FINAL UTILITY REPORT

WILDLAND FIRE STATION
Fire Training Center
6055 Reservoir Road
Boulder, Colorado

May 20, 2013

Prepared for:

Allred & Associates, Inc. /
City of Boulder Facilities and Asset Management

Prepared by:

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Project No. 12495C

ENGINEER'S STATEMENT

I hereby certify that this report for the final utility design of the Wildland Fire Station Site Review was prepared under my direct supervision in accordance with the provisions of the City of Boulder Design and Construction Standards for the owners thereof.

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Donald P. Ash, P.E.
Registered Professional Engineer
State of Colorado No. 36045

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INTRODUCTION

This report is submitted as the Final Utility Report of the existing and proposed conditions for the Wildland Fire Station project located at the Fire Training Center, 6055 Reservoir Road, in Boulder, Colorado. The site is located in Section 10, Township 1N, Range 70W of the 6th Principal Meridian in the City of Boulder, Boulder County, State of Colorado. The area of the project site is approximately 2.0 acres. The site is bounded by open space to the north, Highway 119 to the East, the Fire Training Center to the south and the Boulder Reservoir to the west. A vicinity map is included with this report.

This report is being prepared to accompany the Site Review application for the project. The purpose of this utility report is to analyze the water and wastewater demands based on the proposed improvements. This study meets the requirements set forth in the City of Boulder Design and Construction Standards (DCS).

WATER SYSTEM

A 12″ looped water main was installed during the construction of the Fire Training Center circa 2010. The looped main was installed in order to facilitate the need for water services to the buildings and fire hydrant installations. New domestic water, irrigation, and fire service connections will be made a new 8″ main extension as shown on the Preliminary Utility Plan. The water meter pit will be located in a landscape area adjacent to the proposed building. The meter will have a remote readout device.

The estimated water demands for the proposed project are based on the acreage of the project site. Average-Day Demand and associated minimum and maximum peaking factors are based on the City of Boulder DCS. The estimated water system demands in gallons per minute (GPM) are summarized in the following table.

TABLE NO. 1
PROJECTED WATER DEMAND

Water Demand Conditions	Gallons per Minute (GPM)
Maximum-Hour	35
Maximum-Day	35
Average-Day	14
Insurance Service Office (ISO) Fire Flows	1,500 (estimated)
Irrigation	10 (estimated)

There is a 24″ steel transmission main along the northern portion of State Highway 119, just southeast of the project site. The existing 12″ looped water mains throughout the project site have been connected to this existing 24″ steel line. The proposed demands (including Fire Flow) are insignificant relative to the water system capacity in this area.

SANITARY SEWER SYSTEM

An 8″ sanitary sewer main was installed during the construction of the Fire Training Center circa 2010. This 8″ main connects to a lift station and is pumped through a 4″ force main, underneath of State Highway 119 and into the existing 8″ sanitary sewer main located in Spine Road. A new sanitary sewer service will be installed from the existing main to the Wildland Fire Station as shown on the Preliminary Utility Plan.

The estimated wastewater flows for the proposed project are based on the acreage of the project site. Average-Day Load and associated minimum and maximum peaking factors are based on the City of Boulder DCS. The estimated wastewater system demands in gallons per minute (GPM) are summarized in the following table.

TABLE NO. 2
PROJECTED WASTEWATER FLOW

Wastewater Demand Conditions	Gallons per Minute (GPM)
Average-Day	6.9
Maximum-Day	27.8
Minimum-Day	1.7
Infiltration	0.02

A capacity analysis has been performed on the existing sanitary sewer in Spine Road adjacent to the site. These calculations are included in Appendix A. The maximum-day flow from the site is only 6% of the total capacity of the pipe and will therefore not have a significant impact on the performance of the existing sanitary system.

STORM WATER FACILITIES

Runoff from the roof areas will be directed via overland flow to the detention pond. The parking lot and a portion of the entrance drive will be directed to a storm sewer system that will discharge into the detention pond.

GROUNDWATER

The geotechnical engineer for the project has stated in his report that groundwater is expected to be encountered at depths from 8′ to 10′. The construction will include placing fill and there will be no below grade spaces. Therefore, groundwater will not be an issue at this site.

ELECTRICAL, GAS, FIBER OPTIC AND TELEPHONE

Existing gas, power and fiber optic lines currently run along the north side of the Administration Building at the Fire Training Center. Private utility service will not be a problem given the extent of the existing utility distribution system infrastructure already in the area. Tentative connection locations have been shown on the Preliminary Utility Plan.

CONCLUSION

The primary consideration for this report was to present the existing and proposed sanitary sewer and water systems associated with the proposed Wildland Fire Station. The existing City of Boulder water and sewer in the adjacent roadways can handle the additional demands of the development. Furthermore, the proposed water and sanitary sewer systems will be designed in accordance with the City of Boulder Design and Construction Standards.

APPENDIX A

DEMAND CALCULATIONS

(2) Wastewater collection mains shall be designed to ensure transport of suspended materials and preclude material deposits considering minimum-day flows.

(3) The peak flow shall be determined using average-day forecasts adjusted by a peaking factor and including the allowed and any existing system infiltration or inflow.

(4) Flow capacity and loading data of existing and future conditions for the City's major wastewater collection system shall be obtained from the Utilities Division for use in designing and analyzing proposed improvements. This information is compiled using the City's standard Hydra hydraulic analysis program, and is available in both hard copy and electronic formats.

(5) The minimum-day flow shall be determined using average day-forecasts adjusted by a minimum flow factor and including the allowed and any existing infiltration or inflow.

(6) Average-day flow forecasts shall include the ultimate area, population density, existing wastewater flow, anticipated industrial discharge, and any allowed infiltration/inflow, that produces the greatest wastewater flow rates.

(7) Surface water, ground water, or cooling water shall not be discharged into the wastewater collection system. Prohibited connections include roof drains, storm inlets, foundation perimeter drains, area drains for open patios or driveway entrances to parking structures, and ground water sump systems.

(8) Floor drains internal to covered parking structures, that collect drainage from rain and ice drippings from parked cars or water used to wash-down internal floors, shall be connected to the sanitary sewer using appropriate grease and sediment traps.

(9) Table 6-1 indicates wastewater discharge forecasting for average-day conditions:

Table 6-1: Average Day Load by Development Type

Development Type	Average Day Load
Residential	100 gpcd
Average Persons per Single-Family Unit	3.2
Average Persons per Multi-Family Unit	2.0
Non-Residential	
Commercial	5000 gpad
Industrial	4500 gpad
Infiltration	200 gidm**

NOTES: * The Industrial Average-Day Load Indicates Non-Water Intensive Industrial Development
** Gallons Per Inch-Diameter-Mile

(10) The average-day forecast loads indicated in Table 6-1 represent minimum forecast loads in determining design flows. Where proposed development is known (based on specific applications or use), and the anticipated wastewater loads exceed the minimum forecast demands, the greater load shall be used to determine design flows.

(11) Table 6-2 indicates the wastewater peaking and minimum flow factors for forecasting discharges. These flow factors are, used to determine minimum required wastewater main capacity:

Table 6-2: Factors for Forecasting Wastewater Discharges

Collection Main Diameter	Minimum Factor	Peaking Factor
10 inches and smaller	0.25	4.0
12 to 15 inches	0.30	3.5

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DATE: 5/20/2013
BY: DPA

PRELIMINARY UTILITY CALCULATIONS
WILDLAND FIRE STATION, BOULDER, CO
SANITARY SEWER DEMANDS
Based on City of Boulder Design and Construction Standards, Chapter 6

OBJECTIVE Determine wastewater:
a) Average Day (GPM)
b) Peak Flow/Maximum Day (GPM)
c) Minimum Day (GPM)
d) Infiltration/Inflow (GPM)

SOLUTION:

a) Average Day = 2 Acres * 5,000 gpad = 10,000 gpd
(avg load, Table 6-1)

Average Day	=	6.9	gpm

b) Peak Flow = 6.9 gpm * 4
(peaking factor, Table 6-2)

Peak Flow	=	27.8	gpm

c) Minimum Flow = 6.9 gpm * 0.25
(min factor, Table 6-2)

Minimum Flow	=	1.7	gpm

d) Infiltration/Inflow = 200 gallons per inch diameter mile * 4 inch diameter * 0.04 mile = 30.3 gpd
(table 6-1)

Infiltration/Inflow	=	0.02	gpm

(4) Table 5-1 indicates water demand forecasting for average-day conditions.

Table 5-1: Average Day Water Demands

Development Type	Average-Day Demand
Residential	
Low Density	180 gpcd
Medium Density	150 gpcd
High Density	75 gpcd
Commercial	10,000 gpad
Industrial	12,000 gpad

(5) Table 5-2 indicates water demand peaking factors for forecasting demands.

Table 5-2: Water Demand Peaking Factors for Forecasting Demands

Development Type	Maximum/Hour	Maximum/Day
Residential		
Low Density	5.1	5.1
Medium Density	5.0	2.5
High-Density	5.0	2.0
Commercial	2.5	2.5
Industrial	1.5	1.5

(6) Water design flows that reduce the water system pressures below acceptable levels specified in this section or elsewhere in these Standards are considered detrimental to the overall system. In these situations, the Director will deny project approval, or require the developer to provide additional water system improvements, both onsite and offsite, to ensure no reduction in levels of service.

(B) Water Services

Design flows for water services shall be determined in conformance with the most current Uniform Plumbing Code (UPC), adopted by the City of Boulder.

5.05 Materials and Installation

Construction of water-related public improvements shall be in compliance with these Standards. All pipe shall be of adequate strength to support the trench and AASHTO HS-20 highway loadings. The type of pipe to be installed shall comply with these Standards, and shall be based upon applicable design flows, pressures, site conditions, corrosion protection, and maintenance requirements.

5.06 Corrosion Protection

Corrosion protection will be required for all water system improvements where corrosive soil conditions are encountered. The Engineer shall perform a soils resistivity survey to evaluate the corrosion potential of soils in proposed projects or developments, and recommend any necessary corrosion protection measures, such as alternative pipe type or cathodic protection. The Director will review the soils resistivity survey and Engineer's recommendations and the service history for water system corrosion in the area, and determine the pipe type or protection to be used prior to construction plan approval.

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PRELIMINARY UTILITY CALCULATIONS
WILDLAND FIRE STATION, BOULDER, CO
WATER SERVICE DEMANDS
Based on City of Boulder Design and Construction Standards, Chapter 5

OBJECTIVE Determine Water:

a) Maximum-Hour (GPM)
b) Maximum Day (GPM)
c) Average Day (GPM)
d) Insurance Services Office (ISO) Fire Flows (GPM)
e) Irrigation Flows (GPM)

SOLUTION:

a) Maximum Hour = 2.5 * 10,000 gpad * 2.00 Acres = 50,000 gpd
(Table 5-1)

Maximum Hour =	35 gpm

b) Maximum Day = 2.5 * 10,000 gpad * 2.00 Acres = 50,000 gpd
(Table 5-1)

Maximum Day=	35 gpm

c) Average Day = 2.00 Acres * 10,000 gpad = 20,000 gpd
(Table 5-1)

Average Day =	14 gpm

d) ISO Fire Flow =

(Estimated)

ISO Fire Flow =	1,500 gpm

d) Irrigation Flow =

(Estimated)

Irrigation Flow =	10.00 gpm

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PROJECT: 12495C
DATE 5/17/2013
BY DPA

Circular Pipe
Flowing full

MANNINGS EQUATION
NORMAL VELOCITY CALCULATIONS
V=1.486 *(R**2/3)*(S**1/2)/n

EX. SANITARY SEWER IN SPINE ROAD

S(%)=	n=
2.00%	0.011

DIA. INCHES	SLOPE (FT/FT)	n	VELOCITY (FPS)	Q (CFS)	Q (GPM)	AREA (SF)	WP (FT)	R
54	0.0200	0.011	20.67	328.67	122,833	15.90	14.14	1.13
48	0.0200	0.011	19.10	240.08	89,724	12.57	12.57	1.00
42	0.0200	0.011	17.48	168.15	62,844	9.62	11.00	0.88
36	0.0200	0.011	15.77	111.48	41,662	7.07	9.42	0.75
30	0.0200	0.011	13.97	68.55	25,621	4.91	7.85	0.63
24	0.0200	0.011	12.04	37.81	14,131	3.14	6.28	0.50
21	0.0200	0.011	11.01	26.48	9,897	2.41	5.50	0.44
20	0.0200	0.011	10.66	23.25	8,690	2.18	5.24	0.42
18	0.0200	0.011	9.93	17.56	6,561	1.77	4.71	0.38
15	0.0200	0.011	8.80	10.80	4,035	1.23	3.93	0.31
12	0.0200	0.011	7.58	5.95	2,225	0.79	3.14	0.25
8	0.0200	0.011	5.79	2.02	755	0.35	2.09	0.17
6	0.0200	0.011	4.78	.94	350	0.20	1.57	0.13
4	0.0200	0.011	3.64	.32	119	0.09	1.05	0.08

755 gpm >> 75 gpm (peak flow from site), the contribution from the site is negligible in comparison with the capacity