).
5. Of note; originally alders (*Alnus* sp.) were proposed for planting within the mitigation and restoration area but were ultimately determined to be unsuitable for use at this site, so they were deleted from the HMMP plant palette and were substituted with coast live oak (*Quercus agrifolia*). Native grassland species were also proposed around the perimeter of the project, in association with the upland coastal sage scrub plantings, but were never fully implemented, additional coastal sage scrub species were utilized instead. Throughout the establishment of the mitigation site additional native plant species have been added to address revegetation of bare areas and to provide supplemental plantings where needed to improve native cover. In addition, coast live oak (*Quercus agrifolia*) trees were added to supplement the coastal sage scrub area on the southwest portion of the project.
6. Overall, the project site is dominated by established native vegetation, which have adapted to the existing site conditions, particularly the depth to the water table. Established native vegetation in combination with regular maintenance efforts, appears to be satisfactory to date in preventing substantial invasion by non-native weeds and exotic/invasive plant species.

3.2.2 Plants and Wildlife Species Observed

The vegetation communities and plant species discussed above provide habitat for many common plant and wildlife species. Several common plant and wildlife species were documented by Dudek during the site evaluation conducted on January 15, 2019. Lists of all vascular plant species observed and wildlife species observed, and their potential to occur are included in Appendices A and B, respectively. A summarized list of plant species observed during the site visits is provided below in *Table 3-4*. The complete list is included in Appendix A.

Table 3-4: Plant Species Observed

Scientific Name	Common Name
Artemisia californica	California sagebrush
Artemisia douglasiana	mugwort
Artemisia dracunculus	tarragon
Artemisia palmeri	San Diego sagewort
Aster sp.	aster
Baccharis pilularis	coyote bush
Baccharis salicifolia	mulefat
**Brassica nigra*	black mustard
**Cortaderia selloana*	Pampas grass
**Cyperus sp.*	nutsedge
Encelia californica	California encelia
Eriogonum fasciculatum	California buckwheat
**Helichrysum luteoalbum*	cudweed
Heteromeles arbutifolia	toyon
Isocoma menziesii	coast goldenbush
Isomeris arborea	bladderpod
Juncus mexicanus	Mexican rush
Lemna sp.	duckweed
Malosma laurina	laurel sumac
**Malva parviflora*	cheeseweed
Oenothera elata	evening primrose
Opuntia littoralis	coastal prickly pear
Phacelia cicutaria	caterpiller phacelia
Platanus racemose	western sycamore
Pluchea odorata	marsh fleabane
Populus fremontii	Fremont's cottonwood
Quercus agrifolia	coast live oak
**Raphanus sativus*	wild radish
Rhus integrifolia	lemonade berry
Rorippa nasturtium-aquaticum	watercress
Rubus sp.	blackberry
**Rumex crispus*	curly dock
Salix exigua	sandbar willow
Salix lasiopelis	arroyo willow
Sambucus nigra ssp. caerulea	blue elderberry
Schoeneoplectus californicus	California bullrush
Solanum sp.	nightshade
Trifolium sp.	clover
Typha latifolia	cattail
Urtica dioica	stinging nettle
Urtica urens	dwarf nettle

* Indicates non-native species

(Of note: Since this biological resources site visit was conducted during the winter dormancy period, it is possible that not all species present on site throughout the year were observed or positively identified.) See Appendix A for a complete list of species observed.
Source: Dudek, 2019

3.2.3 Special Status Biological Resources

The following discussion describes the plant and wildlife species documented within the study area that have been afforded species recognition by Federal, State or local resource conservation agencies and organizations. These species have declining or limited population sizes, usually resulting from habitat loss. Also discussed are habitats that are unique, of relatively limited distribution or of particular value to wildlife. Protected sensitive species are classified by either Federal or State resource management agencies, or both, as threatened or endangered, under the provisions of the Federal and State Endangered Species Act (FESA and CESA).

3.2.3.1 Sensitive Vegetation Communities

Two sensitive vegetation communities were observed within the study area, including southern willow scrub and coastal sage scrub. Both of these vegetation communities were planted as part of the original restoration efforts and are monitored and maintained in accordance with the long-term maintenance plan.

3.2.3.2 Sensitive Plant Species

Sensitive plants include those listed, or candidates for listing, by the USFWS and CDFW; and species considered sensitive by the CNPS (particularly Lists 1A, 1B, and 2). No sensitive plant species were observed during Dudek's site evaluation; however, several sensitive plant species have been observed throughout the study area during previous site assessments and surveys conducted by Endemic Environmental Services, Inc. (EES 2017). These include:

- Southern tarplant (*Centromadia parry*i ssp. *australis*) (CNPS List 1B.1),
- Chaparral sand verbena (*Abronia villosa* var. *aurita*) (CNPS List 1B.1),
- Lewis' evening primrose (*Camisoniopsis lewisii*) (CNPS List 3), and
- South coast branching phacelia (Phacelia ramosissima var. austrolitoralis) (CNPS List 3.2).

3.2.3.3 Sensitive Wildlife Species

Sensitive wildlife includes those species listed as Endangered or Threatened under the FESA or CESA, candidates for listing by the USFWS or CDFW, and Species of Special Concern (SSC) to the CDFW. Only one sensitive bird species, the white-faced ibis (Plegadis chihi) (SSC), was observed during Dudek's site evaluation; however, several sensitive wildlife species have been observed throughout the study area during previous site assessments and surveys conducted by Endemic Environmental Services, Inc. (EES 2017). These include:

- Coastal California gnatcatcher (*Polioptila calfornica californica*) (federally-threatened, SSC),
- Least Bell's vireo (*Vireo bellii pusillus*) (federally and state endangered),
- Yellow-breasted chat (*Icteria virens*) (SSC),
- California least tern (*Sterna antillarum browni*) (federally and state endangered),
- Yellow warbler (*Setophaga petechia*) (SSC),
- Cooper's hawk (*Accipiter cooperii*) (California Watchlist),
- Northern harrier (*Circus cyaneus*) (SSC),
- White-tailed kite (*Elanus leucurus*) (State Watchlist), and
- Merlin (*Falco columbarius*) (State Watchlist).

3.2.3.4 Nesting Bird Species

The study area provides habitat for several nesting bird and raptor species which are protected under the Migratory Bird Treaty Act (MBTA) and Fish and Game Code Section 3503. Several nesting bird species have previously been documented within the study area, including nesting coastal California gnatcatcher. The City has provided ongoing monitoring of nesting activity within the study area and avoidance of active nests during maintenance activities.

3.3 Mitigation and Restoration

From research and review of project documents, Dudek has compiled the following list of constraints, prohibited uses and reserved rights by the City, which apply to the mitigation and restoration areas within the Phase I and Phase II areas detailed in Section 1.2. Constraints, prohibited uses and reserved rights by the City are governed by the existing CE for the Phase I area, and the multi-party agreement for the Phase II area, as outlined in the following sub-sections. Evaluation methods are detailed in Section 2.3. These restrictions and constraints lay the basis for decisions for site modifications that are provided in Section 4.0 Recommended improvements.

3.3.1 Constraints and Prohibited Uses Within the Phase I Mitigation and Restoration Conservation Easement Area

Constraints and prohibited uses within the Phase I mitigation and restoration CE area include the following:

- Unseasonable or supplemental watering is prohibited,
- Use of herbicides, pesticides, biocides, fertilizers, agri. chemicals or weed abatement activities are prohibited, except weed abatement activities necessary to control/remove invasive/exotic plant species,
- Use of off-road vehicles or other motorized vehicles, except for the execution of management duties on the maintenance access roads (i.e., only along northerly perimeter of site) are prohibited,
- Grazing or other agricultural activities are prohibited,
- Recreational activities including but not limited to, horseback riding, biking, hunting or fishing, are prohibited, with the exception of passive use of designated trails,
- Residential, commercial, retail, institutional, or industrial uses are prohibited,
- Breaking-up of the easement (i.e., legal or de facto division, subdivision, or portioning) is prohibited,
- Any construction, reconstruction or placement of any building or other improvement, billboard or sign (except informative and/or restrictive signage that is specifically allowed) is prohibited,
- Dumping, depositing or accumulating soil, trash, ashes, refuse, waste, bio-solids or any other material is prohibited,
- Planting, introduction of, or dispersal of non-native plants or animals is prohibited,
- Filling, dumping, excavating, draining, dredging, mining, drilling, removing or exploring of materials, etc.,
- Altering topography, including but not limited to building roads, trails, and flood control work are prohibited. (Note: The exception to this is that the City has the right to maintain a 2 ft. wide decomposed granite (D.G.) maintenance pathway along each side of the riparian streams and around the perimeter of each pond. In addition, the designated 3 ft. wide passive recreation trail that passes through the easement can be maintained.),
- Removing, destroying or cutting of trees, shrubs or other vegetation is prohibited. Exceptions to this include the establishment of required fire-breaks, prevention of and/or treatment of disease, control of

non-native invasive species, and completion of the required mitigation installation. (Note, it is Dudek's understanding that mosquito infestations which are a health risk to the public could qualify under the category "treatment of disease".),

- Manipulating, impounding or altering any natural watercourse, body of water, or water circulation within the easement and uses detrimental to water quality (i.e., such as degradation or pollution) are prohibited,
- Altering any water rights are prohibited,
- Creation of any other encumbrances, liens, leases, licenses or possessory interests are prohibited,
- Creation of fuel modification zones are prohibited. (Note, there is some discrepancy here in that establishing fire-breaks appears to be acceptable per previous allowances in the CE.)

3.3.2 Allowed Uses/City Responsibilities Within the Phase I Mitigation and Restoration Conservation Easement Area

Allowed uses and City responsibilities within the Phase I mitigation and restoration CE area include the following:

- Control of trespassing,
- Protection of conservation values,
- Weed abatement activities necessary to control /remove invasive/exotic plant species,
- Replacement/repair of approved signage,
- Maintenance and repair of damage to perimeter access roads and to existing trails through the conservation area,
- The City has the right to maintain the 2 ft. wide D.G. maintenance pathways along each side of each riparian stream and around the perimeter of each pond. In addition, the designated 3 ft. wide passive recreation trails that pass through the mitigation/revegetation easement area can be maintained to the 3 ft. width, to keep the trail open to access,
- The City shall take action to preserve the City's rights under the agreement,
- Protect conservation values,
- Repair and restore damage to the conservation area, however, restoration work needs to be approved by the USACOE, and the OCFCD,
- Provide water supply to sustain the mitigated areas in perpetuity,
- Perform long-term maintenance and management to preserve wildlife and wetland/water quality values in perpetuity,
- Get permits/approvals for any activity or use not permitted by the CE.

3.3.3 Reserved Rights by the City of Costa Mesa Within the Phase I Mitigation and Restoration Conservation Easement Area

The CE for the Phase I area outlines certain reserved rights by the City for various activities as follows:

- Reasonable access to the CE areas to perform duties or to address and mitigate emergency situations,
- Habitat enhancement activities to address damage to natural areas or to prevent erosion and to re-establish native vegetation. (Note, it is Dudek's understanding that additional enhancement activities need to be approved by the USACOE.)

- Vegetation debris and exotic plant species removals. (Includes removal or trimming of downed or damaged vegetation due to natural disaster, removal of man-made debris, removal of parasitic vegetation, and removal of non-native exotic plant species.)
- Erection and maintenance of informative signage (additional signage to be approved by ACOE),
- Development of adjacent properties,
- Fire protection (establishment of fire breaks only) to address emergency situations,
- Restoration as defined in the HMMP and agency agreements and the right to remove invasive species,
- Maintenance of access paths (see above section),
- Maintain and repair passive recreation trails (see above section).

3.3.4 Constraints and Prohibited Uses Within the Phase II Mitigation and Restoration Areas

Constraints and prohibited uses within the Phase II mitigation and restoration areas are not specifically outlined in any long-term management documents, since a Conservation Easement has not been finalized yet for the Phase II area. The Phase II mitigation program was implemented based upon an agreement between the OCTA and the City, Agreement No. C-1-2509, dated Feb. 18, 2011 (Multi-Party Agreement). This agreement was drafted to utilize M2 transportation funding, and covered 23 acres of mitigation and restoration. This agreement does not specifically describe site restrictions and prohibited uses, but references the City Fairview Park Wetlands and Riparian Habitat Project Restoration Plan (Restoration Plan), dated Nov. 3, 2010. The assumed restrictions for the Phase II areas outlined herein are inferred based upon the guidelines in the Restoration Plan, and the Phase I constraints and prohibited uses outlined in the Phase I Conservation Easement (CE). Since a CE does not currently exist for the Phase II areas, it is assumed that similar restrictions inferred from the Phase I CE would also apply to the Phase II area. We assume that a new CE or amendment to the Phase I CE will be finalized for the Phase II area, and that it would incorporate the same measures as included in the Phase I CE. Other documents reviewed to establish the guidelines outlined below come from the Restoration Plan, and the Phase II revegetation construction documents. In those documents the Phase II area is referred to in more detail as Phases 1B, 2 and 3, based upon the multi-party agreement.

Assumed constraints and prohibited uses within the Phase II mitigation and restoration areas, would basically follow those for the Phase I CE areas and are assumed to include the following:

- Supplemental watering beyond initial plant establishment and what is necessary to support supplemental or remedial planting efforts is prohibited,
- Undue use of herbicides, pesticides, biocides, fertilizers, agricultural chemicals or weed abatement activities, beyond those abatement activities that are absolutely necessary to control/remove invasive/exotic plant species and pests incurring damage to the mitigation and restoration areas is prohibited,
- Use of off-road vehicles or other motorized vehicles are prohibited. The exception to this would be the minimal access necessary for the execution of maintenance and management duties within the mitigation and restoration areas. To the greatest extent feasible, the vehicles should remain on the maintenance access roads surrounding the site,
- Recreational activities should only be limited to passive recreational trail use,
- Any other uses unrelated to the intent of the mitigation and restoration areas should not be allowed,

- Breaking-up of the area into any separate parcels or differing use areas should not occur, unless approved by the resource agencies,
- Any physical site improvements should be limited to the repair of, and/or addition of, informative and/or restrictive signage. Impacts to native vegetation should be avoided and should be placed along the edges of the mitigation and restoration areas,
- No dumping, depositing or accumulation of soil, trash, ashes, refuse, waste, bio-solids or any other material should be allowed,
- Planting, introduction of, or dispersal of non-native plants or animals should not be allowed,
- No filling, dumping, excavating, draining, dredging, mining, drilling, removing or exploring of materials, should be allowed unless expressly approved by the resource agencies,
- Altering of existing topography, including but not limited to the building of new roads, new trails, and conducting flood control work within the mitigation and restoration areas should be avoided, unless expressly approved by the resource agencies. (Note: The City should have the right to maintain a 2 ft. wide D.G. maintenance pathway along each side of the riparian streams and around the perimeter of each pond, since this is allowed in the Phase I area. In addition, the existing 3 ft. wide passive recreation trail that passes through the mitigation and restoration areas can be maintained to keep the trail open to access.),
- Removing, destroying and/or cutting of native trees, shrubs or other native vegetation should be prohibited. The exception to this would be for the prevention of, and/or treatment of, pests and diseases, control of invasive/exotic species, trimming of vegetation to maintain the approved maintenance access routes and the passive recreational trail, or for completing supplemental/ remedial plantings. (Note, it is Dudek's understanding that mosquito control could qualify as an acceptable treatment within the mitigation and restoration areas, as long as the appropriate chemicals and treatments are used. Use of chemicals would be as specified by a certified Pest Control Advisor and as applied by a certified Applicator.),
- Modifications to the water bodies (i.e,, ponds/lakes) and the water conveyance channels (i.e., streams), within the mitigation and restoration areas, including changes which impact jurisdictional wetlands and waters of the U.S., and/or impacts to sensitive habitat areas, would need to be approved through appropriate permits from the resource agencies. Specific modifications to the Pond-F infiltration basin, in order to restore the footprint and the configuration it occupied prior to the Phase II modification in 2012, as shown in the Restoration Plan, would impact jurisdictional wetlands and waters, so additional permitting with the applicable resource agencies would be necessary,
- The removal of the sloped pond and channel edges and reconstruction of a vertical edge that maintains water depth at a minimum of 2-feet at the edge, will eliminate approximately 36,000 square feet of suitable habitat for development of mosquito larvae that exists in the ponds today. These proposed changes will also require additional permitting with the applicable resource agencies, as they would be conducted within jurisdictional wetlands and waters,
- Restoring the conveyance section of the Placentia Drain to restore conveyance in the channel and eliminate ponded water downstream of Pond-F will also require additional permitting with the applicable resource agencies. This is because the removal of sediment deposited in the Placentia Drain from the bluff slope failure(s), has impeded water movement in the channel and is causing ponding of discharge into the Placentia Drain. This remedial work would be conducted between the blockage of the channel and Pond-F, which would also be considered to be within jurisdictional wetlands and waters,
- The removal of the landscape netting around the perimeter of ponds and the clearing of vegetation to establish a cleared safe walking/access path around each pond and channel, as well as the creation of a more permanent maintenance path, will likely require additional permitting with the applicable resource

agencies, as these changes may also affect jurisdictional wetlands and waters, as well as established riparian vegetation that is within a conserved mitigation area,

- Modifications to the pump and water conveyance systems (i.e., such as above-ground and/or below-ground equipment and piping) could be implemented, as long as no impacts to native vegetation within the mitigation and restoration areas occurs and no significant negative alterations to the available water sources take place (i.e., significant reduction in available water for plant growth and survival). In addition, improvements to the water flow conveyance system and improvements in water availability (i.e., increase in available fresh water for plant growth) would be acceptable, as long as it is not via a permanent irrigation system. Temporary irrigation accommodations for replacement plants and/or remedial plantings would likely be allowed if approved by the resource agencies,
- Creation of fuel modification zones or fire breaks within the mitigation and restoration areas should not be allowed, unless approved by the resource agencies. Fire breaks outside of the mitigation and restoration areas could be acceptable as long as these areas are approved by the resource agencies.

3.3.5 Reserved Rights by the City of Costa Mesa Within the Phase II Mitigation and Restoration Area

Since a CE has not been finalized yet for the Phase II area, it is assumed that the reserved rights by the City for various activities would be the same as the Phase I area and those are repeated again as follows:

- Reasonable access to the CE areas to perform duties or to address and mitigate emergency situations,
- Habitat enhancement activities to address damage to natural areas or to prevent erosion and to re-establish native vegetation. (Note, it is Dudek's understanding that additional enhancement activities need to be approved by the USACOE.),
- Vegetation debris and exotic plant species removals. (Includes removal or trimming of downed or damaged vegetation due to natural disaster, removal of man-made debris, removal of parasitic vegetation, and removal of non-native exotic plant species.),
- Erection and maintenance of informative signage (additional signage to be approved by USACOE),
- Development of adjacent properties,
- Fire protection (establishment of fire breaks only) to address emergency situations,
- Restoration as defined in the HMMP and agency agreements and the right to remove invasive species,
- Maintenance of access paths (see above section), and
- Maintain and repair passive recreation trails (see above section).

3.3.6 Specific Observations

1. Dudek observed that the existing established native vegetation appears to have become adapted to the current site conditions and hydrologic conditions, however some changes in the vegetation species composition to more salt tolerant species appears to be occurring in some locations due to the accumulation of salts. Vegetation community type conversion could occur over time if this trend were to continue due to increased soil salinity levels and salt crust build-up. Vegetation community type conversion would be at odds with the original intent of the mitigation and restoration areas and would need to be reviewed with the regulatory agencies, if type conversion were to become widespread throughout the site. This problem appears to have been the result of sea water being periodically pumped into the wetland system during high tide events and improper functioning of the water diversion structure in the GBC. Improvements to the water flow within the system through modifications to the GBC

diversion will help to reduce seawater intrusion in the system and will help alleviate the salinity problem. The proposed changes to the hydrologic input, and modifications to the ponds and channels to clear vegetation blockage should improve water circulation through the system, which will in turn improve water availability to the vegetation, ground water levels should also improve, which will also help sustain the vegetation over the long term.

2. Dudek believes that shot-hole borer, or other pests might be present within the wetland habitat areas that is leading to the damage of vegetation (i.e., particularly willows). The presence of Shot-Hole Borer onsite could not be conclusively determined during the site visits. The conditions of the onsite trees should continue to be monitored and if additional die-off is detected then a more thorough investigation and testing for Shot-Hole Borer should be implemented. Typically the current recommended protocol for treatment of Shot-Hole Borer is to cut the dead vegetation in place and leave the dead vegetation in place to bio-degrade. The dead/cut debris should be left on site and not be transported offsite, so that other areas are not infected. It may be possible to cut the vegetation and mulch it within the site. In areas where dead trees are cut down and mulched, this could potentially help open-up the site to better flow conveyance, or planting with lower growing native species.
3. Numerous locations throughout the project site showed signs of water quality degradation. Per the CE agreement, maintenance work can be performed if water quality problems are observed. (Dudek believes that non-native aquatic vegetation removal could fall under this category. In addition, salt intrusion or salt build-up and/or the intrusion of poor quality urban runoff could fall into this category.) Any work necessary to correct these issues would need to be done by hand and/or through portable mechanical means, via equipment carried into the site. No vehicular access into the mitigation areas is allowed.

4 Recommended Improvements

The following recommended improvements are intended to address the public concerns and issues (safety, vector control issues, and water quality issues) discussed in Section 1.3 of this report. The recommended improvements outlined herein are consistent with the 2008 Fairview Park Master Plan, but some may potentially require voter approval to comply with Measure-AA. Some of the measures are recommended for emergency implementation to alleviate conditions that may possibly contribute to proliferation of vectors. If the City implements each of these measures, the ponds will be improved to the current state of the art for design, operation, and management of manmade ponds, channels and wetlands. The improvements should result in ponds, channels and wetlands that are largely self-correcting, and that would need minimal maintenance and input to remain as a community asset to residents, visitors and wildlife alike that is a pleasure to visit and reside near.

The following improvements have been organized by importance of implementation or priority:

- Priority A – these measures are recommended to be implemented immediately to address conditions that are currently potentially hazardous to visitors, residents, and/or maintenance personnel.
- Priority B – these measures are recommended to be implemented following the implementation of Priority A measures to ensure the vitality, long-term health, and functionality of the Fairview Park ponds, channels, and wetlands.

The recommended action items within Priority A and B measures are organized into the following categories: Safety Improvements, Operational Improvements, and Biological Improvements.

4.1 Priority A Improvement Measures

The measures and actions discussed below are recommended for implementation in the first phase of a planned renovation to the Fairview Park ponds, channels and wetlands. These recommended measures are provided to assist the City in addressing issues found in the overall wetland system that may currently provide, or result in, conditions that affect the safety of the public, vector control issues, and mechanical and operational efficiency of the water conveyance system to improve the health and sustainability of the native habitat areas. It is Dudek's recommendation that the City address the identified issues and improve the ponds, channels and wetlands immediately to alleviate these potential risk factors and improve the functionality of the system. These recommended improvements do not meet the technical definition of an emergency, but they should be implemented with urgency to resolve the issues in the overall system that could result in risks to public health.

4.1.1 Safety

a) Dense vegetation blocking or obscuring view of the ponds from the public use trails should be selectively thinned and cut vegetation removed to provide vantage points that allow for an unobstructed views of the associated ponds.

b) Vegetation growing over the pond edges should be thinned/cut-back to clearly expose the pond edges. Cut vegetation should be removed from the system.

c) Tree leaf litter and branches should be removed to clearly expose the pond edges.

d) Landscape netting around the perimeter of the ponds and channels should be removed and vegetation should be thinned/cut back to establish a cleared safe two foot wide walking/access path around each pond and channel, as allowed by the CE.

e) Relocate utility vault(s) within pond limits to provide better maintenance access. Vaults should be placed in open disturbed/non-habitat areas to the extent feasible to avoid damage/removal of native vegetation. If native vegetation must be removed, then coordination with the Project Biologist shall be implemented to determine what impacts might result and what associated mitigation measures might be necessary.

f) Clear vegetation at the top of the steep slopes above the water surface along the pond edges. Clearing should only be done where the work would correspond with the allowed two foot wide cleared access paths. The intent would be to establish a cleared safe walking path on flatter ground for maintenance access.

4.1.2 Operational

a) Remove temporary blocks (sand bags) from transfer weirs between ponds and channels to increase the depth of flow and flow velocity in the wetland channels and thereby reduce conditions that are favorable to mosquito larvae development. Alternatively, eliminating the need for the wetland channels should be investigated. The vegetation appears healthy and therefore the benefits of fixing the unfavorable mosquito condition may outweigh the estimated water demand needs. This second alternative would need to be evaluated further to determine if blocking-off flow within the channels would adversely affect the wetland vegetation that has established in those areas.

b) The City does not have regular access to the pump station. Obtaining access to the pump station from the County, for the City to be able to maintain and monitor the pump station operations is key to controlling water flows in the system and understanding exactly how much of the water coming into the system is recycled water and how much is from the GBC.

4.1.3 Mechanical

a) Repair the water recirculation system in the ponds to recycle excess water captured at the downstream end of the wetland pond system in Pond-E and recycle the water back to Pond-A to improve water quality by providing a re-feed loop to create multi-pass treatment in the overall pond/wetland system. This will also increase the flow rate through the system by capturing water currently discharging to the Placentia Drain and recirculate it back to Pond-A. This measure will improve water quality and improve the overall health of the ponds, channels and wetlands to support fish, insects, and other wildlife, and in turn improve mosquito predation. The recirculation pump station flowrate should be sufficient to increase the depth of flow and flow velocity in the wetland channels and to eliminate conditions favorable to development of mosquito larvae.

b) Replace the saline probe sensor in the GBC pump station wetland. Currently the saline sensor is non-operational and inaccessible. Salinity measures are currently being monitored manually. Accidentally pumping a sufficient volume of high salinity water into the wetlands and pond system could destroy the pond/wetland mitigation area by killing vegetation, fish, and wildlife that are sensitive to salts.

c) Replace computers and wiring in the pump station. It was noted that the equipment in the pump station is 15-years old and does not function properly anymore. Replacing this with a system that is functional and “smart” would help control the kind and quantity of water that comes into the system.

d) Replace valves in the pump station to function properly so that they can be closed when the pump station is being maintained or when water quality is not good for the study area ecosystem.

4.1.4 Vector Control Improvements

a) Begin a temporary vector control program, or modify the current procedures, to continue with of active spraying and/or broadcasting Bti pellets to the channels and ponds to control potential mosquito development until permanent measures are installed.

b) Begin a temporary vector control program, or modify the current procedures, to continue with active spraying and/or broadcasting Bti pellets to the Placentia Drain, downstream of Pond-F, to control potential mosquito development in the ponded water areas until conveyance is restored and ponding eliminated downstream of Pond-F.

c) Begin a permanent program or modify the current procedures of active spraying and/or broadcasting Bti pellets to the GBC, upstream of the inflatable dam, to control potential mosquito development in the channel.

d) Remove minimum top 24-inches of gravel and leaf litter in Pond-F. Depth of removal to be determined in the field based upon the condition of the gravel.

e) Prune and thin willow trees surrounding Pond-F to minimize future clogging of the infiltration basin.

f) Implement regular maintenance of Pond-F to ensure infiltration. Maintenance tasks include removing leaf litter, algae and sediment, and trimming and thinning of vegetation where needed to minimize leaf drop.

4.1.5 Biological

The overall condition of the native habitats within the study area is considered to be of high value, especially in an area of the region where native habitats are slowly being degraded by human disturbances and varying degrees of natural resource protection and management are becoming necessary. The study area is very unique as it supports a high biodiversity of plants and wildlife, including several sensitive wildlife species that are otherwise considered a rare occurrence within the area. With the study area providing habitat connectivity to adjacent native habitat areas (i.e., O.C. Flood Control, Talbert Park, Banning Ranch, and adjacent Fairview Park areas), it is important to provide, and to continue to monitor and implement, adaptive management strategies that support a sustainable ecosystem.

The engineering evaluation proposed several recommended improvements to address issues found in the hydrologic and operational functionality of the ponds and channels, including safety issues. While implementation of these recommended improvements is not expected to adversely affect the long-term success of the established biological resources (including sensitive biological resources) within the study area, on-going protection measures are recommended. Dudek understands that many of the recommended improvements provided below are already being implemented as part of the existing maintenance activities occurring in the study area; however, the recommended improvements provided in Sections 4.1.1 and 4.1.2, above, would still require implementation of protection measures to ensure no impacts to wildlife resources occur. Additionally, the measures outlined herein are recommended to supplement/enhance the effectiveness of current and future vector control activities.

4.1.5.1 Species and Habitat Protections

Sensitive Species and Nesting Birds and Raptors

Coastal California gnatcatcher, least Bell's vireo and California least tern, in addition to several other sensitive plant and wildlife species have been documented as occurring within the study area. In addition, coastal California gnatcatcher has been documented as nesting within the coastal sage scrub habitat adjacent to the study area. Implementation of many of the safety, operational, and vector control measures may result in impacts to these species. Therefore, protection measures should be implemented to ensure no impacts occur to sensitive bird species, including common

nesting bird and raptor species that are also protected under the Migratory Bird Treaty Act (MBTA) and the Fish and Wildlife Code. Dudek recommends the following protection measures:

1. If vegetation removal, general maintenance or other adaptive management activities occur within or adjacent to habitat with the potential to support nesting birds or raptors, Dudek recommends that these activities be scheduled outside the nesting season (September 1 to February 14 for songbirds; September 1 to January 14 for raptors). If these activities must occur during the nesting season (February 15 to August 31 for songbirds; January 15 to August 31 for raptors), all potential nesting habitat should be thoroughly surveyed for the presence of nesting birds and raptors by a qualified biologist before commencement of work activities. If any active nests are detected, a buffer zone around the nest should be established and avoided until the nesting cycle is complete. The size and location of the buffer zone may be modified and/or other recommendations proposed as determined appropriate by the biological monitor to minimize impacts.

2. If vegetation removal, general maintenance, or other adaptive management activities occur within or adjacent to habitat occupied by listed species (i.e., coastal California gnatcatcher and least Bell's vireo), consultation with the wildlife agencies prior to these activities occurring may be necessary in order to establish appropriate avoidance and mitigation measures. These measures may include nest surveys and biological monitoring during work related activities, in addition to ensuring any motorized equipment producing sound, vibration or lighting doesn't adversely affect these species. Mitigation for impacts to wetland vegetation may also be necessary.
3. Nesting bird surveys be conducted prior to implementation of any recommended remedial measures that occur within or adjacent to suitable nesting habitat for yellow breasted chat, yellow warbler, Cooper's hawk, white-tailed kite, least Bell's vireo, California Gnatcatcher, and any other sensitive species as required by the wildlife agencies. Surveys should be implemented according to recommended improvements provided above under Item 1, Nesting Birds and Raptors.

Sensitive Plant Species

Dudek recommends that work occurring in areas where sensitive plant species have been documented be flagged in the field prior to work being initiated so work crews can avoid direct impacts to these species. These areas should be surveyed periodically during the appropriate blooming periods, so the extent, location, and occurrence of any new sensitive plant species is documented.

Invasive Wildlife Species Removal

Dudek recommends that an on-going and detailed invasive wildlife species removal program be implemented by a qualified biologist. The direct threats of invasive species include preying on native species, outcompeting native species for food or other resources, causing or carrying disease, and preventing native species from reproducing or killing a native species' young. The study area has been documented to support large populations of non-native/invasive species including brown-headed cowbirds (Molothrus ater), red-eared slider (Trachemys scripta elegans), American bullfrog (Lithobates catesbeianus) and largemouth bass (Micropterus salmoides). Removal of these non-native species will support the abundance and diversity of the native species found within the study area.

Landscape Netting Removal

Dudek recommends that the netting be removed to the maximum extent possible and the study area be monitored periodically for areas where netting has recently become exposed. The exposed netting should be removed and disposed of in a landfill and special care should be taken to ensure no netting is left behind, including pieces that become snagged in trees and shrubs as its being removed. Areas where it is not feasible to remove the netting should be checked several times a week for wildlife that may become ensnared in it. If an animal is found trapped

in the netting a qualified biologist should be contacted to safely remove the animal without harming it. If the animal is injured, then the biologist should coordinate with the nearest wildlife rehabilitation center. Other recommended improvements as they relate to netting removal and safety are discussed in Section 4.1.1, above, and mitigation and restoration in Section 4.3, below.

Wildlife Viewing Lookouts

In order to provide community awareness regarding sensitive biological resources and habitat protection within the Park and region, as well as giving the community the sense that their concerns regarding vector control issues are being addressed, Dudek recommends that designated look-out locations (i.e., observation points) be established for park visitors in appropriate areas around the study area. These areas should be constructed outside of any easement area and within disturbed areas to avoid vegetation impacts. They should be placed in such a way that the onlooker can observe and enjoy the view of habitat areas. They should not be placed adjacent to known occupied habitat for the gnatcatcher or vireo, or require removal of suitable habitat for these species. Public interpretation and education is a vital component to protecting the study area and its natural resources. Therefore, Dudek also recommends placing a series of interpretative signs at each of the lookout locations to provide information on the natural resources in the study area and the impact protecting natural habitats will have on the economy, commercial industries, animals and the native habitats. Community presentations and park field trips should also continue to be conducted on a regular basis. See also Section 4.2.1.

4.1.6 Mitigation and Restoration

The mitigation and restoration areas within the Phase I area are constrained due to the requirements set forth in the CE, with the exception of the allowances and reserved rights incorporated into the easement document. Dudek recommends that the following measures be implemented as part of the Priority A work. The Phase II areas currently have less restrictions in place, as a final CE document for this area has not been established. Dudek assumes however, that the majority of the restrictions established for the Phase I area would apply to the Phase II area. Dudek recommends that work within the Phase II areas would fall under the priority B measures as outlined in Section 4.2.5.

Dudek's interpretation of the project documents reviewed to date offer the following opportunities for site modifications.

4.1.6.1 Recommended Improvements for Measures Addressing Current Site Conditions:

1. Dudek recommends that all non-biodegradable erosion control materials (i.e., plastic erosion matting/netting be removed from the site and disposed of appropriately offsite, and that only bio-degradable products such as jute netting or other natural fibers (i.e., coconut fiber, or rice straw materials) are used if necessary to prevent erosion.

2. Dudek recommends that non-native weed and exotic/invasive species control efforts continue throughout the site. Specific target species (not necessarily observed on site) include, but are not limited to the following, salt cedar, Pampas grass, black mustard, wild radish, garland Chrysanthemum/daisy, tree tobacco, fennel, poison hemlock, horseweed, artichoke thistle, castor bean, sweet clover, Myoporum, giant reed, palm, pepper tree, Acacia and Eucalyptus. Non-native exotic/invasive species can be and should be physically removed, and/or controlled by other methods (i.e., line trimmers/weed whips, herbicide application, etc.). (Note: To the maximum degree possible, native vegetation should not be physically removed, to remove the non-native vegetation.) The current removal of native cattail vegetation might be seen as a violation of the requirement to preserve native

vegetation, unless this removal is being done for the control of pests (i.e., mosquitos), or to improve water quality, which would then be viewed as allowable per the CE). Herbicides can be used to control the non-native exotic/invasive species, as long as native species are not adversely affected by the application and the proper herbicides for use in aquatic habitats are utilized.

3. Dudek recommends that modifications to the ponds and channels be implemented to continue to clear vegetation blockage where allowable per the conservation easement conditions. This should help improve water circulation through the system, which will in turn improve water availability to the vegetation, ground water levels should also improve, which will also help sustain the vegetation over the long term.

4. Areas of salt crust on the soil surfaces should be addressed, through removal and/or leaching. This will assist with the intended native vegetation becoming more established, with improved health.

5. Erosion and damage along the trails and access road should be repaired and/or modified to help reduce the erosion problems.

4.1.6.2 Additional Opportunities for Site Modifications:

1. Based upon allowable uses in the CE document, in areas surrounding the ponds and channels/streams, where maintenance access paths do not currently exist, new maintenance access paths could be created. The Restoration Plan and the CE allow for D.G. maintenance paths on both sides of the ponds and channels in order to facilitate maintenance work. Access is limited foot traffic only and no vehicles are to utilize the paths. Tools and equipment can be carried into the site. Access paths can be 2 feet wide surrounding both sides of the channels/streams and the ponds, per the existing CE document. (Note: Since the 2-foot path width is allowed, Dudek assumes that native vegetation could be pruned/thinned to maintain this 2 foot width.) The creation of new access points to these paths may be feasible to provide additional maintenance access, however this would need to be reviewed with the applicable parties and resource agencies, in order to determine whether these modifications would be considered an additional wetland impact and whether additional wetland permitting would be required. Utilizing currently disturbed areas, bare areas and areas outside of the existing CE boundaries to conduct site modifications and provide access would be the most desirable and would be the least impactful to the mitigation/conservation areas. Impacts to wetland vegetation should be avoided to the greatest extent possible, and where impacts are necessary additional coordination with the resource agencies would be necessary.

2. If additional mitigation is necessary to compensate for additional wetland impacts that might be necessary to facilitate hydrologic and water flow improvements, or other physical alterations and/or vegetation removal within the system, then additional mitigation/revegetation areas may need to be accommodated on-site. Mitigation expansion areas could be established within some of the un-vegetated/disturbed areas surrounding the existing mitigation areas, if site conditions can be modified and/or graded to accommodate additional wetland vegetation. Opportunities for additional upland vegetation establishment, restoration and/or enhancement at other locations within Fairview Park may need to be explored if additional acreage cannot be accommodated directly adjacent to the existing wetland/riparian vegetation. Consultation and if necessary permitting with the resource agencies will be needed if vegetation removal is deemed to be a wetland impact. Additional mitigation obligations should be established up front in order to guide additional work.

3. The three foot wide passive recreation trails that pass through the mitigation and restoration area should be maintained to allow for the 3 foot width. (Note: Since a three foot width is allowed by the CE,

then Dudek assumes that native vegetation could be pruned/thinned to maintain this width. Outright removal of vegetation should be avoided to the extent possible to help avoid additional potential mitigation obligations.)

4. If it is determined through further testing that Shot-Hole Borer are present onsite then dead vegetation should be cut and left in place to bio-degrade. The dead/cut debris should be left on site and not be transported offsite, so that other areas are not infected. It may be possible to cut the vegetation and mulch it within the site. In areas where dead trees are cut and mulched, this could potentially help open-up the site to better flow conveyance, or planting with lower growing native species.

5. Mitigation areas outside of the Phase I CE area and inside the Phase II mitigation area, (i.e., original Phase 1B, 2 &3 area), are basically assumed to fall under the same restrictions as the Phase I area. However, there is only a multi-party agreement in place for the Phase II areas, and an amended or new CE has not been finalized yet for the Phase II areas. A separate CE, or an amendment to the existing Phase I CE, will likely be required before any modifications to the Phase II mitigation areas can take place. The establishment of a new CE, or an amendment to the existing CE should be completed as part of this current planning effort, so that the full extent of the proposed site modifications can be rolled into this new or amended CE document. This could potentially allow the City to write into the new CE specific language allowing for additional measures the City would like to impose, and/or modify current restrictions to facilitate better maintenance and management of the Phase II area. If an amendment to the existing Phase I CE is chosen as the course of action, this might also allow for the incorporation of additional language easing restrictions and incorporating more allowances for modification and maintenance within the Phase I and II areas.

6. All additional impacts to existing wetland vegetation would need to be evaluated further and quantified and consultation with the resource agencies initiated to determine if additional permitting and mitigation measures will be required. Once the extent of the additional impacts and mitigation is known, then a further evaluation of on-site mitigation area expansion would need to be conducted to determine if all additional mitigation can be accommodated onsite, or if additional mitigation acreage would need to be provided elsewhere. Additional permitting issues are discussed in Section 4.4.

4.2 Priority B Improvement Measures

The measures and actions discussed below are recommended for implementation in the second phase of a planned renovation to the Fairview Park ponds, channels and wetlands. These recommended measures are provided to assist the City in addressing additional safety, operational, and biological issues found in the ponds, channels and wetlands. These recommended improvements should be implemented following the implementation of Priority A measures to ensure the vitality, long-term health, and functionality of the Fairview Park ponds, channels, and wetlands.

4.2.1 Safety

a) Dudek recommends that designated look-outs (i.e., observation points) for park visitors be constructed in areas around the perimeter of the study area. These look-outs will not only provide locations for visitors to view the wetland, ponds and channels in an extensive way that is not currently available, but it will also discourage illegal entry into park restoration/mitigation areas by providing visitors opportunities to view the areas from afar, instead of encroaching into the habitat. In addition, look-outs will provide law enforcement and rescue crews with the ability to observe pond areas in emergency situations.

4.2.2 Operational

a) Modify operation of the GBC pump station to prevent ponding of non-saline water behind the inflatable dam for more than 48-hours and/or modify OCVCD mosquito abatement measures in the channel to include treatment of water ponded upstream of the inflatable dam.

b) Modify the GBC pump station to include water quality sensors and automated control systems and programmed logic controllers to sense high concentrations of pollutants in GBC. When high concentrations of pollutants are sensed, the control program could activate a mixing valve to mix recycled water from OCSD with a known water quality with high pollution water in the GBC to reduce the concentration of pollutants pumped into the ponds and wetlands. Pollutants provided at a controlled concentration are more readily treated and assimilated into the treatment train of the ponds and wetlands rather than a single slug of high concentration unknown pollutant(s). This measure will reduce the likelihood of damage to the wetland pond ecosystem such as fish, bird, and bat kills and improve water quality in the ponds and wetlands and thereby improve the overall health of the wetland pond system and thus keep mosquito populations to a minimum.

c) Recommend that pond, channels and wetlands receive regular maintenance activities including weekly maintenance inspections, and annual removal of sediment and debris build-up. Trash, debris and exotic/non-native vegetation should be removed weekly throughout the year and disposed of properly off-site.

4.2.3 Mechanical

a) Install an active aeration system to provide control over the dissolved oxygen content and saturation in the ponds to improve the overall health of the ponds and to support a diverse permanent benthic micro-invertebrate and fish population year round to help avoid fish kills. This will require the installation of mechanical improvements, including electrical supply to the wetland area, air compressor vaults, air compressors, aeration tubing, and aeration pods. These measures will provide drastic improvement in seasonal water quality in the ponds that are less than 8-ft deep and thereby reduce stress on aquatic plants and invertebrates.

b) Increase flowrate in the wetland channels to eliminate stagnant ponded water less than 2-ft deep. This will eliminate approximately 17,500 square-feet of potentially suitable habitat for development of mosquito larvae.

c) Construct permanent dedicated pond and channel perimeter maintenance access paths, in areas previously approved for maintenance access. A hardened surface should be constructed to establish a permanent access path with a maximum width of 2-feet around the entire perimeter of each pond and channel to ensure they can be easily inspected and maintained. This is especially important for vector control because the pond's edges need to be inspected for pond larvae and treated with Bti pellets. When areas are not easily accessible, suitable habitat for mosquito larvae can persist without detection.

d) Construct /install an active water quality treatment system in the ponds such as submerged bio-filters to provide nutrient control and microscopic biological treatment of pond water and thereby improve the health of the ponds and wetlands to support fish, benthic micro-invertebrates, and other wildlife to improve mosquito predation. This measure will require installation of electrical power in the wetland area, pump vaults, pump stations, pump equipment, and pond water recirculation plumbing.

e) As an alternative to constructing a recirculation system, we recommend restoration of the Pond-F infiltration basin footprint. Re-installing a pervious bottom substrate in the basin to increase the infiltration rates will reduce residence times within the system. Water residence time within the system is a large contributor to degraded water quality and therefore the development of vector problems. Absent recirculation, if water remains in the system longer than 10 days it is considered stagnant and becomes prime mosquito larvae habitat. When sediment/debris volume within Pond F reaches 10% of pond volume the sediment must be removed and the pond bottom scarified to restore percolation capacity.

4.2.4 Vector Control

a) Remove all emergent vegetation in ponds, in water less than 2-feet deep. We recommend constructing aquatic planters and/or planting shelves in water greater than 2-ft deep to confine vegetation to areas of appropriate depth consistent with the 2015 Vector Control Plan. The existing aquatic planters should be abandoned or modified to confine planting to areas only where the water is at the appropriate depth, 2-ft or greater.

b) Thin and reduce the density of emergent aquatic vegetation clusters to comply with recommendations in the 2015 Vector Control Plan to limit the density of leaf area (i.e., tillerage) to 30% to 40% of the aquatic planter water surface area.

c) Thin and remove dense emergent vegetation to comply with recommendations in the 2015 Vector Control Plan to limit the width of emergent pond vegetation to clusters of 50 to 75-feet maximum width.

d) Remove the sloped pond and channel edges and reconstruct a vertical edge that maintains water depth at a minimum of 2-feet at the edge. This will eliminate approximately 36,000 square feet of potentially suitable habitat for development of mosquito larvae.

e) Restore the conveyance section of the Placentia Drain to restore conveyance in the channel and eliminate ponded water downstream of Pond-F. Remove sediment deposited in the Placentia Drain from the bluff slope failure(s) that causes ponding of discharge in the Placentia Drain between the deposits of the channel and Pond-F.

f) Increase the resident bat population present in the wetland area by constructing/installing bat boxes to house and support an adequate resident population of bats to provide significant adult mosquito population suppression. A total of 4-6 bat boxes should be strategically placed throughout the site, in areas that would have the highest likelihood for attracting bat species that roost in bat boxes. These bat boxes can be constructed using accepted design details, or purchased pre-fabricated from a reputable source such as Bat Conservation & Management. The bat boxes will be placed onto a 10-20 foot tall pole and cemented into the ground, and placed in an area that will receive sufficient sunlight to maintain an internal day-time temperature of approximately 90° Fahrenheit. A qualified bat biologist should assist in the placement of the bat boxes on the site. Additionally, installing bat boxes could be a community outreach opportunity for the City by partnering with a local Boy Scout troop for an Eagle Scout project to build and place bat boxes.

g) Increase the resident fish population and improve the diversity of fish in the ponds by implementing a structured stocking program to provide significant suppression of juvenile mosquito and larvae populations. The stocking program should include mosquito fish and other compatible native fresh water species such as bass, blue gill, catfish, sunfish, perch, etc. The goal of the fish development program is to develop a compatible fish ecosystem that is complimentary, requires little management and restocking, and is effective at predation of mosquito and midge fly larvae. The fish stocking program should be closely monitored by a qualified biologist.

h) Increase the resident bottom feeding aquatic benthic micro-invertebrate and other aquatic organism population to provide significant water quality improvement and suppression of juvenile mosquito and larvae populations. Periodic stocking may be necessary until a balance is achieved between the bottom feeders and predation by fish, aquatic birds, and amphibians. The stocking program should include native worms, snails, mussels, crayfish, catfish, and turtles, etc. The goal of the bottom feeder development program is to develop a compatible aquatic organism ecosystem that is complimentary, requires little management and restocking, and is effective at predation of mosquito and midge fly larvae. The bottom feeder stocking program should be closely monitored by a qualified biologist.

i) Modify the emergent pond vegetation and wetland vegetation planting palette to include native vegetation and flowering species that attract dragon flies and damsel flies and thereby increase the resident population of each in the wetland/pond area. Dragon flies are effective predators of adult mosquitos. Increasing the resident population would provide an effective complimentary means of suppressing adult mosquito populations.

j) Begin a program of active pruning and thinning the Willow trees that were planted adjacent to the ponds. This measure is intended to control tree leaf drop into the ponds and thereby reduce the biological oxygen demand on the pond system and improve water quality. This measure would also improve safety of the ponds by providing greater visibility of the ponds and improve park visitor experience by increasing visibility of the ponds. Increasing visibility into the pond area by decreasing the density of vegetation around each pond's edge will not only provide a more aesthetically pleasing experience for park users, but will also provide visibility in case an emergency occurs. The existing conditions provide only minimal visibility which could prevent detecting problems in the ponds and notifying authorities.

k) Based upon the observed stagnant water behind the GBC inflatable dam, it could be surmised that mosquito habitat is also being created there. The GBC is maintained by Orange County, but some recommended improvements for how the mosquito habitat might be mitigated can be found below:

   a. Lowering the dam elevation,
   b. Increasing frequency of Bti Pellet application in the channel,
   c. Introduction of Mosquito Fish,
   d. Further study is needed on the channel to further refine the available options.

4.2.5 Biological

4.2.5.1 Species and Habitat Protections and Other Considerations

Nesting Birds and Raptors

The recommended improvements provided for the Priority B measures as they relate to safety, operational, vector control, and mitigation and restoration should still implement protection measures as outlined in Section 4.1.4.2, above, for sensitive species and nesting bird and raptor species to ensure no impacts to these species occur.

Sensitive Plant Species

The recommended improvements provided for the Priority B measures as they relate to safety, operational, vector control, and mitigation and restoration should still implement protection measures as outlined in Section 4.1.4.2, above, for sensitive plant species to ensure no impacts to these species occur.

Coastal California Gnatcatcher and Least Bell's Vireo Census Surveys

Dudek recommends that census surveys for coastal California gnatcatcher and least Bell's vireo be conducted within the study area as well as other areas of the Park where suitable habitat is present. Understanding the population and nesting status of these species within the Park will help identify habitat attributes and threats associated with species occupancy in order to develop specific habitat-based management criteria and recommended improvements. In addition, this information will help fill gaps in data related to the population status of these species along the Santa Ana River Delta, including the extent of occupied and suitable habitats. Prior to the initiation of surveys, the City and/or the City's qualified biologist will need to coordinate with the USFWS for authorization to proceed with surveys.

Sensitive Plant Inventory

Dudek recommends that a comprehensive plant inventory be conducted, and the locations and extents of all sensitive plant species be mapped. Prior to the sensitive plant survey, a California Natural Diversity Database (CNDDB) search should be conducted in order to determine the sensitive plant species that have potential to occur. The sensitive plant surveys should be conducted during the known blooming periods for the species with potential

to occur. Surveys should only be conducted by a qualified biologist. These surveys should be conducted every five years in order to understand the drop and or increase in the diversity of plant species and the population dynamics of sensitive plant species.

4.3 Mitigation and Restoration

The mitigation and restoration areas within the Phase II areas, fall under similar resource agency constraints and requirements as the Phase I areas and will likely apply once a CE for the Phase II areas is finalized. Dudek's interpretation of the project documents reviewed to date offer the following recommended improvements and additional opportunities for site modifications within the Phase II areas.

4.3.1 Recommended Improvements for Measures Addressing Current Site Conditions:

1. Dudek recommends that all non-biodegradable erosion control materials (i.e., plastic erosion matting/netting in the Phase II areas be removed from the site and disposed of appropriately offsite, and that only bio-degradable products such as jute netting or other natural fibers (i.e., coconut fiber, or rice straw materials) are used if necessary to prevent erosion.
2. Dudek recommends that non-native weed and exotic/invasive species control efforts continue throughout the site. Specific target species (not necessarily observed on site) include, but are not limited to the following, salt cedar, Pampas grass, black mustard, wild radish, garland Chrysanthemum/daisy, tree tobacco, fennel, poison hemlock, horseweed, artichoke thistle, castor bean, sweet clover, Myoporum, giant reed, palm, pepper tree, Acacia and Eucalyptus. Non-native exotic/invasive species can be and should be physically removed, and/or controlled by other methods (i.e., line trimmers/weed whips, herbicide application, etc.). (Note: To the maximum degree possible, native vegetation should not be physically removed, to remove the non-native vegetation.) The current removal of native cattail vegetation might be seen as violation of the requirement to preserve native vegetation, unless this removal is being done for the control of pests (i.e., mosquitos), or to improve water quality, which would then be viewed as allowable per the CE). Herbicides can be used to control the non-native exotic/invasive species, as long as native species are not adversely affected by the application and the proper herbicides for use in aquatic habitats are utilized.
3. Any additional vegetation within the Phase II areas that is determined to be damaged by Shot-Hole Borer should be and left in place to bio-degrade. The dead/cut debris should be left on site and not be transported offsite, so that other areas are not infected). It may be possible to cut the vegetation and mulch it within the site. In areas where dead trees are cut and mulched, this could potentially help open-up the site to better flow conveyance, or planting with lower growing native species.
4. The maintenance paths on both sides of the ponds and channels that facilitate maintenance work should continue to be maintained. Access should be limited to foot traffic only and no vehicles should be utilized. Tools and equipment should be carried into the site. Access paths can be maintained as 2 feet wide surrounding both sides of the channels/streams and the ponds, per the existing CE document. (Note: Since the 2-foot path width is allowed, Dudek assumes that native vegetation could be pruned/thinned to maintain this 2 foot width.)
5. The three foot wide passive recreation trails that pass through the mitigation and restoration area should be maintained to allow for the 3-foot width. (Note: Since a three foot width is allowed by the CE, Dudek assumes that native vegetation could be pruned/thinned to maintain this width. Outright removal of vegetation should be avoided to the extent possible.)
6. Erosion and damage along the trails and access road can be repaired and/or modified to help reduce the erosion problems.

7. Areas of salt crust on the soil surfaces should be addressed, through removal and/or leaching. This will assist with the intended native vegetation becoming more established, with improved health.

4.3.2 Opportunities for Site Modifications:

1. The creation of new access points to the existing maintenance paths may be feasible to provide additional maintenance access, however this would need to be reviewed with the applicable parties/resource agencies, in order to determine whether these modifications would be considered additional wetland impacts and whether additional wetland mitigation would be required. Utilizing currently disturbed areas, bare areas and areas outside of the existing CE boundaries to conduct site modifications and provide access would be the most desirable and would be the least impactful to the mitigation/conservation areas. Impacts to wetland vegetation should be avoided to the greatest extent possible, and where impacts are necessary additional coordination with the resource agencies would be necessary.
2. If additional mitigation is necessary to compensate for additional wetland impacts that might be necessary to facilitate hydrologic and water flow modifications, or other physical alterations and/or vegetation removal within the system, then additional mitigation/revegetation areas may need to be accommodated on-site. Mitigation expansion areas could be established within some of the un-vegetated/disturbed areas surrounding the existing mitigation areas, if site conditions can be modified and/or graded to accommodate additional wetland vegetation. Opportunities for additional upland vegetation establishment, restoration and/or enhancement at other locations within Fairview Park may need to be explored if additional acreage cannot be accommodated directly adjacent to the existing wetland/riparian vegetation.
3. Existing damaged signage should be replaced/repaired. Additional informative and/or restrictive signage should be considered.
4. All additional impacts to existing wetland vegetation would need to be evaluated further and quantified and consultation with the resource agencies initiated to determine if additional permitting and mitigation measures will be required. Once the extent of the additional impacts and mitigation is known, then a further evaluation of on-site mitigation area expansion would need to be conducted to determine if all additional mitigation can be accommodated onsite, or if additional mitigation acreage would need to be provided elsewhere.

4.4 Permitting and Funding

Any proposed physical changes, utilities improvements and/or site modifications (i.e., removal of vegetation, and/or clearing for additional maintenance access routes, installation of new physical improvements, etc.) that would result in temporary or permanent impacts to jurisdictional wetlands/riparian vegetation, sensitive species, upland vegetation such as coastal sage scrub (i.e., which serves as habitat for the coastal California gnatcatcher), would need further evaluation regarding potential impacts and potential mitigation. If impacts to these habitats are anticipated, then consultation with the applicable resource agencies would be necessary and additional permits may need to be processed before work could commence. Impacts to the existing mitigation areas may also constitute a higher required mitigation ratio, as these areas were previously credited for other mitigation purposes and were to be preserved with no subsequent impacts anticipated. Specific mitigation ratios and the type of mitigation that would be acceptable would need to be negotiated with the applicable resource agencies.

The mitigation and restoration areas are intended to be protected in perpetuity, with no disturbance/modification anticipated except for the allowable uses and the reserved rights of the City, such as approved maintenance activities, per the CEs and the joint party agreements. See Section 1.2 for additional discussion regarding these permitted uses and reserved rights.

At this time an impacts assessment cannot be conducted, as the full extent of the recommended engineering modifications and site improvements have not been finalized. In addition, in locations where impacts to wetland/riparian vegetation might be anticipated, a more detailed biological resources assessment will need to be conducted, including sensitive species evaluations and wetland delineations, in order to determine what jurisdictional coverage would be applicable per the various resources agencies, (i.e., USACOE, CDFW, USFWS and/or RWQCB.). If impacts will occur, then permits from the applicable resource agency/agencies will need to be applied for, and anticipated mitigation solutions proposed. Significant lead time for permitting would need to be planned for in order to prepare permit application documents and to allow for permit review and processing by the agencies. A nine month to one year time frame would need to be built into any project schedule to allow for the resource agency permitting process.

Funding for additional mitigation would need to be determined by the City, whether it is through additional grant funding, or other sources available to the City.

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Exhibits

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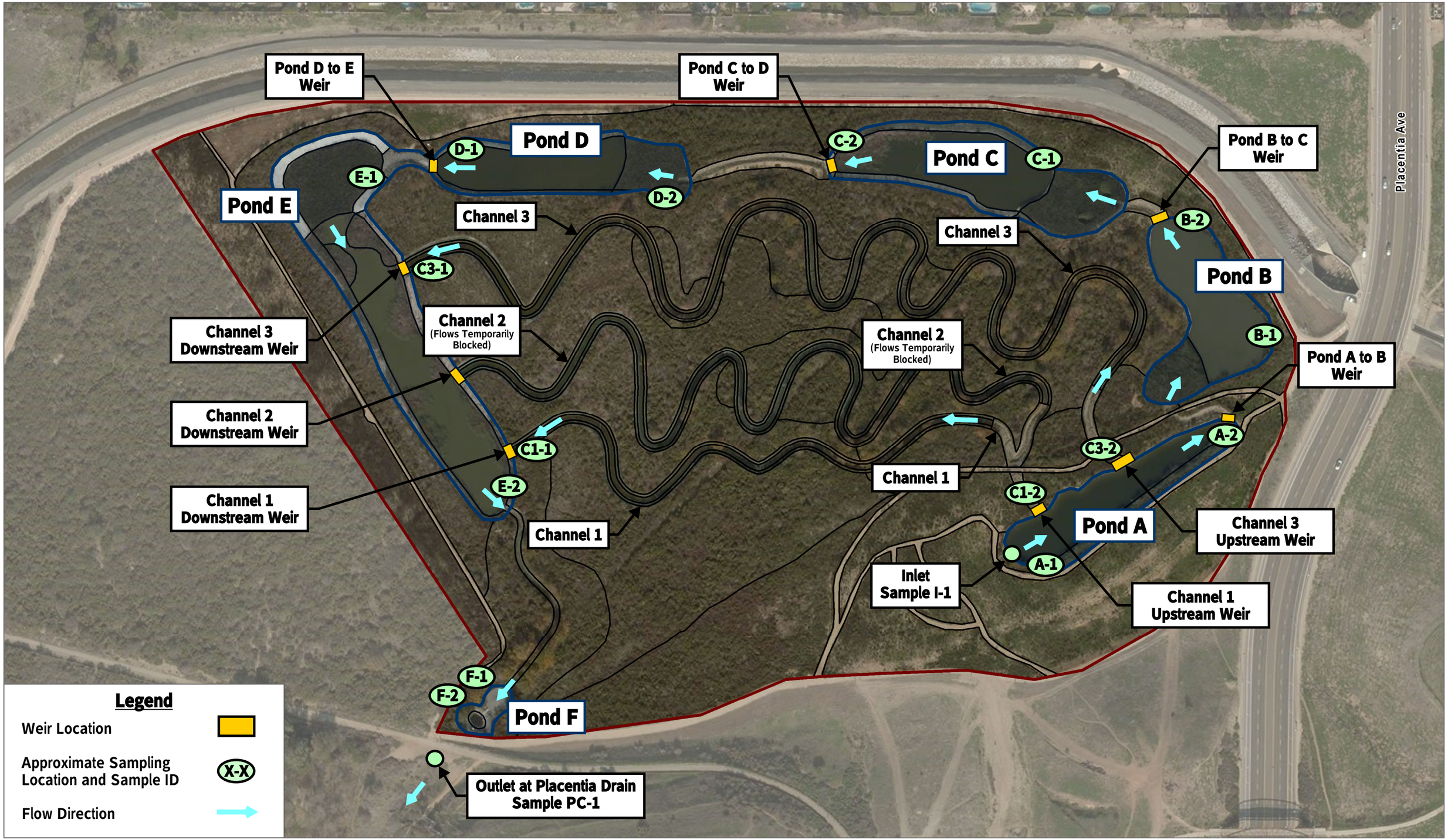

SOURCE: Bing Maps 2019

DUDEK

0 75 150 Feet

EXHIBIT 1

Site Map and Sampling Locations

Fairview Park Riparian and Wetlands Evaluation Project

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SOURCE: Bing Maps 2019

DUDEK

0 75 150 Feet

Exhibit 2a

Habitat Evaluation Vegetation Map

Fairview Park Riparian and Wetlands Mitigation Project

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SOURCE: Bing Maps 2019

DUDEK

0 75 150 Feet

Exhibit 2b

Habitat Evaluation Vegetation Map

Fairview Park Riparian and Wetlands Mitigation Project

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PLAN
SCALE: 1"=100'

LEGEND

- STUDY AREA
- FAIRVIEW CHANNEL
- GREENVILLE–BANNING CHANNEL
- PLACENTIA DRAIN

GRAPHIC SCALE
0 100' 200'
SCALE: 1" = 100'

DUDEK
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SAN JUAN CAPISTRANO, CA 92675
949.450.2525 Fax 805.963.2074

FAIRVIEW PARK COMPREHENSIVE OPERATIONAL EVALUATION

OFFSITE WATER FEATURES MAP

CITY OF COSTA MESA, CA

FIGURE 3

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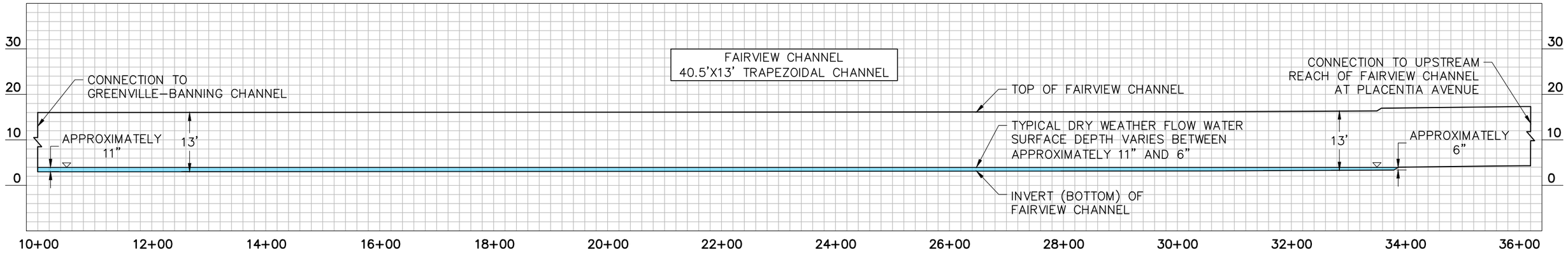

PROFILE
HORIZONTAL SCALE: 1"=80'
VERTICAL SCALE: 1"=10'

PLAN
SCALE: 1"=80'

NOTES

1. WATER DEPTH DATA BASED UPON WATER DEPTHS MEASURED BY SANTA ANA REGIONAL WATER QUALITY CONTROL BOARD (SARWCQB) AND DOCUMENTED IN SARWCQB'S REPORT TITLED USE ATTAINABILITY ANALYSIS FOR GREENVILLE–BANNING CHANNEL – REACH 1, PUBLISHED ON OCTOBER 4, 2013.
2. MOSQUITO LARVAE PREFER TO LIVE IN STAGNANT OR SLOW MOVING WATER THAT IS SHALLOWER THAN 2 FEET.
3. FAIRVIEW CHANNEL DIMENSIONS FROM BASE MAP OF DRAINAGE FACILITIES IN ORANGE COUNTY, SHEET NO. 46/DWG. NO. MAPS–113–3.
4. DRY WEATHER FLOWS ARE PERENNIAL FLOWS THAT COME FROM URBAN RUNOFF SUCH AS IRRIGATION.

LEGEND

▽ WATER SURFACE ELEVATION SYMBOL

GRAPHIC SCALE
0 80 160
SCALE: 1" = 80'

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FAIRVIEW PARK COMPREHENSIVE OPERATIONAL EVALUATION

FAIRVIEW CHANNEL WATER DEPTH

CITY OF COSTA MESA, CA

FIGURE 4

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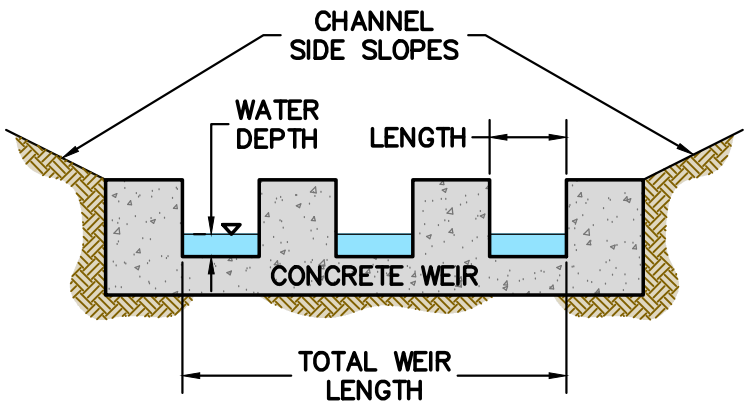
EXHIBIT 5

TYPICAL SECTION OF WEIRS IN FAIRVIEW PARK



LEGEND

▽ WATER SURFACE ELEVATION SYMBOL

EXAMPLE PICTURE OF WEIRS IN FAIRVIEW PARK

Appendix A

Vascular Plant Species Observed

Appendix A
Vascular Plants

EUDICOTS

VASCULAR SPECIES

ANACARDIACEAE—SUMAC OR CASHEW FAMILY
Malosma laurina—laurel sumac
Rhus integrifolia—lemonade berry

ASTERACEAE—SUNFLOWER FAMILY
Artemisia californica—California sagebrush
Artemisia douglasiana—Douglas' sagewort
Artemisia dracunculus—wild tarragon
Artemisia palmeri—San Diego sagewort
Baccharis pilularis—coyote brush
Baccharis salicifolia—mulefat
Encelia californica—California brittle bush
Isocoma menziesii—Menzies's golden bush
Pluchea odorata—sweetscent
Pseudognaphalium luteoalbum—Jersey cudweed*

BORAGINACEAE—BORAGE FAMILY
Phacelia cicutaria—caterpillar phacelia

BRASSICACEAE—MUSTARD FAMILY
Brassica nigra—black mustard*
Nasturtium officinale—watercress
Raphanus sativus—cultivated radish*

CACTACEAE—CACTUS FAMILY
Opuntia littoralis—coast prickly pear

CLEOMACEAE—CLEOME FAMILY
Peritoma arborea—bladderpod spiderflower

FAGACEAE—OAK FAMILY
Quercus agrifolia—coast live oak

MALVACEAE—MALLOW FAMILY
Malva parviflora—cheeseweed mallow*

ONAGRACEAE—EVENING PRIMROSE FAMILY
Oenothera elata—Hooker's evening primrose

PLATANACEAE—PLANE TREE, SYCAMORE FAMILY
Platanus racemosa—California sycamores

POLYGONACEAE—BUCKWHEAT FAMILY
Eriogonum fasciculatum—California buckwheat
Rumex crispus—curly dock*

ROSACEAE—ROSE FAMILY
Heteromeles arbutifolia—toyon

SALICACEAE—WILLOW FAMILY
Populus fremontii—Fremont cottonwood
Salix exigua—sandbar willow
Salix lasiolepis—arroyo willow

URTICACEAE—NETTLE FAMILY
Urtica dioica—stinging nettle
Urtica urens—dwarf nettle*

MONOCOTS

VASCULAR SPECIES

CYPERACEAE—SEDGE FAMILY
Cyperus eragrostis—tall flatsedge
Schoenoplectus californicus—California bulrush

JUNCACEAE—RUSH FAMILY
Juncus mexicanus—Mexican rush

POACEAE—GRASS FAMILY
Cortaderia selloana—Uruguayan pampas grass*

TYPHACEAE—CATTAIL FAMILY
Typha latifolia—broadleaf cattail

* signifies introduced (non-native) species

Appendix B

Wildlife Species Observed

Appendix B
Wildlife Species Observed

BIRD

FINCHES

FRINGILLIDAE—FRINGILLINE AND CARDUELINE FINCHES AND ALLIES
Spinus psaltria—lesser goldfinch

FLYCATCHERS

TYRANNIDAE—TYRANT FLYCATCHERS
Sayornis nigricans—black phoebe

HAWKS

ACCIPITRIDAE—HAWKS, KITES, EAGLES, AND ALLIES
Buteo jamaicensis—red-tailed hawk

HERONS AND BITTERNS

ARDEIDAE—HERONS, BITTERNS, AND ALLIES
Ardea alba—great egret
Egretta thula—snowy egret

HUMMINGBIRDS

TROCHILIDAE—HUMMINGBIRDS
Calypte anna—Anna's hummingbird

IBISES AND SPOONBILLS

THRESKIORNITHIDAE—IBISES AND SPOONBILLS
Plegadis chihi—white-faced ibis

JAYS, MAGPIES AND CROWS

CORVIDAE—CROWS AND JAYS
Corvus corax—common raven

KINGLETS

REGULIDAE—KINGLETS
Regulus calendula—ruby-crowned kinglet

NEW WORLD VULTURES

CATHARTIDAE—NEW WORLD VULTURES
Cathartes aura—turkey vulture

OLD WORLD WARBLERS AND GNATCATCHERS

SYLVIIDAE—SYLVIID WARBLERS
Polioptila caerulea—blue-gray gnatcatcher

RAILS, GALLINULES AND COOTS

RALLIDAE—RAILS, GALLINULES, AND COOTS
Fulica americana—American coot

WOOD WARBLERS AND ALLIES

PARULIDAE—WOOD-WARBLERS
Geothlypis trichas—common yellowthroat
Setophaga coronata—yellow-rumped warbler

WOODPECKERS

PICIDAE—WOODPECKERS AND ALLIES
Colaptes auratus—northern flicker

MAMMAL

CANIDS

CANIDAE—WOLVES AND FOXES
Canis latrans—coyote

REPTILE

LIZARDS

PHRYNOSOMATIDAE—IGUANID LIZARDS
Sceloporus occidentalis—western fence lizard

* signifies introduced (non-native) species

Appendix C

Water Quality Test Results

SIERRA ANALYTICAL

31 January 2019

Jonis Smith
Dudek - SJC
31878 Camino Capistrano Suite 200
San Juan Capistrano, CA 92675

RE:NA

Work Order No.: 1901297

Attached are the results of the analyses for samples received by the laboratory on 01/25/19 14:05.

The samples were received by Sierra Analytical Labs, Inc. with a chain of custody record attached or completed at the submittal of the samples.

The analyses were performed according to the prescribed method as outlined by EPA, Standard Methods, and A.S.T.M.

The remaining portions of the samples will be disposed of within 30 days from the date of this report.
If you require any additional retaining time, please advise us.

Sincerely,

Richard K. Forsyth

Richard K. Forsyth

Laboratory Director

Sierra Analytical Labs, Inc. is certified by the California Department of Health Services (DOHS),
Environmental Laboratory Accredidation Program (ELAP) No. 2320.

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
A-1	1901297-01	Liquid	01/25/19 12:31	01/25/19 14:05
A-2	1901297-02	Liquid	01/25/19 12:55	01/25/19 14:05
B-1	1901297-03	Liquid	01/25/19 12:03	01/25/19 14:05
B-2	1901297-04	Liquid	01/25/19 12:06	01/25/19 14:05
C-1	1901297-05	Liquid	01/25/19 12:13	01/25/19 14:05
C-2	1901297-06	Liquid	01/25/19 12:16	01/25/19 14:05
D-1	1901297-07	Liquid	01/25/19 11:15	01/25/19 14:05
D-2	1901297-08	Liquid	01/25/19 11:18	01/25/19 14:05
E-1	1901297-09	Liquid	01/25/19 10:59	01/25/19 14:05
E-2	1901297-10	Liquid	01/25/19 11:05	01/25/19 14:05
F-1	1901297-11	Liquid	01/25/19 10:41	01/25/19 14:05
F-2	1901297-12	Liquid	01/25/19 10:46	01/25/19 14:05
C1-1	1901297-13	Liquid	01/25/19 11:44	01/25/19 14:05
C1-2	1901297-14	Liquid	01/25/19 12:53	01/25/19 14:05
C3-1	1901297-15	Liquid	01/25/19 11:50	01/25/19 14:05
C3-2	1901297-16	Liquid	01/25/19 12:43	01/25/19 14:05
I-1	1901297-17	Liquid	01/25/19 12:57	01/25/19 14:05
PC-1	1901297-18	Liquid	01/25/19 13:02	01/25/19 14:05

26052 MERIT CIRCLE SUITE 105, LAGUNA HILLS, CALIFORNIA 92653
TELEPHONE: (949) 348-9389 FAX: (949) 348-9115
E-MAIL: SIERRALABS @ SIERRALABS.NET

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
A-1 (1901297-01) Liquid Sampled: 01/25/19 12:31 Received: 01/25/19 14:05									
Ammonia as N	**0.620**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**3.80**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**4.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1090**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.56**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**8.50**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.44**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**3.15**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**690**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**1.16**	0.0200	NTU	"	"	"	"	SM 2130B	
A-2 (1901297-02) Liquid Sampled: 01/25/19 12:55 Received: 01/25/19 14:05									
Ammonia as N	**0.330**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**3.40**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**2.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1070**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.42**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**7.70**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.48**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**3.40**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**680**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**1.40**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
B-1 (1901297-03) Liquid Sampled: 01/25/19 12:03 Received: 01/25/19 14:05									
Ammonia as N	**0.170**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**2.90**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**5.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1110**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.29**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**5.70**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.44**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.70**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**700**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**3.38**	0.0200	NTU	"	"	"	"	SM 2130B	
B-2 (1901297-04) Liquid Sampled: 01/25/19 12:06 Received: 01/25/19 14:05									
Ammonia as N	**0.360**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**2.70**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**7.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1100**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.39**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**6.20**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.58**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.55**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**690**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**1.96**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C-1 (1901297-05) Liquid Sampled: 01/25/19 12:13 Received: 01/25/19 14:05									
Ammonia as N	**0.500**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**3.10**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**6.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1080**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.07**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**4.70**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.41**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.15**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**685**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**2.12**	0.0200	NTU	"	"	"	"	SM 2130B	
C-2 (1901297-06) Liquid Sampled: 01/25/19 12:16 Received: 01/25/19 14:05									
Ammonia as N	**0.410**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**2.10**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**8.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1090**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.08**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**5.10**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.38**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.10**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**680**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**1.93**	0.0200	NTU	"	"	"	"	SM 2130B	

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Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
D-1 (1901297-07) Liquid Sampled: 01/25/19 11:15 Received: 01/25/19 14:05									
Ammonia as N	**0.190**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**3.90**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**21.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1080**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.46**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**3.90**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.45**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**1.55**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**670**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**4.19**	0.0200	NTU	"	"	"	"	SM 2130B	
D-2 (1901297-08) Liquid Sampled: 01/25/19 11:18 Received: 01/25/19 14:05									
Ammonia as N	**0.270**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**2.90**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**20.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1080**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.34**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**4.30**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.36**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**1.70**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**675**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**2.06**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
E-1 (1901297-09) Liquid Sampled: 01/25/19 10:59 Received: 01/25/19 14:05									
Ammonia as N	**0.540**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**5.10**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**17.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1070**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.29**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**3.00**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.08**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**1.00**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**684**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**1.72**	0.0200	NTU	"	"	"	"	SM 2130B	
E-2 (1901297-10) Liquid Sampled: 01/25/19 11:05 Received: 01/25/19 14:05									
Ammonia as N	**0.430**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**6.10**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**14.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1110**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.33**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**6.50**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.73**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.25**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**710**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**6.43**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
F-1 (1901297-11) Liquid Sampled: 01/25/19 10:41 Received: 01/25/19 14:05									
Ammonia as N	**0.380**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**6.40**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**12.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1120**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**5.98**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**4.20**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.76**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**1.95**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**716**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**7.36**	0.0200	NTU	"	"	"	"	SM 2130B	
F-2 (1901297-12) Liquid Sampled: 01/25/19 10:46 Received: 01/25/19 14:05									
Ammonia as N	**0.650**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**5.20**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**10.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1120**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.15**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**4.00**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.71**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**1.80**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**720**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**6.07**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C1-1 (1901297-13) Liquid Sampled: 01/25/19 11:44 Received: 01/25/19 14:05									
Ammonia as N	**0.520**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**5.10**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**17.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1120**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.04**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**6.80**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.78**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.75**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**712**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**3.53**	0.0200	NTU	"	"	"	"	SM 2130B	
C1-2 (1901297-14) Liquid Sampled: 01/25/19 12:53 Received: 01/25/19 14:05									
Ammonia as N	**0.540**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**5.95**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**13.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1100**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.19**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**6.90**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.54**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**3.00**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**700**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**3.62**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
C3-1 (1901297-15) Liquid Sampled: 01/25/19 11:50 Received: 01/25/19 14:05									
Ammonia as N	**0.770**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**8.90**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**10.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1120**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**5.88**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**6.30**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.73**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.50**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**715**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**21.5**	0.0200	NTU	"	"	"	"	SM 2130B	
C3-2 (1901297-16) Liquid Sampled: 01/25/19 12:43 Received: 01/25/19 14:05									
Ammonia as N	**0.850**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**5.90**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**8.00**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1100**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.07**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**7.80**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.77**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**2.75**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**705**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**5.23**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Conventional Chemistry Parameters by APHA/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
I-1 (1901297-17) Liquid Sampled: 01/25/19 12:57 Received: 01/25/19 14:05									
Ammonia as N	**0.980**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**4.20**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**18.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1060**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.32**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**8.60**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.25**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**3.40**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**675**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**1.24**	0.0200	NTU	"	"	"	"	SM 2130B	
PC-1 (1901297-18) Liquid Sampled: 01/25/19 13:02 Received: 01/25/19 14:05									
Ammonia as N	**4.20**	0.100	mg/L	1	B9A3034	01/25/19	01/25/19 16:14	SM 4500-NH3	
Biochemical Oxygen Demand	**6.15**	2.00	"	"	"	"	01/30/19 16:14	SM 5210 B	
Color	**19.0**	1.00	Color Units	"	"	"	01/25/19 16:14	SM 2120B	
Specific Conductance (EC)	**1120**	0.100	µmhos/cm	"	"	"	"	SM 2510 B	
Dissolved Oxygen	**6.20**	0.100	mg/L	"	"	"	"	EPA 360.1	
Nitrate as N	**4.20**	0.500	"	"	"	"	"	HACH 10206	
pH	**7.80**	0.100	pH Units	"	"	"	"	SM 4500-H+	H-01
Phosphorus	**1.90**	0.0500	mg/L	"	"	"	"	EPA 365.2	
Salinity	ND	2.00	PPT	"	"	"	"	SM 2520	
Total Dissolved Solids	**712**	1.00	mg/L	"	"	"	"	SM 2540 C	
Turbidity	**4.97**	0.0200	NTU	"	"	"	"	SM 2130B	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Physical Parameters by APHA/ASTM/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
A-1 (1901297-01) Liquid	**Sampled: 01/25/19 12:31**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
A-2 (1901297-02) Liquid	**Sampled: 01/25/19 12:55**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
B-1 (1901297-03) Liquid	**Sampled: 01/25/19 12:03**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
B-2 (1901297-04) Liquid	**Sampled: 01/25/19 12:06**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
C-1 (1901297-05) Liquid	**Sampled: 01/25/19 12:13**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
C-2 (1901297-06) Liquid	**Sampled: 01/25/19 12:16**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
D-1 (1901297-07) Liquid	**Sampled: 01/25/19 11:15**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
D-2 (1901297-08) Liquid	**Sampled: 01/25/19 11:18**	**Received: 01/25/19 14:05**							
Redox Potential	**100**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
E-1 (1901297-09) Liquid	**Sampled: 01/25/19 10:59**	**Received: 01/25/19 14:05**							
Redox Potential	**110**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Physical Parameters by APHA/ASTM/EPA Methods

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
E-2 (1901297-10) Liquid Sampled: 01/25/19 11:05 Received: 01/25/19 14:05									
Redox Potential	**86**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
F-1 (1901297-11) Liquid Sampled: 01/25/19 10:41 Received: 01/25/19 14:05									
Redox Potential	**85**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
F-2 (1901297-12) Liquid Sampled: 01/25/19 10:46 Received: 01/25/19 14:05									
Redox Potential	**74**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
C1-1 (1901297-13) Liquid Sampled: 01/25/19 11:44 Received: 01/25/19 14:05									
Redox Potential	**78**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
C1-2 (1901297-14) Liquid Sampled: 01/25/19 12:53 Received: 01/25/19 14:05									
Redox Potential	**85**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
C3-1 (1901297-15) Liquid Sampled: 01/25/19 11:50 Received: 01/25/19 14:05									
Redox Potential	**82**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
C3-2 (1901297-16) Liquid Sampled: 01/25/19 12:43 Received: 01/25/19 14:05									
Redox Potential	**85**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
I-1 (1901297-17) Liquid Sampled: 01/25/19 12:57 Received: 01/25/19 14:05									
Redox Potential	**94**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	
PC-1 (1901297-18) Liquid Sampled: 01/25/19 13:02 Received: 01/25/19 14:05									
Redox Potential	**84**		mV	1	B9A3034	01/25/19	01/25/19 16:14	SM 2580	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Inductively Coupled Plasma (ICP) Spectroscopy

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
A-1 (1901297-01) Liquid	**Sampled: 01/25/19 12:31**	**Received: 01/25/19 14:05**							
Hardness	**171**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
A-2 (1901297-02) Liquid	**Sampled: 01/25/19 12:55**	**Received: 01/25/19 14:05**							
Hardness	**155**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
B-1 (1901297-03) Liquid	**Sampled: 01/25/19 12:03**	**Received: 01/25/19 14:05**							
Hardness	**171**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
B-2 (1901297-04) Liquid	**Sampled: 01/25/19 12:06**	**Received: 01/25/19 14:05**							
Hardness	**173**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
C-1 (1901297-05) Liquid	**Sampled: 01/25/19 12:13**	**Received: 01/25/19 14:05**							
Hardness	**172**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
C-2 (1901297-06) Liquid	**Sampled: 01/25/19 12:16**	**Received: 01/25/19 14:05**							
Hardness	**157**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
D-1 (1901297-07) Liquid	**Sampled: 01/25/19 11:15**	**Received: 01/25/19 14:05**							
Hardness	**158**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
D-2 (1901297-08) Liquid	**Sampled: 01/25/19 11:18**	**Received: 01/25/19 14:05**							
Hardness	**167**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
E-1 (1901297-09) Liquid	**Sampled: 01/25/19 10:59**	**Received: 01/25/19 14:05**							
Hardness	**167**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	

26052 MERIT CIRCLE SUITE 105, LAGUNA HILLS, CALIFORNIA 92653
TELEPHONE: (949) 348-9389 FAX: (949) 348-9115
E-MAIL: SIERRALABS @ SIERRALABS.NET

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Inductively Coupled Plasma (ICP) Spectroscopy

Sierra Analytical Labs, Inc.

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
E-2 (1901297-10) Liquid Sampled: 01/25/19 11:05 Received: 01/25/19 14:05									
Hardness	**168**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
F-1 (1901297-11) Liquid Sampled: 01/25/19 10:41 Received: 01/25/19 14:05									
Hardness	**176**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
F-2 (1901297-12) Liquid Sampled: 01/25/19 10:46 Received: 01/25/19 14:05									
Hardness	**172**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
C1-1 (1901297-13) Liquid Sampled: 01/25/19 11:44 Received: 01/25/19 14:05									
Hardness	**175**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
C1-2 (1901297-14) Liquid Sampled: 01/25/19 12:53 Received: 01/25/19 14:05									
Hardness	**164**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
C3-1 (1901297-15) Liquid Sampled: 01/25/19 11:50 Received: 01/25/19 14:05									
Hardness	**177**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
C3-2 (1901297-16) Liquid Sampled: 01/25/19 12:43 Received: 01/25/19 14:05									
Hardness	**168**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
I-1 (1901297-17) Liquid Sampled: 01/25/19 12:57 Received: 01/25/19 14:05									
Hardness	**151**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	
PC-1 (1901297-18) Liquid Sampled: 01/25/19 13:02 Received: 01/25/19 14:05									
Hardness	**176**	1.32	mg/L	1	B9A2510	01/25/19	01/28/19 19:07	Calculation	

Dudek - SJC	Project: NA	
31878 Camino Capistrano Suite 200	Project Number: [none]	**Reported:**
San Juan Capistrano CA, 92675	Project Manager: Jonis Smith	01/31/19 15:46

Notes and Definitions

H-01	Sample received without sufficient time to complete analysis within recommended holding time.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference

SIERRA ANALYTICAL

TEL: 949 • 348 • 9389
FAX: 949 • 348 • 9115
26052 Merit Circle • Suite 104 • Laguna Hills, CA • 92653

CHAIN OF CUSTODY RECORD

Date: 1/25/19 Page: 1 of 2

Lab Work Order No.: 1901297

Client: DUDEK
Client Address: 27372 CAMINO CAPISTRANO
Client Tel. No.: (949) 373-8334
Client Fax. No.:
Client Proj. Mgr.: Jonis Smith

Client Project ID: 11483

Turn Around Time Requested: ☐ Immediate ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 4 Day ☐ 5 Day ☒ Normal ☐ Mobile

Analyses Requested: Salinity, Ammonia, Color, Conductivity, Diss. Oxygen, Hardness, NO3, pH & Turbidity, Phosphorus, Redox Potential, TDS, BOD

Geotracker EDD Info:
Client LOGCODE
Site Global ID
Field Point Names / Comments

Client Sample ID.	Sierra No.	Date	Time	Matrix	Preservative	Container Type	No. of Containers
A-1	01	1/25/19	12:31	WATER	ICE	BOTTLE	1
A-2	02	1/25/19	12:55	"	"	"	1
B-1	03	1/25/19	12:03	"	"	"	1
B-2	04	1/25/19	12:06	"	"	"	1
C-1	05	1/25/19	12:13	"	"	"	1
C-2	06	1/25/19	12:16	"	"	"	1
D-1	07	1/25/19	11:15	"	"	"	1
D-2	08	1/25/19	11:18	"	"	"	1
E-1	09	1/25/19	10:59	"	"	"	1
E-2	10	1/25/19	11:05	"	"	"	1

1 Sampler Signature: Jonis Smith
Printed Name: Jonis Smith
Company: DUDEK
Shipped Via:
(Carrier/Waybill No.)

2 Relinquished By: Jonis Smith Date: 1.25.19 Time: 14:05
Received By: TORK Date: 1.25.19
Company: SIERRA Time: 14:05

3 Relinquished By: Date: Time:
Received By: Date:
Company: Time:

4 Relinquished By: Date: Time:
Received By: Date:
Company: Time:

Special Instructions:
To bill call (619) 756 5167 or email jobren@dudek.com

10 Total Number of Containers Submitted to Laboratory

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under SIERRA's Terms and Conditions, unless otherwise agreed upon in writing between SIERRA and CLIENT.
* - Samples determined to be hazardous by SIERRA will be returned to CLIENT.

10 Total Number of Containers Received by Laboratory

Sample Disposal:
☐ Return to Client
☐ Lab Disposal *
☐ Archive ____ mos.
☐ Other ____

FOR LABORATORY USE ONLY - Sample Receipt Conditions:
☐ Intact ☑ Chilled - Temp (°C) 6°C
☐ Sample Seals ☐ Preservatives - Verified By
☑ Properly Labelled ☐ Other
☐ Appropriate Sample Container ☐ Storage Location

Rev: 120321

DISTRIBUTION: White - To Accompany Samples, Yellow - Laboratory Copy, Pink - Field Personnel Copy

SIERRA ANALYTICAL
TEL: 949 • 348 • 9389
FAX: 949 • 348 • 9115
26052 Merit Circle • Suite 104 • Laguna Hills, CA • 92653

CHAIN OF CUSTODY RECORD

Date: 1/25/19 Page: 2 of 2

Lab Work Order No.: 1901297

Client: DUDEK
Client Address: 2737 Camino Capistrano, San Juan Cap 92675
Client Tel. No.: (949) 373-8334
Client Fax. No.:
Client Proj. Mgr.: Jenis Smith

Client Project ID: 11487

Turn Around Time Requested: ☐ Immediate ☐ 24 Hour ☐ 48 Hour ☐ 72 Hour ☐ 4 Day ☐ 5 Day ☒ Normal ☐ Mobile

Analyses Requested

Geotracker EDD Info:
Client LOGCODE
Site Global ID

Client Sample ID.	Sierra No.	Date	Time	Matrix	Preservative	Container Type	No. of Containers	Salinity	Ammonia	Color	Conductivity	Diss. Oxygen	Hardness	NO3	pH & Turbidity	Phosphorous	Redox Potential	TDS	BOD	Field Point Names / Comments
F-1	11	1/25/19	10:41	Water	Ice	Bottle	1	X	X	X	X	X	X	X	X	X	X	X	X	
F-2	12	1/25/19	10:46	"	"	"	1													
C1-1	13	1/25/19	11:44	"	"	"	1													
C1-2	14	1/25/19	12:53	"	"	"	1													
C3-1	15	1/25/19	11:50	"	"	"	1													
C3-2	16	1/25/19	12:43	"	"	"	1													
I-1	17	1/25/19	12:57	"	"	"	1													
PC-1	18	1/25/19	1:02	"	"	"	1													
							8													

1 Sampler Signature: [signature] Printed Name: Jenis Smith
Shipped Via:
(Carrier/Waybill No.)

2 Relinquished By: [signature] Company: Dudek Date: 1/25 Time: 2:03
Received By: TORA Company: SIERRA Date: 1.25.19 Time: 14:03

3 Relinquished By: Company: Date: Time:
Received By: Company: Date: Time:

4 Relinquished By: Company: Date: Time:
Received By: Company: Date: Time:

Special Instructions:
SEND REPORT to jsmith@dudek.com AND jobrien@dudek.com

8 Total Number of Containers Submitted to Laboratory

The delivery of samples and the signature on this chain of custody form constitutes authorization to perform the analyses specified above under SIERRA's Terms and Conditions, unless otherwise agreed upon in writing between SIERRA and CLIENT.
* - Samples determined to be hazardous by SIERRA will be returned to CLIENT.

8 Total Number of Containers Received by Laboratory

Sample Disposal:
☐ Return to Client
☐ Lab Disposal *
☐ Archive ____ mos.
☐ Other ____

FOR LABORATORY USE ONLY - Sample Receipt Conditions:
☑ Intact ☑ Chilled - Temp (°C) 6 C
☐ Sample Seals ☐ Preservatives - Verified By
☑ Properly Labelled ☐ Other
☑ Appropriate Sample Container ☐ Storage Location

Rev: 120321

DISTRIBUTION: White - To Accompany Samples, Yellow - Laboratory Copy, Pink - Field Personnel Copy