

ATTACHMENT E: Biological Resources Review

MEMORANDUM

To: Stephanie Strelow
From: Dave Compton, Biologist
Subject: Wharf Master Plan Comments Regarding Birds
Date: October 14, 2016

Comments on the Santa Cruz Wharf Master Plan Mitigated Negative Declaration were submitted to the City Council on August 22, 2016 after the close of the public review period that ended on April 12, 2016. Several comments raised the issue of pigeon guillemots (*Cephus columba*) and other birds nesting on the Wharf and requested a biological review of impacts of the proposed Wharf Master Plan on birds.

Specific comments include:

“A small number of pigeon guillemots nest under the wharf at the south end. This species is protected under the Migratory Bird Treaty Act. Snowy egrets were also noted to “inhabit” the western side of the wharf.”

“A wide variety of birds either nest, rest or shelter on the structure and may be significantly impacted by Master Plan projects. In particular the pigeon guillemot and other bird species are regularly found nesting in this structure.”

Citing information in the *Birds of North America Online* (Rodewald 2016), one comment stated that to avoid disturbing nesting pigeon guillemots, “at a very minimum, no construction activity should take place after March 15 or before September 15, i.e. 6 months.”

Therefore, these comments emphasize several points:

1. Pigeon guillemots and other bird species nest under or on the wharf, with guillemots nesting under the southern portion of the wharf.
2. Impacts to nesting birds could occur from construction activities associated with the master plan projects, in violation of the Migratory Bird Treaty Act.
3. Construction should be prohibited for at least six months (March 15 to September 15) to avoid disturbing these nesting birds.

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4. Wharf Master Plan projects could result in removal of nesting habitat for pigeon guillemots and other species nesting under or on the Wharf, which should be considered a significant impact.

This response acknowledges that pigeon guillemots nest on the Santa Cruz Wharf (“Wharf”), and accepts that bird nesting on the Wharf could potentially occur at least from March 15 to September 15. The discussion below explains that no nesting habitat for pigeon guillemot or any other species will be removed, and it introduces a measure to ensure that no take of birds or bird nests will result from implementation of Wharf Master Plan projects, in violation of the Migratory Bird Treaty Act (MBTA) and the California Fish and Game Code. It also addresses the issue of the Wharf as Coastal Bird Habitat, per the General Plan 2030 (City 2012) and Local Coastal Program (LCP), and addresses bird species issues related to this designation. These issues are addressed below in supplemental text to the MND/IS.

INITIAL STUDY BIOLOGICAL RESOURCES

In accordance with the California Environmental Quality Act (CEQA), State CEQA Guidelines, City of Santa Cruz plans and policies, and agency and professional standards, the MND/IS Section 4 states that a project impact would be considered significant if the project would:

- a. Have a substantial adverse effect, either directly or through habitat modifications on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;
- b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service;
- c. Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means;
- d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- f. Conflict with the provisions of an adopted Habitat Conservation Plan (HCP), Natural Community Conservation Plan (NCCP), or other approved local, regional, or state habitat conservation plan.

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Criteria c. and f. are not potentially relevant to the issue of nesting or roosting birds. Therefore, this response addresses only criteria a., b., d. and e.

a. Special-Status Species – No impact. Pigeon guillemot is a common species that is not listed under ESA or CESA and does not possess any special-status species designation, per the California Special Animals List (CDFW 2016b). It is listed in the General Plan 2030 Environmental Impact Report (General Plan EIR; City 2012) as a species roosting or nesting on the Wharf, and the Wharf is identified as Coastal Bird Habitat in the General Plan 2030 (City 2012). However, it is not considered a sensitive species in City’s General Plan (2012). The City’s LCP Land Use Plan Map EQ-9, Sensitive Species and Habitats, identifies pigeon guillemot as a sensitive species, although the LCP map shows the species in an area near the lighthouse on West Cliff Drive, but not on the Wharf. Therefore, impacts to nesting habitat for pigeon guillemot are addressed below under b. Riparian and Sensitive Habitats.

The commenters also mention snowy egret as a species occurring at the wharf. This species is not listed under ESA or CESA, but is on the Special Animals List, but only for nesting colonies, which occur in trees and other vegetation types that are absent from the Wharf. It is not mentioned in the General Plan 2030 EIR (City 2012) or the LCP (City 1992). Therefore, there would be no impacts to this species as there is no nesting at the Wharf.

The City’s General Plan Table 1, Sensitive Management Protocols for Sensitive Species and Habitat, includes the brown pelican (*Pelecanus occidentalis*) as a species that nests or roosts on the Wharf, although it does not describe the exact nature of the species’ use of the Wharf. However, LCP Map EQ-9 identifies the Wharf as a sensitive species location for the California brown pelican (City 1992). The California brown pelican (*P.o. californicus*) is fully protected species for nesting and roosting, and potential impacts are discussed below.

Other special-status bird species nesting in the vicinity of the Wharf can be determined from a query of the California Natural Diversity Database (CNDDDB; CDFW 2016a), a review of all bird species occurring on the Special Animals List, and a review of bird species considered as special-status in the General Plan 2030 (City 2012). CNDDDB was queried for all bird species occurring in the Santa Cruz U.S. Geological Survey quadrangle (quad), in which the Wharf is located, and the surrounding four quads: Davenport, Felton, Laurel, and Soquel. Breeding bird species identified in the City (2012) and for which CNDDDB includes occurrences are listed below. However, no bird species tracked in CNDDDB were recorded nesting on the Wharf.

- Bank swallow (*Riparia riparia*) – State threatened (ST)
- Black oystercatcher (*Haematopus bachmani*) – U.S. Fish and Wildlife bird species of conservation concern (BCC)

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- Black swift (*Cypseloides niger*) – BCC; California species of special concern (CSSC)
- Black-crowned night-heron (*Nycticorax nycticorax*) – Special Animal (SA)
- Burrowing owl (*Athene cunicularia*) – BCC, CSSC
- California horned lark (*Eremophila alpestris actia*) – WL
- Chipping sparrow (*Spizella passerina*) – General Plan only
- Cooper’s hawk (*Accipiter cooperi*) – Watch List (WL)
- Double-crested cormorant (*Phalacrocorax auritus*) – WL
- Ferruginous hawk (*Buteo regalis*) – WL
- Golden eagle (*Aquila chrysaetos*) – FP, WL
- Great blue heron (*Ardea herodias*) – SA
- Hermit warbler (*Setophaga occidentalis*) – SA
- Long-eared owl (*Asio otus*) – CSSC
- Marbled murrelet (*Brachyramphus marmoratus*) – Federally threatened (FT), State endangered (SE)
- Merlin (*Falco columbarius*) - WL
- Oak titmouse (*Baeolophus inornatus*) – SA
- Osprey (*Pandion haliaetus*) – WL
- Saltmarsh common yellowthroat (*Geothlypis trichas sinuosa*) – BCC, CSSC
- Sharp-shinned hawk (*Accipiter striatus*) – WL
- Tricolored blackbird (*Agelaius tricolor*) – BCC, CSSC, State candidate (SC)
- Vaux’s swift (*Chaetura vauxi*) – CSSC
- Western snowy plover (*Charadrius alexandrinus nivosus*) – BCC, FT, CSSC
- White-tailed kite (*Elanus leucurus*) – FP
- Yellow warbler (*Setophaga petechia*) – CSSC
- Yellow-breasted chat (*Icteria virens*) – CSSC

With the exception of osprey, none of the above species are known to nest within or on structures. Species granted special-status designations for other reasons, such as wintering, are not expected to occur on the Wharf due to absence of suitable habitat. While osprey are reported on occasion in the vicinity of the Wharf, reports from the area in the online database eBird (CLO and NAS 2016) are limited to the period when wintering and migrant birds are present, and include no reports of nesting. The General Plan 2030 EIR (City 2011) does not mention this species. However, the city of Santa Cruz lies outside of the breeding range of the osprey and have not been reported at the Wharf (EcoSystems West Consulting Group, 2009). No other bird species on the Special Animals List has the potential to occur on the Wharf for the part of its life cycle in which it is designated as a special animal. American peregrine falcons (*Falco peregrinus anatum*; federally delisted, BCC, State delisted, FP) occur

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occasionally at the Wharf (CLO and NAS 2016). However, this species is protected only for nesting, and no nesting habitat occurs on the wharf.

Therefore, the only special-status bird species potentially occurring at the Wharf is California brown pelican. Although the General Plan EIR (City 2011) and the LCP (City 1992) includes brown pelican on a list of nesting or roosting species for the Wharf, Appendix F-1 of the EIR (*Biological Resources for the City of Santa Cruz General Plan Update*) describes the brown pelican in Santa Cruz only as a potential roosting species (Ecosystems West Consulting Group 2009), and this species is not known to nest north of the Channel Islands, off of southern California (74 FR 59447). Appendix F further describes the only communal roosts in the City as occurring along West Cliff from Lighthouse Point to Younger Lagoon, although it also known to roost on the Wharf (Ecosystems West Consulting Group 2009). As the Master Plan would involve installing wharf pilings and expanding the wharf for public access, it would not result in removal of roosting habitat for this species. Construction could result in temporary disturbances, but California brown pelicans would be able to continue roosting in various areas around the Wharf, away from construction, while construction activities are underway, and no significant impact would result. After implementation of Wharf Master Plan projects, they would be able to continue using the Wharf as previously. Therefore, no impacts are expected to California brown pelican or to special-status bird species.

b. Riparian and Sensitive Habitats – No impact. The City’s General Plan identifies the Wharf as Coastal Bird Habitat, a sensitive habitat. The General Plan EIR reports the following birds at the Wharf: pigeon guillemots and western gulls (*Larus occidentalis*) and roosting by brown pelicans. Therefore, removal of nesting habitat for pigeon guillemot and western gull or removal of roosting habitat for brown pelican, could represent a significant impact. However, the addition of pilings, the relocation of the Entry Gate, the construction of the East Promenade, and construction of new boat landings and three new buildings would not result in removal of habitat, and these species would be able to occupy the Wharf after construction in the same manner as previously. General Plan Action NRC2.2.1 indicates that as part of the CEQA review process for development projects, potential impacts to sensitive habitat should be evaluated and mitigated for sites located within or adjacent to these areas. NRC2.4.1 references biological assessment protocols to be followed to determine if a sensitive biological resource is present, and identifies general avoidance or management strategies to be employed when sensitive biological resources occur. Table 1 of the General Plan, Assessment and Management Protocols for Sensitive Species and Habitat, includes “Coastal Bird Rookeries” in which avoidance of direct impacts is specified, including conducting construction activities outside of the nesting season and/or establishing appropriate construction buffers. Potential impacts to nesting species are addressed in subsection (d) below.

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d. Wildlife Movement/Breeding – Potentially significant. Implementation of Wharf Master Plan projects would not interfere with the movement of bird species in the project vicinity, which could continue to move about the area freely. However, as noted in the comments, nests of pigeon guillemots and potentially other species (including western gull, which is also known to nest on the Wharf) are protected under the Migratory Bird Treaty Act (MBTA), and they are also protected under the California Fish and Game Code Section 3503. Individual adult pigeon guillemots or other birds are unlikely to be directly killed or injured during construction activities because they are highly mobile and would likely leave the area during construction. However, nesting activities by pigeon guillemots, western gulls, and other bird native bird species could be disrupted, if construction occurs during the breeding season and the birds are present. Noise and vibration, such as from pile driving, could potentially disturb adult birds and result in abandonment of nests, eggs, and young, and in nesting failure. This would represent a violation of MBTA and the California Fish and Game Code, and would be contrary to policies in the General Plan. Therefore this impact would be significant absent mitigation.

Implementation of the following mitigation measure will reduce this impact to less than significant:

Mitigation Measure 2. Pre-construction Nesting Bird Survey and Exclusion.

No less than seven days prior to initiation of construction activities, including pile-driving, scheduled to begin during the nesting season for pigeon guillemot, western gull, or other species potentially nesting on the Wharf (February 15 through September 15, or as determined by a qualified biologist), the City shall have a nesting bird survey conducted by a qualified biologist to determine if active nests of bird species protected by the Migratory Bird Treaty Act and/or the California Fish and Game Code are present in the disturbance zone or within 300 feet of the disturbance zone. If active nests are found, pile-driving or other construction activities within 300 feet of the nests (or as determined by the qualified biologist in consultation with CDFW) shall be postponed or halted, until the nest is vacated and young have fledged, as determined by the biologist, and there is no evidence of a second attempt at nesting. Bird surveys shall include inspection of areas underneath the Wharf for indications of nesting by pigeon guillemots, inspection of rooftops for nesting western gulls, and inspection of any other areas within 300 feet of the construction zone where birds may be nesting.

With the implementation of Mitigation Measure 2, impacts to nesting pigeon guillemots and other common bird species would be mitigated to less than significant.

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e. Conflict with Local Ordinances and Policies – No impact. As noted in the response to d. Riparian and Sensitive Habitats, although the Wharf is considered Coastal Bird Habitat in the City (2012), implementation of Wharf Master Plan projects would not result in permanent impacts to Coastal Bird Habitat.

MANDATORY FINDINGS OF SIGNIFICANCE

In accordance with the California Environmental Quality Act (CEQA), State CEQA Guidelines, City of Santa Cruz plans and policies, and agency and professional standards, a project impact to a wildlife species would be considered significant if the project would:

- a. substantially reduce the habitat of a fish or wildlife species,
- b. cause a fish or wildlife population to drop below self-sustaining levels,
- c. threaten to eliminate a plant or animal community,
- d. reduce the number or restrict the range of a rare or endangered plant or animal.

As noted above, implementation of Wharf Master Plan projects would only result in potential temporary impacts to bird species, including pigeon guillemot and special-status bird species. However, impacts to nesting birds can be mitigated, and no significant impacts to pelican roosting would occur. No permanent loss of habitat would occur to any bird species. Therefore, implementation of Wharf Master Plan projects would not substantially reduce habitat for any bird species, cause a bird species population to drop below self-sustaining levels, threaten to eliminate an animal community, or reduce the number or restrict the range of a rare or endangered bird species.

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REFERENCES

74 FR 59443–50472. “Endangered and Threatened Wildlife and Plants; Removal of the Brown Pelican (*Pelecanus occidentalis*) from the Federal List of Endangered Species.” November 17, 2009.

Carter, H.R., G.J. McChesney, D.L. Jaques, C.S. Strong, M.W. Parker, J.E. Takekawa, D.L. Jory. D.L. Whitworth. *Breeding Populations of Seabirds in California 1989–1991*. U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center and San Francisco Bay National Wildlife Refuge Complex.

CDFW (California Department of Fish and Wildlife). 2016a. Rarefind 5: Commercial version. Online database. California Natural Diversity Database. CDFW, Biogeographic Data Branch. Accessed September 2016. <http://www.dfg.ca.gov/biogeodata/cnddb/mapsanddata.asp>.

CDFW. 2016b. “Special Animals (900 taxa).” California Natural Diversity Database, Biogeographic Data Branch. July 2016. Accessed September 2016. http://www.dfg.ca.gov/biogeodata/cnddb/plants_and_animals.asp.

City (City of Santa Cruz). 2012. Final Environmental Impact Report for the Draft General Plan 2030, including Draft Environmental Impact Report, September 2011.

City. 2012. *City of Santa Cruz General Plan 2030*. Adopted June 2012.

City. 1992 as amended. *Local Coastal Program Coastal Land Use Plan*.

CLO and NAS (Cornell Laboratory of Ornithology and National Audubon Society). 2016. eBird. Accessed September 2016. <http://ebird.org/content/ebird/>.

Ecosystems West Consulting Group. 2009. *Biological Resources for the City of Santa Cruz General Plan Update*. Prepared for the City of Santa Cruz, Department of Planning and Community Development. January 2009.

Ewins, P.J. 1993. “Pigeon Guillemot (*Cepphus columba*).” *The Birds of North America Online*. P. G. Rodewald, ed. Ithaca, N.Y.: Cornell Lab of Ornithology <http://bna.birds.cornell.edu/BNA/>. Accessed September 2016.

Rodewald, P., editor. 2016. *The Birds of North America Online*. Online database. Ithaca, New York: Cornell Laboratory of Ornithology. <http://bna.birds.cornell.edu/BNA/>. Accessed September 2016.

MEMORANDUM

To: Stephanie Strelow
From: Brock Ortega
Subject: Analysis of Impacts to Near-Shore Marine Biological Resources due to Lighting Associated with the Planned Santa Cruz Wharf Master Plan Improvements, Santa Cruz, California
Date: October 13, 2016

Attachment(s): Figure 1 – Proposed Master Plan Lighting
Figure 2 – Existing Lighting
Figure 3 – Lighting Analysis for Santa Cruz Wharf Expansion – Before and After Comparison

This memorandum analyzes the potential impact of light on near-shore biological resources associated with proposed Santa Cruz Wharf Master Plan (Master Plan) improvements. The intent is to address general public comments related to potential lighting impacts associated with the project. The analysis is based on general information provided within the Wharf Master Plan (Roma Design Group, October 2014), literature review, review of aerial and other photographic evidence, and known biological information from the site and vicinity. No specific design lighting layouts or lighting specifications/modeling (e.g., light contours) were completed or provided as part of this assessment.

INTRODUCTION

The Santa Cruz Wharf (Wharf) is located at the northern edge of Monterey Bay, in the City of Santa Cruz (see Figure 1-1 in the Initial Study). It is at the hub of many retail, recreational and commercial uses in the Beach Area. Lighthouse Point is situated approximately 0.65 mile to the west, and the Santa Cruz Beach Boardwalk is situated to the east near the Wharf entrance and faces the Main Beach and Monterey bay. The Boardwalk and its many rides, including the “Giant Dipper” rollercoaster, is illuminated every night between May and September and weekends and holidays during the rest of the year. The Wharf is currently illuminated at numerous locations along its entire length and width. Lighting includes overhead street-type and parking lot-type lighting, lighting for pedestrians, and business lighting. Much of the existing lighting is located along the eastern edge of the Wharf immediately adjacent to the bay waters.

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Three strategies have been developed and discussed within the Master Plan to address the economic development potential of the Wharf and other community objectives for the enhancement and preservation of this landmark. The first strategy calls for the physical expansion of the perimeter of the Wharf for public access, recreation, fishing and boating. Planned improvements include a wide promenade on the east side of the Wharf as well as new boat landings, overlooks and the completion of a west side walkway. The second strategy calls for enhancing the existing public spaces on the Wharf. This includes areas currently devoted to vehicular circulation and parking which currently occupies the largest portion of the Wharf. It also includes three public spaces at the point where the deck widens to accommodate commercial uses. This strategy includes the reorganization of the parking areas for greater efficiency and effectiveness, to reduce pedestrian/vehicular conflicts, and to enhance experience. The third strategy calls for expanding the number, mix and attractiveness of commercial uses on the Wharf within the existing footprint devoted to these purposes.

PROPOSED WHARF LIGHTING

Excerpts from the Wharf Master Plan that provide descriptions of the proposed lighting on the Wharf are summarized below. However, at this time, a specific lighting plan has not been developed. A diagram of the proposed lighting is included as Figure 1.

- 1) Page 12 & 13: policies 6 & 8:
 - a. Under Policy 6: Provide for a row of efficient high quality light fixtures on the east side of the parking spine and remove the light fixtures on the west side that constrain pedestrian movement. Incorporate lighting onto the building frontages and storefronts for the sidewalk area.
 - b. Under Policy 8: Promote a continuous permanent canopy over the sidewalk with integrated lighting and signage for comfort and convenience to the pedestrian in inclement weather and during evening hours.
- 2) Page 18: The lighting concept for the vehicular and parking areas on the Wharf calls for the placement of light fixtures along the inland edge of the East Promenade and on both interior sides of the East Parking Lot extension. This will result in the placement of twenty-six light fixtures at 75 feet on center and in line with the seat wall along the parking lot edge and an additional six light fixtures on the opposite side in the East Parking Lot, for a total of 32 light fixtures. The light fixtures will incorporate features to discourage bird perching and will be approximately 18 feet in height. The features will

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provide adequate lighting for the East Promenade as well as the vehicular access and parking areas, and with additional canopy lighting along the sidewalk, will eliminate the need for light fixtures on the sidewalk adjacent to commercial uses. Nesting low-level way-finding lights will be provided along the bayside edge in the proposed step-down area. The lighting concept is designed to protect the night sky, enhance views to the shore and highlight the commercial storefronts.

- 3) Page 19: No lighting along the new Westside Walkway is anticipated. Because ambient light levels will be high from adjacent commercial uses and because generally it is not anticipated that the Westside Walkway would be accessible in the late evening hours, it is not anticipated that lighting will be provided along its length.
- 4) Page 24: Lighting will be provided on the (boat) ramps and platform so that access after dark can be accommodated if desired.
- 5) Page 35: Overhead lighting will be provided on the relocated entrance structure in the overhead beam of the support columns.
- 6) Page 40: Shows existing lighting at the Wharf.
- 7) Page 44: A continuous canopy that extends from existing storefronts over the sidewalk is proposed, which would also incorporate lighting.
- 8) Page 49: Design Standards-Sidewalk Canopy: A sidewalk canopy or roof overhang of a 12-foot depth and 12 to 15 foot height is required over the entire sidewalk adjacent to and the length of each of the premises to provide continuous weather protection for pedestrians. The canopy shall be structured to be a permanent part of the façade. Awnings or fabric extensions are not an acceptable alternative. Lighting must be incorporated in the overhang to improve the uniformity ratio of parking area lighting, and provide for sidewalk illumination.

ANALYSIS THRESHOLDS

This analysis addresses the thresholds identified under the mandatory findings of significance section of the CEQA initial study. Under the mandatory standards of significance, when a lead agency is determining whether to prepare an MND or an EIR, it must find that a project will have a significant effect on the environment, and require that an EIR be prepared, if the project has the potential to (Guidelines, § 15065(a)(1)) :

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- Reduce substantially the habitat of a fish or wildlife species;
- Cause a fish or wildlife population to drop below self-sustaining levels;
- Threaten to eliminate a plant or animal community; or
- Reduce substantially the number or restrict the range of an endangered, rare, or threatened species.

EXISTING CONDITIONS

Currently, the Wharf and surrounding area includes a variety of lighting sources. According to City staff, existing lighting on the Wharf consists of 83 pedestrian lights and 32 street lights for a total of 115 existing lights that stand between 22 feet tall (street lights) and 14 feet tall (pedestrian lights). This includes lights on the western edge of the Wharf from the parking gates to approximately 1,100 feet; along the entire eastern edge; along an approximate 1,800-foot long strip internally next to the business facades; and, another 400-foot strip within the East Parking Lot. Other lighting consists of business façade building lighting along the sidewalk adjacent to the buildings (Figure 2).

Existing light fixtures include LED lights that are rated at 3100 lumens for the street light fixtures and 1875 lumens for pedestrian lights. Existing building lights are generally in the range of 900-1025 lumens each. The 2014 Wharf Engineering Report also notes that the Santa Cruz Wharf is clearly identified on the nautical chart, is well lit, and has two “obstruction” lights on each corner of the end and indicates that with these fixed aids to navigation (on chart, light and horn) the risk from collision due navigation error is low.

LITERATURE RESEARCH

Commenters discussed the potential for lighting impacts and cited scientific literature. We reviewed these and other papers. In summary, the literature is varied in both scope and conclusion. In some instances and for some species, artificial lighting may be harmful, while for others beneficial. For example, lighting has been shown to have no effect to a positive effect on larval and young grunion (Reynolds and Thomson 1974, Reynolds et al. 1977) where they prefer between 10000 and 32000 lux (929 – 2974 FC). The level of harm or benefit is variable and may be dependent on a variety of factors including wave motion, turbidity, moon phase and other factors. In some cases the results may be statistically significant while not in others.

The topics studied may be directly applicable (e.g., marine microfauna), while others may not be at the Wharf’s location (e.g., sea turtles, coral reef, upland species and habitats; Rich and

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Longicore 2005). Moore et al. (2000) studied the effect of artificial light on freshwater species in low oxygen content freshwater lakes. Moore et al. (2000) concluded that the effects of suppression of zooplankton diel vertical migration by light pollution was most likely to occur in lakes with fish and relatively clear water. They concluded that penetration of light pollution and its effects should be greater in clear lakes with low concentrations of dissolved oxygen content and algae. This is not similar to this site or situation where this is a marine environment with high dissolved oxygen content and comparably cloudy waters.

Finally, the situational location of the studies might not be applicable (e.g., light studies in pristine waters). The effects of lighting on phytoplankton and zooplankton have been studied on aquatic (freshwater) and marine organisms, but much of this is focused on the effects of UV-B solar radiation (Hader et al. 1998). Marine zooplankton migrate up the water column during the night, but these migrations occur through water columns of many meters and over a wide area. In the location of the Wharf, the water depth is relatively shallow (to 30 feet). Absorption or attenuation of the minimal light would occur as soon as light enters the water column. Certain wavelengths are attenuated sooner than others and attenuation is caused by particulate matter and water (Yentch 1962). In this situation, the water column is in constant flux, caused by wave action. This flux increases the amount of particulate matter in the water column. Thus, light attenuation would be higher in this area.

Regardless, what is known is that artificial light may cause some level of effect, whether good or bad, and the importance of that impact is poorly understood at this time.

ANALYSIS - LIGHTING ISSUES

Potential impacts are characterized as resulting from two main different sources: (1) short-term construction-related impacts and (2) long-term impacts related to implementation of the proposed Wharf Master Plan projects.

Lighting may affect essential behavioral activities, physiology, population ecology, and ecosystems of both diurnal and nocturnal wildlife. Longcore and Rich (2004) call these effects "ecological light pollution" and identify three types of effects: (1) chronic or periodically increased illumination; (2) unexpected changes in lighting; and (3) direct glare. Chronic increased illumination includes sky glow, lighted buildings and towers, streetlights, and security lights. Unexpected changes may occur from vehicle lights or other discrete events such as flares or spotlighting by law enforcement helicopters. Direct glare may be chronic or unexpected. Because of the existing condition, none of these effects are expected to increase as a result of this project.

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Longcore and Rich (2004) address the ecological effects of ecological light pollution at three levels: (1) behavioral and population ecology; (2) community ecology; and (3) large-scale ecosystem functions. Effects at the behavioral and population ecology level include orientation/disorientation and attraction/repulsion, reproduction, and communication.

Orientation and disorientation are responses to ambient light levels, while attraction and repulsion are responses to the source of light (*e.g.*, moths attracted to a light bulb). Orientation includes artificially expanding behavioral repertoires of normally diurnal or crepuscular species, such as foraging or territorial advertisement or mate attraction (*e.g.*, singing birds), into nighttime periods. Disorientation may occur in nocturnal species that normally orient during dark periods and whose visual systems are adapted to low light levels. Attraction to lights affects birds that may suffer injury or mortality due to collisions with lighted structures. Many insects are attracted to light sources, resulting in high numbers of prey being taken by nocturnal insectivores, such as bats. Repulsion of nocturnal wildlife by lights is probably quite common and may cause them to avoid lighted areas in their normal home ranges. This is more likely to occur in pristine natural environments versus a built environment such as the Wharf.

Wildlife reproduction may be affected by lighting in various ways. Movement to breeding areas, chorus behavior, and mate selection by some amphibians may be affected (Longcore and Rich 2004). Lighting may disturb the nighttime rest and sleep periods of diurnal species, including most passerine (perching) birds, having similar effects as noise, including annoying individuals and causing them to abandon nests that are otherwise perfectly suitable. Nest site selection by some birds may be affected by light, with nests being established farther from light sources (Longcore and Rich 2004). Artificial light may simulate increased day length, affecting reproductive cycles by triggering premature reproductive activity at a time when environmental conditions are not conducive to successful reproduction (*e.g.*, cold temperatures and/or poor food resources). Because light may interfere with sleep, it can be stressful and may disrupt normal biological rhythms and raise the level of stress hormones, which may in turn affect reproductive capacity. However, there is a pre-existing condition on the Wharf and the revised lighting is not anticipated to increase the overall lighting, and may actually reduce lighting in adjacent areas.

At the level of community ecology, ecological light pollution may affect competition and predation (Longcore and Rich 2004). Behavioral interactions by groups of species may be affected by lighting, as species move into the "light niche" (Longcore and Rich 2004). Species groups that normally partition foraging periods in relation to ambient light levels may be in direct competition under artificial light conditions. Likewise, species that are adapted to higher

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light levels (*e.g.*, crepuscular species) may outcompete strictly nocturnal species that normally forage in the darkest part of the night.

Lighting may increase the risk of predation of both nocturnal and diurnal species because they may be more detectable to nocturnal predators. Some species, such as fish, may be attracted to light because invertebrate prey may congregate around light sources, which may in turn increase the risk of the fish being preyed upon by other species such as mammals. Longcore and Rich (2004) characterize this as a tradeoff in the benefit of foraging longer (or at richer sources) with the cost of higher predation risk. Many small species, actually forage at lower rates at high illumination levels (Longcore and Rich 2004), which may be a biological adaptation to high levels of moonlight. Overall, chronic ecological light pollution may favor light-tolerant species over those that are dark-adapted (Longcore and Rich 2004).

The various levels of ecological light pollution ultimately may affect large-scale ecosystem functions in ways not yet understood, as effects at the behavioral and population ecology and community ecology levels reverberate through the system (Longcore and Rich 2004).

Short-term Impacts Related to Construction of the proposed Project

Lighting during construction is not anticipated as construction will not occur at night. Any security lighting will focus on equipment and will be situated such that it focused on equipment and not the surrounding habitat and lighting will not be more intense at the surrounding habitat than it will be post construction or than it currently is. Given these project features, short-term lighting impacts related to construction are considered to be less-than-significant.

Long-term Impacts Related to Build-Out of the Proposed Projects

As reviewed above, ecological light pollution can have effects at the behavioral and population ecology level, the community ecology level, and the ecosystem level (Longcore and Rich 2004). These effects generally include orientation/disorientation and attraction/repulsion, reproduction, and communication at the behavioral and population ecology level, and competition and predation at the community ecology level, the effects of which would be expected to reverberate to the ecosystem level (Longcore and Rich 2004). These effects are likely different in a marine environment. However, while there will be the addition of downward-directed entrance lighting at the relocated parking

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gates, overall lighting improvements proposed by the the Wharf Master Plan would be reduced from the current condition as discussed below.

1. Construction of the East Promenade will move parking lot lighting further from the edge of the Wharf along most of the eastern side of the Wharf. Light structures along the eastern side of the Wharf where the East Promenade will be constructed will be set back from it's edge by approximately 28 feet whereas they are currently situated at the eastern edge of the Wharf directly adjacent to the bay. This will result in greater or total shading of the marine environment from the downward glare of the lights as shown on Figures 1 and 3. The Master Plan indicates that 32 new light fixtures in this area generally will be the same type and intensity as existing lights. It also appears that the new lights would replace some of the existing street lights along the eastern edge.
2. Limited specific low-level way-finding lights will be installed in the East Promenade seat wall to accommodate pedestrian safety.
3. Limited lighting will occur along the boat ramps, and no lighting will be placed along the new western walkway.
4. Existing light structures adjacent to the commercial buildings will no longer be required as they will be replaced by lights inserted into the continuous canopy adjacent to the building facades. These new lights will direct light to the pedestrian paths only and will not be directly visible by the surrounding marine environment. The store-front pedestrian lights will be changed from overhead lamp-post type lighting to integrated and shielded lighting within the pedestrian canopies.
5. No additional lighting is proposed for the western edge of the Wharf. The overall goal of the Master Plan is to protect the night sky, which will also result in a beneficial impact on the adjacent marine environment.

Due to some reduction of lighting on the west side and better placement of lighting, the long-term impacts related to project lighting on marine species are considered to be less-than-significant.

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CEQA MANDATORY FINDING OF SIGNIFICANCE ANALYSIS

Based on the above information, the following findings regarding significance is determined related to each guideline:

- Reduce substantially the habitat of a fish or wildlife species. Because the current baseline condition already includes lighting and the new plan will reduce the number of light sources and will more effectively shield those light sources that are proposed, the project is expected to enhance habitat for any species in the vicinity, primarily with construction of the East Promenade that will move existing parking lot lights further from the edge of the water. Therefore, no significant impacts are expected.
- Cause a fish or wildlife population to drop below self-sustaining levels. For the reasons stated above, and the fact that the location is currently a functioning active development, no significant impacts are expected.
- Threaten to eliminate a plant or animal community. As discussed above, lighting at the edge of the Wharf would be set back along most of the east side, and no significant impacts have been identified as discussed above. Thus, lighting would not threaten to eliminate a marine community. For the reasons stated above, and the fact that the location is currently a functioning active development, no significant impacts are expected.
- Reduce substantially the number or restrict the range of an endangered, rare, or threatened species. Special status species known in the area include fish species (coho salmon, steelhead, green sturgeon), marine mammals (California sea lion, harbor seal, southern sea otter, and occasional gray whale), and California pelicans. The proposed lighting component of the Wharf Master Plan would not be expected to substantially reduce or restrict the range of any of them for the reasons outlined above. No significant impacts are expected.

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LITERATURE CITED AND REFERENCES

Aubrecht, C., C.D. Elvidge, D. Ziskin, P. Rodrigues, A. Gil. 2010. "Observing Stress of Artificial Night Lighting On Marine Ecosystems – A Remote Sensing Application Study." Ed. W. Wagner and B. Szekely. ISPRS TC VII Symposium – 100 Years ISPRS, Vienna, Austria, July 5-7, 2010, IAPRS, Vol. XXXVIII, Part 7B: 41–46.

California Sea Grant, University of California, San Diego. Artificial Lighting. Accessed on September 30, 2016 from <https://caseagrant.ucsd.edu/project/explore-sandy-beach-ecosystems-of-southern-california/artificial-lighting>.

Crabb T.M., R.C. Morrow, J.C. Emmerich, and M. Gustafson. 2013. U.S. Patent No. 8,388,163 B2. "Marine LED Lighting System." Washington D.C.: U.S. Patent and Trademark Office.

Davies, T.W., J.P. Duffy, J. Bennie, and K.J. Gaston. 2015. "Stemming the Tide of Light Pollution Encroaching into Marine Protected Areas." *Conservation Letters A journal of the Society for Conservation Biology* 9(3):164–171. Wiley Periodicals, Inc. May/June 2016. doi: 10.1111/conl.12191.

Gillespie, T.W., K.S. Willis, S Ostermann-Kelm, O. Jenkins, F. Federico, T. Longore, L. Lee, and G.M. MacDonald. 2016. The Distribution and Dynamics of Nighttime Lights in the Mediterranean Coast Network of Southern California: Cabrillo National Monument, Channel Islands National Park, Santa Monica Mountains National Recreation Area. Natural Resource Report NPS/MEDN/NRR—2016/1290. U.S. Department of the Interior National Park Service, Fort Collins, Colorado.

International Dark-Sky Association (IDA). *Light Pollution Effects on Wildlife and Ecosystems*. Accessed on September 29, 2016 at <http://darksky.org/light-pollution/wildlife/>.

McConnell, A., R. Routledge, B.M. Connors. 2010. "Effect of Artificial Light on Marine Invertebrate and Fish Abundance in an Area of Salmon Farming." *Marine Ecology Progress Series*, 419: 147–156. doi: 10.3354/meps08822.

Phys Org. 2015. *Coastal Light Pollution Disturbs Marine Animals, New Study Shows*. Accessed on September 29, 2016 at <http://phys.org/news/2015-04-coastal-pollution-disturbs-marine-animals.html>.

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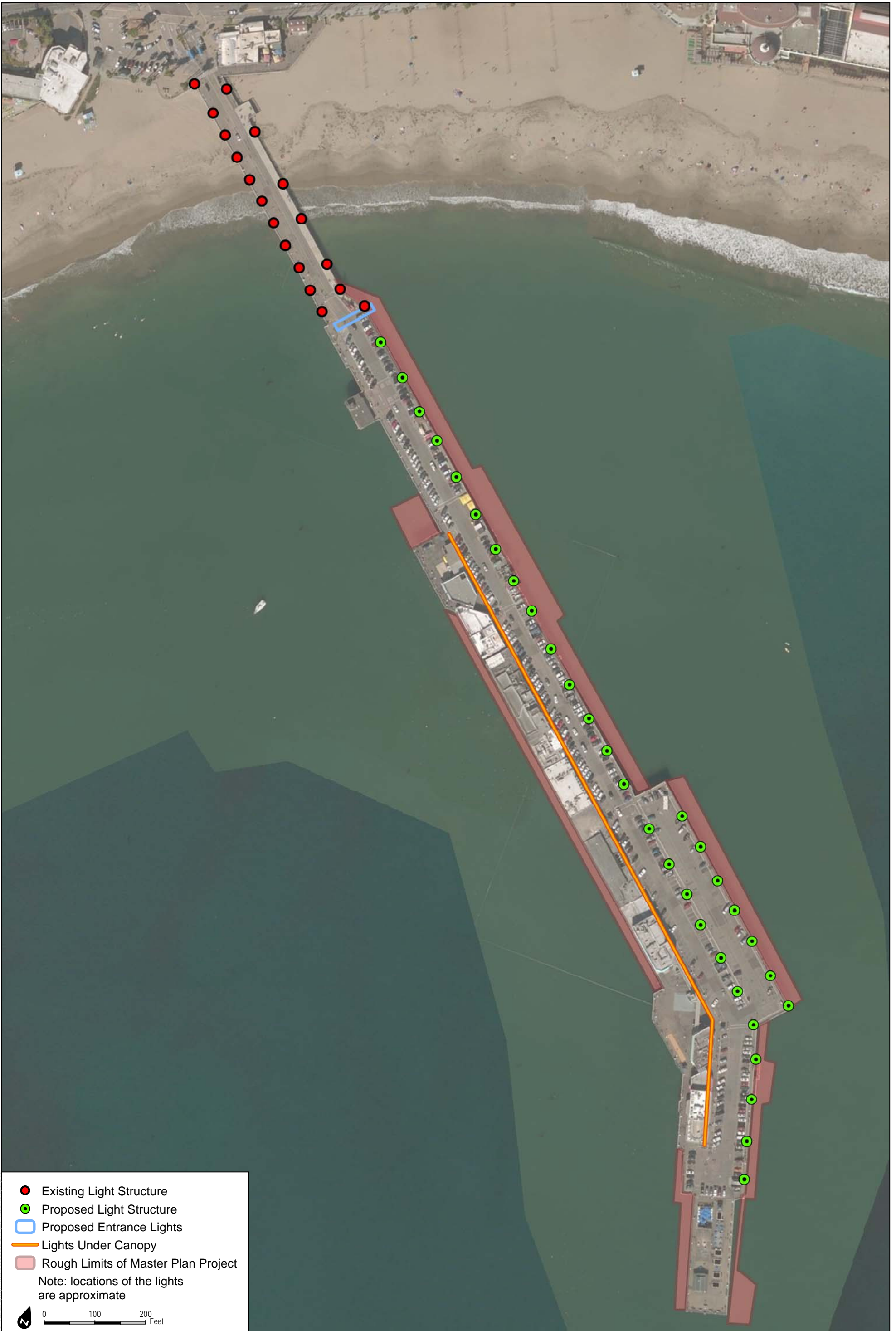
Subject: Analysis of Impacts to Near-Shore Marine Biological Resources due to Lighting Associated with the Planned Santa Cruz Wharf Master Plan Improvements, Santa Cruz, California

Peters, G. 2015. *Into the Light: How Marine Life is Affected by Artificial Light in Harbours*.

Accessed on September 20, 2016 at <http://www.ship-technology.com/features/featureinto-the-light-marine-life-affected-by-artificial-light-in-harbours-4615259/>.

Wheeling, K. 2015. *Artificial Light May Alter Underwater Ecosystems*. Science Magazine.

Accessed on September 29, 2016 at <http://www.sciencemag.org/news/2015/04/artificial-light-may-alter-underwater-ecosystems>. Doi: 10.1126/science.aab2565.





- Existing Light Structure
 - Proposed Light Structure
 - Proposed Entrance Lights
 - Lights Under Canopy
 - Rough Limits of Master Plan Project
- Note: locations of the lights are approximate

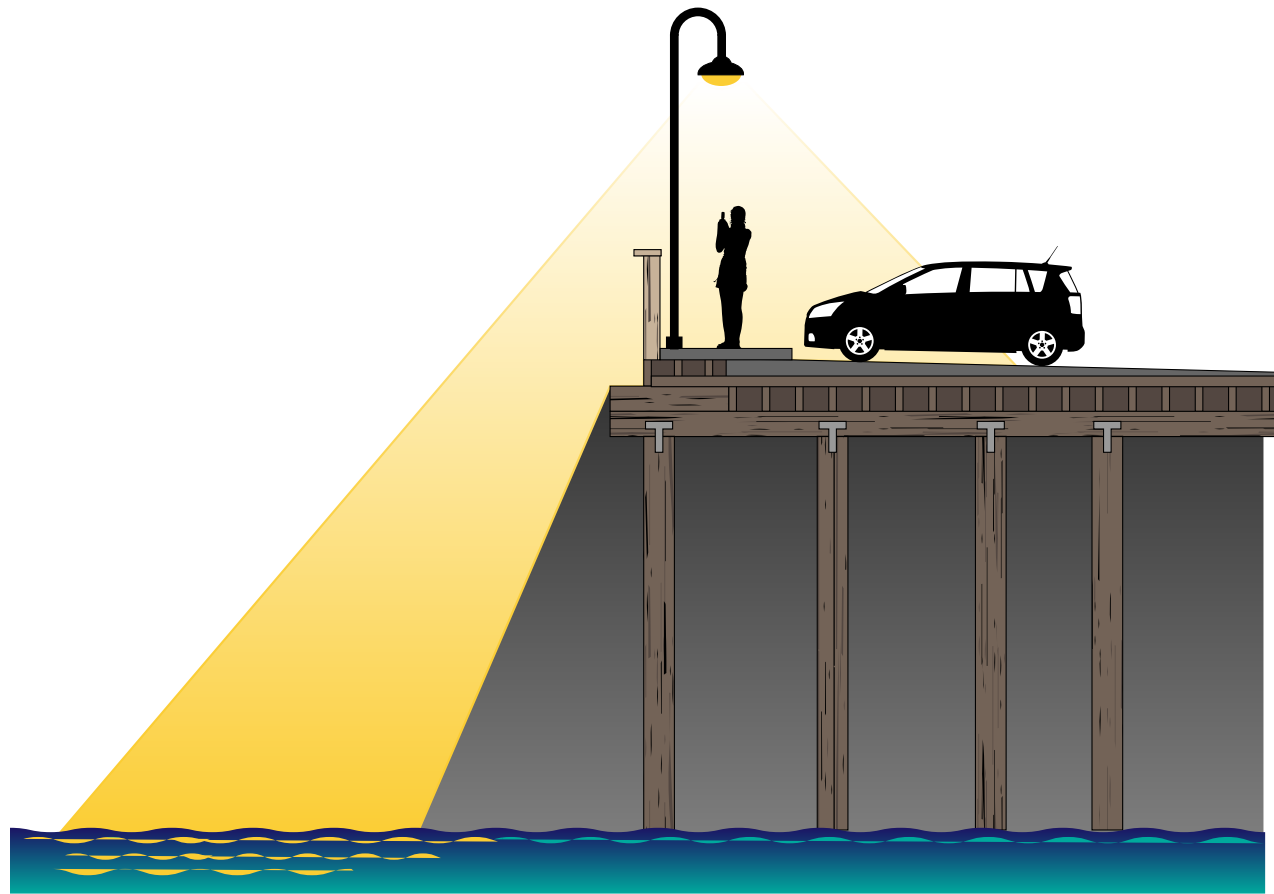
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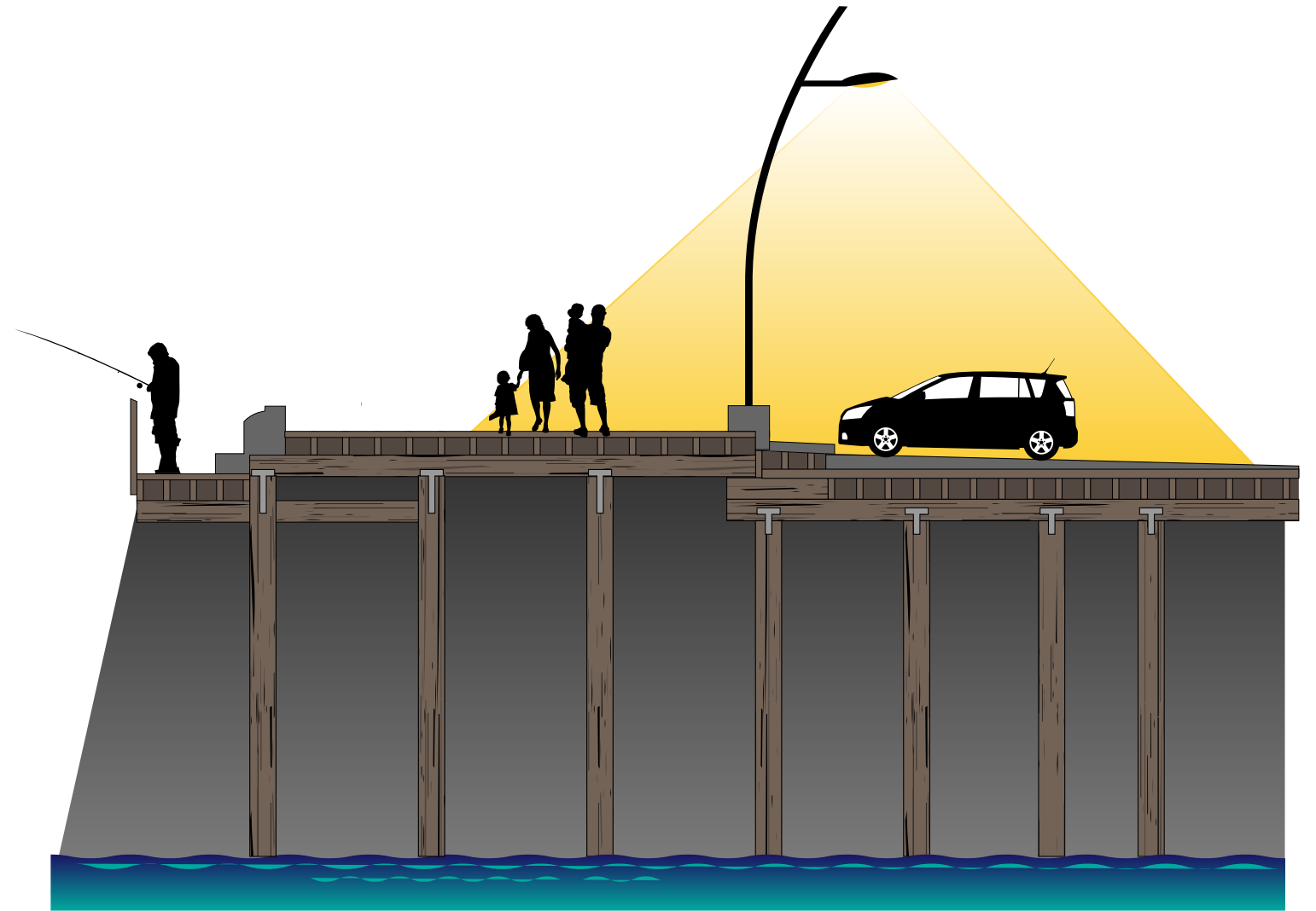
FIGURE 2
Existing Lighting

 LIT AREAS

 SHADED AREAS



BEFORE: CURRENT LIGHTING AT EDGE OF WHARF



AFTER: PROPOSED WHARF EXPANSION AND NEW LIGHT POSITIONING