Non-Potable Engineering Report Template
(September 2018 Revision)

Instructions

This template is intended to aid Applicants seeking a permit under San Francisco Health Code Article 12C in writing an Alternate Water Source System Engineering Report.

Please delete these instructions and definitions pages prior to submittal.

Submittal of this Engineering Report is a requirement under applicable San Francisco Codes; final or conditional approval of the report will be obtained prior to seeking a plumbing permit from the Department of Building Inspection.

Project Applicants should complete all sections of the Engineering Report, including all applicable Tables.

Explanatory instructions are provided in *[this format]* throughout the template. These instructions should be deleted by the Applicant prior to submission of the report. Upon completion of the template, the table numbers can be updated by right clicking on any table number and selecting 'Update Field'.

Please note that approval of this report does not supersede compliance with relevant aspects of the plumbing code.

Definitions[1]

Blackwater: Wastewater containing bodily or other biological wastes, as from toilets, dishwashers, kitchen sinks and utility sinks.

Graywater: Untreated wastewater that has not been contaminated by any toilet discharge, has not been affected by infectious, contaminated, or unhealthy bodily wastes, and does not present a threat from contamination by unhealthful processing, manufacturing, or operating wastes. Graywater includes, but is not limited to, wastewater from bathtubs, showers, bathroom sinks, clothes washing machines, and laundry tubs, but does not include wastewater from kitchen sinks or dishwashers.

Foundation Drainage: Nuisance groundwater that is extracted to maintain a building's or facility's structural integrity and would otherwise be discharged to the sanitary sewer system. Foundation Drainage does not include non-potable groundwater extracted for beneficial use that is subject to City groundwater well regulations.

[1] For a complete list of definitions, refer to SFDPH Article 12C Rules and Regulations

Log Reduction: The removal of a pathogen or surrogate in a unit process expressed in log units. A 1-log reduction equates to 90-percent removal, 2-log reduction to 99-percent removal, 3-log reduction to 99.9-percent removal, and so on.

Log Reduction Credit: The log reduction value (LRV) credited by SFDPH-EH to a treatment technology based on the technology's ability to remove or inactivate pathogens and proposed surrogate parameter for continuous monitoring.

Log Reduction Target (LRT): The log reduction target for the specified pathogen group (i.e., viruses, bacteria, or protozoa) to achieve the agreed level of risk to individuals (e.g., 10^{-4} infections per year).

LRT Compliance Monitor: monitor that is required to demonstrate ongoing performance of a unit process receiving pathogen reduction credit in accordance with an accepted pathogen crediting framework.

Project Applicant: The Person(s) or entity(s) applying for initial authorization to install an Alternate Water Source System. The Project Applicant is the Responsible Party as defined in Section 12C.2 of Health Code Article 12C. The Project Applicant is responsible for applying for the permit, assuring that the Alternate Water Source System is installed consistent with the approved Engineering Report, the Operations and Maintenance Manual, these Rules and Regulations, and applicable state and local laws. The Project Applicant becomes the Permittee upon issuance of the first Permit to operate.

Rainwater: Precipitation collected from roof surfaces or other manmade, above-ground collection surfaces. Hydrocarbon-based fuels, hazardous materials, or fertilizers are prohibited from being stored or used on such surfaces.

Stormwater: Precipitation collected from at-grade or below grade surfaces or from any surface where hydrocarbon-based fuels, hazardous materials, or fertilizers are stored or used.

Water Quality Monitor: monitor that is not required to demonstrate LRT compliance, but are necessary for demonstration of compliance with water quality goals.

Alternate Water Source System Engineering Report

<Insert Responsible Party>
<Insert Project Name>
<Insert Project Address>

Prepared by:
<Insert Engineer Name>
<Insert Company Name>
<Insert Company Address>

Insert CA Registered Professional Engineer Seal & Signature

Submitted to: San Francisco Department of Public Health
Date: <Insert Date>

Table of Contents

[Table of Contents should be updated by right clicking on the table and selecting "update fields"]

1. General

1.1. Facility Information

Table 1. Facility information summary.

Project Applicant	RESPONSIBLE PARTY NAME
Address	STREET NO. STREET NAME SAN FRANCISCO CA ZIP
Development Type	☐ Commercial ☐ Residential ☐ Mixed ☐ New ☐ Existing ☐ Other:
Total Square Footage	Commercial: square feet Residential: square feet Mixed: square feet Total: square feet
Number of Floors	floors
Residential Units	units
Residents	residents
Non-Resident Employees	employees
Occupancy and Staffing	Hours building will be occupied Hours building staff will be present on-site Days of week building will be occupied
Alternate Water Sources	☐ Rainwater ☐ Foundation Drainage ☐ Stormwater ☐ Graywater ☐ Blackwater ☐ Other:
Total Average Daily Inflow	gallons
Non-Potable Water End Uses (indoor)	☐ Toilet and Urinal Flushing for toilets, urinals ☐ Priming Drain Traps ☐ Clothes Washing ☐ Other:
Non-Potable Water End Uses (outdoor)	☐ Subsurface Irrigation ☐ Drip or Other Surface Non-Spray Irrigation ☐ Spray Irrigation ☐ Decorative Fountains and Impoundments ☐ Cooling Applications ☐ Dust Control/Street Cleaning ☐ Other:
Average Daily Distribution	gallons

1.2. Project Milestones and Timeline

Estimated Date of Temporary Certificate of Occupancy (TCO): Insert TCO Date Here

Table 2. Alternate Water Source System estimated implementation timeline.

Tasks for Implementing Alternate Water Source System[1]	Start	Finish
Design Phase		
Construction Phase		
Development of Operations & Maintenance Manual		
Start-Up and Commissioning		

[1] This table is intended to provide estimated dates; projects will not be held to the dates in this table.

1.3. Vicinity Map (insert as Appendix A.1)

Provide a vicinity map of the location of the development including neighboring properties.

1.4. Facility Map (insert as Appendix A.2)

Provide a facility map of the location of the Alternate Water Source System within the development.

1.5. Plan/Layout of the Alternative Water Source System (insert as Appendix A.3)

Provide a general arrangement drawing (plan view) of the Alternate Water Source System:

- Unit treatment processes (location and dimensions)
- Tanks (location and dimensions)
- Pumps (location and dimensions of pad or skid)
- Tie-point connections (inlet, outlet, drains, overflows, etc.)
- Locations of egress (i.e., entry and exit doors, etc.)

2. Basis of Design for Alternate Water Source System

2.1. Outdoor Source Water Flow Rates and Water Quality

[Fill out the following tables if outdoor sources, i.e. rainwater and stormwater, are being used. The total annual estimated supply for rainwater and stormwater should match the numbers that were provided in the water budget, water calculator, and stormwater control plan.

Water quality values are intended as design guidelines. Project Applicant can change default values; if they are changed, please mark with a footnote and explain data source/rationale Project Applicant should delete rows corresponding to source waters that are not included in the proposed project.]

Table 3A Summary of Alternative Water Source inflows for outdoor sources.

Type of Source Water	Total annual estimated supply (gal/yr)
Rainwater	
Stormwater	
Total	

Table 3B Alternate Water Source outdoor source raw water quality summary.

Type of Source Water	Turbidity (NTU)	TSS (mg/l)	pH	Total coliform (CFU/100ml)	BOD (mg/l)
Rainwater	10 - 30	20 - 50	5 – 9	10^2 - 10^3	<15
Stormwater	--	100 - 500	6 – 9	10^2 - 10^5	<40

2.2. Indoor Source Water Flow Rates and Water Quality

[Provide estimates of the inflows of indoor source waters, if being used. Project Applicant should delete rows corresponding to source waters that are not included in the proposed project.]

Table 3C Summary of Alternate Water Source inflows for indoor sources.

	Average Daily Supply[1] (gal)	Daily supply (if applicable)[2] (gal)						
		Mon	Tue	Wed	Thu	Fri	Sat	Sun
Foundation Drainage								
Graywater								
Blackwater								
Other:								
Total								

[1] This value should match the numbers that were provided in water budget and water calculator.
[2] For buildings with differences in occupancy on weekdays and weekends (i.e. commercial), please estimate breakdown of flows by day of the week.

[Complete the table below if foundation drainage or other indoor source waters are being used. Project Applicant can change default values; if they are changed, please mark with a footnote and explain data source/rationale. Project Applicant should delete rows corresponding to source waters that are not included in the proposed project.]

Table 3D. Alternate Water Source raw water quality for indoor sources.

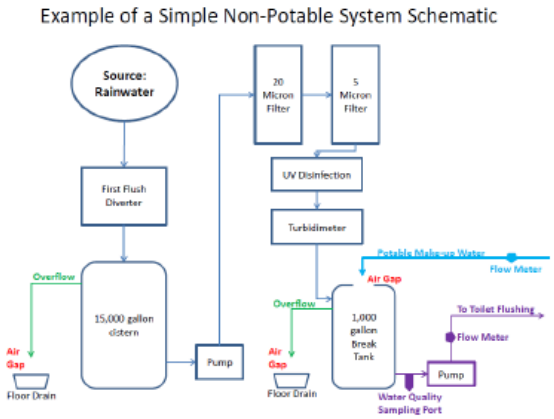
Type of Source Water	Total Coliform (CFU/100ml)	BOD (mg/l)	TSS (mg/l)	Turbidity (NTU)	pH	Ammonia (mg/l as N)
Graywater[1]	10^4 – 10^7	100 – 300	100 – 300	20 - 200	6 – 9	3 – 10
Blackwater	10^8 – 10^{10}	700 – 1,000	300 – 600	--	6 – 9	50 – 150
Foundation Drainage[2]						
Other:						

[1] These values are assuming that laundry is not a significant component of graywater; values should be modified if there is significant laundry water contribution.
[2] Data should be obtained from monitoring program, if foundation drainage is being used.

3. Treatment Train Design Criteria

3.1. Treatment Train Process Flow Diagram (PFD)

[PFD should be a simplified block diagram including all tanks, treatment processes[2], LRT compliance monitors[3], water quality monitors[4], waste streams, diversions, and potable makeup supply location] See example schematic below:



[Please also complete the table below for all system components included in the PFD. Cut sheets for components described in this table should be provided in Appendix B.]

Table 4. Summary of system components.

System Component	Function	Capacity/Size	LRT compliance process or monitor? (Y/N)

3.2. Pathogen Log Reduction Credit

Table 5. Log reduction credits for Critical Control Point unit processes in treatment train.

Unit Process	Proposed Virus Credit	Proposed Protozoa Credit	Proposed Bacteria Credit	Crediting Framework[1]
TOTAL				
REQUIRED[2]				

[1]Please list approved crediting framework. If proposing a new crediting framework, list 'other' and attach explanatory text.
[2]Required log reduction credits are specified in the Rules and Regulations

[2] Treatment processes should include any pre-treatment (e.g. pre-screens) and post-treatment (e.g. stabilization)
[3] LRT compliance monitors are those that are required to demonstrate ongoing performance of a unit process receiving pathogen reduction credit, e.g. UVT for UV disinfection, free chlorine residual for chlorine disinfection, pressure decay test for membrane filtration.
[4] Water quality monitors are those that are not required to demonstrate LRT compliance, but are necessary for demonstration of compliance with water quality goals, e.g. turbidity.

3.3. Treatment Train Flow Summary

[Complete the following flow summary table. Replace 'unit process 1', etc. with name of each unit process included in treatment train. If a process or tank is not receiving continuous flow (e.g. the first equalization tank), the hrs/day receiving flow should be less than 24. If there is not a constant demand for water at the end uses, e.g. toilet flushing in a commercial building, the hrs/day producing flow from the treated water storage tank should be less than 24. If unit processes do not receive a constant flow rate, a min/avg/max should be provided and the hrs/day receiving and producing flow should likely be less than 24.

This table should include all tanks and unit processes. The purpose of the table is to evaluate whether sufficient storage is being provided to handle variable influent flows, and whether flows in and out of tanks and unit processes are compatible.]

Table 6. Unit process flow summary.

	Influent Flow		Effluent Flow	
	Hrs/day receiving flow	Influent flow rate[1] (gpm)	Hrs/day producing flow	Effluent flow rate[1] (gpm)
Equalization/storage tank				
Unit process 1				
Unit process 2				
…				
Treated water storage tank				

[1] *If influent or effluent flows are not constant, please provide min/avg/max flow rates.*

3.4. Unit Process Design Criteria

*[**Include only tables corresponding to unit processes in proposed treatment train; delete unused tables**. You may update the Table letters by right clicking and choosing "update field". If using a process not included in any tables, please modify an existing table and include key design criteria. If relevant design criteria are not listed, please add them to tables. For chemical disinfection processes, please provide simple diagram of contactor configuration.]*

Table 7A. Membrane bioreactor design criteria.

Membrane Bioreactor		
Parameter	Units	Value
System manufacturer	--	
Effluent flow rate	gpm	
Nitrifying?	--	
Volume	gal	
pH	pH units	
Temperature	°C	
Hydraulic retention time (HRT)	hr	
Solids retention time (SRT)	days	

Mixed liquor suspended solids (MLSS)	mg/L	
Dissolved oxygen	mg/L	
Transmembrane pressure	kPa	
Flux	gal/ft^2/d	
Effluent turbidity	NTU	
Effluent ammonia	mg/L	
Effluent BOD	mg/L	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

Table 7B. Biological treatment design criteria.

Biological Treatment		
Parameter	Units	Value
Treatment type	--	
System manufacturer	--	
Effluent flow rate	gpm	
Temperature	°C	
Influent BOD	mg/L	
Volume	gal	
Hydraulic residence time	hr	
Solids retention time	days	
Dissolved oxygen	mg/L	
Mixed liquor suspended solids	mg/L	
Effluent ammonia	mg/L	
Effluent BOD	mg/L	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

Table 7C. Granular media filtration design criteria.

Granular Media Filter		
Parameter	Units	Value
Type of filtration	--	
System manufacturer	--	
Effluent flow rate	gpm	
Area	sf	
Loading rate	gpm/sf	
Media type(s)	--	
Media size(s)	mm	
Media depth(s)	ft	

Backwash rate	gpm/sf	
Air scour rate	scfm	
Effluent turbidity	NTU	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

Table 7D. Membrane filtration design criteria.

Membrane Filter		
Parameter	Units	Value
Manufacturer	--	
Net product flow	gpm	
Nominal pore size	µm	
Total membrane area	sf	
Chemical cleaning frequency		
Flux	gal/ft²/day	
Pressure drop		
Pressure decay test		
Effluent turbidity	NTU	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

Table 7E. Reverse osmosis design criteria.

Reverse Osmosis		
Parameter	Units	Value
Manufacturer	--	
Net product flow	gpm	
Number of elements		
Area per element	sf	
Flux	gfd	
Recovery	%	
Chemical cleaning frequency		
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

Table 7F. Filtration design criteria.

Other Filter		
Parameter	Units	Value
Type of filtration	--	
System manufacturer	--	
Effluent flow rate	gpm	

Total area	sf	
Loading rate	gpm/sf	
Nominal pore size	µm	
Effluent turbidity	NTU	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

Table 7G. UV design criteria.

UV Disinfection		
Parameter	Units	Value
Number of reactors	--	
System manufacturer and model	--	
Effluent flow rate	gpm	
UV Dose	mJ/cm^2	
Influent UVT (expected)	%	
Minimum validated UVT (if applicable)	%	
UV Intensity	mW/cm^2	
Validation Protocol (if applicable)		
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

[Include description and diagram of chlorine contact configuration]

Table 7H. Chlorine disinfection design criteria.

Chlorine Disinfection		
Parameter	Units	Value
System manufacturer (if applicable)	--	
Chlorine type		
Effluent flow rate	gpm	
Contactor volume	gallons	
Hydraulic residence time	Min	
Baffling factor	--	
CT	mg-min/L	
Chlorine residual	mg/L	
Influent ammonia	mg/L	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

[Include description and diagram of ozone contact configuration]

Table 7I. Ozone disinfection design criteria.

Ozone Disinfection		
Parameter	Units	Value
Effluent flow rate	Gpm	
Contactor volume	Gallons	
Hydraulic residence time	Min	
Baffling factor	--	
CT	mg-min/L	
Ozone residual(s)	mg/L	
System manufacturer	--	
Oxygen source	--	
Ozone generation method	--	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

[Include description and diagram of disinfection contact configuration]

Table 7J. Disinfection design criteria.

Other Disinfectant [specify]		
Parameter	Units	Value
Effluent flow rate	Gpm	
Contactor volume	Gallons	
Hydraulic residence time	Min	
Baffling factor	--	
CT	mg-min/L	
Disinfectant residual(s)	mg/L	
System manufacturer	--	
Basis for crediting (if applicable)[1]	*[Describe the crediting framework or technology-specific validation approach for pathogen crediting]*	

[1] *Include any necessary documentation in Appendix C*

3.5. Secondary Disinfection

*[The Rules and Regulations specify a requirement for chlorine residual at the **point of entry** to the distribution system (0.5 – 2.5 mg/L). Systems should **also** maintain a residual throughout the distribution system, such that the farthest use location has a residual. Please describe strategy for maintaining secondary disinfectant residual in distribution system. Respond to the bullets below. Note that for rainwater systems, this section may not be applicable, as chlorine is not required for these systems.]*

- Secondary disinfectant residual: free chlorine, chloramine, other?
- Minimum residual concentration target at farthest use location in the building (e.g. top-floor toilet)?
- How will this residual be ensured and verified?

3.6. Chemical Use & Handling

[Fill out the table below for all chemicals used in the Alternate Water Source System]

Table 8. Summary of chemical handing.

Name and CAS Number	Storage and Handling Facilities	Point of Application	Dosages	Method and Degree of Mixing

3.7. Solids Handling

[Provide description of how the treatment residuals will be handled, if applicable]

4. Monitoring, Alarms, and Reporting

This section is intended to provide an overview of the system monitoring and alarms. Note that in the event of any event that is likely to result in environmental harm or increased public risk, the notification procedure outlined in Article 12C, Section 7e, must be followed.

4.1. System control strategy

[Complete the following table.]

Table 9. Summary of system control strategy.

Type of automated control	☐ PLC ☐ SCADA ☐ Other:
Remote monitoring?	☐ YES ☐ NO

4.2. Online monitoring

[Complete the following table with all LRT compliance and water quality online monitors, as well as flow meters. The order in which monitors are listed should correspond to the order in which they appear in the PFD and. Values shown in the table are examples and should be replaced with system-specific information. If a membrane filter pressure decay test is being used, that should be included here.]

Table 10. Summary of online LRT compliance and water quality monitoring.

Location	Parameter	LRT compliance monitor? (Y/N)	Water Quality Requirements (if applicable)	Manufacturer and Model
MF Effluent	Turbidity	Y	95% <0.2 NTU Always <0.5 NTU	
Storage tank	Chlorine	N	24-hr avg 0.5 – 2.5 mg/L	

4.3. Grab sampling

[Complete the following table with all grab sample types (e.g. total coliform, BOD, TSS, etc.). Values shown in the table are examples and should be replaced with system-specific information.]

Table 11. Summary of grab sample monitoring.

Parameter	Location	Frequency	Water Quality Requirement	Reporting Parameter
Total coliform	Treated water storage tank	Daily	< 2.2 MPN/100 mL	Daily value

4.4. Alarms and Diversions

[Complete the following table with all alarm-triggering conditions, such as turbidity, UVT, chlorine residual etc. Where applicable, specify both 'alert level' and 'critical level' alarm criteria. Values shown in the table are examples and should be replaced with system-specific information.]

Table 12. Summary of alarm conditions and corrective actions.

Parameter	Location	Alarm Criteria		Corrective Actions
		Alert Level[1]	Critical Level[2]	
Turbidity	MF Effluent	0.4 NTU	0.5 NTU	Immediate shutdown and diversion

[1] *Alert level alarm criteria are intended to provide operators with an indication that process performance is changing but has not yet reached a critical level.*
[2] *Critical level alarm criteria indicate that process performance is no longer sufficient to achieve compliance with LRT and/or water quality requirements.*

5. Supplemental Water Supply & Cross Connection Control

[Complete all fields in the following tables]

Table 13. Makeup water supply description.

Description	
Quantity available	
Anticipated circumstances when make-up water will be used	
Anticipated average daily volume of make-up water (gal)	

Table 14. Cross connection and backflow prevention measures summary.

Responsible party for cross-connection control and control of access to plumbing	
Alternate water source plumbing design and proximity to potable water plumbing	
Backflow prevention devices and assemblies	
Does project have approved air gap?	☐ YES ☐ NO
Does project have approved backflow devices in other system locations as appropriate?	☐ YES ☐ NO
Will cross connection shutdown test be scheduled prior to system startup?	☐ YES ☐ NO
Will cross connection test (shutdown, pressure differential, dye, or other accepted method) be scheduled every four years?	☐ YES ☐ NO

6. Public Exposure and Impact

Table 15. Summary of public exposure.

Public Exposure	
Description of use area potential public contact	
Strategies to minimize public exposure	
Food Facilities	
Will the development include food facilities with service to the public?	☐ YES ☐ NO
If yes (above): list features located within food facilities which will receive non-potable water	
If yes (above): list precautions which will be in place to prevent contact with non-potable water	

7. Appendix A: Drawings

A.1: Vicinity Map

A.2: Facility Map

A.3: Plan/Layout of Alternative Water Source System

8. Appendix B: Component Cut Sheets

[Include only components described in Section 4.1 Components Summary Table]

9. Appendix C: Log Reduction Evidence