OTHER SCHEDULED ITEMS **BELVEDERE CITY COUNCIL**
MARCH 12, 2018

To: Mayor and City Council

From: Robert Zadnik, Public Works Manager
Craig Middleton, City Manager

Subject: Report on the Beach Road Seawall Repair Project

Recommended Motion/Item Description

Consider the proposed design options and authorize staff to initiate geotechnical and structural work for a permanent repair to the Beach Road Seawall.

Background

Over the last year, Public Works has observed measurable outward movement on a portion of the Beach Road Seawall, directly adjacent to Peninsula Road. This movement was discovered when the cap of the concrete wall began to develop cracks and spalling. The root cause of this wall migration is wave action that is undermining the foundation of the concrete wall. In 2015, the City addressed a similar defect to a section of the Beach Road Seawall near Main Street.

Findings

As part of the work funded by the Local Levee Assistance Program, Department of Water Resource (DWR) grant, CLE Engineering (CLE) performed a structural inspection of the seawalls comprising portions of the Beach Road levee.

The concrete seawalls were found to be in typical condition for their age, showing cracking of the concrete caps and spalling around penetrations. In addition to these typical conditions, CLE identified a global issue of insufficient footing depth. This has resulted in localized failures of the wall in the past due to rotation and/or sliding – likely caused by scouring of the beach profile over time. As sand and mud have been removed by wave action, the seawall has been undermined and has begun to shift. It is likely that the shallow footing condition exists along the entire length of the seawall.

It is important to note that the condition of the seawall is such that it can be augmented rather than replaced. Once the foundation is stabilized and strengthened, the seawall will be able to support upward extensions if warranted.

According to CLE, the most effective way to stabilize and strengthen the seawall foundation is through the use of sheet piles that would be driven into the bay mud and attached to the wall. While

more expensive than a temporary fix, the use of sheet piles would provide a permanent repair that would allow for a variety of options for improving the effectiveness of the seawall in the future.

Options to protect the City from flooding are currently being studied; they include various treatments that would enhance the ability of the seawalls/levees to handle rising seas and 100-year storm events.

Stetson Engineering, Miller Pacific Engineering Group, and CLE Engineering are currently considering a wide range of reasonable coastal flood protection measures for Belvedere. That preliminary list is being evaluated through the following criteria:

- Resiliency and adaptability to sea level rise
- Engineering practicality and constructability
- Environmental impacts/regulatory permitting acceptability
- Ease of operation and maintenance
- Cost: Capital and O&M
- Impacts on adjacent properties and navigability/community acceptability
- Flood protection effectiveness/benefits

At the February 28, 2018, Citizens' Flood Zone Committee (CFZC) meeting, the aforementioned criteria and a list of preliminary flood protection options were presented to the group. Given the high cost of construction, along with the known regulatory restrictions for offshore structures, the Committee unanimously agreed that sheet piles and an incremental raise of the Beach Road seawall was the preferred, and most feasible, flood protection measure for Beach Road.

Stetson Engineering and staff will continue to work with the CFZC to select the final evaluation criteria, and will seek feedback from the Committee throughout the remaining alternatives evaluation process.

Near-Term Options

Stabilizing the seawall at Beach Road is time sensitive; it should be done as soon as possible. To protect against further undermining and to stabilize the seawall, coastal structural and geotechnical engineers have provided staff with repair options and preliminary budgets.

Option 1: A minimal effort repair would include removing the sidewalk and installing a series of tiebacks and dowel pins, essentially locking in the wall from any future movement. This type of repair was performed in 2015 for a similar seawall defect near Main Street, and was intended to be the first of a phase of a permanent repair. It's important to note that this category of repair has considerable throw-away costs when compared to the next option. Cost for this repair option is estimated at approximately $70,000, however further investigation of the soil conditions under the sidewalk could have an impact on the scope and dollar estimate.

Option 2: The long-term repair consists of sheet piles installed along the bayward toe of the seawall foundation (see first attachment). The proposed sheet piles would be driven into the soil to an approximate depth of 20-40 feet and secured to the toe of the existing wall. The total length of the sheet piling would extend approximately 60-80 linear feet along Beach Road.

Stabilization though sheet piles, and ultimately the buildup of the Beach Road Seawall, as depicted in the second attachment, was identified during the February 28th CFZC meeting as the most promising and feasible design option for resiliency and future flood protection. Given that this repair option can be easily incorporated into the global seawall fix, and that it would therefore minimize throw-away cost, it presents the most compelling option. CLE has provided staff with a preliminary budget estimate for the work, ranging from $290,000 - $375,000. Further geotechnical and structural investigation is needed to hone in the length of the repair area and required depth of the sheet piles. Some of the design and structural evaluation work may be covered under the DWR grant.

Fiscal Impact

With either option, funds will be reallocated from the existing FY2017-18 Capital Improvement Budget, and likely carried over into 2018-19. A significant source of funds for Option 2 would be the budget for Bayview Avenue road repair projects funded with Road Impact Funds.

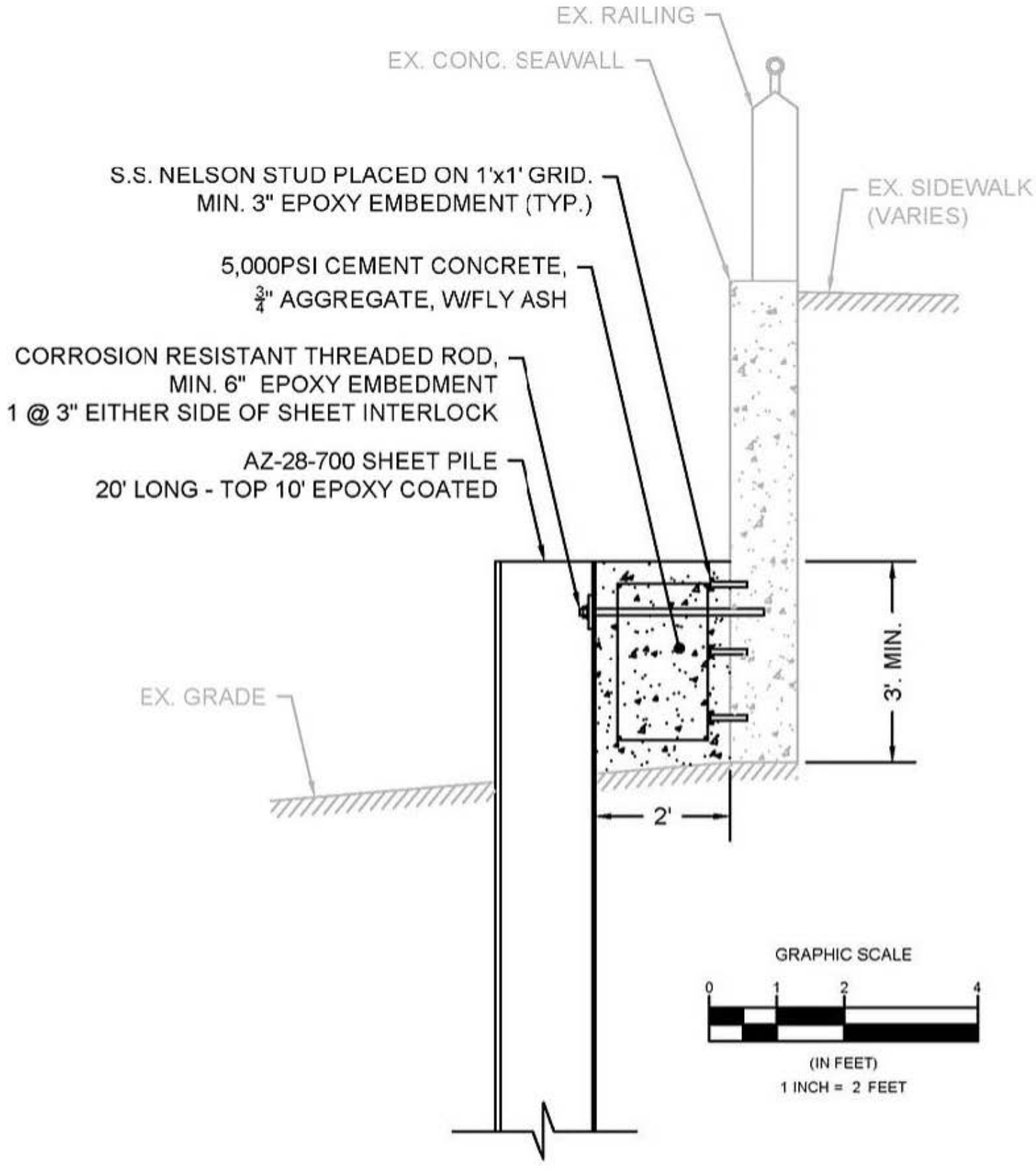
Recommendation

Approve staff's recommendation to fund the long-term Beach Road Seawall Repair and authorize staff to initiate further structural and geotechnical work.

Attachments

- Beach Road Seawall Phase 1 Design
- Beach Road Seawall Phase 2 Proposed Concrete Cap

ATTACHMENT 1



PROPOSED SHEET PILE TOE PROTECTION
BEACH ROAD

LOCATION
BELVEDERE, CA

CLIENT
CITY OF BELVEDERE

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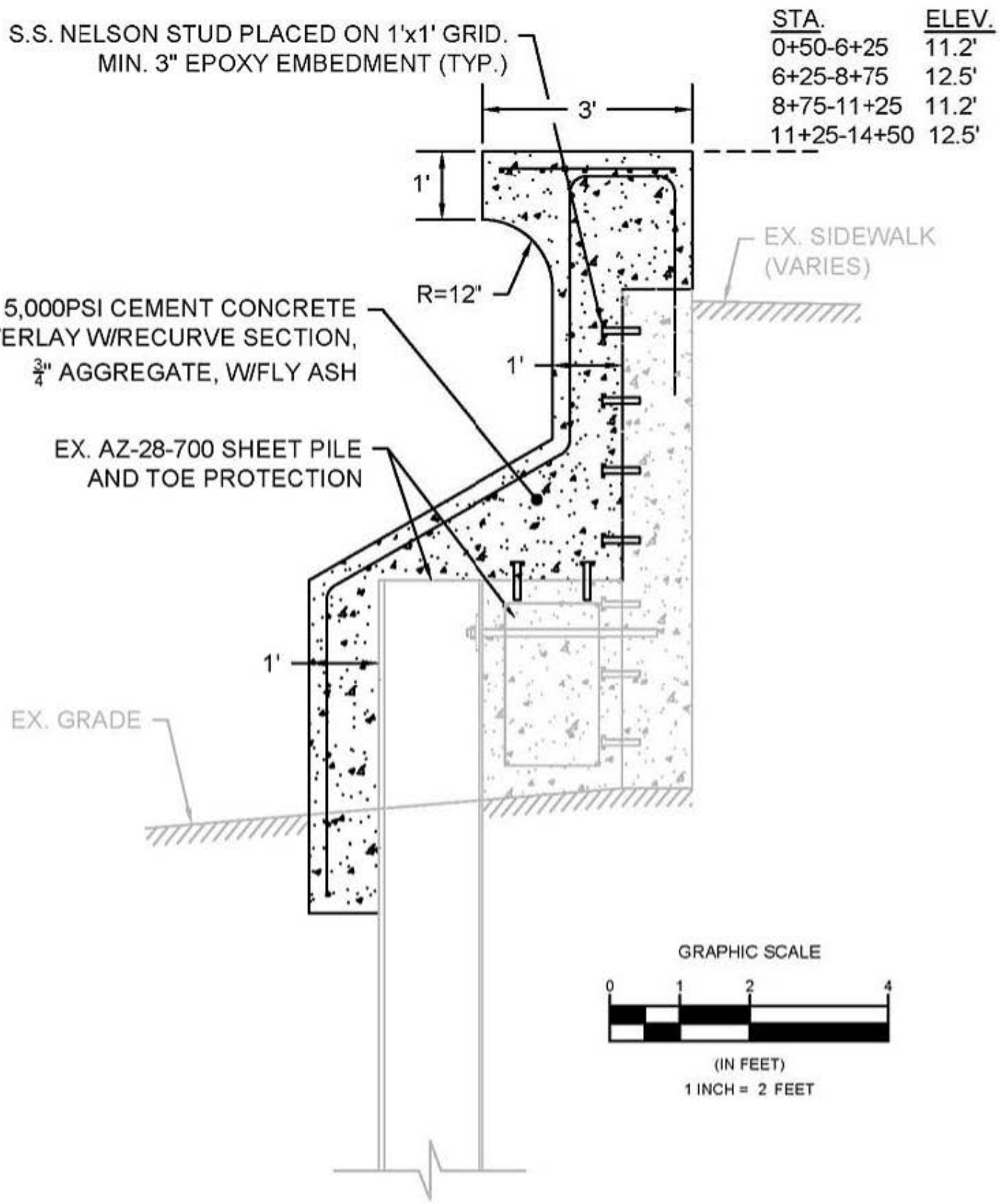

PROPOSED SEAWALL OVERLAY
BEACH ROAD

LOCATION
BELVEDERE, CA

CLIENT
CITY OF BELVEDERE

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