

**SPECIAL MEETING
COMMITTEE TO PROTECT BELVEDERE’S SEAWALLS,
LEVEES, AND UTILITIES
THURSDAY, JUNE 6, 2019, 1:00 P.M.
BELVEDERE CITY HALL – COUNCIL CHAMBERS
450 SAN RAFAEL AVENUE
BELVEDERE, CALIFORNIA**

AGENDA

OPEN FORUM

This is an opportunity for any citizen to briefly address the Committee to Protect Belvedere’s Seawalls, Levees, and Utilities on any matter that does not appear on this agenda. Upon being recognized by the Chair, please state your name, address, and limit your oral statement to no more than three minutes. Matters that appear to warrant a more lengthy presentation or Committee consideration may be agendaized for further discussion at a later meeting.

SCHEDULED ITEMS

1. Approve minutes of the June 3, 2019, meeting.
2. Continued discussion and review of various proposed approaches and design alternatives developed to protect the City from flooding and sea level rise and selection a combination of protection measures for recommendation to the City Council.
3. Wrap up and review of Committee’s progress and recommendation.

ADJOURN

NOTICE: WHERE TO VIEW AGENDA MATERIALS

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**COMMITTEE TO PROTECT BELVEDERE'S
SEAWALLS, LEVEES, AND UTILITIES
MONDAY, JUNE 3, 2019, 5:00 P.M.
BELVEDERE CITY HALL - COUNCIL CHAMBERS
450 SAN RAFAEL AVENUE
BELVEDERE, CALIFORNIA**

MINUTES

COMMITTEE PRESENT: Denise Bauer, Justin Faggioli, Glenn Isaacson, Ken Johnson, Nancy Kemnitzer, Bob McCaskill, William Rothman, Larry Wheat, Sally Wilkinson, and Chair Jim Lynch

COMMITTEE ABSENT: Andrew Allen

OTHERS PRESENT: City Clerk Alison Foulis, City Manager Craig Middleton, Stetson Engineer James Reilly, Miller Pacific Engineer Scott Stephens, and Public Works Manager Robert Zadnik

CALL TO ORDER OF REGULAR MEETING

The meeting was called to order at 5:03 PM by Chair Lynch.

OPEN FORUM

No one wished to speak.

SCHEDULED ITEMS

1. **Approve minutes of the May 28, 2019, meeting.**

The minutes were approved as presented.

2. **“Integrated Planning and Long-Range Perspective” presentation and discussion led by Matthijs Bouw, Founding Principle of One Architecture.**

Chair Lynch introduced the speaker, Matthijs Bouw, and welcomed him to the meeting. Mr. Bouw discussed his work in the field of resiliency and coastal adaptations. Mr. Bouw shared his current project, The Big U, an integrated coastal protection project in Manhattan, NY, that began following

the Hurricane Sandy extreme storm event. Mr. Bouw emphasized the importance of the potential dual-use of flood structure, integrating human activity into project proposals, and careful consideration of the future adaptability of a project.

The Committee asked questions of Mr. Bouw regarding the alternatives to barriers in a project design, the Resilient by Design Bay Area Challenge, and the reliability of deployables (such as aqua fences or dams) in long term solutions. Mr. Bouw commented that, while the City will likely need to look at barriers for its initial project, it should also consider which design has the most potential for co-benefits and adaptability in the future. When asked about strategies for establishing community consensus on the appropriate project design, Mr. Bouw encouraged public discussion on the benefits, feasibility and risk reduction associated with certain designs as well as easily understandable graphic materials.

Chair Lynch called for public comment and Thomas Cromwell asked about the durability and reliability of deployables over time. Mr. Bouw responded that there is some uncertainty with long term use of deployables and the Committee discussed the topic further. The Committee confirmed with Stetson Engineer James Reilly that the Tiburon barrier portion of the proposed project could be delayed to allow time for more consideration and Mr. Reilly confirmed but noted the extended timeline was not very long.

Chair Lynch and members of the Committee thanked Mr. Bouw for his presentation.

3. Discussion and review of various proposed approaches and design alternatives developed to protect the City from flooding and sea level rise and consideration of selecting a combination of protection measures for recommendation to the City Council.

Stetson Engineer James Reilly led the Committee in discussion on some of the various design alternatives proposed at the four flood pathways in the City.

San Rafael Avenue Levee

The Committee discussed and asked questions about the Alt. 1A and Alt. 2 proposals. Concerns raised about Alt. 1A included neighbor privacy and view blockage, the need for a child-safe railing which would block additional views, the added weight of the elevated path which could lead to roadway stability issues if built up further, and the more difficult adaptability to future sea level rise compared to Alt. 2. The Committee also discussed sheet piling, construction estimates, risk probabilities, and the history of overtopping events on San Rafael Avenue since the rip rap was installed in 1984.

Committee Member Faggioli left the meeting at 6:43 PM.

West Shore Road/San Rafael Avenue Intersection

The Committee reviewed two new proposed alternatives – Alt. 4 which continues the San Rafael Avenue seawall behind the first 6-7 properties along West Shore Road and Alt. 5 which builds a

low wall along a median on the first stretch of West Shore Road. The Committee discussed the West Shore Road residents' likely preference for Alt. 4 and asked questions about the seismic benefits of each alternative. The Committee also considered the use of deployables as a temporary stop gap before a larger project potentially involving walls and flood gates was pursued.

4. Wrap up and review of agenda for next meeting on June 6, 2019.

Chair Lynch distributed a worksheet which he encouraged Committee Members to use in their review of the proposed design alternatives before the Committee meets again on June 6th.

ADJOURN

The Committee meeting was adjourned at 7:12 PM.

THE FOREGOING MINUTES were approved at a meeting of the Committee to Protect Belvedere's Seawalls, Levees, and Utilities on _____ by the following vote:

AYES:

NOES:

ABSENT:

APPROVED: _____

Jim Lynch, Chair

ATTEST: _____

Alison Foulis, City Clerk



CITY OF BELVEDERE

Staff Report

TO: Committee to Protect Belvedere's Seawalls, Levees and Utilities

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

SUBJECT: Considerations and Staff Recommendations

DATE: June 5, 2019

Recommended Motion/Item Description

Consider the information provided to the Committee and the staff recommendations. Determine a set of recommendations to the City Council that facilitate a set of next steps for addressing seismic, flooding and climate related vulnerabilities.

Background

The City Council established the Committee to Protect Belvedere's Seawalls, Levees and Utilities ("Committee") on May 13, 2019. The Committee was created in order to review information and make recommendations related to a number of vulnerabilities that the City faces – severe storm events, sea-level rise, and earthquakes – and the associated failure of utility systems, access routes, and flood prevention infrastructure. The Committee has 11 members, including two members of the City Council and 9 residents from neighborhoods throughout the City. The City Manager and Public Works Manager staff the Committee.

The Committee has received materials and oral briefings on: flood risk to public infrastructure and private dwellings; risks to key utility systems that service much of the City (electrical, gas, water, sewer and fire suppression); vulnerability of levees, seawalls, access roads and utility systems to seismic events that can reasonably be expected to occur over the next three decades; and vulnerability of the same to projected levels of sea-level rise over the same period and beyond.

The Committee has also reviewed numerous options for addressing the City's vulnerabilities and strengthening its resilience. These include a number of engineered approaches to reinforcing seawalls and levees; raising current seawall heights; and creating offshore islands, beaches or other structures to dissipate wave energy. Some of these solutions can be accomplished entirely within the jurisdictional boundaries of Belvedere; others will require the cooperation and

participation of the neighboring Town of Tiburon. All options would require regulatory approval, environmental analysis, and more refined costing prior to their implementation by the City.

Information about the cost of each alternative has been provided to the Committee. However, these cost estimates are conceptual at this point, and are therefore useful primarily as a tool in comparing various alternatives. The Committee has not been charged with determining how best to fund its recommended approach; that task will be taken up by Belvedere's Finance Committee when more detailed cost information becomes available later in the year.

The Committee has also had an opportunity to consider recommendations from Matthijs Bouw, a prominent urban architect/planner from the Netherlands, as to the importance of looking for options that are adaptable to changing conditions and that offer "co-benefits" that improve the livability of our community. Bouw also pointed out that future regulatory regimes may be more supportive of offshore nature-based elements than is currently the case, and that a longer-term approach that allows for continued adaptation may be the best way to take advantage of evolving perspectives.

The Committee has been asked by the City Council to present its recommendations on June 10th in public session. The Council would then be in a good position to give direction to consultants and staff as to its priorities and preferences relative to the next body of analysis. The Council could also call for public meetings to be held, preferably in the Fall of 2019, at which vulnerabilities and solutions, as well as livability enhancement questions could be discussed. As better cost numbers are developed, the Council could also charge the Finance Committee with the task of developing financing options. Most financing options that are envisioned currently would ultimately require the support of Belvedere's voters.

Sources of state, local and federal funding will also be explored. While no known grants are open at this time, it is speculated that a Federal Infrastructure bill may be available in the future. Under this scenario, projects that are shovel-ready would likely be first in line for funding.

Considerations

At this juncture, as the Committee prepares to consider the whole of the information presented and develop its recommendations, staff would stipulate the following as particularly relevant issues:

- There is a near-term significant possibility of failure of parts of the Beach Road seawall due to insufficient anchoring and undermining of the structure by wave action over decades.
- Combined still water and wave run up from a 100-year storm in today's conditions will overtop the levees at low points.
- Portions of the levee at San Rafael Avenue are low relative to expected future king tide levels, and sheet flow of still water through these low-level areas of the levee would

cause widespread flooding. This condition is exacerbated by settling of the levee, which is expected to continue, and will lower its height relative to water levels in the Bay.

- Significant flooding at San Rafael and Beach Road levees, and/or sustained exposure through frequent flooding or overtopping events, would have a deleterious effect on utilities. Salt water incursion will cause damage to electrical transformers and sewer lift stations, causing disruption in service primarily to residents of Belvedere Island.
- The State of California estimates conservatively that water levels in the Bay are likely to rise by 1.1 feet within the next 30 years; and by 3.5 feet by the end of the century.
- A significant seismic event would likely cause deformation of levees, particularly at Beach Road, where the seawall could move seaward seven or more feet. A major factor is the presence of unstable liquefiable sands and bay mud that exist below each levee. Anchoring walls to the more stable stratum beneath these soils would provide significant levels of stability.
- Utility pipes embedded in each of the levees are made of rigid material - steel or clay - which is not flexible and is therefore subject to breakage during a seismic event.
- Fire suppression, which depends to a great degree on pressurized fire hydrants throughout the City, would be severely hampered if supply lines embedded in the levees were to be disrupted by a seismic event. It is often the case that residential gas lines break during major earthquakes, which could create a significant fire risk with only limited capability for addressing it.
- Belvedere Island and much of the Lagoon area is accessed by Beach Road and San Rafael Avenue. Ingress and egress for the population, as well as for first responders, is dependent on these two access routes, as emergency access capability via water has not yet been developed. Significant deformation of the levees, or sustained flooding, could result in the island becoming isolated from the mainland for extended periods of time.
- The cost of repairing a major seawall or utility system failure, in the aftermath of a region-wide seismic or flooding event, could well exceed the cost of taking preventative measures prior to such an event. Obtaining financing during an emergency could be difficult and the cost of financing undeterminable.

While one can reasonably debate the level of near-term or longer-term risk related to these vulnerabilities (earthquakes and sea level rise projections are based on probabilities), it is staff's view that these vulnerabilities are real; that they present significant risks to the people of Belvedere and to the public assets of the City; and that they are not confined to any single neighborhood.

Recommendations

The Council and City staff are looking to the Committee for recommendations as to how best to protect the City's residents and public infrastructure. Importantly, it is hoped that the Committee will assist in narrowing the range of options that have been considered, so that the City can focus its further work and limit the expense associated with the next phase of study.

Staff would, at this juncture, offer some thoughts as to priorities:

- Given the very real present vulnerability of the Beach Road seawall, as well as the ever-present risk of an earthquake, enhancing the near-term stability of this seawall should be a high-priority item.
- Given the age and rigidity of the current infrastructure (water supply, fire suppression, and gas and sewer lines) embedded in both Beach Road and San Rafael Avenue levees, efforts should be made to encourage PG&E, MMWD, Sani 5 and other utility providers to replace their underground utility structures with more flexible options as soon as possible.
- The City has worked for years to underground its electrical utilities in order to achieve a variety of benefits, not the least of which is fire protection. Because of the ever-present risk of fire and its potentially devastating consequences, particularly to Belvedere Island, any solution should strengthen the survivability of water supply lines embedded in the levees. This should be a high priority.
- Sea-level rise estimates vary, but all point to significant rises in bay levels over the next several decades. To be good stewards of public resources, seawalls and other protective infrastructure should be designed so as to be adaptive to changing circumstances. Configurations and approaches that are most adaptable should be given priority consideration.
- While the focus of this effort is primarily related to the protection of public assets; the provision of public safety to Belvedere citizens; and the avoidance of future catastrophic costs for infrastructure repair and replacement, actions to build a more resilient City are also likely to have a positive effect on home values and insurance rates.

We are grateful for the opportunity to learn lessons from projects in the nearby area, and from the experiences of other cities, which have been grappling with the complexities inherent in projects that must address multiple challenges. While the creation of offshore berms or islands may not be effective against sea-level rise (as stated by the county environmental engineer), they may be worthy of further consideration for their environmental and wave attenuation benefits.

We also appreciate the early involvement of the Bay Conservation and Development Commission (BCDC) and urge continued interaction with regulators as the project moves into subsequent phases of design.

Advice provided by Matthijs Bouw to view various solutions as parts of an integrated whole, and to plan for long-term multiple benefits for Belvedere, is well-taken.

In order to facilitate conversation by members of the Committee, staff proposes the following specific design and sustainability recommendations for consideration:

1. That the City Council undertake to develop designs and schematic-level cost estimates for the following:
 - Seismic strengthening of both levees to ensure against their deformation in the event of significant earthquake.
 - A raised seawall along San Rafael Avenue to protect against a rise in sea level of 1.1 feet plus some wave protection, designed so as to be adaptable to higher sea levels if needed. Staff recommends the configuration that would involve construction of a vertical seawall with plantings and a walking path on the street side of the wall (Alternative 2). This alternative would provide the best integration with a sheet pile approach to seismic strengthening. It would also protect the privacy of adjacent homeowners by preserving the walking trail at street level.
 - A raised seawall along Beach Road to be located in the median strip. Of the alternatives presented, this configuration (Alternative 2B) would have the least visual impact on homes on the bay side of Beach Road. It would also require fewer openings in the wall, and would therefore serve more reliably as a flood barrier. (Further refinement and adaptation of this wall with respect to co-benefit designs could be considered during the later Planning Design Review phase.)
2. That the City conduct further analysis of a berm or wall on the bay side of 6-7 homes on West Shore Road. While staff believes that a bay side berm or wall would likely offer the most benefit for residents of West Shore Road, this preferable option requires more analysis to determine its feasibility. The option of raising the road at the intersection may suffice, at least for the next several decades. A new option (Alt. 5) that would construct a floodwall in the center of West Shore Road may merit further investigation; however, road width, parking and traffic flow constraints may be disqualifiers.
3. That the City initiate discussions with the Town of Tiburon about its preferences for dealing with potential flooding risks to both its downtown district and to Belvedere, and that these discussions inform decisions by Belvedere as to how best to deal with flood risks from Tiburon. The goals of these discussions would be: 1) to agree on a reliable solution that would be most beneficial to Tiburon and Belvedere, and 2) to determine whether to include Tiburon flood control barriers in a first round of projects; to construct a flood wall within Belvedere's city jurisdiction; or to study the issue further.

4. That the City initiate discussions with utility providers with the objective of ensuring the timely replacement of key pipes and conduits in levees with flexible products that will improve systemic viability in the event of a significant earthquake.

In addition to these recommendations, staff believes that Belvedere is in a unique position to share its experience in dealing with the set of complex issues presented by climate related and seismic challenges, and to educate others. As well, in order to demonstrate the City’s willingness to contribute to addressing the root causes of climate change, the City should redouble its efforts to reduce its reliance on carbon-rich sources of energy. Staff would therefore urge consideration of the following additional recommendations:

5. That the City seek to develop partnerships with scientific, environmental and educational organizations with the goals of: 1) using Belvedere’s experience as an early implementer of resilience measures to educate others about challenges and possible solutions to issues related to sea-level rise and climate change; 2) providing opportunities for students and citizens to assist in monitoring impacts and identifying potential co-benefits and opportunities to enhance the natural environment in Belvedere and beyond; and 3) participating in regional and national conversations about the resilience challenges faced by small communities.
6. That the City and its residents endeavor to reduce their reliance on carbon-based fuels and energy sources by promoting “deep green” energy; committing to replace its gasoline-powered municipal fleet over time; and installing solar panels on municipal buildings where feasible.

Fiscal impact of staff recommendations

As has been mentioned many times throughout the Committee’s deliberations, cost estimates are very preliminary at present. Based roughly on conceptual cost estimates that Stetson Engineers has provided to this Committee, the costs associated with staff’s recommendations are as follows:

Project	Cost range (\$M)
Seismic strengthening of Beach Road and Floodwall in Median (2B)	8.8 – 10.8
Seismic strengthening of San Rafael Avenue Levee	5.5
Concrete floodwall on bay side of landscaped pedestrian pathway	1.6 – 2.1
Floodwall on bay side of six homes on West Shore Road, or Raise of intersection/other	NA 1.1 – 1.8
Total Cost Range	17 – 20.2
Total Adjusted Cost Range (with 30% contingency)	22.1 – 26.3

Any potential costs to Belvedere related to flood control measures undertaken in Tiburon are unknown at this time. Any costs to Belvedere associated with prioritizing the replacement of rigid utility pipes and conduits are also unknown at this time.

Any costs associated with staff recommendations #5 and #6 could be accommodated within the City's annual operating and capital budgets

Recommended Motion/Item Description

Consider the information provided to the Committee and the staff recommendations. Determine a set of recommendations to the City Council that facilitate a set of next steps for addressing seismic, flooding, and climate related vulnerabilities.