OFFICE OF SUSTAINABILITY
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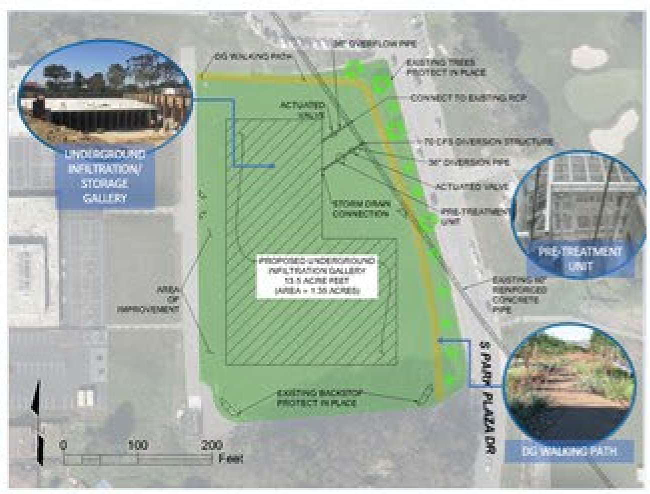
C/CAG
City/County Association of Governments
of San Mateo County

Concept Design Report

Benjamin Franklin Intermediate School

May 31, 2022



San Mateo County Office of Sustainability (OOS)
455 County Center, 4th Floor
Redwood City, CA 94063

craft water™ engineering, inc.

ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

CONCEPT DESIGN REPORT

BENJAMIN FRANKLIN INTERMEDIATE SCHOOL REGIONAL PROJECT

May 31, 2022

PRESENTED TO

San Mateo County Office of Sustainability (OOS)
455 County Center, 4th Floor
Redwood City, CA 94063

City/County Association of Governments of San Mateo County (C/CAG)
555 County Center, 5th Floor
Redwood City, CA 94063

OneShoreline
San Mateo County Flood & Sea Level Rise Resiliency District
1700 S. El Camino Real, Suite 502
San Mateo, CA 94402

PRESENTED BY

Craftwater Engineering, Inc.
San Diego | Los Angeles
Tel 805.729.0943
www.craftwaterinc.com

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
ac-ft	acre-feet
BMP	Best Management Practice
C/CAG	City/County Association of Governments of San Mateo County
cfs	cubic feet per second
EPA	Environmental Protection Agency
ft	feet
GIS	Geographic Information System
hr	hour
HSG	Hydrologic soil group
in	inch
LiDAR	Light Detection and Ranging
LSPC	Loading Simulation Program C++
MRP	Municipal Regional Permit
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
NSF	National Sanitation Foundation
O&M	Operations and Maintenance
PCB	Polychlorinated biphenyls
RAA	Reasonable Assurance Analysis
RCP	Reinforced Concrete Pipe
SSURGO	Soil Survey Geographic Database
SUSTAIN	System for Urban Stormwater Treatment and Analysis IntegratioN
TMDL	Total Maximum Daily Loads

1.0 INTRODUCTION AND EXISTING CONDITIONS

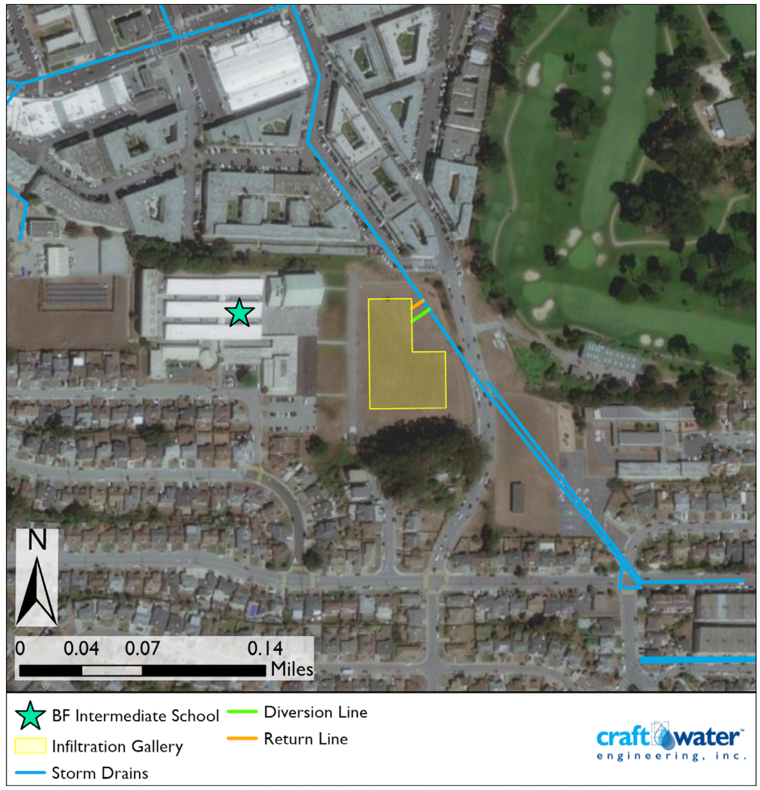


Figure 1-1. Project location.

To address the requirements of the Municipal Regional Permit (MRP), the County of San Mateo, City/County Association of Governments of San Mateo County (C/CAG) and other agencies are collaborating to determine the most impactful and effective ways to capture stormwater and improve water quality in managed watersheds that include their jurisdiction. The MRP, a Phase I municipal stormwater permit, was issued by the San Francisco Bay Regional Water Quality Control Board and includes requirements for Permittees to address regional water quality issues including trash loading and TMDLs (Total Maximum Daily Loads) for mercury and PCBs (polychlorinated biphenyls) as part of the San Francisco Bay Basin Plan. To provide required pollutant reductions and contribute to other regional watershed management goals (flood management, green infrastructure, water reuse, etc.), C/CAG has taken a progressive approach to achieve compliance with the MRP in a cost-efficient manner by promoting multi-benefit projects and leveraging collaboration and funding sources. C/CAG's recently completed Regional Collaborative Program Framework White Paper (C/CAG, 2022) provides a cost-benefit analysis of regional project implementation and countywide programmatic implementation of distributed green infrastructure (GI). The White Paper identifies regional projects as a more cost-effective and optimized approach to achieving multi-benefit objectives. An additional outcome of the White Paper is the identification and prioritization of the next round of regional project opportunities throughout the County.

A regional stormwater capture project is proposed at the Benjamin Franklin Intermediate School near Daly City within unincorporated San Mateo County. The map above (Figure 1-1) shows the location of the proposed project. The project is intended to intercept the dry-weather flow and a sizeable portion of the stormwater flows from the adjacent storm drain to a subsurface structure under the open play field area of the school. Stormwater will be diverted from a 60-inch RCP storm drain running south to north within the eastern side of the school property. The site location proposes several technical design decisions that will be addressed in this document, including the following:

- Stormwater Diversion Location
- Pump Station Considerations/Necessity
- Best Management Practice (BMP) Type and Configuration

Each of these components of design for this project have been evaluated with emphases on feasibility, constructability, cost-effectiveness, and water quality impact. The full range of options for this project has been assessed to ensure that final design recommendations best match desired outcomes for the project and provide the maximum benefit given site constraints. Additional considerations for the project have been evaluated to ensure that the final design considers community impact and enhancement, regional water reuse efforts, and ongoing operations and maintenance costs. Details of this process and the findings can be found herein.

1.1 PROJECT OBJECTIVES

The objective of this report is to provide 10% design-level documents that will ultimately guide the development of the 100% detailed design documents and project implementation. The project concepts presented herein will be optimized to meet the needs of the region, as demonstrated by supporting technical design, hydrologic, hydraulic, and water quality analytics. This document demonstrates preliminary consideration of the technical challenges for this project as well as creative solutions that overcome these challenges by ensuring the technical feasibility of the project and positioning the design for future grant-funding with a clear demonstration of effectiveness and constructability.

1.2 EXISTING SITE CONDITIONS

Benjamin Franklin Intermediate School (700 Stewart Ave, Daly City, CA 94015) is on a 12-acre parcel owned by the Jefferson Elementary School District. The proposed runoff capture facilities will be located underneath the playing field surface located on the east side of the property (see Figure 1-2). The existing playing field is mostly open with turf grass vegetation, backstops, a dirt walking path, and straightaway track located on the west side of the field. All school building structures are located on the hilltop on the west side of the property and will not be impacted by the proposed work. The school contains a regional groundwater storage and recovery project well owned and operated by San Francisco Public Utilities Commission (labeled as 'pump station' below). The well site is located within the southwest corner of the field with a utility easement that follows the west side. The east side of the parcel contains a 60-inch reinforced concrete pipe (RCP) that is underneath the field surface. This drain eventually discharges to the Pacific Ocean with an overflow to Lake Merced.

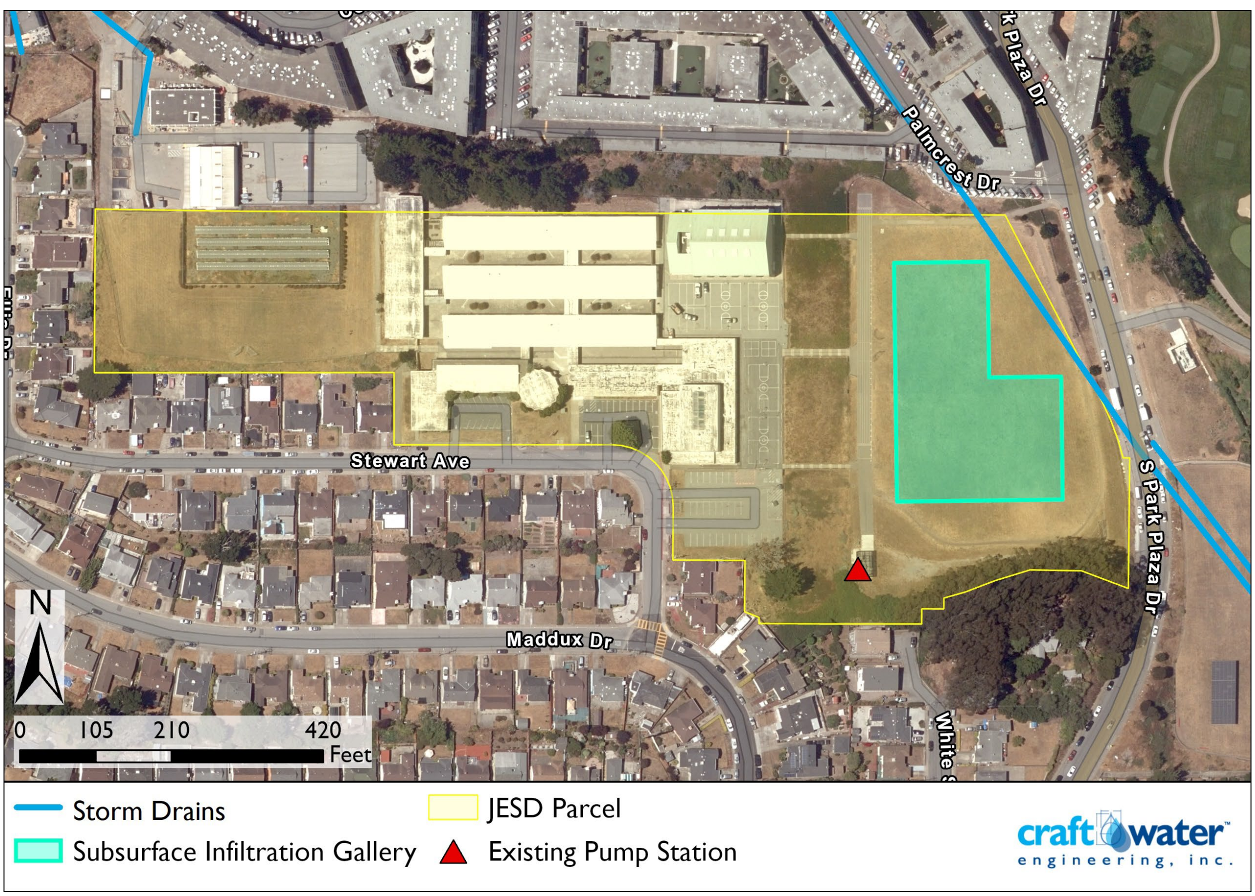


Figure 1-2. Site location.

1.2.1 Utility Information

Because the storm drain passes through the playing field, there are minimal utilities anticipated to be encountered. There are water lines and irrigation located throughout the field that will require careful planning. No other utilities are anticipated to be within the project vicinity; however, a thorough utility investigation will be required during design development. Coordination with SFPUC regarding their on-site production well station would be required to investigate the potential for discharge within proximity to their system and impacts of infiltration on their infrastructure. The local or State setback requirements may preclude the use of the site due to the water-supply well with a minimum of 75 to 150 feet from the edge of the infiltration gallery.

1.2.2 Geotechnical Investigation Constraints

A review of the Annual Westside Groundwater Monitoring Report from 2019 (San Francisco Public Utilities Commission, 2020) was conducted prior to project concept development. It was determined that the existing groundwater level is approximately 40 feet below sea level. As the elevation of the project footprint is around 100 feet above sea level, the estimated depth to the groundwater table is 140 feet. The deep groundwater at this location makes it possible to construct the infiltration gallery without encountering problems with a shallow groundwater table.

Infiltration data is presently unavailable for the project location, but the Soil Survey Geographic database (SSURGO) indicates an average hydrologic soil group (HSG) that is capable of infiltration (HSG C). To meet the 72-hour drawdown, an infiltration rate of 1.67 inches/hour will be required. If during soil testing, infiltration rates are found to be lower, a shallower system would be needed to maintain drawdown. Actual field measured rates will require a full geotechnical analysis to be performed prior to full design.

1.2.3 Stormwater Diversion Location

The Benjamin Franklin site provides the opportunity for a single diversion point from a 60-inch RCP storm drain to the proposed facility. The storm drain flows from south to north and enters the project site from Park Plaza Drive. The pipe then cuts underneath the east edge of the property. A potential diversion location was identified (Figure 1-3) and will require careful future analysis of hydraulic capacity required to tie-in to existing infrastructure, costs related to diversion length, pumping (if necessary), and retrofit of existing infrastructure, as well as agency permitting and coordination that the diversion may require.

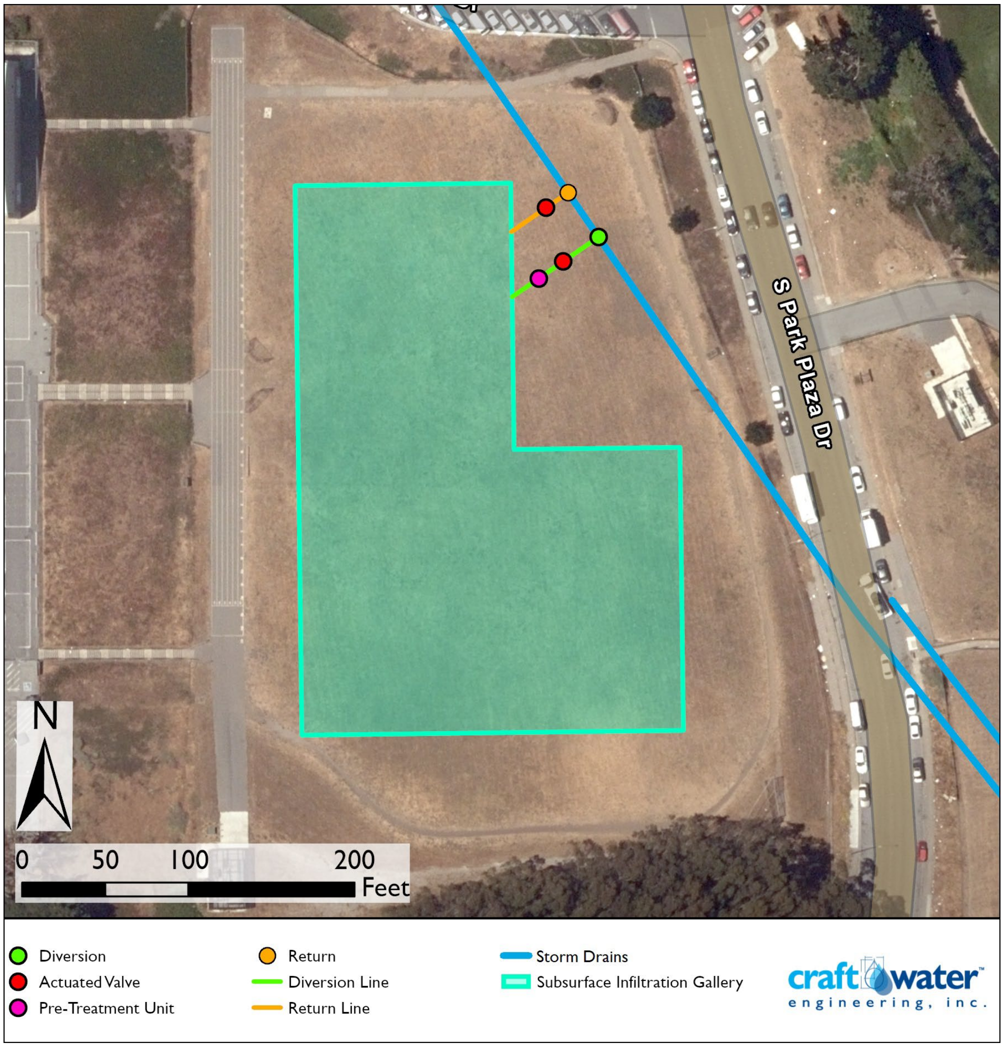


Figure 1-3. Map of diversion location.

2.0 DECISION SUPPORT MODELING

The purpose of the Benjamin Franklin Intermediate School project is to maximize pollutant removal and stormwater capture for groundwater recharge and/or beneficial reuse of captured stormwater; therefore, alternative system configurations were modeled to quantify potential performance and provide design options and considerations for advancing this project concept. The performance of the project as a whole is dependent on a number of configuration options as well as site constraints that determine the range of options available for the stormwater capture unit. The following sections briefly summarize the strategy to most accurately simulate these realistic engineering constraints while optimizing the system configuration to provide the most cost-effective recommendation that best meets the goals of runoff capture, water quality benefit, and water supply augmentation and reuse.

2.1 BASELINE CONDITIONS AND CONSTRAINTS

The following subsections summarize the performance targets, baseline runoff and pollutant loading, onsite non-potable water demand, and groundwater considerations used to inform modeling.

2.1.1 Stormwater Performance Targets

In accordance with the MRP sizing requirements and other countywide multi-benefit stormwater goals, the goal of capturing 80% of annual runoff over the long term has been established for regional projects. This target follows the regional goal of maximizing “greened acres” by effectively treating the water quality design runoff volume for a project’s drainage area. Long-term baseline hydrology from the Reasonable Assurance Analysis (RAA) was utilized to assess how different project options contribute to this goal at the project site. Runoff capture was also paired with water quality reductions to contextualize the multi-benefits offered by different design options for this project. By assessing different project alternatives based on long-term runoff capture and pollutant reduction, final design recommendations can be based on the performance of the BMP across a range of climate conditions to provide a more robust demonstration that the project configuration will attain comprehensive yet cost-effective performance.

2.1.2 Watershed Characterization

For this study, the Loading Simulation Program C++ (LSPC) from the RAA (C/CAG 2020) was used to simulate the sediment-bound pollutant loading, runoff volume, and flow rate associated with a long-term, 10-year continuous time series (Water Year 2006 to Water Year 2015). This model was developed and calibrated to meet criteria established by the *Bay Area Reasonable Assurance Analysis Guidance Document* (BASMAA 2017).

The drainage area delineation for the project site (see Figure 2-1) was developed using geospatial data associated with the RAA modeling subwatersheds and verified/corrected slightly using further geographic information system (GIS) analysis where full subwatersheds did not coincide with project locations. Digital storm drain inventories and high-resolution Light Detection and Ranging (LiDAR) elevation data were used to accomplish subwatershed splitting. Developed drainage areas were used to model runoff and water quality that was then utilized to optimize the BMP decision variables. The overall drainage area size and impervious fraction are summarized in Table 2-1.

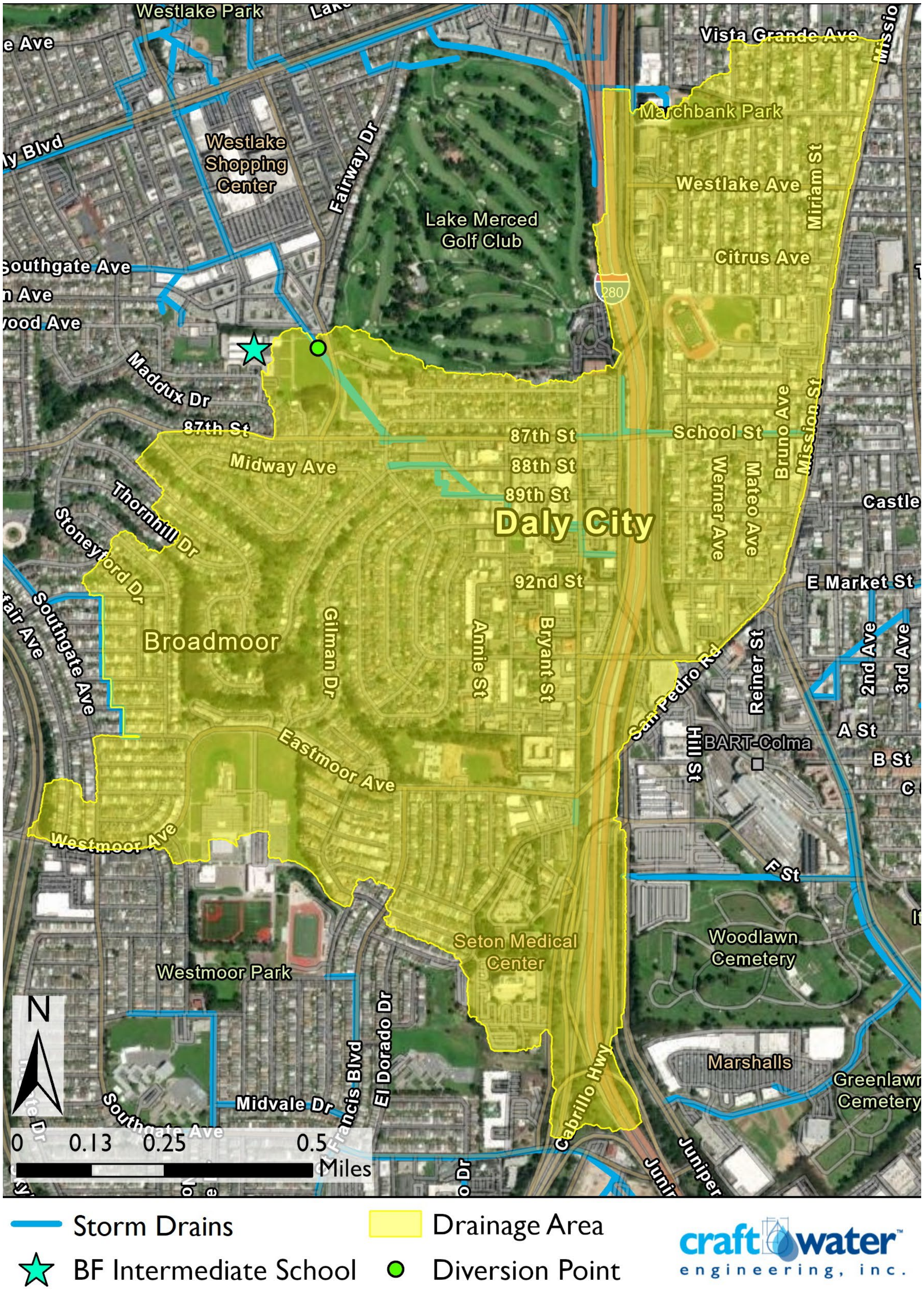


Figure 2-1. Project drainage area.

Table 2-1. Summary of modeled watershed hydrologic and water quality conditions for the Project drainage area.

Total Drainage Area (ac)	Impervious Drainage Area (ac)	Average Annual Runoff (ac-ft)	80% Avg. Annual Runoff Capture Target (ac-ft)	Average Annual TSS Loading (lbs)	Average Annual PCB Loading (g)	Average Annual Hg Loading (g)
759	472 (62%)	551	441	317,000	16.1	26.3

2.1.3 Hydrologic Considerations

Long-term baseline flows and pollutant loads to the site using the 2020 RAA model are summarized in Table 2-1. The annual loadings presented in this table represent the maximum possible reductions that could be achieved by control measures at the project site. However, pragmatic diversion limitations, space constraints, and subsequent treatment mechanisms will ultimately limit how much runoff and associated pollutant levels can potentially be diverted into the BMP. The 80% long-term runoff capture target is also identified in the table and will serve as a design consideration in sizing the BMP and making a final recommendation for this site.

2.1.4 Primary BMP Treatment/Discharge Alternatives

Multiple fates for the discharge of captured stormwater have been considered for the Benjamin Franklin Intermediate School Project. They are detailed here with acknowledgement of specific constraints and parameters that have been used in BMP modeling to accurately simulate the differences among the alternatives.

2.1.4.1 Infiltration

No local geotechnical investigations for the project site have been conducted, so subsurface infiltration rates are currently unknown. Local soil types indicate mostly urban soils exist at the site in HSG C. The majority of San Mateo County's soils are either in HSG C or undefined, and these soils are not typically associated with high infiltration rates. Modeling in the RAA (C/CAG 2020) utilized an infiltration rate of 0.5 in/hr for projects with similar soil types. This infiltration rate was utilized in modeling this site but will need to be verified in future design stages due to the high sensitivity of BMP performance and sizing recommendations related to this important performance variable. A more conservative infiltration rate of 0.2 in/hr was also modeled which represents average rates for HSG C soils identified by a large review of national studies (MSSC 2005) and documents relating this property to the HSG.

As mentioned in section 1.2.1, there is an existing production well on the southwest corner of the project site installed in 2015 at a depth of 750 feet. Due to the close proximity of the well, future investigations would be needed to evaluate the influence an infiltration BMP would have on the quantity and quality of water extracted by the well. SFPUC desires a reasonable analysis of potential impacts to groundwater quality before approval.

2.1.4.2 On-site non-potable use

Capture, storage, and filtration of stormwater is increasingly utilized for on-site non-potable use as stormwater offers an attractive supplemental water source where water demands can be met by dry-weather flows. Coordination with the City/County can identify other non-contact uses including municipal tree watering, street sweeping, or other on-site non-contact uses through school district operations This option will require a treatment system that filters and sanitizes stormwater so that it is safe for irrigation and able to meet or exceed National Sanitation Foundation NSF-350 standards for non-potable water, as well as any local water quality standards. An assessment of expected monthly irrigation demand and average monthly dry-weather flows will provide further information whether this practice would be warranted at this site.

2.1.4.3 Filtration / Return to Storm Drain

As an alternative to infiltration, the Benjamin Franklin Intermediate School Project site could be designed to capture stormwater and filter it, using a proprietary stormwater filtration unit before returning captured flows to existing storm drains. This option typically offers an alternative discharge in areas where infiltration is infeasible or limited in throughput. Filtration offers high efficiency in water quality treatment for regional projects that can treat a large drainage area in a cost-effective manner despite infiltration rates that may not be favorable to support that type of BMP in a given location or area. Based on current regulatory interpretations in the area, filtration of captured stormwater and return to storm drains using proprietary devices is not currently acceptable practice to receive full credit for treatment via regional BMPs. This option was still considered, and performance results will be shared herein in case infiltration is deemed infeasible at the site and an alternative treatment is necessary in the future.

2.2 WATER QUALITY OPTIMIZATION STRATEGY

The primary design goal of the Benjamin Franklin Intermediate School Project is to capture runoff and reduce long-term annual loading of pollutants to the watershed and downstream receiving waters. To ensure that the system will be sized to maximize load reductions in a cost-effective manner, optimization modeling was performed.

The purpose of optimization modeling is to balance design components (including BMP volume and inflow diversion rates) such that no one component limits the performance of the system subject to potential discharge options (see Figure 2-2 at right). Optimization supports decision making throughout the design process by guiding selection of the most cost-effective system design.

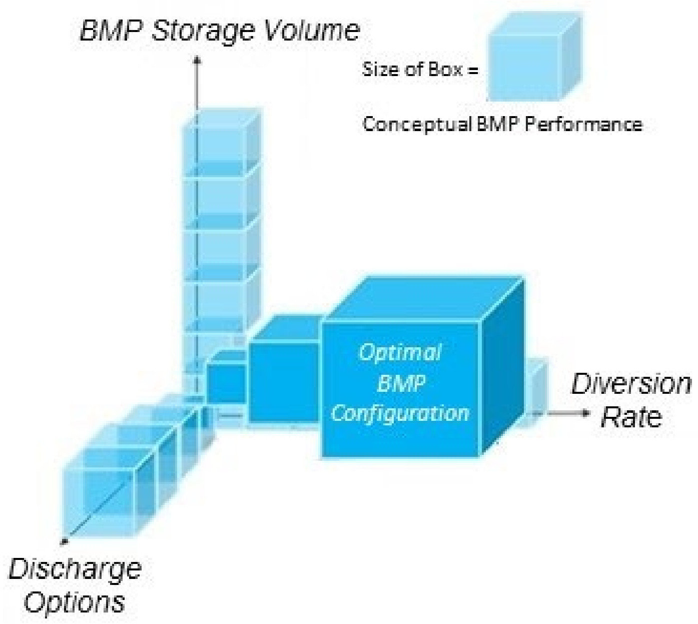


Figure 2-2. Conceptual graphic representing BMP configuration optimization.

The model setup for water quality simulation and optimization is complex, involving several modeling systems and iterative feedback from design engineers. In this approach, sediment pollutant loading capture is a useful surrogate for overall water quality cost-optimization as significant pollutants of concern (metals, PCBs, nutrients) are typically sediment bound. The general methodology is discussed below, and the results are presented thereafter.

2.2.1 Preliminary Size and Diversion Optimization

The first step of the modeling was to predict BMP performance for a range of potential BMP sizes, diversion points and inflow rates, and discharge alternatives. A custom BMP model was used to improve upon certain modeling limitations in EPA's System for Urban Stormwater Treatment and Analysis Integration (SUSTAIN). This custom model is grounded in the physical BMP representations used in SUSTAIN, and it provides built-in optimization algorithms to more systematically automate the process of evaluating many different BMP configurations to select a cost-effective solution related to project goals. The model was run using 10 years of runoff and pollutant loading time-series data generated by LSPC at an hourly time step. During this preliminary decision-support modeling, the discharge alternatives were simulated using certain site constraints to capture approximate BMP throughflow rates at the same time as varying the diversion rate and storage volume. These preliminary optimization model runs produced a point cloud from which the optimal cost-effectiveness curves were extracted. Subsequent targeted modeling then provided a clear decision pathway for the development of optimal project alternatives. Modeling efforts investigated the range of BMP configurations as detailed in the following subsections.

2.3 OPTIMIZATION MODELING RESULTS

The optimization analysis aimed to maximize the long-term runoff capture and pollutant load reduction by simultaneously varying the diversion rate, BMP size, and discharge rates related to options previously discussed. Each of these design features has an associated range of options that were modeled to assess alternatives against long-term water quality benefits and identify the most effective alternative. By optimizing based on these variables, multiple pathways to achieve maximum water quality benefit were identified and the most cost-effective alternatives were determined. Different configuration alternatives and modeling parameters are presented below to demonstrate the cost-effectiveness associated with these options and narrow them down to a few key recommended project configurations that will provide the most cost-effective range of benefits in line with regional stormwater management goals.

2.3.1 Diversion Rate

Multiple diversion rates were modeled for this project from 10 to 100 cfs by 10 cfs increments. The design diversion rate should be selected with care. The diversion rate should be large enough to direct a substantial amount of the expected runoff into the BMP, especially runoff during the first flush of storm events which often carries a large amount of the pollutant load for a given watershed. It should also not be sized too large that it is out of balance with BMP storage and outflows causing the BMP to fill too fast during wet weather and limit overall BMP capture or require oversized infrastructure given the runoff dynamics in the watershed. Plots of diversion rate versus sediment capture for the proposed BMP show that pollutant reduction should increase with diversion rate substantially until the diversion rate reaches 70 cfs (see Figure 2-3). For higher diversion rates, only modest improvements in pollutant reduction should be expected. Because of this, a maximum diversion rate of 70 cfs is recommended for this project.

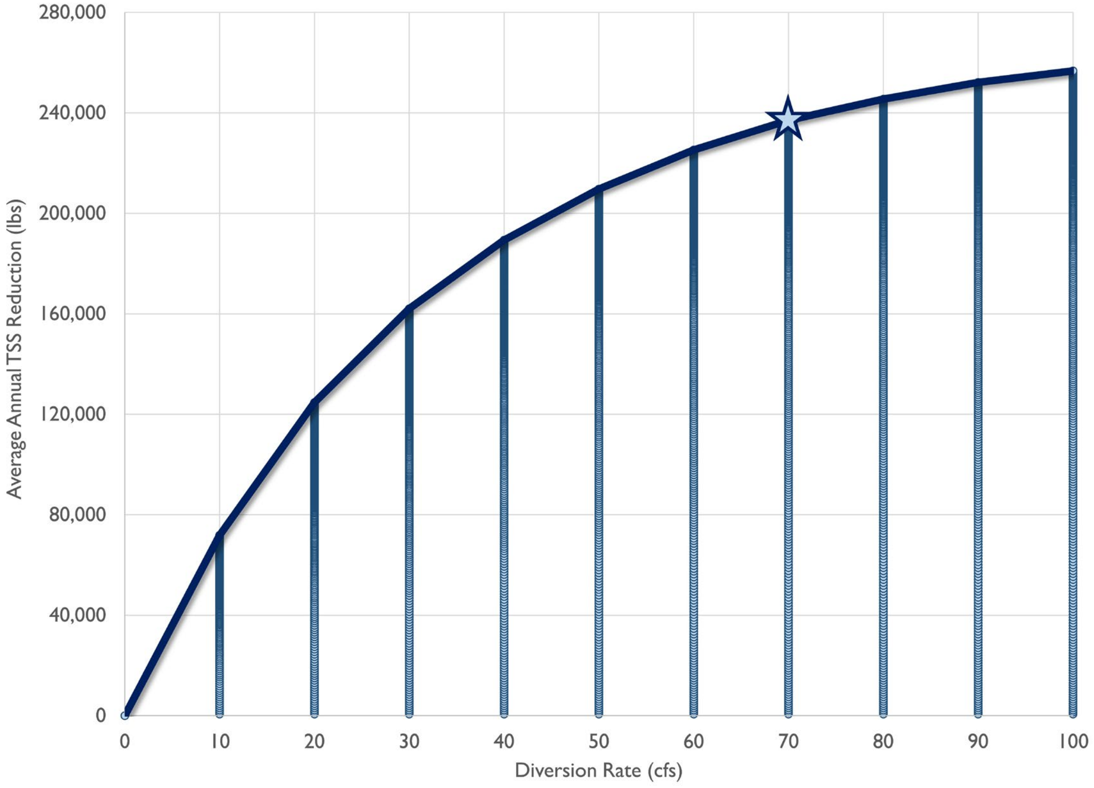


Figure 2-3. Pollutant capture and diversion rate at the project site.

2.3.2 Sizing for Runoff Capture Volume Targets

The ultimate water quality goal for the Benjamin Franklin Intermediate School Project would be to size the BMP so that it is able to capture 80% or more of the long-term estimated annual runoff. The BMP was modeled across different diversion rates and storage sizes up to just greater than 40.0 ac-ft to assess the relationship between BMP sizes and runoff capture. Figure 2-4 shows how runoff capture varies with storage volume for a BMP with a 70 cfs diversion rate at this site. Even at 40.0 ac-ft of storage, an infiltration BMP is not able to meet this reduction target for the probable range of infiltration rates at this site. While the 80% runoff capture target might be infeasible to accomplish for this site, a regional BMP at Benjamin Franklin Intermediate School would still offer substantial runoff capture and water quality benefit for the drainage area.

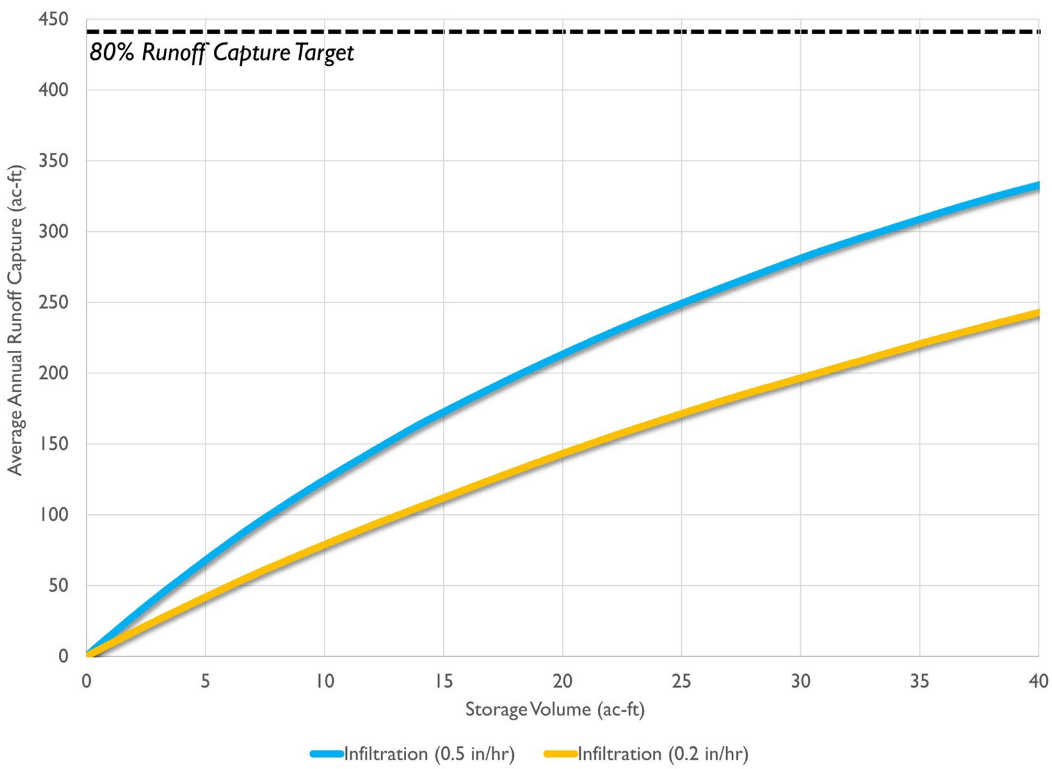


Figure 2-4. Runoff capture as a function of storage volume for the project.

2.3.3 Sizing for Water Quality Benefits

Often regional BMPs have very large drainage areas and only a modest portion of annual runoff can be captured. If sized correctly, these practices can still be very impactful in terms of pollutant reductions. Assessing the modeling results across BMP storage volumes for a BMP with a 70 cfs diversion rate, it is evident that this is the case at Benjamin Franklin Intermediate School (Figure 2-5). It can be seen by the shape of these curves that runoff capture and pollutant reduction do not occur in sync and that these dynamics are related to storage volume in a somewhat different manner due to the different dynamics in the watershed related to rainfall-runoff responses and pollutant generation. In lieu of meeting runoff capture targets, it is useful to size a BMP to maximize water quality benefits as a secondary criterion at a storage volume along these curves before they show diminishing returns (ie, only slight increases in water quality benefit for increased storage volumes). This sizing will be revisited in the following section to highlight multiple potential BMP endpoints for this site.

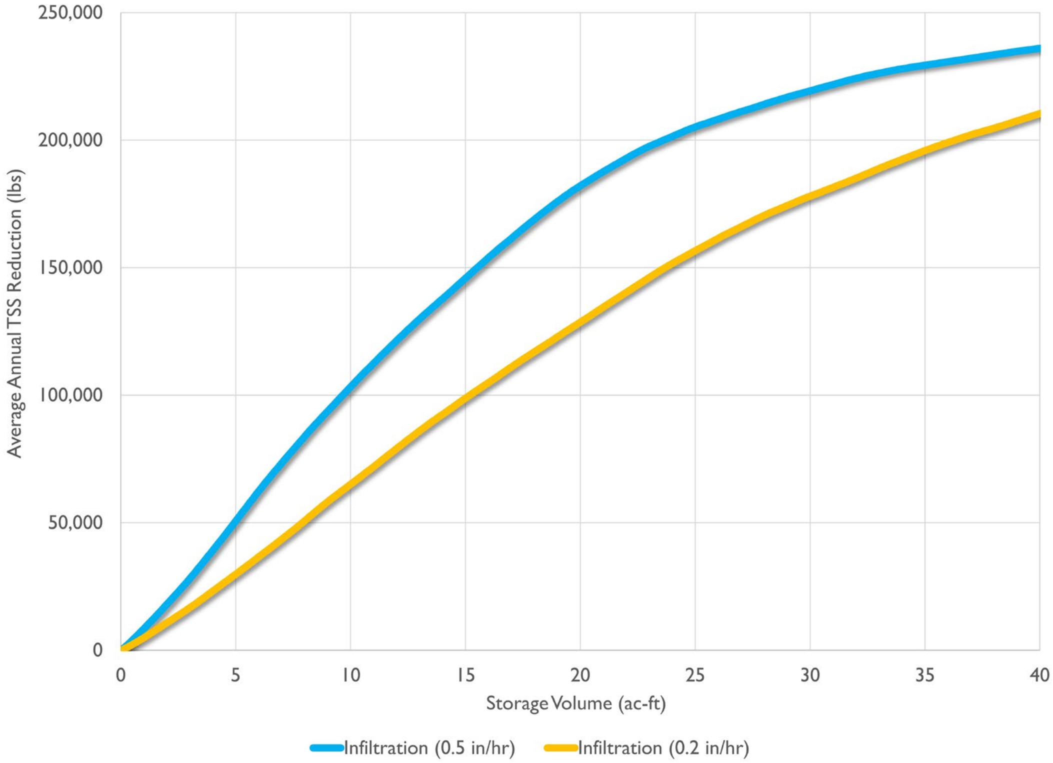


Figure 2-5. Water quality benefit as a function of storage volume for the project.

2.3.4 Considering On-site Irrigation Reuse

The use of captured stormwater for irrigation use was not explicitly modeled. This is because this reuse option would accompany infiltration options as an ancillary benefit and would not have a significant impact on overall annual water quality benefit estimates. Dry-weather flows are typically tapped as a resource for irrigation reuse because the volume is more manageable, reliable, and appropriate for use as an irrigation water source. Irrigation does not typically occur during wet-weather events, and the large runoff volumes collected during these events would not likely be used on-site within recommended storage volume drawdown time periods (72 hours). There is typically adequate available storage in the BMP during dry conditions to capture all dry-weather flows and either filter them for irrigation use or allow them to discharge normally. To better understand on-site irrigation demands, monthly estimates for Benjamin Franklin Intermediate School were calculated based on average monthly evapotranspiration data (CIMIS 2019) using the SLIDE rule (Simplified Landscape Irrigation Demand Estimation; ANSI 2017). These results are displayed in Figure 2-6, and they indicate that average monthly irrigation demand exceeds dry-weather runoff for most of the year. For these purposes, dry-weather runoff here has been defined as modeled runoff on days when rainfall is less than 0.1 inches. The exception is during the cooler, wetter winter months when irrigation supply is in less demand. While dry-weather flows should always be verified through monitoring, the size of the drainage area is not likely to support enough flow to meet irrigation demands for the mostly turf school site.

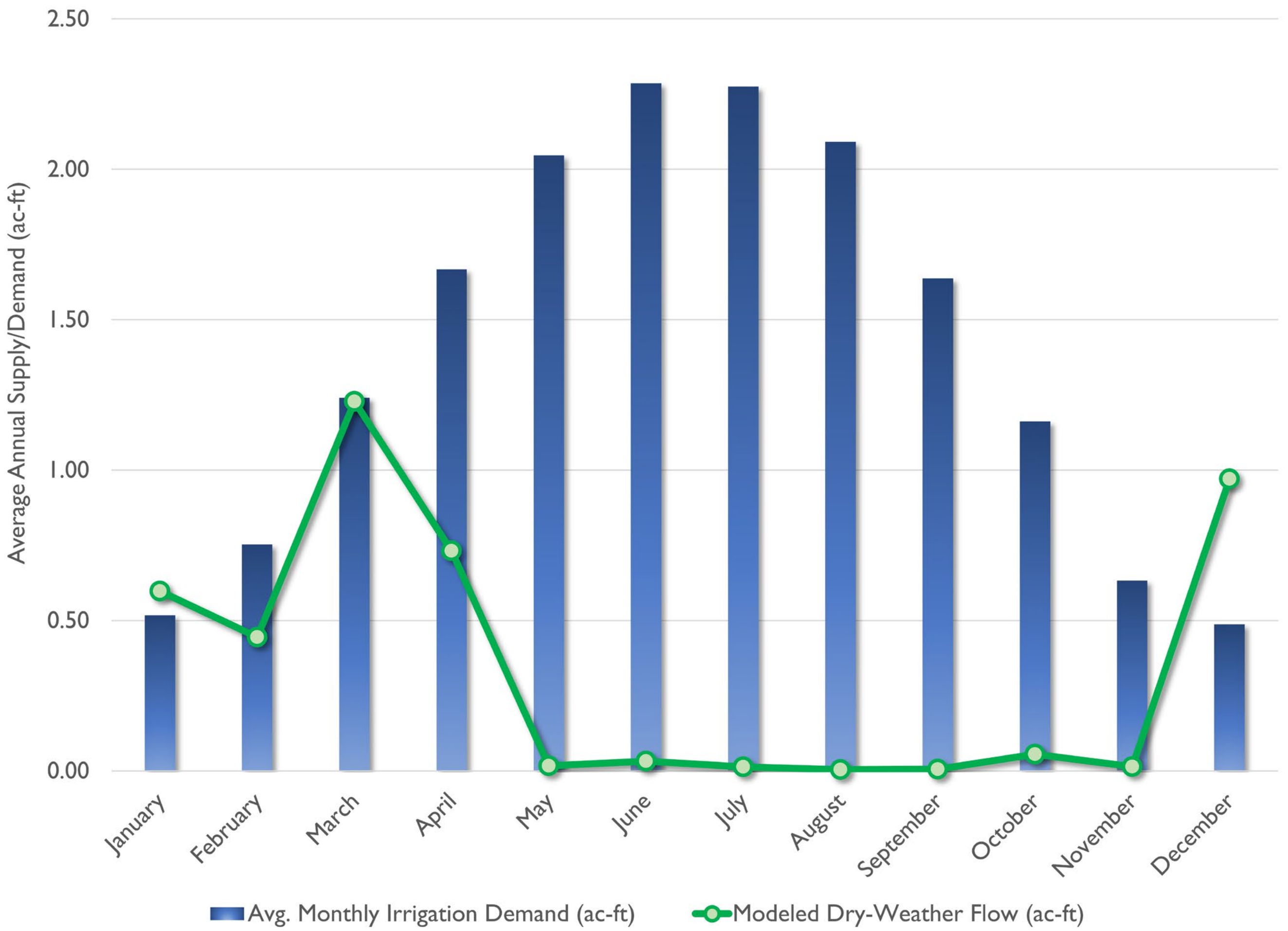


Figure 2-6. Estimated irrigation water demand and potential dry weather supply for the project.

2.3.5 Cost Considerations and Project Cost Comparison

To make final recommendations, water quality benefits predicted for the different BMP configuration options must be weighed against capital construction and operations and maintenance costs (O&M; 20 years included) to determine the optimal choice for the Benjamin Franklin Intermediate School Project. While these are planning level costs and do not incorporate all project costs (i.e. design, permitting, environmental), they do form a strong basis to weigh alternatives against one another in determining the best project for the site. Table 2-2 details key aspects that are both consistent among and differentiate the various modeled options.

Table 2-2. Summary of key cost components for different discharge options.

Cost applicable to….	Key Cost Components	O&M Cost Components
All Options	Diversion Infrastructure, Pretreatment	Inspection, Sediment Removal
Infiltration Vault	Concrete Vault Structure, Optional Pump to Vault	Pumping Maintenance/Electricity
Irrigation Reuse	Filtration Unit, Irrigation System	Filter Operation, Cleaning/Replacement
Filtration/Detention	Excavation, Filtration Unit(s)	Filter Cartridge Cleaning

2.3.5.1 Project Cost Comparisons

Optimal cost-effectiveness curves plotting project cost against average annual sediment reduction from model results are shown in Figure 2-7. It is often advisable to build out a project two one of two endpoints: (1) the cost-effective size at which BMP performance exhibits diminishing returns in terms of project objectives or (2) the maximum feasible size for the project site. Based on the curves for water quality benefit at this site, points of diminishing returns are beyond the maximum feasible project size for the site (approximately 13.5 ac-ft, highlighted by stars on the curves). Project details for the three highlighted BMPs is summarized in Table 2-3.

Figure 2-7. Estimated project cost vs pollutant reduction for a BMP with a 70 cfs diversion rate at the project site.

BMP Size Options

The following BMP sizes and diversion rates are recommended based on different endpoints of design and with the range of performance that might be realized using different discharge options.

Capture of 80% of Long-Term Annual Runoff

Feasible capture of 80% of average annual runoff is not possible across modeled BMP storage volumes with the diversion rate of 70 cfs that was identified. BMP volumes up to 40.0 ac-ft were modeled based to fully assess the relationship between storage and performance at the project site. However, for even the highest diversion rate and storage volume combinations modeled, a BMP at this site is not expected to be able to attain an 80% annual runoff reduction given expected infiltration rates. Considering a maximum feasible size of 13.5 ac-ft that accounts for infrastructure configuration and setbacks needed at the site, meeting this target would not likely be feasible at this site using an infiltration BMP.

Most Cost-Effective Pollutant Reduction

Because capture of 80% of the long-term annual runoff at this site would be difficult and cost-prohibitive, a more cost-effective sizing approach would be to right-size the BMP to maximize water quality benefits up to a BMP size of diminishing returns. Since this would be beyond the maximum feasible storage size for the site, a BMP with the maximum of 13.5 ac-ft of storage is recommended. The expected benefits for this BMP size have been summarized in Table 2-3. These are also displayed in Figure 2-7.

Table 2-3. Summary of cost-effective BMP sizing for each discharge option

Treatment Rate	Avg. Annual Runoff Capture (%)	Avg. Annual TSS Reduction (%)
Infiltration @ 0.5 in/hr	29%	42%
Infiltration @ 0.2 in/hr	19%	28%

Most cost-effective BMP size for the Benjamin Franklin Intermediate School site

Because infiltration rates at this site are modest, it will be best to size the BMP to the maximum size possible based on expected performance analysis. Therefore, it is recommended that the Benjamin Franklin Intermediate School Project be sized with a 70 cfs diversion rate and 13.5 ac-ft storage. These recommendations can be revisited once site infiltration rates are known to ensure that this sizing is still the most cost-effective. Additionally, if future project objectives shift more towards maximizing water quality first and foremost (as opposed to capture for infiltration to groundwater reserves), filtration of captured stormwater and on-site reuse or return to the storm drain is a beneficial option to consider. The same BMP (70 cfs diversion rate with a 13.5 ac-ft storage) could see greatly enhanced water quality performance with the use of a ***proprietary filtration device***, with a 7.84 cfs treatment rate device (currently the most efficient off-the-shelf model available) contributing towards a ***69% reduction in sediment for the drainage area***.

3.0 BMP DESIGN COMPONENTS

This section presents the engineering and design components recommended for Benjamin Franklin Intermediate School based on the preceding decision support modeling to capture both dry weather and wet weather flows from the drainage network.

3.1 DIVERSION STRUCTURE

A single point of diversion is proposed as a part of the recommended project. A manhole junction structure is proposed along the 60-inch RCP to divert stormwater during low-flow and up to 70 cfs during storm events to the pretreatment device. At the proposed flow rate of 70 cfs, the structure will require a 2.6-foot drop below the existing invert and a 36-inch diameter diversion pipe at a 1% slope. Figure 2-1 shows an example schematic of the proposed storm drain diversion manhole structure.

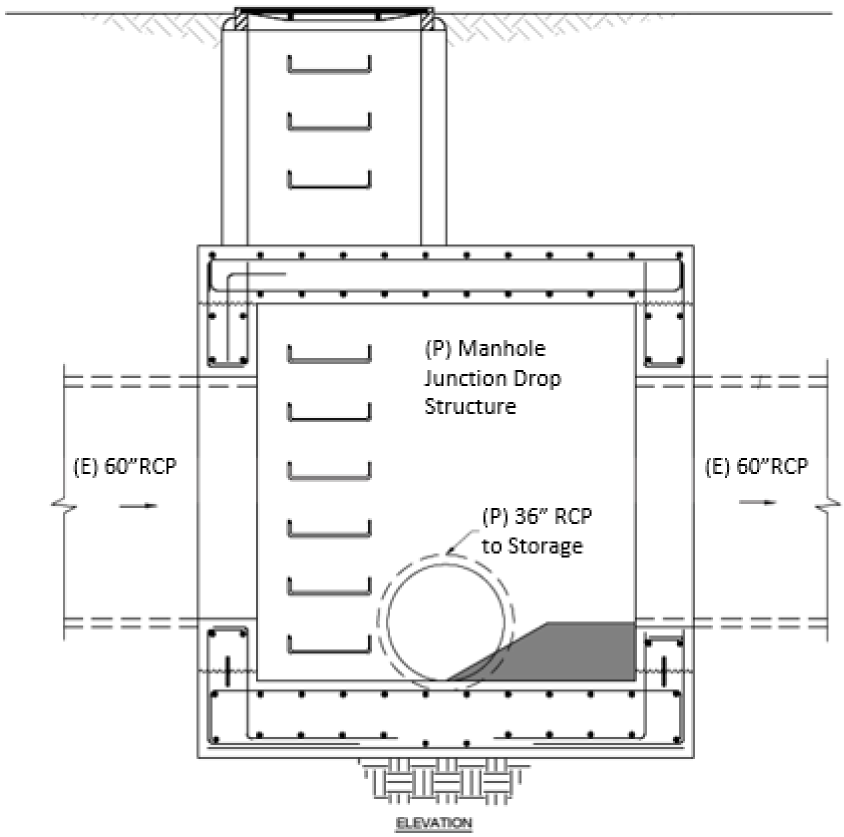


Figure 3-1. Schematic of diversion in storm drain.

3.2 PRETREATMENT

Stormwater runoff transports sediment, metals, nutrients, trash, and debris that can compromise the performance of stormwater facilities and pollute receiving waters. Pretreatment will be an integral component of the treatment strategies to extend the life of the system. It will be prescribed in order to reduce the maintenance frequency of the Benjamin Franklin Intermediate School stormwater facilities, focus maintenance efforts to a concentrated area, and bolster compliance. Two of the pretreatment devices evaluated for this project are included in the following sections. Other similar units are also readily available and can be evaluated and selected during the later design phase of this project.

3.2.1 Hydrodynamic Separators

A typical hydrodynamic separator collects the stormwater runoff on one or more sides of the structure where it then directs the water into a separation chamber where water begins swirling, forcing the particles out of the runoff. All floatables and neutrally buoyant debris larger than the screen aperture (2400 microns or 2.4 mm) are collected in the isolated sump of the system, eliminating scour potential. In addition to the screen aperture filtration, at least 80% of particles that are 130 microns or larger in size are removed for flows up to 70 cfs. With the chambered system, hydrocarbons float to the top of the water surface and are prevented from being transported downstream. Systems such as the Contech CDS units are designed with a hydrocarbon baffle to contain hydrocarbons within the device. A target flow rate for each of the devices will be based on the final design of the diversion structure. Currently a total of 70 cfs from the RCP diversion is anticipated to be diverted to a single pretreatment device. It will be designed to have the capacity to treat the maximum flow diverted to the unit. The size of the unit will also be based on the estimated sediment that will be collected in the sump to maximize sediment removal while balancing the routine maintenance required. Figure 3-2 represents a typical Contech CDS type hydrodynamic separator. The Stormceptor and the Jensen Deflective Separator are other examples of hydrodynamic separators.

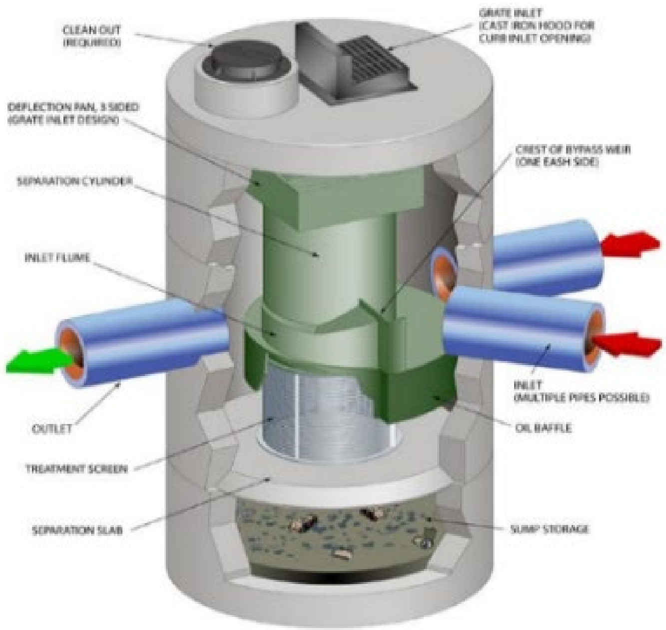


Figure 3-2. Typical Hydrodynamic Separator (Source: Contech Engineered Solutions)

3.2.2 Debris Separating Baffle Box

Debris Separating Baffle Boxes (DSBB) by Bio Clean Environmental Services and the Nutrient Separating Baffle Box (NSBB) are also being considered as pretreatment solutions for the Benjamin Franklin Intermediate School regional project pipe diversion. At a total flow rate of up to 70 cfs, DSBBs are available in models varying in the level of treatment they can be provide (i.e., 150 microns vs. 250 microns). The DSBB systems use screens that are suspended above the sedimentation chambers that capture and store trash and debris. TSS is removed by routing the flows through a triple chambered system. An oil skimmer with hydrocarbon booms traps and absorbs oil. Figure 3-3 illustrates the typical operation of a DSBB system.

A summary comparison of the five pretreatment devices is provided in Table 3-1.

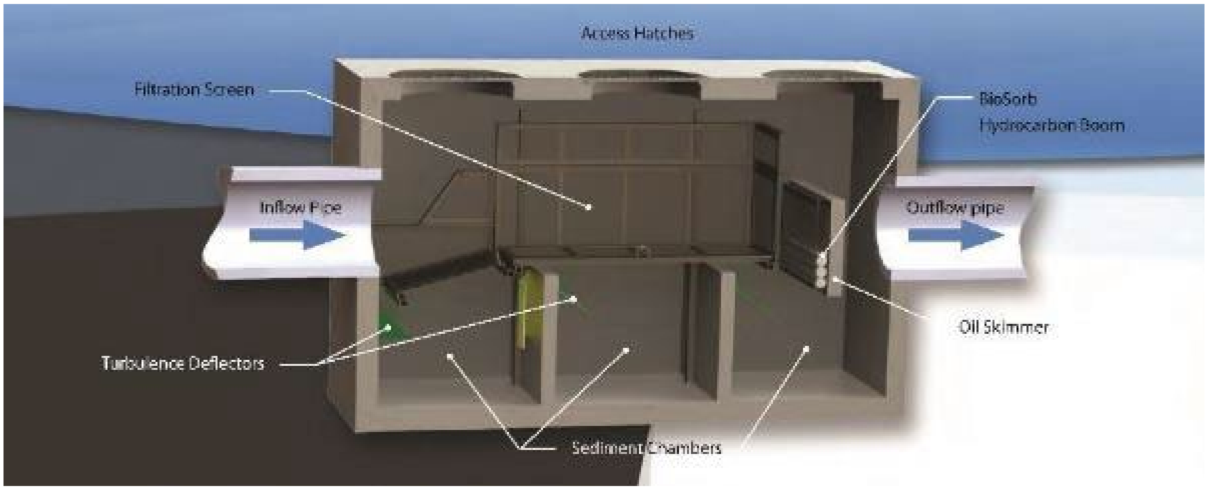


Figure 3-3. Typical DSBB System (Source: Bio Clean Environmental, Inc.)

Table 3-1. Comparison of Pretreatment Devices

	Contech CDS	Jensen Deflective Separator	Stormceptor	Bio Clean DSBB	Suntree Technologies NSBB
100% Gross Solids Removal (Full Capture Device)	Yes	Yes	No	No	No
Internal Bypass	Yes	Yes	Yes	Yes	Yes
Maximum Prefabricated Sediment Storage Sump Capacity	8.7 cy*	37.2 cy	> 70 cy	31.7 cy	> 30 cy
Effective up to 70 cfs	Yes	Yes	Yes	Yes	Yes

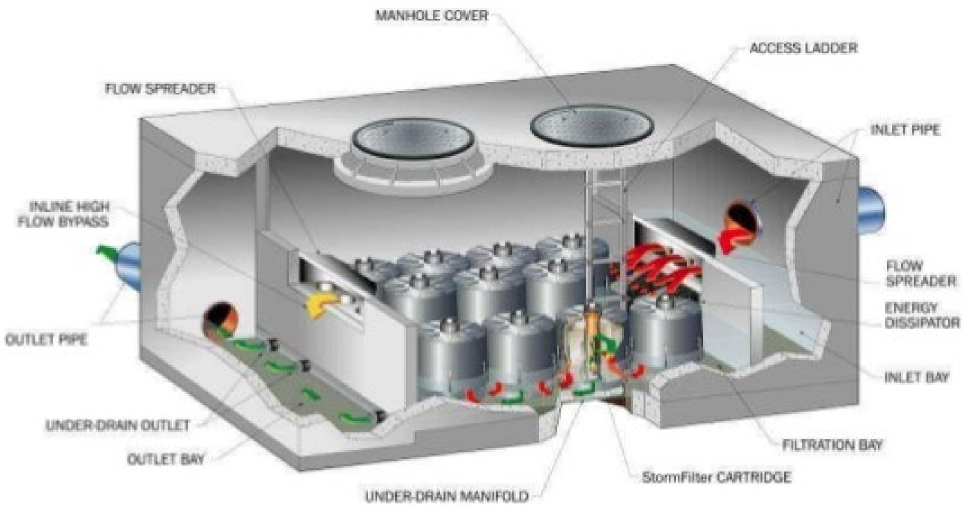
* Contech CDS can be constructed deeper to accommodate greater sediment storage if needed

3.3 OPTIONAL FILTER UNIT

Filter units provides final pollutant removal prior to on-site non-potable reuse or discharge back into the storm drain channel. There are various filtration options including cartridge filters and up-flow media filters.

3.3.1 Cartridge Filters

The most commonly used filtration system is cartridge system (***Figure 3-4***). Flow enters the filter where it is then provided sufficient contact time with the filter cartridges. The cartridges has an opening size of 10 microns and typically can treat anywhere from 0.05 gallons per minute (gpm) to 1 gpm per square foot of cartridge surface area. Multiple cartridges are installed in a large concrete reservoir that can be sized according to the designed discharge rate. Pollutants build up on the cartridge preventing migration back to the channel. The cartridges can be cleaned and re-used providing an easy maintenance process. The Contech StormFilter and BioClean Kraken are examples of cartridge filters used for stormwater treatment.



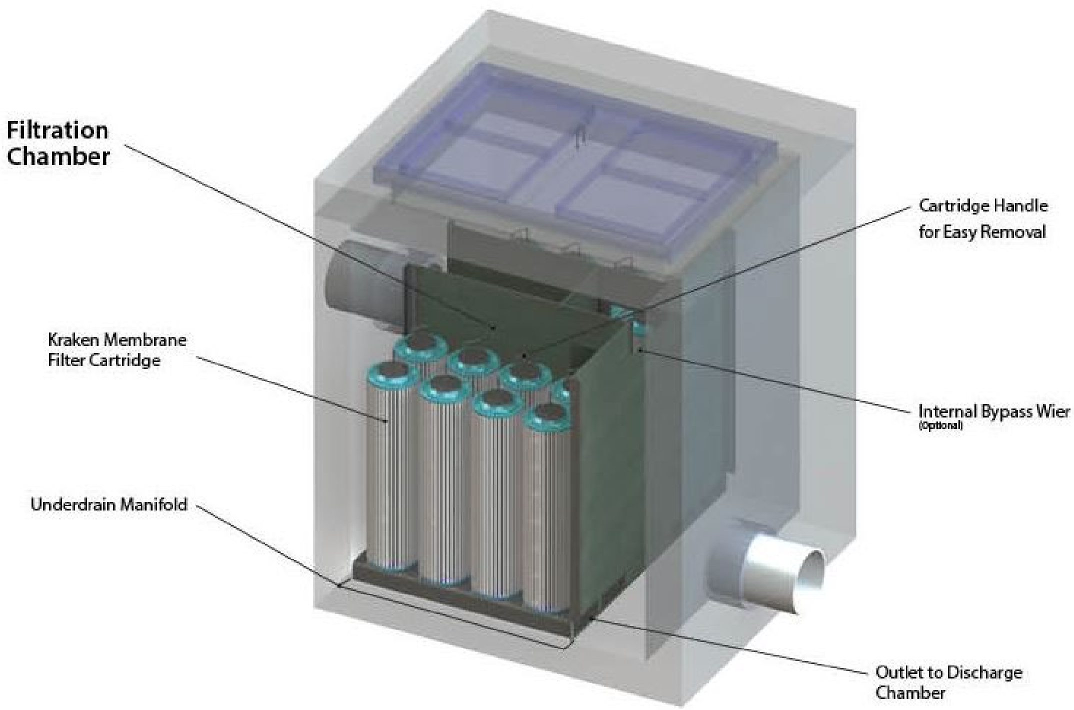


Figure 3-4***.*** Example cartridge filter systems

3.3.2 Up-flow Media Filters

Up-flow media filters are designed to force water to flow up through a media bed trapping pollutant on the underside allowing them to fall to the bottom of the unit for removal (***Figure 3-5***). Flow enters the unit and builds pressure through a series of chambers and then passes through the media. Once the flow subsides, the water level will be lower, causing the pressure to drop, reversing flow through the filter and removing the pollutant. This allows for passive back wash that will prolong the life of the filter through the prevention of clogging. The BioClean Water Polisher is an example of an up-flow media filter. Flowrates for this up-flow filter can reach up to 1.64 cfs depending on the size of the unit.

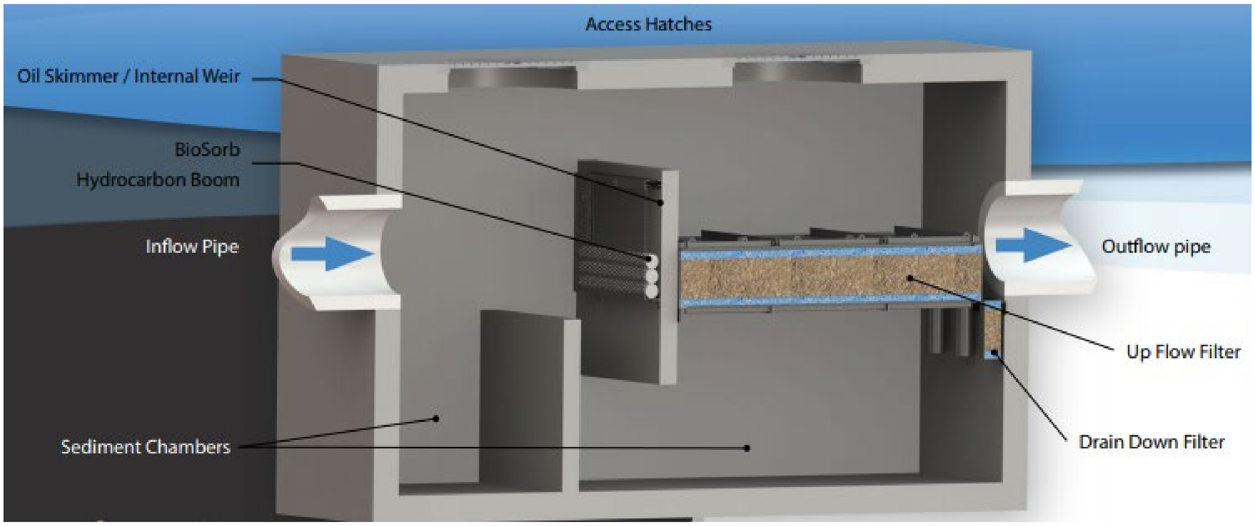


Figure 3-5**.** Example up-flow media filter system

3.4 PROPOSED STORMWATER BMP

As previously discussed, an infiltrating subsurface stormwater capture unit is proposed at the school location. Water quality treatment in the subsurface infiltration gallery is accomplished through pretreatment as well as runoff infiltration into the native subsoils. The proposed BMP will consist of a single tank that is separated into a sedimentation basin/energy dissipation piece and an infiltration tank. The infiltration gallery will provide an overall storage of 13.5 ac-ft (see Figure 3-6).

Diverted flows to the subsurface infiltration gallery will be pretreated before conveyance to the tank. Energy dissipation will ensure that inflows do not erode the infiltration surface or create alternative pathways for water within the system. A ponding depth of 10.0 feet will be maintained within the system for captured stormwater. The primary outlet of runoff is the infiltration, and a high flow bypass will reconnect the system back to the 60-inch RCP pipe. A portable pump can be brought to the site to drain the system in case of emergency, but a permanent pumping solution is not recommended due to the elevated costs and desire to infiltrate.

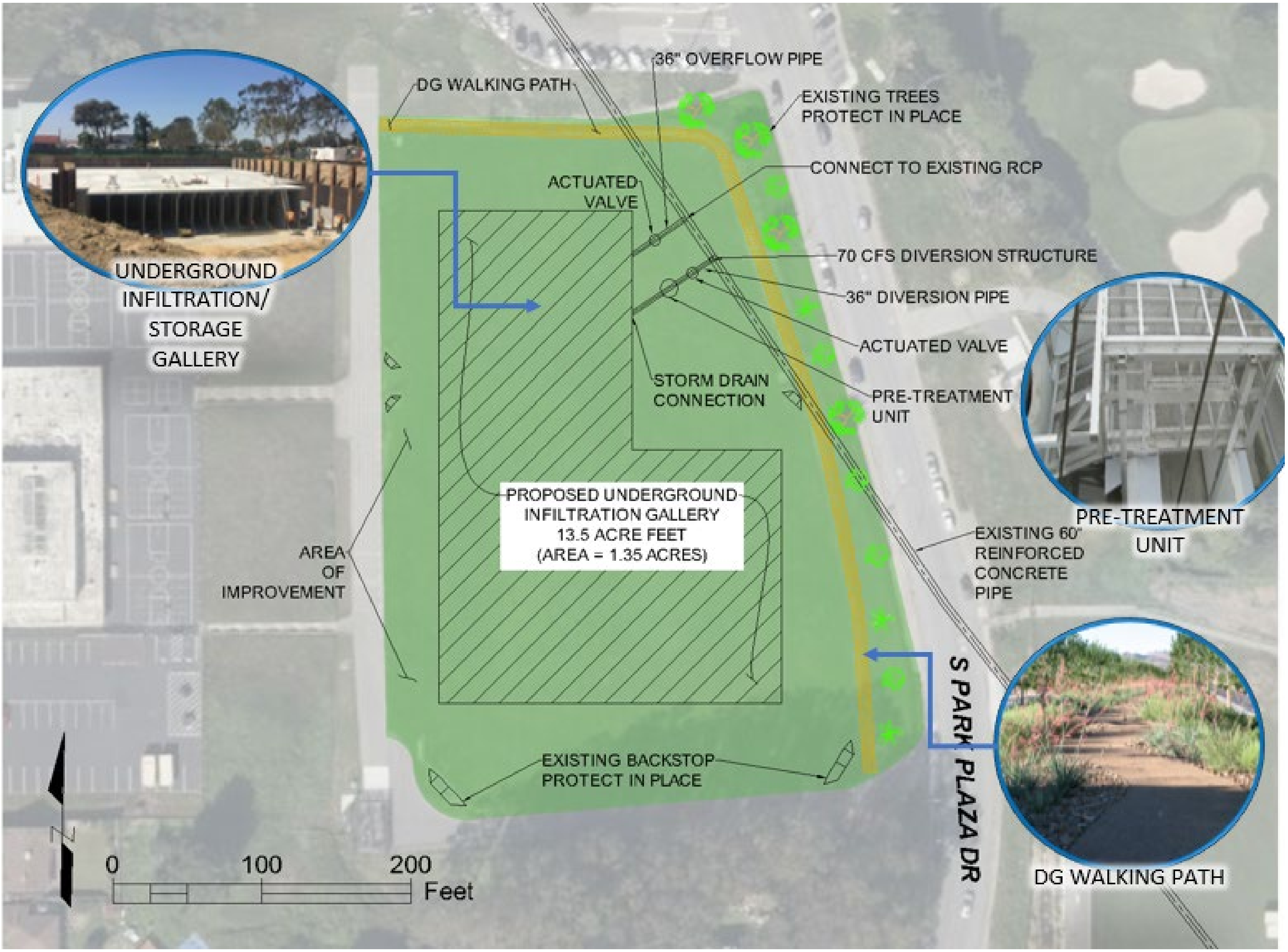


Figure 3-6. Benjamin Franklin Intermediate School BMP Layout

4.0 ANTICIPATED PERMITS AND COORDINATION

Consultation with regulatory agencies and acquisition of permits is required before the project components can be constructed. The following table summarizes the plan checks, regulatory permits, and approvals relevant to the project (Table 4-1). Additionally, a full Phase I environmental study should be performed at the site.

Table 4-1: Listing of Anticipated Required Permits.

Agency	Permit/Notification Name	Rationale	Initial Steps
San Mateo County Public Works	Erosion and Sediment Control Plan	Project will require grading and site disturbance	Preparation of the erosion control plan in conjunction with the SWPPP development
San Mateo County Public Works	Encroachment Permit	Project will disturb the public right of way	Contact Department of Public Works
State Water Resources Control Board	Construction General Permit	One or more acres of soil will be disturbed during construction.	Develop a Storm Water Pollution Prevention Plan (SWPPP).
CA Division of the State Architect	Application for Approval of Plans & Specifications	Projects at schools require review and acceptance by the State of CA Division of State Architect	Register for project submittal by completing DSA-1 form (minimum of 6 weeks and a maximum of 8 week prior to formal submission). Subsequent forms (DSA-3, DSA-103, Construction Documents, etc) will be required to be completed with initial project submittal.
CA Natural Resources Agency	CEQA Initial Study	State mandated environmental review	Prepare the Initial Study and associated documentation (Mitigated Negative Declaration [MND] or Environmental Impact Report [EIR])
San Mateo County Mosquito & Vector Control District	Mosquito & Vector Abatement District	Potential mosquito concerns.	Provide Vector Control District conceptual project plans for review.
AB52 Tribal Resources Consultation	Consultation with Native American representatives	Required per AB 52	Identify tribes that have asked to be notified by the County and prepare letters for submission to the surrounding indigenous tribes

5.0 COST ESTIMATE AND SCHEDULE

The cost estimate and project schedule have been created to validate that the project concept may be built within the specified budget and within the time allocated to use the funds.

5.1 PROJECT COST ANALYSIS

The cost analysis is utilized as a tool to ensure the project concept is within the amount of funds available to the project. If the cost analysis indicates that the project is not feasible, then the design will need to be adjusted to bring it within the project budget while still meeting the project goals. The cost analysis was developed using various sources of information, as well as the Cost Estimator's judgment.

5.1.1 Construction Costs

The construction cost entails the various components of the project that a Contractor would construct. Construction costs do not include items of work not directly performed by the Contractor, such as the County's construction management during construction. The construction costs were developed using various sources of cost information. The estimated total construction cost is $15,768,822 for the recommended BMP configuration. Table 5-1 lists the respective breakdowns of the items required to complete the project. A more detailed cost estimate can be found in Appendix B.

Table 5-1. Estimated Construction Costs, Optimal BMP Configuration.

PLANNING LEVEL COST ESTIMATE				
Description	Quantity	Unit	Unit Price	Total
Diversion Structure	1	EA	$95,000	$95,000
Pretreatment	1	EA	$175,000	$175,000
Diversion Pipe (36" RCP)	63	FT	$461.57	$29,079
Excavation & Site Demo	61,395	CY	$35.53	$2,181,156
Subsurface Infiltration Reservoir	646,866	CF	$13.05	$8,439,700
Overflow Pipe & Valve	1	EA	$37,587	$37,587
Surface Restoration	64,687	SF	$6.30	$407,393
CAPITAL SUBTOTAL				$11,364,915
Mobilization (10% capital)				$1,136,492
Contingency (15% capital)				$1,704,738
Design (10% of Capital, Mobilization, and Contingency)				$1,420,615
Environmental Documentation & Permitting (1%)				$142,062
CONSTRUCTION TOTAL				$15,768,822
Assumptions: -Full itemized cost estimate included in Appendix B -Rough order of magnitude preliminary opinion of costs. Actual costs may vary -Facility will infiltrate and inflow/overflow are gravity lines -Shoring is required for construction due to space limitations				

5.1.2 Operations & Maintenance Costs

Long-term maintenance of the system is vital to its operation. The operations and maintenance costs were developed on the basis that a service contractor would maintain the various components of the system. Estimated total annual operations and maintenance costs are presented in Table 5-2.

Table 5-2. Annual Estimated Operations & Maintenance Costs.

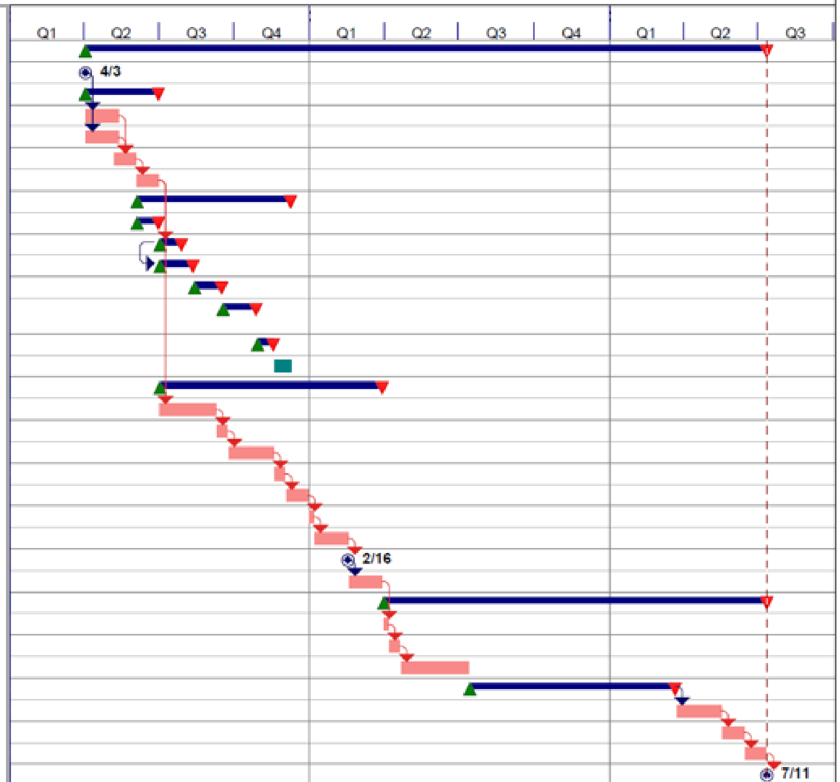
PLANNING LEVEL OPERATIONS & MAINTENANCE ESTIMATE				
Description	**Frequency**	**# Times per Year**	**Unit Price**	**Total**
Diversion Structure – Inspection & Cleaning	Monthly	12	$8,000	$96,000
Pretreatment Device – Vacuum	Quarterly	4	$10,000	$40,000
Valve Maintenance	Semi-Annually	2	$5,000	$10,000
Control Panel Inspection & Maintenance	Annually	1	$4,000	$4,000
Storage – Wet Season Inspection & Cleaning (Vacuum)	Quarterly	4	$10,000	$40,000
TOTAL (Annual)				$190,000

5.2 IMPLEMENTATION SCHEDULE

The preliminary project implementation schedule is provided in Figure 5-1. The schedule includes finalizing the design plans, environmental planning and permitting, bid and award, and construction.

PROJECT SCHEDULE FOR SMC REGIONAL PROJECT

ID	TASK NAME	DUR
1	REGIONAL PROJECT	595 d
2	Notice to Proceed	0 d
3	TASK 1. Predesign	65 d
4	Hydrology and Hydraulic Analysis	30 d
5	Water Quality Analysis	30 d
6	Water Conservation Analysis	20 d
7	Preliminary Design Report	20 d
8	Task 2. Environmental Evaluation	135 d
9	Prepare/Submit Project Descriptior	20 d
13	Prepare Technical Evaluations	20 d
20	Prepare/Submit Adminstrative Drai	30 d
23	Prepare/Submit Screencheck Draft	25 d
26	Prepare/Submit Public Review Draft IS/MND, MMRP, NOI	30 d
32	Prepare/Submit Responses to Con	15 d
36	Attendance at Public Hearings	15 d
37	Task 3. Full Design	195 d
38	30% Plans and Specifications	50 d
39	CITY REVIEW	10 d
40	60% Plans and Specifications	40 d
41	CITY REVIEW	10 d
42	90% Plans and Specs	20 d
43	CITY REVIEW	5 d
44	100% Plans and Specs	30 d
45	Plans, Specs, and Estimate Com	0 d
46	Bid	30 d
47	Task 4. Construction & Testing	335 d
48	Issue NTP to Construction Contrac	5 d
49	Commence Construction	10 d
50	Contractor Move-in Period	60 d
51	Construction of Gallery	180 d
55	Operational Testing	40 d
56	Site Walkthrough	20 d
57	Field Acceptance	20 d
58	Project Complete	0 d



Project: SAN MATEO COUNTY REGIONAL PROJECT
Date: Thu 3/24/22

Task		Manual Task	
Split		Duration-only	
Milestone		Manual Summary Rollup	
Summary		Manual Summary	
Project Summary		Start-only	
External Tasks		Finish-only	
External Milestone		Critical	
Inactive Task		Critical Split	
Inactive Milestone		Progress	
Inactive Summary		Deadline	

SCHEDULE for SMC Regional Projects   Page 1

Figure 5-1. Project schedule.

6.0 CONCLUSIONS & RECOMMENDATIONS

While there are many options for the Benjamin Franklin Intermediate School Regional Project, the recommended option given the full range of identified outcomes and constraints for this project is a 13.5 ac-ft subsurface infiltration gallery that will provide stormwater capture and treatment while also maintaining the open playfield facility with new turf amenities and potential additional campus improvements for the school. This stormwater infiltration gallery will feature the following key components:

- 70 cfs (36-inch RCP) diversion from the 60-inch RCP with a new manhole junction structure,
- Gravity flow through 36-inch RCP to the pretreatment facility to ensure effective pollutant reduction and minimized maintenance frequency
- A 10-ft tall underground vault structure providing at least 13.5 ac-ft of BMP storage volume with openings in the bottom for infiltration
- Infiltration of stored, treated stormwater into native soils.

This BMP will provide substantial pollutant reduction for runoff to the Pacific Ocean and Lake Merced and will carry an estimated construction cost of $15,768,822 and an estimated annual operation and maintenance cost of $190,000. Configuration details and costs will be refined at further stages of design and may be subject to change.

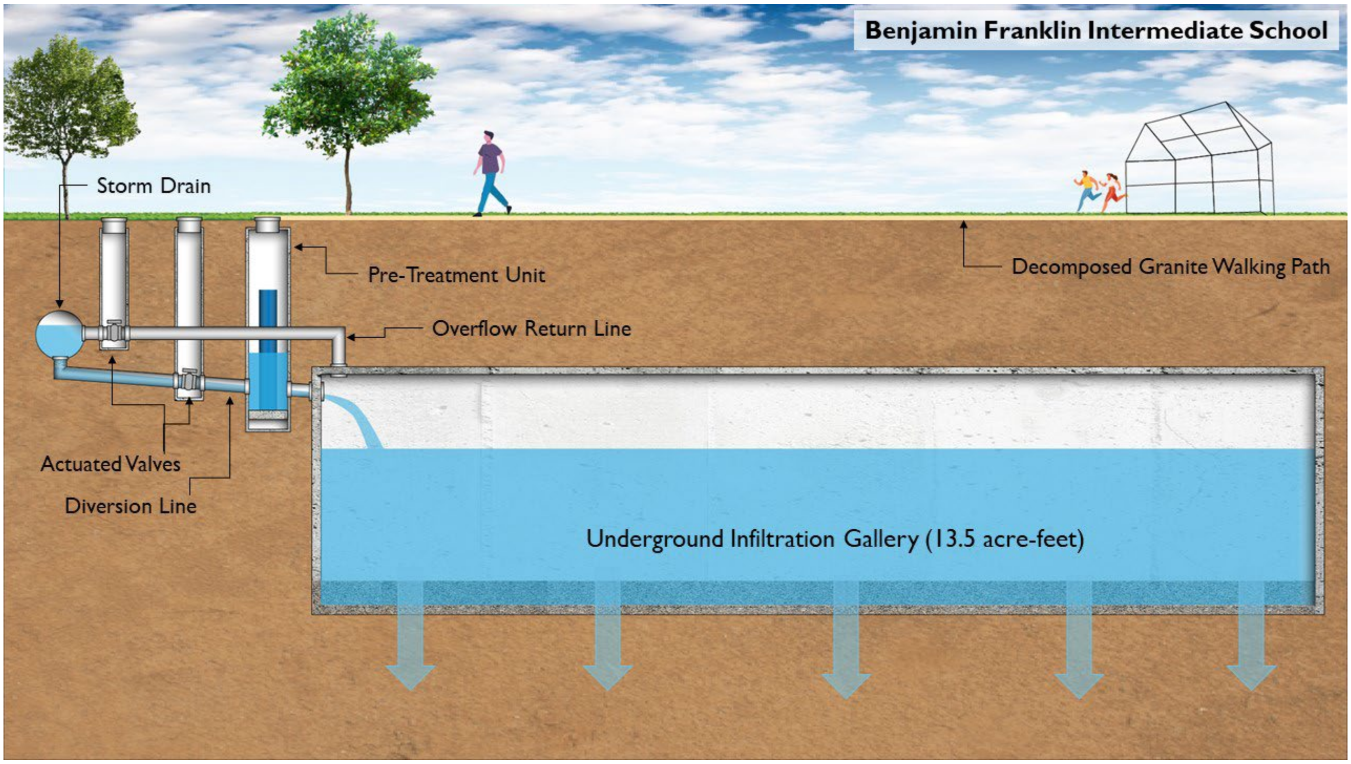


Figure 6-1. Preliminary concept.

7.0 REFERENCES

Bay Area Stormwater Management Agencies Association (BASMAA). 2017. *Bay Area Reasonable Assurance Analysis Guidance Document*. June 2017.

California Stormwater Quality Association (CASQA). 2003. *California Stormwater BMP Handbook – New Development and Redevelopment.*

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San Francisco Public Utilities Commission. 2020. *2019 Annual Groundwater Monitoring Report Westside Basin San Francisco and San Mateo Counties, California.*

Minnesota Stormwater Steering Committee (MSSC), 2005. "The Minnesota Stormwater Manual". Developed by Emmons and Olivier Resources for the Stormwater Steering Committee, Minnesota Pollution Control Agency, St. Paul, MN. http://www.pca.state.mn.us/pyria84.

APPENDIX A: CONCEPTUAL DESIGN FACT SHEET

Note: The site configuration may be modified during final design.

BENJAMIN FRANKLIN INTERMEDIATE SCHOOL – PROJECT CONCEPT DESIGN

ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

OFFICE OF SUSTAINABILITY
COUNTY OF SAN MATEO

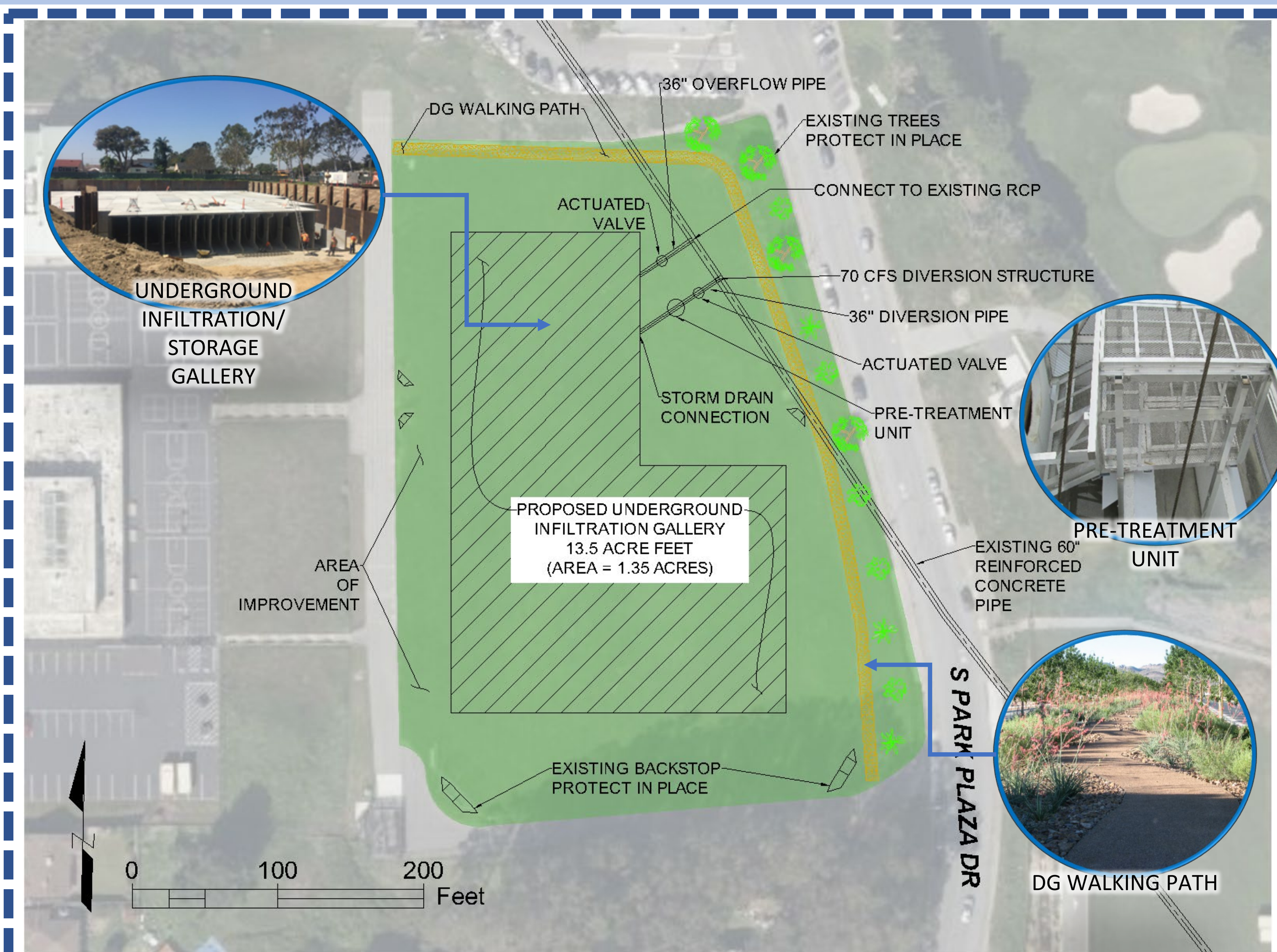
C/CAG
City/County Association of Governments of San Mateo County

PROJECT LOCATION, DESCRIPTION, & PURPOSE

LOCATION: 700 Stewart Ave, Daly City, CA 94015 | **LAT:** 37°41'42.40"N, **LONG:** 122° 28'50.35"W | **SITE OWNER:** Jefferson Elementary School District

DESCRIPTION: Benjamin Franklin Intermediate School is a public site that is owned and operated by the Jefferson Elementary School District within Daly City, CA. The site sits at the bottom of a 759-acre drainage area that is subject to onsite flooding and is immediately adjacent to a 60-inch RCP storm drain. Flows up to 70 cfs will be diverted from the existing drain through a 63-ft 36-inch RCP, pretreated to remove trash and sediments, and stored within a 13.5-acre-foot subsurface infiltration gallery structure located underneath the school play field surface. Captured water will be infiltrated into the subgrade to recharge the local groundwater supply while removing trash, sediments, and other pollutants from the upstream drainage area. The project is sized to optimize the sediment reductions as a retrofit project with the most cost-effective sizing balancing pollutant removal and cost. All work will be limited to the existing open space.

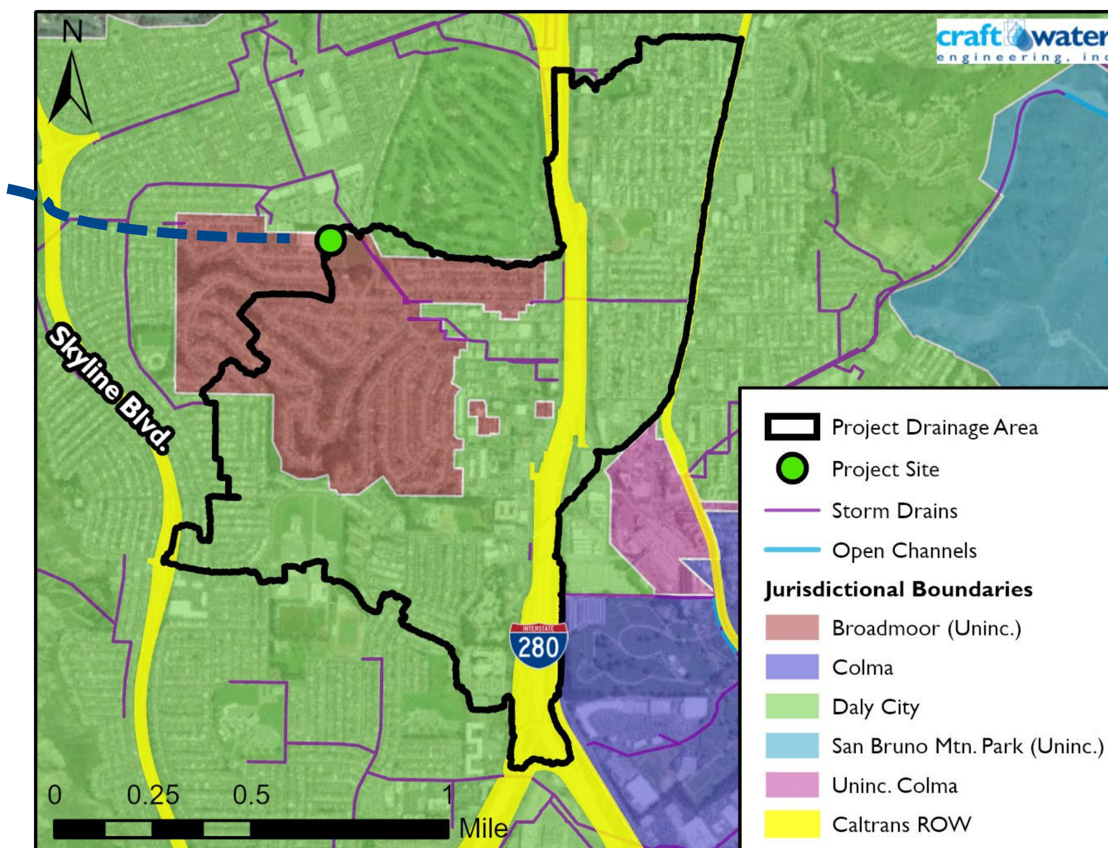
PURPOSE & NEED: San Mateo County is required to improve water quality, per the MS4 permit, in addition to providing flood protection to the residents. The most recent iteration of the Municipal Regional Permit (MRP) focuses water quality benefits on trash removal, pollutant reduction, and impervious areas managed, while the County is also interested in water supply augmentation and flood risk reduction. Targeted projects in old industrial areas in conjunction with green streets and regional stormwater capture projects are proposed to meet the water quality goals for both the Pacific Ocean and San Francisco Bay discharges. The project at Benjamin Franklin Intermediate School can provide significant runoff volume management, trash reduction, and impervious area treated as illustrated by the project benefits table on this page. Additionally, the project targets onsite flooding that poses a risk to passing vehicular and pedestrian traffic.



PROJECT BENEFITS

Sediment (TSS) Reduction	44.4 ton/yr
Volume Managed	355 ac-ft/yr
Volume Reduction of 10yr, 24hr	27.6 ac-ft/yr
Peak Reduction of 10yr, 24hr	0 cfs
Water Supply Volume	355 ac-ft/yr
Site Water Demand Offset	52%
WPP Trash Generation Area Treated	170 ac
CALTRANS Trash Capture Area	88 ac
Population in Walking Distance (1/2 mi)	7,301 people

Disadvantaged Community (DAC) Benefits:
The neighborhood immediately to the north of the school is identified as a DAC. The project adds improved walking paths and park facilities for students and the community members.



ACKNOWLEDGEMENT

This project was funded by the EPA San Francisco Bay Water Quality Improvement Fund

Concept Prepared by: craftwater engineering, inc.

BENJAMIN FRANKLIN INTERMEDIATE SCHOOL – PROJECT CONCEPT DESIGN

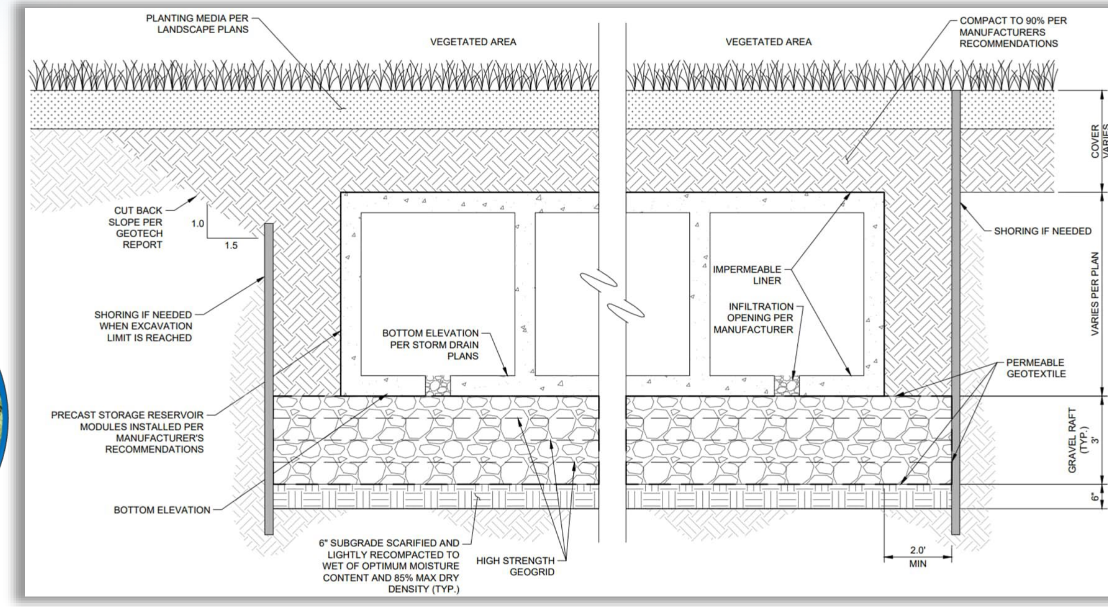
ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

KEY PROJECT ASSUMPTIONS

The area is assumed to have HSG C soil with an infiltration rate of 0.2 - 0.5 in/hr. No outflow pump will be required.

Gravity diversion is assumed feasible with no need to pump the flows into the system.

Typical Section



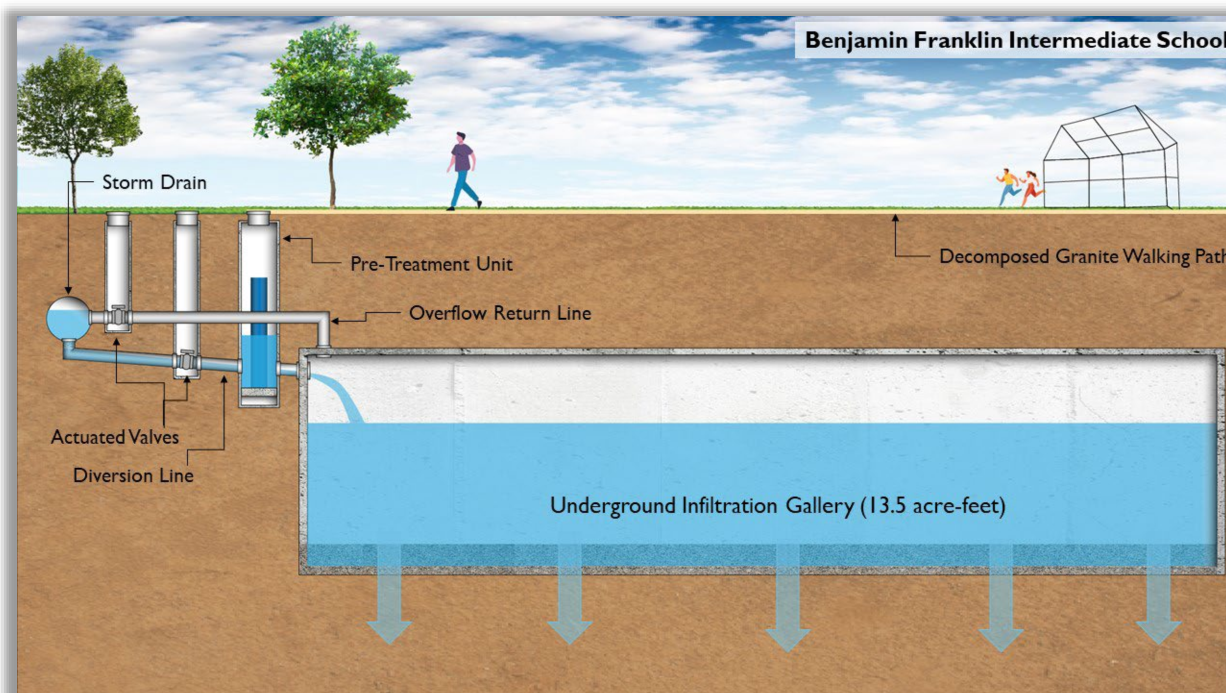
DRAINAGE AREA CHARACTERISTICS

RECEIVING WATER	Lake Merced
TOTAL DRAINAGE AREA	759 ac Daly City (73.2%) Colma (0.3%) County (26.5%)
TOTAL IMPERVIOUS AREA	472 ac
BASELINE RUNOFF (Avg)	551.4 ac-ft/yr
BASELINE TSS (Avg)	158.5 tons/yr
EXISTING STORM DRAIN	60-inch RCP

SITE DESIGN VALUES

PROJECT TYPE	Subsurface Vault
TREATMENT METHOD	Infiltration
INFILTRATION RATE	0.2 in/hr (estimate)
FOOTPRINT	1.35 acres
HEIGHT	10.0 ft
DIVERSION RATE & TYPE	70 cfs (Gravity)
CAPACITY	13.5 ac-ft

Existing Conditions



BENJAMIN FRANKLIN INTERMEDIATE SCHOOL – PROJECT CONCEPT DESIGN

ADVANCING REGIONAL STORMWATER MANAGEMENT IN SAN MATEO COUNTY

PLANNING LEVEL COST ESTIMATE

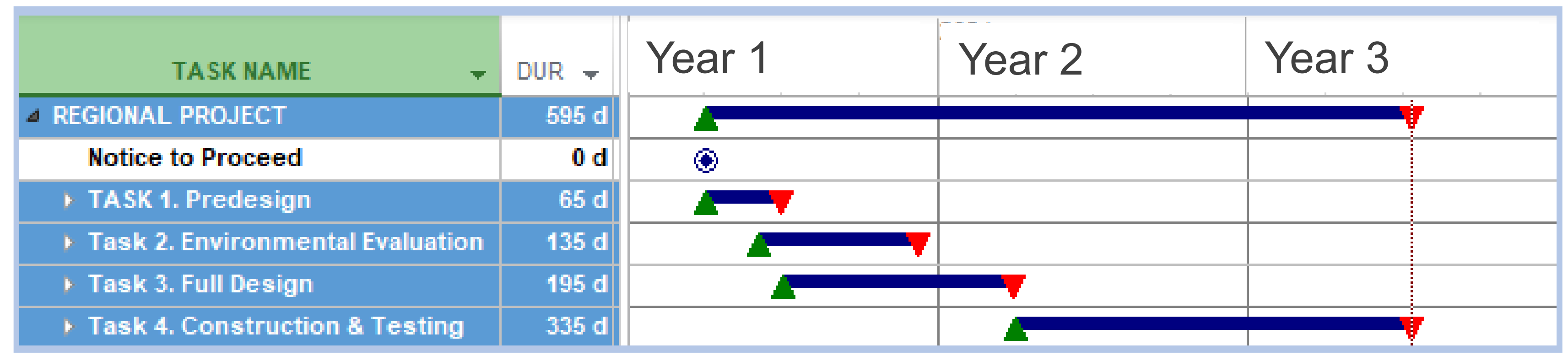
Description	Quantity	Unit	Unit Price	Total
Diversion Structure	1	EA	$95,000	$95,000
Pretreatment	1	EA	$175,000	$175,000
Diversion Pipe (36" RCP)	63	FT	$461.57	$29,079
Excavation & Site Demo	61,395	CY	$35.53	$2,181,156
Subsurface Infiltration Reservoir	646,866	CF	$13.05	$8,439,700
Overflow Pipe & Valve	1	EA	$37,587	$37,587
Surface Restoration	64,687	SF	$6.30	$407,393
			CAPITAL SUBTOTAL	$11,364,915
Mobilization (10% capital)				$1,136,492
Contingency (15% capital)				$1,704,738
Design (10% total)				$1,420,615
Environmental Documentation & Permitting (1% total)				$142,062
			GRAND TOTAL	$15,768,822

Assumptions:
- Full itemized cost estimate included within accompanying report
- Rough order of magnitude preliminary opinion of costs. Actual costs may vary
- Facility will infiltrate and inflow/overflow are gravity lines
- Shoring is required for construction due to space limitations

PLANNING LEVEL OPERATIONS & MAINTENANCE ESTIMATE

Description	Frequency	# Times per Year	Unit Price	Total
Diversion Structure – Inspection & Cleaning	Monthly	12	$8,000	$96,000
Pretreatment Device – Vacuum	Quarterly	4	$10,000	$40,000
Valve Maintenance	Semi-Annually	2	$5,000	$10,000
Control Panel Inspection & Maintenance	Annually	1	$4,000	$4,000
Storage – Wet Season Inspection & Cleaning (Vacuum)	Quarterly	4	$10,000	$40,000
			TOTAL (Annual)	$190,000

PRELIMINARY PROJECT SCHEDULE



ADDITIONAL CONSIDERATIONS

This project concept is planning-level and requires further analysis and review for full design.

Storm Drain Depth: Invert of the 60-inch RCP line will dictate the system depths and is presently unknown. As-build information will be needed for the full design.

Geotechnical Investigation: The infiltration rates, groundwater depths, and soil suitability require a full evaluation to determine infiltrative capability of the project. Initial soils data indicate suitable infiltration rates, but field-tested values are required for the full design analysis.

Utilities: Close coordination with SFPUC and the setback requirements and groundwater quality from runoff due to the production well on site. No other utilities anticipated.

School Coordination: The project is located within a school property and is thus subject to construction requirements and standards as set forth by the California Division of State Architect. Close coordination with the school officials and required review periods is anticipated. Additionally, construction activities will impact use and availability of the recreation fields. Phasing should be considered in design.

Environmental Documentation: The project is anticipated for eligibility for a mitigated negative declaration in response to CEQA. A full project description and evaluation is required during design.

Sizing Criteria: As a stormwater capture and pollutant removal project, the MRP designated design goal is to capture 80% of the annual runoff. As such, the project is intended to maximize pollutant removal while minimizing overall costs. Project sizing used 10-years of continuous simulation to estimate the average annual PCB loading and removal by various combinations of diversion and storage.

APPENDIX B: ENGINEER'S 10% COST ESTIMATE

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

Client: **San Mateo County**
Project: **Benjamin Franklin Intermediate School**
Status: **10% Cost Estimate**

Prepared by: **MMT**
Checked by: **CS**
Date **3/27/2022**

Description	Qty	Unit	Unit Price	Total
Diversion Structure				**$95,000**
Temporary Diversion	1	EA	$20,000.00	$20,000
Drop Inlet w/ Grate	1	EA	$50,000.00	$50,000
Actuated Valve and Structure	1	EA	$25,000.00	$25,000
Pretreatment				**$175,000**
Pretreatment Device (70 CFS) (Includes excavation & shoring)	1	EA	$175,000.00	$175,000
Diversion Pipe (36" RCP)				**$29,079**
Piping (36-in RCP) to storage (Includes excavation & shoring)	63	LF	$364.00	$22,932
Backfill and Compaction for Piping Base (crushed aggregate)	47	CY	$46.00	$2,147
Flap Gate	1	EA	$4,000.00	$4,000
Excavation & Site Demo				**$2,181,156**
Excavation	61,395	CY	$35.00	$2,148,813
Turf Removal	7,187	SY	$4.50	$32,343
Subsurface Infiltration Reservoir (13.5 AF)				**$8,439,700**
Underground Infiltration Gallery Precast Structures	646,866	CF	$10.00	$6,468,660
Shoring	1,010	LF	$30.00	$30,300
Installation	1	LS	$120,000.00	$120,000
Backfill and Compaction	37,437	CY	$25.00	$935,916
Hauling	23,958	CY	$28.00	$670,824
Construction Dewatering	1	LS	$150,000.00	$150,000
Maintenance Hole	4	EA	$16,000.00	$64,000
Outflow Pipe & Valve				**$37,587**
Actuated Valve and Structure	1	EA	$25,000.00	$25,000
Piping (18" RCP) to Outfall (Includes excavation & shoring)	41	LF	$307.00	$12,587
Surface Restoration				**$407,393**
Tree Replacement	12	EA	$2,500.00	$30,000
Shrubs, Perennials, and Grasses	1,000	SF	$5.00	$5,000
Turf/Sod Replacement	64,687	SF	$5.00	$323,433
Decompoased Granite Path	660	LF	$6.00	$3,960
90-Day Plant Establishment Period	1	LS	$45,000.00	$45,000
SUBTOTAL				**$11,364,915**
Mobilization / Demobilization (10% capital)	1	LS	$1,136,492.00	$1,136,492
Contingency (15% capital)	15%	LS	$1,704,738.00	$1,704,738
			Construction Subtotal	**$14,206,145**
Design (10% Total)	10%	LS	$1,420,615.00	$1,420,615
Environmental Documentation & Permitting (1% total)	1%	LS	$142,062.00	$142,062
	GRAND TOTAL			**$15,768,822**

craftwater engineering, inc.

ENGINEER'S OPINION OF PROBABLE CONSTRUCTION COSTS

Client:	**San Mateo County**	Prepared by:	**MMT**
Project:	**Benjamin Franklin Intermediate School**	Checked by:	**CS**
Status:	**10% Cost Estimate**	Date	**3/27/2022**

Description	Qty	Unit	Unit Price	Total

Assumptions and Exclusions

1 This is a rough order of magnitude preliminary opinion of probable construction costs only. Actual costs may vary.
2 The unit cost data is derived from inhouse sources, recent bids on similar construction, and RSMeans current construction cost data.
3 This opinion of cost is based on the project program and plans made available at the time of preparation.
4 Material prices are based on current quotations and do not include escalation.
5 This opinion of cost assumes that all improvements will be constructed at one time.
6 Quantity take offs were performed when possible and parametric estimates and allowances are used for items that cannot be quantified at this stage of the design.
7 This opinion has been based on a competitive open bid situation with a recommended 5 - 7 bonafide reputable bids from general contractors and a minimum of 3 bidders for all items of subcontracted work.
8 All unit costs take into account sales tax, general conditions, bonding and insurance, and subcontractor and general contractor overhead and profit.
9 Where applicable, unit costs include the cost of freight.

The following are excluded:

1 Environmental clearances and permits
2 Hazardous spoil disposal, if encountered
3 Property and Right of Way acquisition or easements
4 Legal and accounting fees
5 Plan check, building permit fees
6 Utility Connection Fees
7 Testing and inspection
8 Fire and all risk insurance
9 Removal of unforeseen underground obstructions
10 Relocation of unforeseen subsurface utilities
11 Signage and wayfinding
12 Additional fill or import
13 Loose furniture and equipment
14 Utility connection fees
15 Tel/data system
16 Construction contingency
17 Work done after business hours
18 Design, engineering and consulting fees other than those specifically listed in the above estimate

Items that may affect the cost estimate:

1 Modifications to the scope of work included in this estimate
2 Unforeseen sub-surface conditions
3 Restrictive technical specifications or excessive contract conditions
4 Any other non-competitive bid situations
5 Bids delayed beyond the projected schedule

OPERATIONS AND MAINTENANCE ESTIMATE

Client: **San Mateo County**
Project: **Benjamin Franklin Intermediate School**

Prepared by: **MT/ODG**
Checked by: **ODG**

Operations and Maintenance (Annual Estimate)

Date: **March 27, 2022**

Description	Frequency	No. of Times per Year	Unit Price	Total
Diversion Structure - Inspection and Cleaning	Monthly	12	$8,000	$96,000
Pretreatment Device - Vacuum	Quarterly	4	$10,000	$40,000
Valve Maintenance	Semi-Annually	2	$5,000	$10,000
Control Panel Inspection and Maintenance	Annually	1	$4,000	$4,000
Storage - Wet Season Inspection and Cleaning (Vacuum)	Quarterly	4	$10,000	$40,000

TOTAL (Annual) Total **$190,000**