

ROLE OF OTHERS

On the Kennedy/Jenks team, key partners were:

- » Helix Environmental Planning
- » Staheli Trenchless Consultants

Additionally, SEJPA retained:

- » Black and Veatch Corporation, Construction Manager
- » J.R. Filanc Construction Company, Contractor

A key stretch of the land outfall pipeline that conveys treated wastewater from North San Diego County to the ocean outfall, has been replaced with new environmentally-friendly, corrosion-resistant pipe. The San Elijo Land Outfall Replacement Project was successfully completed in June 2018 and utilized an innovative, and minimally disruptive, approach to successfully replace existing aging infrastructure.

The land outfall pipeline, managed by the San Elijo Joint Powers Authority (SEJPA), conveys up to 25 million gallons per day of treated wastewater from the cities of Encinitas, Solana Beach, Del Mar, and Escondido beneath the San Elijo Lagoon for ocean disposal approximately 1.5 miles from shore. The original pipeline was estimated to have reached the end of its useful life due to age and surrounding soil type. Since the San Elijo Lagoon has been designated as a marine reserve by the State of California due to its biological significance, failure of this pipeline would likely have had environmental and financial impacts.

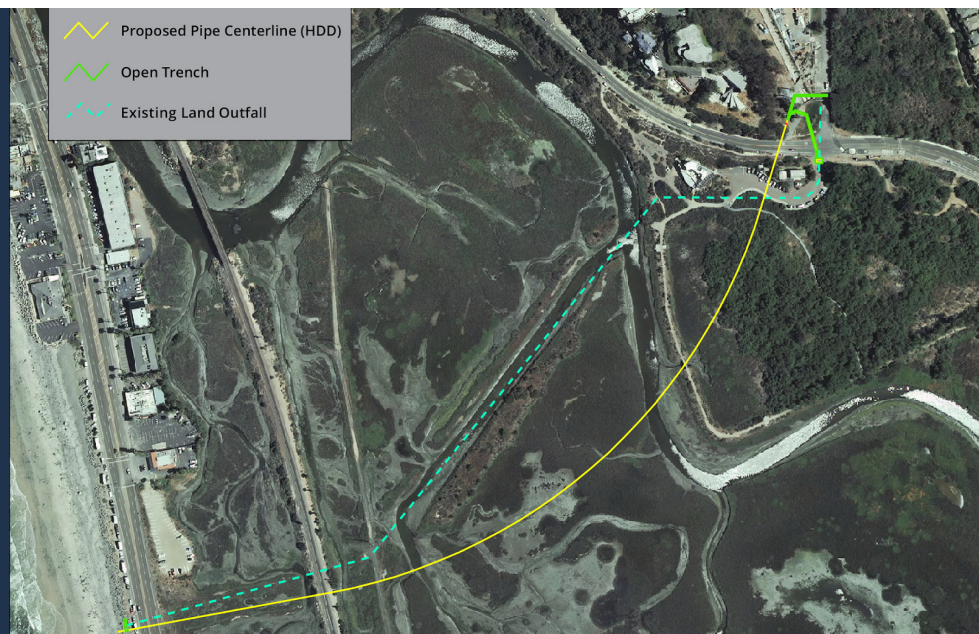
Role of Entrant's Firm

To protect the San Elijo Lagoon and a reliable wastewater/recycled water system, in 2015 SEJPA retained Kennedy/Jenks to plan, design and permit the land outfall replacement from the San Elijo Water Reclamation Facility (SEWRF) to Cardiff State Beach.

The Kennedy/Jenks project team provided:

- An Outfall Preliminary Design Report to identify and evaluate alternative methods of rehabilitation or replacement of the Outfall.
- Final design of the pipeline replacement with the selected technique including drawings and technical specifications.
- Coordination with Regulatory Agencies and securing of applicable permits.
- Engineering support during construction including:
 - » review of contractor submittals and assistance on contractor RFIs,
 - » evaluation of potential change orders,
 - » coordination of permitting agencies during construction, and
 - » resolution of conflicts discovered in the field.

The new land outfall spans 2,600 linear feet across the protected San Elijo Lagoon, North County Transit District Railroad Tracks, the Pacific Coast Highway, and connects to the existing ocean outfall on Cardiff State Beach.



UNIQUENESS AND/OR INNOVATIVE APPLICATION OF NEW OR EXISTING TECHNIQUES

The location of the outfall under the environmentally protected San Elijo Lagoon presented unique challenges. The project was in the jurisdiction of multiple permitting agencies, which required minimization of environmental impacts. The lagoon could not be accessed on the surface, including geotechnical exploration, which resulted in minimal availability of geotechnical data, and affected constructability for an open cut approach. Kennedy/Jenks worked with the SEJPA to determine evaluation criteria to select the best construction method for replacement or rehabilitation of the outfall.

The following three alternatives were evaluated: 1) open cut installation; 2) trenchless installation, both single horizontal directional drill (HDD) and HDD with pipe ramming of a casing across the railroad tracks were considered; and 3) rehabilitation of the existing pipe including sliplining and cast-in-place liner (CIPP).

Each alternative was evaluated based on the following criteria: Permitting, Constructability, Cost, Hydraulics, Construction Risk, Interfacing with Other Projects and Useful Life. Based on these criteria, the Single HDD option was selected because:

- This option has the least environmental impact of all the options as it avoids disturbance within the lagoon limits.
- Of the feasible installation options, HDD is the least expensive.
- No major obstacles were anticipated during the permitting process.
- Full replacement with a non-corrosive pipe material via HDD provides the greatest expected service life (100 years).

FUTURE VALUE TO THE ENGINEERING PROFESSION AND PERCEPTION BY THE PUBLIC

MULTI-AGENCY COORDINATION MINIMIZES PUBLIC IMPACTS

SEJPA and Kennedy/Jenks worked collaboratively with stakeholders and interested parties to identify other projects that were in planning and design and were directly tied to the proposed outfall replacement project due to their location along the land outfall alignment. Planned construction sequencing of these projects was necessary to prevent delays and unnecessary additional environmental impacts to the sensitive water bodies and surrounding communities.

Additionally, SEJPA worked with Caltrans to develop the Opportunistic Sand Replenishment Program. Caltrans had excess cut material from their nearby I-5 widening project that was deemed to be “beach quality sand”; so rather than Caltrans disposing of it, SEJPA was able to utilize some of it for beneficial use on the beach. The sand was used to raise the elevation of the work area to be more resilient to high surf and storm surge. This example shows how agencies worked together on unrelated concurrent projects in the same vicinity to produce a win-win situation and help save costs to both projects, which ultimately benefited rate and tax payers.



Kennedy/Jenks led inter agency coordination to minimize impact to the environment and community.

ADVANCING IMPLEMENTATION OF HDD APPLICATION TO PROTECT ENVIRONMENTALLY SENSITIVE HABITAT

The original SEWRF outfall system consisted of roughly 3,000 linear feet of 30-inch class 100 asbestos cement pipe across the lagoon installed in 1964, and 4,192 linear feet of 30-inch reinforced concrete pipe (RCP) and 4,000 linear feet of 48-inch reinforced concrete pipe ocean outfall. The inland portion of the outfall crosses the lagoon, the existing railroad tracks, and Highway 101/Pacific Coast Highway (PCH). A non-invasive installation technique was required to successfully replace the outfall. With a total drill length of 2,600 linear feet and a diameter of 30 inches, the drill was exemplary of the benefits provided by HDD.

PROVIDING LONGEVITY AND RELIABILITY TO THE REGION'S WASTEWATER TREATMENT/RECYCLED WATER SYSTEM

By replacing the outfall pipeline, it was possible to take the older, unreliable asbestos cement pipe out of service and install a new high-density polyethylene (HDPE) pipe that will have a life expectancy of approximately 100 years.

SOCIAL, ECONOMIC AND SUSTAINABLE DESIGN CONSIDERATIONS

COORDINATION OF SCHEDULE WITH OTHER ONGOING PROJECTS TO REDUCE IMPACTS

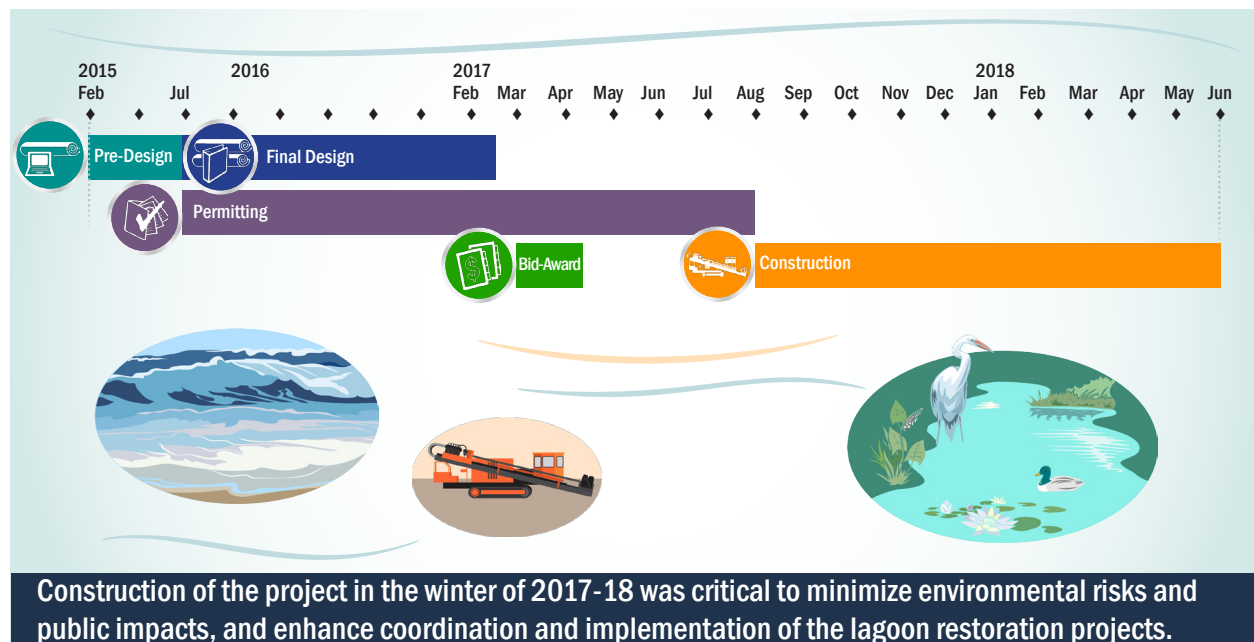
In addition to the need to replace the aged AC pipeline, there were several other time-sensitive factors driving the schedule of the project.

- San Diego Association of Governments (SANDAG) had plans to expand the existing railroad tracks that cross the lagoon, referred to as the Double Track Project. The expansion of the railroad was of concern because there will be additional soil loads and live loads applied to the existing outfall pipe. The additional fill is anticipated to cause settlement of the soil around the outfall pipe, which could result in damage to the outfall if not appropriately protected. By replacing the outfall pipe prior to the Double Track work, the risk of damaging the existing pipe would be mitigated. The existing track owner, North County Transit District (NCTD), did not need to install additional track protection measures for the existing pipe, which not only saved in project costs but also reduced associated risks of damaging the existing pipeline.
- The railroad work was being planned simultaneously with the North Coast Corridor expansion of the I-5 Freeway. The North Coast Corridor expansion is close to the SEWRF and will have traffic impacts, which were reduced by synchronizing the projects.
- The San Elijo Lagoon Conservancy Lagoon Restoration project was planned in conjunction with the Double Track and I-5 expansion projects with the goal of revitalizing the wetlands with improved circulation for enhanced water quality and plant/wildlife ecosystems, as well as protecting the lagoon from sea level rise. Since the Lagoon Restoration Project would include significant dredging and grading in the vicinity of the existing outfall pipe, the installation of the new outfall pipe prior to this construction was critical to mitigating risk of damaging the existing aged pipe.
- The City of Encinitas' Living Shoreline project was concurrently taking place, with an objective of revitalizing the beach sand dune habitat. Since the Outfall project would have a significant footprint on the beach, it made sense to schedule the outfall installation prior to the Living Shoreline project.

These projects had potential to greatly impact the lagoon due to construction of levees, grading and altering the water level in the lagoon. Kennedy/Jenks worked with SEJPA to lead communication among the various agencies and prompt agreement that it would be advantageous to replace the San Elijo Outfall via HDD prior to, or concurrently with, proposed construction in the vicinity.

MINIMIZED IMPACT TO PUBLIC DURING CONSTRUCTION

As one of the most popular beaches in southern California, it was critical to prioritize public access during construction. The staging area footprint at the beach was minimized to enhance public access around construction



on the beach. Since summer is the most popular time for beach-goers, construction was performed during winter. However, winter construction on the beach is subject to higher surf and storm surge conditions. A “beach pad” with surf/surge protection devices crafted from large sand bags had to be constructed to protect workers and equipment. Extensive pedestrian traffic controls ensured that the existing bike lane was maintained open throughout construction. Traffic control was designed for work in the public right-of-way, with flagmen to maintain traffic flows on PCH for equipment and trucks entering and leaving the site. Sound curtains provided the added benefit of noise mitigation.

AVOIDANCE AND MINIMIZATION OF IMPACTS TO RESOURCES

Kennedy/Jenks specifically designed the project to avoid and minimize impacts to U.S. waters and other sensitive resources. At least five threatened or endangered birds occupy the San Elijo Lagoon, including the California least tern, the light-footed clapper rail, Belding’s savannah sparrow, the brown pelican, and the western snowy plover. It was critical to avoid adverse impacts on these species. This was accomplished by restricting activities and work space at the HDD beach launching site and receiving site at the SEWRF. At the beach, the construction access, staging and storage areas are restricted to uplands and as far east as possible from the mean high water and high tide line for the Pacific Ocean. Noise mitigation curtains were installed. Temporary sand berms and installation of steel sheet piles were constructed to prevent surge into the work area. Containment requirements and strict adherence to Coastal BMPs were required by Kennedy/Jenks to prevent inadvertent impacts.



The pipeline design was designed to be forward compatible with the City of Encinitas’ Living Shoreline project. SEJPA and Encinitas staff had ongoing coordination to facilitate mutually successful and compatible projects, including construction schedules and verifying depths and clearances between the outfall replacement and the rip rap bank protection proposed under the living shoreline project. SEJPA’s proposed schedule with construction completion by Spring 2018 enabled a portion of the existing outfall pipe to be used temporarily as part of the Lagoon Restoration project to reduce the cost, schedule and environmental impacts of transporting dredged sand from the lagoon as proposed under the Lagoon Restoration project.

Kennedy/Jenks and SEJPA worked closely with the San Elijo Lagoon Conservancy to sync the outfall replacement with the Lagoon Restoration Project, designed to increase flow of healthy water to the lagoon, wildlife diversity, and increase resiliency to Sea Level Rise.

COMPLEXITY

SUCCESSFUL MULTIPLE JURISDICTIONAL AGENCY COORDINATION AND PERMITTING

The permitting process for the Land Outfall Project was extensive and complex, which created concerns for the ability to meet the necessary construction schedule. The land outfall traverses the environmentally sensitive San Elijo Lagoon, North County Transit District railroad tracks, and the PCH so it lies within the jurisdiction of multiple local, state and federal agencies that required permits to successfully implement the project. The agencies having jurisdiction over the project include the United States Army Corps of Engineers (USACE), United States Fish and Wildlife Service (USFWS), California Department of Fish and Wildlife (CDFW), Regional Water Quality Control Board (RWQCB), California Coastal Commission (CCC), City of Encinitas, North County Transit District (NCTD), County of San Diego Parks & Rec Department and California State Lands Commission (CSLC). Kennedy/Jenks teamed with Helix Environmental to secure permits to meet the construction schedule.

DETAILED PLANNING OF THE OUTFALL CONSTRUCTION PHASE TO PROTECT ENVIRONMENT, COMMUNITY AND OWNER

Kennedy/Jenks worked closely with the owner to determine the appropriate risk allocation for the drilling. To protect the owner, the contractor was required to fulfill parameters as described below, while given some freedom and associated risk burden to select their own means and methods.

Horizontal Directional Drilling (HDD) Procedure. Construction occurred in a single phase over a total duration of approximately four months, beginning with installation of 60-inch casing pipe (within PCH ROW) and launching of the HDD pilot bore at the beach. The directional drilling and reaming was completed in six to eight weeks. Pipeline

was assembled at the SEWRF; an additional week was taken to insert the pipeline from the SEWRF and pull it from the beach. Two more weeks were required to make the final connection on the beach side to the existing ocean outfall pipe.

HDD Risk Control. The contractor was required to submit an Inadvertent Returns (frac-out) and Surface Spill Contingency Plan with procedures for preventing drilling fluid losses or returns to the surface. The plan addressed: roles and responsibilities of involved parties; monitoring; prevention; containment; cleanup; documentation procedures; and observations to be made if spills or hydrofracture occurred, including provisions for containment and cleanup of an in-water hydrofracture event. The plan also addressed changes that may be required to the contractor's operations to avoid recurrences. For the length of the new outfall installation, the depth of the pipe was very deep below ground surface (up to 70 feet), which greatly reduced the risk of fluids migrating to the surface. During drilling, the contractor was required to use a down hole pressure monitoring tool that provided additional information regarding bottom hole pressure that could be compared against calculated maximum allowable drilling fluid pressure. The SEJPA Resident Engineer was on-site for the construction period and compared the measured down-hole pressures to the maximum allowable pressures and minimum required pressures calculated from a hydrofracture risk evaluation prior to start of the bore. If actual downhole pressures approached maximum allowable values, the resident engineer was to advise the contractor so they could modify drilling practices and further minimize frac-out risks.



The excavation at the beach was protected from tidal influences so that reconnection to the existing outfall could be completed.

Staging Area. Two construction staging areas were required, including one at the beach and one at the SEWRF. The primary staging area was located solely within the secured SEWRF site that served as the principal area for staging of material, equipment and labor.

The secondary staging site on the beach was an approximately 200-foot by 100 foot rectangular area that accommodated the HDD launch site. This staging area contained only the necessary equipment to perform the HDD operation, including the drill rig, mud pumps, spoils separation plant, drill rod trailer, crane, baker tank and control cab. The study of recent tidal data and expected future sea level rise led to requirements for the contractor to protect the site from tidal influence. The contractor was enabled to select from several



The contractor elected to construct a sandbag platform backfilled with sand to elevate the work area above the high tide line.

temporary methods consistent with the permitting requirements for the project, such as: constructing an elevated platform; berming or sandbagging perimeter of work; or use of interlocking steel sheet piling. The contractor opted for a combination of the first and third options. All equipment, sand bags, sheet piling and related protective measures were required to be removed by the contractor and the work area was returned to existing conditions.

SUCCESSFUL FULFILLMENT OF CLIENT/OWNER NEEDS

The Outfall Replacement Project was successfully completed using a compressed construction schedule while successfully coordinating with other critical regional projects to meet the owner's strategic objectives of:

- Protection of the San Elijo Lagoon.
- A reliable wastewater/recycled water system.
- Minimal community and environmental impacts.
- Promoting effective collaboration with area jurisdictional agencies.

The project has been considered a great success in meeting these objectives and will provide service to the North County Communities for many years to come.