TRANSPORT COLORADO - SUB-AREA 1

MANILA ROAD AND COLFAX AVENUE

MASTER UTILITY REPORT

CITY OF AURORA, COLORADO

APRIL 2020

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MASTER UTILITY REPORT
FOR
TRANSPORT COLORADO – SUB-AREA 1

City of Aurora Approval Block

Aurora Water	Date
City Engineer	Date
Fire Department	Date

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Colorado Professional Engineer Date
Jason Mann, CO P.E. No. 42735

ENGINEER'S STATEMENT:

This utility study "Master Utility Report for TransPort Colorado Sub-Area 1" was prepared under my direct supervision in accordance with the provisions of the City of Aurora Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure. I understand that the City of Aurora does not and will not assume liability for facilities designed by others.

_____ _____

Jason Mann, CO P.E. No. 42735 Date
CVL Consultants of Colorado, Inc.

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1 INTRODUCTION

1.1 Project Description

TransPort Colorado is a proposed logistics and commerce park consisting of approximately 5,400 acres of industrial and commercial development adjacent to the Colorado Air and Space Port (Space Port), formerly known as Front Range Airport, in Aurora, Colorado. The project offers significant growth opportunity for the area due to its proximity to I-70, Highway 36, Denver international Airport (DIA), and the Union Pacific Rail line that borders the southern portion of the site.

The TransPort Colorado Project is divided into six separate sub-areas with planned light to heavy industrial, and mixed commercial uses. Improvements will include the construction of new roads, water, sanitary, and stormwater infrastructure, as well as parks and open space.

1.2 Project Location

The project is located at the eastern edge of Aurora, Colorado, approximately 20 miles east of downtown Denver, and approximately 6 miles southeast of DIA. The site is immediately adjacent to Space Port, I-70, and a Union Pacific Railroad track. It consists of property in Sections 8, 16, 17, 20, 21, 22, 24, 25, 27, 28, 29, 32, and 33, Township 3 South, Range 64 West of the Sixth Principal Meridian. The project includes unannexed property in Sections 17, 20, and 29. These unannexed parcels are outside the limits of Sub-Area 1 and are not considered in this report. Refer to Figure 1 below for a vicinity map of the project and surrounding areas.

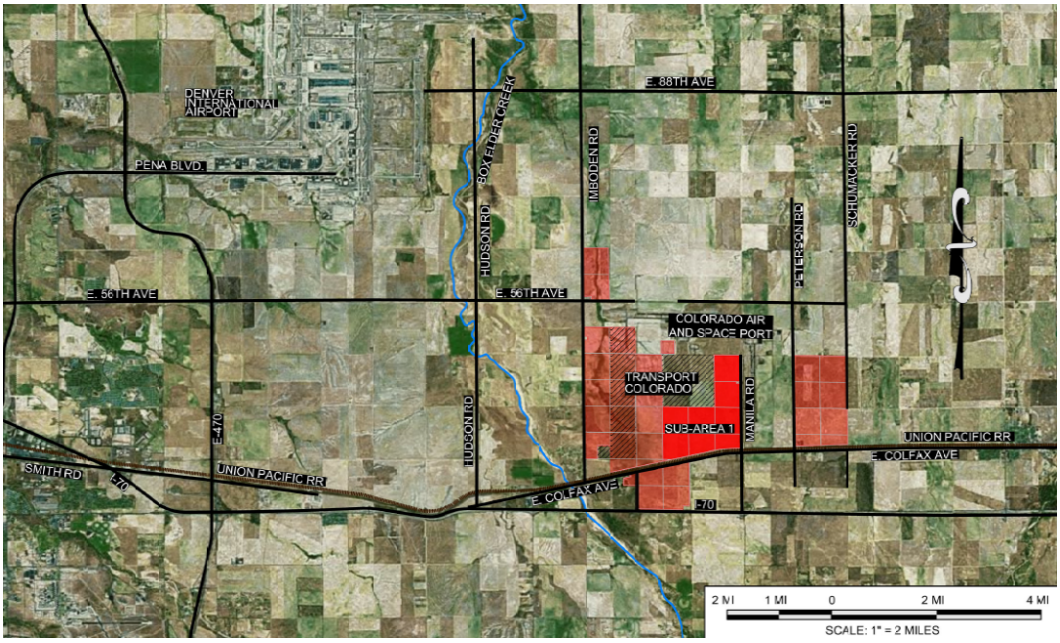


Figure 1 – Vicinity Map

This study will focus on Sub-Area 1, which is approximately 1,154 acres of planned industrial development in the eastern portion of the site. Refer to Figure 2 below for the location of Sub-Area 1 as it relates to the overall project.

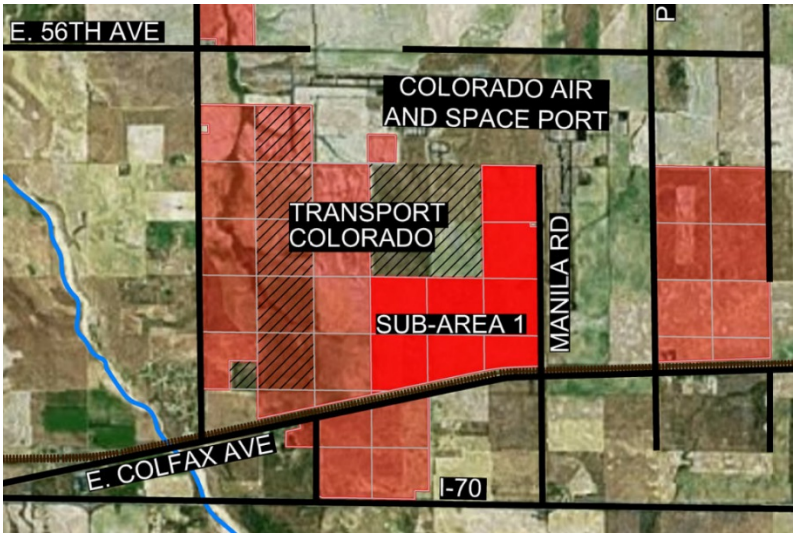


Figure 2 – Sub-Area 1 Location Map

1.3 Scope

This report serves as a companion document to the amended Framework Development Plan (FDP) and Public Improvement Plan (PIP) for TransPort Colorado - Sub-Area 1. The purpose of this Sub-Area 1 Master Utility Report (MUR) is to establish the water and wastewater infrastructure needed to support Sub-Area 1 at full build-out while accounting for the surrounding areas as shown in the respective City of Aurora (COA) Capital Improvement Plans (CIPs). This report is in conformance with the **TransPort Colorado Master Utility Report** developed by CVL for the FDP Amendment (Ref. 1). This report is currently under review. Any relevant changes made during the review process will be reflected herein.

Two studies were previously performed for the site. The first is titled, **Water and Wastewater Master Plan for Front Range Airport and Surrounding Area** by the Farnsworth Group, dated December 20, 2001 (Ref. 2). The second is titled, **Transport and Front Range Airport Area Master Utilities Plan** by the Matrix Design Group, Inc., dated May 1, 2007 (Ref. 3). The latter was a companion document to the FDP that was approved in 2005 and revised in 2006. In addition to the reports referenced above, a third report titled **Transport Sub-Area 1 – Master Utilities Plan** was developed by Matrix Design Group, Inc. and approved December 24, 2008 (Ref. 4). The limits of Sub-Area 1 have changed substantially from the previous report; therefore, this study will reference the report compiled by Matrix in 2007. Excerpts will be in shown in italics.

Similar to the 2007 Matrix report, this study will follow several guiding principles for the implementation of the design. Those guiding principles for the implementation of the design. Those guiding principles are as follows:

- *Develop just-in-time construction strategies that defer capital expenditures to the extent possible to enable the development to become established and create revenue streams to support broader regional capital improvement programs,*
- *Minimize stranded cost related to phasing infrastructure. To the extent practicable, trunk infrastructure will be sized to serve either build-out conditions or to provide a reasonable life cycle to justify future replacement,*
- *Utilize a wide variety of funding sources including developer contributions, water and sewer enterprise funds, Title 32 Metropolitan District tax revenues, and State/Federal grants to clear the significant cost hurdles for water and wastewater systems at this location, and*
- *Provide for a design of infrastructure that becomes fully integrated into the City of Aurora capital and operations programs.*

2 SANITARY SEWER MASTER PLAN

2.1 Objective

The objective of this report is to define the sanitary requirements and establish a conceptual design and system layout for the initial phases and full build-out of Sub-Area 1. The approach taken by the project will provide just-in-time delivery of infrastructure to support the development. Because there are many unknowns regarding timing and actual users, detailed design will be performed at the Site Plan level when the site parameters are better defined. Each Site Plan will include amendments to this MUR identifying actual user demands, and any sanitary sewer treatment systems needed to meet sub-area requirements.

2.2 Existing Conditions

With the exception of Space Port, the predominant land use in the area is agriculture with few residents. There is currently no public sanitary infrastructure in the area of the site. Existing residents are served by individual septic systems. There is an existing wastewater treatment plant servicing Space Port. For the purposes of this report it is assumed that Space Port will connect to the sanitary system installed with the development of TransPort, which may include a future wastewater treatment plant at 64th Avenue and Bear Gulch.

2.3 Criteria

Because there is no city infrastructure in place, it is assumed that all Sub-Area 1 parcels will be served by On-Site Wastewater Treatment System (OWTS). Loading on these systems has been estimated per ***Regulation No. 43 – On-Site Wastewater Treatment System Regulation*** by the Colorado Department of Public Health and Environment (CDPHE) (Ref. 5). Assuming a factory or plant without showers and exclusive of industrial wastewater results in a loading of 20 gpd per employee for an 8-hour shift. The number of employees was calculated using a Floor Area Ratio of 0.15 and an Employee Ratio of 66/100,000 sf for a Heavy Industrial use as described in the Sub-Area

1 FDP documents. Industrial wastewater will require additional treatment as required by CDPHE. The need for industrial wastewater treatment will be determined during the Site Plan design.

As the site is developed, sanitary mains and laterals will be installed with adjacent roadways to ensure the infrastructure is available when a regional treatment facility is on-line, and to avoid asphalt and concrete replacement in the future. Design criteria from the ***Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure*** (Ref. 6) were used to calculate the wastewater loading and design the infrastructure to be installed with the development of Sub-Area 1. These criteria are listed below.

2.3.1 Loading

- Commercial Average Day loading = 1,500 gpd/acre*
- Commercial Equivalent Population per acre = 22*
- Industrial Average Day loading = 1,200 gpd/acre*
- Industrial Equivalent Population per acre = 18*
- Peaking Factor (PF) = $5 \div p^{0.167}$, where p = population in thousands and PF is no greater than 4.0 and no less than 1.7.

2.3.2 Pipe Design

- The flow velocity shall not exceed ten (10) fps flowing full or ½ full using Manning's Formula and n=0.011 for PVC or n=0.013 for RCP. Minimum slope shall be 0.4% for pipes 8" in diameter or larger with a minimum velocity of two (2) fps at least once per day.
- Depth of flow in pipes should not exceed 75% of capacity for pipes 12 inches or smaller and 80% for pipes larger than 12 inches.
- Minimum drop through a manhole from inlet to outlet or same diameter pipe shall be:
  - 0.2 ft. on straight through run
  - 0.3 ft. on deflected bends greater than 45 degrees.
- Minimum diameter pipe for service lines is 4 inches.
- Infiltration = 10% of the average flow (not peaked)

*Note: Actual loadings and populations will be reevaluated as individual users come on-line.

2.4 Proposed System

The proposed system at the buildout of Sub-Area 1 is shown on Exhibit SS1 which corresponds to the system described in the FDP Master Utility Report by CVL. The system layout in the FDP MUR generally conforms to the 2018 COA Wastewater CIP (Ref. 7). The phasing of the system is described below.

2.5 Phasing

Due to the scale and long-term nature of the project, and the lack of public infrastructure, the sanitary system for Sub-Area 1 will need to be phased as discussed below.

2.5.1 Initial Improvements

Initial Users will be serviced by OWTS. Systems generating 2,000 gpd or less will be regulated by the Tri-County Health Department. Systems generating more than 2,000 gpd will be regulated by the Colorado Department of Health and Environment. Sanitary mains and laterals will be installed as roads are constructed to ensure adequate infrastructure is in place when a wastewater treatment plant is online. Connections to these mains and laterals will be made available by the developer. Individual users will be required to switch over to the public infrastructure at their lots lines when the regional system becomes active.

2.5.2 Interim Improvements

As noted, a regional wastewater treatment solution has yet to be determined. It is possible that a package plant or sub-regional wastewater treatment facility will be needed before a regional treatment solution is available. If so, the timing of these improvements will depend on how rapidly the sub-areas are developed and what the actual loading of the planning areas is. It is possible that portions of them could be developed simultaneously. This will be evaluated as the site develops and Site Plans are submitted for individual users.

2.5.3 Build-Out Improvements

The build-out of Sub-Area 1 sanitary infrastructure will include mains, laterals, a lift station, a force main, and connection to, or construction of a regional wastewater treatment plant as shown on Exhibit SS1. The need for and location of the WWTP shown is still undetermined. The City is collaborating with the Metro Wastewater Reclamation District on a feasibility study to develop a regional approach for development in the Box Elder Basin. If a regional public treatment solution is not in place or planned by the time it is needed for the development, it is recommended that the City, Space Port, and TransPort work together to develop a detailed study including preliminary design of a Wastewater Treatment Plant to serve the project and surrounding areas. This study should begin when approximately 70% of the projected OWTS loading for Sub-Area 1 is reached to ensure that final design, permitting and construction can be achieved by the time Sub-Area 1 is built out. This recommendation is consistent with that made in the previously approved Master Utility Plan developed by Matrix.

If required, the WWTP will be constructed east of Imboden Road at E. 64th Avenue and Bear Gulch. This facility will be constructed by the developer and owned/operated by the metro district established for the development.

2.6 System Analysis

The sewer network was sized using the COA criteria listed above to support the project and the properties included in the regional service area shown on Exhibit SS1 in Appendix B. This analysis conforms to the study developed by CVL for the FDP Amendment referenced above. As such, the service area was analyzed for the fully built-out scenario and incorporates historical data from the previously approved reports for the off-site areas. The historical land uses have been updated to reflect those shown

in the "Aurora Places" comprehensive plan. The loading calculated in the previous report have been updated to reflect the city's current criteria.

Although likely conservative, on-site planning areas that are anticipated to contain mostly warehouse-related businesses are designed as industrial uses. As individual users come online, the design will be reevaluated to ensure sanitary mains are not unnecessarily over-sized. The on-site and off-site loading is described in more detail below.

2.6.1 OWTS Loading

The OWTS loading for Sub-Area 1 as shown on Exhibit SS1 in Appendix B was analyzed based on the anticipated land uses and planning area gross acreages. Flows were estimated per the CDPHE criteria described above. Refer to Table 1 below for a summary of the OWTS loading for Sub-Area 1.

TABLE 1 – OWTS LOADING

PLANNING AREA	LAND USE	GROSS AREA (AC)*	AVG. DAY (GPD)
10	Heavy Industrial	156.8	13,524
11	Heavy Industrial	118.2	10,195
12	Heavy Industrial	60.9	5,253
13	Heavy Industrial	160.2	13,817
14	Heavy Industrial	253.5	43,728
15A	Heavy Industrial	150.9	13,015
15B	Heavy Industrial	2.5	216
16	Heavy Industrial	176.2	15,197
17	Heavy Industrial	23.2	2,001
TOTALS		**1,102.4**	**116,945**

*Note: For sanitary loading calculations, open space is excluded from the gross area.

It should be noted that the flows shown above are aggregated by planning area. Individual systems will be much smaller as each user will be required to design, permit, and construct an OWTS for their specific site. Individual users will not be permitted to combine systems. Systems generating up to 2,000 gpd will be reviewed and permitted by the Tri-County Health Department. Systems generating flows in excess of 2,000 gpd will be regulated by CDPHE.

2.6.2 On-site Infrastructure Loading

As mentioned above, infrastructure will need to be sized for full buildout. As such, the sewer network was sized using the City of Aurora criteria listed above to support the project and surrounding properties included in the regional service area. On-site flows were calculated based on industrial land uses as listed in the FDP Land Use Matrix, and off-site flows were updated from the previously approved Matrix report to current loading standards. Table 2 below shows a summary of the on-site flows generated by

each planning area in Sub-Area 1. Off-site flows were accounted for in the sizing of the mains in Manila Road and East 48th Ave. Refer to the calculations in the appendix for a more detailed breakdown of the flows generated both on and off-site.

TABLE 2 – ON-SITE FLOWS

PLANNING AREA	USE	GROSS AREA* (AC)	AVG. DAY (GPD)
10	Industrial	156.8	188,160
11	Industrial	117.2	140,640
12	Industrial	60.8	72,960
13	Industrial	160.2	192,240
14	Industrial	251.1	301,320
15A	Industrial	150.6	180,720
15B	Industrial	2.8	3,360
16	Industrial	174.5	209,400
17	Industrial	23.2	27,840
TOTALS		**1,097.2**	**1,316,640**

*Note: For sanitary loading calculations, open space is excluded from the gross area.

It is worth noting that the loading shown in Table 2 is significantly higher than that shown in Table 1. As users develop their respective parcels, actual or more accurate demand forecasts will need to be evaluated to ensure mains are adequate while not being unnecessarily over-sized.

2.6.3 Off-site Loading

The Sub-Area 1 system at full build-out will serve areas outside the projects boundaries and city limits should those properties be annexed. The infrastructure has been sized to account for these areas. The sanitary loading for Space Port calculated in the Matrix report was broken down by module. These modules were not defined or delineated. Therefore, this report maintains the acreages listed in the Matrix report for Space Port and the off-site parcels contained within the service boundary. The off-site loading calculations were then updated to reflect the land uses shown in "Aurora Places" and incorporate COA criteria. Refer to Table 3 below for a summary of the off-site flows. See Appendix B for greater detail.

TABLE 3 – OFF-SITE SANITARY FLOWS

OFFSITE PLANNING AREA	USE	GROSS AREA* (AC)	AVERAGE DAY LOADING (GPD)
FUTURE PLANNING AREAS (F2 & F4)	INDUSTRIAL	320	383,640
SPACE PORT	INDUSTRIAL	662	794,280
OFFSITE (OS-J THRU N & U)	INDUSTRIAL	4,807	5,768,400
TOTALS		**5,789**	**6,946,320**

*Note: For sanitary loading calculations, open space is excluded from the gross area.

2.7 Outstanding Issues

Aurora Water and the Metro Wastewater Reclamation District are collaborating on a feasibility study to determine a regional wastewater treatment solution for the Box Elder Basin. Until an approach is determined, it is assumed that a regional wastewater treatment plant will be constructed at E. 64th Avenue and Bear Gulch. Coordination between the various stakeholders will be required to determine the timing and design of the regional wastewater treatment plant. The necessity and timing of any interim improvements, such as package plants or sub-regional wastewater treatment plants will also need to be addressed. The details and triggers for these improvements will be further evaluated with the development of the Sub-Area Master Utility Studies.

3 WATER SUPPLY MASTER PLAN

3.1 Objective

The objective of this report is to define the water requirements for the site and establish a conceptual design and system layout. Because there are many unknowns regarding timing and actual user demands, this analysis will need to be reevaluated as information becomes available. Detailed design will be performed at the Site Plan level when the site parameters are better defined. Each Site Plan will include amendments to this Master Utility Report identifying actual water demands and infrastructure needed to meet sub-area requirements.

3.2 Existing Conditions

Similar to the sanitary system, there is currently no city water infrastructure in the vicinity of the site. Existing residents are served by groundwater wells. Space Port has two on-site storage and distribution systems. One is owned and operated by COA, the other is owned and operated by Space Port. Per discussions with COA staff, the Space Port system does not have additional capacity to supply the TransPort Colorado project. This report assumes that Space Port will connect to the city system when it becomes available.

3.3 Criteria

Because the water network will ultimately connect to the city infrastructure, the system will be designed per COA criteria. As such, the following list of criteria was used to design the water network for Sub-Area 1:

3.3.1 Demands

- Commercial Average Day demand = 1,500 gpd/acre*
- Industrial Average Day demand = 1,200 gpd/acre*
- Parks and Greenbelts demand = 1,800 gpd/acre*
- Max Day Factor = 2.8 x average day demand
- Max Hour Factor = 4.5 x average day demand

*Note: actual demands will be analyzed as individual users come on-line.

3.3.2 Maximum Velocity

- Max Hour Velocity for 6-inch line = 2.5 fps
- Max Hour Velocity for 8-12-inch line = 3 fps

- Max Hour Velocity for 16-24-inch = 4.5 fps
- Max Hour Velocity for >24-inch = 7.8 fps

3.3.3 Maximum Head Loss

- Max Head Loss for 6-inch line = 5ft/1000ft
- Max Head Loss for 8-12-inch line = 5ft/1000ft
- Max Head Loss for 16-24-inch line = 5ft/1000ft
- Max Head Loss for >24-inch line = 4ft/1000ft

3.3.4 Fire Flow

- Commercial Fire Flow = 2,500 gpm for 2 hours
- Industrial Fire Flow = 3,500 gpm for 3 hours
- 20 psi minimum at any point in system

3.3.5 Pressures

Allowable pressures are not defined within the COA water criteria; however, the city has indicated that pressures ranging from 45psi – 120psi have been permitted for industrial sites.

3.4 Proposed System

At full build-out, water infrastructure will include mains, service lines and connections to the city water system. The layout of the water mains will generally follow the 2018 COA Water CIP (Ref. 8). The proposed network will be sized to provide service to the project and Space Port in accordance with the criteria listed above. However, since there is currently no city infrastructure in place and the existing system at Space Port has no additional capacity, a phased approach will be taken to supply the site with water. This will include a tank, chlorination, and pump system supplied by groundwater wells; followed by a connection to a city water supply as described below. Sufficient looping will be incorporated to minimize the effects of main breaks. Refer to Exhibit WL1 – Water System Layout Plan in Appendix C for a map of the proposed system for Sub-Area 1.

3.5 Phasing

3.5.1 Initial Improvements

It is anticipated that development will begin in Sub-Area 1 with the initial 100-300 acres being served by a well, tank and pump system. Early estimates indicate that 1.0-1.5MG tank will be sufficient to supply the initial development and firefighting needs. Water demands will be refined as actual users come online.

A Water Service Agreement with COA will be required for the use of groundwater wells. Based on discussions with Wright Water Engineers, an output of 40 acre-feet/year should be assumed. This would require approximately 2-5 wells to supply the initial users. Output may vary, so the estimated number of wells needed will be adjusted as better information becomes available.

The developed acreage estimate above is preliminary based on city demand criteria and limited well production information. As wells are drilled and production information becomes available, this estimate may change. Also, as users purchase property and are able to provide more accurate demand forecasts, this design will be re-analyzed, and the developable acres adjusted.

3.5.2 Build-Out Improvements

Once development surpasses the capacity of the tank and well system described above, a connection to a city water source will be needed. This connection is anticipated to be made after the first 100-300 acres of Sub-Area 1 are developed. At that time, it is planned for the site to connect to the existing line at the southeast corner of the Porteos site, east of E. 56th Avenue and Powhaton Road.

The 2018 Capital Improvement Plan shows a 12" line being provided by the city in approximately 15 years. Preliminary calculations indicate that a 16" line will be adequate to fill the tank and meet the required volumes of Sub-Area 1 Separate agreements will be necessary to determine cost sharing/reimbursement possibilities for the construction of a larger line.

Once the connection to city infrastructure is made, the wells will be disconnected and the 16" line will fill the tank. The pump(s) will continue to provide for the average day, maximum day, maximum hour and fire flow demands. .The tank and pump system will be maintained and operated by the Metro District until a second city connection is made, however, Aurora Water reserves the right to assume ownership of the interim system at the discretion of the Aurora Water Department.

Additionally, COA is contemplating a feasibility study which would include a non-potable water line being brought to the area. This would be beneficial to the project and surrounding area as it could supply irrigation and industrial uses, allowing for more development with potable sources. This will be further evaluated pending results of the feasibility study.

3.6 System Analysis

Initial on-site users will be served by groundwater wells and a tank. There are four aquifers from which the site will be able to acquire water: Denver; Upper Arapahoe; Lower Arapahoe; and Laramie-Fox Hills. Of the four, the Denver aquifer is the only "not non-tributary" aquifer, which means drawing from it would require an augmentation plan. The Laramie-Fox Hills aquifer is known to have poor water quality. For these reasons, the project will prioritize the use of the Upper and Lower Arapahoe aquifers. Until more definitive data is available, initial well production estimates are conservative at 100 gpm. Operating at 12 hours/day, this yields 80 acre-feet/yr resulting in 2-5 wells being needed to develop the initial 100-300acres. This yield will need to be reevaluated as wells are drilled and more information becomes available.

As mentioned above, it is anticipated that a 1.0 -1.5 MG tank is needed for the initial phases of Sub-Area 1. This is based on an industrial fire flow demand of 3,500 gpm for 3 hours (3,500gpm x 3hr x 60min/hr = 630,000gal) in addition to the Average Day Demand for 300 acres of industrial development (1,200gpd/acre x 300acres = 360,000gpd).

As the site is developed, an additional water source will be required. Preliminary calculations show that a 16" line from the Porteos site would provide adequate flows to fill the tank. The pump(s) will provide for the average day, maximum day, maximum hour and fire flow demands. The tank referenced above is represented as reservoir R1 in the calculations shown in Appendix C.

The city has indicated that the majority of the site is within pressure Zone 4E with an HGL of 5,744'. Northern portions of the site fall within Zone 3E which has an HGL of 5,665'. The connection west of E. 48th Ave. is anticipated to be in Zone 3 with an HGL of 5,720'. The pressure zones will be reevaluated as the project is developed. Pressure reducing valves (PRVs) will be used to separate the different zones.

The system for Sub-Area 1 has been designed to meet the maximum day plus fire flow demand with a residual pressure of no less than 20 psig at any point in the water distribution system. Demands were calculated using the criteria listed above for the land uses proposed in the Sub-Area 1 FDP documents. These land uses are summarized in the calculation tables in the appendix. The demands are summarized by planning area in Table 3 below. Refer to Exhibit WL1 for the network layout and pipe sizing. Smaller mains will be looped within individual planning areas as they are developed. These designs will be shown on the Site Plans for those areas.

TABLE 3 – WATER DEMANDS

			DEMAND			
PLANNING AREA	**USE**	**GROSS AREA* (AC)**	**AVG. DAY (GPM)**	**MAX. DAY (GPM)**	**MAX. HR. (GPM)**	**MAX DAY + FIRE FLOW (GPM)**
10	Industrial	156.80	130.67	365.87	588.00	3,866
11	Industrial	117.20	97.67	273.47	439.50	3,773
12	Industrial	60.80	50.67	141.87	228.00	3,642
13	Industrial	160.20	133.50	373.80	600.75	3,874
14	Industrial	251.10	209.25	585.90	941.63	4,086
15A	Industrial	150.60	125.50	351.40	564.75	3,851
15B	Industrial	2.80	2.33	6.53	10.50	3,507
16	Industrial	174.50	145.42	407.17	654.38	3,907
17	Industrial	23.20	19.33	54.13	87.00	3,554
36	Open Space	29.80	37.25	104.30	N/A	0
37	Open Space	3.70	4.63	12.95	N/A	0
TOTALS		**1,130.7**	**956.21**	**2,677.38**	**4,114.50**	**N/A**

*Note: The gross acreage does not include area within the existing or proposed floodplain.

3.7 Results

The system was analyzed using WaterGEMS by Bentley. The results of the analysis are presented in Appendix A. This analysis represents the proposed water distribution system, including node locations, pipe locations and pipe sizes that serve the project site. Table 4 below shows a summary of the WaterGEMS analysis for the initial phase with an isolated well, tank and pump system.

TABLE 4 – WATERGEMS RESULTS (INITIAL PHASE – ISOLATED TANK/PUMP SYSTEM)

SCENARIO		MINIMUM PRESSURE		MAXIMUM PRESSURE		MAXIMUM	PIPE
		(PSIG)	NODE	(PSIG)	NODE	VELOCITY (FPS)	ID
1	AVERAGE DAY	50	J-3	81	J-1	0.27	P-7
2	MAX DAY	50	J-3	81	J-1	0.77	P-7
3	MAX HOUR	50	J-3	80	J-1	1.23	P-7
4	MAX DAY + FIRE FLOW	47	J-2	62	J-1	6.51	P-7

Table 5 below shows a summary of the results for the build-out phase which includes a connection to the city system. This system would provide for the Average Day, Max Day and Max Hour Demands as well as the Max Day + Fire Flow.

TABLE 5 – WATERGEMS RESULTS (BUILD-OUT PHASE – 16" CITY CONNECTION)

SCENARIO (DEMAND NODES ONLY)		MINIMUM PRESSURE		MAXIMUM PRESSURE		MAXIMUM	PIPE
		(PSIG)	NODE	(PSIG)	NODE	VELOCITY (FPS)	ID
1	AVERAGE DAY	54	J-6	88	J-2	0.68	P-2
2	MAX DAY	47	J-6	80	J-2	1.90	P-2
3	MAX HOUR	35	J-6	68	J-2	3.05	P-2
4	MAX DAY + FIRE FLOW	N/A	N/A	N/A	N/A	N/A	N/A

3.8 Outstanding Issues

The well, tank, chlorination, and pump systems will need to be designed as the approval process progresses. At this time, well production data is limited, so estimates are conservative. As wells are drilled on-site, production estimates will need to be reevaluated.

Tank sizing is preliminary, and the design of the chlorination and pump system is not included in this analysis. Additionally, connection to city sources will need to be further discussed and evaluated for viability and cost implications.

Lastly, construction water demands will need to be determined. In the 2007 Matrix report, it was estimated that 302,000 gpd would be required for compaction operations. At the current well production estimates, this would require approximately 10 wells. This estimate will need to be reevaluated and a viable source will need to be identified.

4 CONCLUSION

This Master Utility Report for the TransPort Colorado development was prepared in accordance with the Aurora Water Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure, CDPHE Regulation 43, and per discussions with Aurora Water and Tri-County Health. The purpose of this Master Utility Report was to size the water and sanitary sewer infrastructure to serve the TransPort Colorado – Sub-Area 1 development while providing a high-level discussion on initial and interim conditions.

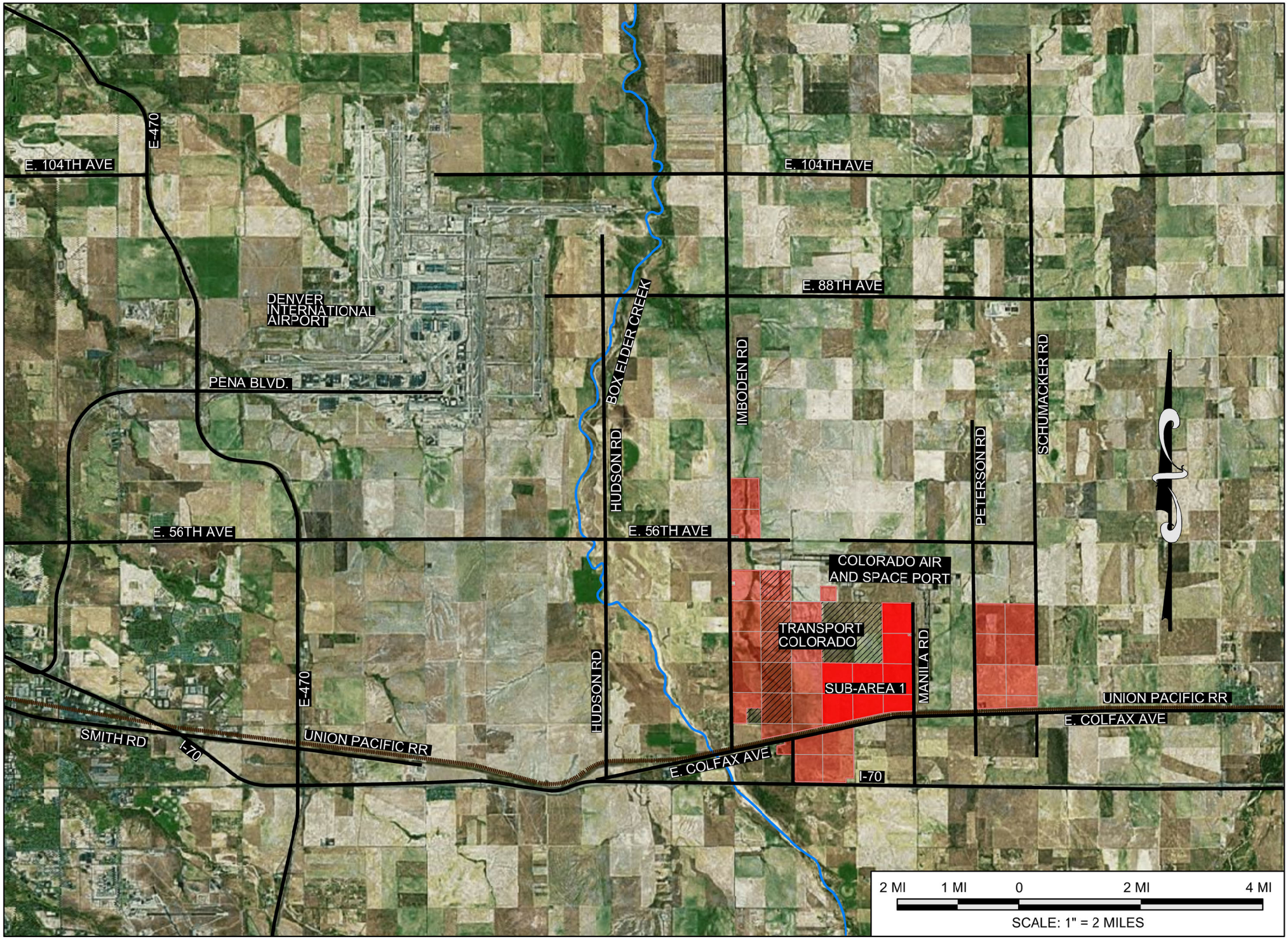
5 REFERENCES

1. CVL Consultants of Colorado, Inc. “TransPort Colorado Master Utility Report.” Under Review.
2. Farnsworth Group. “Water and Wastewater Master Plan for Front Range Airport and Surrounding Area.” December 20, 2001 Matrix Design Group, Inc. "Transport/Front Range Airport Area Master Utilities Plan." May 1, 2007. (COA #207075)
3. Matrix Design Group, Inc. “Transport and Front Range Airport Area Master Utilities Plan.” May 1, 2007. (COA #207075)
4. Matrix Design Group, Inc. " Transport Sub-Area 1 Master Utilities Plan." December 1, 2008. (COA #208145)
5. Colorado Department of Public Health and Environment. “Regulation No. 43 – On-Site Wastewater Treatment System Regulation.” May 15,2018.
6. City of Aurora. "Standards and Specifications Regarding Water, Sanitary Sewer and Storm Drainage Infrastructure." January 2012.
7. City of Aurora. “City of Aurora Wastewater Capital Improvement Plan.” January 2018.
8. City of Aurora. “City of Aurora Water Capital Improvement Plan.” May 2018.

APPENDIX A

VICINITY MAP

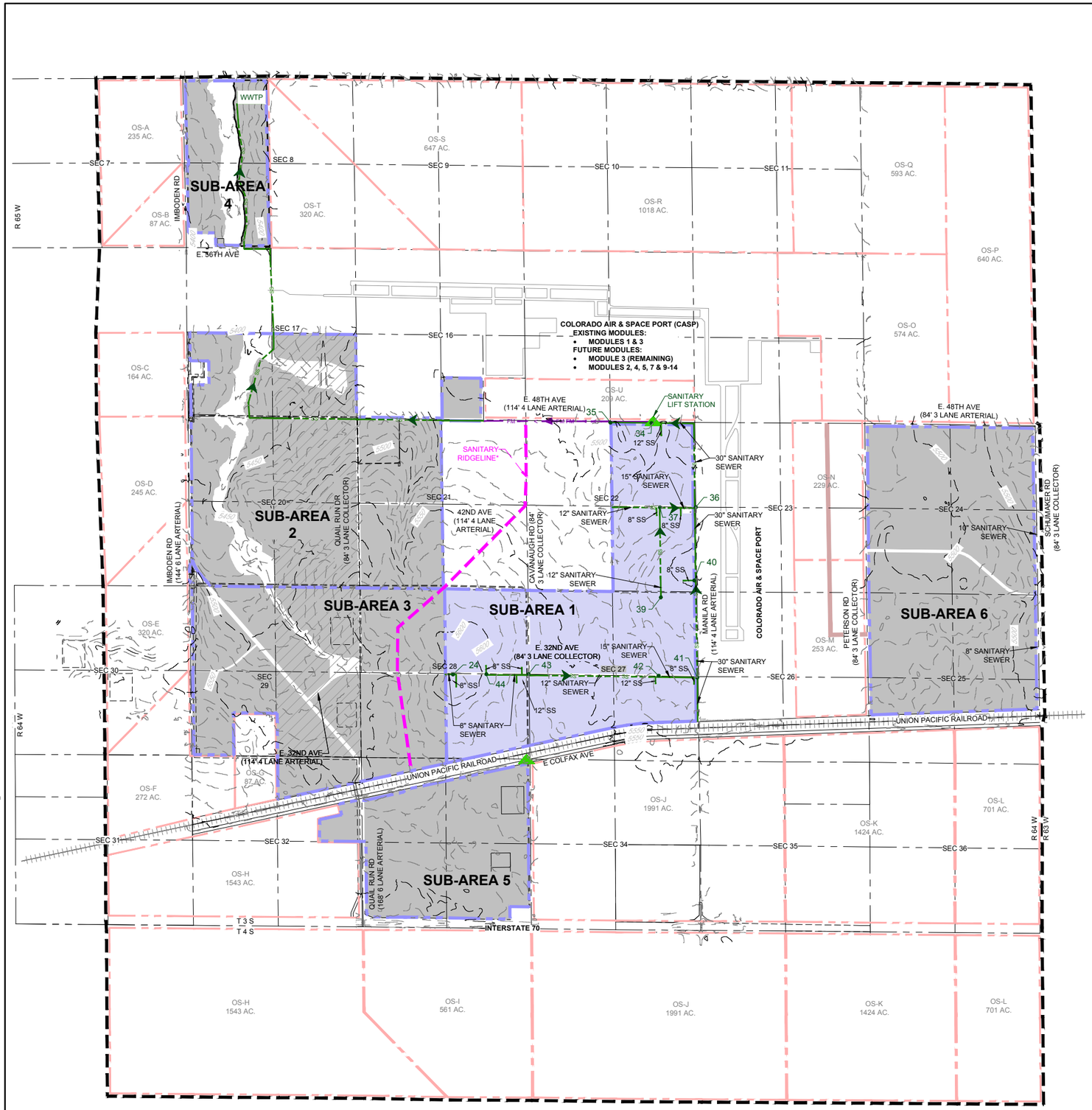
VICINITY MAP



APPENDIX B

Sanitary Sewer System

1. Wastewater System Layout Plan
2. Sanitary Routing Layout Schematic
3. Sanitary Sewer Calculations
    a. OWTS Loading Calculations
    b. System Loading Calculations
    c. Routing and Sizing Calculations
    d. FlowMaster Results



LEGEND

- UNANNEXED ADAMS COUNTY
- PROJECT AREA
- PLANNING AREA
- REGIONAL SERVICE BOUNDARY
- SUB-AREA BOUNDARY
- OFF-SITE PARCEL BOUNDARY
- SECTION/HALF SECTION LINE
- SS — SANITARY SEWER MAINS
- FM — SANITARY SEWER FORCE MAINS
- SANITARY SEWER LIFT STATION
- WWTP — WASTE WATER TREATMENT PLANT

1600 800 0 1600 3200

SCALE: 1" = 1600'

SANITARY SEWER DESIGN POINT	CONTRIBUTING PARCEL/PLANNING AREA	NET ACRES OF CONTRIBUTING AREA
1		
	F1	158.0
2		
	F2	159.1
	F3	158.6
	F4	160.5
	MODUAL 1 & 3	68.5
	MODUAL 2	48.0
	MODUAL 3 (REMAINING)	14.4
3		
	MODUAL 4	48.0
4		
	MODUAL 5	73.0
5		
	MODUAL 7	106.0
6		
	MODUAL 9-14	304.0
7		
	OS-A	235.0
	OS-B	87.0
8		
	OS-C	164.0
9		
	OS-D	245.0
10		
	OS-E	320.0
11		
	OS-F	272.0
	OS-G	87.0
12		
	OS-H	1,543.0
	OS-I	561.0
13		
	OS-J	1,991.0
14		
	OS-K	1,424.0
	OS-L	701.0
15		
	OS-M	253.0
16		
	OS-N	229.0
17		
	OS-O	574.0
18		
	OS-P	640.0
19		
	OS-Q	593.0
20		
	OS-R	1,018.0
	OS-S	647.0
21		
	OS-T	320.0
	OS-U	209.0
	PA-10	156.8
22		
	PA-11.1	35.2
23		
	PA-11.2	82.0
24		
	PA-12	60.8
	PA-13.1	96.1
25		
	PA-13.2	64.1
	PA-14	251.1
26		
	PA-15A.1	37.6
	PA-15A.2	113.0
27		
	PA-15B	2.8
	PA-16	174.5

SANITARY SEWER DESIGN POINT	CONTRIBUTING PARCEL/PLANNING AREA	NET ACRES OF CONTRIBUTING AREA
28		
	PA-17	23.2
29		
	PA-18.1	182.7
30		
	PA-18.2	146.2
31		
	PA-18.3	130.5
32		
	PA-18.4	62.6
33		
	PA-19.1	244.3
	PA-19.2	142.0
34		
	PA-19.3	96.6
35		
	PA-19.4	85.2
	PA-1A	117.6
	PA-1B.1	58.8
	PA-1B.2	58.8
	PA-20	88.2
	PA-21	55.8
	PA-22	57.3
	PA-23A	19.7
	PA-23B	82.5
36		
	PA-24	154.0
37		
	PA-25	136.0
38		
	PA-26	82.6
39		
	PA-27A	42.1
40		
	PA-27B	18.6
41		
	PA-28.1	94.8
42		
	PA-28.2	94.8
43		
	PA-29	64.3
	PA-2A	81.2
44		
	PA-2B	28.7
45		
	PA-3	121.9
46		
	PA-30	31.6
	PA-31.1	256.3
47		
	PA-31.2	256.3
	PA-4	37.4
48		
	PA-5.1	69.6
49		
	PA-5.2	69.6
	PA-6.1	51.6
50		
	PA-6.2	51.6
51		
	PA-7.1	160.9
52		
	PA-7.2	160.9
53		
	PA-8	158.2
54		
	PA-9	159.1

NOTES:
- REFER TO THE MASTER UTILITY REPORT BY CVL INCLUDED IN FDP AMENDMENT FOR INFORMATION REGARDING OFF-SITE BASINS. ALSO, REFER TO SS2, SUB-AREA 1 ROUTING SCHEMATIC FOR ADDITIONAL ROUTING INFORMATION INFORMATION.
- SANITARY RIDGELINE: SANITARY LINES EAST OF THE RIDGELINE RUN TO A TRUNKLINE WITHIN MANILA. ALL OTHER LINES RUN WEST TO THE TRUNKLINE PARALLELING BEAR GULCH. ALL LINES ULTIMATLY RUN NORTH TO THE WWTP.

No.	Revisions	Date	Init.	Appr.	Date

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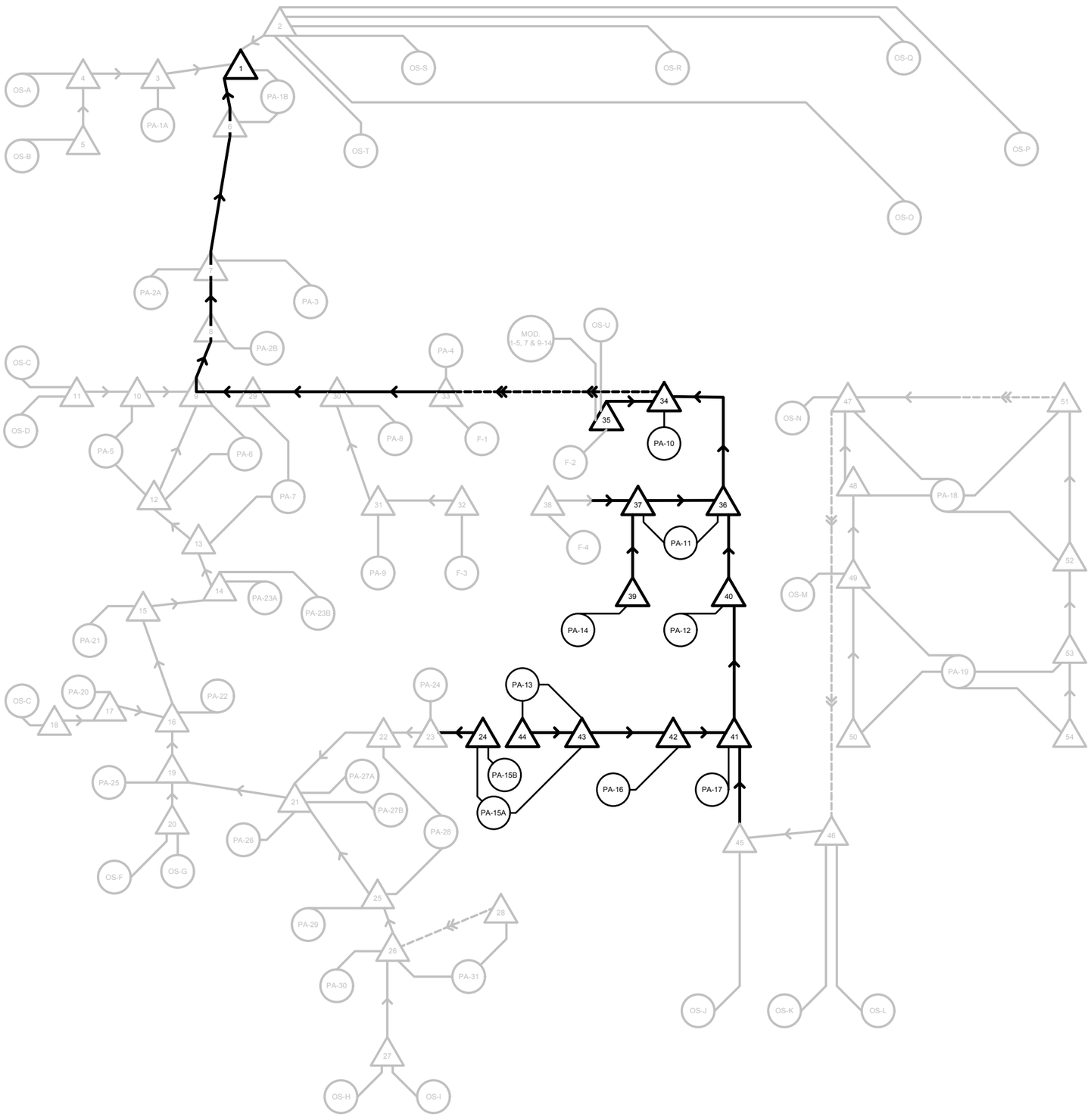
TRANSPORT COLORADO
MASTER UTILITY REPORT
SUB-AREA 1
WASTEWATER SYSTEM LAYOUT PLAN

DRAWN BY:	CJB	SCALE:	AS SHOWN
CHECKED BY:	JMM	FILE NO:	8130292103
DATE:	FEBRUARY 2020		

SHEET NUMBER SS1

N:\PROJECTS\TRANSPORT COLORADO\DOCS\MASTER UTILITY REPORT\OVERALL FDP\SUBMITTAL 3\SANITARY CALCS\SAN SEWER_MAP.DWG, CHRISTOPHER B., 2/12/2020 3:07 PM



LEGEND

- XX — CONTRIBUTING PARCEL/PLANNING AREA
- XX — SANITARY SEWER DESIGN POINT
- XX — FUTURE CONTRIBUTING PARCEL/PLANNING AREA
- XX — FUTURE SANITARY SEWER DESIGN POINT
- SANITARY SEWER FLOW DIRECTION (GRAVITY)
- SANITARY SEWER FLOW DIRECTION (FORCE MAIN)
- FUTURE SANITARY SEWER FLOW DIRECTION (GRAVITY)
- FUTURE SANITARY SEWER FLOW DIRECTION (FORCE MAIN)

1600 800 0 1600 3200

SCALE: 1" = 1600'

SANITARY SEWER DESIGN POINT	CONTRIBUTING PARCEL/PLANNING AREA	NET ACRES OF CONTRIBUTING AREA
1		
	F1	158.0
2		
	F2	159.1
	F3	158.6
	F4	160.5
	MODUAL 1 & 3	68.5
	MODUAL 2	48.0
	MODUAL 3 (REMAINING)	14.4
3		
	MODUAL 4	48.0
4		
	MODUAL 5	73.0
5		
	MODUAL 7	106.0
6		
	MODUAL 9-14	304.0
7		
	OS-A	235.0
	OS-B	87.0
8		
	OS-C	164.0
9		
	OS-D	245.0
10		
	OS-E	320.0
11		
	OS-F	272.0
	OS-G	87.0
12		
	OS-H	1,543.0
	OS-I	561.0
13		
	OS-J	1,991.0
14		
	OS-K	1,424.0
	OS-L	701.0
15		
	OS-M	253.0
16		
	OS-N	229.0
17		
	OS-O	574.0
18		
	OS-P	640.0
19		
	OS-Q	593.0
20		
	OS-R	1,018.0
	OS-S	647.0
21		
	OS-T	320.0
	OS-U	209.0
	PA-10	156.8
22		
	PA-11.1	35.2
23		
	PA-11.2	82.0
24		
	PA-12	60.8
	PA-13.1	96.1
25		
	PA-13.2	64.1
	PA-14	251.1
26		
	PA-15A.1	37.6
	PA-15A.2	113.0
27		
	PA-15B	2.8
	PA-16	174.5

SANITARY SEWER DESIGN POINT	CONTRIBUTING PARCEL/PLANNING AREA	NET ACRES OF CONTRIBUTING AREA
28		
	PA-17	23.2
29		
	PA-18.1	182.7
30		
	PA-18.2	146.2
31		
	PA-18.3	130.5
32		
	PA-18.4	62.6
33		
	PA-19.1	244.3
	PA-19.2	142.0
34		
	PA-19.3	96.6
35		
	PA-19.4	85.2
	PA-1A	117.6
	PA-1B.1	58.8
	PA-1B.2	58.8
	PA-20	88.2
	PA-21	55.8
	PA-22	57.3
	PA-23A	19.7
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36		
	PA-24	154.0
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	PA-26	82.6
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	PA-27A	42.1
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	PA-27B	18.6
41		
	PA-28.1	94.8
42		
	PA-28.2	94.8
43		
	PA-29	64.3
	PA-2A	81.2
44		
	PA-2B	28.7
45		
	PA-3	121.9
46		
	PA-30	31.6
	PA-31.1	256.3
47		
	PA-31.2	256.3
	PA-4	37.4
48		
	PA-5.1	69.6
49		
	PA-5.2	69.6
	PA-6.1	51.6
50		
	PA-6.2	51.6
51		
	PA-7.1	160.9
52		
	PA-7.2	160.9
53		
	PA-8	158.2
54		
	PA-9	159.1

NOTES:

- REFER TO THE MASTER UTILITY REPORT BY CVL INCLUDED IN FDP AMENDMENT FOR INFORMATION REGARDING OFF-SITE BASINS.

No.	Revisions	Date
		Appr.
		Int.
		Date

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TRANSPORT COLORADO
MASTER UTILITY REPORT
SUB-AREA 1
ROUTING SCHEMATIC

SCALE: AS SHOWN
FILE NO: 8130292103
DRAWN BY: CAK
CHECKED BY: JWM
DATE: FEBRUARY 2020
SHEET NUMBER: SS2

N:\PROJECTS\TRANSPORT COLORADO\DOCS\MASTER UTILITY REPORT\OVERALL FDP\SUBMITTAL 3\SANITARY CALCS\SAN SEWER_MAP SCHEMATIC.DWG, CHRISTOPHERB, 2/12/2020 5:04 PM

TRANSPORT COLORADO - SUB-AREA 1
ON-SITE WASTEWATER TREATMENT SYSTEM CALCULATIONS
COLORADO DEPARTMENT OF PUBLIC HEALTH CRITERIA

USE	EMPLOYEE PER 100,000 SF	AVG. FLOW (GPD/PERSON)	AVG.FLOW (GPD/SF)	FAR
COMMERCIAL	97	--	0.10	0.30
LIGHT INDUSTRIAL	40	15		0.18
MEDIUM INDUSTRIAL	66	20		0.18
HEAVY INDUSTRIAL	66	20		0.15

EMPLOYMENT ESTIMENTS		
USE	AVG. BUILDING (SF)	EMPLOYIES PER 100,000 SF
HEAVY INDUSTRIAL	1500	66
MEDIUM INDUSTRIAL (WAREHOUSE	1500	66
RAIL	2000	50
MIXED USE (LODGING, OFFICE & RETAIL)	1029	97
DATA CENTER	2500	40

SUB-AREA	PLANNING AREA	USE	GROSS AREA (AC)	GROSS AREA (SF)	FAR	BUILDING (SF)	BUILDING (AC)	AVG. DAY (GPD/ PERSON)	AVG. DAY (GPD/SF)	POPUL LATION	AVG. DAY (GPD)
SA-1	PA-10	Heavy Industrial	156.8	6,830,208	0.15	1,024,531	23.52	20.00	--	676	13,524
SA-1	PA-11	Heavy Industrial	118.2	5,148,792	0.15	772,319	17.73	20.00	--	510	10,195
SA-1	PA-12	Heavy Industrial	60.9	2,652,804	0.15	397,921	9.14	20.00	--	263	5,253
SA-1	PA-13	Heavy Industrial	160.2	6,978,312	0.15	1,046,747	24.03	20.00	--	691	13,817
SA-1	PA-14	Heavy Industrial	253.5	11,042,460	0.30	3,312,738	76.05	20.00	--	2,186	43,728
SA-1	PA-15A	Heavy Industrial	153.9	6,703,884	0.15	1,005,583	23.09	20.00	--	664	13,274
SA-1	PA-15B	Heavy Industrial	2.5	108,900	0.15	16,335	0.38	20.00	--	11	216
SA-1	PA-16	Heavy Industrial	176.2	7,675,272	0.15	1,151,291	26.43	20.00	--	760	15,197
SA-1	PA-17	Heavy Industrial	23.2	1,010,592	0.15	151,589	3.48	20.00	--	100	2,001
	Total		**1,105.4**	**48,151,224**		**8,879,053**	**203.84**			**5,860**	**117,203**

TRANSPORT COLORADO - SUB-AREA 1
SANITARY LOADING CALCULATIONS
CITY OF AURORA CRITERIA

LAND USE	AVG DAY (GPD/AC)	EQUIVALENT POPULATION PER ACRE
COMMERCIAL	1,500	22
INDUSTRIAL	1,200	18

DESIGN POINTS*	SUB-AREA	PLANNING AREA	LAND USE	GROSS AREA (AC)	AVG. DAY (GPD/AC)	POPULATION (THOUSANDS)	AVG. DAY (GPD)
1	SA-4	PA-1B.1	Medium Industrial	58.8	1,200	1.06	70,560
2	OFF-SITE FUTURE	OS-O	Industrial	574.0	1,200	10.33	688,800
2	OFF-SITE FUTURE	OS-P	Industrial	640.0	1,200	11.52	768,000
2	OFF-SITE FUTURE	OS-Q	Industrial	593.0	1,200	10.67	711,600
2	OFF-SITE FUTURE	OS-R	Industrial	1,018.0	1,200	18.32	1,221,600
2	OFF-SITE FUTURE	OS-S	Industrial	647.0	1,200	11.65	776,400
2	OFF-SITE FUTURE	OS-T	Industrial	320.0	1,200	5.76	384,000
3	SA-4	PA-1A	Medium Industrial	117.6	1,200	2.12	141,120
4	OFF-SITE FUTURE	OS-A	Industrial	235.0	1,200	4.23	282,000
5	OFF-SITE FUTURE	OS-B	Industrial	87.0	1,200	1.57	104,400
6	SA-4	PA-1B.2	Medium Industrial	58.8	1,200	1.06	70,560
7	SA-2	PA-2A	Medium Industrial	81.2	1,200	1.46	97,440
7	SA-2	PA-3	Medium Industrial	121.9	1,200	2.19	146,280
8	SA-2	PA-2B	Medium Industrial	28.7	1,200	0.52	34,440
9	SA-2	PA-6.1	Medium Industrial	51.6	1,200	0.93	61,920
10	SA-2	PA-5.1	Medium Industrial	69.6	1,200	1.25	83,520
11	OFF-SITE FUTURE	OS-C	Industrial	164.0	1,200	2.95	196,800
11	OFF-SITE FUTURE	OS-D	Industrial	245.0	1,200	4.41	294,000
12	SA-2	PA-5.2	Medium Industrial	69.6	1,200	1.25	83,520
12	SA-2	PA-6.2	Medium Industrial	51.6	1,200	0.93	61,920
13	SA-2	PA-7.1	Medium Industrial	160.9	1,200	2.90	193,080
14	SA-3	PA-23A	Medium Industrial	19.7	1,200	0.35	23,640
14	SA-3	PA-23B	Medium Industrial	82.5	1,200	1.49	99,000
15	SA-3	PA-21	Medium Industrial	55.8	1,200	1.00	66,960
16	SA-3	PA-22	Medium Industrial	57.3	1,200	1.03	68,760
17	SA-3	PA-20	Medium Industrial	88.2	1,200	1.59	105,840

TRANSPORT COLORADO - SUB-AREA 1
SANITARY LOADING CALCULATIONS
CITY OF AURORA CRITERIA

LAND USE	AVG DAY (GPD/AC)	EQUIVALENT POPULATION PER ACRE
COMMERCIAL	1,500	22
INDUSTRIAL	1,200	18

DESIGN POINTS*	SUB-AREA	PLANNING AREA	LAND USE	GROSS AREA (AC)	AVG. DAY (GPD/AC)	POPULATION (THOUSANDS)	AVG. DAY (GPD)
18	OFF-SITE FUTURE	OS-E	Industrial	320.0	1,200	5.76	384,000
19	SA-3	PA-25	Medium Industrial	136.0	1,200	2.45	163,200
20	OFF-SITE FUTURE	OS-F	Industrial	272.0	1,200	4.90	326,400
20	OFF-SITE FUTURE	OS-G	Industrial	87.0	1,200	1.57	104,400
21	SA-3	PA-26	Medium Industrial	82.6	1,200	1.49	99,120
21	SA-3	PA-27A	Medium Industrial	42.1	1,200	0.76	50,520
21	SA-3	PA-27B	Medium Industrial	18.6	1,200	0.33	22,320
22	SA-3	PA-28.1	Heavy Industrial	94.8	1,200	1.71	113,760
23	SA-3	PA-24	Heavy Industrial	154.0	1,200	2.77	184,800
24	SA-1	PA-15A.1	Heavy Industrial	37.6	1,200	0.68	45,120
24	SA-1	PA-15B	Heavy Industrial	2.8	1,200	0.05	3,360
25	SA-3	PA-28.2	Heavy Industrial	94.8	1,200	1.71	113,760
25	SA-3	PA-29	Medium Industrial	64.3	1,200	1.16	77,160
26	SA-5	PA-30	Commercial	31.6	1,500	0.70	47,400
26	SA-5	PA-31.1	Commercial	256.3	1,500	5.64	384,450
27	OFF-SITE FUTURE	OS-H	Industrial	1,543.0	1,200	27.77	1,851,600
27	OFF-SITE FUTURE	OS-I	Industrial	561.0	1,200	10.10	673,200
28	SA-5	PA-31.2	Commercial	256.3	1,500	5.64	384,450
29	SA-2	PA-7.2	Medium Industrial	160.9	1,200	2.90	193,080
30	SA-2	PA-8	Heavy Industrial	158.2	1,200	2.85	189,840
31	SA-2	PA-9	Heavy Industrial	159.1	1,200	2.86	190,920
32	FUTURE	F3	Heavy Industrial	158.6	1,200	2.85	190,320
33	FUTURE	F1	Heavy Industrial	158.0	1,200	2.84	189,600
33	SA-2	PA-4	Light Industrial	37.4	1,200	0.67	44,880
34	SA-1	PA-10	Heavy Industrial	156.8	1,200	2.82	188,160
35	FUTURE	F2	Heavy Industrial	159.1	1,200	2.86	190,920

TRANSPORT COLORADO - SUB-AREA 1
SANITARY LOADING CALCULATIONS
CITY OF AURORA CRITERIA

LAND USE	AVG DAY (GPD/AC)	EQUIVALENT POPULATION PER ACRE
COMMERCIAL	1,500	22
INDUSTRIAL	1,200	18

DESIGN POINTS*	SUB-AREA	PLANNING AREA	LAND USE	GROSS AREA (AC)	AVG. DAY (GPD/AC)	POPULATION (THOUSANDS)	AVG. DAY (GPD)
35	CO AIR & SPACE PORT	MODUAL 1 & 3	Airport Industrial	68.5	1,200	1.23	82,200
35	CO AIR & SPACE PORT	MODUAL 2	Airport Industrial	48.0	1,200	0.86	57,600
35	CO AIR & SPACE PORT	ODUAL 3 (REMAININ	Airport Industrial	14.4	1,200	0.26	17,280
35	CO AIR & SPACE PORT	MODUAL 4	Airport Industrial	48.0	1,200	0.86	57,600
35	CO AIR & SPACE PORT	MODUAL 5	Airport Industrial	73.0	1,200	1.31	87,600
35	CO AIR & SPACE PORT	MODUAL 7	Cargo	106.0	1,200	1.91	127,200
35	CO AIR & SPACE PORT	MODUAL 9-14	Cargo	304.0	1,200	5.47	364,800
35	OFF-SITE FUTURE	OS-U	Industrial	209.0	1,200	3.76	250,800
36	SA-1	PA-11.1	Heavy Industrial	35.2	1,200	0.63	42,240
37	SA-1	PA-11.2	Heavy Industrial	82.0	1,200	1.48	98,400
38	FUTURE	F4	Heavy Industrial	160.5	1,200	2.89	192,600
39	SA-1	PA-14	Heavy Industrial	251.1	1,200	4.52	301,320
40	SA-1	PA-12	Heavy Industrial	60.8	1,200	1.09	72,960
41	SA-1	PA-17	Heavy Industrial	23.2	1,200	0.42	27,840
42	SA-1	PA-16	Heavy Industrial	174.5	1,200	3.14	209,400
43	SA-1	PA-13.1	Heavy Industrial	96.1	1,200	1.73	115,320
43	SA-1	PA-15A.2	Heavy Industrial	113.0	1,200	2.03	135,600
44	SA-1	PA-13.2	Heavy Industrial	64.1	1,200	1.15	76,920
45	OFF-SITE FUTURE	OS-J	Industrial	1,991.0	1,200	35.84	2,389,200
46	OFF-SITE FUTURE	OS-K	Industrial	1,424.0	1,200	25.63	1,708,800
46	OFF-SITE FUTURE	OS-L	Industrial	701.0	1,200	12.62	841,200
47	OFF-SITE FUTURE	OS-N	Industrial	229.0	1,200	4.12	274,800
47	SA-6	PA-18.1	Heavy Industrial	182.7	1,200	3.29	219,240
48	SA-6	PA-18.2	Heavy Industrial	146.2	1,200	2.63	175,440
49	OFF-SITE FUTURE	OS-M	Industrial	253.0	1,200	4.55	303,600
49	SA-6	PA-19.1	Heavy Industrial	244.3	1,200	4.40	293,160

TRANSPORT COLORADO - SUB-AREA 1
SANITARY LOADING CALCULATIONS
CITY OF AURORA CRITERIA

LAND USE	AVG DAY (GPD/AC)	EQUIVALENT POPULATION PER ACRE
COMMERCIAL	1,500	22
INDUSTRIAL	1,200	18

DESIGN POINTS*	SUB-AREA	PLANNING AREA	LAND USE	GROSS AREA (AC)	AVG. DAY (GPD/AC)	POPULATION (THOUSANDS)	AVG. DAY (GPD)
50	SA-6	PA-19.2	Heavy Industrial	142.0	1,200	2.56	170,400
51	SA-6	PA-18.3	Heavy Industrial	130.5	1,200	2.35	156,600
52	SA-6	PA-18.4	Heavy Industrial	62.6	1,200	1.13	75,120
53	SA-6	PA-19.3	Heavy Industrial	96.6	1,200	1.74	115,920
54	SA-6	PA-19.4	Heavy Industrial	85.2	1,200	1.53	102,240
		SUB-AREA 1 TOTAL		**1,097.2**		**19.74**	**1,316,640**

NOTE: DESIGN POINTS THAT ARE SHADED REPRESENT PORTIONS OF THE ENTIRE TRANPORT COLORADO PROJECT, BUT ARE NOT AFFILIATED WITH THE SUBJECT SUB-AREA.

TRANSPORT COLORADO - SUB-AREA 1
SANITARY LOADING, ROUTING AND PIPE SIZING SIZING CALCULATIONS
CITY OF AURORA CRITERIA

ROUTING DESIGN POINTS	INCLUDED UPSTREAM ROUTING DP's	DESIGN POINT LOADING (GPD)	CUMULATIVE LOADING (GPD)	DESIGN POINT POP. (THOUSANDS)	CUMULATIVE POP. (THOUSANDS)	CUMULATIVE INFILTRATION 10% (GPD)	PEAKING FACTOR*	CUMULATIVE PEAK LOADING (GPD)	CUMULATIVE PEAK LOADING (CFS)	PIPE DIAMETER (IN.)	MIN. SLOPE (%)	MIN. SLOPE VELOCITY (FT/S)	MAX. SLOPE (%)**	PERCENT FULL (%)
54	--	102,240	102,240	1.53	1.53	10,224	4.00	419,184	0.65	8	0.4	2.81	12.74	62.8
53	54	115,920	218,160	1.74	3.27	21,816	4.00	894,456	1.38	10	0.4	3.37	7.36	70.4
52	53-54	75,120	293,280	1.13	4.40	29,328	3.90	1,174,303	1.82	12	0.4	3.65	6.18	60.7
51***	52-54	156,600	449,880	2.35	6.75	44,988	3.63	1,680,196	2.60	15	0.4	4.01	4.93	52.3
50	--	170,400	170,400	2.56	2.56	17,040	4.00	698,640	1.08	10	0.4	3.21	8.95	59.3
49	50	596,760	767,160	8.95	11.51	76,716	3.32	2,627,398	4.07	18	0.4	4.48	3.61	51.1
48	49-50	175,440	942,600	2.63	14.14	94,260	3.21	3,122,375	4.83	18	0.4	4.67	3.16	56.7
47***	48-54	494,040	1,886,520	7.41	28.30	188,652	2.86	5,586,033	8.64	24	0.4	5.41	2.14	50.6
46	47-54	2,550,000	4,436,520	38.25	66.55	443,652	2.48	11,447,554	17.71	30	0.4	6.47	1.29	54.5
45	46-54	2,389,200	6,825,720	35.84	102.39	682,572	2.31	16,437,102	25.43	30	0.4	6.98	1	69.5
44	--	76,920	76,920	1.15	1.15	7,692	4.00	315,372	0.49	8	0.4	2.64	16	52.5
43	44	250,920	327,840	3.76	4.91	32,784	3.83	1,289,454	2.00	12	0.4	3.72	5.72	64.9
42	43-44	209,400	537,240	3.14	8.05	53,724	3.53	1,949,864	3.02	15	0.4	4.16	4.35	57.6
41	42-54	27,840	7,390,800	0.42	110.86	739,080	2.28	17,572,953	27.19	30	0.4	7.05	0.96	73.3
40	41-54	72,960	7,463,760	1.09	111.95	746,376	2.27	17,718,674	27.41	30	0.4	7.06	0.95	73.8
39	--	301,320	301,320	4.52	4.52	30,132	3.89	1,201,221	1.86	12	0.4	3.67	6.06	61.8
38	--	192,600	192,600	2.89	2.89	19,260	4.00	789,660	1.22	10	0.4	3.29	8.13	64.3
37	38-39	98,400	592,320	1.48	8.89	59,232	3.47	2,115,406	3.27	15	0.4	4.23	4.09	60.6
36	37-54	42,240	8,098,320	0.63	121.47	809,832	2.24	18,975,803	29.36	30	0.4	7.11	0.91	78.5
35	--	1,236,000	1,236,000	18.52	18.52	123,600	3.07	3,919,305	6.06	18	0.4	4.9	2.66	65.9
34***	35-54	188,160	9,522,480	2.82	142.81	952,248	2.18	21,743,248	33.64	36	0.4	7.57	0.83	60.2
33***	34-54	234,480	9,756,960	3.51	146.32	975,696	2.17	22,192,444	34.34	36	0.4	7.61	0.82	61
32	--	190,320	190,320	2.85	2.85	19,032	4.00	780,312	1.21	10	0.4	3.28	8.18	64
31	32	190,920	381,240	2.86	5.71	38,124	3.74	1,463,109	2.26	15	0.4	3.88	5.51	48.2
30	31-54	189,840	10,328,040	2.85	154.88	1,032,804	2.15	23,279,150	36.02	36	0.4	7.68	0.79	63
29***	30-54	193,080	10,521,120	2.90	157.78	1,052,112	2.15	23,644,248	36.58	36	0.4	7.71	0.78	63.7
28***	--	384,450	384,450	5.64	5.64	38,445	3.75	1,478,391	2.29	12	0.4	3.81	5.15	71.5
27***	--	2,524,800	2,524,800	37.87	37.87	252,480	2.73	7,133,006	11.04	24	0.4	5.73	1.77	58.9
26***	27-28	431,850	3,341,100	6.34	49.85	334,110	2.60	9,030,708	13.97	24	0.4	6.01	1.49	69.3
25***	26-28	190,920	3,532,020	2.87	52.72	353,202	2.58	9,461,207	14.64	24	0.4	6.06	1.44	71.9
24	--	48,480	48,480	0.73	0.73	4,848	4.00	198,768	0.31	8	0.4	2.31	24.99	38.9
23	24	184,800	233,280	2.77	3.50	23,328	4.00	956,448	1.48	12	0.4	3.5	7.19	53.9
22	23-24	113,760	347,040	1.71	5.21	34,704	3.80	1,351,861	2.09	12	0.4	3.76	5.48	67.4
21	22-28	171,960	4,051,020	2.58	60.51	405,102	2.52	10,613,774	16.42	30	0.4	6.35	1.36	52.1
20	--	430,800	430,800	6.47	6.47	43,080	3.66	1,620,055	2.51	15	0.4	3.97	5.08	51.2
19	20-28	163,200	4,645,020	2.45	69.43	464,502	2.46	11,904,323	18.42	30	0.4	6.53	1.25	55.9
18	--	384,000	384,000	5.76	5.76	38,400	3.73	1,471,613	2.28	12	0.4	3.81	5.16	72.1
17	18	105,840	489,840	1.59	7.35	48,984	3.58	1,804,296	2.79	15	0.4	4.08	4.67	54.5
16	17-28	68,760	5,203,620	1.03	77.81	520,362	2.42	13,094,339	20.26	30	0.4	6.67	1.17	59.4
15	16-28	66,960	5,270,580	1.00	78.81	527,058	2.41	13,235,705	20.48	30	0.4	6.69	1.16	59.8
14	15-28	122,640	5,393,220	1.84	80.65	539,322	2.40	13,493,660	20.88	30	0.4	6.72	1.14	60.5
13	14-28	193,080	5,586,300	2.90	83.55	558,630	2.39	13,897,812	21.50	30	0.4	6.76	1.12	61.7
12***	13-28	145,440	5,731,740	2.18	85.73	573,174	2.38	14,200,897	21.97	30	0.4	6.79	1.1	62.6

SANITARY LOADING, ROUTING AND PIPE SIZING SIZING CALCULATIONS
CITY OF AURORA CRITERIA

ROUTING DESIGN POINTS	INCLUDED UPSTREAM ROUTING DP's	DESIGN POINT LOADING (GPD)	CUMULATIVE LOADING (GPD)	DESIGN POINT POP. (THOUSANDS)	CUMULATIVE POP. (THOUSANDS)	CUMULATIVE INFILTRATION 10% (GPD)	PEAKING FACTOR*	CUMULATIVE PEAK LOADING (GPD)	CUMULATIVE PEAK LOADING (CFS)	PIPE DIAMETER (IN.)	MIN. SLOPE (%)	MIN. SLOPE VELOCITY (FT/S)	MAX. SLOPE (%)**	PERCENT FULL (%)
11***	--	490,800	490,800	7.36	7.36	49,080	3.58	1,807,433	2.80	15	0.4	4.08	4.64	54.7
10	11	83,520	574,320	1.25	8.61	57,432	3.49	2,061,804	3.19	15	0.4	4.2	4.19	59.4
9	10-54	61,920	16,889,100	0.93	253.05	1,688,910	1.98	35,204,051	54.47	42	0.4	8.52	0.6	63.1
8	9-54	34,440	16,923,540	0.52	253.57	1,692,354	1.98	35,264,328	54.56	42	0.4	8.52	0.6	63.2
7	8-54	243,720	17,167,260	3.65	257.22	1,716,726	1.98	35,690,993	55.22	42	0.4	8.54	0.6	63.7
6	7-54	70,560	17,237,820	1.06	258.28	1,723,782	1.98	35,814,267	55.41	42	0.4	8.55	0.59	63.8
5	--	104,400	104,400	1.57	1.57	10,440	4.00	428,040	0.66	8	0.4	2.82	12.55	63.5
4	5	282,000	386,400	4.23	5.80	38,640	3.73	1,479,145	2.29	15	0.4	3.88	5.46	48.5
3	4-5	141,120	527,520	2.12	7.92	52,752	3.54	1,919,655	2.97	15	0.4	4.14	4.43	56.7
2	--	4,550,400	4,550,400	68.25	68.25	455,040	2.47	11,693,956	18.09	30	0.4	6.5	1.27	55.3
1	2-54	70,560	22,386,300	1.06	335.51	2,238,630	1.89	44,618,489	69.04	42	0.4	8.87	0.53	75.4

* PEAKING FACTOR BASED ON CUMULATIVE POPULATION VALUES

** MAXIMUM SLOPE IS BASED ON A MAXIMUM VELOCITY OF 10 FT.SEC.

*** FORCE MAIN MAY BE REQUIRED FOR A PORTION OR ENTIRE STRETCH. TBD AT TIME OF DESIGN.

NOTE: SHADED ROWS REPRESENT FUTURE AREAS THAT WILL ULTIMATLY BE ROUTED THROUGH THE TRANSPORT COLORADO PROJECT.

Worksheet for DESIGN POINT 24

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.29	ft³/s

Results

Normal Depth	3.11	in
Flow Area	0.13	ft²
Wetted Perimeter	0.90	ft
Hydraulic Radius	1.68	in
Top Width	0.65	ft
Critical Depth	0.25	ft
Percent Full	38.9	%
Critical Slope	0.00467	ft/ft
Velocity	2.31	ft/s
Velocity Head	0.08	ft
Specific Energy	0.34	ft
Froude Number	0.92	
Maximum Discharge	0.97	ft³/s
Discharge Full	0.90	ft³/s
Slope Full	0.00041	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	38.93	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	3.11	in
Critical Depth	0.25	ft
Channel Slope	0.40000	%
Critical Slope	0.00467	ft/ft

Worksheet for DESIGN POINT 34

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	36.00	in
Discharge	33.67	ft³/s

Results

Normal Depth	21.68	in
Flow Area	4.45	ft²
Wetted Perimeter	5.33	ft
Hydraulic Radius	10.01	in
Top Width	2.94	ft
Critical Depth	1.88	ft
Percent Full	60.2	%
Critical Slope	0.00352	ft/ft
Velocity	7.57	ft/s
Velocity Head	0.89	ft
Specific Energy	2.70	ft
Froude Number	1.08	
Maximum Discharge	53.62	ft³/s
Discharge Full	49.85	ft³/s
Slope Full	0.00182	ft/ft
Flow Type	SuperCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	60.21	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	21.68	in
Critical Depth	1.88	ft
Channel Slope	0.40000	%
Critical Slope	0.00352	ft/ft

Worksheet for DESIGN POINT 35

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	18.00	in
Discharge	6.06	ft³/s

Results

Normal Depth	11.87	in
Flow Area	1.24	ft²
Wetted Perimeter	2.84	ft
Hydraulic Radius	5.22	in
Top Width	1.42	ft
Critical Depth	0.95	ft
Percent Full	65.9	%
Critical Slope	0.00448	ft/ft
Velocity	4.90	ft/s
Velocity Head	0.37	ft
Specific Energy	1.36	ft
Froude Number	0.93	
Maximum Discharge	8.45	ft³/s
Discharge Full	7.85	ft³/s
Slope Full	0.00238	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	65.94	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	11.87	in
Critical Depth	0.95	ft
Channel Slope	0.40000	%
Critical Slope	0.00448	ft/ft

Worksheet for DESIGN POINT 36

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	30.00	in
Discharge	29.39	ft³/s

Results

Normal Depth	23.54	in
Flow Area	4.13	ft²
Wetted Perimeter	5.44	ft
Hydraulic Radius	9.11	in
Top Width	2.05	ft
Critical Depth	1.85	ft
Percent Full	78.5	%
Critical Slope	0.00457	ft/ft
Velocity	7.11	ft/s
Velocity Head	0.79	ft
Specific Energy	2.75	ft
Froude Number	0.88	
Maximum Discharge	32.98	ft³/s
Discharge Full	30.66	ft³/s
Slope Full	0.00368	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	78.48	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	23.54	in
Critical Depth	1.85	ft
Channel Slope	0.40000	%
Critical Slope	0.00457	ft/ft

Worksheet for DESIGN POINT 37

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	3.29	ft³/s

Results

Normal Depth	9.08	in
Flow Area	0.78	ft²
Wetted Perimeter	2.23	ft
Hydraulic Radius	4.18	in
Top Width	1.22	ft
Critical Depth	0.73	ft
Percent Full	60.6	%
Critical Slope	0.00445	ft/ft
Velocity	4.23	ft/s
Velocity Head	0.28	ft
Specific Energy	1.04	ft
Froude Number	0.94	
Maximum Discharge	5.19	ft³/s
Discharge Full	4.83	ft³/s
Slope Full	0.00186	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	60.56	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	9.08	in
Critical Depth	0.73	ft
Channel Slope	0.40000	%
Critical Slope	0.00445	ft/ft

Worksheet for DESIGN POINT 38

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	10.00	in
Discharge	1.22	ft³/s

Results

Normal Depth	6.43	in
Flow Area	0.37	ft²
Wetted Perimeter	1.55	ft
Hydraulic Radius	2.87	in
Top Width	0.80	ft
Critical Depth	0.49	ft
Percent Full	64.3	%
Critical Slope	0.00514	ft/ft
Velocity	3.29	ft/s
Velocity Head	0.17	ft
Specific Energy	0.70	ft
Froude Number	0.85	
Maximum Discharge	1.76	ft³/s
Discharge Full	1.64	ft³/s
Slope Full	0.00222	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	64.33	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	6.43	in
Critical Depth	0.49	ft
Channel Slope	0.40000	%
Critical Slope	0.00514	ft/ft

Worksheet for DESIGN POINT 39

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	12.00	in
Discharge	1.87	ft³/s

Results

Normal Depth	7.41	in
Flow Area	0.51	ft²
Wetted Perimeter	1.81	ft
Hydraulic Radius	3.38	in
Top Width	0.97	ft
Critical Depth	0.58	ft
Percent Full	61.8	%
Critical Slope	0.00478	ft/ft
Velocity	3.67	ft/s
Velocity Head	0.21	ft
Specific Energy	0.83	ft
Froude Number	0.89	
Maximum Discharge	2.86	ft³/s
Discharge Full	2.66	ft³/s
Slope Full	0.00197	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	61.79	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.41	in
Critical Depth	0.58	ft
Channel Slope	0.40000	%
Critical Slope	0.00478	ft/ft

Worksheet for DESIGN POINT 40

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	30.00	in
Discharge	27.43	ft³/s

Results

Normal Depth	22.14	in
Flow Area	3.88	ft²
Wetted Perimeter	5.17	ft
Hydraulic Radius	9.02	in
Top Width	2.20	ft
Critical Depth	1.79	ft
Percent Full	73.8	%
Critical Slope	0.00433	ft/ft
Velocity	7.06	ft/s
Velocity Head	0.78	ft
Specific Energy	2.62	ft
Froude Number	0.94	
Maximum Discharge	32.98	ft³/s
Discharge Full	30.66	ft³/s
Slope Full	0.00320	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	73.81	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	22.14	in
Critical Depth	1.79	ft
Channel Slope	0.40000	%
Critical Slope	0.00433	ft/ft

Worksheet for DESIGN POINT 41

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	30.00	in
Discharge	27.20	ft³/s

Results

Normal Depth	21.99	in
Flow Area	3.86	ft²
Wetted Perimeter	5.14	ft
Hydraulic Radius	9.00	in
Top Width	2.21	ft
Critical Depth	1.78	ft
Percent Full	73.3	%
Critical Slope	0.00431	ft/ft
Velocity	7.05	ft/s
Velocity Head	0.77	ft
Specific Energy	2.61	ft
Froude Number	0.94	
Maximum Discharge	32.98	ft³/s
Discharge Full	30.66	ft³/s
Slope Full	0.00315	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	73.29	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	21.99	in
Critical Depth	1.78	ft
Channel Slope	0.40000	%
Critical Slope	0.00431	ft/ft

Worksheet for DESIGN POINT 42

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	15.00	in
Discharge	3.04	ft³/s

Results

Normal Depth	8.63	in
Flow Area	0.73	ft²
Wetted Perimeter	2.15	ft
Hydraulic Radius	4.08	in
Top Width	1.24	ft
Critical Depth	0.70	ft
Percent Full	57.6	%
Critical Slope	0.00433	ft/ft
Velocity	4.16	ft/s
Velocity Head	0.27	ft
Specific Energy	0.99	ft
Froude Number	0.95	
Maximum Discharge	5.19	ft³/s
Discharge Full	4.83	ft³/s
Slope Full	0.00159	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	57.55	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	8.63	in
Critical Depth	0.70	ft
Channel Slope	0.40000	%
Critical Slope	0.00433	ft/ft

Worksheet for DESIGN POINT 43

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	12.00	in
Discharge	2.01	ft³/s

Results

Normal Depth	7.79	in
Flow Area	0.54	ft²
Wetted Perimeter	1.87	ft
Hydraulic Radius	3.46	in
Top Width	0.95	ft
Critical Depth	0.61	ft
Percent Full	64.9	%
Critical Slope	0.00492	ft/ft
Velocity	3.72	ft/s
Velocity Head	0.22	ft
Specific Energy	0.86	ft
Froude Number	0.87	
Maximum Discharge	2.86	ft³/s
Discharge Full	2.66	ft³/s
Slope Full	0.00228	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	64.92	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	7.79	in
Critical Depth	0.61	ft
Channel Slope	0.40000	%
Critical Slope	0.00492	ft/ft

Worksheet for DESIGN POINT 44

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.011	
Channel Slope	0.40000	%
Diameter	8.00	in
Discharge	0.49	ft³/s

Results

Normal Depth	4.20	in
Flow Area	0.19	ft²
Wetted Perimeter	1.08	ft
Hydraulic Radius	2.06	in
Top Width	0.67	ft
Critical Depth	0.33	ft
Percent Full	52.5	%
Critical Slope	0.00500	ft/ft
Velocity	2.64	ft/s
Velocity Head	0.11	ft
Specific Energy	0.46	ft
Froude Number	0.88	
Maximum Discharge	0.97	ft³/s
Discharge Full	0.90	ft³/s
Slope Full	0.00118	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

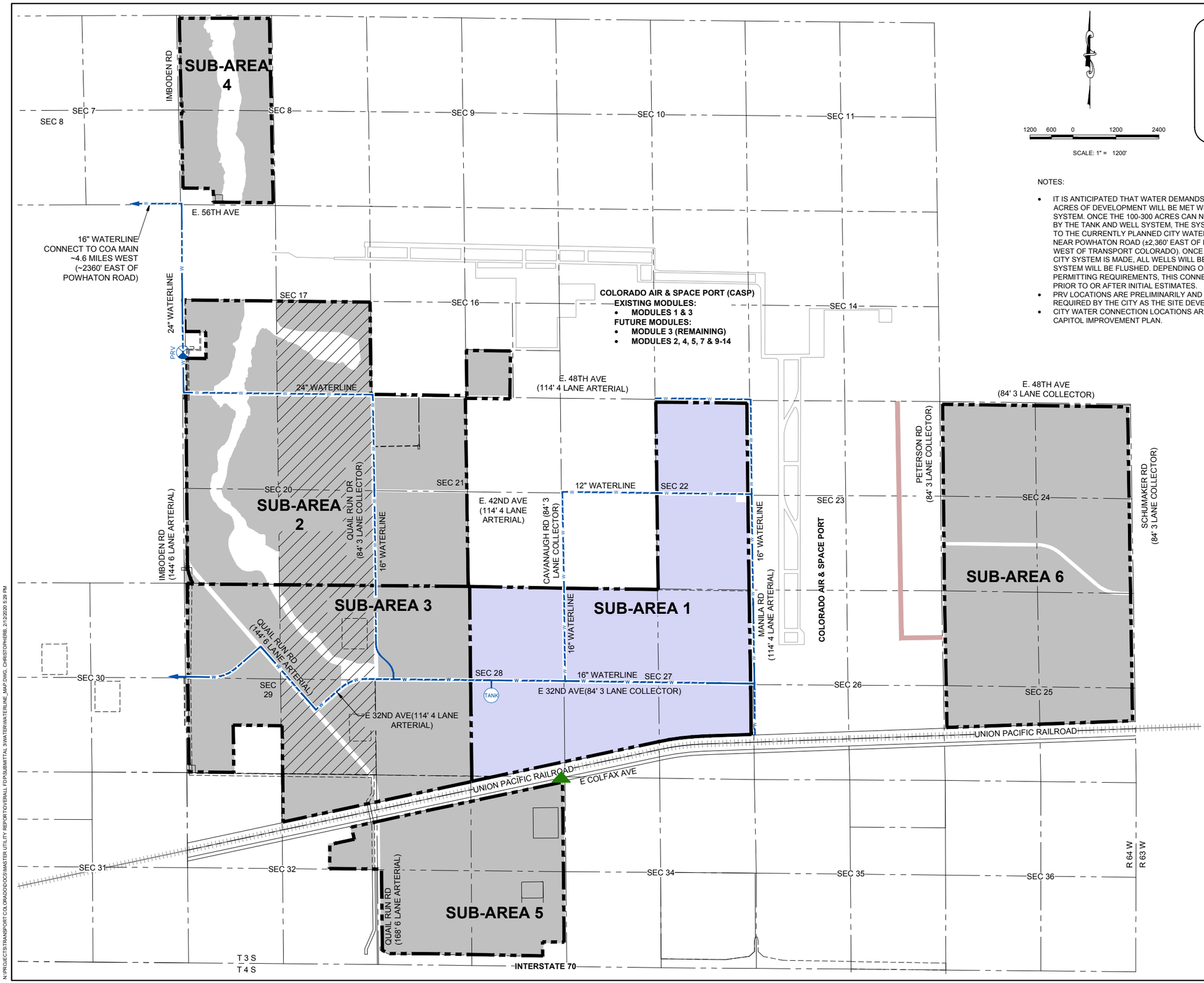
GVF Output Data

Upstream Depth	0.00	in
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	52.49	%
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	4.20	in
Critical Depth	0.33	ft
Channel Slope	0.40000	%
Critical Slope	0.00500	ft/ft

APPENDIX C

Water System

1. Water System Layout Plan
2. Water Calculations
    a. Water Demand & Distribution Calculations
    b. Network Schematic – Initial Layout
    c. Average Day Results
    d. Max Day Results
    e. Max Hour Results
    f. Fire Flow Results
    g. Network Schematic – Build-out
    h. Average Day Results
    i. Max Day Results
    j. Max Hour Results
    k. Fire Flow Results



LEGEND

- UNANNEXED ADAMS COUNTY
- PROJECT AREA
- PLANNING AREA
- SUB-AREA BOUNDARY
- SECTION/HALF SECTION LINE
- WATER MAINS

1200 600 0 1200 2400

SCALE: 1" = 1200'

NOTES:

- IT IS ANTICIPATED THAT WATER DEMANDS FOR THE INITIAL 100-300 ACRES OF DEVELOPMENT WILL BE MET WITH A TANK AND WELL SYSTEM. ONCE THE 100-300 ACRES CAN NO LONGER BE SUPPORTED BY THE TANK AND WELL SYSTEM, THE SYSTEM WILL BE CONNECTED TO THE CURRENTLY PLANNED CITY WATER SUPPLY IN E. 56TH AVENUE NEAR POWHATON ROAD (±2,360' EAST OF POWHATON ROAD, 4.6MI WEST OF TRANSPORT COLORADO). ONCE THE CONNECTION TO THE CITY SYSTEM IS MADE, ALL WELLS WILL BE DISCONNECTED, AND THE SYSTEM WILL BE FLUSHED. DEPENDING ON ACTUAL DEMANDS AND PERMITTING REQUIREMENTS, THIS CONNECTION MAY TAKE PLACE PRIOR TO OR AFTER INITIAL ESTIMATES.
- PRV LOCATIONS ARE PRELIMINARILY AND MAY BE ADJUSTED AS REQUIRED BY THE CITY AS THE SITE DEVELOPS.
- CITY WATER CONNECTION LOCATIONS ARE BASED ON THE 2018 CAPITOL IMPROVEMENT PLAN.

No.	Revisions	Date
		Appr.
		Int.
		Date

10333 E. Dry Creek Rd.
Suite 240
Englewood, CO 80112
Tel: (720) 482-9526
Fax: (720) 482-9546

CVL CONSULTANTS

TRANSPORT COLORADO, LLC
3311 7TH STREET, SUITE 1000
DENVER, COLORADO 81611

TRANSPORT COLORADO
MASTER UTILITY REPORT
SUB-AREA 1
WATER SYSTEM LAYOUT PLAN

DRAWN BY:	CAK	SCALE:	AS SHOWN
CHECKED BY:	JMM	FILE NO:	8130292103
DATE:	FEBRUARY 2020		

SHEET NUMBER WL1

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TRANSPORT COLORADO - SUB-AREA 1
WATER DEMAND CALCULATIONS
CITY OF AURORA CRITERIA

USE	AVG. DAY (GPD/AC)	MAX. DAY (GPD/AC)	MAX. HR. (GPD/AC)	FIRE FLOW (GPM)	FIRE FLOW DURATION (HR)
COMMERCIAL	1,500	4,200	6,750	2,500	2
PARKS & GREENBELTS	1,800	5,040	N/A	N/A	N/A
HEAVY INDUSTRIAL	1,200	3,360	5,400	3,500	3

				LOADING			DEMAND			
SUB-AREA	PLANNING AREA	USE	GROSS ACREAGE	AVG. DAY (GPM/AC)	MAX. DAY (GPM/AC)	MAX. HOUR (GPM/AC)	AVG. DAY (GPM)	MAX. DAY (GPM)	MAX. HR. (GPM)	MAX DAY + FIRE FLOW (GPM)
SA-1	10	Heavy Industrial	156.80	0.83	2.33	3.75	130.67	365.87	588.00	3,866
SA-1	11	Heavy Industrial	117.20	0.83	2.33	3.75	97.67	273.47	439.50	3,773
SA-1	12	Heavy Industrial	60.80	0.83	2.33	3.75	50.67	141.87	228.00	3,642
SA-1	13	Heavy Industrial	160.20	0.83	2.33	3.75	133.50	373.80	600.75	3,874
SA-1	14	Heavy Industrial	251.10	0.83	2.33	3.75	209.25	585.90	941.63	4,086
SA-1	15A	Heavy Industrial	150.60	0.83	2.33	3.75	125.50	351.40	564.75	3,851
SA-1	15B	Heavy Industrial	2.80	0.83	2.33	3.75	2.33	6.53	10.50	3,507
SA-1	16	Heavy Industrial	174.50	0.83	2.33	3.75	145.42	407.17	654.38	3,907
SA-1	17	Heavy Industrial	23.20	0.83	2.33	3.75	19.33	54.13	87.00	3,554
SA-1	36	PARKS & GREENBELTS	29.80	1.25	3.50	N/A	37.25	104.30	N/A	0
SA-1	37	PARKS & GREENBELTS	3.70	1.25	3.50	N/A	4.63	12.95	N/A	0
	Total		**1,130.7**				**956.21**	**2,677.38**	**4,114.50**	

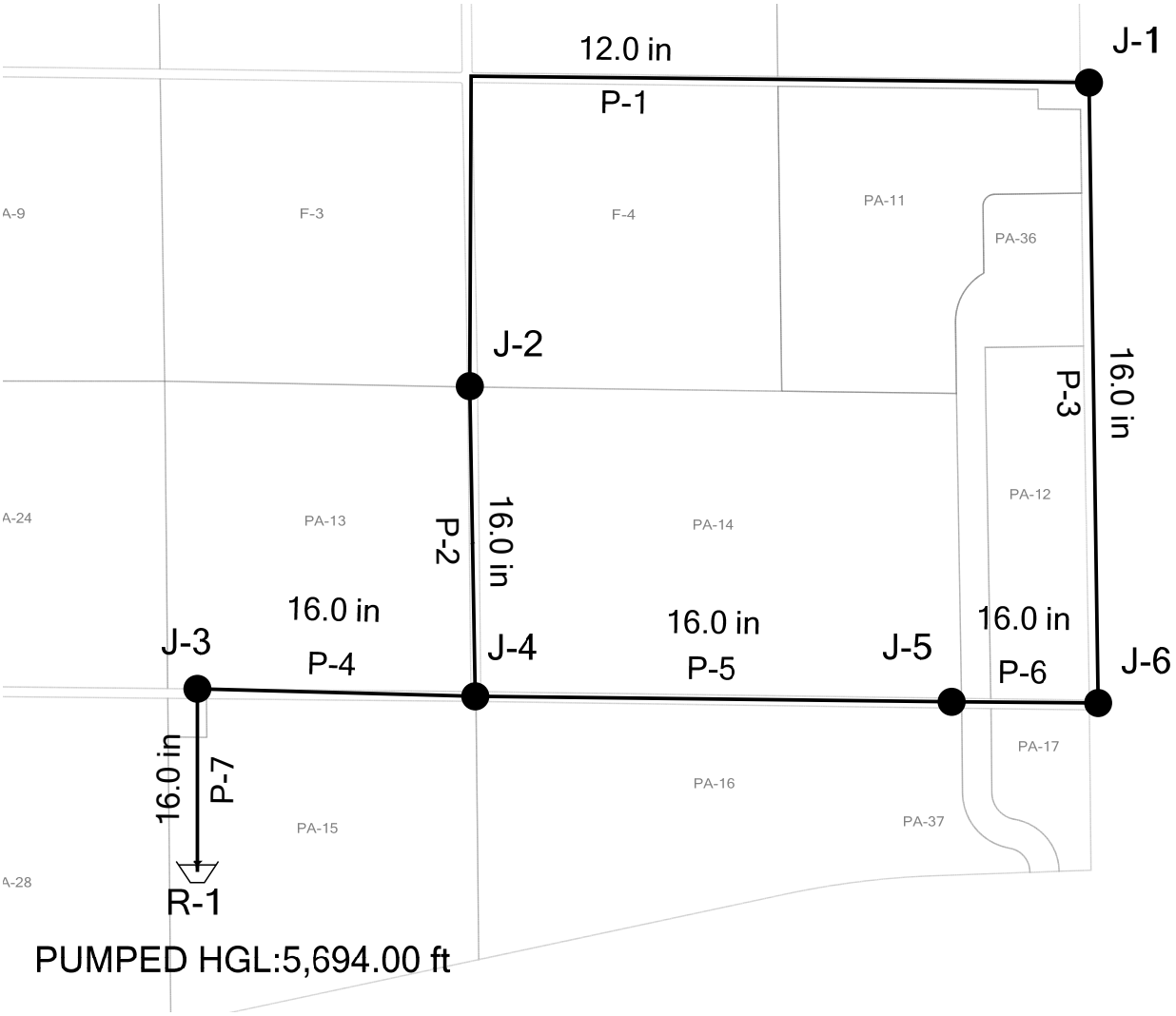
AVERAGE DAY WATER DEMAND DISTRIBUTION
TRANSPORT COLORADO - SUB-AREA 1: INITIAL 200 ACRES

JUNCTION	PLANNING AREA	DISTRIBUTION %	DEMAND (GPM)
J-1			
	--	--	--
J-2			
	--	--	--
J-3			
	15B	100%	2.33
J-4			
	16	50%	72.71
J-5			
	16	50%	72.71
	37	100%	4.63
J-6			
	17	100%	19.33

AVERAGE DAY WATER DEMAND DISTRIBUTION
TRANSPORT COLORADO - SUB-AREA 1 BUILD-OUT

JUNCTION	PLANNING AREA	DISTRIBUTION %	DEMAND (GPM)
J-1			
	11	100%	97.67
J-2			
	10	100%	130.67
J-3			
	13	100%	133.50
J-4			
	12	50%	25.33
J-5			
	15A	100%	125.50
	15B	100%	2.33
J-6			
	14	50%	104.63
	16	50%	72.71
J-7			
	14	50%	104.63
	16	50%	72.71
	37	100%	4.63
	36	100%	37.25
J-8			
	12	50%	25.33
	17	100%	19.33

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT



TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: AVERAGE DAY

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,507.03	0	5,693.94	81
J-2	5,560.27	0	5,693.95	58
J-3	5,578.49	2	5,694.00	50
J-4	5,567.14	73	5,693.95	55
J-5	5,526.11	77	5,693.94	73
J-6	5,516.51	19	5,693.94	77

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: AVERAGE DAY

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	True	7,921	0	J-2	J-1	PVC	150.0	12.0	22	0.06	0.000
P-2	True	2,649	0	J-4	J-2	PVC	150.0	16.0	22	0.03	0.000
P-3	True	5,298	0	J-1	J-6	PVC	150.0	16.0	22	0.03	0.000
P-4	True	2,373	0	J-3	J-4	PVC	150.0	16.0	169	0.27	0.000
P-5	True	4,066	0	J-4	J-5	PVC	150.0	16.0	75	0.12	0.000
P-6	True	1,251	0	J-5	J-6	PVC	150.0	16.0	-2	0.00	0.000
P-7	True	1,564	200	R-1	J-3	PVC	150.0	16.0	172	0.27	0.000

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: AVERAGE DAY

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,694.00	172	5,694.00

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. DAY

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,507.03	0	5,693.60	81
J-2	5,560.27	0	5,693.68	58
J-3	5,578.49	7	5,693.98	50
J-4	5,567.14	204	5,693.69	55
J-5	5,526.11	217	5,693.58	72
J-6	5,516.51	54	5,693.58	77

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. DAY

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	True	7,921	0	J-2	J-1	PVC	150.0	12.0	61	0.17	0.000
P-2	True	2,649	0	J-4	J-2	PVC	150.0	16.0	61	0.10	0.000
P-3	True	5,298	0	J-1	J-6	PVC	150.0	16.0	61	0.10	0.000
P-4	True	2,373	0	J-3	J-4	PVC	150.0	16.0	474	0.76	0.000
P-5	True	4,066	0	J-4	J-5	PVC	150.0	16.0	210	0.33	0.000
P-6	True	1,251	0	J-5	J-6	PVC	150.0	16.0	-7	0.01	0.000
P-7	True	1,564	200	R-1	J-3	PVC	150.0	16.0	481	0.77	0.000

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. DAY

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,694.00	481	5,694.00

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. HR

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,507.03	0	5,693.03	80
J-2	5,560.27	0	5,693.24	58
J-3	5,578.49	10	5,693.94	50
J-4	5,567.14	327	5,693.25	55
J-5	5,526.11	348	5,692.99	72
J-6	5,516.51	87	5,692.99	76

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. HR

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	True	7,921	0	J-2	J-1	PVC	150.0	12.0	98	0.28	0.000
P-2	True	2,649	0	J-4	J-2	PVC	150.0	16.0	98	0.16	0.000
P-3	True	5,298	0	J-1	J-6	PVC	150.0	16.0	98	0.16	0.000
P-4	True	2,373	0	J-3	J-4	PVC	150.0	16.0	762	1.22	0.000
P-5	True	4,066	0	J-4	J-5	PVC	150.0	16.0	337	0.54	0.000
P-6	True	1,251	0	J-5	J-6	PVC	150.0	16.0	-11	0.02	0.000
P-7	True	1,564	200	R-1	J-3	PVC	150.0	16.0	773	1.23	0.000

TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. HR

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,694.00	773	5,694.00

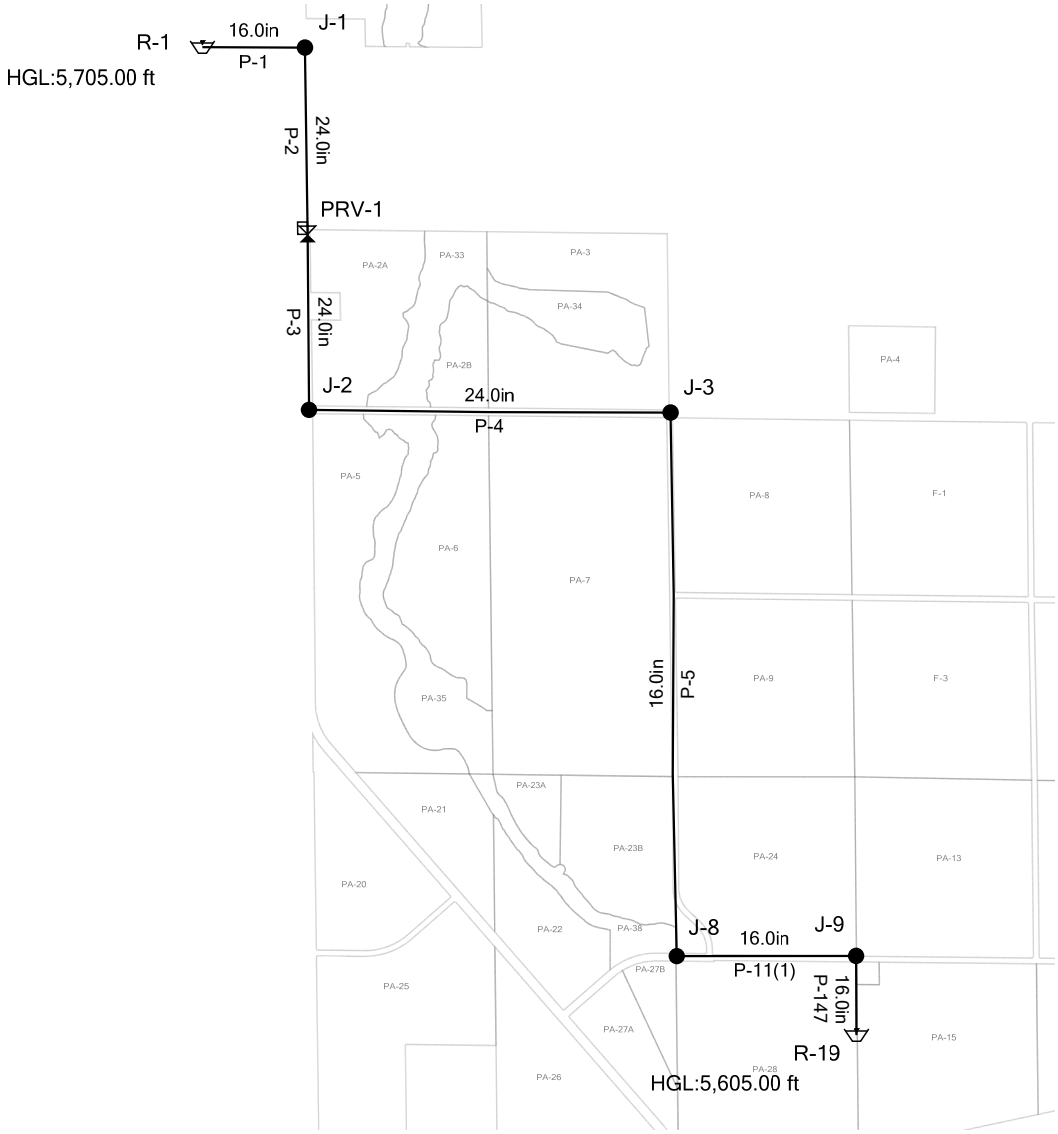
TRANSPORT COLORADO - SUB-AREA 1: INITIAL LAYOUT

Active Scenario: MAX. DAY + FIRE FLOW

Fire Flow Node FlexTable: Fire Flow Report

Label	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Fire Flow (Upper Limit) (gpm)	Fire Flow (Total Upper Limit) (gpm)	Pressure (Calculated System Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Is Fire Flow Run Balanced?	Velocity of Maximum Pipe (ft/s)	Pipe w/ Maximum Velocity
J-3	2	True	3,500	3,600	3,507	3,607	3,600	3,607	54	49	J-4	True	6.51	P-7
J-4	2	True	3,500	3,600	3,704	3,804	3,600	3,804	49	48	J-3	True	6.51	P-7
J-5	2	True	3,500	3,600	3,717	3,817	3,600	3,817	48	59	J-4	True	6.51	P-7
J-2	2	True	3,500	3,600	3,500	3,600	3,600	3,600	48	47	J-4	True	6.51	P-7
J-1	2	True	3,500	3,600	3,500	3,600	3,600	3,600	48	62	J-4	True	6.51	P-7
J-6	2	True	3,500	3,600	3,554	3,654	3,600	3,654	48	62	J-4	True	6.51	P-7

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT



TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,403.42	0	5,638.87	102
J-2	5,432.81	0	5,636.84	88
J-3	5,464.12	0	5,634.81	74
J-8	5,534.26	0	5,612.81	34
J-9	5,573.32	0	5,605.55	14

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	True	1,500	23,900	R-1	J-1	PVC	150.0	16.0	2,578	4.11	0.003
P-2	True	2,731	0	J-1	PRV-1	PVC	150.0	24.0	2,578	1.83	0.000
P-3	True	2,568	0	PRV-1	J-2	PVC	150.0	24.0	2,578	1.83	0.000
P-4	True	5,287	0	J-2	J-3	PVC	150.0	24.0	2,578	1.83	0.000
P-5	True	7,952	0	J-3	J-8	PVC	150.0	16.0	2,578	4.11	0.003
P-11 (1)	True	2,623	0	J-8	J-9	PVC	150.0	16.0	2,578	4.11	0.003
P-147	True	1,159	200	J-9	R-19	PVC	150.0	16.0	2,578	4.11	0.003

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: PRV Table

Label	Elevation (ft)	Diameter (Valve) (in)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)	Status (Initial)	Status (Calculated)
PRV-1	5,431.15	24.0	5,665.00	102	-2,578	5,637.83	5,637.83	0.00	Inactive	Inactive

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,705.00	2,578	5,705.00
R-19	5,605.00	-2,578	5,605.00

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,403.42	0	5,638.87	102
J-2	5,432.81	0	5,636.84	88
J-3	5,464.12	0	5,634.81	74
J-8	5,534.26	0	5,612.81	34
J-9	5,573.32	0	5,605.55	14

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	True	1,500	23,900	R-1	J-1	PVC	150.0	16.0	2,578	4.11	0.003
P-2	True	2,731	0	J-1	PRV-1	PVC	150.0	24.0	2,578	1.83	0.000
P-3	True	2,568	0	PRV-1	J-2	PVC	150.0	24.0	2,578	1.83	0.000
P-4	True	5,287	0	J-2	J-3	PVC	150.0	24.0	2,578	1.83	0.000
P-5	True	7,952	0	J-3	J-8	PVC	150.0	16.0	2,578	4.11	0.003
P-11 (1)	True	2,623	0	J-8	J-9	PVC	150.0	16.0	2,578	4.11	0.003
P-147	True	1,159	200	J-9	R-19	PVC	150.0	16.0	2,578	4.11	0.003

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: PRV Table

Label	Elevation (ft)	Diameter (Valve) (in)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)	Status (Initial)	Status (Calculated)
PRV-1	5,431.15	24.0	5,665.00	102	-2,578	5,637.83	5,637.83	0.00	Inactive	Inactive

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,705.00	2,578	5,705.00
R-19	5,605.00	-2,578	5,605.00

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J-1	5,403.42	0	5,638.87	102
J-2	5,432.81	0	5,636.84	88
J-3	5,464.12	0	5,634.81	74
J-8	5,534.26	0	5,612.81	34
J-9	5,573.32	0	5,605.55	14

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P-1	True	1,500	23,900	R-1	J-1	PVC	150.0	16.0	2,578	4.11	0.003
P-2	True	2,731	0	J-1	PRV-1	PVC	150.0	24.0	2,578	1.83	0.000
P-3	True	2,568	0	PRV-1	J-2	PVC	150.0	24.0	2,578	1.83	0.000
P-4	True	5,287	0	J-2	J-3	PVC	150.0	24.0	2,578	1.83	0.000
P-5	True	7,952	0	J-3	J-8	PVC	150.0	16.0	2,578	4.11	0.003
P-11 (1)	True	2,623	0	J-8	J-9	PVC	150.0	16.0	2,578	4.11	0.003
P-147	True	1,159	200	J-9	R-19	PVC	150.0	16.0	2,578	4.11	0.003

TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: PRV Table

Label	Elevation (ft)	Diameter (Valve) (in)	Hydraulic Grade Setting (Initial) (ft)	Pressure Setting (Initial) (psi)	Flow (gpm)	Hydraulic Grade (From) (ft)	Hydraulic Grade (To) (ft)	Headloss (ft)	Status (Initial)	Status (Calculated)
PRV-1	5,431.15	24.0	5,665.00	102	-2,578	5,637.83	5,637.83	0.00	Inactive	Inactive

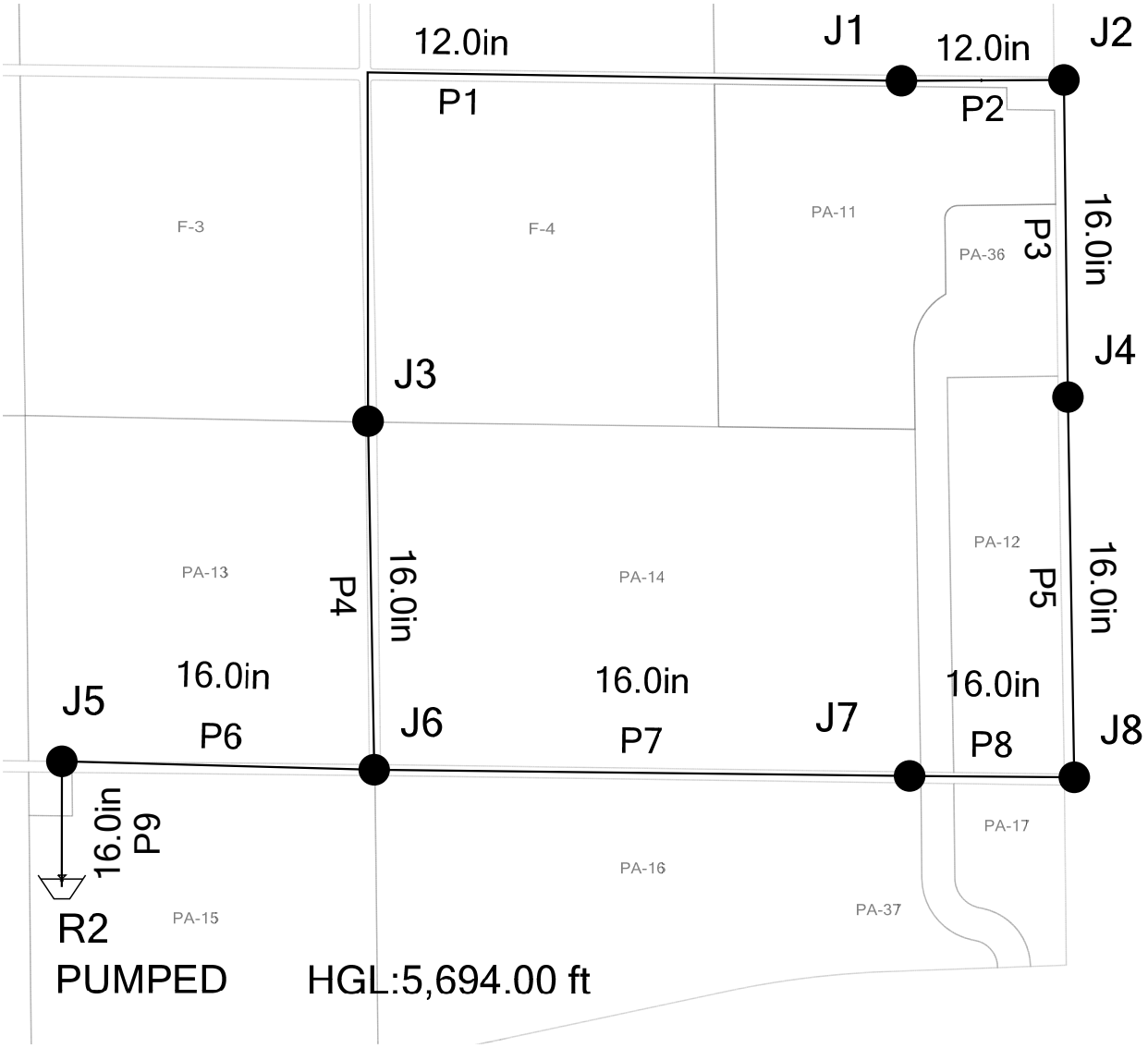
TRANSPORT COLORADO - SUB-AREA 1: WEST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R-1	5,705.00	2,578	5,705.00
R-19	5,605.00	-2,578	5,605.00

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT



TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J1	5,498.85	99	5,692.72	84
J2	5,507.03	131	5,692.71	80
J3	5,560.27	134	5,693.01	57
J4	5,503.34	25	5,692.73	82
J5	5,578.49	128	5,693.91	50
J6	5,567.14	179	5,693.11	55
J7	5,526.11	215	5,692.78	72
J8	5,516.51	45	5,692.76	76

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P1	True	6,703	0	J3	J1	PVC	150.0	12.0	129	0.36	0.000
P2	True	1,234	0	J2	J1	PVC	150.0	12.0	-30	0.09	0.000
P3	True	2,409	0	J4	J2	PVC	150.0	16.0	101	0.16	0.000
P4	True	2,649	0	J6	J3	PVC	150.0	16.0	262	0.42	0.000
P5	True	2,889	0	J8	J4	PVC	150.0	16.0	126	0.20	0.000
P6	True	2,373	0	J5	J6	PVC	150.0	16.0	827	1.32	0.000
P7	True	4,066	0	J6	J7	PVC	150.0	16.0	385	0.62	0.000
P8	True	1,251	0	J7	J8	PVC	150.0	16.0	171	0.27	0.000
P9	True	954	200	R2	J5	PVC	150.0	16.0	954	1.52	0.000

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: AVERAGE DAY

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R2	5,694.00	954	5,694.00

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J1	5,498.85	276	5,685.35	81
J2	5,507.03	366	5,685.33	77
J3	5,560.27	374	5,687.32	55
J4	5,503.34	71	5,685.44	79
J5	5,578.49	358	5,693.41	50
J6	5,567.14	501	5,688.03	52
J7	5,526.11	601	5,685.79	69
J8	5,516.51	125	5,685.64	73

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P1	True	6,703	0	J3	J1	PVC	150.0	12.0	360	1.02	0.000
P2	True	1,234	0	J2	J1	PVC	150.0	12.0	-84	0.24	0.000
P3	True	2,409	0	J4	J2	PVC	150.0	16.0	282	0.45	0.000
P4	True	2,649	0	J6	J3	PVC	150.0	16.0	734	1.17	0.000
P5	True	2,889	0	J8	J4	PVC	150.0	16.0	353	0.56	0.000
P6	True	2,373	0	J5	J6	PVC	150.0	16.0	2,315	3.69	0.002
P7	True	4,066	0	J6	J7	PVC	150.0	16.0	1,079	1.72	0.001
P8	True	1,251	0	J7	J8	PVC	150.0	16.0	478	0.76	0.000
P9	True	954	200	R2	J5	PVC	150.0	16.0	2,672	4.26	0.003

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. DAY

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R2	5,694.00	2,672	5,694.00

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: Junction Table

Label	Elevation (ft)	Demand (gpm)	Hydraulic Grade (ft)	Pressure (psi)
J1	5,498.85	443	5,673.17	75
J2	5,507.03	588	5,673.12	72
J3	5,560.27	601	5,677.91	51
J4	5,503.34	114	5,673.38	74
J5	5,578.49	575	5,692.58	49
J6	5,567.14	806	5,679.63	49
J7	5,526.11	967	5,674.23	64
J8	5,516.51	201	5,673.86	68

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: Pipe Table

Label	Is Active?	Length (Scaled) (ft)	Length (User Defined) (ft)	Start Node	Stop Node	Material	Hazen-Williams C	Diameter (in)	Flow (gpm)	Velocity (ft/s)	Headloss Gradient (ft/ft)
P1	True	6,703	0	J3	J1	PVC	150.0	12.0	579	1.64	0.001
P2	True	1,234	0	J2	J1	PVC	150.0	12.0	-136	0.38	0.000
P3	True	2,409	0	J4	J2	PVC	150.0	16.0	452	0.72	0.000
P4	True	2,649	0	J6	J3	PVC	150.0	16.0	1,180	1.88	0.001
P5	True	2,889	0	J8	J4	PVC	150.0	16.0	567	0.90	0.000
P6	True	2,373	0	J5	J6	PVC	150.0	16.0	3,720	5.94	0.005
P7	True	4,066	0	J6	J7	PVC	150.0	16.0	1,735	2.77	0.001
P8	True	1,251	0	J7	J8	PVC	150.0	16.0	768	1.23	0.000
P9	True	954	200	R2	J5	PVC	150.0	16.0	4,295	6.85	0.007

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. HR

FlexTable: Reservoir Table

Label	Elevation (ft)	Flow (Out net) (gpm)	Hydraulic Grade (ft)
R2	5,694.00	4,295	5,694.00

TRANSPORT COLORADO - SUB-AREA 1: EAST BUILD-OUT

Active Scenario: MAX. DAY + FIRE FLOW

Fire Flow Node FlexTable: Fire Flow Report

Label	Fire Flow Iterations	Satisfies Fire Flow Constraints?	Fire Flow (Needed) (gpm)	Fire Flow (Available) (gpm)	Flow (Total Needed) (gpm)	Flow (Total Available) (gpm)	Fire Flow (Upper Limit) (gpm)	Fire Flow (Total Upper Limit) (gpm)	Pressure (Calculated System Lower Limit) (psi)	Pressure (Calculated Residual) (psi)	Junction w/ Minimum Pressure (System)	Is Fire Flow Run Balanced?	Velocity of Maximum Pipe (ft/s)	Pipe w/ Maximum Velocity
J2	2	True	3,500	3,600	3,866	3,966	3,600	3,966	40	49	J6	True	10.01	P9
J5	2	True	3,500	3,600	3,858	3,958	3,600	3,958	51	49	J6	True	10.01	P9
J8	2	True	3,500	3,600	3,625	3,725	3,600	3,725	40	50	J6	True	10.01	P9
J3	2	True	3,500	3,600	3,874	3,974	3,600	3,974	40	38	J6	True	10.01	P9
J1	2	True	3,500	3,600	3,776	3,876	3,600	3,876	40	51	J6	True	10.01	P9
J7	2	True	3,500	3,600	4,101	4,201	3,600	4,201	40	48	J6	True	10.01	P9
J4	2	True	3,500	3,600	3,571	3,671	3,600	3,671	40	53	J6	True	10.01	P9
J6	2	True	3,500	3,600	4,001	4,101	3,600	4,101	43	40	J3	True	10.01	P9