

# 9 Evaluation of Alternatives

## 9.1 Review of Findings

### 9.1.1 Alternative 1A – Tunnel Beginning of Canal to New Outfall Considerations

#### Public Benefits and Impacts

The following public benefits and impacts should be considered in the preferred alternative selection process:

- This alternative would provide stormwater re-use benefits including wetlands development opportunities.
- This alternative would increase the level of flood protection.
- This alternative would reduce the likelihood of localized flooding caused by the design storm event.
- This alternative would decrease the likelihood of stormwater overflows into Lake Merced.
- This alternative would reduce the amount of debris deposited along the beach.
- This tunnel alignment and tie-in may not permanently affect the lands under consideration for wetlands enhancement.
- This alternative can be combined with an Alternate 9 stormwater storage option.

#### Geologic and Geotechnical Issues

The geologic and geotechnical assessments provided insight into anticipated tunneling and excavation conditions. The following geologic and geotechnical issues should be considered in the preferred alternative selection process:

- A significant landslide potential exists near the proposed new outfall structure. Landslides would complicate the tunnel excavation and would likely have a significant impact on future operation and maintenance of the required outfall structure.
- The proposed outfall structure and a portion of the tunnel would need to be designed to anticipate continued shoreline erosion and bluff retreat.

#### Utility Issues

The following utilities may affect the design and construction of in-line debris screening devices:

- A 20-inch-diameter natural gas transmission pipeline beneath Lake Merced Boulevard.

The following utilities may affect the design and construction along the Vista Grande Canal:

- A 33-inch-diameter gravity wastewater treatment plant effluent pipeline,
- Overhead electric distribution lines,
- Underground telecommunications lines.

#### Right-of-Way Issues

Applicable authorities would need to agree to the land use for construction staging areas and permanent facilities. The following stakeholders would be involved in the right of way and easement discussions:

- City of Daly City,
- City and County of San Francisco,
- Olympic Club,

- State of California (Caltrans and State Parks),
- California Coastal Commission, and
- Golden Gate National Recreation Area.

#### Permitting and Easement Issues

The following permit and easement issues should be considered:

- Multiple permits and easements, described in Section 8, may be required.
- Permitting a new outfall structure on the coast is anticipated to be difficult and time consuming.
- There is limited staging area available at the east end of the tunnel. A temporary construction easement from the Olympic Club may be required.

#### Constructability Issues

Construction costs and risks will be affected by an alternative's complexity, site access and constraints, ease of access, and other factors. To minimize construction costs and risks, the following constructability issues should be considered in the preferred alternative selection process:

- Traffic at the intersection of Lake Merced Boulevard and John Muir Drive would be disrupted and relocated during construction.
- Residents near the intersection of Lake Merced Boulevard and John Muir Drive could be disturbed by the construction noise.
- Vibrations from shaft construction may disturb residents within 300-feet of sheet pile and soldier pile driving activities.
- Construction could induce surface settlement in adjacent structures along the tunnel alignment or bluffs.
- Tunnel vibrations may be noticeable to some residents within a 100-foot-wide corridor along the tunnel alignment. It is anticipated that vibrations will be most noticeable at night and will primarily be caused by muck trains traveling in the tunnel. Flexible mining schedules may be required for the proposed tunnel project in the vicinity of apartments or residences.
- The estimated tunnel and outfall construction duration is 18 months, which includes an average tunneling production rate of about 50 feet per day (20 hours per day mining).

#### Potential Operations and Maintenance (O&M) Issues

The lifecycle costs will be driven largely by O&M expenditures. The following O&M issues should be considered in the preferred alternative selection process:

- Two separate debris screening facilities would be required: a primary facility in the new canal box culvert, and a secondary facility at the existing Daly City Outfall Tunnel entrance to screen residual debris blown into the open canal.
- Screening devices and systems would require monitoring throughout the winter.
- Periodic maintenance of the screening devices and systems would be required.
- Debris screening devices would require periodic debris removal and cleaning. This would be particularly important following the first flush caused by the early season rain storms.

### 9.1.2 Alternative 4 - Tunnel South of County Line along Northgate Drive Considerations

#### Public Benefits and Impacts

The following public benefits and impacts should be considered in the preferred alternative selection process:

- This alternative would provide stormwater re-use benefits, including wetlands development opportunities.
- This alternative would increase the level of flood protection.
- This alternative would reduce the likelihood of localized flooding caused by the design storm event.
- This alternative would decrease the likelihood of stormwater overflows into Lake Merced.
- This alternative would reduce the amount of debris deposited along the beach.
- This tunnel alignment and tie-in may not permanently affect the lands under consideration for wetlands enhancement.
- Temporary unavailability of selected Westlake Park areas could significantly affect the use of the park.
- Residences and community buildings near/in Westlake Park may be disturbed by the construction noise.
- Residents along Cliffside Drive could be disturbed by the noise, lighting, and air pollution during the construction of a receiving shaft.
- This alternative can be combined with an Alternate 9 stormwater storage option.

#### Geologic and Geotechnical Issues

The geologic and geotechnical assessments provided insight into anticipated tunneling and excavation conditions. The following geologic and geotechnical issues should be considered in the preferred alternative selection process:

- A significant landslide potential exists near the proposed new outfall structure. Landslides would complicate the tunnel excavation and would likely have a significant impact on future operation and maintenance of the required outfall structure.
- The proposed outfall structure and a portion of the tunnel would need to be designed to anticipate continued shoreline erosion and bluff retreat.

#### Utility Issues

The following utilities may affect the design and construction of the Cliffside intercept and connection:

- Overhead electric distribution lines,
- A 54-inch-diameter storm sewer along Cliffside Drive,
- A 15-inch-diameter abandoned sanitary sewer east of the ball field,
- An 8-inch- and 10-inch-diameter sanitary sewer beneath Cliffside Drive,
- A 60-inch-diameter high-pressure water main (SFPU), and
- Water distribution lines.

The following utilities may affect the design and construction of the new drainage tunnel:

- A 20-inch-diameter natural gas transmission pipeline beneath Lake Merced Boulevard,
- A 33-inch-diameter wastewater treatment plant effluent gravity line,
- A 27-inch-diameter wastewater treatment plant effluent forced main,

### Right-of-Way Issues

Applicable authorities would need to agree to the land use for construction staging areas and permanent facilities. The following stakeholders would be involved in the right of way and easement discussions:

- City of Daly City,
- Olympic Club,
- State of California (Caltrans and State Parks),
- California Coastal Commission, and
- Golden Gate National Recreation Area.

### Permitting and Easement Issues

The following permit and easement issues should be considered:

- Multiple permits and easements, described in Section 8, may be required.
- Permitting a new outfall structure is anticipated to be difficult and time-consuming.
- There is limited staging area available at the east end of the tunnel. A temporary construction easement from the Olympic Club may be required.

### Constructability Issues

Construction costs and risks will be affected by an alternative's complexity, site access and constraints, ease of access, and other factors. To minimize construction costs and risks, the following constructability issues should be considered in the preferred alternative selection process.

- Traffic at the intersection of Lake Merced Boulevard and the entrance to Westlake Park would be disturbed by dump truck traffic during construction.
- Residents near Cliffside Drive could be disturbed by construction noise.
- There is limited staging area available at Westlake Park. Use of the park would be interrupted during construction.
- Vibrations from shaft construction may disturb residents within 300-feet of sheet pile and soldier pile driving activities.
- Construction vibration may induce ground settlement in adjacent structures along the tunnel alignment or bluffs.
- Tunnel vibrations may be noticeable to some residents within a 100-foot-wide corridor along the tunnel alignment. It is anticipated that vibrations will be most noticeable at night and will primarily be caused by muck trains traveling in the tunnel. Flexible mining schedules may be required for the proposed tunnel project in the vicinity of apartments or residences.
- The estimated tunnel and outfall construction duration is 18 months, which includes an average tunneling production rate of 50 feet per day (20 hours per day mining).

### Potential Operations and Maintenance Issues

The lifecycle costs will be driven largely by O&M expenditures. The following O&M issues should be considered in the preferred alternative selection process:

- Two separate debris screening facilities would be required; a primary facility in the new canal box culvert, and a secondary facility at the existing Daly City Outfall Tunnel entrance to screen residual debris blown into the open canal.
- Screening devices and systems would require monitoring throughout the winter.
- Periodic maintenance of the screening devices and systems would be required.

- Debris screening devices would require periodic debris removal and cleaning. This would be particularly important following the first flush caused by the early season rain storms.

### **9.1.3 Alternative 5B - Tunnel 1/3 Up Canal to Existing Outfall Considerations**

#### Public Benefits and Impacts

The following public benefits and impacts should be considered in the preferred alternative selection process:

- This alternative would provide stormwater re-use benefits including wetlands development opportunities.
- This alternative would increase the level of flood protection.
- This alternative would reduce the likelihood of localized flooding caused by the design storm event.
- This alternative would decrease the likelihood of stormwater overflows into Lake Merced.
- This alternative would reduce the amount of debris deposited along the beach.
- During construction, this tunnel alignment would affect the areas being considered for wetlands development along John Muir Drive. Scheduling the wetlands development to follow the tunnel construction would eliminate this conflict.
- This alternative could increase the amount of area being considered for wetlands development along John Muir Drive. Wetlands could be constructed on top of the new box culvert.
- The modifications to the existing outfall structure could include pulling the outfall back into the cliffside, thereby improving the beach access around the outfall.
- This alternative can be combined with an Alternate 9 stormwater storage option.

#### Geologic and Geotechnical Issues

The geologic and geotechnical assessments provided insight into anticipated tunneling and excavation conditions. The following geologic and geotechnical issues should be considered in the preferred alternative selection process:

- The proposed rehabilitated outfall structure and a portion of the tunnel would need to be designed to anticipate continued shoreline erosion and bluff retreat.

#### Utility Issues

The following utilities may affect the design and construction along the Vista Grande Canal and new drainage tunnel:

- Overhead electric distribution lines,
- Underground telecommunications lines,
- A 33-inch-diameter wastewater treatment plant effluent gravity line, and
- Four-inch- and 2-inch-diameter natural gas distribution lines.

#### Right-of-Way Issues

Applicable authorities would need to agree to the land use for construction staging areas and permanent facilities. The following stakeholders would be involved in the right of way and easement discussions:

- City of Daly City,
- City and County of San Francisco,
- Olympic Club,

- State of California (Caltrans and State Parks),
- California Coastal Commission, and
- Golden Gate National Recreation Area.

#### Permitting and Easement Issues

The following permit and easement issues should be considered:

- Multiple permits and easements, described in Section 8, may be required.
- Permitting the rebuilding of the existing outfall structure may be time-consuming.
- There is limited staging area available at the east end of the tunnel. A temporary construction easement from the Olympic Club may be required.

#### Constructability Issues

Construction costs and risks will be affected by an alternative's complexity, site access and constraints, ease of access, and other factors. To minimize construction costs and risks, the following constructability issues should be considered in the preferred alternative selection process:

- Residents along John Muir Drive would be disturbed by the noise, traffic, and air pollution caused by construction activities.
- Traffic along John Muir Drive would be disturbed by dump truck traffic during construction.
- The construction staging area between John Muir Drive and the Vista Grande Canal is limited.
- Work in the existing canal may require stormwater diversion and infrequent work stoppages.
- Vibration from shaft construction may disturb residents within 300-feet of sheet pile and soldier pile driving activities. Construction vibration may induce ground settlement in adjacent structures along the tunnel alignment or bluffs.
- Tunnel vibrations may be noticeable to some residents within a 100-foot-wide corridor along the tunnel alignment. It is anticipated that vibrations will be most noticeable at night and will primarily be caused by muck trains traveling in the tunnel. Flexible mining schedules may be required for the proposed tunnel project in the vicinity of apartments or residences.
- The estimated tunnel and outfall construction duration is 18 months, which includes an average tunneling production rate of 50 feet per day (20 hours per day mining).

#### Potential Operations and Maintenance Issues

The lifecycle costs will be driven largely by O&M expenditures. The following O&M issues should be considered in the preferred alternative selection process:

- Two separate debris screening facilities would be required: a primary facility in the new canal box culvert, and a secondary facility at the entrance to the existing Daly City Outfall Tunnel to screen residual debris blown into the open canal.
- Screening devices and systems would require monitoring throughout the winter.
- Periodic maintenance of the screening devices and systems would be required.
- Debris screening devices would require periodic debris removal and cleaning. This would be particularly important following the first early-season rain storms.

#### **9.1.4 Alternative 6 – Tunnel 2/3 Up Canal to Existing Outfall Considerations**

##### Public Benefits and Impacts

The following public benefits and impacts should be considered in the preferred alternative selection process:

- This alternative would provide stormwater re-use benefits including wetlands development opportunities.
- This alternative would increase the level of flood protection.
- This alternative would reduce the likelihood of localized flooding caused by the design storm event.
- This alternative would decrease the likelihood of stormwater overflows into Lake Merced.
- This alternative would reduce the amount of debris deposited along the beach.
- During construction, this tunnel alignment would affect the areas being considered for wetlands development along John Muir Drive. Scheduling the wetlands development to follow the tunnel construction would eliminate this conflict.
- This alternative could increase the amount of area being considered for wetlands development along John Muir Drive. Wetlands could be constructed on top of the new box culvert.
- The modifications to the existing outfall structure could include pulling the outfall back into the cliffside, thereby improving the beach access around the outfall.
- This alternative can be combined with an Alternate 9 stormwater storage option.

##### Geologic and Geotechnical Issues

The geologic and geotechnical assessments provided insight into anticipated tunneling and excavation conditions. The following geologic and geotechnical issues should be considered in the preferred alternative selection process:

- The proposed outfall structure and a portion of the tunnel would need to be designed to anticipate continued shoreline erosion and bluff retreat.

##### Utility Issues

The following utilities may affect the design and construction along the Vista Grande Canal and new drainage tunnel:

- Overhead electric distribution lines,
- Underground telecommunications lines,
- A 33-inch-diameter wastewater treatment plant effluent gravity line, and
- Four-inch- and 2-inch-diameter natural gas distribution lines.

##### Right-of-Way Issues

Applicable authorities would need to agree to the land use for construction staging areas and permanent facilities. The following stakeholders would be involved in the right of way and easement discussions:

- City of Daly City,
- City and County of San Francisco,
- Olympic Club,
- State of California (Caltrans and State Parks),
- California Coastal Commission, and
- Golden Gate National Recreation Area.

### Permitting and Easement Issues

The following permit and easement issues should be considered:

- Multiple permits and easements, described in Section 8, may be required.
- Permitting the rebuilding of the existing outfall structure may be time-consuming.
- There is limited staging area available at the east end of the tunnel. A temporary construction easement from the Olympic Club may be required.

### Constructability Issues

Construction costs and risks will be affected by an alternative's complexity, site access and constraints, ease of access, and other factors. To minimize construction costs and risks, the following constructability issues should be considered in the preferred alternative selection process:

- Residents along John Muir Drive could be disturbed by the noise, traffic, and air pollution caused by the construction activities.
- Traffic along John Muir Drive would be disturbed by dump truck traffic during construction.
- The construction staging area between John Muir Drive and the Vista Grande Canal is limited.
- Work in the existing canal may require stormwater diversion and infrequent work stoppages.
- Vibration from shaft construction may disturb residents within 300-feet of sheet pile and soldier pile driving activities. Construction vibration may induce ground settlement in adjacent structures along the tunnel alignment or bluffs.
- Tunnel vibrations may be noticeable to some residents within a 100-foot-wide corridor along the tunnel alignment. It is anticipated that vibrations will be most noticeable at night and will primarily be caused by muck trains traveling in the tunnel. Flexible mining schedules may be required for the proposed tunnel project in the vicinity of apartments or residences.
- The estimated tunnel and outfall construction duration is 18 months, which includes an average tunneling production rate of 50 feet per day (20 hours per day mining).

### Potential Operations and Maintenance Issues

The lifecycle costs will be driven largely by O&M expenditures. The following O&M issues should be considered in the preferred alternative selection process:

- Two separate debris screening facilities would be required: a primary facility in the new canal box culvert, and a secondary facility at the existing Daly City Outfall Tunnel entrance to screen residual debris blown into the open canal.
- Screening devices and systems would require monitoring throughout the winter.
- Periodic maintenance of the screening devices and systems would be required.
- Debris screening devices would require periodic debris removal and cleaning. This would be particularly important following the first early-season rain storms.

#### **9.1.5 Alternative 7 - Parallel Tunnel (to Existing Tunnel) to Existing Outfall Considerations**

##### Public Benefits

The following public benefits and impacts should be considered in the preferred alternative selection process:

- This alternative would increase the level of flood protection.
- This alternative would reduce the likelihood of localized flooding caused by the design storm event.
- This alternative would decrease the likelihood of stormwater overflows into Lake Merced.

- This alternative would reduce the amount of debris deposited along the beach.
- During construction, this tunnel alignment would affect the areas being considered for wetlands development along John Muir Drive. Scheduling the wetlands development to follow the tunnel construction would eliminate this conflict.
- This alternative could increase the amount of area being considered for wetlands development along John Muir Drive. Wetlands could be constructed on top of the new box culvert.
- The modifications to the existing outfall structure could include pulling the outfall back into the cliffside, thereby improving the beach access around the outfall.
- Residents along John Muir Drive could be disturbed by the noise, traffic, and air pollution caused by the construction activities.
- This alternative can be combined with an Alternate 9 stormwater storage option.

#### Geologic and Geotechnical Issues

The geologic and geotechnical assessments provided insight into anticipated tunneling and excavation conditions. The following geologic and geotechnical issues should be considered in the preferred alternative selection process:

- The proposed outfall structure and a portion of the tunnel would need to be designed to anticipate continued shoreline erosion and bluff retreat.

#### Utility Issues

The following utilities may affect the design and construction along the Vista Grande Canal and new drainage tunnel:

- Overhead electric distribution lines,
- Underground telecommunications lines,
- A 33-inch-diameter wastewater treatment plant effluent gravity line, and
- Four-inch- and two-inch-diameter natural gas distribution lines.

#### Right-of-Way Issues

Applicable authorities would need to agree to the land use for construction staging areas and permanent facilities. The following stakeholders would be involved in the right of way and easement discussions:

- City of Daly City,
- City and County of San Francisco,
- Olympic Club,
- State of California (Caltrans and State Parks),
- California Coastal Commission, and
- Golden Gate National Recreation Area.

#### Permitting and Easement Issues

The following permit and easement issues should be considered:

- Multiple permits and easements, described in Section 8, may be required.
- Permitting the rebuilding of the existing outfall structure may be time-consuming.
- There is limited staging area available at the east end of the tunnel. A temporary construction easement from the Olympic Club may be required.

### Constructability Issues

Construction costs and risks will be affected by an alternative's complexity, site access and constraints, ease of access, and other factors. To minimize construction costs and risks, the following constructability issues should be considered in the preferred alternative selection process:

- Residents along John Muir Drive could be disturbed by the noise, traffic, and air pollution caused by the construction activities.
- Traffic along John Muir Drive would be disturbed by dump truck traffic during construction.
- The construction staging area between John Muir Drive and the Vista Grande Canal is limited.
- Work in the existing canal may require stormwater diversion and infrequent work stoppages.
- Vibration from shaft construction may disturb residents within 300-feet of sheet pile and soldier pile driving activities.
- Construction vibration may induce ground settlement in adjacent structures along the tunnel alignment or bluffs.
- Tunnel vibrations may be noticeable to some residents within a 100-foot-wide corridor along the tunnel alignment. It is anticipated that vibrations will be most noticeable at night and will primarily be caused by muck trains traveling in the tunnel. Flexible mining schedules may be required for the proposed tunnel project in the vicinity of apartments or residences.
- The estimated tunnel and outfall construction duration is 18 months, which includes an average tunneling production rate of 50 feet per day (20 hours per day mining).

### Potential Operations and Maintenance Issues

The lifecycle costs will be driven largely by O&M expenditures. The following O&M issues should be considered in the preferred alternative selection process:

- Two separate debris screening facilities would be required: a primary facility in the new canal box culvert, and a secondary facility at the entrance to the existing Daly City Outfall Tunnel to screen residual debris blown into the open canal.
- Screening devices and systems would require monitoring throughout the winter.
- Debris screening devices would require periodic debris removal and cleaning. This would be particularly important following the first early-season rain storms.
- Periodic maintenance of the screening devices and systems would be required.

#### **9.1.6 Alternative 9 – Detention Basins at Westlake Park Considerations**

##### Public Benefits and Impacts

The following public benefits and impacts should be considered in the preferred alternative selection process:

- This alternative would provide stormwater re-use benefits including wetlands and groundwater recharge opportunities.
- This alternative would increase the level of flood protection.
- This alternative would reduce the likelihood of localized flooding caused by the design storm event.
- This alternative would decrease the likelihood of stormwater overflows into Lake Merced.
- This alternative would reduce the amount of debris deposited along the beach.
- Selected Westlake Park areas could be unavailable for use.
- Residences and community buildings near/in Westlake Park may be disturbed by the construction noise.

- Residents along Cliffside Drive could be disturbed by the noise, lighting, and air pollution during the construction of a receiving shaft.

#### Geologic and Geotechnical Issues

The geologic and geotechnical assessments provided insight into anticipated tunneling and excavation conditions. The following geologic and geotechnical issues should be considered in the preferred alternative selection process:

- During excavation below the groundwater in the Colma Formation, it may be difficult to control ground and limit surface settlement of adjacent structures.

#### Utility Issues

The following utilities may complicate the design and construction:

- Potential underground electric lines,
- Potential underground gas lines,
- Potential underground water lines,
- Potential sanitary sewer lines,
- A 54-inch-diameter storm sewer along Cliffside Drive,
- A 15-inch-diameter abandoned sanitary sewer east of the ball field,
- An 8-inch- and 10-inch-diameter sanitary sewer beneath Cliffside Drive,
- A 33-inch-diameter wastewater treatment plant effluent gravity line,
- A 27-inch-diameter wastewater treatment plant effluent forced main, and
- A 60-inch-diameter high-pressure water main (SFPUC).

#### Permitting and Easement Issues

There are no non-City of Daly City permitting or easement issues associated with constructing a stormwater storage basin at Westlake Park.

#### Constructability Issues

Construction costs and risks will be affected by an alternative's complexity, site access and constraints, ease of access, and other factors. To minimize construction costs and risks, the following constructability issues should be considered in the preferred alternative selection process:

- The proposed deep excavation would require an extensive temporary ground support system.
- Unexpectedly high groundwater levels in Westlake Park may complicate the underground construction.
- Traffic at the intersection of Lake Merced Boulevard and the entrance to Westlake Park would be disturbed by dump truck traffic during construction.
- Residents near Cliffside Drive could be disturbed by construction noise.
- There is limited staging area available at Westlake Park. Use of the park would be interrupted during construction.
- Construction vibration may disturb residents during the installation of driven piles and lagging.
- Construction vibration may induce ground settlement in adjacent structures.
- The estimated construction duration is 24 months.

#### Right-of-Way Issues

Applicable authorities would need to agree to the land use for construction staging areas and permanent facilities. The following stakeholders would be involved in the right of way and easement discussions:

- The land use for these construction staging areas and permanent facilities is already within the City of Daly City's right of way.
- If the detention basin is connected with the Cliffside Drive culvert, then additional right of way will be required from local residents and the SFPUC.

#### Potential Operations and Maintenance Issues

The lifecycle costs will be driven largely by O&M expenditures. The following O&M issues should be considered in the preferred alternative selection process:

- Two separate debris screening facilities would be required: one at Westlake Park, and the second at the entrance to the existing Daly City Outfall Tunnel.
- Screening devices and systems would require monitoring throughout the winter.
- Periodic maintenance of the pumps, compressors, screening devices and systems would be required.
- Debris screening devices would require periodic debris removal and cleaning. This would be particularly important following the first early-season rain storms.

#### **9.1.7 Alternative 10 - Stormwater Re-Use Considerations**

Stormwater re-use opportunities exist with all alternatives.

Wetlands development opportunities include:

- Alternatives 1A and 4 do not affect the areas being considered for wetlands development along John Muir Drive.
- During construction, Alternatives 5B, 6, and 7 would affect the areas being considered for wetlands development along John Muir Drive. Scheduling the wetlands development to follow the tunnel construction would eliminate this conflict.
- Alternatives 5B, 6, and 7 could increase the amount of area being considered for wetlands development along John Muir Drive. Wetlands could be constructed on top of the new box culvert.
- Integrated design efforts should be considered to jointly develop complementing wetlands and stormwater system improvements.

Groundwater recharge opportunities include:

- Alternative 9 provides the capacity for groundwater recharge because of the storage capacity of the detention basins.
- The stormwater detention basins could be designed with permeable floors or a substructure permeable pipe distribution system. This would allow a portion of the screened stormwater to percolate directly into the aquifer below Westlake Park. The maintenance of the permeable floors or pipe system should be carefully considered in the detailed design phase.
- Requirements for groundwater quality would identify the additional treatment systems which could be added to Alternative 9. It is possible that screened stormwater could be pressure-injected directly at Westlake Park, depending on the location of the closest well. Proximity limitations would need to be clarified to identify appropriate injection sites.

## 9.2 Screening Methodologies

This section describes the proposed tunnel alignment evaluation methodology for the Vista Grande Drainage Basin Tunnel Alternatives Analysis Project. The methodology consists of two screening levels: an initial screening methodology, and an evaluation framework.

### 9.2.1 Initial Screening Methodology

The initial screening compared the alignments to subjective thresholds which have to be met to satisfy the project objectives. To pass the initial screening, an alternative had to:

- Leverage existing stormwater assets to full capacity,
- Incur acceptable right-of-way acquisition time and expenditures,
- Involve a reasonable permitting effort and duration,
- Be located where there is acceptable ground stability and a baseline rate of coastal erosion, or
- Not demand extensive political capital to gain public support to satisfy the project objectives.

The initial screening methodology was intended to reduce the total number of combinations to a number which can be easily evaluated using the framework.

### 9.2.2 Evaluation Framework Methodology

The evaluation framework consisted of objectives, a weighting factor, evaluation criteria, and an evaluation rating. The objectives included:

- Delivering public benefits, including meeting the project objective;
- Operating efficiently;
- Being environmentally compliant;
- Minimizing land acquisition costs, including right of ways and easements;
- Maximizing constructability;
- Minimizing lifecycle costs, including direct construction costs, indirect contractor costs, and ongoing operations and maintenance costs.

The weighting factor will be determined by the City. The rating ranges from 1 to 5, where 1 reflects the best case and 5 reflects the worse case. The rating definitions vary by attribute. Table 9.1 presents the evaluation framework which would be applied to each combination passing the screening level. Using the available information, participants would subjectively rate the various alternative combinations using the defined rating range. Combining the ratings will yield a score for each area of focus, and by applying the weighting factor, a composite score is developed for each combination.

Completing the evaluation framework and applying the weighting factors yields a list of the most viable combinations ranked from 1 to 7. The lower composite scores suggest a strong preference for meeting the project objectives, whereas higher composite scores suggest alternative combinations less likely to meet the objectives. This process should be beneficial in identifying the preferred alternative.

### 9.2.3 Relative Cost Assessment

To address the potential influence that project cost would have on the methodology, a relative cost matrix was developed and is included in Appendix F. A cost estimating approach consistent with the American Association of Cost Estimators and CalTrans' Project Development Procedures Manual was used. Due to the similarities among the alternatives, a unit cost method was used. This method is consistent with

screening- or feasibility-level studies which rely on judgment and stochastic methods for the unit cost development.

The relative cost assessment was developed in sufficient detail to identify key cost elements and evaluate the total relative cost sensitivity. The relative unit costs are based on comparable project elements and vendor estimates. Where available, past project costs were extrapolated. The influence that specific unit costs had on the overall evaluation was considered using a simple sensitivity analysis. Where unit costs had a significant impact on the alternatives' cost, the unit costs were further evaluated to ensure the unit cost was appropriate.

### 9.3 Preliminary Evaluation

Seventeen combinations of tunnel alignment alternatives and storage options are presented in Table 9.2.

#### 9.3.1 Initial Screening Evaluation

The objective of the initial screening method was to reduce the number of combinations to seven. Based on its knowledge of the project objectives, existing infrastructure, and alternative combinations, the project team used the initial screening methodology to process the multiple combinations. The discussions and results are listed below.

- Leverage existing stormwater assets to their full capacity. This screening test suggests that the full containment storage alternative (43 million gallons) is unattractive because the existing canal and tunnel would be under- utilized at 0 cfs design flow.
- Incur acceptable right-of-way acquisition time and expenditures. This screening test suggests that the development of a new outfall structure on the beach would require extensive time and resources to obtain the necessary right-of-way on California Coastal Commission, State Lands Commission, and National Park Service Lands. This condition applies to all Alternative 1A and 4 tunnel alignments, which pass stormwater to a new outfall structure.
- Involve a reasonable permitting effort and duration. This discussion paralleled the right-of-way discussion of a new outfall structure on the beach. Alternatives 1A and 4 are expected to require extensive efforts to obtain the necessary permits. Some level of stormwater detention capacity should be provided to preserve options for groundwater recharge and water re-use. In addition, discussions with the Regional Water Quality Control Board suggest that stormwater quality will be an important issue. Detained stormwater can be screened as applicable to the water's use and applicable water quality requirements. Alternatives 1A, 4, and all 0-detention/storage combinations were deemed unattractive with regard to this objective.
- Be located where there is acceptable ground stability and a baseline rate of coastal erosion. This screening test applies directly to Alternatives 1A and 4, which traverse unstable ground and areas of extensive coastal erosion. These alternatives are unattractive because of landslide and coastal erosion concerns.
- Not demand extensive political capital to gain public support to satisfy the project objectives. Any alternative with extensive permitting and right-of-way acquisition requirements is unlikely to meet this objective.

#### 9.3.2 Framework Screening Evaluation

The objective of the framework screening method was to rank the most viable alternatives from 1 to n. Again, based upon its knowledge of the project objectives, existing infrastructure, and alternative combinations, the project team used the framework screening methodology to process the alternatives that

passed the initial screening evaluation. Table 9.3 presents the results of the project team's preliminary evaluation.

#### **9.4 Sensitivity Analysis**

Several of the project objectives correlate strongly with cost, while others do not. To test the evaluation methodology's sensitivity to cost, a weighting sensitivity matrix was developed. Four weighting scenarios were created: equal weight distribution; 65% cost / 35% non-cost; 48% cost / 52% non-cost; and 35% cost / 65% non-cost. The different weighting scenarios were applied to the unweighted scores. The results are presented in Table 9.4.