Technical Memorandum

SAN FRANCISQUITO CREEK
JOINT POWERS AUTHORITY

Prepared by: Denean Ni, Project Manager (SFCJPA)
Tess Byler, Senior Project Manager (SFCJPA)

Date: August 21, 2026

Project: San Francisquito Creek Urban Reach 2 Project

Subject: Summary of Tunnel Diversion Feasibility Study and Decision to Discontinue Further Evaluation

1. Introduction

This memorandum provides a detailed summary of the San Francisquito Creek Joint Powers Authority (SFCJPA) decision to discontinue further evaluation of the underground tunnel (tunnel diversion) alternative for the Reach 2 Project. This decision is based on findings from the Black & Veatch Tunnel Diversion Feasibility Study (2025), subsequent comments and feedback from the member agency staff, Board members, and the public on the study.

2. Background

The Urban Reach 2 area extends from West Bayshore Road to El Camino Real, with capacity issues beginning upstream of the Middlefield Road Bridge. The Reach 2 Project aims to increase the capacity of San Francisquito Creek to provide flood protection for a 7,200 cubic feet per second (cfs) storm event, approximately equivalent to a 70-year storm and the 1998 storm of record. There is also a long-term goal of providing flood protection for the 100-year storm, which is approximately 8,500 cfs flow.

The SFCJPA has been using a comprehensive watershed approach to the problem of urban flooding, with the overarching goal to improve creek conditions for all inhabitants. We are coordinating and using the same hydraulic model with other projects throughout the watershed, and have embarked on a creek management plan that will enable invasive species management and improve conveyance capacity.

The creek currently has capacity for approximately a 25-year storm (5,400 cfs) between Middlefield Road Bridge to Newell Road Bridge. Additional capacity is needed in this segment due to inadequate capacity in the existing channel to contain higher flows. From the new Newell Road Bridge downstream to West Bayshore Road, capacity is estimated to be about 8,500 cfs; however, this capacity is dependent upon existing floodwalls that are reaching the end of their useful life.

As part of the Reach 2 Project alternatives evaluation, the SFCJPA retained Black & Veatch to provide a high-level evaluation of the feasibility of an underground bypass tunnel. And to understand what portion of a 70-year storm flow, could be conveyed by bypassing the segment of the creek with the lowest capacity.

This study evaluated the viability of three tunnel construction methods: Tunnel Boring Machine (TBM) tunneling, Microtunneling, and Horizontal Directional Drilling (HDD), as well as seven potential tunnel alignments.

3. Summary of Feasibility Study Findings

Table 1 summarizes each construction method evaluated in the study. Of the three tunneling methods studied, microtunneling was the only technology that may be suitable for San Francisquito Creek due to space constraints.

The tunnels would need to provide supplemental capacity of approximately 1,800 cfs and 3,100 cfs for the 70-year and 100-year storms respectively. This is the amount of excess flow that the existing San Francisquito Creek channel cannot convey during the target storm events. The study assumed an existing creek capacity of approximately 5,400 cfs, compared to design flows of 7,200 cfs for the 70-year storm and 8,500 cfs for the 100-year storm. The difference between design flow and existing capacity is the design target for the tunnels.

Table 1: Summary of tunnel construction methods and viability for San Francisquito Creek

Considerations/ Tunneling Method	Method Description	Viability for SFC
Tunnel boring machine (TBM) tunneling	TBMs can be used to construct tunnels of up to 58 ft in diameter and can excavate tunnels through a variety of ground conditions. It uses a rotating cutter head at the front of the machine to dig and break up the earth, while simultaneously installing concrete segments to line the tunnel and support the surrounding ground. TBMs are ideal for long, large-diameter tunnel projects, but require large areas of workspace for TBM entry and exit (approximately 3.7 acres).	No. This is the only technology that could provide enough capacity for protection from both 70-year and 100-year storm but would require approximately 4 acres of land for input and output shafts, with a subset of this space permanently used for ongoing operations and maintenance. This open space is not available in or near the project area. Tunneling under private property requires significant property/easement acquisition, which will not be contemplated for this project.
Microtunneling	A Microtunnel Boring Machine (MTBM) is a remote-controlled pipe jacking method that installs pipelines of up to 10 ft diameter. This tunneling method is particularly well suited for urban environments where surface disruption must be minimized, and it is often	Theoretically feasible, but with constraints which require further evaluation to confirm suitability. Tunnelling would need to be significantly deeper than the existing infrastructure in the streets or other public right of way.

Considerations/ Tunneling Method	Method Description	Viability for SFC
	used for sewer, stormwater, and water supply systems. Less workspace area is required for MTBM entry and exit: • Launch Shaft - 7,000 square feet (0.16 acres) • Receiving Shaft - 4,000 square feet (0.1 acres)	Clearance requirements may necessitate extensive easements. Supporting infrastructure (pumps, pump stations, utility relocations, energy needs) and associated real estate requirements have not been evaluated in detail. With a 10’ diameter pipe, microtunneling can accommodate approximately 33% – 39% of the excess flow for the 70-year event and 19% – 23% for the 100-year event, depending on alignment. This technology cannot achieve enough by-pass flow to meet the project goal of 7200 cfs. It can augment, but not replace other project elements to provide protection for a 70-year storm.
Horizontal Directional Drilling (HDD)	HDD is a surface-launched, trenchless method used primarily for installing pipelines and conduits beneath surface obstacles like rivers, roads, railways and buildings. The maximum pipe diameter is typically 4.5 ft. The laydown area required is 100 feet x 150 feet, plus a 50 feet wide corridor for staging the pipe on the surface.	No. HDD is limited to a 4.5’ diameter pipe, which was found to provide less than 8% of the required capacity needed for the project goal. HDD is also generally not applicable to gravity-fed systems, which is what the cities have.

Seven potential alignments were identified for microtunneling. The tunnel would need to be within public rights-of-way in all seven alignments to eliminate the need for private property acquisition. All alignments focused on diverting water from a location upstream of Pope-Chaucer Bridge (either Middlefield Road or Pope-Chaucer) and discharging it at a location downstream of Newell Road Bridge (either Newell Road or West Bayshore culvert), bypassing the section of the creek with the least capacity.

An alignment along Woodland Ave that follows the creek (Alignment 1) was deemed infeasible due to the number and extent of curves, which could not be achieved using any tunnel construction method.

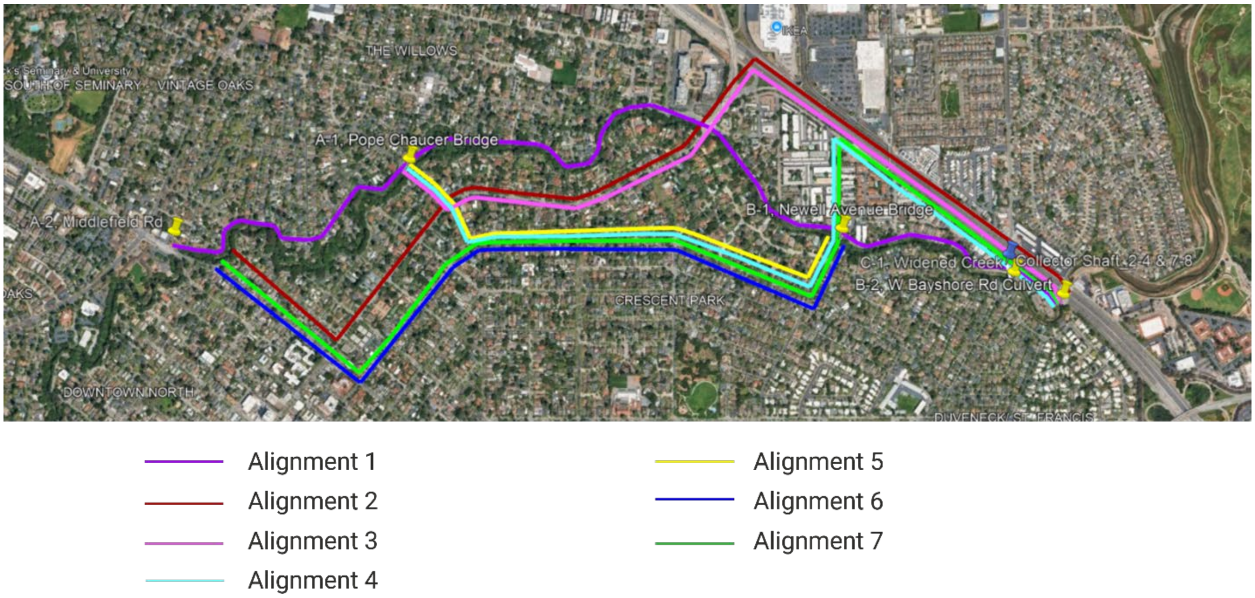

Figure 1: Potential tunnel alignments using microtunneling

Hydraulic capacity for each alignment was refined for the following considerations:

- Pipe diameter limitations associated with the tunneling method
- Friction losses along the tunnel length
- Local hydraulic losses at bends, junctions, intake/outfall structures, and transitions
- Tunnel slope and hydraulic grade line
- Alignment length and geometry, including the number of curves and crossings
- Assumptions that the tunnels and pump stations would be clean of sediment or debris

These calculations concluded that a 10’ diameter pipe, the maximum diameter tunnel that can be achieved through microtunneling, can accommodate approximately 33-39% of the excess flow for the 70-year event and 19-23% for the 100-year event, depending on alignment.

The following table summarizes the capacity achieved with each alignment as well as the estimated cost of construction, following guidelines for American Association of Cost Engineering (AACE) Level 5 cost estimates.

Table 2: Summary of viable tunnel alignments with hydraulic capacity and estimated cost of construction

Alignment ID	Description	# of Shafts	Tunnel capacity (cfs)	Percent of 70-year storm	Percent of 100-year storm	Estimated Cost (Millions USD) [4]
2 (Red)	Middlefield Rd (A-2) – University Ave – W Bayshore Rd – West Bayshore Rd Culvert (B-2)	8	703.3	39%	23%	103
3 (Pink)	Pope Chaucer Bridge (A-1) – Chaucer St – University Ave - West Bayshore Rd – West Bayshore Rd Culvert (B-2)	7	636.5	35%	21%	76
4 (Light blue)	Pope Chaucer Bridge (A1) – Chaucer St – Hamilton Ave – Newell Rd (B-1) - West Bayshore Rd – West Bayshore Rd Culvert (B-2)	8	598.0	33%	19%	85
5 (Yellow)	Pope Chaucer Bridge (A-1) – Chaucer St – Hamilton Ave – Newell Rd (B-1)	5	585.2	33%	19%	51
6 (Blue)	Middlefield Rd (A-2) – Hamilton Ave – Newell Rd – West Bayshore Rd – Woodland Ave/Widened SF Creek (C-1)	6	705.2	39%	23%	78
7 (Green)	Middlefield Rd (A-2) – Hamilton Ave – Newell Rd – West Bayshore Rd – West Bayshore Rd Culvert (B-2)	9	678.3	38%	22%	112

Notes:

1. Alternatives #2, 3, 4, and 7 have the option of discharging water at Point C-1, near the intersection of West Bayshore Road and Woodland Avenue, allowing elimination or deferral of the lower 650' of West Bayshore Road tunnel. This option is shown on the respective figures as a white colored alternate alignment running between the collector shaft and point C-1.
2. All alternatives crossing the SF Creek will require more in-depth assessment to ensure there is sufficient cover above the tunnel.
3. Further investigation is required to verify the availability and/or acquisition of space for each shaft along the respective alignments, as well as to ensure adequate workspace or laydown areas.
4. Cost estimates are based on cost of construction labor and materials, and do not include various elements including but not limited to: design of the all the project elements, regulatory permitting, construction of pump station (s), long term O&M, property/easement acquisition, dewatering, or utility relocation required to construct the access shafts and at grades improvements.

Based on the findings of the study, a tunnel bypass could not function as a standalone solution, and would require additional elements such as widening, floodwalls, and bridge modifications to achieve the project goal of 70-year flood protection.

4. Limitations and Reasons to Discontinue Further Evaluation

The tunnel bypass alternative presents significant technical, operational, and implementation challenges while providing less than half of the additional flood conveyance capacity needed to meet the project's goal.

Discussions with SFCJPA member agency technical and executive-level staff following the release of the feasibility study have raised numerous concerns over the tunnel bypass and reasons to discontinue this alternative from further evaluation. Key issues are listed below and further described in Sections 4.1 through 4.3:

- Extensive operations and maintenance requirements, including routine inspection, debris removal, sediment management, and post-storm dewatering of the tunnel, and maintenance of pumps and services needed for continued operation
- Would not improve the creek and watershed condition and could be harmful to fish and other wildlife that could get caught in screens or tunnels.
- Significant construction impacts to surrounding neighborhoods, including traffic disruptions and detours, noise, construction staging in the street, and potential impacts to residents and businesses that may persist for a year or longer.
- Limited geotechnical information and uncertainty regarding subsurface conditions, utility conflicts, and the feasibility of constructing shafts and staging areas within constrained spaces and public rights-of-way.
- A lengthy design and implementation timeline requiring substantial additional engineering and hydraulic studies, geotechnical investigations, environmental review, permitting associated with creek diversion, and property coordination
- Significant uncertainty regarding total project costs, as the feasibility study did not include conceptual designs or cost estimates for major components such as intake structures, outfall structures, pump stations, utility relocations, property acquisition, and long-term operations and maintenance.

4.1 Hydraulic and Operational Uncertainties

The preliminary capacity estimates were based on tunnel alignment and do not include hydraulic modelling of the system during major storm events. Hydraulic modelling may indicate lower capacity than estimated, which would make this alternative even less viable, especially due to the high cost of tunnel construction.

4.2 Capital Cost Uncertainty

Costs of intake and outfall structures, debris management systems, pump stations, and other facilities needed for long-term system operation and maintenance were not included in the cost estimates in the table above, which means that costs of a full tunnel bypass system are expected to be much greater than estimated.

4.3 Operations and Maintenance Requirements

A bypass tunnel would require extensive and costly operations and maintenance to ensure reliable and effective flood protection. Operationally, the tunnel would need to be emptied within 48–72 hours after a storm event to avoid water quality impacts to aquatic life and mosquito breeding and accumulated sediment, debris, and trapped material would need to be removed and managed. These maintenance activities would require having crews and equipment on hand during storm events that are not currently available and would add long-term operational costs. Additionally, there is potential for clogging or loss of capacity during storm events.

The system would need routine inspection, debris removal, sediment management, and post-storm dewatering to ensure that capacity remains available during future storm events. The long-term costs and operational responsibilities associated with these activities have not been fully evaluated in this study. Member agencies have expressed a preference for project alternatives that do not require expensive and recurring maintenance.

4.4 Constructability Challenges, Community and Watershed Impacts

There is limited space available for launch shaft and intermediate shaft construction within public rights-of-way. Some would need to be placed in Caltrans right of way which may not be feasible. Intermediate shafts would likely need to be constructed in roadway intersections, causing closure of the intersection for prolonged periods of time. Geotechnical investigations would also be required to determine whether microtunneling is feasible along the proposed alignments. Additional investigations would also be needed to confirm whether sufficient space exists for construction, staging, and maintenance access. Utility conflicts have not been fully identified or evaluated, and some alignments may require property acquisition for temporary and permanent easements.

Construction of a tunnel through microtunneling would be highly disruptive to the surrounding community and its residents. Numerous shafts would be required throughout residential neighborhoods and along major roadways, along with multiple staging and material storage areas. Due to the length of the tunnel and the number of shaft locations, construction would likely occur simultaneously at several locations or require an extended construction duration. Residents and businesses would experience significant traffic impacts, roadway closures, detours, noise, vibration, and restricted access for an extended period. Some alignments would also require construction activities near the Highway 101 interchange, creating additional traffic management challenges and requiring extensive coordination with Caltrans. Such impacts during construction would not be acceptable to the community or member agencies.

As articulated in WRA's May 2025 *Alternatives Evaluation Report*[1], the SFCJPA is committed to a holistic watershed approach that addresses flood risk mitigation, enriches the ecological health of the area, enhances recreational opportunities, and prepares for future adaptive actions related to resiliency and future potential 100-year flood protection. San Francisquito creek is less modified than other South Bay Creeks and is designated critical habitat for steelhead trout (Oncorhynchus mykiss).

The public draft Alternatives Evaluation Report included a specific evaluation criterion for "holistic watershed approach" that potential alternatives were evaluated against. The draft report considered a bypass tunnel alternative, including potential configurations aimed to reduce environmental impacts; however, the flood benefit potential was not cost effective. A bypass tunnel option was rejected in the report due to potential environmental impacts without accomplishing commensurate flood risk reduction or environmental benefits within the watershed.

5. Conclusion

The tunnel bypass alternative presents substantial technical, financial, operational, environmental, maintenance, and community challenges. While a tunnel may be theoretically feasible through microtunneling, it does not provide sufficient hydraulic capacity benefit to justify the cost, complexity, and impacts.

There are major uncertainties remaining regarding tunnel operation, sediment and debris management, pump station utility, real estate needs, and long-term maintenance requirements and costs. Permitting an underground bypass system could also be very difficult. The bypass tunnel would have significant challenges due to potential fish and wildlife trapping, sediment management, energy use, and pump station noise. It would not be consistent with a holistic watershed approach.

Construction would be highly disruptive, requiring multiple shaft locations, staging areas, traffic management or closures at major intersections, and prolonged impacts to surrounding neighborhoods. The extent of additional study required to fully evaluate all aspects of the tunnel bypass alternative would require significant investment and may still lead to an assessment that the alternative is ultimately not viable, nor acceptable to the community and SFCJPA member agencies.

Based on these factors, the SFCJPA and its member agencies have determined that there is sufficient justification to discontinue further evaluation of bypass tunnel alternatives at this time.

---

[1] https://www.sfcjpa.org/files/a501f10d7/1_Alternatives%2BEvaluation%2BTechnical%2BReport_Public%2BDraft.pdf