7.0 PLANNING AND SIZING CRITERIA

Planning and sizing criteria presented herein are based on generally accepted standards for reliable, cost-effective, and efficient water systems. The criteria provide a means by which the hydraulic performance and reliability of the existing system can be evaluated, and for the ability to plan for future facilities to meet future system conditions and demands. Criteria has been recommended considering the previous criteria established in the 2010 WMP as well as American Water Works Association (AWWA) guidelines for potable water system planning.

7.1 DISTRIBUTION SYSTEM PERFORMANCE

7.1.1 Supply Source Capacity

The City has access to potable water from MWD imported water supplies and groundwater from the City's two active wells. The criterion for sources of supply adopted by most water agencies is to maintain a total water source capacity for MDD. Under this criterion, reservoir storage is assumed to provide the following:

- Peak demands above the MDD in addition to regulating hourly fluctuations in demand
- Fire flow storage
- Storage for emergency conditions, such as an outage of a source of supply for an extended duration

Existing system demand requirements are shown in Table 7-1.

Table 7-1 – Supply Requirements

Supply Source Capacity			
Description	**Criteria**	**Existing Peaking Factor**	**Existing Supply Requirement**
Local Supply	Average Day Demand	-	2,968 gpm (4.3 mgd)
Total Supply	Maximum Day Demand (except for closed zone, Hill Zone, which shall be Maximum Day Demand plus Fire Flow Demand or Peak Hour, whichever is greater)	1.5 x ADD	4,451 gpm

7.1.2 Distribution System Pressures

Adequate system pressure is important for acceptable water distribution system performance. The water system should be capable of providing at least 50 psi as minimum static pressure and 40 psi during peak hour demand period. Desired pressures under normal conditions range from 60 psi to 80 psi. During fire flow, minimum pressure of 20 psi is required at the hydrant outlets.

Maximum service static pressures should be limited to 80 psi. Where the maximum service pressure exceeds 80 psi, individual pressure regulators should be equipped at the service in accordance with the Uniform Plumbing Code. The maximum static pressures in the distribution system should not exceed 150 psi with a maximum pressure recommendation of 125 psi. If the maximum pressures exceed 125 psi, special consideration should be given to the design of new facilities, such as increasing the pressure rating of pipeline, fittings, and other appurtenances. Pressure requirements are shown in Table 7-2.

Table 7-2 – Distribution System Pressure

Description	Criteria
Static Pressures	• Minimum 50 psi • Desired 60-80 psi • Maximum 150 psi
Dynamic Pressures	• Minimum 40 psi during Peak Hour Demands under Maximum Day Demand conditions
Fire Flow	• Minimum 20 psi at fire hydrant outlets for the required fire flow

7.1.3 Fire Flow Requirements

The required fire flows are based upon the California Fire Code (Table B105) and are shown in Table 7-3. The single-family residential flow was set at 1,500 gpm for two hours. Multi-family residential fire flow was set at 2,500 gpm for three hours. Fire flow for schools was established at 3,000 gpm for three hours. Fire flow for commercial and industrial uses was established at 4,000 gpm for four hours. According to the California Fire Code, fire hydrants should be spaced at an average of 450 feet in single family residential areas, 450 feet in multi-family areas, and 350 feet in all other commercial and industrial areas.

Table 7-3 – Fire Flow Requirements

Description	Flow (gpm)	Duration (hrs)	Residual Pressure at Hydrant Outlet (psi)	Average Spacing between Hydrants (ft)	Max Distance from Hydrant to any Point on Frontage (ft)
Fire Flow Demands					
Single Family Residential	1,500	2	20	450	225
Multi-Family Residential	2,500	3	20	450	225
Schools	3,000	4	20	400	225
Commercial / Industrial	4,000	4	20	350	210

7.2 FACILITY SIZING

7.2.1 Booster Station Sizing

Booster pump stations are sized to deliver MDDs of the service areas. In a closed zone, such as the Hill Area Pressure Zone, the pump stations must be able to deliver the MDD plus the fire flow or the peak hour flow, whichever is greater.

All booster pump stations must incorporate a standby pump of the same size as the largest duty pump. The design flow rate will depend on whether there is adequate storage for operational and fire flow requirements. The pump station shall be equipped with a backup power source. A portable generator can be considered acceptable as a backup power source for the station.

7.2.2 Water Storage Sizing

The storage necessary for reliable potable water system operation is divided into three categories: operational storage, fire flow storage, and emergency storage. Operational, fire flow, and local emergency storage are typically provided in local storage facilities (i.e., storage tanks/reservoirs).

Operational Storage Requirements

Storage is typically provided in each service area to balance the differences between the rate of supply and the hourly demand variation on a maximum day. Operational storage is also referred to as equalization storage. When the peak hour demands exceed the rated capacity of the supply, given most pump stations are not designed to match these demands, storage facilities are used to supply their respective storage service area.

Typically, the storage facility is replenished during hours when the demand is less than the supply rate, and usually occurs in the night-time hours. The operational storage might typically be based on one MDD if groundwater storage is not available. For the City's water system, operational storage criteria are based on 35 percent of the ADD.

Emergency Storage Requirements

Emergency storage is used in the event of an interruption in imported or external water supply sources. MWD estimates that most outages in its service can be mitigated within seven days. Accordingly, many agencies that depend solely on imported MWD water utilized seven average days of storage as their emergency storage criterion.

It is reasonable to expect that groundwater sources will be available during an outage of the imported water supplies. Therefore, the required emergency storage volumes may be reduced by the firm groundwater supply capacity. The City of Manhattan Beach's emergency storage volumes can be reduced by the actual firm production capacity of its wells.

Fire Flow Storage Requirements

Fire flow requirements for various land uses are shown in Table 7-4. Fire flow storage volumes required are 0.24 MG for single family residential, 0.54 MG for multi-family residential, 0.84 MG for schools, and 0.96 MG for commercial/industrial. Fire flow storage is the volume required to supply the service area with the required fire flows, which range from 1,500 to 4,000 gpm for a duration of two to four hours.

Table 7-4 – Fire Flow and Fire Storage

Description	Criteria	Existing Requirement
Reservoir Capacity		
Operational Storage	35% of Average Day Demand (4.27 MGD)	1.50 MG
Emergency Storage	Seven Average Day Demands less local firm well capacity	14.77 MG
Fire Flow Storage		
Single Family Residential	1,500 gpm for 2 hours	0.24 MG
Multi-Family Residential	2,500 gpm for 3 hours	0.54 MG
Schools	3,000 gpm for 4 hours	0.84 MG
Commercial / Industrial	4,000 gpm for 4 hours	0.96 MG

7.2.3 Water Transmission and Distribution Pipeline Sizing

Pipe velocities should be in accordance with Table 7-5 and have a minimum size of 6 inches in diameter. The City uses maximum pipeline velocities when evaluating existing pipelines and sizing new distribution and transmission pipelines. To maintain adequate system pressures and prolong the life of the pipe, flow velocities should be limited. The system should operate at velocities of 1 to 3 feet per second (fps) normally, with a maximum velocity of 5 fps at ADD flows. The pipe velocity at MDD flows should not exceed 7 fps.

Table 7-5 – Pipeline Evaluation

Description	Criteria
Minimum Pipe Size	• 6-inch for looped distribution system pipe • 8-inch for new un-looped mains connected to a fire hydrant
Maximum Velocities	• 5 ft/s at Average Day Demand • 7 ft/s at Maximum Day Demand • 10 ft/s at Fire Flow Demand

7.3 SERVICE LIFE OF FACILITIES

All facilities have useful lives for which relatively trouble-free service can be expected. Once exceeded, these facilities become less reliable, expensive to maintain, and are subject to failure. Therefore, facility age is considered in the assessment of all water systems and in formulating future replacement projects.

The determination of the useful life is dependent upon multiple considerations. Consistent with the previous Master Plan, Table 7-6 details the recommended planning criteria for a useful life of the City's infrastructure. These criteria should be one of the considerations in determining the phasing of facility replacement.

Table 7-6 – Useful Life

Facility	Useful Life (Years)
Steel Reservoirs	60-100
Steel Reservoir Coating and Lining	20
Concrete Reservoirs	60-100
Lined & Coated Ductile Iron/Steel Pipe	60-75
PVC Pipe	80-100
Asphalt Concrete Pipe	75
CI and Steel Pipe (Lining or coating of non-current practice)	40
Pump Stations/Wells/Treatment Facilities • Structure • Piping • Valves • Mechanical • Electrical • Mild Steel Well Casing	 • 40-60 • 40 • 20-40 • 20-25 • 15-20 • 30-50

7.4 DISTRIBUTION SYSTEM MAINTENANCE PROGRAM

Regular maintenance of a distribution system is an essential part of a properly operated water distribution system. Over the past five years, City water maintenance staff is responsible for maintaining and repairing the City's water system. In addition to providing water meter reading services for 13,500 water meters, the City water maintenance staff performs the following: installing and repairing water meters, repairing water main breaks, cycling water system valves, repairing faulty valves, and installing fire hydrants.

Servicing of Valves and Hydrants

For the water maintenance practice, the City has placed an emphasis on locating and exercising the more than 1,800 valves that are part of the water distribution system. Valves can be found inaccessible, inoperable, or closed and should therefore be tested and exercised regularly. In the event of a line break, it is important that valves operate properly so that the break can be isolated for repair. Records of repair should require a notation of the time at which valves are closed and reopened so that valves do not remain closed inadvertently.

Hydrants should be periodically inspected for leaks at the hose outlets. Leaking hydrants should be removed and/or reconditioned and then replaced.

Flushing

Flushing is performed to remove any accumulated sediments or other impurities which have been deposited in the system pipes. It will also help to restore system capacity. Flushing is performed by causing a large volume of water to pass through a pipe section that has been isolated. Opening flushing valves or fire hydrants allow flow into the isolated pipeline where settled sediments are suspended. It is important that the existing system flushing program be continually and systematically performed to remove the sedimentation.

The City's hydraulic water model should be used to establish a phased or systematic flushing protocol for the entire system. This can be a useful tool in understanding flow directions to isolate certain areas of particular water quality concerns.

Leak Surveys

Comparison of pumping and purchase records, and customer meter readings and other uses such as system flushing can indicate if excessive leakage is occurring in the system. Leak surveys should be conducted when excessive leakage well above normal is suspected.

Water Main Replacement and Repair

Water mains are repaired and/or replaced when pipes are found to be broken, corroded, or leaking. Pipes are either replaced or repaired with a sleeve and clamp around the outside of the damaged section. The method of repair should consider if the line is scheduled for replacement, its location in the system, and the conditions which led to the failure. Following the repair or replacement of any pipe, the line should be flushed and disinfected in accordance with the applicable requirements.

7.5 STORAGE TANK AND RESERVOIR MAINTENANCE

The storage tanks should be inspected periodically by a qualified diver. The reports from diving inspections should be utilized in scheduling the subsequent inspection program, as well as the maintenance/repair projects.

7.6 WATER QUALITY

Drinking water quality is regulated by the Division of Drinking Water (DDW) and the U.S. Environmental Protection Agency (USEPA); types of contaminants include radionuclides, inorganic constituents, organic chemicals, disinfectant residuals in the water distribution system, and other constituents. The regulations through 2010 are addressed in the 2010 WMP. A summary of regulations effective after 2010 is provided in Table 7-7. More information on these regulations can be found on the DDW website.

Table 7-7 – Water Quality Regulations Effective after 2010

Regulation	Title	Effective Date
SBDDW-20-001	Perchlorate Detection Limit for Purposes of Reporting (DLR)	July 1, 2021
SBDDW-20-002	Revised Total Coliform Rule	July 1, 2021
SBDDW-17-003	Point of Use/Point of Entry Treatment Permanent Regulations	March 22, 2019
SBDDW-16-02	Surface Water Augmentation (SWA) Regulations	October 1, 2019
SBDDW-17-001	1,2,3-Trichloropropane MCL	December 14, 2017
SBDDW-16-01	Point of Use/Point of Entry Treatment Emergency Regulations	April 1, 2016
DPH-11-005	Hexavalent Chromium Maximum Contaminant Level (MCL)	July 1, 2014[a]
DPH-14-003E	Groundwater Replenishment Using Recycled Water	June 18, 2014
DPH-09-014	Long Term 1 and 2 Enhanced Surface Water Treatment Rules	July 1, 2013
DPH-09-004	Disinfectant Residual, Disinfection Byproducts, and Disinfection Byproduct Precursors	June 21, 2012
DPH-10-011E	Point of Entry Treatment	September 22, 2011
DPH-09-007	Ground Water Rule	August 18, 2011
DPH-10-009E	Point of Use Treatment	December 21, 2010

a) DPH-11-005 Hexavalent Chromium Maximum Contaminant Level (MCL) was removed on September 11, 2017.
Reference: 2021 State of California https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/Recentregs.html

In addition to the regulations, response, and notification levels for two per- and polyfluoroalkyl substances (PFAS) have been implemented. Of the PFAS contaminants, the DDW began monitoring perfluoro octane sulfonate (PFOS) and perfluorooctanoic acid (PFOA) to action levels in August 2019: a notification level where the water supply agency must notify the consumers the contaminant is in the water and a response level, where the water supply agency must remove the contaminant or discontinue use of the water source. Response levels are monitored as a quarterly running annual average. Table 7-8 shows the DDW action levels for PFAS updated in August 2019.

Table 7-8 – PFAS Notification Levels and Response Levels

Contaminant	Notification Level (ng/L)	Response Level (ng/L)
PFOS	6.5	40
PFOA	5.1	10
PFOS + PFOA	70	70

Reference: 2021 State of California https://www.waterboards.ca.gov/pfas/drinking_water

7.6.1 Water Quality Review

The quality of water served by the City of Manhattan Beach has to be in accordance with the Federal standards as well as the State of California Department of Public Health (CDPH) standards as set forth in Title 22 of the California Code of Regulations. The basic water quality standards are established by the Safe Drinking Water Act (SDWA), which mandated the U.S. Environmental Protection Agency (USEPA) to develop primary drinking water standards. There are two types of standards. Primary standards protect you from substances that could potentially affect your health. Secondary standards regulate substances that affect the aesthetic qualities of water. Regulations set a Maximum Contaminant Level (MCL) for each of the primary and secondary standards. The MCL is the highest level of a substance that is allowed in your drinking water. Advisory levels are health-based limits that consider analytical detection levels and are non-enforceable. These are interim guidance levels, which may trigger mitigation action by the water utility. Advisory levels include California Public Health Goals (PHGs) and Federal Maximum Contaminant Level Goals (MCLGs). PHGs are set by the California Environmental Protection Agency and provide more information on the quality of drinking water to customers, and are like their federal counterparts, MCLGs. Both PHGs and MCLGs are concentrations of a substance below which there are no known or expected health risks.

Primary Standards: A brief review of the Manhattan Beach 2019 Annual Water Quality Report indicated no exceedance of primary standards for MCL levels in the groundwater or surface water. There were four contaminants that exceeded the MCLG or PHGs limits in the groundwater as shown in Table 7-9, however these exceedances do not pose any health concerns. They are advisory levels which may trigger mitigation action by the water utility. These contaminants should continue to be monitored and evaluated.

Table 7-9 – Contaminants Exceeding Water Quality Limits in Groundwater Sources

Contaminant	Groundwater Average	Groundwater Range	MCL	MCLG or PHG	Major Sources in Drinking Water
Primary Standards - Substances Monitored for Public Health					
Arsenic (ug/L)	0.14	ND-0.27	10	0.004	Erosion of natural deposits; glass/electronics production wastes; runoff
Gross alpha particles (pCi/L)	3.3	ND-6.8	15	0	Erosion of natural deposits
Bromate (ug/L)	5.6	ND-8.4	10	0.1	By-product of drinking water disinfection
Secondary Standards - Monitored at the Source for Aesthetic Purposes					
Manganese (ug/L)	52	43-60	50	500	Erosion of natural deposits; glass/electronics production wastes; runoff
Other Parameters					
Hexavalent chromium (ug/L)	0.03	ND-0.07	-	0.02	Erosion of natural deposits; glass/electronics production wastes; runoff

Reference: Manhattan Beach 2019 Annual Water Quality Report

Secondary Standards: The only reported contaminant exceeding the MCL levels is the manganese level (52 ug/L) as shown in Table 7-9. Manganese exceeded the secondary MCL in one well. As mentioned earlier, water from the well is blended with imported surface water to reduce concentrations prior to pumping into the distribution system. To mitigate the need for blending water and to reduce dependence on imported water, the City is upgrading the Peck Facility with the treatment ability to remove manganese via a greensand filtration system. The Peck Facility has been in construction since fall of 2020 and is anticipated to be online in the Spring of 2022. Groundwater from the City's wells will be treated through the greensand filtration system.

7.7 FUTURE REGULATIONS

The USEPA and the State Water Quality Control Board (State Water Board) have a few upcoming regulations in process or planned. These potential regulations are related to Hexavalent Chromium, Microplastics, Lead and Copper Rule (LCR), and Cross Connection Control. The Hexavalent Chromium regulation may be more applicable to the City than the others. However, it is unknown what the details of any new regulation will be at this time. Therefore, no budgetary recommendations are provided.

<u>Hexavalent Chromium</u>

The State Water Board is gathering and analyzing the occurrence data, treatment costs, and holding a white paper discussion on the economic feasibility of a hexavalent chromium MCL. The previous hexavalent chromium MCL was set at 10 parts per billion (ppb) (July 2014) but was repealed on September 11, 2017. It is unknown what the new regulation will be. The City tests the hexavalent chromium levels in the groundwater wells and has encountered levels near the existing notification level of 10 ppb. The City should continue to monitor hexavalent chromium to ensure compliance with a future MCL. Since the details of this regulation are unknown, budget recommendations related are also unknown.

Microplastics

The State Water Board is required by Senate Bill No. 1422 to adopt a definition of microplastics in drinking water and adopt a standard testing methodology for microplastics. This includes requiring four years of testing and reporting, along with public disclosure of results. The definition was adopted on June 16, 2020, while the standard testing methodology must be adopted by July 1, 2021. The State Water Board defines microplastics in drinking water as “solid polymeric materials to which chemical additives of other substances may have been added, which are particles which have at least two dimensions that are greater than 1 and less than 5,000 um. Polymers that are derived in nature that have not been chemically modified (other than by hydrolysis) are excluded” (State of California 2020). The standard methodology has not been adopted yet. Standardized methods for extraction and analysis of microplastics in drinking water were made available on September 28, 2021 for Raman spectroscopy and infrared spectroscopy, while the method interlaboratory comparison study is anticipated to be published in a peer-reviewed journal in Winter 2022. It is too early to determine a recommendation or budget related to this regulation.

Lead and Copper Rule (LCR)

The USEPA is reviewing the existing LCR by conducting virtual engagements to gather input from communities impacted by lead, including national water associations, Tribes and Tribal communities, and the USEPA’s state co-regulators. Improvements to the revised LCR include finding more sources of lead in drinking water using science-based protocols, establishing a “trigger level” to mitigate contamination earlier, requiring testing in schools and child-care facilities, requiring water systems to identify and make public lead service lines, and replacing complete lead service lines. The LCR revision’s effective date is December 16, 2021, and the compliance deadline is October 16, 2024.

Cross Connection Control

Assembly Bill 1671 requires the State Water Board to establish cross connection and backflow standards and update associated regulations. Specific allowable features to prevent backflow and back siphonage can be found in the Draft Policy Handbook. The State Board is currently seeking public comment on the Draft Policy Handbook.