CITY OF LONG BEACH

DRAFT

SHOEMAKER BRIDGE

REPLACEMENT PROJECT

MIGRATORY BIRD TREATY ACT COMPLIANCE STUDY

JANUARY 2023

[TO ADD PROJECT TEAM LOGOS]

SHOEMAKER BRIDGE REPLACEMENT
Migratory Bird Treaty Act Compliance Study

Executive Summary

- A joint California Environmental Quality Act (CEQA)/National Environmental Policy Act (NEPA) document was prepared for the Shoemaker Bridge replacement project (Project). The City of Long Beach (City) served as the CEQA lead agency, and the California Department of Transportation (Caltrans) served as the CEQA responsible agency and the NEPA lead agency, as assigned by the Federal Highway Administration for the joint Environmental Document (ED) which consists of an Environmental Impact Report (EIR) prepared in accordance with CEQA and an Environmental Assessment (EA) prepared in accordance with NEPA.

- The Final EIR was approved by the City in April 2020. Subsequently, a Final EA was signed by Caltrans, and a Finding of No Significant Impact (FONSI) was issued in June 2020. The approved CEQA/NEPA document is hereto referred as the Final Environmental Document (FED).

- Two design options for a roundabout (Design Option A) and "Y" intersection (Design Option B) at the easterly end of the bridge were evaluated in both build types.

- After the public circulation of the Draft ~~F~~EIR/EA, and with the consideration of the comments received during the public comment period, the Project Development Team (PDT) determined the Preferred Alternative would be Alternative 3, which includes removal of the existing bridge, with the Design Option A (Roundabout).

- The FEIR/EA also considered two conceptual bridge types: a single pylon cable-stayed bridge and a segmental bridge. As discussed in the FEIR/EA, the final bridge type would be evaluated further and decided upon during Final Design.

- The final bridge type that was selected consists of a Symmetrical Rings Cable-Supported Bridge which suspends the Bridge above the Los Angeles (LA) River, with two closely spaced piers within the LA River Flood Control Channel, which is expected to reduce impacts to the River and River hydrology.

- In early 2022, the ~~City of Long Beach (~~City~~)~~ commissioned a literature study to identify possible migratory bird impacts related to cable-supported bridges. While there is significant information available related to bird collisions with buildings, utility lines, wind turbines, and vehicles, there is limited readily available modern-day evidence in the literature suggesting impacts to birds from cable-supported bridges. There is some data related to towers, but the evidence suggests that towers under 300 feet do not create an issue for migratory birds (NYSDOT and USDOT 2011).

- Even though the literature search demonstrates no foreseeable impacts, the City will be conducting a year-long bird survey, including the use of Avian Radar to map bird movement through and above the Bridge prism to collect data on birds in the area. Biological field surveys are also being conducted with additional monitoring through the use of an acoustic species identifier.

- The City has retained a bridge lighting expert with extensive national experience to design a bird-friendly lighting system as described further in this Migratory Bird Treaty Act (MBTA) Compliance Study.

- Additionally, the City is proposing to install cameras on the bridge to allow for what is believed to be the first comprehensive study of cable-supported bridges and avian interaction using cameras. The data collected will be made available to the scientific community, regulatory agencies, and the public.

- MBTA compliance is documented in this Report and is intended to provide the information that Caltrans needs to confirm that the Project does not create foreseeable incidental take of migratory birds and that all beneficial practices to avoid or minimize incidental take are being implemented. Therefore, there are not foreseeable impacts resulting from construction of a cable stay bridge over a segmental bridge.

- The additional measures described herein do not change the analysis in the FEIR/EA but will augment the data and will be memorialized in the FEIR/EA Revalidation for the ~~PS&E~~ phase of the ~~project~~.

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I. INTRODUCTION

The Shoemaker Bridge Replacement Project (Project) was analyzed under the California Environmental Quality Act (CEQA) and National Environmental Policy Act (NEPA) in the *Shoemaker Bridge Replacement Project Final Environmental Impact Report/Environmental Assessment* (FEIR/EA). The Final EIR was approved by the City in April 2020. Subsequently, a Final EA was signed by Caltrans, and a Finding of No Significant Impact (FONSI) was issued in June 2020. The Project includes the demolition of the existing Shoemaker Bridge, construction of a new bridge to the south and associated roadway improvements as shown in Figure 1. The FEIR/EA included two conceptual bridge types, a segmental bridge design and a single pylon cable-stayed bridge design. Through the FEIR/EA process, the City of Long Beach and Caltrans have committed to several minimization/avoidance measures as ~~as~~ enumerated in Attachment 1, Shoemaker Bridge Measures.

The USFWS expressed concerns with avian interaction with the cables on cable-supported bridges. To address these concerns, this MBTA Compliance Study was undertaken to document the results of a literature review that was performed to identify possible migratory bird impacts related to cable-supported bridges, identify what measures other cable-supported bridge projects have implemented to limit the possibility of incidental take of migratory birds and ensure all measures to minimize or mitigate bird strike issues have been incorporated into the Project.

II. SELECTED BRIDGE TYPE

Since the approval of the FEIR/EA, the City has chosen a cable-supported bridge consisting of Symmetrical Rings as the selected bridge type. The Symmetrical Rings Cable-Supported Bridge is designed to be 286 feet above the water at its highest point (top of the rings), with two 600-foot spans across the LA River. The bridge is supported by two closely spaced piers in the center of the LA River. Nine to 12 inch diameter cables spaced 20 to-40 feet apart connect the bridge deck to the rings, as shown in Figure 2. This design minimizes the impacts to the LA River, and river hydrology and hydraulics. It should be noted that these dimensions are subject to change as final design is completed.

Figure 1: Project Limits

Figure 2: Shoemaker Bridge Symmetrical Rings Cable-Supported Bridge

III. MIGRATORY BIRD TREATY ACT

The Migratory Bird Treaty Act (MBTA) is a federal law protecting "any bird, whatever its origin and whether or not raised in captivity, which belongs to a species listed in 50 CFR 10.13, or which is a mutation or a hybrid of any such species, including any part, nest, or egg of any such bird, or any product, whether or not manufactured, which consists, or is composed in whole or part, of any such bird or any part, nest, or egg thereof." The United States Department of the Interior, Fish and Wildlife Service Directors Order No. 225, Section 5, dated October 5, 2021, states in relevant part:

> *"The Service recognizes that a wide range of activities may result in incidental take of migratory birds. Pursuing enforcement for all these activities would not be an effective or judicious use of our law enforcement resources. For that reason, the Service will focus our enforcement efforts on specific types of activities that both foreseeably cause incidental take and whether the proponent fails to implement known beneficial practices to avoid or minimize incidental take."*

In a meeting on August 9, 2022, Thomas Dietsch, Migratory Bird Biologist from the USFWS Carlsbad Office, suggested that an Avian Study be developed to identify measures to minimize or mitigate bird strike issues. He requested that the Project Team consider the use of avian groups at the Project, including (1) shorebirds that migrate through in spring and fall, (2) long-distance migrants traveling at night, (3) local resident bird species and (4) migratory birds that are present during the breeding and wintering seasons. This Compliance Study and the Best Management Practices that will be implemented focus on these avian groups to identify whether foreseeable impacts could occur and to ensure that all beneficial practices known to avoid or minimize impacts are implemented. Additionally, the City has identified opportunities to create a long-term survey to study bird use around cable stay bridges to benefit future infrastructure projects in the U.S.

USFWS also recommended developing an adaptive management framework to be implemented to reduce bird fatalities after the bridge is built and a two-year post-construction monitoring plan. This Compliance Study includes post-construction monitoring and state-of-the-art adaptive management techniques related to bridge lighting.

The USFWS provided three links to USFWS resources, including the "Nationwide Standard Conservation Measures", "Incidental Take Beneficial Practices: Communication Towers", and "Avoiding and Minimizing Incidental Take of Migratory Birds" (USFWS 2022). The Project Team has reviewed each of these documents, and they are described further in Section VII below.

Thomas Dietsch reminded the group that USFWS can only make recommendations on the MBTA. USFWS does not approve or deny projects. Regarding Alternative 3 Option A, and the Segmental bridge type, USFWS stated in the Biological Opinion letter, dated March 10, 2020:

> *"Based on the information provided and the conservation measures that have been incorporated into the project description, we concur with your determination that the proposed project is not likely to adversely affect the least tern and plover. Therefore, the interagency consultation requirements of section 7 of the Act have been satisfied."*

The Project Team has compiled information regarding special status species (see Section IV) and avian groups (see Section V) and has prepared a Literature Review of other cable-supported bridges (see Section

VI) to identify minimization/avoidance measures used by others. Finally, the Project Team has synthesized the Best Management Practices (BMPs) and designed pre- and post- construction survey methods to gather data and conduct a long term MBTA survey for cable-supported bridges, along with adaptive management techniques (see Section VII).

IV. SPECIAL STATUS SPECIES

Two federally and state-listed avian species are known to occur within the LA River, in the vicinity of the Project Limits (Figure 1), California least tern (*Sterna antillarum browni*) and Western snowy plover (coastal population) (*Charadrius alexandrinus nivosus*), as identified in the Shoemaker Bridge Biological Assessment (BA), the Natural Environment Study (NES), and FEIR/EA (HDR and Caltrans 2019a, HDR and Caltrans 2019b, Caltrans and City of Long Beach 2020. Regarding Alternative 3 Option A, and the Segmental bridge type, USFWS stated in the Biological Opinion letter, dated March 10, 2020:

> *"Based on the information provided and the conservation measures that have been incorporated into the project description, we concur with your determination that the proposed project is not likely to adversely affect the least tern and plover. Therefore, the interagency consultation requirements of section 7 of the Act have been satisfied."*

CALIFORNIA LEAST TERN

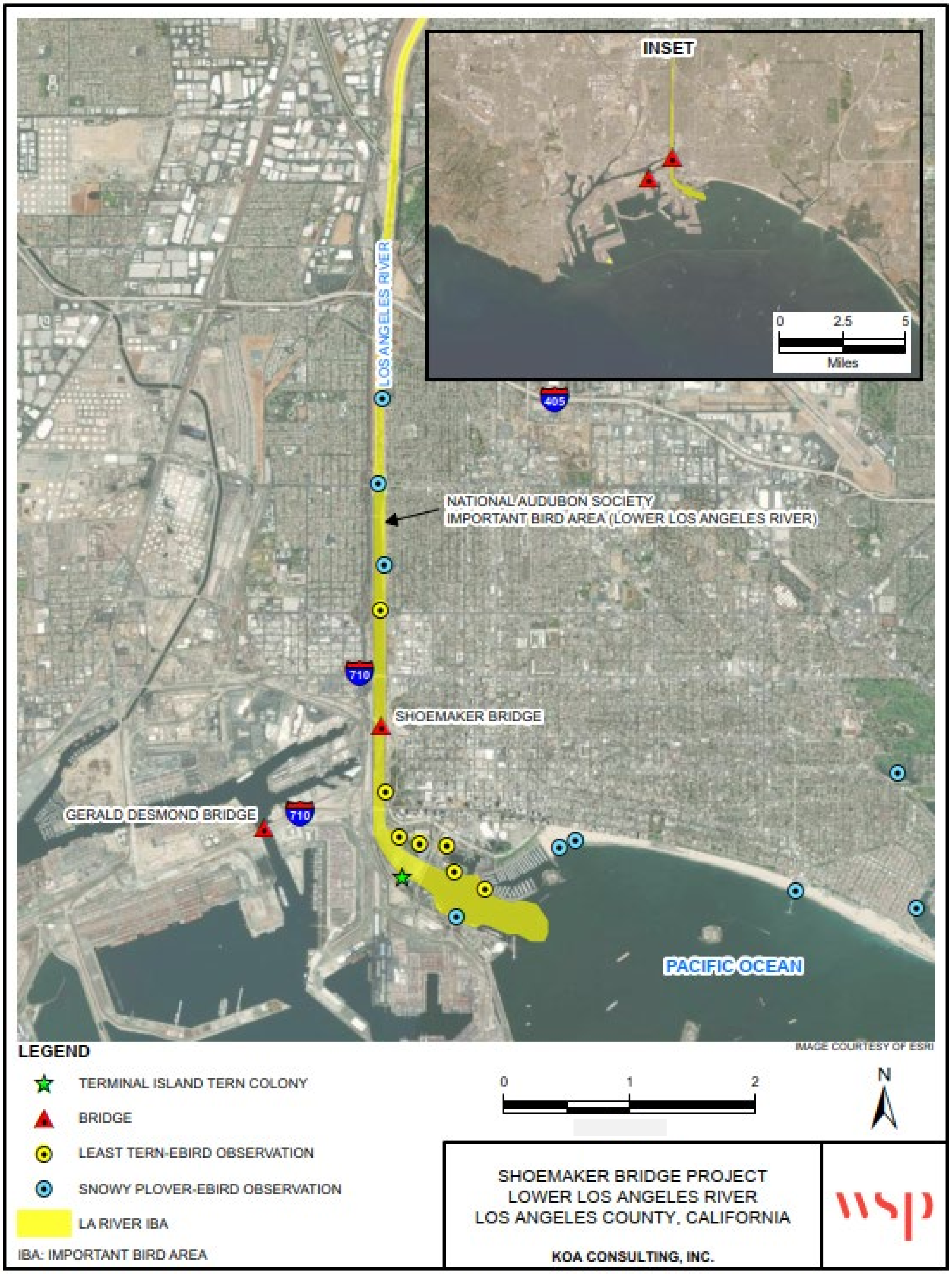
California least tern is a federally and state-listed endangered species. No critical habitat has been designated, and the area of the Project Limits is not within Habitat Conservation Plans established for this species (HDR and Caltrans 2019). There are two breeding colonies in Los Angeles County, at Venice Beach and at Terminal Island in the Port of Los Angeles, approximately 4.5 miles southwest of the Shoemaker Bridge. California least terns depart their nesting colonies around August and migrate south along the California coast. In addition to nesting sites, USFWS considers secure roosting and foraging areas essential to recovery of the species (USFWS 2006). California least terns forage primarily in nearshore ocean waters and in shallow estuaries and lagoons. At colonies where feeding activities have been studied, California least terns foraged mostly within 2 miles (3.2 kilometers) of the breeding area and in nearshore ocean waters less than 60 feet (18.3 meters) deep (USFWS 2006). Foraging California least terns regularly visit the LA River mouth below the Queensway Bridge and occasionally upstream. Least terns are rare away from the estuarine portions of the LA River but have been recorded north to I-5 and off-channel ponds east of the LA River north of I-5. California least terns would have the potential to be present within the area of the Project Limits from the first week of April to the first week of September. Although focused surveys for California least tern were not conducted, the species was not incidentally observed during general biological surveys in the I-710 Corridor Study Area in 2009 and in the BSA in 2011 (HDR and Caltrans 2019b).

California least tern has been observed foraging in the LA River mouth below the Queensway Bridge and occasionally upstream (see Figure 3). However, due to the distance of the Project Limits from the nearest nesting location at the Port of Los Angeles, foraging California least terns would be uncommon in the area of the Project Limits.

WESTERN SNOWY PLOVER

Western snowy plover (coastal population) is federally listed as threatened and a state species of special concern in California. There is no suitable nesting habitat within the area of the Project Limits, but foraging habitat is present (HDR and Caltrans 2019). This species has occasionally been observed foraging in the LA River north of the Project Limits near Willow Street and near Wardlow Road to 28th Street Pipe Bridge, most recently on August 5, 2021 (eBird 2022, see Figure 3 below). It is noteworthy that almost all the recorded observations of western snowy plover in the southern reach of the LA River have occurred in the month of August, which would indicate post-breeding dispersal and fall migration movements. This species has also been observed foraging 1.7 miles south of the Project Limits at the Harry Bridges Memorial Park (eBird 2022). There is no designated critical habitat in the area of the Project Limits. The nearest designated critical habitat for western snowy plover is located approximately 9.5 miles to the southwest.

Figure 3: Lower LA River



Source: https://ebird.org/explore, accessed 2022.

V. RESIDENT AND MIGRATORY BIRDS

The Shoemaker Bridge is located within the subtidal portion of the LA River about 1.8 miles upstream from the river mouth. Tidal influence extends inland from the Shoemaker Bridge about 2.2 miles to the Willow Street crossing in Long Beach. South of the latter location, the river is soft-bottomed (no concrete) and supports low earth terraces on both sides of the active channel, which provide roosting and foraging habitat for resident and migratory birds, including shorebirds, waterfowl, and passerines, throughout the year.

Over 100 avian species have been documented to use the LA River at the Shoemaker Bridge, including songbirds, shorebirds, ducks, and hawks (eBird 2022). According to the Southern Pacific Shorebird Conservation Plan, there are three important wetland systems in Los Angeles County, one of which is the LA River (Hickey et al. 2003). Species diversity peaks in late August and early September and is lowest in May and June.

Bird species that do not migrate and that use the area around the Shoemaker Bridge are considered year-round residents. They are familiar with their native landscape, and research suggests that resident birds can acclimate to artificial light sources, such as bridge lighting, streetlights, and other sources (*Mouritsen et al. 2005*). Since research suggests that resident birds can acclimate to their environment, it is expected that they would acclimate to the presence of a cable-supported bridge and avoid colliding with the bridge components.

Black-necked stilt (*Himantopus mexicanus*), American avocet (R*ecurvirostra americana*), killdeer (*Charadrius vociferus*), and spotted sandpiper (A*ctitis macularius*) are four shorebird species known to nest along the LA River (Hickey et al. 2003). Peregrine falcon and white-tailed kite also forage year-round, and a remnant population of common ground-dove persists in the older sections of Long Beach alongside the river (*National Audubon Society 2013*).

Thousands of resident white-throated swifts have also been observed roosting in the urban areas of Long Beach and surrounding areas, feeding in the LA River in the fall, with the roosts remaining into the winter (*National Audubon Society 2013*).

In the fall, large groups of black-necked stilt, western sandpiper, and least sandpiper (*Calidris minutilla*) and hundreds of American avocet and long-billed dowitcher (*Limnodromus scolopaceus*) have been observed along the LA River (*Hickey et al. 2003*). In the fall, large groups of ducks, particularly cinnamon teal (*Spatula cyanoptera*) and northern pintail (*Anas acuta*), have been observed feeding near the Willow Street overcrossing. During shorebird migration in Southern California, more than two dozen species of sandpipers and plovers have been recorded along this section of the river (*National Audubon Society 2013*). Surveys conducted during 1999 and 2000 documented numbers of birds between 8,000 to 15,000 per day between July and October, peaking in August and early September (National Audubon Society 2013).

A substantial number of shorebirds also winter along the channel during dry spells (water level rises following even light rains, which temporarily eliminates shorebird habitat). More than 2,000 western sandpipers (*Calidris mauri*) were observed in January 2001 (*National Audubon Society 2013*).

VI. LITERATURE REVIEW

New bridge designs could result in occasional bird collisions, including by migratory birds. The concern is related to whether the Single Pylon Cable-Stayed Bridge Design would increase risk of impact to migratory birds over and above a traditional bridge design. To address this issue, the Project Team conducted a literature search to identify possible migratory bird impacts related to cable-supported bridges and to identify measures that other cable-supported bridge projects implemented to minimize these impacts.

Avian mortality via collisions with large man-made structures has been well documented, especially for nocturnal migrant birds at night (Evans Ogden 2002, Erickson et al. 2005, Gauthreaux Jr. and Belser 2006, Gehring et al. 2009, Martin 2011), as well as with vehicles (Finnis 1960, Pons 2000, Erickson et al. 2005, Jacobson 2005). Studies have shown that avian mortality with man-made structures is largely a result of collisions with buildings, communications towers, high-tension lines, and wind turbines (Ove Arup and Partners 2002, Erickson et al. 2005, Longcore et al. 2012). Mortality events may be dependent on several parameters, such as the concentration of birds present; the status (resident or migrating) of the birds; the time of migration (fall or spring); the time of the day (day migration or night migration); and the meteorological conditions when the birds interact with the structure (clear skies, fog, rain, etc.). Limited information is available regarding avian mortality resulting from collisions with bridges or bridge stays (adapted from Stanton and Klick 2018).

Birds are more susceptible to collision with tall man-made structures at migration heights (*USFWS 2022*). A recent study by the BirdCast team, a partnership of Cornell Lab of Ornithology, Colorado State University, and University of Massachusetts Amherst, analyzed migrating bird altitudes above ground (*Living Bird 2021*). Average flight heights in the east for nocturnal fall migration were about 1,300 to 1,600 feet, while averages were higher in the western United States at about 2,600 feet. There can be a lot of variation in migration flight heights with geography, weather, and time of day/night. A broad summary of the range of altitudes that most birds migrate includes 500 to 6,000 feet Above Ground Level (AGL) for songbirds, 1,000 to 13,000 feet AGL for shorebirds, 200 to 4,000 feet AGL for waterfowl and 700 to 4,000 feet AGL for raptors (*Smithsonian National Zoo 2022*). For comparison, the cable-supported structure being proposed for the Project will reach a height of approximately 286 feet at its highest point.

A summary of relevant bridge studies and associated bird impacts, along with monitoring and minimization measures employed, is included below for the bridges discovered in our literature search.

KOSCIUSZKO BRIDGE

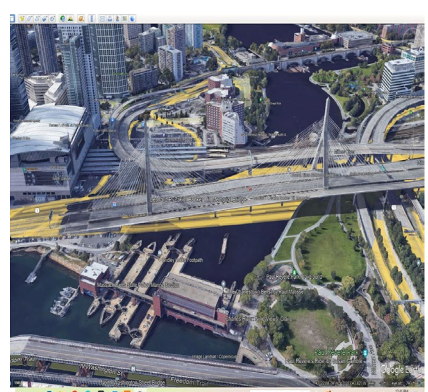
Kosciuszko Bridge Aerial

This cable-stayed bridge in Queens, New York, is 290 feet above the ground surface, which is 125 feet higher than the bridge it replaced (New York State Department of Transportation [NYSDOT] and U.S. Department of Transportation [USDOT] 2011). During the design phase, the USFWS and New York State Department of Environmental Conservation expressed concerns over potential increased bird mortality associated with the cable-stayed bridge design option. A cable-stayed structure type was selected as the best option meeting the objectives set forth in the Final Environmental Impact Statement (FEIS) while minimizing environmental impacts for the Kosciuszko Bridge in New York City (NYSDOT 2008).

An avian impact evaluation study (Study) was undertaken for the Kosciuszko Bridge by Parsons Brinckerhoff, which was acquired by WSP in 2014. This Study included an extensive literature and database review and agency discussions with staff familiar with existing cable-stayed bridges. The results of the Study were documented in the "Kosciuszko Bridge Project Reevaluation Statement," dated January 2011. In summary, the Study found that the potential risk of increased bird mortality due to the Cable-Stayed Main Span option appeared to be low. To mitigate any possibility of bird strikes with the bridge, the following measures were recommended: limit the height of the bridge to below 300 feet; use flashing aerial beacons, preferably white strobe lights; use light colored stays; turn off aesthetic lighting, if any, during periods of bird migration; use light-emitting diode (LED) aesthetic lighting; and limit the type of vegetation around the bridge. The eastbound cable-stayed bridge span was completed in 2017 while the westbound one was completed in 2019.

Several bridge projects were discussed in the "Kosciuszko Bridge Project Reevaluation Statement" as part of the avian impact evaluation (NYSDOT and USDOT 2010). These included the Leonard P. Zakim Bridge, Sidney Lanier Bridge, Talmadge Bridge, Oresund Bridge, Cooper River Bridge, Throgs Neck and Newport Bridge, which are described below.

LEONARD P. ZAKIM BRIDGE

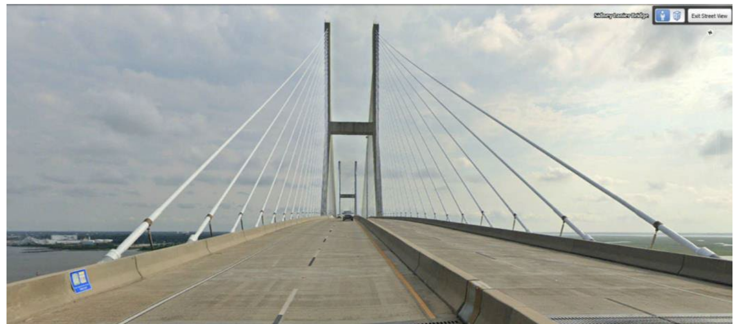


Leonard P. Zakim Bridge Aerial

Lev Bentsman, the Massachusetts Turnpike Authority Director of Bridges, responsible for inspection and maintenance of the Leonard P. Zakim Bridge over the Charles River in Boston, Massachusetts, was also contacted as part of the Kosciusko Bridge EIS (NYSDOT and USDOT 2011). This cable-stayed bridge has a main span of 745 feet with two towers at 270 feet tall each. The bridge is lit at night with aesthetic white and blue lights and also has flashing red aerial beacons mounted on the top of each tower. Mr. Bentsman reported that the bridge is not being monitored for bird strikes, however there had been no reports of bird mortality due to collisions with the bridge.

SIDNEY LANIER BRIDGE

Chris Coppola from the Brunswick, Georgia, USFWS office was contacted during the Kosciuszko Bridge study concerning the Sidney Lanier Cable-Stayed Bridge in Georgia. This bridge has an overall main span of 2,500 feet with two towers each at 480 feet above water. Mr. Coppola indicated at the time that they are not monitoring for bird strikes and that all lighting issues were geared towards sea turtles. They use low- pressure sodium lights for illuminating roadway/deck. Currently there is no aesthetic lighting being used on the bridge, but he reported that, if and when this occurs, the intention is to restrict the use of aesthetic lighting during months of migration and turtle nesting.



Sidney Lanier Bridge

TALMADGE BRIDGE

Craig Watson, migratory bird southeast coordinator from the USFWS in Charleston, South Carolina, reported at the time of the Kosciusko Bridge Study that USFWS was not monitoring the Talmadge Bridge for bird strikes. This cable-stayed bridge spans between Savannah, Georgia, and South Carolina and is located at the southerly limits of the Savannah National Wildlife Refuge. Its main span is over 1,100 feet long with two towers each at 480 feet tall.

Talmadge Bridge

ORESUND BRIDGE

The Oresund Bridge connects Sweden to Denmark and was completed in June 2000. This 5-mile-long (16 kilometers) bridge has a 1,608-foot cable-stayed main span with two spotlighted towers each at 670 feet tall (Nilsson and Green 2002). This Scandinavian bridge was studied after bird mortality was observed during migration. It is located in a well-known and heavily used (an estimated 10 million birds pass the bridge during fall migration) migration corridor (Nilsson and Green 2002). The study implicated bridge location, meteorological conditions, tower lighting, and tower height as factors influencing bird collisions and concluded that mortality due to collisions with the Oresund Bridge was negligible, representing approximately 0.01 to 0.05 percent of the birds passing over the bridge (Nilsson and Green

Oresund Bridge

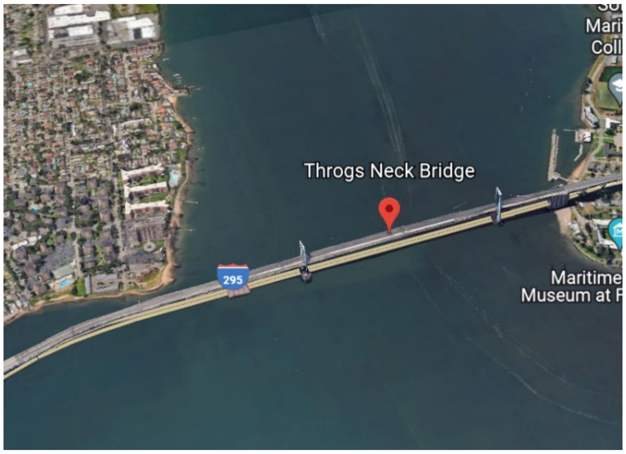
2002). Nilsson and Green observed that the majority of bird strikes (53 percent) occurred in proximity to the spotlighted 670 ft. tall bridge towers. European robins (Erithacus rubecula) were recorded as being the most numerous species observed and most numerous casualties in the study. This bridge project developed an environmental management system. To mitigate impacts to birds, the lighting on the pylons is turned off during dense fog to avoid birds colliding with the bridge (Oresundbron 2022). They also protect the development of the artificial island Peberholm, which has become a very important habitat for endangered species, specifically the black-headed gull (*Chroicocephalus ridibundus*), which have decreased dramatically in both Denmark and Sweden. The species has established a vital colony some years, consisting of several hundred pairs.

COOPER RIVER BRIDGE

Cooper River Bridge

This bridge replacement project was discussed in the "Kosciuszko Bridge Project Reevaluation Statement" as part of their avian impact evaluation (NYSDOT and USDOT 2010). Craig Watson, migratory bird southeast coordinator from the USFWS in Charleston, South Carolina, indicated that they are not monitoring the Cooper River Cable-Stayed Bridge for bird collisions (NYSDOT and USDOT 2010). The Cooper River Bridge, located in Mount Pleasant, South Carolina, was the longest cable-stayed bridge in North America when it was built. It has an overall main span length of 2,846 feet, with two towers, 572.5 feet above the water. Mr. Watson reported that they have a pedestrian/bike trail on the bridge that receives significant traffic and are relying on the public to report any bird strikes. The bridge was opened to traffic in 2005 and as of 2010 there had been no reports of bird mortality due to collisions with the bridge. Mr. Watson indicated that the areas on both sides of the bridge are known to be important stopover areas for migrating songbirds. Considerations about bird collisions were not raised until after the permit was issued. He indicated that the major considerations for wildlife were to shut off the aesthetic lights during the periods when sea turtles come to shore to nest.

THROGS NECK AND NEWPORT BRIDGE



Throgs Neck and Newport Bridge

One of the authors of the Kosciuszko Bridge study (Parsons Brinckerhoff 2011) had inspected a wide range of major bridges with elements that could cause bird collisions. Two suspension bridges inspected were the Throgs Neck Bridge across the East River in New York City (length of 1,800 feet and two 350-foot towers) and the Newport Bridge in Newport, Rhode Island (length of 1,600 feet and two towers each 400 feet tall) (NYSDOT and USDOT 2011). Three arch bridges were also inspected: the Bourne and Sagamore Bridges in Cape Cod, Massachusetts (616-foot-long suspended main span decks) and the Blatnick Bridge in Duluth, Minnesota (575-foot-long suspended main span deck), which crosses a bay of Lake Superior. Many of the inspections were conducted during peak months of bird migration, and no evidence of bird collisions with the small diameter suspender ropes or with the main cables of suspension bridges were reported.

Along with the above bridges that were used to support the "Kosciuszko Bridge Project Reevaluation Statement," the Project Team also obtained information on the following additional bridges with respect to avian interactions:

PEACE BRIDGE EXPANSION

In 2007, a design panel recommended a 567-foot-high, two-tower cable-stayed bridge for the Peace Bridge expansion project. This selection was touted as a "signature bridge" over the Niagara River and supported by the City of Buffalo, Town of Fort Erie, and the Buffalo and Fort Erie Bridge Authority in a Draft Environmental Impact Statement (DEIS). As lead agency for the NEPA DEIS review, the Federal Highway Administration (FHWA) rejected the recommended alternative due to concerns over potential impacts on the common tern (*Sterna hirundo*; a New York State-listed threatened species) and migratory birds that were expressed by environmental agency reviewers. This decision was highly unpopular in the community and was a major setback for the expansion project. In 2009, a new design was developed around a three-span arch concept with a profile below 300 feet at the highest point, but the project never resumed the permitting process due to other non-wildlife issues, and the original bridge remains in place today.

Peace Bridge Street View

The greatest concern for the agencies associated with the proposed Peace Bridge Expansion was the impact on the common tern, which had a large nesting colony nearby and there was known, frequent use by terns in the bridge area. Many of the breeding terns at the colony would make flights over the existing bridge to capture fish and then return to the colony by flying over the bridge again; avian studies documented the terns and most other species opting to fly over the existing bridge rather than fly under the deck. With multiple flights per day to feed their young, the environmental agencies were concerned that flying over a 567-foot-high bridge would add strain to the adults and potentially negatively affect their young as well. Although it was acknowledged that a negative level of strain on the terns could not be proven, the precautionary principle prevailed with the wildlife agencies. Therefore, possible strain for nearby nesting terns was the driving concern, not terns colliding with the bridge. The height of the recommended bridge was also a concern to agency reviewers for nocturnal migrant birds that might be attracted to it through lighting and result in collisions in a known migratory flyway near Lake Erie; however, this was not a concern for alternatives with heights below 300 feet. The recommended alternative design and construction method was also considered to possibly disrupt the nearshore movements of the emerald shiner (*Notropis atherinoides*), which is the primary food for the terns.

SHENZHEN WESTERN CORRIDOR BRIDGE

The Shenzhen Western Corridor Bridge Study was completed to quantify how various types of human-made structures, including bridges, affects on bird mortality, specifically for the Shenzhen Bay Bridge (Ove Arup & Partners Hong Kong Ltd 2002). This cable-stayed bridge was built in 2007, is 3.5 kilometers long with approach viaducts, and links Shenzhen and Hong Kong. An Environmental Monitoring and Auditing program was developed for this bridge (Major Works Project Management Office Highways Department 2007). Monitoring efforts included bridge lighting scheme and bird mortality due to collision with the bridge structure.

This study reviewed many abstracts or summaries of published reports on bird mortality in relation to bridges. No publications documenting bird collisions with or bird mortality due to collisions with bridges or bridge stays were found (Ove Arup & Partners Hong Kong Ltd 2002).

Birds fly either over or under bridges depending to some extent upon the bird species. Gulls and cormorants in Holland tend to fly over low bridges, and collisions with bridges or bridge cables or other associated structures are unknown (C. Swennen, pers. Comm., Ove Arup & Partners Hong Kong Ltd 2002). Cormorants, pelicans, falcons, terns, and gulls in San Francisco Bay typically fly over bridges. Cormorants nest in San Francisco Bay, and many have built nests on bridge structures. Caltrans recently authorized installation of 700 square meters of stainless-steel cormorant nesting platforms on a new bridge in San Francisco Bay to increase opportunities for cormorant nesting on the bridge (M. Rauzon, pers. Comm.). Some birds, often juveniles with poorly developed flight skills, collide with vehicles occasionally (normally tall trucks) crossing bridges in San Francisco Bay. The same was observed with shorebirds along the Texas coastline (R. Harness, pers. Comm.), and similar collisions typically involved young birds with poorly developed flight skills.

In summary, the Shenzhen Western Corridor Bridge Study found that, based on the literature review and local observations, bridges do not cause significant bird mortality. Design recommendations this study proposed were as follows: no power lines over bridge decks; cable- stayed portions of bridge should be flood-lit in good weather to increase visibility of cables to birds; cable-stayed portions of the bridge should be visible to birds in all weather conditions (use red strobe lighting); light undersurface of the bridge; and standard highway lighting on the top of the deck to increase visibility at night. Note that more recent studies and guidance in North America on lighting of structures to reduce avian impacts are contrary to some of those proposed in this study and are considered more accurate.

KAUAI, HAWAII BRIDGES AND POWER LINES

Researchers studied the mortality of Newell's Shearwater due to collisions with man-made structures, primarily power lines at bridges in Kauai, Hawaii. These bridges were not identified as causes of bird strikes (Podolsky et al. 1998). Instead, it was hypothesized that the visibility of power lines to birds was the cause of collisions and fatalities.

AP LEI CHAU BRIDGE

This study investigated how the levels of traffic on the Ap Lei Chau Bridge in Hong Kong, a 750-foot (230 meters) long box girder bridge, may disrupt flight paths and impact roosting birds (Stanton and Klick 2018). Egrets and herons were the focus of this visual survey study in recording the flight height and behavior of flying birds as they flew toward a roost. The birds were documented to be adaptable to traffic conditions and no bird collisions with traffic or the bridge were observed during the study. Bird flights were reported as almost always over the bridge rather than under the bridge. "Information regarding mortality as a result of direct collisions with bridges is sparse. During a review of over 1,500 abstracts or summaries of published reports on bird mortality in relation to man-made structures, there were no publications documenting bird collisions with, or bird mortality due to, collisions with bridges or bridge stays (Ove Arup and Partners 2022, Parsons Brinckerhoff 2011)."

LONG BEACH INTERNATIONAL GATEWAY BRIDGE/GERALD DESMOND BRIDGE REPLACEMENT

Gerald Desmond Bridge

The Long Beach International Gateway Bridge/Gerald Desmond Bridge Replacement has a cable-stayed bridge design that is located in the southwest portion of Long Beach, California. Before being built, it was evaluated for bird migration impacts prior to replacement (Caltrans 2010). This bridge is the second tallest cable-stayed bridge in the United States. It is 2.7 miles from the Shoemaker Bridge (Figure 1) with a main span that is 2,000 feet (610 meters) long, 205 feet (61 meters) above the water, has two towers on either side that are 515 feet (157 meters) tall, with 40 cables per tower. Discussion of migratory bird collision risk was related to disorientation due to bright lighting rather than collisions with the bridge itself, which was found to be a minor consideration (Caltrans 2010). One minimzation measure concerning bridge lighting was developed for migratory birds. It stated that the bridge will incorporate permanent lighting types, such as low-pressure sodium lights, high-pressure sodium lights, or LED lights, to avoid lighting types known to disrupt migrating birds and thus minimize potential for bird collisions with the bridge (Jones 2000, Parsons-HNTB Joint Venture 2010). Additionally, during construction and operation, lighting was shielded to ensure light was focused inward and the amount of light reduced where possible.

The FEIR/EA for this Project anticipated no cumulatively considerable significant or adverse impacts associated with artificial lighting on special-status species or resident/migratory birds. Aside from lighting, avian minimization measures focused on nesting peregrine falcons, which often nest on man-made structures (Caltrans 2010).

GOLDEN GATE BRIDGE

An avian impact study for the Golden Gate Bridge Suicide Deterrent System Project was conducted by the City and County of San Francisco and Marin County in 2009. A relatively short (13 hours) daytime visual survey found that most birds passed over the bridge roadway in the central and southern portions seeming to avoid flying close to the main towers. Only one gull was documented flying through the vertical cables above the roadway (EDAW 2009). All the other birds that crossed the bridge crossed over the bridge cables. This study suggests that birds in the Golden Gate Bridge area would likely adjust flight patterns to avoid structural components.

PENSACOLA BRIDGE AND SAN SEBASTIAN STATE RECRECATION AREA BRIDGE

In the 1930s in Pensacola, Florida, one example of bird mortality occurred after birds died after colliding with a power distribution line suspended above the Pensacola Bay Bridge between light poles (Weston 1966). This bridge was a 3-mile-long reinforced concrete girder bridge and around 65 feet tall. Around 740 dead birds representing 75 species were counted during irregular checks between 1938 and 1949 (an average of approximately 67 birds annually over the 11-year period). The power line was lowered from the light poles to the bridge deck in 1949, and no further bird deaths were reported (Weston 1966).

LITERATURE REVIEW SUMMARY

Based on the above relevant cable-supported bridge studies, the Project Team discovered that there was limited readily available modern-day evidence in the literature to suggest that there are impacts to birds caused by cable-supported bridges. The Project Team found some data related to towers, but the data suggests that towers under 300 feet do not create an issue for migratory birds (NYSDOT and USDOT 2011).

Although existing literature does not suggest an increased risk of avian interaction with bridge cables, the City is committed to implementing measures to demonstrate that the Project does not foreseeably identify incidental take of migratory birds and that the Project is implementing all known beneficial practices to avoid and minimize incidental take of migratory birds.

Section VIII documents the BMPs considered to be the most effective for minimizing avian interactions with cable-supported bridges and will describe some innovative BMPs being proposed by the City.

VII. USFWS BMPs

There are three documents that the USFWS recommended that this Project consider for minimizing impacts to birds. These documents are as follows: "Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning;" "Nationwide Standard Conservation Measures;" and "Threats to Birds: Collison-Road Vehicles" (USFWS 2022). This section identifies the BMPs that are applicable to the Project.

1. Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning

Since there are significant differences between the visibility of bridges compared to communication towers, the BMPs from the Communication Tower Design study do not appear applicable.

2. Nationwide Standard Conservation Measures

This study describes many effective methods to mitigate impacts of a project on birds (USFWS 2015). Both lighting and collisions are two main areas where birds can be negatively impacted by bridges. Applicable useful measures are presented below:

- To the maximum extent practicable, limit construction activities to the time between dawn and dusk to avoid the illumination of adjacent habitat areas.
- If construction activity time restrictions are not possible, use down shielding or directional lighting to avoid light trespass into bird habitat (i.e., use a 'Cobra' style light rather than an omnidirectional light system to direct light down to the roadbed). To the maximum extent practicable, while allowing for public safety, low intensity energy saving lighting (e.g., low-pressure sodium lamps) will be used.
- Bright white light, such as metal halide, halogen, fluorescent, mercury vapor and incandescent lamps should not be used.
- Minimize collision risk with project infrastructure (e.g., temporary and permanent) by increasing visibility through appropriate marking and design features (e.g., lighting, wire marking, etc.).
- On bridges with adjacent riparian, beach, estuary, or other bird habitat, use fencing or metal bridge poles (Sebastian Poles) that extend to the height of the tallest vehicles that will use the structure.

3. Threats to Birds: Collison-Road Vehicles

This study notes that one of the top five direct causes of bird mortality in the United States are collisions with vehicles (Jacobson 2005 and Loss 2014). High-risk groups of birds include ground-dwelling and ground-nesting birds, waterbirds, fruit-eating birds, and birds that are drawn to attractants such as roadkill, on roads. Ground-dwelling species, such as ducks and geese, have reduced maneuverability, which increases the risk of a collision. Certain combinations of wind direction and road position increase waterbirds' risk for vehicle collisions. Being carried by wind currents perpendicular to bridges or areas traveled frequently by waterbirds can put birds in the way of oncoming traffic. There are five potential minimization measures to reduce the likelihood of bird/vehicle collision:

- Use diversion poles
- Use low fences
- Remove attractants such as carcasses and fruiting plants
- Use wildlife crossing warning signs
- Monitor dead and/or injured birds.

VIII. BEST MANAGEMENT PRACTICES

The literature search findings from Section VI and VII revealed that potential impacts to birds related to bridges most likely come from the following sources: lighting attraction leading to collisions; bird/bridge collisions; and bird/car collisions. For any type of bridge, best management practices are recommended to avoid and minimize impacts to birds. The measures described below related to lighting, cable diameter and spacing, bridge height, and flight diverters shall be incorporated as applicable to minimize the potential for avian collisions.

LIGHTING

Several studies have identified best management practices for the lighting of bridge and communication towers. Birds tend to be attracted to and disoriented by bright white lights, which causes major mortality at brightly lit towers and tall buildings, especially during migration, at night, and during poor weather or fog (International Dark-Sky Association 2002; Longcore and Rich 2004; Horton et al 2019). Birds are known to occasionally become disoriented in bright lights and collide with power lines and towers, including coastal lighthouses (Poot et al. 2008). However, decreasing the number of lights overall and altering the lighting so that it flashes intermittently tends to decrease mortality (Avery et al. 1976, Manville 2005, Longcore et al. 2008).

Studies show that by eliminating non-flashing lights on communication towers, migratory bird collisions can be reduced by as much as 70 percent while simultaneously reducing energy costs for tower owners (USFWS 2022). A study completed in Michigan on communication towers showed that bird mortality can be reduced by about 71 percent by turning lights off at night (Gehring and Kerlinger 2009). Findings from this study found that avian fatalities at communication towers could be reduced by removing non- flashing/steady-burning red lights, as significantly fewer fatalities were found at towers lit by flashing lights (Gehring et al. 2009). Another study done in the North Sea on oil platforms showed that blue and green lighting reduced avian attraction by 50 to 70 percent (Poot et al. 2008).

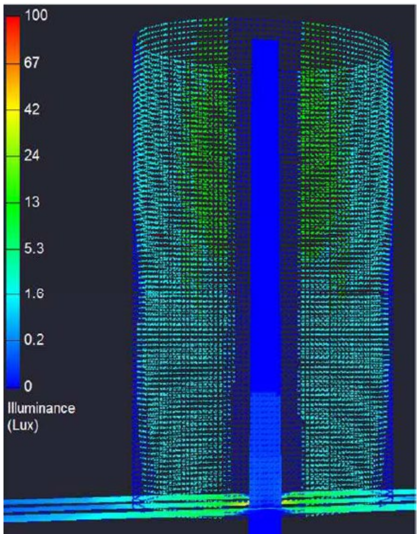
The Federal Aviation Administration (FAA) now supports extinguishing side-marker (L-810) lights on towers taller than 350 feet AGL and reprogramming non-flashing side-markers on towers 150 to 350 feet AGL. Although these recommendations are for communication towers, programmable LED lighting systems on bridges may also prove useful at avoiding bird collisions. The Project Lighting Plan will utilize best available science/technology for both construction and operational lighting as well as aesthetic lighting.

CONSTRUCTION AND OPERATIONAL LIGHTING

Construction and operational bridge lighting during and following construction will be designed to minimize the potential for bird collisions with the bridge structure. Lighting types known to minimize adverse effects (i.e., low-pressure sodium lights, high-pressure sodium lights, or LED lights) will be used, and lighting types known to be disruptive to migrating wildlife, such as mercury vapor lamps (Jones 2000), will be avoided. Additionally, lighting will be shielded to ensure that light is focused where it is needed, focusing lighting inward and minimizing the amount of lighting used to the maximum extent possible.

AESTHETIC LIGHTING

Aesthetic lighting on bridges is common and awareness about avian, aquatic species, and human sensitivity



Lateral Light Pollution Calculation Grid

to lighting has generated a precise and specialized science to address lighting impacts. Experts can build computer models and design lighting systems that can precisely illuminate architectural features while minimizing or eliminating spillover light. Lighting systems are now designed with LED lighting units that provide for greater control of sky glow and light spillover, controlling light so it does not stray into the river or up into the sky. Color changing luminaires are controlled by a programmable architectural lighting control system. This system allows pre-programmed events to turn on and off at scheduled times. The flexibility of the control system allows for different colors of light to be used and lights can be dimmed, designed to pulsate, or turned off to respond to different events or environmental conditions.

The precision of the lighting, as shown in the figure above, demonstrates the system's ability to produce aesthetic lighting that reflects within a prism with no spillover light into the water below or the night sky.

The aesthetic lighting on the Project will use low-intensity and low-wavelength light fixtures. In inclement weather, the lighting can be controlled towards a bluer light frequency that is less visible to birds and the intensity of the lighting can be reduced to prevent conditions of poor visibility. During periods of migration, the lighting intensity can be reduced, hours of lighting can be further reduced and/or lighting can be turned off. This state-of-the-art lighting program will allow for adaptive management throughout the lifespan of the Bridge.

CABLE DIAMETER AND SPACING

A cable-supported bridge can be more hazardous to birds than other designs if the cables are not designed thick enough or are placed too close together (Manville 2009). A Hong Kong study found that the thick cables on cable-stayed bridges, which can be illuminated, are safer for birds than power lines, which are usually thin and not lighted (Ove Arup & Partners 2002). Increased spacing between cables may help birds to maneuver around cables more easily without collision (EDAW 2009). The Shoemaker Bridge Replacement cables will be approximately 9-12 inches in diameter and will be illuminated as necessary.

GUY WIRES VS. CABLE-STAYS

It is important to note the distinction between guy wires and cable stays. A guy wire is a thin tensioned cable, wire, or rope that is used to brace, guide or secure all sorts of structures like ship masts, electric poles, radio towers, or wind turbines, which are of tremendous heights and not self-supporting in place (RAX, 2023). These wires have a small circumference and can be difficult to see because of their size. Guy wires are very different from larger cable stays, which can be up to a foot in diameter.

BRIDGE HEIGHT

Birds are known to fly at lower elevations during migration when weather is unfavorable, increasing collision risk with structures (Richardson 2000). Radar studies of bird migration through the Cape May, New

Jersey corridor conducted by Mizrahi (2009) revealed that the bulk of nocturnal migration occurred between 300 and 900 feet AGL. Earlier studies by Able (1970) showed that, in general, nocturnal migrants travel at higher altitudes than diurnal migrants; are found in higher concentrations; and most frequently travel at altitudes between 2,000 and 3,000 feet AGL. Due to the great variability in migration altitudes, and to the paucity of data on bird migration, it is recommended that bridge height not exceed 300 feet AGL (NYSDOT and USDOT 2011).

Research indicates that bird collision mortality increases with structure height for most structures (e.g., communication towers and wind turbines) (USFWS 2022). Higher collision impacts are associated with the tallest towers, excessively bright artificial lighting (particularly constant white light), the presence of transparent glass (which may be invisible to the birds or reflect landscaping, sky or water and cause collision), and narrow guy wires (Erickson et al. 2005, New York City Audubon 2007, Longcore et al. 2008).

FLIGHT DIVERTERS

The main objective of bird flight diverter devices is to increase wire visibility for birds, thus reducing collision risk. Structural elements, such as fencing and walls on bridges, can force direct birds to fly below the bridge or above the walls, avoiding traffic (Kociolek et al. 2015). Flight diversion works best for species with direct, rapid flight rather than for those species with slower or meandering flight. Poles that produce an illusion of a solid barrier were effective in reducing bird roadkill in open coastal areas for royal terns and brown pelicans (Bard et al. 2002). Flags or wider posts may also be effective. Structural fencing will be positioned on the Shoemaker Bridge to avoid bird collisions with vehicles.

BMP APPLICABILITY TO LA RIVER AVIAN GROUPS

BMP considerations for avian groups known to use the LA River are discussed below.

1. RESIDENT BIRDS
   Resident birds are considered most likely to acclimate to the presence of structures, although, as an overall group, they would experience the greatest exposure to the bridge due to being in the area for more time than seasonal migrants, or even nocturnal migrants that might be in the area for mere minutes. BMPs to shield birds from flying into vehicles on the bridge deck, preventing perching locations near vehicles, and the potential use of bird diverters would benefit this group.

2. BREEDING AND WINTERING MIGRATORY BIRDS
   Many migratory birds, depending on the species, come to southern California and the Los Angeles River to either breed during the spring and summer months or to "winter" during the fall and winter months. Whether they are breeding or wintering, these migratory birds spend nearly half the year in southern California and would likely acclimate to a new structure, similar to how resident species would be likely to. Regardless, the BMP's described for other avian groups could benefit this group.

3. SHOREBIRDS THAT STOPOVER DURING MIGRATION
   Many migratory birds stopover to forage and "refuel" in and along the LA River during migration. Shorebirds are recognized as the highest potential concern for avian impacts due to their documented abundance at the LA River. The largest concentrations of shorebirds occur north of the Shoemaker Bridge area (Hickey et al. 2003). Their flight paths to and from this area

past the Shoemaker Bridge, as well as flight patterns and height, are not thoroughly known, and should be informed by the current visual surveys and radar study. While shorebirds may be the most abundant of the species groups using the area, they are expected to have mostly daytime flights when visibility is better and when potential disorientation due to bridge lighting is not a factor. Shorebirds as a group are not considered to be at high risk of collisions with structures, such as buildings, communication towers, and wind turbines, compared to other species groups, although this can be influenced by their habitats occurring more near water and shorelines (AWWI 2021). As with the long-distance migrants discussed below, a lower bridge height, reduced overall footprint, and absence of power lines, guy wires, or thin cables are appropriate BMPs for this avian group.

4. LONG-DISTANCE MIGRANTS TRAVELING THROUGH AT NIGHT

   The BMPs to be followed regarding lighting will be valuable to reduce potential collisions for nocturnal migrants. A lower bridge height, reduced overall footprint, and absence of power lines, guy wires, or thin cables will be beneficial to reduce impacts for this group. The use of Robin Radar will capture the heights of long-distance migrants.

IX. ADDITIONAL STUDIES TO BE CONDUCTED BY THE CITY OF LONG BEACH

PRE-CONSTRUCTION

RADAR STUDY

In addition to BMPs discussed within this section and in the above-mentioned documents, the City of Long Beach will initiate a pre-construction bird survey that will continue for at least one year. The survey will utilize an Avian Radar single sensor system, which provides full 3D information of all birds in the nearby environment, including migratory birds thousands of feet above the bridge location. Through the use of this radar system, height data is available for all bird tracks around the radar, at any time. The radar system also allows for uniquely detailed 3D visualization of bird flight paths, which can be exported to Google Earth, as shown below in Figures 4 and 5,. Avian observation data provided by this radar system, will be compiled into a detailed report as shown below, in Figure 6.

Figure 4: 3D Modeling and Radar Specifics

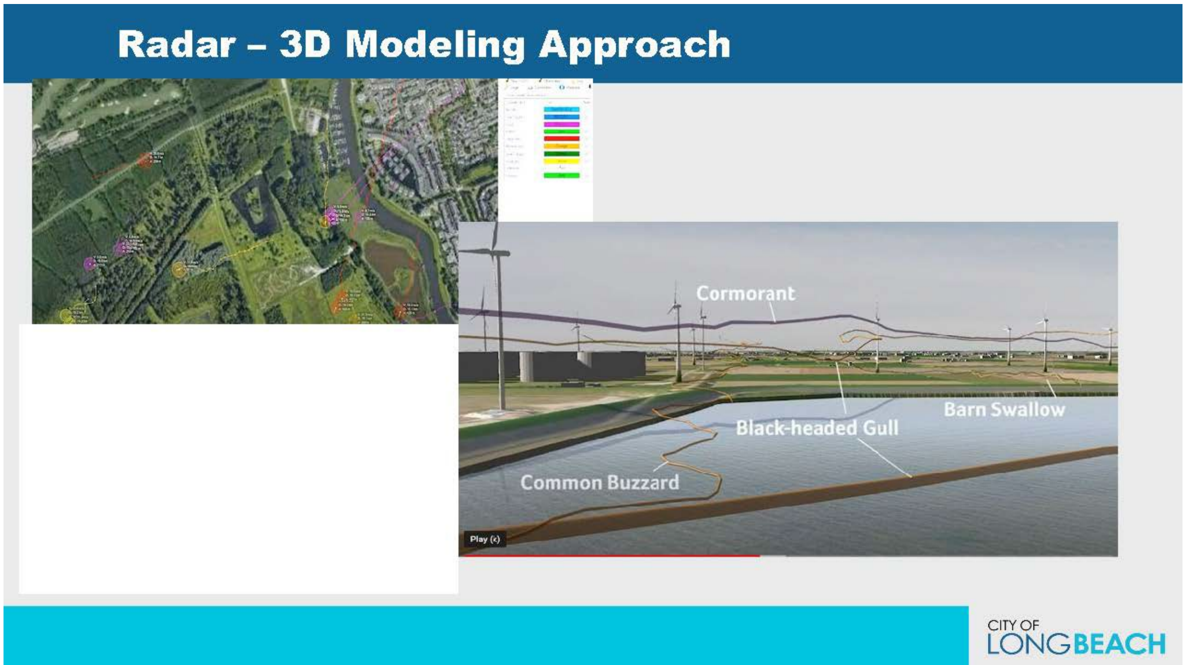


Figure 5: 3D Modeling Base Data Example

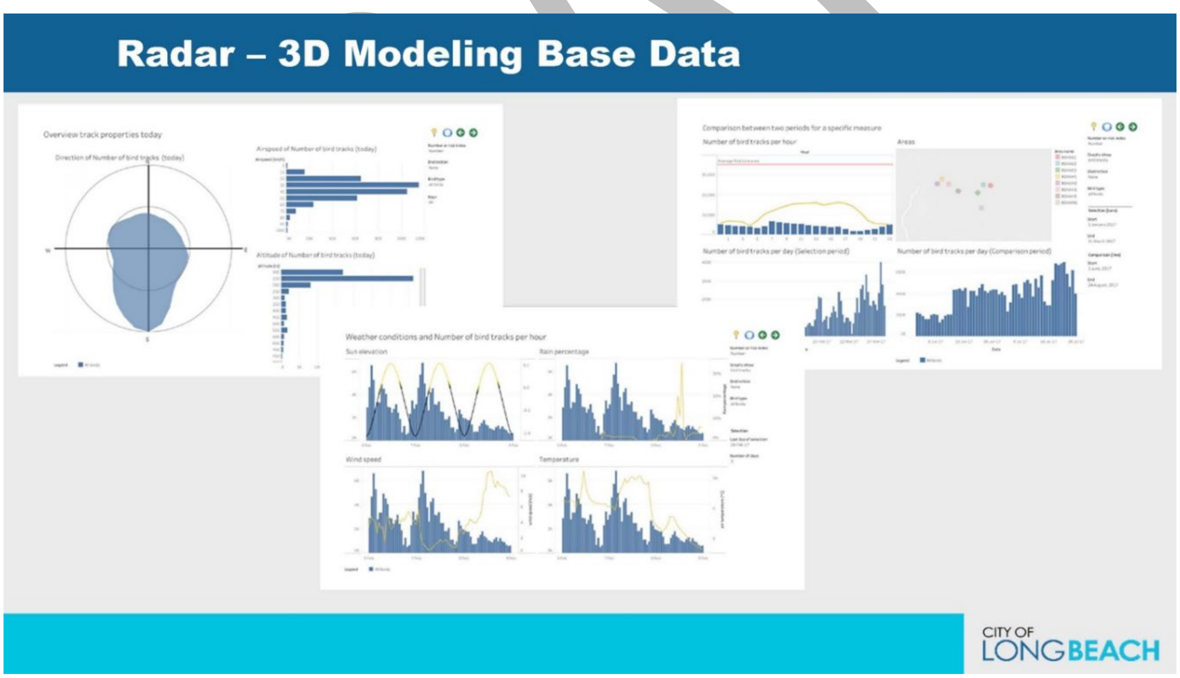
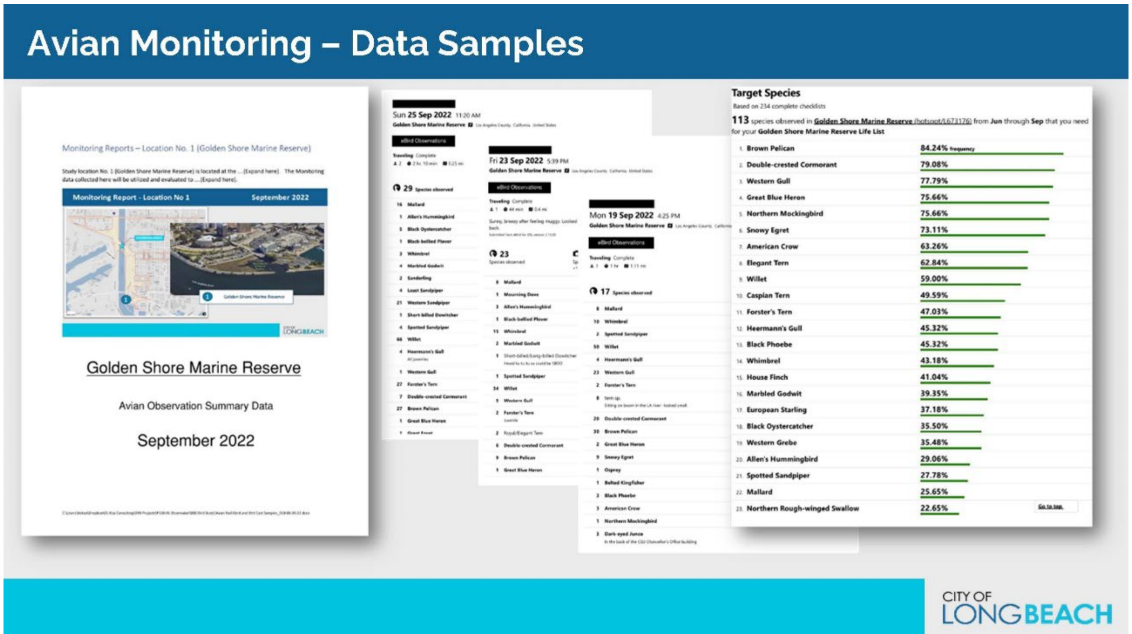


Figure 6: Avian Monitoring Data Samples



POST CONSTRUCTION STUDIES

Due to the sparsity of studies related specifically to migratory birds and cable-supported bridges, the City is also proposing a multi-year study in conjunction with California State University, Long Beach (CSULB). Cameras will be embedded into the Shoemaker Bridge Replacement structure, using Best Available Technology, to record bird activity within the bridge prism. The study will be kicked off by the City's team of biologists upon construction completion for a two-year period and will continue into a longer-term management monitoring and reporting program with CSULB students. CSULB students will be asked to monitor camera data for an additional eight years to record bird activity within the bridge prism. Annual reporting will be conducted during the decade-long study and will be available to the scientific community, regulatory agencies, and the public.

X. SUMMARY

The existing Shoemaker Bridge and proposed replacement project are located within the LA River Important Bird Area (IBA), which is recognized for shorebird and waterbird use, most prominently during the shorebird migration in late summer and early fall. Concrete-bottomed areas a few miles to the north of the Shoemaker Bridge draw the largest numbers of shorebirds in the IBA. The flight paths for how shorebirds enter and disperse from this area are not thoroughly documented. Prior studies for the project did not detect large numbers of birds using the existing bridge area. A more thorough radar and visual survey study will help inform the collective understanding of bird use at the bridge, such as flight locations, flight height, species groups, and timing.

Avian mortality via collisions with certain man-made structures (buildings, communications towers, electric transmission lines, wind turbines) has been well documented, especially for nocturnal migrant birds at night. Lighting has typically been a major factor with nocturnal avian migration at these structures, with the light serving to attract the birds toward harm in the way of buildings, guy wires, or turbine blades. Structure height and design are also important factors, with taller structures (generally starting at 300 feet AGL and taller) in line with the typical lower flight altitudes of nocturnal avian migration, as well as guy wires at communication towers and spinning turbine blades that are not applicable at bridges.

Limited information is available regarding avian mortality due to collisions with bridges. Bridge-bird interactions are far less studied than avian collisions with buildings, communication towers, and wind turbines, with the premise that bridge-bird interactions are much less of an issue. This is not to say that collisions do not occur, just that evidence of bird mortality at bridges and/or cable-stay bridges is generally lacking.

In addition to minimization measures discussed in the above-mentioned documents, the City of Long Beach will initiated a pre-construction field bird survey that will continue for one year. Additionally, the Radar single sensor system, which provides full 3D information of all birds in the nearby environment will capture height data for all bird tracks around the radar, 24-hours a day.

Due to the lack of studies related specifically to migratory birds and cable-supported bridges, the City of Long Beach is also proposing a multiple year post-construction study in conjunction with California State University, Long Beach CSULB). Cameras will be embedded into the Shoemaker Bridge structure, using Best Available Technology, to record all bird activity within the Bridge prism. The Study will be kicked off by the City's team of biologists for a two-year period and will continue into a long-term management monitoring and reporting program with CSULB. All survey data and monitoring reports will be made available to the scientific community, regulatory agencies and the public.

Construction and operational lighting, as well as, aesthetic lighting will be modified into the design in order to minimize the potential for bird collisions with the bridge structure.

The additional measures described herein do not change the analysis in the FEIR/EA but will augment the data and will be memorialized in the FEIR/EA Revalidation for the PS&E phase of the project.

XI. CONCLUSION

This MBTA compliance study finds that it is unlikely that there will be increased mortality at the Shoemaker Bridge as compared to other similar bridges given the following:

(1) There appears to be limited bird flight in the existing bridge location

(2) There are generally few documented cases of bird impacts with cable-stay bridges

(3) Shorebirds, as a group, have demonstrated low risk for collisions with structures

(4) Several studies at other bridge locations have shown that many day-flying birds tend to fly above the bridge rather than through the bridge structure

(5) Studies have shown that larger cables are more visible to day-flying birds, thus decreasing the possibility of collision

(6) The maximum height of the bridge (286 feet AGL) will be below the lowest level where nocturnal migrant collisions are considered to increase (300 feet AGL)

(7) The diameter of the cables, at 9 to 12 inches, is much larger and more visible than what flying birds encounter with electric power lines and guy wires

(8) Implementation of BMPs that have already been established in project reviews and that are consistent with current knowledge will minimize impacts

(9) State of the art lighting will be installed, which allows for adaptive management techniques throughout the life of the bridge

(10) Post construction studies are expected to provide valuable data on bridge design and lighitng

This MBTA compliance study concludes that foreseeable impacts to migratory birds are expected to be minimal with no known difference between a segmental bridge or cable-stay bridge, and all beneficial practices to avoid and minimize incidental take of migratory birds are being implemented. Additionally, the proposed decade-long study would provide valuable information on bird activities around bridges.

XII. SUMMARY OF NEXT STEPS

The following is a summary of the next steps:

a. Caltrans to confirm no foreseeable impacts to migratory birds and implementation of appropriate BMPs as outlined in the report.

b. The Project Team is currently securing radar and sound equipment to augment field surveys to quantify bird use within the vertical/horizontal Bridge prism and above. This data will be used to inform the multiple year post-construction study.

c. Project Team to prepare the parameters and specifications of the Post-Construction Cable Supported Bridge Avian Interaction Study, including Adaptive Management techniques related to lighting, flight diverters, and fencing.

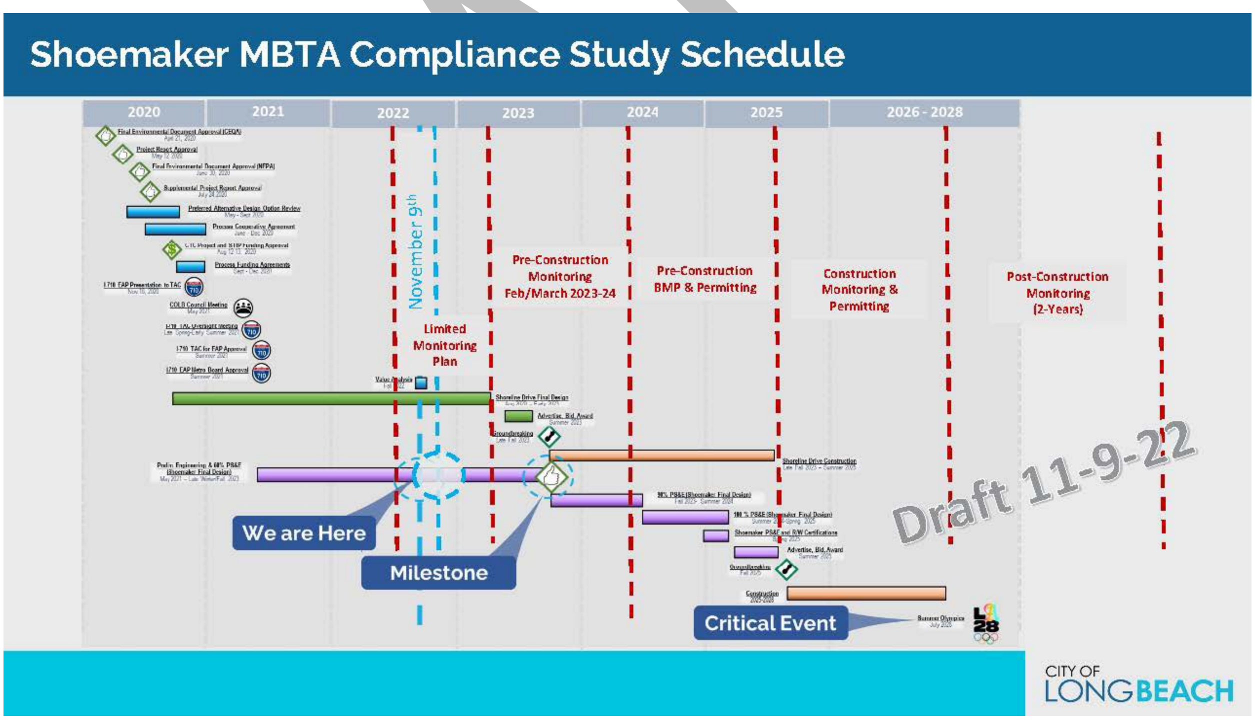
d. Project Team to prepare the Shoemaker Bridge Lighting Plan for Caltrans and USFWS review.

e. Project Team to identify bird camera locations and hardware/software required.

f. Project Team to work with CSULB to discuss long term camera data collection and reporting.

SCHEDULE

The following schedule identifies the milestones for the MBTA compliance study:



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References:

Able, K. P. 1970. A radar study of the altitude of nocturnal passerine migration. Bird-Banding 41: 282-290. American Wind Wildlife Institute (AWWI). 2021. Wind Turbine interactions with Wildlife and Their

Habitats: A Summary of Research Results and Priority Questions. Washington, DC. Available at www.awwi.org.

Avery, M., Springer, P.F., & Cassel, J.F. 1976. The effects of a tall tower on nocturnal bird migration - A portable ceilometer study. Auk, 93, 281-291.

Bard, Alice & Smith, Henry & Egensteiner, Erik & Mulholland, Rosi & Harber, Terese & Heath, Gayle & Miller, William & Weske, John. (2002). A Simple Structural Method to Reduce Road-Kills of Royal Terns at Bridge Sites. Wildlife Society Bulletin. 30. 603-605. 10.2307/3784522.

eBird. 2022. eBird Hotspot xx. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: http://www.ebird.org. (Accessed: Date August 2022).

Erickson, W.P., G.D. Johnson, and D.P. Young. 2005. A summary and comparison of bird mortality from anthropogenic causes with an emphasis on collisions. USDA Forest Service Gen. Tech. Rep. PSW-GTR191. 1029-1042.

Evans Ogden, L. J. 2002. Summary report on the bird friendly building program: effect of light reduction on collision of migratory birds. A special report for the Fatal Light Awareness Program (FLAP), Toronto, Ontario, Canada.

Federal Aviation Administration. 2015. Obstruction marking and lighting. Advisory Circular AC 70/7460-1L. U.S. Department of Transportation.

Federal Aviation Administration. 2020. Obstruction marking and lighting. Advisory Circular AC 70/7460-1M. U.S. Department of Transportation. Hickey, C., W.D. Shuford, G.W. Page, and S. Warnock.

Federal Highway Administration. Wind Tunnel Investigations of An Inclined Stay Cable With A Helical Fillet. Chapter 2: Experimental Conditions- Prototype Stay Cables.U.S. Department of Transportation. Accessed February 2023. https://www.fhwa.dot.gov/publications/research/infrastructure/structures/bridge/14070/003.cfm

2003. Version 1.1. The Southern Pacific Shorebird Conservation Plan: A strategy for supporting California's Central Valley and coastal shorebird populations. PRBO Conservation Science, Stinson Beach, CA.

Finnis R. G. 1960. Road casualties among birds. Bird Study 7: 21–32

Gauthreraux Jr., S.A., and C.G. Belser. 2006. Effects of artificial night lighting on migrating birds. In Ecological Consequences of Artificial Night Lighting, edited by C. Rich and T. Longcore, pp. 67–93. Washington D.C.: Island Press.

Gehring, Joelle, P. Kerlinger, A. Manville. 2009. Communications towers, lights, and birds: successful methods of reducing the frequency of avian collisions. Ecological applications: a publication of the Ecological Society of America. 2009 Mar; 19(2):505-14.

Google Earth. (n.d.). [Google Earth Imagery of Cooper River Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/cooper+river+bridge/@32.80266603,-79.91388289,60.66269142a,611.70153352d,35y,-13.88978519h,44.99835066t,0r/data=Cn4aVBJOCiUweDg4ZmU3MDgxYzE2ZWE3MmY6MHhhZjJlZjA4MWJiNDQ4OWNmGZKdbSS_ZkBAIRnvfWB9-lPAKhNjb29wZXIgcml2ZXIgYnJpZGdlGAEgASImCiQJDdyNgMz6S0ARDH3f1P6rS0AZMhy2KKn7KkAhFbejS6X6KEA

Google Earth. (n.d.). [Google Earth Imagery of Gerald Desmond Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/long+beach+gateway+bridge/@33.76465228,-118.22207414,66.09720802a,960.57075908d,35y,133.10212174h,45.00063582t,-0r/data=CoQBGloSVAolMHg4MGRkMzZmNWM2YWE2YjlmOjB4MzI1YjhmMjM3YTk4OGU4ORmqNu6D4uFAQCEgWtAgKo5dwCoZbG9uZyBiZWFjaCBnYXRld2F5IGJyaWRnZRgCIAEiJgokCRK3GO-3dEVAEWpQZaPmckVAGQmy6VoLuVPAIf3dZgV9ulPA

Google Earth. (n.d.). [Google Earth Imagery of Kosciuszko Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/KOSCIUSZKO+BRIDGE/@40.7276482,-73.9287488,18.97425793a,777.42234129d,35y,323.99965595h,45t,0r/data=CnwaUhJMCiUweDg5YzI1OTI1ZTU1Y2E4NDE6MHgxYTYzODUxNDNiZWJlMzc3GSP_gpMjXURAIcCMzp5we1LAKhFLT1NDSVVTWktPIEJSSURHRRgBIAEiJgokCd_ZyTvc7jNAEdzZyTvc7jPAGVmryxRbHkNAITxUrFtehk_A

Google Earth. (n.d.). [Google Earth Imagery of Leonard P. Zakim Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/Leonard+P.+Zakim+bridge/@42.3688121,-71.063493,179.81148448a,756.15585279d,35y,0h,45t,0r/data=CoIBGlgSUgolMHg4OWUzNzA5MjQwMmQ3ZDU1OjB4MmY5YmY1N2RjNjEzNTZmMRk-7yE8NS9FQCGYofFEEMRRwCoXTGVvbmFyZCBQLiBaYWtpbSBicmlkZ2UYAiABIiYKJAn49bqKw11EQBHgSeHR2FxEQBkEdLIO13pSwCF_duouCnxSwCgC

Google Earth. (n.d.). [Google Earth Imagery of Oresund Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/Oresund+Bridge,+Sweden/@55.552637,12.83063664,-1.43388869a,37888.01003925d,35y,56.47128985h,45.23732079t,0r/data=CoEBGlcSUQolMHg0NjUzYTcwMjNhMDUxYWZiOjB4YmMwZTkzYzExYzM3Mjg3MxlaVHpcCslLQCE1WN2PgLIpQCoWT3Jlc3VuZCBCcmlkZ2UsIFN3ZWRlbhgBIAEiJgokCXniXO5KDEBAESa0P5uzCkBAGZo3t1BYRVTAIYB5ughLR1TA

Google Earth. (n.d.). [Google Earth Imagery of Peace Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/peace+bridge+niagara/@42.90841197,-78.90697162,172.21281823a,789.0626427d,35y,154.97891525h,45.0002544t,0r/data=Cn8aVRJPCiUweDg5ZDMxMzBhYjdjMGQ4MDk6MHhmODY2MjM1NGNiMTQ4YzMwGSRens4VdEVAIaDuTR31uVPAKhRwZWFjZSBicmlkZ2UgbmlhZ2FyYRgCIAEiJgokCWq4Yh7EakRAEc1HdhfWY0RAGcU4CuzBcVLAIWyPC4pRdVLA

Google Earth. (n.d.). [Google Earth Imagery of Sidney Lanier Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/Sidney+Lanier+Bridge,+Brunswick,+GA/@31.1166303,-81.4847336,-837.75594001a,888.92170547d,35y,0h,45t,0r/data=Co4BGmQSXgolMHg4OGU0ZDhmN2I4MGU4NDNiOjB4ODdkM2RiZDkwMGMzZDk4MRkAObx72x0_QCFu0RPgBV9UwCojU2lkbmV5IExhbmllci

BCcmlkZ2UsIEJydW5zd2ljaywgR0EYAiABIiYKJAkOdFm3PDBFQBGkWkbUri5FQBkmHXotXsNRwCGo9Boba8RRwCgC

Google Earth. (n.d.). [Google Earth Imagery of Talmadge Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/Talmadge+Memorial+Bridge,+Savannah,+GA/@32.08821786,-81.09873503,-0.83039019a,1581.32787338d,35y,0.00000001h,39.38690574t,0r/data=CigiJgokCf3uyhXCHD9AEWeE_Uq8HD9AGZNT1VPBXlTAIa8m-hbDXlTA

Google Earth. (n.d.). [Google Earth Imagery of Throgs Neck and Newport Bridge]. Retrieved December 7, 2022 from https://earth.google.com/web/search/throgs+neck+bridge/@40.80057303,-73.79650974,-0.75698015a,3256.76013773d,35y,-70.19307044h,45.01577103t,0r/data=Cn0aUxJNCiUweDg5YzJmMzBkNmQ0MTlkY2Q6MHhmMzZhZWUwMjY2N2ZjODFmGXnDIitkZkRAIWNT-H3JclLAKhJ0aHJvZ3MgbmVjayBicmlkZ2UYAiABIiYKJAkDUGCGgWdAQBHqhmVAcmZAQBkprLUsHvpTwCGbu3ZHB_tTwA

HDR and Caltrans. 2019a. Shoemaker Bridge Replacement Project Biological Assessment. City of Long Beach, County of Los Angeles.

HDR and Caltrans. 2019b. Shoemaker Bridge Replacement Project, Natural Environment Study. City of Long Beach, County of Los Angeles.

Hickey Catherine, Gary Page, W. David Shuford, Sarah Warnock. 2003. Southern Pacific Shorebird Conservation Plan: A Strategy for Supporting California's Central Valley and Coastal Shorebird Populations. Version 1.1. December 2003.

HLB. 2022. Lighting Cable Stay Bridge Light Pollution Report Example.

Horton K.G., C. Nilsson, B. Van Doren, F. La Sorte, A. Dokter, A. Farnsworth. Bright lights in the big cities: migratory birds' exposure to artificial light. Frontiers in Ecology and the Environment. Volume 17, Issue 4. May 2019. Pages 209-214. https://doi.org/10/1002/fee.2029.

International Dark-Sky Association. 2002. Effects of Artificial Light at Night on Wildlife. Information Sheet # 187. Tucson, Arizona.

Jacobson, S. 2005. Mitigation measures for highway-caused impacts to birds. USDA Forest Service Gen.

Tech. Rep. PSW-GTR-191.

Jones, J. 2000. Impact of Lighting on Bats. Accessed via Web site at: http://www.lbp.org.uk/07library/LIGHTING%20AND%20BATS.pdf.

Kociolek Angela, Clara Grilo and Sandra Jacobson. 2015. Flight Doesn't Solve Everything: Mitigation of Road Impacts on Birds. Handbook of Road Ecology. Chapter 33. Edited by Rodney van de Ree, Daniel and Clara Grilo. Published 2015 by John Wiley and Sons, Ltd. https://bcs.wiley.com/he-bcs/Books?action=index&bcsId=9649&itemId=1118568184.

Living Bird. Autumn 2021. As viewed online 9/21/22 https://www.allaboutbirds.org/news/new-birdcast-analysis-shows-how-high-migrating-birds-fly/#

Longcore T., and C. Rich. 2004. Ecological Light Pollution. Frontiers in Ecology and the Environment. 2 (4): pp 191-198

Longcore, T. C. Rich, and S. A. Gauthroaux, Jr. 2008. Height, Guy Wires, and Steadyburning Lights Increase Hazard of Communication Towers to Nocturnal Migrants: A Review and Meta-analysis. The Auk 125(2):485–492

Longcore, T., C. Rich, P. Mineau, B. MacDonald, D.G. Bert, L.M. Sullivan, E. Mutrie, S.A. Gauthreaux, M.L. Avery, R.L. Crawford, A.M. Manville, E.R. Travis, and D. Drake. 2012. An estimate of avian mortality at communication towers in the United States and Canada. PLoS One 7(4): 1-17.

Loss, Scott R., Tom Will, Sara Loss, and Peter Marra. 2014. Bird-building collisions in the United States: Estimates of annual mortality and species vulnerability. The Condor: Ornithological Application. Vol. 116, pp.8-23. DOI: 10.1650/CONDOR-13-090.1

Major Works Project Management Office, Highways Department. 2007. Operation of Shenzhen Section of Senzhen Bay Bridge. Environmental Impact Assessment Ordinance (CAP 499), S.5 (1)(b).

Manville, A.M. 2005. Bird strikes and electrocutions at power lines, communication towers, and wind turbines: State of the art and state of the science – next steps toward mitigation. (p. 1051-1064). In C. John Ralph and Terrill D. Rich, eds. Bird Conservation Implementation and Integration in the Americas: Proceedings of the Third International Partners in Flight Conference. 2002 March 20-24. Asilomar, California, Volume 1. Gen. Tech. Rep. PSW-GTR-191, Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture: 651 p. Office of Migratory Bird Management. May 2000. Accessed November 2022.

Manville, A.M. 2009. Towers, turbines, power lines, and buildings – steps being taken by the U.S. Fish and Wildlife Service to avoid or minimize take of migratory birds at these structures. In Tundra to tropics: Connecting habitats and people. Proceedings of the 4th International Partners in Flight Conference (eds. T.D. Rich, C. Arizendi, D. Demarest, and C. Thompson). Pp. 1-11.

Martin, Graham. 2011. Understanding Bird Collisions with Man-made Objects: a Sensory Ecology Approach. Accessed September 2022. IBIS Volume 153, Issue 2. Pages 239-254. Understanding bird collisions with man-made objects: a sensory ecology approach - MARTIN - 2011 - Ibis - Wiley Online Library.

Mizrahi DS, R Fogg, KA Peters, PA Hodgetts. 2009. Assessing nocturnal bird and bat migration patterns on the Cape May peninsula using marine radar: potential effects of a suspension bridge spanning Middle Thorofare, Cape May County, New Jersey. Draft report. Cape May Court House, NJ

Mouritsen, H., Feenders, G., Liedvogel, M., Wada, K. & Jarvis, E. D. 2005. "A Night Vision Brain Area in Migratory Songbirds", PNAS 102, 8339-8344.

National Audubon Society. 2013. Lower Los Angeles River Important Bird Area. Accessed 9/2022 https://netapp.audubon.org/iba/Reports/201?_gl=1*4mtcqr*_ga*ODM2NDc1MTYyLjE2NTQxODg2 ODk.*_ga_X2XNL2MWTT*MTY2MzY4ODc5Ny43LjEuMTY2MzY4OTQzMC4zMC4wLjA.

New York State Department of Transportation (NYSDOT). 2008. Final Environmental Impact Statement/Final Section 4(f) Evaluation for PIN X729.77 Kosciuszko Bridge Project, Brooklyn-Queens

Expressway (I-278) from Morgan Avenue in Brooklyn to the Long Island Expressway (I-495) in Queens, Kings and Queens Counties, New York. FWHA-NY-EIS-07- 01-F.

NYSDOT and U.S. Department of Transportation Federal Highway Administration (US DOT). 2011.

Kosciuszko Bridge Project. Reevaluation Statement. Kings & Queens Counties, New York.

Nilsson, L., and Green, M. (2002). Bird strikes with the Öresund bridge. Report from the University of Lund.

Oresundsbron. 2022. Nature and Environment. Accessed September 2022. https://www.oresundsbron.com/en/info/nature-and-environment

Ove Arup & Partners. 2002. Shenzhen Western Corridor - Investigation and Planning. Appendix 9B – Bird Collision with Manmade Structures with Reference to the Proposed Shenzhen Western Corridor. 23pp.

Parsons Brinckerhoff. 2011. Kosciuszko Bridge project. Reevaluation statement to U.S. Department of Transport. [online] www.dot.ny.gov/con tent/delivery/region11/projects/X72977-Home/X72977-Repository/ Reevaluation%20Statement.pdf. Accessed 13 October 2017

Parsons – HNTB Joint Venture. 2010. Final Gerald Desmond Bridge Replacement Project. Environmental Impact Report / Environmental Assessment and Application Summary Report. Prepared for Port of Long Beach and Caltrans.

Patterson, J.W. 2012. Evaluation of new obstruction lighting techniques to reduce avian fatalities.

Technical Note: DOT/FAA/TC-TN12/9

Podolsky, R., D. G. Ainley, G. Spencer, L. Deforest and N. Nur. 1998. Mortality of Newell's Shearwaters caused by collisions with urban structures on Kauai. Colonial Waterbirds 21(1): 20-34.

Podolsky, R., D. G. Ainley, G. Spencer, L. Deforest and N. Nur. 1998. Mortality of Newell's Shearwaters caused by collisions with urban structures on Kauai. Colonial Waterbirds 21(1): 20-34.

Pons, Pere. 2000. Height of Road Embankment Affects Probability of traffic Collision by Birds. Bird Study.

Vol. 47, pps 122-125.

Poot, H., B. J. Ens, H. de Vries, M. A. H. Donners, M. R. Wernand, and J. M. Marquenie. 2008. Green light for nocturnally migrating birds. Ecology and Society 13(2): 47.

RAX. What Is A Guy Wire And How To Use It? – The Ultimate Guide. 2023. Accessed January 2023.

Richardson, W.J. (2000). Bird Migration and Wind Turbines: Migration Timing, Flight Behavior, and Collision Risk.

Smithsonian's National Zoo & Conservation Biology Institute. 2022. Help Migratory Birds. https://nationalzoo.si.edu/migratory-birds/neotropical-migratory-bird-faqs.

Stanton, D. J. and B. Klick. 2018. Flight modifications as a response to traffic by night-roosting egrets crossing a road bridge in Hong Kong. Journal of Heron Biology and Conservation 3:4 [online] www.HeronConservation.org/JHBC/vol03/art04/.

State of California Department of Transportation (Caltrans) and the City of Long Beach. 2020. Shoemaker Bridge Replacement Project Final Environmental Impact Report/Assessment.

U.S. Energy Information Administration (eia). 2023. Wind turbine heights and capacities have increased over the past decade. Accessed January 24, 2023. https://www.eia.gov/todayinenergy/detail.php?id=33912#:~:text=Since%202012%2C%20the%20average%20height,such%20as%20trees%20or%20buildings

U.S. Fish and Wildlife Service (USFWS). 2006. 5-Year Review of Pacific Coast Population of Western Snowy Plover. Accessed September 10, 2019. https://ecos.fws.gov/docs/five_year_review/doc770.pdf.

. https://www.fws.gov/sites/default/files/documents/nationwide-standard-conservation-measures.pdf

USFWS. 2021. Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning. https://www.fws.gov/sites/default/files/documents/usfws-communication-tower-guidance.pdf.

USFWS. 2022. Threats to Birds: Collisions. https://www.fws.gov/library/collections/threats-birds-collisions.

ATTACHMENT 1

SHOEMAKER MBTA MEASURES

Several measures have been identified in the BA, NES, and FEIR/EA for the Shoemaker Bridge Replacement Project related to migratory birds. They include:

BIOLOGICAL ASSESSMENT MEASURES

BA-1: *NO CONSTRUCTION WORK BETWEEN APRIL 1 TO SEPTEMBER 15. IF CONSTRUCTION IS NECESSARY, PRE-CONSTRUCTION SURVEY BY QUALIFIED BIOLOGIST REQUIRED.*

In order to avoid effects to foraging California least terns during construction activities, no work in the LA River, including, but not limited to, new bridge construction and old bridge demolition, shall occur between April 1 and September 15. In the event that work in the LA River is necessary during this time, a qualified biologist must conduct a pre-construction survey to identify if California least terns are actively foraging in the area of the Project Limits. The qualified biologist must have the appropriate training for conducting focused pre-construction surveys for California least terns. If California least terns are actively foraging in the project area, Caltrans will consult with the wildlife agencies to determine effective measures to avoid and minimize adverse impacts to this species. The City shall ensure that these measures will be carried out during construction by City's resident engineer or designated contractor.

BA-2 AND BIO-15 (NES): *BRIDGE DESIGN MUST BE BIRD SAFE. FENCING REQUIRED DURING CONSTRUCTION.*

To protect bird species that fly up and down the LA River, the new Shoemaker Bridge will be designed to ensure bird safety. During construction, the City's resident engineer or designated contractor shall ensure that at a minimum, suitable fencing at least 14 feet high will be installed to direct flying birds up and out of the way of traffic to prevent birds from being struck by passing vehicles. Fencing will also restrict materials from falling from the bridges onto wildlife or aquatic habitat below.

NATURAL ENVIRONMENT STUDY MEASURES

TE-1 (FEIR/EA), BIO-1 (NES): *WEEKLY SITE VISIT OF BIOLOGIST DURING CONSTRUCTION*

The City will ensure that a biologist approved by the Carlsbad Fish and Wildlife Office (CFWO) will be on site weekly during Project construction within 200 feet of western snowy plover and California least tern habitat in order to ensure compliance with all conservation measures.

TE-2: *CONSTRUCTION COMPLIANCE REPORT*

After construction, the City will ensure a qualified biologist submit a final report to the CFWO within 120 days of Project completion. This should include photographs of impact areas and adjacent habitat, documentation that authorized impacts were not exceeded, and documentation that compliance with all conservation measures was achieved.

TE-3: *NIGHTTIME CONSTRUCTION LIGHTING*

If nighttime construction is necessary, the City will ensure all Project lighting (e.g., staging areas, equipment storage sites, roadway) will be selectively placed and directed toward the construction site and away from western snowy plover and California least tern habitat. Lighting will be of the lowest illumination necessary for safety, and light glare shields will be used to reduce the extent of illumination into western snowy plover and California least tern habitat.

TE-4: *PERMANENT PROJECT LIGHTING*

During construction, the City will ensure permanent Project lighting be of the lowest illumination necessary for safety, and such lighting will be directed toward the bridge and paved roadway and away from sensitive habitats. Light glare shields will be used to reduce the extent of illumination into sensitive habitats. Caltrans will review the permanent lighting plans for the Project and then submit them to CFWO.

TE-5: *EQUIPMENT MANAGEMENT AND WETLANDS*

During construction, the City will keep equipment maintenance, staging, and dispensing of fuel, oil, coolant, or any other such activities outside of jurisdictional wetlands or waters. The equipment will be located such that runoff from the designated areas will not enter western snowy plover and California least tern habitat and will be shown on construction plans.

TE-6: *TRASH MANAGEMENT*

During construction, the City will ensure that the Project site will be kept as clear of debris as possible, including keeping food trash enclosed in sealed containers and regularly removed from the site.

TE-7: *INCORPORATION OF BRIDGE POLE DIVERTERS*

The City will consider the incorporation of bridge poles or fencing into the design of the new bridge, to avoid and minimize vehicle caused bird mortality. Bridge poles or fencing that may be incorporated will be designed to be visible to birds and prevent perching by raptors and will be of sufficient height to guide birds over vehicle traffic.

TE-8: *NO PLANTING TALL TREES*

The City will ensure that the Project landscape design plan not include planting tall trees adjacent to the LA River, as raptors may use tall trees for perching and nesting. Such action will discourage raptor species from preying upon foraging western snowy plovers and California least terns.