

CITY OF PASCO

CITY OF PASCO URBAN GROWTH AREA EXPANSION CAPITAL FACILITIES ANALYSIS

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Prepared By:



J-U-B ENGINEERS, Inc.
2810 W. Clearwater Ave., Ste., 201
Kennewick, WA 99336

In Coordination with the City of Pasco
and Oneza & Associates

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INTRODUCTION

The City of Pasco is currently in the process of updating its Comprehensive Plan as required by the Washington State Department of Commerce. The Plan is a revision and update of the 1995 and 2007 plan that was initially created in response to the Growth Management Act (GMA), which was adopted at that time. The purpose of the Comprehensive Plan is to outline the community vision for the future and provide guidance for the development and implementation of specific ordinances and regulations affecting the physical environment of the community. The plan also identifies an anticipated future population and employment growth and how public facilities and services will be provided to accommodate that growth.

As a result, under the provisions of the GMA, urban growth is to be principally contained within designated boundaries (Urban Growth Boundaries) surrounding urban centers in all counties planning under the Act. The Urban Growth Boundary defines the location of the city's urban growth area (UGA). The UGA is where urban development is expected and where growth can be supported by urban services. The UGB is the demarcation line between where the community encourages urban growth and where rural activities are to be preserved. By directing growth to UGA's, natural resource lands such as commercially significant farms lands can be conserved, and the character of rural areas can be maintained for future needs. Each UGA, including Pasco's, is to contain sufficient land area to accommodate expected growth for a 20-year planning horizon. The expected growth is determined by population projections prepared by the State Office of Financial Management which are used by Franklin County and the cities therein to allocate urban and rural growth for each jurisdiction.

The UGA defines the area in which the City must plan under GMA. The UGA establishes the boundaries for land use planning, transportation planning, public service planning and utility planning. Under the GMA, cities are identified as the units of government most appropriate to provide urban governmental services. In general, urban governmental services are to be confined within the UGA. Only in limited circumstances where it is necessary to protect public health and safety, or the environment can these services extend beyond the UGA.

As a result, based on recent population estimates provided by the Washington State Office of Financial Management (OFM), the City of Pasco is projected to increase nearly 50,000 people by the year 2038, with a total population of 121,828. In 2018, the OFM estimated the population for the City is 73,590. In order to accommodate this growth, the City has evaluated their current land vacancy and capacity analysis as well as identified areas for the City to accommodate this growth in population as well as the resulting growth in commercial, industrial, schools, parks and other services needed. Based on this analysis, the City will need to add another 3,400 acres in to the UGA to accommodate the projected growth by 2038. The detailed land capacity analysis is located in the 2019 City of Pasco Comprehensive Plan.

The purpose of this report is to evaluate the capacity of the City of Pasco to provide the necessary capital facilities to service the expanded UGA, an area of approximately 3,400 acres, shown in Figure 1. Capital facility requirements and service capacities for this area are projected for both the 6-year and 20-year time periods. In addition, capital facility costs are projected for the 6-year time period. For this analysis, it is anticipated that growth will continue to occur in undeveloped areas within the existing City Limits and UGA within the next 6-years as well as expand into portions of the proposed UGA. The proposed 6-year development areas within the proposed UGA that was analyzed for concurrency, as well as the anticipated infill development areas within the existing City Limits. A more detailed analysis of the water and sewer infrastructure was prepared by Murraysmith & Associates and is included in Appendix A for Reference (Technical memorandum of the Expanded UGA Infrastructure Evaluation).

The Washington State Growth Management Act (GMA) of 1990 requires that cities conduct a Capital Facilities Analysis (CFA), that shows they have the capacity to serve the Urban Growth Area (UGA) within their jurisdiction and that they adopt a Capital Facilities Plan (CFP) as part of their comprehensive plans, in order to ensure that utilities, transportation, and other public facilities will be reasonably available to accommodate planned growth over the next twenty years. Capital facilities provide the basic infrastructure of the community and are critical if growth is to be accommodated.

This CFP complies with the Growth Management Act (RCW 36.70A.070 (3) and WAC 365-195-315) in order to assure that the City of Pasco Urban Growth Area (UGA) can meet the concurrency requirements of RCW 36.70A.020 (12), and WAC 365-195-210. RCW 36.70A.020 (12) of the Growth Management Act includes a goal to:

"...ensure that those public facilities and services necessary to support development shall be adequate to service the development at the time the development is available for occupancy and use without decreasing current service levels below locally established minimum standards".

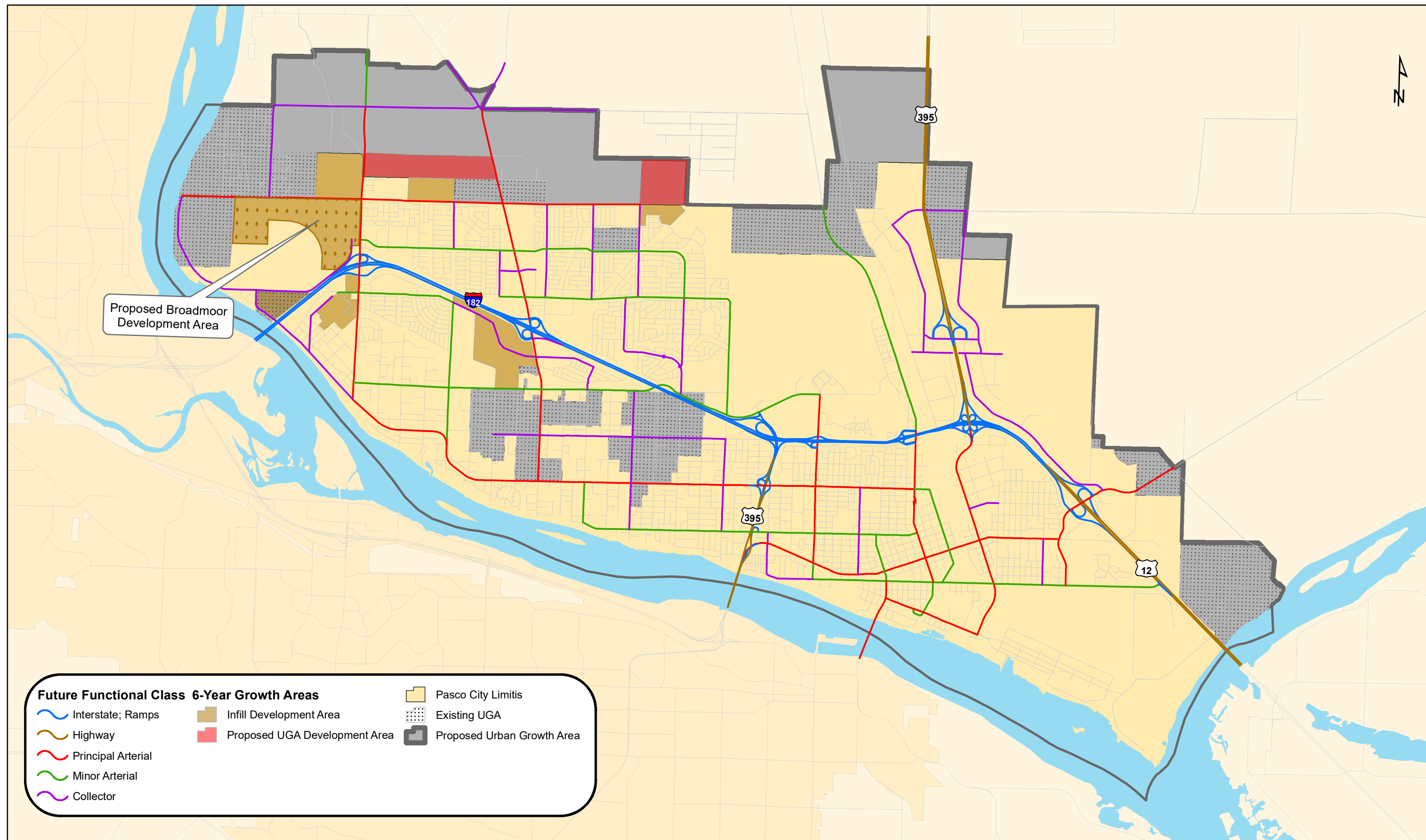
WAC 365-196-415(1) and RCW 36.70A.070 (3) requires that CFPs must address at least the following:

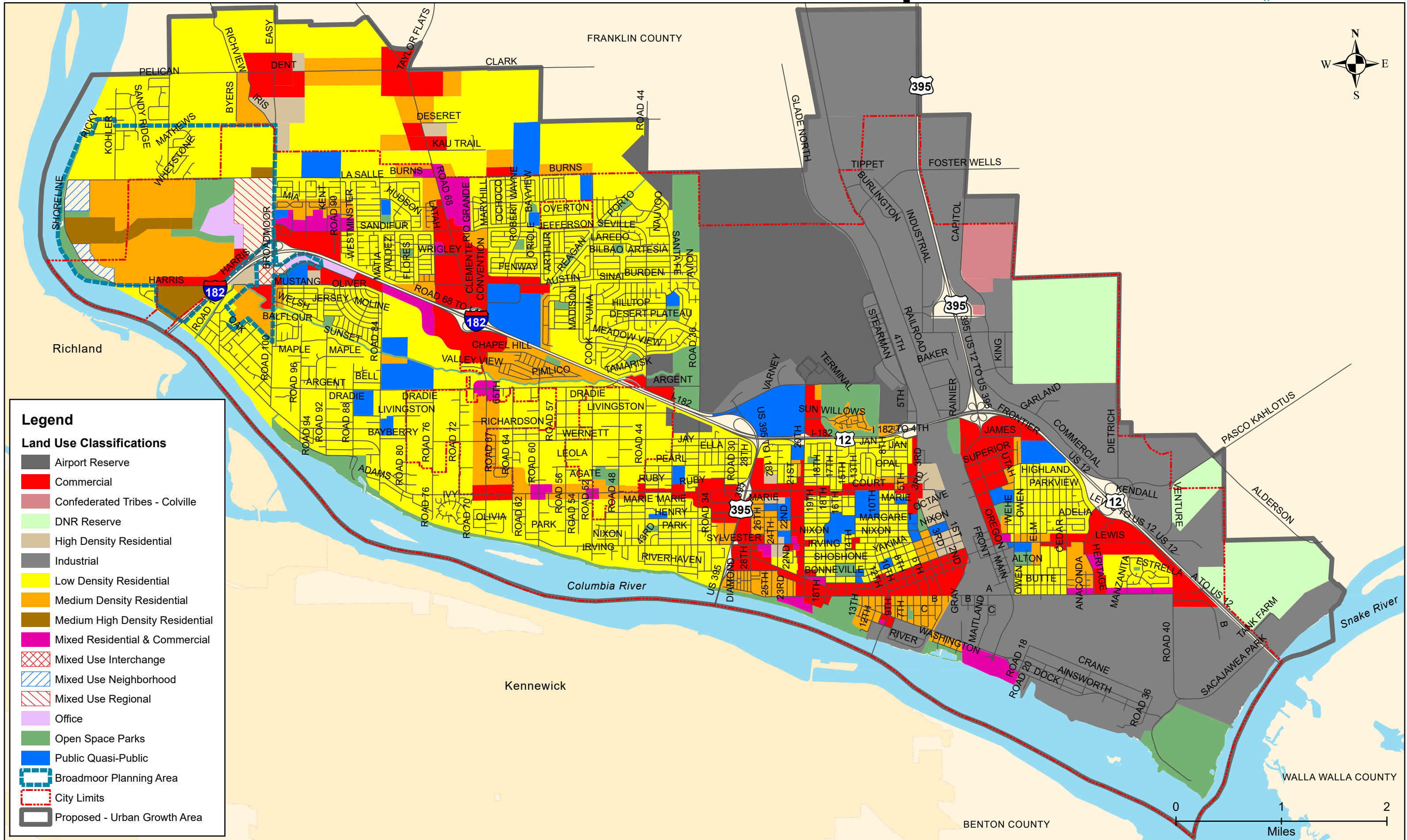
- (a) An inventory of existing capital facilities owned by public entities, also referred to as "public facilities," showing the locations and capacities of the capital facilities;*
- (b) A forecast of the future needs for such capital facilities based on the land use element;*
- (c) The proposed locations and capacities of expanded or new capital facilities;*
- (d) At least a six-year plan that will finance such capital facilities within projected funding capacities and clearly identifies sources of public money for such purposes; and*
- (e) A requirement to reassess the land use element if probable funding falls short of meeting existing needs and to ensure that the land use element, capital facilities plan element, and financing plan within the capital facilities plan element are coordinated and consistent. Park and recreation facilities shall be included in the capital facilities plan element.*

PROPOSED LAND USE DESIGNATION

For the Comprehensive Plan Update, City of Pasco evaluated the future land use designations and completed a land capacity analysis to determine the capacity of the existing UGA and how much area is needed to accommodate the projected growth. The detailed Land Capacity Analysis is included in the Appendix of the 2019 City of Pasco Comprehensive Plan. As a result, it was identified that the City has the capacity to accommodate approximately 30,372 people in the vacant and undeveloped portions of the current UGA. A majority of this growth is expected to occur in the Broadmoor Master Planning Area. Another 3,400 acres will be needed to provide the additional land area needed to accommodate 17,866 additional people by the year 2038. Within the proposed UGA Expansion area, the City of Pasco has designated the land use as single and multi-family residential with areas of commercial use. Within the residential land use other public uses such as schools, parks, fire stations, and churches are anticipated to be included. Figure 1 identifies the proposed future land use.

In addition, the City is also proposing to transfer a portion of the Industrial designated land located in east Pasco to an area along US-395, north of the existing UGA Boundary. Within the current Industrial designated land, several hundred acres of the property is owned by the Washington State Department of Natural Resources and the Pasco Airport. It has been identified that this land is not available for future industrial development at this time and the City has requested that the land use be reclassified to DNR and Airport Reserve. As a result, an additional 609 acres has been identified for future industrial land. However, for the purposes of this study it is not anticipated that development will occur within the proposed industrial area over the next 6-years, therefore this area was not evaluated for concurrency. However, 20 year needs analysis was prepared to identify future improvements necessary to serve the area as full buildout.





DEFINITIONS

While the GMA requires jurisdictions to prepare a Capital Facilities Plan it does not specifically define what a Capital Facility is. The GMA defines public facilities as including “streets, roads, highways, sidewalks, street and road lighting systems, traffic signals, domestic water systems, storm and sanitary sewer systems, parks and recreational facilities, and schools.” It defines public services as including “fire protection and suppression, law enforcement, public health, education, recreation, environmental protection, and other governmental services.” The GMA also defines “urban governmental service” or “urban service” in WAC 365-196-200 (19) to include:

“...those public services and public facilities at intensity historically and typically provided in cities, specifically including storm and sanitary sewer systems, domestic water systems, street cleaning services, fire and police protection services, public transit services, and other public utilities associated with urban areas and normally not associated with rural areas.”

While the Growth Management Act does not specifically define a Capital Facility, over the years the Growth Management Hearings Board (GMHB) has provided the following guidance:

For purposes of conducting the inventory required by RCW 36.70A.070(3)(a), “public facilities” as defined in RCW 36.70A.030(13) are synonymous with “capital facilities owned by public entities.” *West Seattle Defense Fund v. City of Seattle, CPSGMHB Case 94-3-0016, FDO April 4, 1995*, as cited in *EWGMHB Case 06-1-0009c, FDO March 12, 2007*.

The board further defined capital facilities as what is required to fulfill the GMA obligation:

“The Board holds that a Capital Facilities Element (CFE) must include all facilities that meet the definition of public facilities set forth in RCW 36.70A.030(12). All facilities included in the CFE must have a minimum standard [level of service] (LOS) clearly labeled as such (i.e., not “guidelines” or “criteria”), must include an inventory and needs assessment and include or reference the location and capacity of needed, expanded, or new facilities. (RCW 36.70A.070(3)(a), (b) and (c). In addition, a CFE must explicitly state which of the listed public facilities are determined to be “necessary for development” and each of the facilities so designated must have either a “concurrency mechanism” or an “adequacy mechanism” to trigger appropriate reassessment if service falls below the baseline minimum standard. Transportation standards are the only facilities required to have a concurrency mechanism, although a local government may choose to adopt a concurrency mechanism for other facilities.” Jody L. McVittie v. Snohomish County, CPSGMHB Case No. 01-3-0002, FDO, July 25, 2001, as cited in EWGMHB Case 06-1-0009c, FDO March 12, 2007.

And in *Wilma et al v. Stevens County, EWGMHB Case 06-1-0009c, FDO March 12, 2007*, the Eastern Board included:

“streets, roads, highways, sidewalks, street and road lighting systems, traffic signals, domestic water systems, storm and sanitary sewer systems, parks and recreational facilities, and schools...fire protections and suppression, law enforcement, public health, education, recreation, environmental protection and other governmental services. (WAC 365-195-200(12) and (13).”

The Washington Administrative Code (WAC) was updated in 2010, after the cases above were determined. WAC 365-196-415 provides guidance as to which capital facilities should be included in the inventory. At a minimum, they should include water systems, sanitary sewer systems, storm water facilities, reclaimed water facilities, schools, parks and recreational facilities, police and fire protection facilities.

“Public Facilities” are defined by WAC 365-196-200 (14) to include:

“..streets, roads, highways, sidewalks, street and road lighting systems, traffic signals, domestic water systems, storm and sanitary sewer systems, parks and recreational facilities, and schools.”

“Public Services” are defined by WAC 365-196-200 (15) to include:

“...fire protection and suppression, law enforcement, public health, education, recreation, environmental protection, and other governmental services.”

In addition, WAC 395-196-210 provides the following definitions:

"Concurrency" means that adequate public facilities are available when the impacts of development occur, or within a specified time thereafter. This definition includes the concept of "adequate public facilities"..."

"Adequate public facilities" means facilities which have the capacity to serve development without decreasing levels of service below locally established minimums.

"Utilities" or "public utilities" means enterprises or facilities serving the public by means of an integrated system of collection, transmission, distribution, and processing facilities through more or less permanent physical connections between the plant of the serving entity and the premises of the customer. Included are systems for the delivery of natural gas, electricity, telecommunications services, and water, and for the disposal of sewage.

The GMA further requires each jurisdiction to define capital facilities and identify which capital facilities and public services are included in their CFP. Additionally, each jurisdiction should clearly identify which capital facilities and public services are necessary to support development.

For the purposes of preparing this CFP, a “Capital Facility”, as identified in the City of Pasco Capital Improvement Plan, is an existing City facility/infrastructure or new construction projects that add to the City’s infrastructure assets. The minimum threshold for a Capital Facility project is \$50,000 and may span over several years with multiple funding sources.

In order to limit capital facilities to major components which can be analyzed at a level of detail which is both manageable and reasonably accurate for this initial CFP, this report does not include capital outlay for such items as equipment, or the city’s rolling stock. In addition, capital facilities that are normally provided by a private developer to service individual lots or businesses, such as minor streets and side sewers as a normal part of the subdivision or land development permit process, are not included.

Based on this, the City of Pasco has determined that capital facilities must be in place or funding available, within six years to meet this concurrency requirement as required by RCW 36.70A.070(6). Using the above requirements and definitions, the City has identified the following is a list of the types of capital facilities that are required to meet the concurrency requirement:

- Parks and Recreation Facilities
- Schools
- Fire and Emergency Service Facilities
- Police Service Facilities
- Library Facilities
- Irrigation District Facilities.
- Transportation (Streets & Roads)
- Transit
- Sewers
- Surface and Stormwater Management
- Domestic Water
- Other Governmental Services
- Solid Waste
- Electrical

Some of the above public facilities and services are not controlled by the City. While the City has established goals and policies regarding the siting of these capital facilities, and has established recommended levels of services, it does not have the authority to mandate capital facility improvements or to assure financing. Consequently, these capital facilities cannot be subject to the funding requirements of the City under GMA. The City will coordinate with the purveyors of these facilities and services to assure that adequate facilities are available to accommodate growth. The capital facilities listed above are further divided into three main categories that classify the level of concurrency required. These categories are identified as follows:

Category 1 - Locally Provided Regulatory Concurrency

A public facility or service, owned and operated by the City of Pasco, that is either in place, or for which there is a financial commitment in place, to provide the service within six (6) years. All Category 1 capital facilities will be subject to City of Pasco GMA concurrency requirements.

Based on the wording of WAC 360.196.840(2) the City of Pasco may determine which public facilities and services will be required to “support development” and therefore meet the concurrency requirements of the GMA. Consequently, after reviewing all of the capital facilities that will be required for growth when the expanded urban growth area comes under city control, the City of Pasco has determined that **streets and roads, domestic water, and sanitary sewers** are Category 1 capital facilities and will be subject to the concurrency requirements of the Growth Management Act.

Streets and roads are included under this category as a result of both the requirements of RCW 36.70A.070(6)(a) of the Growth Management Act and because of concerns relating to traffic congestion and safety. Sewer and water power are included because of both the requirements and recommendations of WAC 365.196.840(2) and because of their critical relationship to public health and safety, and environmental quality.

Category 2 - Locally Provided Planning Concurrency

A public facility or service, owned and operated by the City of Pasco for which goals and policies have been adopted, capital facilities planned, and funding needs projected, which is not required to either be in place or have a financial commitment at time of development.

The City of Pasco has determined that **fire protection, law enforcement, parks and recreation, solid waste, and storm water management** are all Category 2 capital facilities. For fire protection this decision is based on the ability of current laws to assure that new growth will meet minimum fire protection standards. For the remaining facilities and services, it is based on the range of acceptability in service levels for these facilities, and the less quantifiable impacts these facilities have directly on public health and safety. Upon the annexation of this urban growth area by the City of Pasco, these capital facilities will be funded as part of the City’s ongoing adopted capital facilities budget. This budget process, upon approval of the Pasco City Council, will then become the funding level for these facilities.

Category 3 - Provided by others Planning Concurrency

A public facility or service, which is either owned or operated by the state or federal government, or an independent district or utility, and that: 1) is in place or has a financial commitment in place to provide the service within six (6) years; or 2) for which goals and policies have been adopted, capital facilities planned, and funding needs projected, which is not required to be in place or have a financial commitment at the time of development.

The City of Pasco has determined that **schools** (Pasco School Districts), **libraries** (Mid-Columbia Library), **transit** (Ben Franklin Transit), **natural gas** (Cascade Natural Gas and Williams-Northwest Pipeline), **communications** (Frontier and other local providers) **power** (Bonneville Power Administration, Franklin PUD) and **irrigation** (City of Pasco and South Columbia Basin Irrigation District) are all Category 3 capital facilities and are not subject to concurrency requirements. The City will work with these service providers to reach an agreement on ways to ensure that these services are reasonably available when needed to serve projected growth. This decision was based on: 1) The inability of the City of Pasco to allocate the required funding for these facilities; 2) The broader range of acceptability in service levels for some of these facilities as determined through public involvement; and, 3) The less quantifiable impacts some of these facilities have on public health and safety.

As identified in Categories 2 and 3 these public facilities and services only require planning concurrency by the City of Pasco. The City of Pasco has established goals and policies regarding the siting of these capital facilities, and has determined whether these capital facilities have sufficient capacity to serve the projected growth. The City is not required to commit financing for the development of these facilities, for Category 2 facilities, only a general financial commitment needs to be in place, and a general commitment is all that is required for a Category 3. Coordination with the purveyors of these facilities and services to assure that adequate facilities are available to accommodate growth is required. Where the City of Pasco does not have the authority to commit financing for the maintenance of Category 2 and 3 public facilities and services, there is not a requirement for concurrency.

The purpose of this analysis is to identify whether the City of Pasco has the capacity to provide Category 1 services to the proposed UGA expansion area and to identify if the City has the financial commitment required by the City to provide these services within six (6) years to meet the concurrency requirements.

LEVELS OF SERVICE

“Level of service” (LOS) means an established minimum capacity for public facilities or services that must be provided per unit of demand or other appropriate measure of need, and is used as a gauge for measuring the quality of service. Levels of service need to be consistent with the growth projections of the Land Use Element of the City of Pasco Comprehensive Plan. Under the concurrency requirements of GMA, if levels of service are set too high, it may result in the community not achieving its growth objectives. On the other hand, if levels of service are set too low, it may adversely impact the quality of life in the community. Even if concurrency is not required, LOS standards are valuable planning and budgetary tools.

LOS standards were initially established under the City of Pasco Comprehensive Plan. These standards were reviewed, evaluated, and approved by the Pasco City Council as a balance between economic feasibility and community benefit. For the purposes of this analysis, the City of Pasco Level-of-Service criteria contained in their 2007 Comprehensive Plan were used. This was based on the assumption that Pasco will have the ultimate responsibility for providing the necessary capital facilities for this area.

Table 1 defines LOS standards for a broad array of public facilities and services in the City of Pasco. These LOS standards have been adopted as the standards that the City of Pasco will use to evaluate future development approvals and will establish the basis for the future submission of capital budgets for approval within the UGA area. As established above, the levels of service standards, for regulatory concurrency purposes, apply only to Category 1 capital facilities (streets and roads, water, and sewer).

Table 1. LOS Standards

Facility	Adopted LOS
Streets and Roads	
Local Roads	LOS D
Arterials	LOS D
Signalized Intersections	LOS D
Unsignalized Intersections	LOS D
Domestic Water	
Demand per ERU ^a	
ADD	424 gallons per day
MDD	890 gallons per day
PHD	1,119 gallons per day
MDD ^b /ADD ^c Factor	2.1
PHD ^d /MDD Factor	2.64
Service Pressure	30 – 80 psi
Sewer	
Residential Unit Flows	80 gallons/capita/day
Commercial Unit Flows	80 gallons/capita/day
Industrial Unit Flows	1,500 gallons/acre/day
Manning Pipe Roughness Coefficient	0.025
Minimum Sewer Velocity	2 feet/second
Parks	
Neighborhood Parks	2.00 acres/1,000 population
Community Parks	2.10 acres/1,000 population

Facility	Adopted LOS
Large Urban Parks	2.99 acres/1,000 population
Regional Parks	8.93 acres/1,000 population
Linear Parks	1.56 acres/1,000 population
Special Use Areas	5.80 acres/1,000 population
Facilities	
Youth baseball Fields	1 field/2,900 population
Adult Softball Fields	1 field/3,000 population
Soccer Fields	1 field/2,000 population
Tennis Courts	1 court/1,500 population
Trails	0.50 miles/1,000 population
Police	
Patrol District	1 district/18,000 residents
Mini-station	1 station/18,000 residents
Fire	
Turnout Time	2 minutes or less, 90% of the time
Travel Time – arrival of 1 st apparatus	6 minutes or less, 90% of the time
Travel Time – arrival of adv. life support	6 minutes or less, 90% of the time
Travel Time – arrival of full 1 st alarm assignment	12 minutes or less, 90% of the time

CAPITAL FACILITY INVENTORY

This section discusses existing facilities, owned by public entities, and provides information about the service provider, along with the location and capacity of the existing facilities.

Transportation

Streets

The existing functionally classified roadway network, as formally shown on the Washington State Department of Transportation (WSDOT) system, in the vicinity of the proposed Urban Growth Area (UGA) that will provide access to the expanded UGA is described below. It should be noted that the 2008 Pasco Comprehensive Plan identified additional roadways that will form a more complete grid network of roadways as the area north of I-182 matures. These roadways, intersection geometry and traffic control for these major roadways are shown in Figure 2.

Interstate 182 (I-182) – is an east-west limited access freeway providing 6 travel lanes with a 70 MPH speed limit. It connects to I-82 west of Pasco, providing connections to the City of Richland over the Columbia River. To the east it connects to US 395 and US 12 with access to the City of Pasco, the Tri-Cities Airport, and further to the east and north the cities of Walla Walla and Spokane.

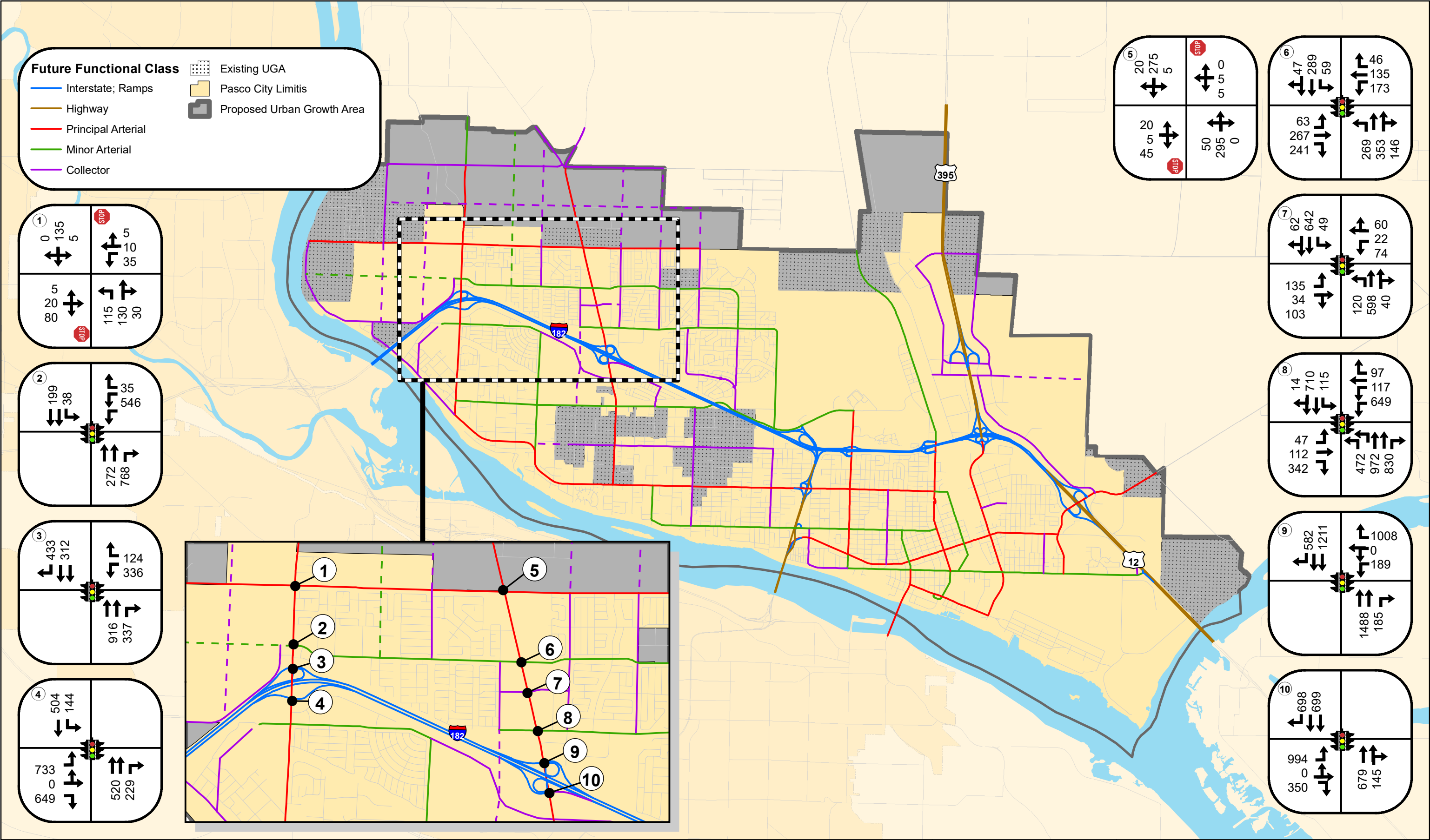
The only access to I-182 between the Columbia River and US 395 that provides continuity to the north towards the majority of the UGA Expansion Area is provided at the Road 68 and Road 100 Interchanges. The Road 68 interchange is a partial clover leaf interchange that includes a collector-distributor system through the interchange to facilitate weaving because of two loop ramps for the northbound to westbound and southbound to eastbound on-ramp movements; these movements merge with the other on-ramps prior to merging with the mainline. These loop ramps eliminate left turns from Road 68 onto the freeway on ramps. Left turns from the off-ramps to Road 68 at signalized intersections are still required. The Road 100 Interchange had the northbound to westbound loop ramp constructed in recent years which has reduced congestion at the interchange. Traffic signals are present at each of the ramp terminals of both interchanges.

Road 68 north of I-182 is a minor arterial roadway generally in a north-south direction but angling slightly to the west north of I-182. Road 68 has two through lanes in each direction with channelized left turn lanes and sidewalks from I-182 to just north of Sandifur Parkway. The speed limit is 35 MPH. North of Sandifur Parkway it transitions to a rural 2 lane section with a speed limit of 45 MPH. North of Burns Road it is designated a major collector. South of I-182 to court street Road 68 is a 2 lane principal arterial.

Taylor Flats Road is the continuation of Road 68 north of the intersection with Columbia River Road. It is a two-lane rural roadway with a speed limit of 55 MPH and is classified a major collector.

Columbia River Road is a minor collector roadway that connects to Road 68 and angles to the northwest. It is a two-lane rural roadway with a speed limit of 50 MPH and is classified a minor collector.

Road 100 is also known as Broadmoor Boulevard north of I-182. From south of I-182 to Harris Road just north of the I-182 westbound ramps it is a minor arterial, then a major collector from Harris Road to Burns Road and a minor collector from there to Dent Road. It has two lanes in each direction with a center turn lane from I-182 to north of Sandifur Parkway where it transitions to a three-lane section including a two-way left turn lane from Vincenzo Drive to Burns Road. North of Burns Road it transitions to a two-lane rural roadway. The speed limit is 35 MPH and there is sidewalk on the east side where development has occurred.



Burden Boulevard is an east-west collector roadway between Road 68 and Road 44 with a speed limit of 35 MPH. It has 4 lanes with a raised median and left turn lanes at intersections, curb, gutter and sidewalks, streetlights and a separated pathway on the south side. East of Road 60 it transitions to a 3-lane roadway with a two-way left-turn lane to Road 44. East of Road 44 has recently been added as a minor arterial with one lane each way and curves to connect to Road 36 which is also a minor arterial south to Argent Road. It also extends west of Road 68 as a local roadway approximately one-quarter mile west of Road 68 to provide access to commercial development.

Sandifur Parkway is an east-west major collector roadway between Road 100 and Road 68. East of Road 100 it provides 5 lanes of travel including a two-way left-turn lane and has curb, gutter and sidewalks. East of the Broadmoor Mall entrance the roadway transitions to a 3-lane section with one through lane each way with a two-way left-turn lane. The speed limit of 35 MPH. East of Road 68 Sandifur Parkway was recently designated a minor arterial roadway. It has a single lane in each direction and curves to provide a continuation to Road 44 and provides significant access to many residential neighborhoods.

Road 44 is a north south collector roadway from Argent Road north to Burden Blvd where it becomes a minor arterial roadway that curves and connects to Sandifur Parkway.

Harris Road is a 45 MPH 2 lane minor arterial that connects from Broadmoor Blvd west to Shoreline. It is a rural roadway section with roadside ditches and no pedestrian facilities.

Shoreline is a 45 MPH 2 lane major collector with a rural roadway section that extends from Harris Road westward and then follows the Columbia River to connect to Dent Road.

Dent Road is a 2-lane rural roadway with a 50 MPH speed limit. On the west it connects to Shoreline as a major collector. One mile west of Road 100 Dent Road is designated a minor collector and the alignment turns to the north for 1 mile then turns east-west again for approximately 2 miles where it connects to Columbia River Road.

Burns Road is an east-west 2 lane rural roadway section designated as a major collector between Road 100 and Road 68 one-half mile north of Sandifur Parkway. This roadway extends west of Road 100 to connect with Dent Road where Dent Road turns north, but is currently designated a local roadway.

Clark Road is a 2 lane rural roadway designated as a minor collector with a 50 MPH speed limit. On the west it connects to Dent Road and on the east it connects to Glade Road.

US 395 is a 4 lane north-south limited access divided highway on the National Highway System that is designated as an Expressway north of I-182. It connects the Tri-Cities to rural communities and Spokane further to the north. It has a grade separated interchange at Kartchner Street and at-grade intersections with East Foster Wells Road and Vineyard Drive. The speed limit is 60 MPH from I-182 to north of East Foster Wells Road where it increases to 70 MPH.

East Foster Wells Road is a 35 MPH rural east-west 2-lane minor arterial that connects Railroad Road to US 395 and further east of US 395 into the farming areas.

Railroad Avenue is 2 lane rural roadway that connects from Hillsboro Road to Vineyard Drive. It is a major collector south of East Foster Wells Road, a minor arterial for one mile north of East Foster Wells Road and then a major collector again north of there. The speed limit is 45 MPH.

Glade Road is a 2-lane north-south minor arterial that connects from 4th Avenue north of I-182 into the farming areas to the north. Approximately 1 miles south of Clark Road it is designated a major collector. The speed limit is 45 MPH.

Traffic Volumes

The City of Pasco recently completed study *“Feasibility Traffic Study for Interchange Project”* in 2017. Traffic volumes were collected for that study for several intersections, including multiple intersections that are considered important to provide access to the proposed Urban Growth Area on both Broadmoor Boulevard and Road 68. Traffic volumes from that study that represented then-existing conditions for several intersections are used as a baseline for this study. Those volumes as well as estimated PM Peak Hour traffic volumes for the northernmost intersections on the two primary corridors of interest are shown in Figure 2 along with intersection geometry and traffic control.

Level of Service

The analysis of Level-of-Service (LOS) is a means of quantitatively describing the quality of operational conditions of a roadway segment or intersection, and the perception by motorists and passengers. Service levels are identified by letter designation, A to F, with LOS “A” representing the best operating conditions and LOS “F” the worst. Each LOS represents a range of operating conditions, and one or more measures of effectiveness (MOE) are used to quantify the LOS of a roadway element. For intersections, the MOE used is average control delay (seconds) per vehicle. While there are several methodologies for estimating the LOS of intersections, the most commonly used is that presented in the Highway Capacity Manual and is the methodology used in this study (HCM 2017). The Highway Capacity Manual LOS criteria for signalized and unsignalized intersections are summarized in Table 2.

Table 2. Level-of-Service Criteria for Intersections

Level of Service (LOS)	Average Control Delay (seconds/vehicle)	
	Signalized Intersections	Unsignalized Intersections
A	< =10	< =10
B	>10 - < 20	>10 - < 15
C	>20 - < 35	>15 - < 25
D	>35 - < 55	>25 - < 35
E	>55 - < 80	>35 - < 50
F	>80	>50
Source: Highway Capacity Manual 6 th Edition, Transportation Research Board, National Research Council, Washington, D.C., 2017.		

The signalized method is based on the capacity available to service the various movements at a signalized intersection, based on the amount of green time provided for each movement. The impacts of any conflicting movements, etc. For unsignalized intersections delay is based on the availability of gaps in the major street to allow minor street movements to occur. Delay results in driver frustration and anxiety, loss of time, unnecessary fuel consumption, and contributes to unnecessary air pollution.

The Benton Franklin Council of Governments and the City of Pasco have adopted regional standards for intersection service standards at LOS “D”. These proposed criteria will be the basis for determining appropriate mitigation actions for future traffic volumes.

Peak hour traffic volumes and intersection geometry from Figure 2 were used to determine the delay and Level of Service at the intersections. The results of the capacity analysis and intersection delay for existing conditions are shown in Table 3.

Table 3. Summary of Existing PM Peak Hour Delay (sec) and Level of Service

Intersection	PM Peak Hour	
	Overall Intersection	Worst Approach
Road 100/I-182 EB Ramps	13.6/B	NB—15.0/B
Road 100/I-182 WB Ramps	9.9/A	WB--26.9/C
Road 100/Sandifur Parkway	10.3/B	WB—12.8/B
Road 100/Burns Road	*	WB—18.2/C
Road 68/I-182 EB Ramps	11.8/B	EB—15.7/B
Road 68/I-182 WB Ramps	4.2/A	WB--5.4/A
Road 68/Burden Boulevard	44.6/D	EB—104.6/F
Road 68/Wrigley Drive	16.8/B	WB—28.8/C
Road 68/Sandifur Parkway	14.5/B	EB—15.4/B
Road 68/Burns Road	*	WB—23.4/C

LEGEND

13.6/B Delay and Level of Service using existing lane configurations

* Uncontrolled Movements (major street through) not provided for overall intersection Analysis for Two-way Stop Controlled Intersections

NB = northbound, SB = southbound, WB = westbound, EB = eastbound

As shown in Table 3, all intersections on the two primary corridors that will provide primary access to the proposed Urban Growth Area currently function with acceptable Levels of Service. Only Road 68/Burden Blvd operates with LOS “D”, all others operate at LOS “A” or “B”.

Sanitary Sewer Service

Currently, there is no sanitary sewer service in the UGA Expansion Area. Sanitary sewer service in this area will be provided by the City of Pasco. The City of Pasco updated its Comprehensive Sewer Plan in 2014, with amendments to the Northwest Service Area in 2017. The Sewer Plan discusses the total capacity, utilized capacity, and remaining capacity of both the Wastewater Treatment Plant (WWTP) and the sanitary sewer collection system. The following is a summary of the WWTP capacity and the sanitary sewer collection system based upon this planning document.

The City recently updated Wastewater Treatment Plant Facility Plan (WWFP) in 2019. This plan evaluates the WWTP through a 20-year horizon and takes into consideration the projected growth identified in the 2019 Comprehensive Plan update. The WWFP also provides a Capital Improvement Plan to accommodate the projected demands associated with the expected increase in population for the City of Pasco and its UGA.

Wastewater Treatment Plant

The City of Pasco operates a wastewater collection and treatment system to manage the domestic wastewater needs of the community. This system operates under a National Pollutant Discharge

Elimination System Waste Discharge Permit issued by Ecology. Currently, the system is served by one activated sludge wastewater treatment plant (WWTP) which oxidizes, nitrifies and disinfects wastewater flow prior to discharging to the Lake Wallula reach of the Columbia River. The plant currently experiences flows of approximately 6 million gallons per day (MDG). The City's existing WWTP has a capacity of 6.5 million gallons per day (mgd) of sewer flow as identified in Table 4.

Table 4. Estimated WWTP Capacity Limit

Parameter	Annual Average
Average Flow	6.0 mgd
BOD	14,960 lbs/day
(Biochemical Oxygen Demand)	276 mg/L
TSS	15,775 lbs/day
(Total Suspended Solids)	291 mg/L

The City owns, maintains and operates a separate industrial wastewater treatment plant (PWRP – Process Water Reuse Facility) that collects, stores and then land applies food processor wastewater to farm circles north of the City as irrigation. The PWRP is an industrial facility that receives the discharge of process water from six food processors in the region. The PWRP is a public/private partnership. The PWRP and associated farm circle properties are located in an area of irrigated agriculture production fields on approximately 1,800 acres north of Pasco and east of Highway 395 in Franklin County. The PWRP is a separate entity from the City's municipal wastewater collection and treatment system and therefore is not included in this evaluation.

Collection System

The City's wastewater collection system contains over 240 miles of sewer pipeline ranging from 8-inch to 36-inch in diameter. The system also includes approximately 4,430 manholes and 10 lift stations. For the most part, the gravity pipelines convey wastewater from the residential and commercial areas and route it to interceptors and large sewer trunks, which drain to the WWTP. Due to the varied topography in the City, several localized and regional lift stations are required to convey sewage to the WWTP. The City's two (2) primary lift stations (Maitland and 9th and Washington) are located just outside the WWTP and convey sewage directly to the WWTP. The Harris Road Sewer Transmission Main, has recently been constructed, which will provide sewer service for portions of the existing and proposed UGA. Figure 6 in Appendix A depicts the existing sanitary sewer collection system in the vicinity of the UGA Study Area.

Potable Water Service

The UGA Study Area is outside of the current water service area of the City of Pasco water system. The City of Pasco completed the update of their Comprehensive Water System Plan (CWSP) in 2019, which has been reviewed and approved by the Washington Department of Health (WDOH). The planning periods outlined in the CWSP are 2022, 2027, and 2036. The CWSP identifies the existing system, expected City growth and projected demands for each planning horizon, as well as, the performance criteria that dictate whether new infrastructure is required.

Source Capacity

The CWSP indicates that the City currently holds surface water rights for 13,269.25 acre-feet of annual withdrawal and 20,149 gpm (29 mgd) of instantaneous withdrawal. The source for these rights is the Columbia River which are to be used for domestic potable purposes. As defined in the CWSP, the City is currently in compliance with water right quantities by borrowing the surplus from the Quad Cities water

right, at a current consumption of 14,424 acre-feet by volume and 18,456 gpm instantaneous. The City also holds individual groundwater rights sourced by various wells for separate irrigation purposes. Water rights held by the City are anticipated to increase in the future pending the following:

- Reassignment of water rights that the City currently holds.
- The outcome of applications for new water rights made to Washington State Department of Ecology (Ecology) in 2011 and 2015.
- Additional water rights available through subsequent distributions of water available under the regional Quad City Water Right (QCWR) permit.
- Additional water rights the City may acquire in the future, these include:
 - Lake Roosevelt Incremental Storage Releases Project
 - 508-14 Water Rights Program

The City's water treatment and storage system includes two surface water treatment plants and three water reservoirs. The following is a list of key system water facilities.

- Butterfield Water Treatment Plant: capacity of 26.8 million gallons per day
- West Pasco Water Treatment Plant: capacity of 6.0 million gallons per day (with the ability to expand to 18.0 mgd)
- Riverview Heights reservoir: 10 million gallons
- Rd 68 reservoir: 2.5 million gallons
- Broadmoor Boulevard reservoir: 1 million gallons

Distribution System

The City's water system inventory consisted of approximately 330 miles of piping ranging from 2-inch to 36-inch in diameter, 6 booster stations, 3 reservoirs, 2 water treatment plants, and 20 pressure reducing valve (PRV) stations. Service is presently provided to customers at a minimum elevation of 340 feet to a maximum elevation of 525 feet. The water system is divided into 3 large pressure zones to serve the range in service area elevations within the Study Area. Currently, there are limited transmission mains within the Study Area. Figure 4 in Appendix A depicts the existing water distribution system near the UGA

Surface and Storm Water Management

Currently, there are no storm water systems within the UGA Study Area. All stormwater runoff generated on the site will need to be retained on-site as required by the City. Each proposed development must safely collect, route and retain stormwater on their site. Stormwater management for the proposed access roads will need to be included in the design and construction of the roadways.

Other Governmental Services

Power

Franklin County Public Utility District (Franklin PUD) provides the majority of the electrical service to the City of Pasco. The Big Bend Electrical Cooperative also provides service to a small portion of northwestern Pasco and the UGA in the vicinity of Broadmoor Boulevard. The Franklin PUD purchases power from the

regional power grid (Bonneville Power Administration) and then distributes through substations and distribution lines to the end users.

The Franklin PUD and Big Bend Electrical Cooperative operate electrical transmission and distribution systems and facilities within public right-of-way and easements all in accordance with state law. Electrical power needs in the Pasco UGA area are generally served by 10 miles of 115kV transmission lines, 7 substations and 45 electric feeder lines. Each feeder supplies the needs of a number of defined geographic areas within the community, often referred to as sub-regions. The feeders are the basic planning component within the Franklin PUD system. Each feeder supplies the needs of approximately 850 houses.

Natural Gas

Cascade Natural Gas corporation provides gas service to the Pasco UGA. Cascade obtains its gas from the Williams interstate line through two reduction and gate stations within the Pasco UGA. The original gate station is located at the northwest corner of Court Street and Road 76. To serve the needs of an expanding community a seconded gate station was constructed in 1995 east of the Soccer complex and south of Burden Boulevard. From these two stations natural gas is conveyed through the Pasco UGA in a distribution system of smaller lines and regulators. Cascade supplies natural gas to 4,600 residential and 1,022 commercial customers in Pasco. Some of the less densely developed areas of West Pasco do not have gas service.

Natural gas consumption is directly related to both local and regional land use development. As local and regional development increases the demand for natural gas also increases. Based on current trends and projected population growth Cascade Natural Gas projects the system can be expanded to meet community growth needs. Future extensions of the natural gas distribution system will occur on an as-needed basis as development warrants.

Telecommunications

Telecommunications include conventional telephone, cellular phone, and cable television. Interstate and international telecommunication activities are regulated by the federal communications Commission (FCC), an independent Federal Government agency.

Changes in technology are having a major impact on telecommunications. Much of these technologies are merging with much less distinction between data, video, and voice technologies. Some of these utilities are regulated by the Washington State Utilities and Transportation Commission to meet a specific level of service to their service areas.

Conventional Telephone:

Telephone service to Pasco is provided by Qwest Communications International, Inc (Qwest). Qwest facilities within the Pasco UGA include a switching station, trunk lines and distribution lines. The switching station is located in a building at the corner of 5th Avenue and West Lewis Street. Four main feeder cable routes extended out from the switching station. Connected to these main feeders routes are branch feeder lines. The branch feeders connect with thousands of local loops that provide dial tone to every subscriber. These facilities may be aerial, or buried, copper or fiber optic. Local loops can be used for voice or data transmission.

While Qwest is involved with its own planning efforts much of the system necessary to accommodate future growth will be constructed on an as needed basis.

Cellular Telephone:

Cellular telephone service is provided by broadcasting and receiving radio signals to and from cellular facilities and cellular phone handsets. Cellular telephone service is licensed by the FCC for operation in Metropolitan Services Areas (MSAs) and Rural Service Areas (RSAs). The FCC grants several licenses within each service area. Current licensed cellular service providers for the Pasco area include Verizon, Sprint, Cingular, T-Mobile, Qwest and Nextel.

A number of cellular base stations and antennas are located within the Pasco UGA. These base stations connect cellular phones to the regional network. Cellular antennas must be placed at a height that allows them to broadcast throughout their local area. In Pasco the antennas are located on the Housing Authority high rise apartment, on the city water tanks, on the Sacajawea Apartments building, on school, college and County property and on freestanding communication towers.

Expansion of cellular facilities is demand driven. Raising the density of transmission/reception equipment to accommodate additional subscribers follows, rather than proceeds, increase in local system load. Cellular companies therefore maintain a short response time and a tight planning horizon.

Internet Providers:

There are over a dozen internet service providers in the Pasco area. These internet companies provide a variety of data networking options for business and personal use. These services include standard dial up service, DSL, broadband, business voice services, web hosting, secure data centers, inter-office networks and high capacity data transport.

Irrigation

Irrigation within the City of Pasco is currently provided by The Franklin County Irrigation District and the City of Pasco. The Franklin County Irrigation District No.1 (FCID) provides irrigation water to almost 7 square miles of land within the existing Pasco UGA. Most of the properties within the FCID are located west of Highway 395 and south of the FCID canal. Some properties located between Highway 395 and 22nd Avenue also receive irrigation water from the FCID.

The City owns and operates a non-potable water utility that provides irrigation water to residential customers and a limited number of commercial customers in the northwest part of the City. The irrigation system serves approximately 6,890 residential accounts and 39 commercial and public facility accounts. Providing a system for irrigation water separate from the drinking water utility allows the City's customers to avoid using treated drinking water to irrigate.

The proposed UGA will also be located with the service area of the South Columbia Basin Irrigation District (SCID). The SCID operates and maintains many of the facilities used to deliver irrigation water to landowners within Franklin County, and have the statutory authority to make decisions on development, water delivery, payment for and distribution of new water supplies as available.

Fire Protection and Suppression

Pasco Fire Department (PFD) provides fire suppression, advanced life support emergency medical services and ambulance transport services, technical rescue services, and hazardous materials services (through a regional partnership) to its service area community. The Pasco Fire department, through a contract with the Port of Pasco, also provides Aircraft Rescue and Firefighting services to the Pasco airport. The City of Pasco has four fully staffed fire stations—Stations 81, 82, 83 and 84. Station 81 is located on Oregon Avenue. Station 82 is located at the Tri-Cities Airport, Station 83 is on Road 68 north of Argent Road and Station 84 is located at the intersection of Road 48 and West Octave Street. These stations are manned

staffed by full-time emergency medical personnel, and firefighters. The closest stations that serves the proposed UGA expansion within the city limits of Pasco, are Station 82 and 83.

The City cooperates with the Franklin County Fire Protection District No. 3 which is a Combination Career/volunteer-supported fire protection service. The District has one fire station in the Riverview area providing service to the unincorporated islands within west Pasco. The Fire District also maintains a fire station near the corner of Clark Road and Road 36. This Station can respond to emergencies inside the UGA.

The UGA is served by a total of six fire stations—four within the city limits and two in the County. However, the Tri-Cities community relies heavily on an extensive Automatic Aid agreement. The agreement defines the “full effective response” for Residential fires as 16 to 18 firefighters and Commercial fire responses as 24-26 firefighters. In most cases none of the agencies can supply that force with their own on duty staff.

The determining factor in adding additional fire stations will be the ability of the fire department to meet council established travel times. Developing areas outside the 6-minute travel time will impact the ability to provide service throughout the City. Multiple simultaneous events within the same stations service area drives the need to add additional staffing at existing stations or add additional stations as well as impacting travel times as units from stations further away must cover the 2nd or 3rd incident.

Law Enforcement

Law enforcement services for the City are provided by the City Police Department, located at 215 W Sylvester St, Pasco, WA. Unincorporated areas of the UGA are served by the County Sheriff. The City and County law enforcement agencies cooperate readily when the need arises. Pasco currently has 1.03 patrol officers per 1,000 people (2020 Comprehensive Plan).

The Pasco Police Department provides service to the community through two divisions. The Field Operations Division responds to citizen complaints, handles traffic enforcement, accident investigations, reporting and is primarily responsible for maintaining public order. The Support Operations Division includes the investigative services detectives, street crimes unit, Task Force detectives, Area and School Resource Officers and the Records Division. The primary function of Support Operations consists of investigating serious criminal offenses, internal affairs investigations, record management and department wide training.

The City is divided into four patrol districts with a mini-station located in each district. Police mini-stations are in Chiawana Park, Kurtzman Park, Central Business District and Alderwood Square. The new police department community services building completed construction in early 2017 as is located on Sylvester Street directly east of Pasco City Hall.

Libraries

Pasco has two libraries, located at 1320 West Hopkins Street and 7525 Wrigley Drive and operated as branches of the Mid-Columbia Library District. The Mid-Columbia Library District has 12 branch libraries and serves nearly 241,000 people within Benton and Franklin and Adams Counties. It is governed by a seven-member Board of Trustees appointed by the Benton and Franklin County Commissioners.

Parks and Recreation

The City of Pasco owns and maintains 34 Parks / Facility Type recreation areas. There are a variety of different types of parks: Neighborhood Parks (105 acres), Community Parks (70.77 acres), Large Urban

parks (127.00 acres), Regional Parks (284 acres), Linear Parks (25 acres) and Special Use Areas (277.68 acres).

- Neighborhood parks include playgrounds and parks designed primarily for non-supervised, non-organized recreation activities. Neighborhood parks are generally small (3-7 acres) and serve a radius of approximately one-half mile.
- Community parks are typically designed for organized activities and sports, although individual and family activities are encouraged. Community parks can also provide indoor facilities to meet a wider range of recreation needs. Community parks can double as a neighborhood park, although they serve a much larger area. The service area of a community park is about a one-mile radius.
- Large urban parks, like Chiawana Park, are designed to serve the entire community. They are similar to a community park but much larger. They provide a wide variety of specialized facilities such as large picnic areas, water related activities, indoor recreation facilities and sports fields. They require more support facilities such as parking, restrooms and play areas. Large urban parks usually exceed 50 acres in size.
- Regional parks are large recreational areas that serve the entire city or region. These parks can be very large and often include one specific use or feature. Sacajawea State Park is the only regional park in Pasco. Columbia Park in Kennewick, Howard Amon Park in Richland, and Hood Park in Walla Walla County are examples of other regional parks in the Tri-City region. These parks offer riverfront and boating facilities as well as passive recreation opportunities and are within a short travel time for Pasco residents.
- Linear Parks are land areas that generally follow a drainage corridor, ravine or some other elongated feature such as a power line or railroad right-of-way. This type of park often contains various levels of a trail system and sometimes includes greenbelts.
- Special use areas include miscellaneous sites that do not fit into any other category of park designation. These areas include specialized single purpose fields, sports complexes and land occupied by major recreation structures (Pasco 2020 Comp. Plan – Chapter 9).

Schools

The Pasco School District currently owns and operates 22 schools; 1 K-12 online school, 15 elementary schools, 3 middle schools and 4 high schools (Pasco School District #1, 2018-2019 District Overview). The combination of these 22 schools, as of October 1, 2017, enrolled 18,082 students. This far exceeds the permanent capacity to serve 13,340 students in their schools. There are 226 portable classrooms throughout the District providing additional capacity to house 4,132 students (Pasco School District 2016 CFP Update).

Two new elementary schools, providing additional capacity for 1,240 elementary students, will be constructed by 2023. In addition, a new middle school #4 and an expansion of Stevens Middle School in 2023 will increase capacity by 795.

The district is currently Building a new elementary and middle school near the urban growth area expansion area . The district currently owns nine unimproved parcels, totaling approximately 146 acres. Two sites are being used for the new elementary and middle school from the 2017 bond, bringing the District's total available unimproved property to 82 acres. The District plans to acquire additional property for future schools (Pasco School District 2016 CFP Update). The closest high school is Chiawana.

FACILITY REQUIREMENTS

This section of the UGA Capital Facilities Analysis presents capital improvement projects required by the City of Pasco, to meet and maintain the level of service standards discussed earlier, based on the land use projections outlined. As identified earlier, the purpose of this analysis is to identify whether the City of Pasco has the capacity to provide Category 1 services to the proposed UGA expansion area and to identify the financial commitment required by the City to provide these services within six (6) years. As a result, the Category 2 are identified, but concurrency is not required. Category 3 services provided by other agencies were not analyzed.

Because the Pasco UGA Expansion Area is under private ownership, a substantial portion of the capital facilities required for growth will be provided by the private sector through the City's standard permitting process. This includes local access streets, internal sewer, water and utility distribution systems and connections. Future developer(s) will also be required to provide contributions toward the construction of public facilities on a "fair share" basis.

Transportation

Six-Year With UGA Expansion

The proposed UGA Expansion Area consists of approximately 3,400 acres, primarily to the north and west of the Tri-Cities Airport. 726 of these acres are proposed for industrial purposes along the west side of the US 395 corridor. This industrial area is not anticipated to be needed in the next 6-years and thus no evaluation has been performed in that portion of the City.

As discussed above, the Road 68 and Road 100 corridors are anticipated to provide primary access to the proposed Urban Growth Area. In order to evaluate 6-year traffic conditions with the proposed expansion a review of available data and information was performed. It was determined that the study entitled "City of Pasco Feasibility Traffic Study for Interchanges" (Feasibility Study), completed in 2017 provided the best information for forecasting traffic 6-year traffic volumes.

As a tool in preparing the Regional Transportation Plan, the Benton Franklin Council of Governments (BFCOG) maintains a set of regional computerized transportation models. The model is developed using current traffic data and land uses in the region using Transportation Analysis Zones (TAZs) that are defined with various attributes describing the number and type of households and employees as well as other land uses within each zone. The model is calibrated for existing conditions using Federal Highway Administration procedures and methods. Once calibrated, changes in assumptions for future land uses and roadway networks can be made to determine the potential impacts of developments and/or roadway scenarios. Land use assumptions representing future conditions are developed to determine various impacts on the roadway network at a regional level.

The Feasibility Study relied on the year 2030 model created by the BFCOG. The project team worked with the City, BFCOG and the Washington State Department of Transportation (WSDOT) to develop a methodology to update the model's design year from 2030 to 2040. One of the major assumptions incorporated into the year 2040 model was an increase in population to 126,000, which is slightly higher than the projected population being used for the year 2038 in the current City of Pasco Comprehensive Plan Update prepared in 2018. The model also assumed that in order to accommodate this significant increase in population (more than 40% higher than the population in the 2030 model), that it was reasonable to assume that growth would occur outside the existing UGA. It was determined through the course of that study that only approximately 102,000 people could be accommodated within the existing UGA and more than 20,000 people would need to be in an expanded UGA.

These assumptions fit the purposes of this current UGA capital facilities analysis quite well. To prepare a 6-year forecast, the 2040 forecasted volumes prepared for the Feasibility Study were reviewed and the growth between existing volumes and year 2040 volumes was interpolated. The resulting traffic volumes are shown in Figure 3.

It is worth mentioning that although a straight-line interpolation between the 2015 and 2040 traffic volumes was used, it is reasonable to expect that much of the growth within the next six years will occur within the existing city limits and within other areas currently inside the UGA such as the county islands south of I-182. As such, the forecasted traffic volumes shown in Figure 3 are considered to be conservatively high.

Using the 6-year traffic volumes shown in Figure 3, capacity analysis was performed using the existing intersection geometry to determine any mitigation that would need to be implemented in order to provide acceptable Levels of Service in the two primary study corridors in the short-range analysis. For the purposes of this analysis it was assumed that Harris Road west of Road 100 would be realigned to connect to Road 100 opposite the existing Sandifur Parkway intersection. This improvement will help both intersections function better, as well as provide improved operation at the I-182 westbound ramps because of increased storage for the two southbound through lanes.

In traffic operations analysis, and in fact in on-the-ground implementation, there can be many goals: sometimes it is most important to maximize through-put of a particular roadway, sometimes it is desirable to minimize total delay at an intersection, other times it may be important to distribute delay evenly around an intersection. At unsignalized intersections there is less opportunity to achieve these various goals since traffic laws govern who has the right-of-way at an intersection and minor street traffic must wait for gaps in traffic on the major street. At signalized intersections, timing of the traffic signal can dictate which movements have priority and how much green time each lane group is allotted during the signal cycle, within the constraints of the lane configurations available. Coordination of traffic signals through a corridor can also facilitate the reduction of delay at intersections, allowing for platooning of vehicles departing one intersection to arrive at the next signalized intersection while the traffic signal is green. For the purposes of this study the goal was to provide overall intersection delay that meets Level of Service standards of “D”, with no approach to a signalized intersection falling below LOS “E”. It is important to note that in order to achieve these purposes some increased delay may be experienced for the major street through movements in order to provide additional green time for side street movements or for left turns. The results of the analysis are included in Appendix B and shown in Table 5.

Table 5. Summary of 6-Year Forecast PM Peak Hour Delay (sec) and Level of Service

Intersection	PM Peak Hour	
	Overall	Worst
	Intersection	Approach
Road 100/I-182 EB Ramps	41.1/D	NB—44.4/D
Road 100/I-182 WB Ramps	9.5/A	WB38.2/D
Road 100/Sandifur Parkway	30.6/C	EB—37.0/D
Road 100/Burns Road	*	WB—37.7/E
	*(1)	WB—34.8/D
Road 68/I-182 EB Ramps	18.2/B	NB—23.0/C
Road 68/I-182 WB Ramps	8.5/A	SB—9.0/A
Road 68/Burden Boulevard	51.5/D	WB—65.1/E
Road 68/Wrigley Drive	14.4/B	EB—29.8/C
Road 68/Sandifur Parkway	20.4/C	SB—23.9/C
Road 68/Burns Road	*	WB—27.6/D
	*(2)	WB—27.0/D

LEGEND

13.6/B Delay and Level of Service using existing lane configurations

* Uncontrolled Movements (major street through) not provided for overall intersection Analysis for Two-way Stop Controlled Intersections

NB = northbound, SB = southbound, WB = westbound, EB = eastbound

Notes:

- (1) Assumes an exclusive NB right turn lane.
- (2) Assumes exclusive NB and SB exclusive left turn lanes.

As shown in Table 5, with minor improvements at existing unsignalized intersections, and with signal timing modifications at signalized intersection, all intersections on the two primary corridors can provide acceptable Levels of Service for the forecasted volumes. At the unsignalized intersection of Road 100/Burns Road poor LOS for the westbound approach can be improved by providing a northbound right turn lane. This will aid westbound vehicles to recognize gaps in the north-south flow of traffic enough to improve the LOS to an acceptable level. At the unsignalized intersection of Road 68/Burns Road it is recommended that exclusive northbound and southbound left turn lanes be provided.

Although the delay/LOS do not reflect unacceptable levels the 45 MPH speed of the facility creates an unsafe situation for turning vehicles. The WSDOT Design Manual provides guidance for left turn lanes through Exhibit 1310-7a shown below for the Road 68/Burns Road 6-year traffic volumes (Figure 4). The cost of each of these improvements is in the range of \$200,000 to \$300,000.

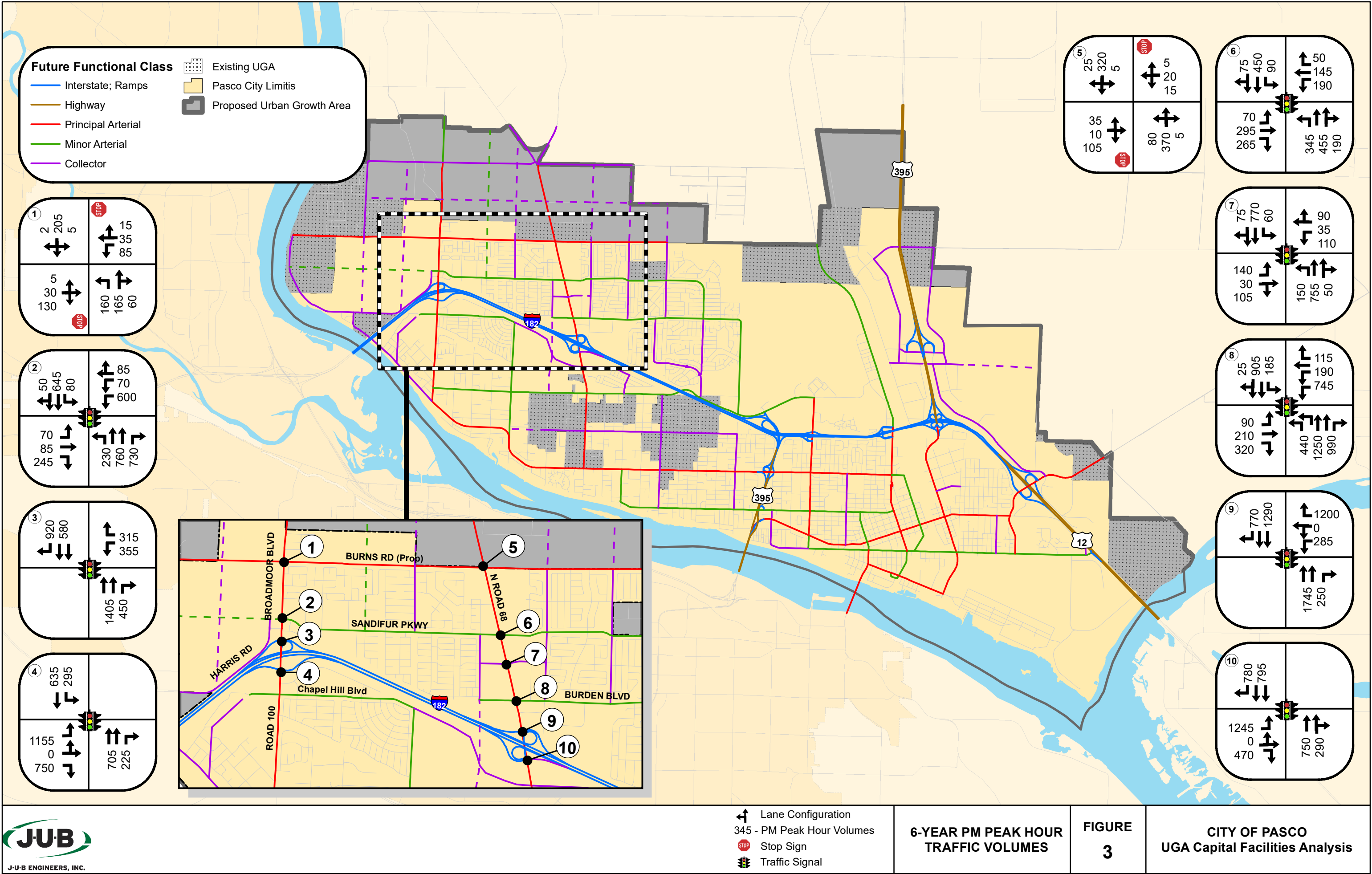
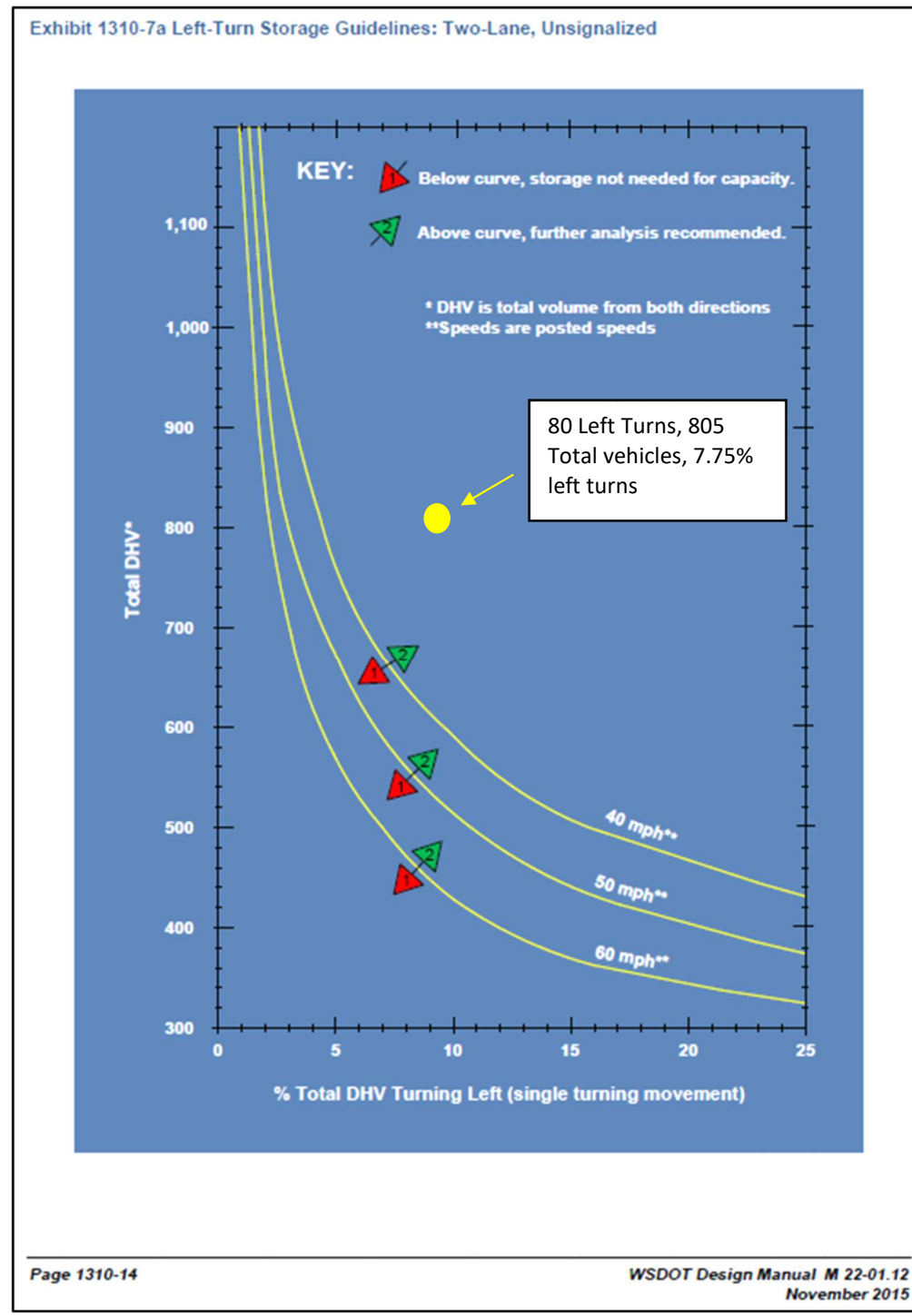


Figure 4. WSDOT Left-Turn Storage Guidelines



2038 With UGA Expansion

For the 20-year traffic analysis general roadway capacity was examined to determine what potential large capacity capital projects might be anticipated. It is inherent in this analysis that intersection improvements will need to occur over time, but specific improvements for the 20-year period at the intersection level are difficult to determine for such a long-range forecast with so many variables. It is clear that the intersections of Road 100/Burns Road and Road 68/Burns Road will need to be signalized.

More detailed evaluation will be required in the future, when specific site proposals are presented, to better understand future traffic patterns and impacts of proposed developments on the existing roadway network. However, it is anticipated that Road 100 and Road 68 will need to be widened from I-182 north to Sandifur Parkway to 6 lanes, and north of Sandifur Parkway will need to be at least 4 lanes with turn lanes at intersections.

A roadway network to serve current undeveloped areas will also need to be built to serve that development and will be constructed by development that will occur in the expanded UGA.

The Feasibility Study referenced earlier was the beginning of the process that the City of Pasco has initiated with both the WSDOT and the Federal Highway Administration to identify appropriate improvements in the I-182 corridor as well. It is clear that for the 20-year horizon that additional studies will need to be pursued and that agreements made regarding appropriate improvements.

Sanitary Sewer Service

Sanitary sewer service will be provided by the City of Pasco. The following section describe the projected flows and necessary expansion of the sanitary sewer system to serve the UGA Study Area for both the 6-year and the 20-year planning periods. It should be noted that as a result of the anticipated growth, UGA expansion, and land use changes, the City conducted an Expanded UGA Infrastructure Evaluation in 2019. The purpose of this analysis is to provide additional modeling of the sewer system to identify what additional improvements are needed to accommodate the future growth.. The results of this evaluation are summarized below and included in Appendix A.

Estimated Sewer Flows

For the purposes of this analysis, the study area was divided into sewer basins based on contour information which would provide gravity flow service. The population of each basin was divided up based on the land use and respective densities. As a result, the seven basins within the Study Area are projected to serve a residential population of approximately 41,648 people. The expanded industrial area will only include municipal flows representative of typical employee lunch/restroom facilities, which aligns with what was included in the 2014 CSP model. The resulting total average dry weather flow is 2,450 gpm, with a peak wet weather flow of 7,675 gpm.

Sewer Design Standards

The sewer design standards used as part of the evaluation were consistent with the City's level of service and design criteria defined within the 2014 CSP. These design standards have been adopted as the standards that the City will use to evaluate and approve future development proposals within the Study Area. A summary of the Sewer Design Standards is identified in Appendix A, Table 8.

Capacity Analysis

The expanded UGA infrastructure analysis evaluated the infrastructure capacity required to serve the project 20-year (2038) flows from the study area. The results were compared with the 2014 CSP to identify where additional capital facilities or potential upsizing may be required to account for the additional growth.

For this analysis it was assumed that the entire Study Area will flow to the new Harris Road Sewer Transmission Main and be conveyed to the Pasco WWTP through a new trunkline parallel to the existing West Pasco Trunk. The sewer system was evaluated to meet future 20-year (2038) loading conditions by analyzing the capacity of the infrastructure recommended from previous analyses based on the defined design standards. The following is a summary of the required improvements to convey flow from the Study Area through the existing service area to the WWTP.

Treatment Capacity

The City finalized the WWFP for the WWTP with a 20-year horizon. A population growth rate of 3 percent per year was selected by the City for planning purposes for the WWFP, which results in a 2035 population of 126,137, which is 4,309 more than the anticipated 2038 population projections as noted earlier. This WWFP includes recommended modifications to the City's WWTP for the next 20 years that are found to be cost-effective solutions to both the City's near and long-term needs. The preferred improvements defined in the WWTP Capital Improvement Program have been prioritized and spread out over the next 20 years. No change in the WWTP CIP outlined in the WWFP is required to accommodate the flows from the projected population growth for the Study Area.

Lift Station Capacity

Three new lift stations have been identified within the Study Area based on topography. Additional localized lift stations may be required based on timing and location of development. A new parallel lift station to the 9th & Washington Lift Station is also assumed and sized to convey flows from the new parallel trunkline to the WWTP for the Study Area 2038 peak flows. The proposed lift stations and their required peak pumping capacity are presented in Table 9 and depicted on Figure 6 of Appendix A. New force mains to convey the lift station flows are also identified.

Outside of the Study Area, the 2014 CSP identified that two additional lift stations are required to provide sewer service to the Riverview Area, the Road 84 & Roberts Drive Lift Station and Road 52 & Pearl Street Lift Station. These two projects are identified in the City's current CIP and it has been identified that the future land use for this area will remain relatively unchanged. As a result, no update is included as part of this infrastructure evaluation and these two lift stations were not evaluated further.

Collection System

The natural ground topography of the UGA Study Area creates one singular sanitary sewer service area to the southwest. A strategy for providing gravity sanitary sewer service to this UGA Study Area was included in the 2017 Northwest Service Area Evaluation. The trunk sewers identified in this system was updated based on the proposed Major Street Plan identified earlier. The trunk sewers were added to the collection system model developed during the 2014 CSP update and evaluated. The anticipated flows were allocated, and pipe sizing was determined as depicted on Figure 6 of Appendix A, to meet the design criteria requirements. The trunk sewer diameters were sized to convey 2038 flow projections for the basins identified in the Study Area.

The evaluations completed after the 2014 CSP identified future capacity limitations in the existing West Pasco Trunk sewer pipeline alignment, which is the logical route for discharge from the Study Area. The capacity deficiencies along this line are expected to increase with increased population and service area. As a result, the existing West Pasco Trunk sewer pipeline is anticipated to have limited or no capacity to serve the Study Area. In order to provide additional capacity, a new trunk sewer pipeline parallel to and with similar slopes of the West Pasco Trunk sewer pipeline will be needed. This new trunk sewer pipeline will range from 30-42 inches in size.

The infrastructure evaluation also identified that an alternative conveyance route and lift stations could be evaluated as specific development plans and projects are proposed and designed. Additionally, it is recommended that the City complete an update to its CSP to provide a comprehensive review of the sewer collection system capacity to assess further alternatives to serve growth areas within the City's existing limits as well as the proposed UGA.

Potable Water Service

Potable water service will be provided by the City of Pasco. The City completed the update of their Comprehensive Water System Plan (CWSP) in early 2019. . The planning period for this CWSP is 2022, 2027, and 2036, and identifies the existing system, the expected growth, the projected demands in each planning horizon. The CWSP projected a 2036 population of 112,200 which is 9,628 people less than the anticipated 2038 population projection of 121,828 people as noted earlier. As a result, the CWSP includes a majority of the future demands and new water infrastructure required to serve the identified 2038 population projections. There are some further recommendations from the 2019 Expanded UGA Infrastructure Evaluation based on the additional 9,628 people in the 2038 population projections as well as the UGA expansion.

The following sections is a summary of the proposed water demands and necessary expansion of the potable water system to serve City for the 20-year planning period.

Estimated Water Demands

The analysis of the Study Area began with the identification of individual pressure zone demands. The water system pressure zone boundaries were created and updated from the 2019 CWSP based on available contour data. The population within the Study Area was then divided up into pressure zones based on land use and respective densities.

Water supply projections were created based on the existing supply per capita per year factor as stated in the CWSP. As a result, the Study Area is estimated to have a total average day demand (ADD) of 5,148 gpm and maximum day demand (MDD) of 10,861 gpm. An additional 3.1 million gallons per day (2,152 gpm) demand is allocated to the north central location of the City's current industrial area in Zone 3 for an anticipated future industrial demand.

Water Design Standards

For the purposes of this analysis, the City's level of service and design criteria defined within the 2019 CWSP were used. These design standards have been adopted as the standards that the City will use to evaluate and approve future development proposals within the Study Area.

Capacity Analysis

The 2019 Expanded UGA Infrastructure Evaluation reviewed the capacity of the existing water system to meet the updated 20-year (2018) demands to determine what improvements are needed to serve the Study Area. The proposed projects were compared with the projects identified in the CWSP to determine potential overlap. For the purpose of the 2019 analysis, the existing hydraulic model from the SWSP was used to evaluate existing infrastructure. Demand was only updated in the Study Area.

The capacity analysis evaluated the future demand conditions of the supply, storage, and pumping system components. The following is a summary of the evaluation required to assess the capacity of each component of the water system.

Supply

Currently, there are two WTPs in the City's water system; Butterfield WTP (26.8 mgd) and West Pasco WTP (6.0 mgd), for a total existing supply of 32.8 mgd. The existing sources combined total capacity is not adequate to serve 2038 projected MDD demands of 45.8 mgd, and results in a total deficiency of 13.0 mgd. The current CWSP has identified two planned West Pasco WTP projects that will expand reliable capacity from 6.0 mgd to 18.0 mgd bringing the total system reliable capacity to 44.8 mgd, which is still deficient by just under 1.0 mgd to meet the 2038 demands. As a result, the City will need to increase source capacity in the future.

The City is planning to complete a Water Treatment Facility Plan (WFP) for the Butterfield WTP, which was also recommended in the 2019 CWSP. The WFP will evaluate the overall plant and determine necessary improvements to increase the reliable capacity of the plant to meet 2038 demands.

Pumping Capacity

The existing pump capacity was evaluated. As a result, the analysis identified that there is adequate pumping capacity within the system to serve future demands in the Study Area. The East Side Pump Station shows a negative surplus, but with surplus capacity in Zone 3, the PRV stations at Foster Wells/Capital, Hillsboro, and Road 36 can provide the additional required supply under a condition with the large pump offline at the East Side Booster Pump Station. No addition pumping capacity is needed to serve the Study Area.

Distribution System

The 2019 CWSP identified major transmission piping to serve the Study Area. The alignment of that piping was modified to match the proposed Major Street Plan for the Comprehensive Plan update. Additional transmission pipes were also added to the Study Area as required to provide a "backbone" pipe network. The proposed transmission piping to serve the Study Area was added to the current hydraulic model, along with the proposed facility improvements identified in the supply, storage, and pumping capacity evaluations.

Demands based on the 2038 population projections were allocated to the proposed transmission piping. The updated hydraulic model was used to determine the size for the transmission pipe to provide adequate service pressures, velocities and fire flows. As a result, three new pipe projects are required in addition to the projects previously identified in the CWSP.

Storage Capacity

The CWSP storage analysis evaluation was updated to include the additional population served in the Study Area. The total storage deficiency increased by 0.7 million gallons (MG) from the CWSP. The CWSP identified that two new storage reservoirs are needed to meet future demands, one located in the East Pasco Industrial Area, which will serve Zone 2 with a capacity of 5.75 MG and one located within the Study Area, which will serve Zone 3 with a capacity of 3.5 MG. As a result of the analysis, it was confirmed that two storage tanks are still required, but the storage capacity in Zone 3 will need to increase to 5.75 MG to meet the new future storage requirements and the storage in Zone 2 can decrease to 4 MG, based on the assumed demand condition that future large industrial development occurs in Zone 3. Additionally, constructing a large reservoir in Zone 3 provides the City more flexibility if large industrial demands also occur in Zone 2, with the ability to provide excess storage from Zone 3 to Zone 2 through the PRV stations at Foster Wells/Capital, Hillsboro, and Road 36.

Irrigation

The City is currently in the process of studying how irrigation service will be provided to the proposed UGA Area.

Fire Protection & Law Enforcement

As development occurs within the City and portions of the UGA are annexed, the need for Police and Fire services will also need to be expanded. The increased service demands and costs will be offset by added revenues associated with development. Development into the far northwest portions of the UGA will also bring with it a need for additional fire stations and Police Mini-Stations along with new police patrol districts and mini-stations.

The 2016 Pasco Emergency Services Master Plan, proposes a reconfiguration of stations and an extended service area. This will be completed by the end of 2021. Property for an additional station has been purchased at 3624 Road 100. Additional station locations need to be determined in the Northwest area of the City and in the industrial area off the Kartchner interchange.

Parks and Recreation

To meet the population growth, the City of Pasco has planned Parks and Facilities, totaling 112 acres. Within the city limits the following parks will be built: street sports complex, RD 48 Fire Station park, Chapel Hill Boulevard, and RD 84/Pasco School District. The UGA will need have multiple parks, totaling 37-40 acres of land (Pasco 2020 Comp. Plan – Chapter 9).

The Parks, Recreation and Forestry Plan is scheduled to be updated in 2021 to address current and future parks and recreational need. The adopted standards (level of service) do not take into consideration the benefit school playgrounds provide in fulfilling park and open space needs. Depending on where various types of parks are located there could be an overlap in use that is also not reflected in the standards. A community park could also fulfill neighborhood park needs for residential subdivision adjacent to community parks. Likewise, a large urban park may double as a community park limiting the need for acquiring additional park lands.

When the Parks, Recreation and Forestry Plan is updated in 2021 additional refinement of the standards should be considered. As well as incorporate the Proposed UGA area.

Libraries

The library system is managed by the Mid-Columbia libraries, as development continues to occur the City should coordinate with the library system to assure that future growth of the library is planned and provided.

Schools

Based on a total projected future enrollment in the Pasco School District of 21,170 students in grades K-12, the District must add permanent and temporary capacity at the elementary and secondary levels to serve the growth (Pasco School District 2016 CFP Update). The District expects the new capacity projects, including two new elementary schools, a new middle school, expansion and replacement of Stevens Middle School, safety and health improvements at various schools, and improvements to the District's transportation and maintenance facilities, will be completed no later than the 2023-2024 school year.

The City should continue to work with the School District as development occurs in the UGA to assure the locations of the future school sites are planned for.

FUNDING SOURCES

This section discusses many of the existing and potential revenue sources, debt capacity and options for using debt financing by the City of Pasco to fund needed capital improvements related to growth.

The City of Pasco uses several different financing sources to pay for capital projects. Typically, large capital projects are financed through long-term bonded debt and grants and loans. For the purposes of this CFP, it is assumed that the cost of capital improvements will be funded by a variety of funding sources which range from the City of Pasco, late comer agreements and grants and loans.

The following discusses the various revenue sources available to the City of Pasco. Not all of these sources are currently being used by the City to fund capital improvements. Those that are being currently used are identified.

Taxes

Property Taxes

RCW 84.52 authorizes this tax on the assessed valuation of real and personal property, subject to two limitations: Initiative 747 limits growth of regular property taxes to 1% of the highest amount levied in the previous year, before adjustments for new construction and annexations; and, The State Constitution limits the total regular property taxes to 1% of assessed valuation or \$10.00 per \$1,000 of value (if the taxes of all districts exceed this amount, each is proportionately reduced until the total is at or below the 1% limit).

Voters may approve excess property tax levies over the constitutional and statutory limits for a number of years to pay off general obligation bonds for construction, or a single year levy (two years for school districts) for general operating purposes. The constitution requires 40% voter turnout in the previous general election and a 60% favorable majority vote (RCW 41 and 84).

RCW 85.55 allows cities that are levying property taxes at a rate lower than the statutory maximum, to lift the levy lid by more than 1%. A simple majority vote is required. The purpose for which the money will be used does not need to be specified. Cities that are levying at their statutory maximum rate can raise their rate for one year. This is called an Operations and Maintenance Levy and also requires 40% voter turnout in the previous general election and a 60% favorable majority vote. The purpose for which the money will be used does not need to be specified.

Retail Sales and Use Tax

There is levied a total of 8.6% on all retail sales, except for off-premise food and drugs. The allocation of the 8.6% is as follows:

- State - 6.5%
- County - 1.5%
- City - 0.60%

The City does not need to designate how their portion of the sales taxes will be spent.

Real Estate Excise Taxes

The state authorizes a tax of 1.28% on the sale of all real estate. RCW 82.46 authorizes cities, planning under the GMA, to assess an additional tax on real estate sales of .25%. These funds must be spent on capital projects listed in the capital facilities plan. A second .25% may also be levied to help defray the costs of development and rehabilitation. The City levies both .25% taxes for use in funding capital projects.

Lodging Excise Taxes

RCW 67.28 authorizes a 2% tax on all charges for lodging furnished for a continuous period of less than one month. This tax is taken as a credit against the 6.5% State sales tax assessed on the lodging charges for the promotion of tourism, acquisition and or operation of tourism related facilities (i.e. specific stadium, convention, performance or visual arts facilities). An additional 2% tax can be levied for a total rate of 4%. The additional 2% levy does not reduce the sales tax rate.

Leasehold Excise Tax

RCW 82.29A authorizes a 12.84% tax on the permanent occupancy of publicly-owned premises for private use for 30 days or more. The tax is a substitute for regular property taxes to compensate for services provided. The tax is sent to the Department of Revenue which keeps 6.84%, with 2% of the remaining 6% going to the County and 4% going to the City. The purpose for which the money will be used does not need to be specified.

Commercial Parking Tax

The Transportation Improvement Act authorizes a tax on commercial parking based on either gross proceeds, the number of parking stalls or on the number of users. Revenues must be spent for general transportation purposes, including highways, public transportation, high capacity transportation, transportation planning, etc. Currently, the City of Pasco does not impose a Commercial Parking Tax.

Business and Occupation Tax

RCW 35.11 authorizes cities to collect this tax on gross or net income of businesses, not to exceed a rate of 0.2 percent. Revenue may be used for capital facility acquisition, construction, maintenance, and operations. Voter approval is required to initiate the tax or increase the tax rate.

Gambling Tax

RCW 9.46 provides for a tax on gambling revenues. Currently the City collects 5% of the gross revenue less the amount paid for prizes for bingo and raffles, 10% of gross receipts for punch boards and pull-tabs, and 10% of gross receipts on all card games. Funding is primarily used for gambling enforcement.

Admission Tax

All cities may levy an admission tax in an amount no greater than five percent of the admission charge, as is authorized by RCW 35.21.280. This tax can be levied on admission charges (including season tickets) to places such as theaters, dance halls, circuses, clubs that have cover charges, observation towers, stadiums, and any other activity where an admission charge is made to enter the facility.

The statute provides exceptions for admission to elementary or secondary school activities and any public facility of a city or county public facility district for which the district has levied an admission tax under RCW 35.57.100 or 36.100.210. A city may, however, impose its own tax on admission to activities at a public facility district, in addition to the tax the district levies, if the revenue is used for the construction, operation, maintenance, repair, replacement, or enhancement of that public facility or to develop, support, operate, or enhance programs in that public facility.¹³⁹ The admission tax must be collected, administered, and audited by the city. Some cities exempt certain events sponsored by nonprofits from the tax. This is not a requirement, however.

At this time the City's admission tax is 2.5 percent which applies to all for profit admission fees within the City.

Local Option Sales Tax

Local government may collect a tax on retail sales of up to 1.1 percent, of which .1 percent can be used only for criminal justice purposes. Imposition of this tax requires voter approval.

Intergovernmental Revenues

Liquor Revenues and Liquor Excise Taxes:

The City receives distributions from the state for liquor related taxes through Liquor Excise Taxes and Liquor Board Profits. 2% of all liquor revenues received must be used for an approved alcohol and drug addiction program under RCW 71.24.555. Initiative 1183 passed November 2011 privatized the distribution and retail sale of liquor effective June 1, 2012.

Liquor Excise Taxes:

In 2012, the state legislature diverted all liquor excise tax revenue to the state general fund for FY2013. For FY2014, \$10 million was permanently diverted to the state general fund, the majority of which comes from the City portion. For the 2013-2015 budget, the state legislature increased the share of liquor taxes collected and remitted under RCW 82.08 that is deposited into the state general fund effectively decreasing the local share to 17.5%. The increased share for the state general fund will end on June 30, 2015, however, the permanent diversion of \$10 million per year will not.

Liquor Board Profits:

The markups on liquor have been replaced as a state revenue source by license fees that are paid to the state by retailers and distributors. A portion of these fees goes to cities, counties and border cities and counties. They are apportioned in a manner that provides that each category of recipients received in the aggregate, no less than it received from the liquor revolving fund during comparable periods prior to December 8, 2011. An additional distribution of \$10 million per year from the spirits license fees must be provided to border areas, counties, cities and towns for the purpose of enhancing public safety programs.

The result is a 0.3% of the total amount distributed to border cities and counties. Of the remaining 97%, 80% goes to cities and 20% to counties. The City must use 20.23% of its distribution for public safety programs.

Motor Vehicle Fuel Tax

The State of Washington provides a state-collected gasoline tax that is shared with cities (RCW 82.36). The base tax in Washington State is 37.5 cents per gallon. Of this amount, the City receives 10.6961% of 23 cents and 8.3333% of 3 cents. These funds are placed in the city street fund and can be used for general anew construction, repair or reconstruction of streets identified in the City's six-year street improvement program and approved by the state. Cities are required to spend 0.42% of gas tax receipts on paths and trails unless the amount is less than \$500.

Local Option Fuel Tax

The Transportation Improvement Act authorizes the County, with voter approval, to levy a local option tax equivalent to 10% of the statewide Motor Vehicle Fuel Tax and a special fuel tax of 2.3 cents per gallon. Revenues are distributed to the County and cities on a weighted per capita basis, i.e. 1.5 County/1.0 City. City of Pasco does not have a local option fuel tax at this time. These revenues must be spent for highway purposes, including construction, maintenance and operation.

Licenses and Permits

The City collects fees for a number of licenses and permits, including Business Licenses, Building Permits and permit fees for zoning plan review and inspections.

Utility Taxes and Franchise Fees

RCW35A.82 authorizes the collection of taxes on the operating revenues of private and public utilities within the City. The City levies taxes on electric, gas, telephone, cable, water, sewer, storm water and garbage utilities operating within the City. The current rate is 8.5 percent.

Charges for Services

Park User Fees and Program Fees

The City charges fees for using park facilities, or for participating in recreational programs.

Sewer User Fees

The state authorizes sewer charges to wastewater generators. Fees may be based on the amount of potable water consumed based on the assumption that there is a correlation between water consumption and wastewater generation or a flat (base) rate only. Commercial customers pay base and consumption rate. Revenue may be used for capital facilities, operations and maintenance.

Water User Fees

State authorized rate charged to each residential and commercial customer, based on the volume of water used. Revenue may be used for capital facilities, operations and maintenance.

Road Impact Fees

ESHB 2929 authorizes impact fees to pay for roads required to serve new development. Impact fees must be used for capital facilities needed for growth, and not to meet current deficiencies and cannot be used for operating expenses. Road impact fees must also be directly related to the impacts created by the development and must be utilized within 5 years or returned.

Fire Protection and Emergency Services Impact Fees

ESHB 2929 authorizes impact fees to pay for fire protection and emergency service facilities required due to new development. These fees are usually collected at the issuance of building permits or certificates of occupancy. Fire and emergency services fees are usually based on a flat rate for dwelling units by type and per square foot for non-residential uses. Adjustments must be made to fee calculations to account for fire and Emergency Services costs that are paid by other sources of revenue. Additional credit can also be given to developers that contribute land, improvements or other assets. These impact fees are in addition to any mitigation or voluntary payments authorized by SEPA, local improvement districts, etc. Impact fees must be used for capital facilities needed for growth, and not to meet current deficiencies, and cannot be used for operating expenses. Fire and emergency services impact fees must also be directly related to the impacts created by the development and must be utilized within 5 years or returned. Currently, City of Pasco does not impose fire protection and emergency services impact fees.

Park and Recreation Impact Fees

ESHB 2929 authorizes impact fees to pay for park and recreation facilities required due to new development. These fees are usually collected at the issuance of building permits or certificates of occupancy. Adjustments must be made to fee calculations to account for park and recreation costs that are paid by other sources of revenue. Additional credit can also be given to developers that contribute

land, improvements or other assets. These impact fees are in addition to any mitigation or voluntary payments authorized by SEPA, local improvement districts, etc. Impact fees must be used for capital facilities needed for growth, and not to meet current deficiencies, and cannot be used for operating expenses.

Bonds

General Obligation/Councilmanic Bonds

There are two types of General Obligation Bonds: Voter approved and Councilmanic. Voter approved bonds are backed by the value of the property within the jurisdiction. They increase the property value rate, with increased tax revenues dedicated to paying the principal and interest on the bonds. Councilmanic Bonds are authorized without voter approval and paid from general tax sources without an increase in tax revenue. The amount of local government debt allowable in the form of general obligation bonds is limited to 7.5 percent of the taxable value of property in the jurisdiction. This is divided so that a jurisdiction cannot use all of its bonding capacity for one type of improvement. The total general obligation bonding capability is divided as follows: 2.5 percent general purpose use; 2.5 percent for utility bonds, and; 2.5 percent open space and park facilities. If the jurisdiction has an approved general purpose bond with unused capacity, as much as 1.5 percent of the 2.5 percent may be used as council manic bonds.

Special Assessment District Bonds

Special assessment districts, such as Local Improvement Districts (LID), Road Improvement Districts (RID) and Utility Local Improvement Districts (ULID), may be formed by the city to finance capital facilities required by other entities (property owners, developers, etc.). These capital facilities are funded through the issuance of special assessment bonds, paid for by the entities benefited. Use of special assessment bonds is restricted to the purpose for which the special assessment district is created.

Grants and Loans

Community Development Block Grants

Department of Community Development grants of up 100% may be available through the Federal Department of Housing and Urban Development for public facilities projects, economic development, housing, etc. which benefit low and moderate income households.

Community Economic Revitalization Board Grants

Department of Trade and Economic Development revenue are available for low interest loans and grants to finance sewer, water, access roads, etc. to facilitate private sector industrial development that supports the trading of goods or services outside of the State, and either creates or maintains jobs.

Public Works Trust Fund Loans

Department of Community Development low interest loan funds are available for capital facilities, emergency planning, and capital improvement planning. Applicants must have a capital facilities plan, must be levying the 1/4% real estate excise tax, and must be in compliance with UGA requirements. Capital improvement planning projects are limited to planning for streets and utilities.

Federal Bridge Replacement Program

Grants (80% Federal/20% Local) issued by the Washington State Department of Transportation (WSDOT) State Aid Division, are available for replacement of structurally deficient or functionally obsolete bridges. The bridge must be on the Washington State Inventory of Bridges.

National Highway System Grants

WSDOT State Aid Division revenue is available for construction and improvement of the National Highway System. The project must be on the Regional Transportation Improvement Program (TIP) list and must be a component of the National Highway System (NHS), including all highways classified as principal arterials. These funds are available on an 86.5% Federal/13.5% Local match, based on the highest ranking projects from the Regional TIP list.

Transportation Improvement Board (TIB) Grants

State Transportation Improvement Board (TIB) grants are available for roadway and sidewalk projects caused by economic development or growth, development activities, and partially funded locally. Grants are funded 80% State/20% Local.

- Urban Arterial Program (UAP) - best suited for roadway projects that improve safety and mobility.
- Urban Sidewalk Program (SP) – Best suited for sidewalk projects that improve safety and connectivity.
- Arterial Preservation Program (APP) – provides funding for overlay of federally classified arterial streets in cities with a assessed valuation less than \$2 billion.

Transportation Partnership Program (TPP)

Transportation Improvement Board grants are available for projects to relieve and prevent traffic congestion. Preference is given to projects that are structurally deficient, congested by traffic, and has geometric deficiencies or accident incidents. Grants are funded 80% State 20% Local.

Surface Transportation Program

WSDOT State Aid Division block grant revenue is available for road construction and maintenance, transit capital projects, bridge projects, transportation planning, research and development, participation in wetland mitigation and wetland banking. Funds are distributed generally at 80% federal/20% local based on the highest ranking projects from Regional Transportation Improvement Program list.

State Parks and Recreation Commission Grants

State Parks and Recreation Commission grants are available for the acquisition of land and capital improvement projects for parks and recreation purposes. Funds come from both State and Federal sources and are granted on a 50% State and 50% Local basis.

Department of Health Grants & Loans

State grants & loans for technical assistance and updating existing water systems, are available for ensuring effective management, and achieving maximum conservation of safe drinking water. Matching requirements for grant vary depending on the program and loan rates for loan programs.

Centennial Clean Water Fund

Department of Ecology grants for the design, acquisition, construction, and improvement of Water Pollution Control facilities (WPC), and related activities, are available to meet state and federal WPC requirements and protect and improve water quality.

Department of Ecology administers low interest loans and loan guarantees. Applicants must show water quality need, have a facility plan, have the ability to repay, and conform to other State and Federal WPC requirements.

Department of Ecology Grants

State of Washington supplies grants for a variety of programs related to solid waste, including Remedial Action Grants to assist with local hazardous waste sites, Moderate Risk/Hazardous Waste Implementation Grants to manage local hazardous waste, and Food and Yard Waste Composting Grants.

Local Revitalization Financing (LRF) program

In the 2009 Legislative Session Senate Bill 2SSB 5045 Chapter 270 was adopted creating the Local Revitalization Financing (LRF) program. The program helps local governments finance public improvement projects that encourage private development within a revitalization area. The LRF program authorizes cities and counties to create “revitalization areas” and allows certain increases in local sales and use tax revenues and local property tax revenues generated from within the revitalization area, additional funds from other local public sources, and a state contribution to be used for payment of bonds issued for financing local public improvements within the revitalization area. The state contribution is provided through a new local sales and use tax that is credited against the state sales and use tax (sometimes referred to as the “LRF tax”). This tax does not increase the combined sales and use tax rates paid by consumers.

The Department of Revenue administers the LRF program. The state provides money to the local government sponsoring the LRF area through a local sales and use tax under RCW 82.14.510 (commonly referred to as the “LRF tax”). This local sales and use tax is credited against the state sales and use tax, so it does not increase the sales and use tax rate for the consumer. Instead, the LRF tax shifts revenue from the state general fund to the sponsoring local government.

The maximum amount allowed statewide for state contributions to LRF is \$4.75 million per state fiscal year. Of this amount, \$2.25 million is allocated for the seven demonstration projects, and \$2.5 million is allocated for the other projects approved on a first-come basis. The maximum amount of state contribution for each demonstration project is specified in the bill and ranges from \$200,000 to \$500,000 per project. The maximum state contribution for each project approved on a first-come basis is \$500,000.

CAPITAL FACILITIES FUNDING

The Growth Management Act requires that funding for capital facilities be reasonably available to meet the projected growth at the adopted level of service for at least a 6-year period. This section discusses the funding for those public facilities for which additional capital improvements will be required over the next 6 years and 20 years.

Funding for capital facilities, projected growth rates and desired LOS need to be in balance. This balancing effort has been achieved for the UGA with the assistance of City staff and technical consultants.

Projected Capital Facility Cost

Table 6 below summarizes the total public capital facilities costs to serve the UGA Expansion Area for the period 2018 to 2024. These costs are based on the information provided in the previous Section, Facility Requirements, and were calculated based on 2019 construction costs. A portion of these costs may be shared between the City and Future developers. Potential funding sources have been included for reference. Additional projects required to meet the 20 year buildout of the UGA are identified in the 2019 City of Pasco Comprehensive plan.

Table 6. Estimated Capital Facilities Costs 2019-2025

Street and Roads	Timeframe	Funding Sources	Total Cost (\$)
Road 100/Burns Road -northbound right turn lane	-	Arterial Street Fund, I-182 Corridor Impact Fund, Developer	\$250,000
Road 68/Burns Road - northbound and southbound left turn lanes	-	Arterial Street Fund, I-182 Corridor Impact Fund, Developer	\$250,000
TOTAL STREETS AND ROADS			\$500,000

Sanitary Sewer	Timeframe	Funding Sources	Total Cost (\$)
Waste Water Treatment Plant (WWTP) Improvements - Phase 1	2020-2022	Unsecured Revenue Bond Utility Expansion Fees 2017 Revenue Bond	\$25,805,000
Waste Water Treatment Plant (WWTP) Improvements - Phase 2	2023-2025	Unsecured Local Grant/Loan Unsecured Revenue Bond	\$15,367,000
Regional/Broadmoor Area Lift Station	-	LID	\$3,500,000
Gravity Sewer Main – Extension of Harris Rd Sewer*	-	LID	\$9,169,000
Gravity Sewer Main- Regional Lift Station Basin*	-	Utility Rate	\$18,620,000
Kohler RD Lift Station*	-	LID	\$528,000
TOTAL SANITARY SEWER			\$72,989,000

Domestic Water	Timeframe	Funding Sources	Total Cost (\$)
West Pasco WTP Improvements	2020-2022	Utility Rate	\$4,620,000
Reservoir Storage Tank - Zone 3	2020-2023	Unsecured Revenue Bond	\$11,700,000

		Utility Rate Utility Expansion Fees	
Zone 3 Tank Transmission Main*	-	Utility Rate	\$776,000
Water Main Extension - WTP to Zone 3*	-	Utility Rate	\$5,206,000
Backbone Transmission Main*	-	Utility Rate	\$18,355,000
TOTAL DOMESTIC WATER			\$40,657,000
GRAND TOTAL			\$ 114,146,000

Source: City of Pasco

All costs are in current dollars, are rounded to the nearest hundred, and include all applicable fees and contingency costs. Current costs are used under the assumption that both construction costs and projected income would rise at similar rates because of the difficulty of projecting costs and income into the future. The above costs identify do not include costs for capital facilities normally provided by developers as part of their projects or by non-City utilities such as telephone and cable. Also, not included are costs for projects that may be partially funded by developers in order to meet concurrency requirements and to mitigate projected impacts (on-site infrastructure) as required during the subdivision process. For City provided utilities, only those capital facilities that are in excess of normal line expansion covered by the City's normal utility hook-up fees are included.

Projected Capital Facilities Revenue Sources

Revenues to fund transportation capital facilities are anticipated to come from a variety of sources ranging from general funds, LID's, grants, the Motor Vehicle Fuel Tax (both Restricted and Unrestricted), and developer contributions to fund capital improvements. Revenues to fund capital improvements of sewers and water facilities will come from LID's, consumer utility rates, developer contributions and state and federal loans and grants. It is also anticipated that a substantial portion of the cost will be borne by developers because the Study Area is mainly under private ownership. Additionally, the City's annual water and sewer Upsize-Development Programs are in place to enable the City to extend and improve infrastructure when opportunities exist to coordinate with private development and/or other City projects.

The City currently collects impact fees to help offset the cost of new growth and mitigate its impacts to the community. The City charges impact fees, mitigation fees, latecomer's fees, and other development-related charges and costs, which often, as a function of State law, are recouped over many years after commercial or residential development starts its operation. The following is a list of impact fees the city currently collects to help offset the cost of needed improvements.

Transportation Impact Fees:

- A. Residential Developments \$709
- B. Multi-Family Units \$435
- C. Commercial \$43.00 per daily vehicle trip

School Impact Fees

- A. Single Family Residence \$4,700
- B. Multi-Family Residence \$4,525

Park Impact Fees

- A. Single Family Dwelling \$1,300
- B. Multi-Family Dwelling \$1,300
- C. All Other Dwelling Units \$1,300

Capital Improvement Planned Projects

Based on the City's current 2020-2026 Capital Improvement Plan the following projects identified in Table 6 above are identified for funding:

Street and Roads

- Funding sources for the identified right turn lanes at Road 68/Burns and Road 100/Burns have not been identified at this time, however it is likely that these would be partially paid by developer contributions.

Sanitary Sewer

- Wastewater Treatment Plant (WWTP) Improvements - Phase 1 – this project is identified to be partially funded by Unsecured Revenue Bond, Utility Expansion Fees, & 2017 Revenue Bond. This project is currently planned to be constructed in the years 2020-2022.
- Wastewater Treatment Plant (WWTP) Improvements - Phase 2 – this project is not funded at this time but has identified that potential funding sources is Unsecured Local Grant/Loan, & Unsecured Revenue Bond. This project is currently planned to be constructed in the years 2023-2025.

Domestic Water

- West Pasco WTP Improvements - this project is identified to be fully funded by Water Utility Rates and is planned to be designed and constructed in the years 2020-2022.
- Reservoir Storage Tank - Zone 3 - this project is identified to be partially funded by Unsecured Revenue Bond, Utility Rate, & Utility Expansion Fees and is planned to be designed and constructed in the years 2020-2023.

Developer Contributions

Recent State Supreme Court decisions and State law have limited developer contributions to those which directly relate to the impact that a specific development will have on a capital facility. The City must show a direct relationship, or “nexus”, between a specific project and the mitigation measure being imposed. The exception to this is where a development will result in a lack of concurrency in the Level of Service for a Category 1 Capital Facilities. It is anticipated that as the City continues to grow to the north, all new development will be required to pay for all City infrastructure in direct proportion to the impact of the project on the City Facility. As a result, all cost associated to upsize or increase capacity of the infrastructure to serve the other development areas will be paid by the City or other funding sources.

Summary

Based on the discussion above, it is anticipated that the funding needed for the proposed infrastructure project to serve the UGA Expansion Area over the next 6 years will be provided by a range of funding sources including developer contributions, water and sewer utility fees, bonds. In addition, other revenue sources will also be available to help the City pay for these facilities including the tax revenues, mitigation fees, LID's, and grants. As a result, to meet the growth projected for the UGA Expansion Area over the next 6 years, it is recommended that the city evaluate the new proposed project for future addition to 6-year CIP. In addition, coordination with future developers to make sure infrastructure for each development is master planned to accommodate for future growth.

APPENDIX A:

City of Pasco Comprehensive Plan Update
Expanded UGA Infrastructure Evaluation

APPENDIX B:

City of Pasco Comprehensive Plan Update
Expanded UGA Transportation Evaluation

Technical Memorandum

Date: November 18, 2019
Project: City of Pasco Comprehensive Plan Update
To: Oneza and Associates
From: Murraysmith
Re: Expanded UGA Infrastructure Evaluation



Introduction

Oneza and Associates (OA) requested assistance in the development of water and sewer infrastructure requirements to serve the proposed Urban Growth Area (UGA) boundary expansion in the northwest and north central areas for the City of Pasco (City). The City was interested in evaluating the capacity of the existing water and sewer infrastructure to serve the 2038 population projections for this new area as well as assess the additional required infrastructure. The purpose of this analysis is to identify planning level infrastructure upgrades required to provide service to the proposed Study Area based on meeting level of service and design criteria defined within the current Comprehensive Water System Plan (CWSP) and Comprehensive Sewer Plan (CSP). This technical memorandum (TM) summarizes the evaluation to assess future water and sewer infrastructure needs to accommodate the proposed future growth and provide planning level cost estimates for recommended improvements.

Background

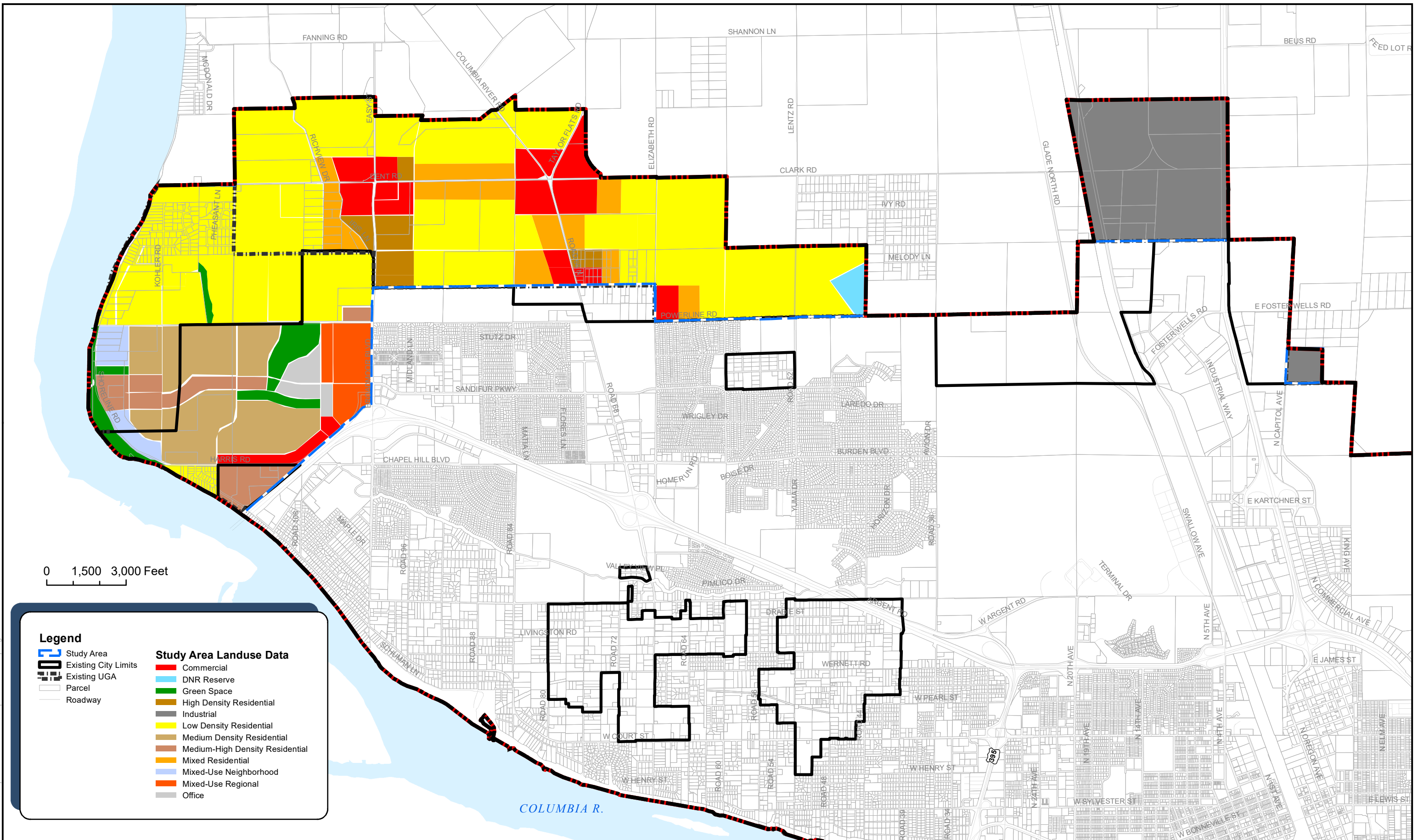
The City's current CWSP was finalized in January 2019 and the current CSP was finalized in May 2014. Through the development of both of these plans the population has grown rapidly, with projected population growth continually changing. The Office of Financial Management (OFM) in 2018 estimated the City's population at 73,590 and based on historic data and OFM estimates, a population of 121,828 is expected to be reached by 2038, an increase of 48,238 persons over the current population.

Planning work completed by OA indicate that the area within the City and the existing UGA, which includes the Riverview Area, has capacity to accommodate another 30,372 persons in the vacant and under-utilized land. OA completed a Land Capacity Analysis that determined the City needs to expand the UGA by approximately 3,400 acres to provide additional land area and do some land use re-classification within the existing UGA to accommodate 17,866 more people to allow for the expected total population increase of 48,238.

For this evaluation, the area of analysis, herein referred to as the Study Area, includes the northern and western portions of the existing UGA west of Broadmoor Boulevard and north of Burns Road and the expanded UGA. The existing and expanded UGA as well as the Study Area are shown on **Figure 1**.

Land use information was developed as part of the Land Capacity Analysis being completed by OA. This information was utilized in this utility analysis to allocate the 41,648 people throughout the Study Area. These allocations were then used to determine the infrastructure required to provide water and sewer service to the Study Area to serve the projected 2038 population. See **Figure 2** for different land use densities.

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Water System

2019 Comprehensive Water System Plan

The City completed the update of their CWSP in early 2019, which has been reviewed and approved by the Washington Department of Health (WDOH). The planning periods outlined in the CWSP are 2022, 2027, and 2036. The CWSP identifies the existing system, expected City growth and projected demands for each planning horizon, as well as, the performance criteria that dictate whether new infrastructure is required.

The CWSP projected a 2036 population of 112,200 which is 9,628 people less than the anticipated 2038 population projection of 121,828 people as noted earlier. As a result, the CWSP includes a majority of the future demands and new water infrastructure required to serve the identified 2038 population projections. There are some further recommendations in this analysis based on the additional 9,628 people in the 2038 population projections as well as the UGA expansion.

Description of Existing Water Utility Infrastructure

The City's water system is supplied from surface water withdrawals from the McNary Pool of the Columbia River. Currently, the system is served by two surface water treatment plants, Butterfield Water Treatment Plant (WTP) which is a conventional filtration plant and West Pasco WTP which is an ultrafiltration membrane plant. The 2019 CWSP defines that the Butterfield WTP has capacity of 26.8 million gallons a day (mgd) while the West Pasco WTP has a capacity of 6.0 mgd with the ability to expand to 18.0 mgd.

The CWSP indicates that the City currently holds surface water rights for 13,269.25 acre-feet of annual withdrawal and 20,149 gallons per minute (gpm) (29 mgd) of instantaneous withdrawal. As defined in the CWSP the City is currently in compliance with water right quantities by borrowing the surplus from the Quad Cities water right, at a current consumption of 14,424 acre-feet by volume and 18,456 gpm instantaneous. The City also holds individual groundwater rights sourced by various wells for separate irrigation purposes. Water rights held by the City are anticipated to increase in the future pending the following:

- Reassignment of water rights that the City currently holds.
- The outcome of applications for new water rights made to Washington State Department of Ecology (Ecology) in 2011 and 2015.
- Additional water rights available through subsequent distributions of water available under the regional Quad City Water Right (QCWR) permit.
- Additional water rights the City may acquire in the future, these include:
 - Lake Roosevelt Incremental Storage Releases Project

- 508-14 Water Rights Program

The City's water system inventory consisted of approximately 330 miles of pipe ranging from 2-inch to 36-inch in diameter, 6 booster stations, 3 reservoirs, 2 water treatment plants, and 20 pressure reducing valve (PRV) stations. Service is presently provided to customers at a minimum elevation of 340 feet to a maximum elevation of 525 feet. The water system is divided into 3 large pressure zones with some subzones. Currently, there are limited transmission mains within the Study Area.

Water Utility Infrastructure Analysis

Demand Projections

The analysis completed for the water infrastructure within the Study Area was started with identifying the individual pressure zone demands. Water system pressure zone boundaries were modified, based on available contour data, to incorporate the land within the Study Area that was not already designated in the 2019 CWSP. The pressure zones are depicted on **Figure 3**. As shown, Pressure Zone 3 was extended to encompass the entire Study Area. The population within the Study Area was divided up into pressure zones based on land use and respective densities.

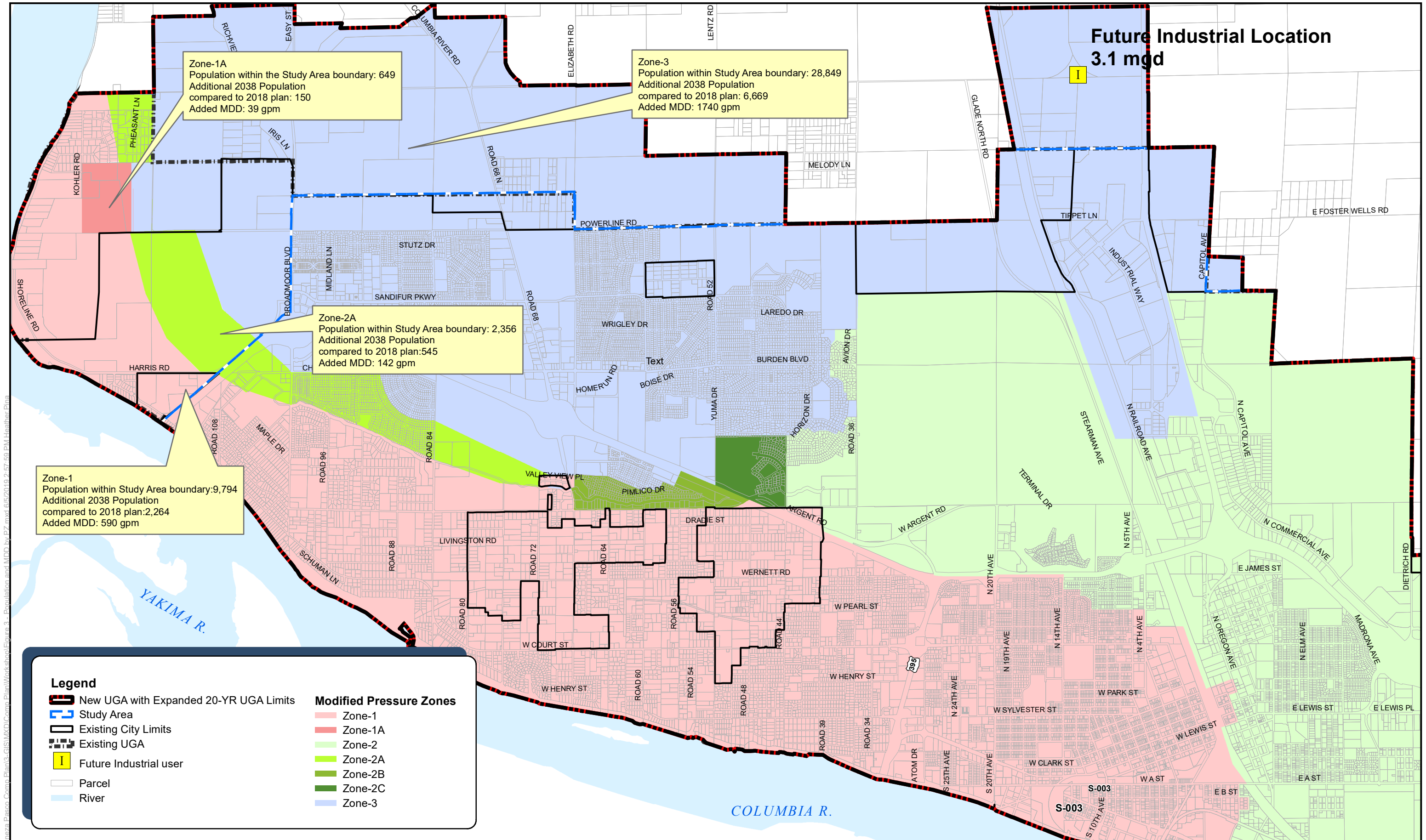
Water supply projections are based on the existing supply per capita per year factor as stated in the CWSP of 64,964 gallons per year per capita which includes: residential, non-residential and system losses. As stated in the CWSP, the supply required per capita is assumed to remain constant in the future, implying that the residential and non-residential use ratios will also remain constant. The population per pressure zone was used with the supply per capita factor to determine the average day demand (ADD) of the Study Area by pressure zone. Using the CWSP identified maximum day demand (MDD) peaking factor of 2.11 estimates for the 2038 projected water demand for MDD within the Study Area was also calculated. **Table 1** and **Figure 3** display the results.

Table 1
Study Area Demands by Pressure Zone

Pressure Zone	Study Area Population	ADD (gpm)	MDD (gpm)
1	9,794	1,211	2,554
1A	649	80	169
2A	2,356	291	614
3	28,849	3,566	7,524
Total	41,648	5,148	10,861

In summary, the pressure zones in the Study Area are projected to serve a residential population of approximately 41,648 people which corresponds to a total ADD of 5,148 gpm and MDD of 10,861 gpm. An additional 3.1 million gallons per day (2,152 gpm) demand is allocated to the north

central location of the City's current industrial area in Zone 3 for an anticipated future industrial demand.



I:\BOI Projects\18\2348 - Quaza Pasco Comp Plan\8-GIS\MXD\Comp Plan\Workshop\Figure 3 - Population and MDD by PZ.mxd 6/5/2019 2:57:59 PM Heather.Pina

Water Design Standards

For the purposes of this analysis, the City's level of service and design criteria defined within the 2019 CWSP were used. **Table 2** defines the design standards for water system infrastructure. These design standards have been adopted as the standards that the City will use to evaluate and approve future development proposals within the Study Area.

Table 2
Water Design Standards

Criterion	Element and Description
Hydraulic Analysis	A comprehensive calibrated hydraulic model should be used to size and evaluate the existing and proposed distribution system. WDOH requires a detailed hydraulic analysis as part of a purveyor's CWSP. (WAC 246-290-230(1))
Demand Scenarios	Facilities should be sufficient to meet all customers' water demands during peak day or peak hour operating conditions (when water use is at its highest). The design/evaluation must consider the water system operation under a full range of expected demands and emergency conditions (fire flow). (WAC 246-290-221)
Supply to Distribution System	Water sources should be protected against power loss and potential water system depressurization. WDOH recommends on-site backup power equipment or gravity standby storage, regardless of the power grid reliability. (WAC 246-290-230)
General Supply Reliability	In addition to a source's ability to meet the design demands of a water system over time, reliability includes (1) the ability of the facilities to meet the designed performance criteria for the water system, and (2) the legal authority to use the water over time. (WAC 246-290-222)
Minimum Service Pressure	30 psi during peak hour demand (PHD) condition, when equalizing storage is depleted. (WAC 246-290-230(5)) 20 psi residual within the water distribution system during maximum day demand (MDD) plus fire flow, when equalizing and fire flow storage are depleted. (WAC 246-290-230(6))
Maximum Velocity	8 feet per second (fps) for peak hour demand condition 10 fps for MDD plus fire flow
Fire Flows	Per 2012 International Fire Code (WAC 246-290-221(5)): Residential dwelling with fire flow area ¹ less than 3,600 sqf: 1,000 gpm, 1 hr duration Residential dwelling with fire flow area ¹ of 3,600 sqf or larger 1,500 gpm, 2 hrs duration Commercial and Industrial: based on area and type of construction (see CWSP, Table 5-2). System must be able to provide MDD plus worse case fire flow requirement with a minimum pressure of 20 psi at all service connections.
Reservoir Storage	Storage components (WAC 246-290-235(3)): Operational storage: based on individual system

	<p>Equalizing storage: (PHD-Total Supply Capacity) *150 min or calculate based on diurnal curve</p> <p>Standby storage: Larger of 200 gal/ERU or 2days (ADD-Firm Supply Capacity)</p> <p>Fire suppression storage: Per local fire protection authority, adequate to serve the largest fire requirement in the zone</p> <p>Dead storage: based on each individual storage tank and is removed from the available storage included in capacity evaluation</p>
Pumping Facilities	<p>When supplying open systems (systems with a reservoir):</p> <p>Pump station total capacity must be equal or larger than MDD for the pressure zone or system. Pump station firm capacity must be equal or larger than ADD for the pressure zone or system. (WAC 246-290-222, Water System Design Manual 10.1.1)</p> <p>When supplying closed systems (systems without a reservoir):</p> <p>Pump station must be able to provide PHD with the largest pump out-of-service, and MDD plus fire flow with the largest “routinely used” pump out-of-service. (WAC 246-290-660(1))</p>

Note:

1. Fire flow area: total floor area of all floor levels within the exterior walls and under the horizontal projections of the roof of a building.

Capacity Analysis

Murraysmith reviewed the capacity of the existing system to meet the updated 20-year (2038) demands to determine what improvements were required to serve the Study Area. The projects in the CWSP were reviewed to determine potential overlap with the infrastructure requirements to serve the Study Area.

Evaluation Assumptions

The 2036 MDD projections and allocation in the existing hydraulic model from the CWSP was used to evaluate existing infrastructure. Demand was only updated in the Study Area.

Evaluation Process

The adequacy of the water system was evaluated to meet future demand conditions (2038) by analyzing the capacity of the existing system based on the defined design standards. Supply, storage, and pumping capacity evaluations were performed to identify the adequacy of those respective system components. The following is a summary of the evaluations required to assess the capacity of each component of the water system.

Supply Capacity

The adequacy of the supply capacity was compared to 2038 MDD. There are two WTPs in the City’s water system; Butterfield WTP and West Pasco WTP. As defined previously the Butterfield WTP has a capacity of 26.8 mgd. West Pasco WTP has a capacity of 6.0 mgd, for a total existing supply of 32.8 mgd.

The existing sources combined total capacity is not adequate to serve 2038 projected MDD demands, and results in a total deficiency of 13.0 mgd. This deficiency is 4.0 mgd higher than the supply capacity deficiency identified in the 2019 CWSP. In the current CWSP there are two planned West Pasco WTP projects that will expand reliable capacity from 6.0 mgd to 18.0 mgd bringing the total system reliable capacity to 44.8 mgd. With this added capacity there will still be a deficiency of just under 1.0 mgd to meet the 2038 demands. Currently the City is planning to complete a Water Treatment Facility Plan (WFP) for the Butterfield WTP, which was recommended in the 2019 CWSP. The WFP will evaluate the overall plant and determine necessary improvements to increase the reliable capacity of the plant to meet 2038 demands. **Table 3** summarizes the supply capacity evaluation results.

Table 3
Supply Capacity Evaluation Results

Existing Supply Capacity	gpm	mgd
Butterfield WTP	18,600	26.8
West Pasco WTP	4,200	6.0
2038 Demand	gpm	mgd
Maximum Day Demand	31,772	45.8
Capacity Surplus or Deficiency	(8,993)	(13.0)
Planned Improvement	gpm	mgd
West Pasco WTP – Increased Capacity	8,333	12.0
Capacity Surplus or Deficiency ¹	(660)	(1.0)

Note:

1. Overall surplus or deficiency with the incorporation of the planned improvements to the West Pasco WTP as identified in the 2019 CWSP, increased capacity from 6.0 mgd to 18.0 mgd (increase of 12.0 mgd)

Storage Capacity

The CWSP storage analysis evaluation was updated to include the additional population served in the Study Area. **Table 4** summarizes the updated storage capacity evaluation results. The total storage deficiency increased by 0.7 million gallons (MG) from the CWSP. The CWSP identified that two new storage reservoirs are needed to meet future demands, one located in the East Pasco Industrial Area, which will serve Zone 2 with a capacity of 5.75 MG and one located within the Study Area, which will serve Zone 3 with a capacity of 3.5 MG. As a result of this analysis, it was confirmed that two storage tanks are still required, but the storage capacity in Zone 3 will need to increase to 5.75 MG to meet the new future storage requirements and the storage in Zone 2 can decrease to 4 MG, based on the assumed demand condition that future large industrial development occurs in Zone 3. Additionally, constructing a large reservoir in Zone 3 provides the City more flexibility if large industrial demands also occur in Zone 2, with the ability to provide excess storage from Zone 3 to Zone 2 through the PRV stations at Foster Wells/Capital, Hillsboro, and Road 36.

Table 4
Storage Capacity Evaluation Results

Zone	Storage Requirement (MG)				Total Minimum Recommended Storage (MG)	Existing Reservoir Capacity (MG)	Storage Surplus/ Deficiency (MG)
	Operational	Equalizing	Fire Flow	Standby			
Zone 1	2.03	0	1.38	2.3	7.56	11.0	3.44
Zone 2	0.52	0	1.44	2.02	3.98	0.0	-3.98
Zone 3	1.08	0	1.44	5.75	8.26	2.5	-5.76
2038 Total Storage Deficiency							-9.75

Pumping Capacity

The existing pump capacity (assuming the largest pump or the largest domestic pump unit is out-of-service) was compared to the required flow for each pump station. This analysis shows that there is adequate pumping capacity within the system to serve future demands in the Study Area. The East Side Pump Station shows a negative surplus, but with surplus capacity in Zone 3, the PRV stations at Foster Wells/Capital, Hillsboro, and Road 36 can provide the additional required supply under a condition with the large pump offline at the East Side Booster Pump Station. See **Table 5** for details.

Table 5
Pumping Capacity Evaluation Results

Pumping System	Total Supply Capacity (gpm)	Firm Capacity (gpm)	Average Day Demand (gpm)	Maximum Day Demand (gpm)	Required Capacity (gpm)	Surplus
Butterfield and West Pasco (Entire System)	33,700	26,700	28,442	31,528	31,568	2,132
Broadmoor/Riverview Heights/Road 36 (Zone 3)	20,650	18,775	8,458	17,362	17,362	1,413
East Side Pump Station (Zone 2)	7,555	5,555	2,980	6,175	6,175	-620 ¹

1. The “-620” deficiency for the East Side Pump Station can be supplied as needed through the PRV stations from Zone 3.

Distribution System

The 2019 CWSP identified some of the major transmission piping to serve the Study Area. The alignment of that piping was modified to match the proposed Major Street Plan for the Comprehensive Plan update, see **Exhibit 1**. Additional transmission pipes were also added to the Study Area as required to provide a “backbone” pipe infrastructure. The proposed transmission

pipng to serve the Study Area was added to the current hydraulic model, along with the proposed facility improvements identified in the supply, storage, and pumping capacity evaluations. Demands based on the 2038 population projections were allocated to the proposed transmission piping. The updated hydraulic model was used to determine the size for the transmission pipe to provide adequate service pressures, velocities and fire flows. The fire flow availability throughout the Study Area during MDD conditions was calculated with the hydraulic model and then compared to the minimum required flow for each land use type: residential: 1,000 gpm, commercial: 2,000 gpm or industrial: 3,500 gpm.

Figure 4 depicts the transmission improvements including six projects originally identified in the CWSP and three newly identified projects.

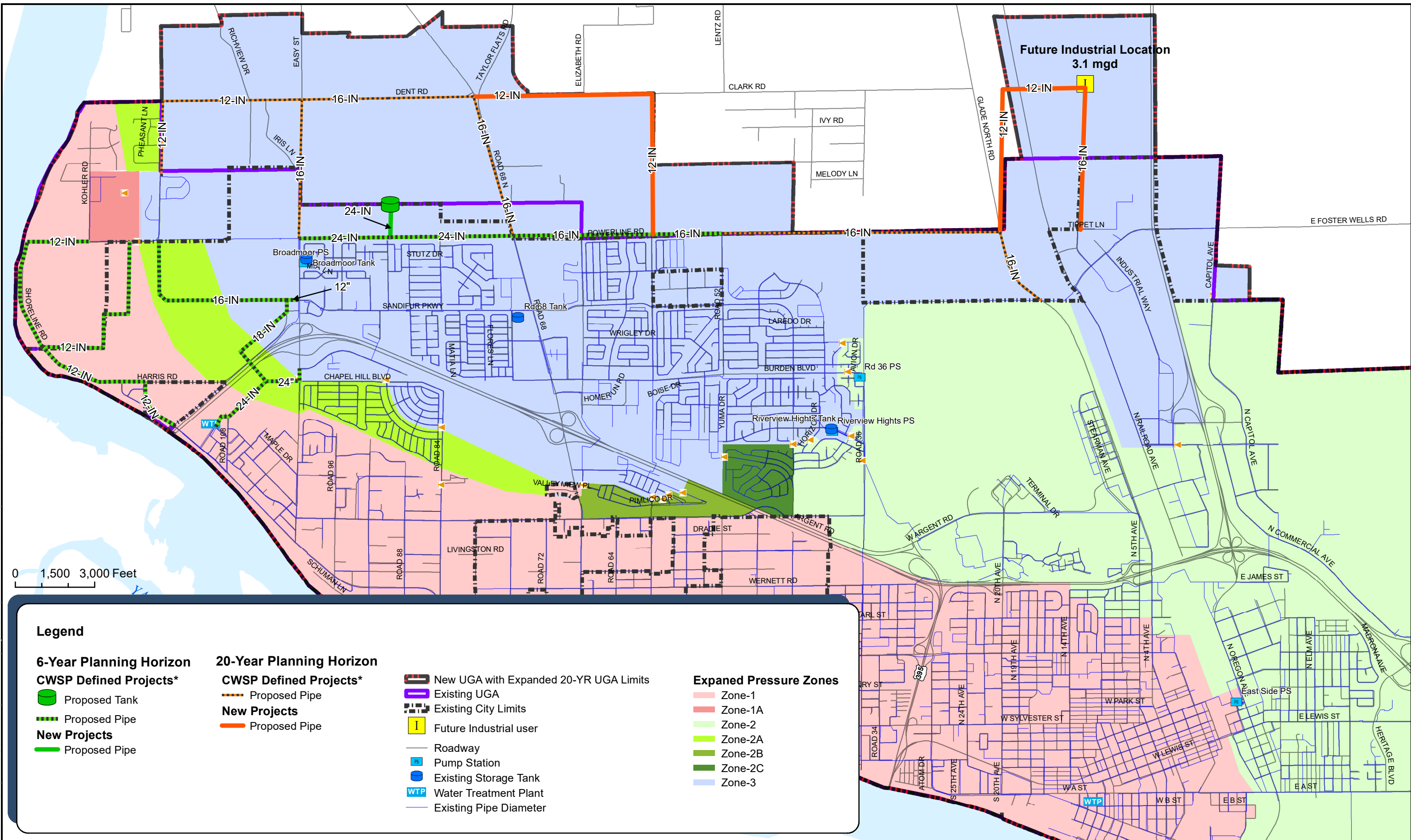
Analysis Summary

A conceptual layout of pressure zone boundaries, transmission piping, and associated facilities required within the Study Area are shown in **Figure 4**. The following are the main conclusions of the water system analysis:

- The results show that for the 20-year (2038) time frame, the City will need increased source capacity, part of which, the West Pasco WTP expansion to 18 mgd, was already planned based on the 2036 projections in the CWSP. Based on the additional population projections for the Study Area the planned expansion of the West Pasco WTP is not sufficient, so further evaluation of the Butterfield WTP will need to take place in order to determine additional upgrades to increase supply capacity by at least 1.0 mgd to meet projected 2038 demands.
- The storage capacity evaluation shows additional deficiencies in Zone 3. The total 2038 deficiency is 5.75 MG, which is an increase of 2.25 MG of additional storage in Zone 3 from the recommendation in the CWSP.
- From this evaluation, three additional pipe projects are required in addition to the projects previously identified in the CWSP. Additionally, the previously identified projects have been modified (pipe diameters, alignments, and lengths) based on the updated population projections and street corridors.
- The City will need to acquire additional water rights to meet 2038 population water demands. Specific information on the quantity and source of the water rights is still being determined, but the City's understanding from their most recent coordination with Ecology is that they will be able to acquire all the water rights they need through the Lake Roosevelt Incremental Storage Releases Project and 508-14 Water Rights Program.

Alternative pipe alignment and infrastructure locations should be evaluated as specific development plans and projects are proposed and designed.

I:\BOI Projects\18\2348 - Oneza Pasco Comp Plan\3-GIS\WXD\Comp Plan\Workshop\Figure 5 - Proposed Water Infrastructure Improvements.mxd 8/8/2019 12:02:50 PM Heather.Pina



City of Pasco
Comprehensive Plan Update
Utility Analysis

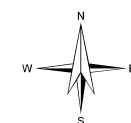


Figure 5
Proposed UGA Expansion
Water Infrastructure
Improvements

Sewer System

2014 Comprehensive Sewer Plan

The CSP was finalized in May 2014 and projects population and loading through a period ending in 2031. The CSP identifies the existing system, expected City growth with projected build out flows, and performance criteria that dictate whether new sewer infrastructure is required. As part of the CSP update, the City anticipated a small amount of future growth and expansion in areas corresponding to the Study Area boundary which are indicated in the plan as the North Court Street Service Area and Northwest Service Area.

The CSP projected a 2031 population of 89,337 which is 32,491 less than the anticipated 2038 population projections noted earlier. As a result, the CSP includes some of the future demands and new sewer infrastructure required to serve the identified 2038 population projections, however there are significant additional project recommendations based on the increased 2038 population projections as well as the UGA expansion.

Subsequent Analyses

In 2017 the City had Murraysmith reevaluate the capacity and loading requirements of the Northwest Service Area as a result of potential development demands and growth projection changes. This analysis evaluated an area of 1,300 acres that included a portion of the Study Area and was based on traffic analysis zone (TAZ) data with a projected build-out population of 19,800 people. The evaluation indicated that the existing West Pasco Trunk sewer pipeline had significant deficiencies with the addition of flow from this Northwest Area.

A strategy for providing trunkline gravity sewer service to the Study Area was included in the 2017 Northwest Service Area Evaluation. Another sewer evaluation, the Burns Road Sewer Evaluation, evaluated alternatives for the Burns Road interceptor to convey flows from the Northwest Service Area.

Following these Northwest Service Area analyses, the City has approved and moved forward with design and construction of some sewer infrastructure in the Study Area. The Harris Road Sewer Transmission Main, a 30-inch diameter pipe has recently been constructed and will provide sewer service for development in the Study Area. The new main runs from the West Pasco Trunk Sewer at the intersection of Road 111 and Court Street to approximately 5,500 feet north, crossing under interstate 182, running northeast along Harris and terminating approximately 1/3 of a mile before the intersection of Harris and Broadmoor Boulevard.

Description of Existing Sewer Utility Infrastructure

The City operates a wastewater collection and treatment system to manage the domestic wastewater needs of the community. The City operates the system under a National Pollutant Discharge Elimination System Waste Discharge Permit issued by Ecology. Currently, the system is served by one activated sludge wastewater treatment plant (WWTP) which oxidizes, nitrifies and

disinfects wastewater flow prior to discharging to the Lake Wallula reach of the Columbia River. The City has just finalized the 2019 Wastewater Treatment Plant Facility Plan (WWFP) that evaluates the WWTP through a 20-year horizon. This WWFP takes into consideration the projected growth identified in the current Comprehensive Plan update and provides a capital improvement plan to accommodate the projected demands associated with the expected increase in population for the City and its expanded UGA. The City's existing WWTP has a capacity of 6.5 million gallons per day (mgd) of sewer flow. The WWTP currently experiences average flows of 6 mgd. For this analysis, treatment capacity is not being evaluated so improvements at the WWTP will need to be determined based on the WWFP.

The City maintains and operates a separate reuse system that collects, stores and then land applies food processor wastewater north of the City. It is a separate entity from the City's municipal wastewater collection and treatment system and therefore is not included in this evaluation.

The City's wastewater collection system contains over 240 miles of sewer pipeline ranging from 8-inch to 36-inch in diameter, 4,430 manholes, and 10 lift stations. The gravity pipelines convey wastewater from the residential and commercial areas and route it to interceptors and large sewer trunks, which drain to the WWTP. Due to the varied topography in the City, several localized and regional lift stations are required to convey sewage to the WWTP. The City's two primary lift stations (Maitland and 9th & Washington) are located just outside the WWTP and convey sewage directly to the WWTP. The Harris Road Sewer Transmission Main, has recently been constructed, which provides sewer service for some development in the Study Area.

Sewer Utility Infrastructure Analysis

Loading Projections

The analysis completed for the sewer infrastructure within the Study Area was started with identifying the individual basin loadings. Sewer basin boundaries were developed for the Study Area based on available contour information. The projected population within the Study Area was divided up into sewer basins based on the land use and respective densities. The proposed basin boundaries and loadings are depicted on **Figure 5**. As shown, five sewer basins are identified to potentially serve the Study Area. Basins were preliminarily identified based on gravity flow service.

The per capita loading estimates from the 2014 CSP were used to calculate the 2038 projected average dry weather flow (DWF). Peak flow is typically the result of any peaking during the day (under dry weather conditions from a diurnal pattern) and any flow contribution during wet weather conditions. The peak flows for each basin are based on population using the Department of Ecology, "Criteria for Sewer Works Design 2008" (Orange Book). The average dry weather loading and range of peaking factors recommended in the Orange Book are summarized in **Table 6**. The resulting dry weather flow and peak wet weather flow (WWF) are in **Table 7**.

Table 6
Sewer Load Assumptions

Component	Value
Per Capita Flow	80 gallons/person/day
Industrial Point Load	137 gpm
Peaking Factor	3.0 -3.7

Table 7
Study Area Load by Sewer Basin

Sewer Basin	Population	AVG DWF (gpm)	Peak WWWF (gpm)
NW Area Trunk – Phase 1a	1,638	91	333
NW Area Trunk – Phase 1b	8,450	470	1,438
NW Area Trunk – Phase 2	7,432	412	1,305
NW Area Trunk (South)	8,184	455	1,382
Regional Lift Station	9,554	530	1,688
East of RD 68	6,390	355	1,117
Industrial Areas ¹	0	137	412
Total	41,648	2,450	7,675

Note:

1. Municipal sewer load component of industrial development. Industrial flow is anticipated to flow to the Hillsboro Interceptor.

In summary, the basins in the Study Area are projected to serve a residential population of approximately 41,648 people. The expanded industrial area will only include municipal flows representative of typical employee lunch/rest room facilities, aligning with what was included in the 2014 CSP model. The resulting total average dry weather flow is 2,450 gpm, with a peak wet weather flow of 7,675 gpm.

I:\BOI Projects\182348 - Oneza Pasco Comp Plan\3-GIS\WXD\Comp Plan\Workshop\Figure 4 - Population and Flow Estimates by Basin.mxd 8/9/2019 1:48:16 PM Heather.Pina

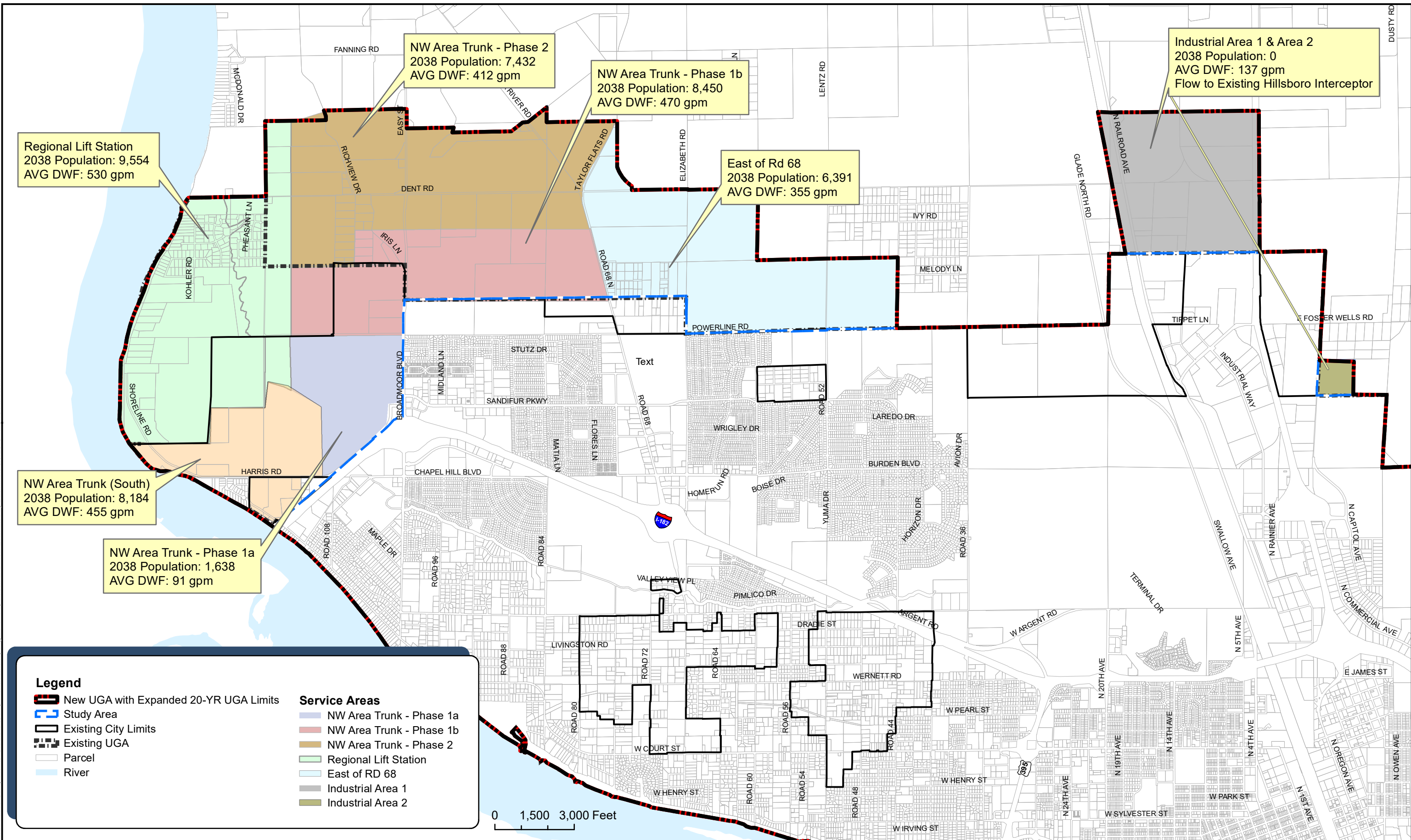


Figure 5
Population and AVG DWF
Estimates by Sewer Basin

Sewer Design Standards

For the purposes of this analysis, where feasible, the City's level of service and design criteria defined within the 2014 CSP were used.

Table 8 defines the design standards for collection system infrastructure. These design standards have been adopted as the standards that the City will use to evaluate and approve future development proposals within the Study Area.

Table 8
Sewer Design Standards

Criteria	Dry Weather	Wet Weather
d/D (water depth/diameter), gravity pipeline	≤ 0.8	≤ 1.0
Surcharge clearance in manhole	No surcharging	2.0 feet from rim
Surcharge clearance in shallow manhole (difference between pipe crown elevation and rim elevation is less than 2.0 feet)	No surcharging	0.5 feet from rim
Minimum cleansing velocity, gravity pipeline and force main (considered for new pipelines only, minimum pipe diameter of 8 inches)	2 ft/sec	2 ft/sec
Maximum velocity, gravity pipeline	10 ft/sec	15 ft/sec
Maximum velocity, force main	6ft/sec ¹	8ft/sec ¹
Lift station capacity, firm and total capacity	Peak hour flow must not exceed lift station capacity with largest pump out of service (firm capacity)	Peak hour flow must not exceed lift station pumping capacity with all pumps in service (total capacity, 10-year design storm)

Note:

1. Used as a guideline but will not determine a deficiency in all cases.

Capacity Analysis

Murraysmith evaluated the infrastructure capacity required to serve the projected 20-year (2038) flows from the Study Area. The projections in the 2014 CSP and subsequent analyses were reviewed to determine potential overlap with the infrastructure requirements to serve the Study Area.

Evaluation Assumptions

The collection system model from the 2014 CSP was used to evaluate the Study Area. The 2031 dry weather and wet weather flow allocation in the existing collection system model from the 2014 CSP was used to evaluate existing infrastructure. Loading was only updated in the Study Area.

The 2017 analyses of the Northwest Area indicated significant deficiencies in the West Pasco Trunk to serve additional flow from the Northwest Area. There are several options the City can consider to address these deficiencies, which could include the following; 1) upsizing of the existing segments of the West Pasco Trunk that are deficient, 2) expanding and/or developing additional conveyance corridors, or 3) a new trunkline parallel to the existing West Pasco Trunk. The City is currently moving forward with an Addendum to their CSP, which will evaluate these options to determine a preferred combination of improvements to meet future population growth.

For this analysis it was assumed that the entire Study Area will flow to the new Harris Road Sewer Transmission Main and be conveyed to the Pasco WWTP through a new trunkline parallel to the existing West Pasco Trunk. This analysis used the elevations and slopes of the existing West Pasco Trunk to size the parallel trunkline to convey the Study Area flows.

Evaluation Process

The adequacy of the sewer system was evaluated to meet future 20-year (2038) loading conditions by analyzing the capacity of the infrastructure recommended from previous analyses based on the defined design standards. The following is a summary of the required improvements to convey flow from the Study Area through the existing service area to the WWTP.

Treatment Capacity

The City just finalized a WWFP for the WWTP with a 20-year horizon. A population growth rate of 3 percent per year was selected by the City for planning purposes for the WWFP, which results in a 2035 population of 126,137, which is 4,309 more than the anticipated 2038 population projections as noted earlier. This WWFP includes recommended modifications to the City's WWTP for the next 20 years that are based on a detailed evaluation of feasible alternatives, with recommendations for improvements that are found to be cost-effective solutions to both the City's near and long-term needs. The preferred improvements defined in the WWTP Capital Improvement Program were prioritized and spread out over the next 20 years. No change in the WWTP CIP outlined in the WWFP is required to accommodate the flows from the projected population growth for the Study Area.

Lift Station Capacity

There are three new lift stations identified within the Study Area based on topography. Additional localized lift stations may be required based on timing and location of development. A new parallel lift station to the 9th & Washington Lift Station is also assumed and sized to convey flows from the new parallel trunkline to the WWTP for the Study Area 2038 peak flows. The proposed lift stations and their required peak pumping capacity are presented in **Table 9** and depicted on **Figure 6**. New force mains to convey the lift station flows are also identified.

Table 9
Proposed Lift Stations

Lift Station	Force Main Size (inch)	Peak WWF (gpm)
Regional Lift Station	12	2,100
Kohler Road Lift Station	6	450
Northeast Lift Station	10	1,400
Proposed Second Wastewater Treatment Plant Lift Station	24	8,350

Additionally, outside of the Study Area, included within OA’s planning work the City is planning to provide sewer service to the Riverview Area. As identified in the 2014 CSP, the Riverview Area Service Concept defined two lift stations required to provide sewer service. The Road 84 & Roberts Drive Lift Station and Road 52 & Pearl Street Lift Station are projects identified in the City’s current CIP. Information provided by the City indicates that land use has remained relatively unchanged, thus no update is included as part of this infrastructure evaluation. These lift stations are assumed to discharge to the existing West Pasco Trunk and were not evaluated as part of the parallel trunkline.

Trunkline

The piping originally outlined in the 2017 Northwest Area Analysis was updated based on the Major Street Plan figure, provided in **Appendix 2**, and the elevations in the Harris Road Sewer Transmission Main being constructed. These trunk sewers were added to the collection system model developed during the 2014 CSP update. The anticipated flows were allocated, and pipe sizing was determined as depicted on **Figure 6**, to meet the design criteria requirements.

The evaluations completed subsequent to the 2014 CSP identified future capacity limitations in the existing West Pasco Trunk sewer pipeline alignment, which is the logical route for discharge from the Study Area. The capacity deficiencies were assumed to increase with the larger projections from the Study Area, so it was assumed that the West Pasco Trunk sewer pipeline has limited or no capacity to serve the Study Area. As a result, it is assumed that sewer flow from the Study Area will be conveyed through a new trunk sewer pipeline parallel to and with similar slopes of the West Pasco Trunk sewer pipeline. This new trunk sewer pipeline was sized and is depicted on **Figure 6**.

Sewer Analysis Results

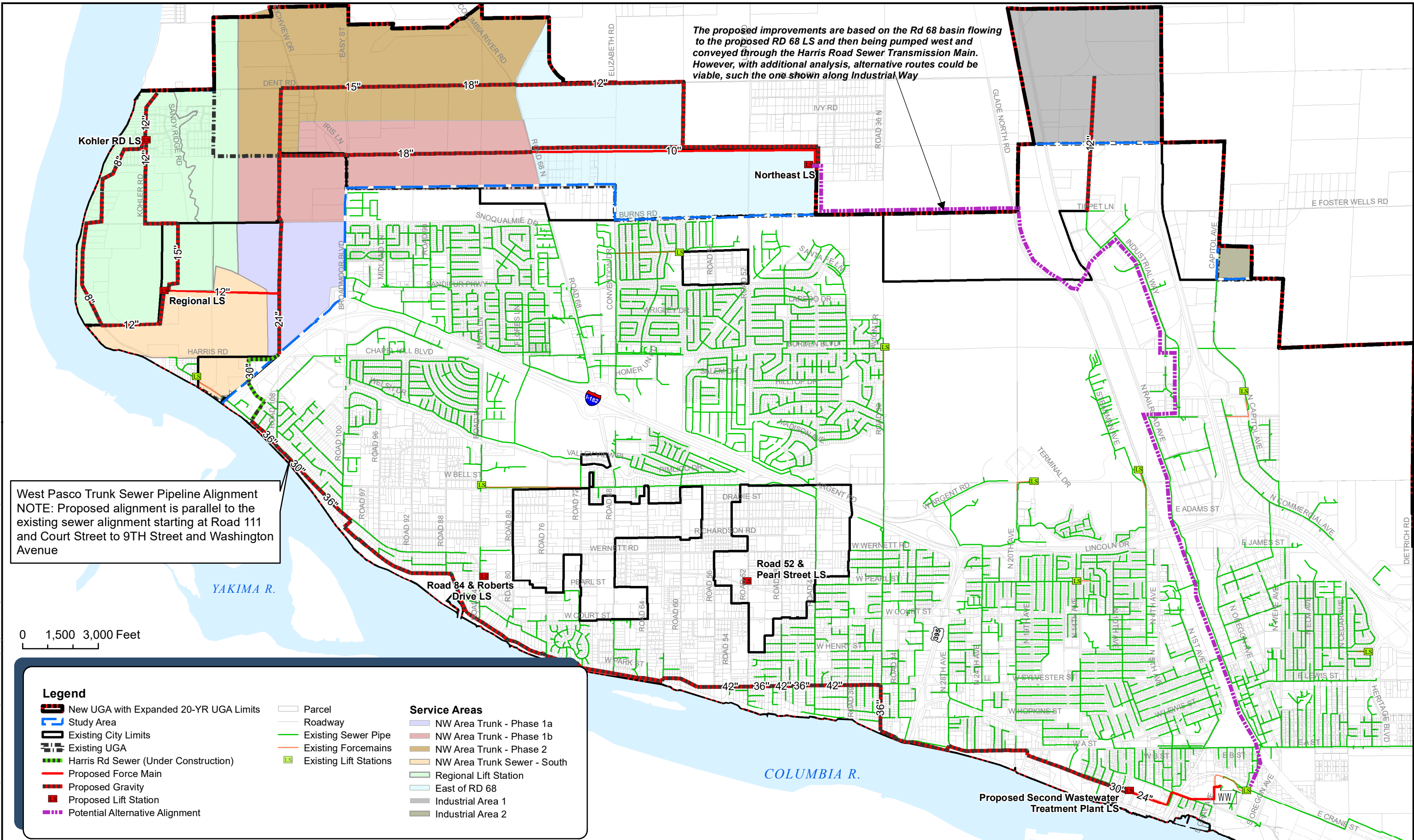
A conceptual layout of basin boundaries, sewer pipelines, and associated lift station facilities to convey flow from the Study Area are shown in **Figure 6**. The following outlines the primary conclusions of the sewer system analysis:

- The WWFP defines the preferred improvements in the WWTP Capital Improvement Program, which were prioritized and spread out over the next 20 years. No change is

required to accommodate the expected flows from the projected population growth in the Study Area.

- Four proposed lift stations are identified which range in peak flows from 450 gpm to 8,350 gpm. The largest is assumed as a parallel lift station to the 9th & Washington Lift Station to convey flows to the WWTP.
- Due to existing anticipated deficiencies in the West Pasco Trunk, it is assumed that a parallel trunk with similar alignment and slope will be installed to convey flows from the Study Area to a lift station parallel to the existing 9th & Washington Lift Station and then on to the WWTP.
- The trunk sewer diameters were sized to convey 2038 flow projections for the basins identified in the Study Area.

Alternative conveyance routes and lift stations could be evaluated as specific development plans and projects are proposed and designed. Additionally, it recommended that the City complete an update to its CSP to provide a comprehensive review of the sewer collection system capacity to assess further alternatives to serve growth areas within the City's existing limits as well as the Study Area growth.



City of Pasco
Comprehensive Plan Update
Utility Analysis

Figure 6
Proposed UGA Expansion
Sewer Infrastructure
Improvements



Cost Summary

This section discusses the planning level capital costs which were developed for all recommended improvements for both the water and sewer systems. This section also includes a cost approach summary for categorizing costs within specified planning horizons and determining incremental cost differences associated with the impacts of increasing the population and boundary within the Study Area as compared to the previous planning documents.

Projects are scheduled in two planning horizons, 6-year and 20-year. Review of the City's current 2019–2024 Capital Improvement Plan (2019–2024 CIP) and coordination with the City was completed to determine which projects identified in this analysis are anticipated to be implemented in the 6-year horizon. A comparison to the 2019–2024 CIP was completed for those identified projects to report the cost increase or identification of new projects (not already listed in the 2019–2024 CIP) related to the results of this analysis. A cost increase between the projects listed in the 2019–2024 CIP and projects identified in this analysis was determined for both the sewer and water utilities. It is also the City's intention to use the City's Annual Upsize-Development Programs, to coordinate with development to upsize infrastructure as needed to install required planned improvements.

Projects not listed in the 6-year horizon are listed in the 20-year horizon. Piping infrastructure is summarized by size, length, and cost to show a comparison to the superseded pipe improvements identified in the CWSP and the CSP.

Water Infrastructure

Unit Costs

The unit costs developed in the CWSP were utilized in this analysis. These unit costs include estimated construction costs, contingency factor, and allowances for permitting, legal, administrative, and engineering fees as described in the CWSP. The unit costs were escalated using the Engineering News Record (ENR) Construction Cost Index (CCI). The ENR CCI measures how inflation impacts construction costs to what they were in the base year. The 20-city average ENR CCI basis was identified as 10,315 (May 2016) in the CWSP and for this analysis was 11,228 (April 2019). Using the ratio of these indices allows for escalating older planning improvement costs to today's costs.

6-Year Planning Horizon

Water projects identified in the 6-year planning horizon include two projects that are currently listed in the City's 2019–2024 CIP;

- West Pasco WTP plant improvements, which will increase plant capacity from 6.0 mgd to 12.0 mgd. This project is not modified by this analysis. It is listed in City's 2019–2024 CIP as Project Number 16008 with a total project cost of \$3,476,000.

- Storage tank to provide storage capacity to Zone 3. Based on this analysis, the 5.75 MG capacity required matches what was specified in the CWSP, however different from the CWSP, shows that its location is better suited in Zone 3 than Zone 2. The City's 2019–2024 CIP has allocated enough funds to cover the cost of the 5.75 MG tank and thus the cost is not modified based on this analysis. This project is listed in the City's 2019–2024 CIP as Project Number 18041 with a total project cost of \$11,700,00.

Since both of these projects are listed in the City's 2019–2024 CIP, there is no additional cost associated with them to serve the Study Area. New projects not identified in the City's 2019–2024 CIP but that are recommended in the 6-year horizon to provide service to the Study Area include:

- 24-inch transmission main from the new Zone 3 Tank to Burns Road to connect the tank to the system.
- A new transmission main from the West Pasco WTP to supply Zone 3, which includes a transmission main crossing under I-182 to supply the western portion of the Study Area. These projects are both identified in the CWSP as IP-005 and a portion of the project FP-017 but have been upsized from 20-inch to 24-inch and 16-inch to 18-inch diameters respectively. The City is planning to include this in their 2020-2025 CIP.
- Backbone transmission mains within the existing City Limits and UGA to provide water infrastructure to the Study Area ranging from 12-inch to 24-inch. These projects were identified in the CWSP but are recommended to be upsized based on this analysis.

Table 10 presents a planning level capital cost of \$39.5 million for the water infrastructure within the Study Area anticipated to be completed within the 6-year planning horizon. This accounts for a \$24.3 million cost increase to the City's 2019–2024 CIP.

Table 10
Water Planning Level Capital Cost Summary – 6-year Planning Horizon

Description	Pipe Size (inch)	Pipe Length (feet)	Total Planned Cost ¹	2019–2024 CIP Cost ²	New Cost Increase from CIP
West Pasco WTP Improvements, 6 to 12 mgd Supply Capacity Increase	-	-	\$3,476,000	\$3,476,000	-
Zone 3 Storage Tank ³	-	-	\$11,700,000	\$11,700,000	-
Zone 3 Tank Transmission Main	24	1,300	\$776,000	-	\$776,000
Transmission Main from WTP to Study Area	24	5,400	\$3,221,000	-	\$3,221,000
	18	4,300	\$1,985,000		\$1,985,000
Backbone Transmission Main	12	20,900	\$6,961,000	-	\$6,961,000
	16	15,300	\$6,562,000		\$6,562,000
	24	8,100	\$4,832,000		\$4,832,000
Total			\$39,513,000	\$15,176,000	\$24,337,000

Notes:

1. The City's Annual Water Upsize-Development Program is anticipated to assist with some of these projects to pay for potential upsizing of water lines related to developer installed lines. A portion of the FP-019 project that runs along Burns Road is currently being installed through this program.
2. Costs taken from the City's 2019–2024 CIP.
3. Project T-001 in the CWSP was indicated for Zone 2, but this analysis indicates it is better located in Zone 3.

20-Year Planning Horizon

The 20-year planning horizon includes additional projects to serve the Study Area that are not already covered in the 6-year planning horizon. The CWSP indicated a majority of these projects, but with the modifications to the Study Area (population and UGA boundary) the transmission mains have been upsized in areas and additional backbone piping was included to incorporate water service to the extents of the Study Area. Additionally, the size of the second storage tank has increased from 3.5 MG to 4.0 MG and been moved from Zone 3, as specified in the CWSP, to Zone 2. The West Pasco WTP improvements will also be included in the 20-year planning horizon that will increase the plant's capacity from 12 mgd to 18 mgd. This project is listed in the CWSP and was not modified based on this analysis. **Table 11** summarizes planning level capital costs for the water infrastructure to serve the Study Area anticipated to be completed after the 6-year planning horizon but within the 20-year period.

Table 11 categorizes the infrastructure by size of pipe and includes the West Pasco WTP supply capacity increase from 12 to 18 mgd and the Zone 2 storage tank. For projects that were identified in the CWSP, the cost is \$25.4 million taking into account the escalation using the ENR index. The new planning level cost for the infrastructure to serve the Study Area is \$36.1 million which accounts for a cost increase of \$10.7 million due to the upsize of pipe diameter, extension of waterlines, upsize of reservoir, and inclusion of additional projects when compared to the CWSP. Again, the City is planning to utilize their Annual Water Upsize-Development Program to pay for a portion of these projects through coordination with planned development.

Table 11
Water Planning Level Capital Cost Summary – 20-year Planning Horizon

Description	Pipe Size (inch)	Pipe Length (feet)	Total Planned Cost	CWSP Cost ¹	Cost Delta from CWSP
West Pasco WTP – Supply Capacity Increase 12 to 18 mgd	-	-	\$1,470,000 ²	\$1,470,000	-
Zone 2 Storage Tank ³	-	-	\$9,291,000	\$8,130,000	\$1,160,000
New Backbone Transmission	12	28,600	\$9,526,000	-	\$9,526,000
Main	16	35,100	\$15,053,000	-	\$15,053,000
	24	1,300	\$775,000	-	\$775,000
CWSP Backbone Transmission	12	5,400	-	\$1,792,000	-\$1,792,000
Main	16	32,600	-	\$13,969,000	-\$13,969,000
Total Cost			\$36,115,000	\$25,362,000	\$10,753,000

Note:

1. CWSP costs were escalated using ENR CCI values.
2. Costs taken from the CWSP and were not modified, no delta associated with this project. The project includes a high service pump station and additional filter backwash.
3. Project T-002 in the CWSP was indicated for Zone 3, but this analysis indicates it is better located in Zone 2.

Sewer Infrastructure

Unit Costs

The process used in the 2014 CSP for developing project capital costs was utilized in this analysis. The unit costs include estimated construction costs, contingency factor, and allowances for legal, administrative, and engineering fees as described in the CSP. New unit costs were developed by escalating unit costs identified in the CSP using the ENR CCI. The ENR CCI measures how inflation impacts construction costs to what they were in the base year. The 20-city ENR CCI basis was identified as 9,437 (January 2013) in the CSP and for this analysis was 11,228 (April 2019). Using the ratio of these indices allows for escalating older planning improvement costs to today's costs.

6- Year Planning Horizon

Sewer projects identified in the 6-year planning horizon include three projects that are currently listed in the City's 2019–2024 CIP:

- WWTP Facility Capital Improvement Project 1 is for recommended upgrades to improve efficiency and effectiveness of the facility. This project is not modified based on this Study Area analysis. The project is listed in the City's 2019–2024 CIP Overall Project Cost table with a total project cost of \$24,073,000.

- WWTP Facility Capital Improvement Project 2 is recommended for further upgrades to improve efficiency and effectiveness of the facility. This project is not modified based on this Study Area analysis. The project is listed in the City's 2019–2024 CIP Overall Project Cost table with a total project cost of \$17,664,000.
- Broadmoor Area Sewer Lift Station consisting of a regional sanitary sewer lift station intended to serve the northwest area of Pasco's UGA. This project is notated as the Regional Lift Station on **Figure 6**.

One project recommended for the 6-year planning horizon not listed in the City's 2019–2024 CIP is the Harris Road Sewer extension, which extends the Harris Road Sewer Transmission Main (recently constructed) north of Dent Rd as shown on **Figure 6**. The City is currently planning to implement this project through a local improvement district (LID). Additional new projects not identified in the City's 2019–2024 CIP, that may be implemented in the 6-year planning horizon depending on development include; sewer transmission mains as noted in the Regional Lift Station Basin and another lift station labeled Kohler Road Lift Station on **Figure 6**.

Table 12 presents the planning level capital cost of \$73.6 million for the sewer infrastructure within the Study Area anticipated to be completed within the 6-year planning horizon. This accounts for an increase of \$28.3 million to the City's 2019–2024 CIP.

Table 12
Sewer Planning Level Cost Summary – 6-year Planning Horizon

Description	Pipe Size (inch)	Pipe Length (feet)	Total Planned Cost	2019–2024 CIP Cost ¹	New Cost Increase from CIP
WWTP Facility Capital Improvement Project 1	-	-	\$24,073,000	\$24,073,000	-
WWTP Facility Capital Improvement Project 2	-	-	\$17,664,000	\$17,664,000	-
Regional/Broadmoor Area Lift Station ²	-	-	\$3,500,000	\$3,500,000	-
Gravity Sewer Main – Extension of Harris Rd Sewer ³	21	12,000	\$9,169,000	-	\$9,169,000
Gravity Sewer Main- Regional Lift Station Basin ⁴	8	8,700	\$5,315,000	-	\$5,315,000
	12	7,600	\$7,138,000		\$7,138,000
	15	6,300	\$6,167,000		\$6,167,000
Kohler Road Lift Station ³	-	-	\$528,000	-	\$528,000
Total			\$73,554,000	\$45,237,000	\$28,317,000

Note:

1. Costs taken from the 2019–2024 CIP and were not modified, no delta associated with these projects.
2. Cost includes the force mains identified in **Table 9**.
3. City planning to complete project through local improvement district (LID).
4. The City's Annual Sewer Upsize-Development Program is anticipated to assist with some of these projects to pay for potential upsizing of sewer lines related to developer installed lines.

As previously indicated, the City is planning to provide sewer service within the Riverview Area. In order to support this development, the construction of two lift station is required. The Road 84 & Roberts Drive Lift Station and Road 52 & Pearl Street Lift Station are projects identified in the City's 2019–2024 CIP but are not included in this analysis since they are outside of the Study Area. These Lift Stations are assumed to discharge to the existing West Pasco Trunk.

20-Year Planning Horizon

The 20-year planning horizon includes all projects to serve the Study Area that are not in the 6-year planning horizon. The CSP included some of these projects but with the modifications to the Study Area (population and UGA boundary) the trunks have been upsized in areas and additional backbone piping was including to incorporate sewer service to the extents of the Study Area. **Table 13** summarizes planning level capital costs for the sewer infrastructure within the Study Area anticipated to be completed after the 6-year planning horizon but within the 20-year period.

Table 13 categorizes the infrastructure by size of pipe and includes the capital improvement projects to increase the WWTP capacity. The total cost identified in the CSP for the projects in the 20-year horizon within the Study Area is \$11.4 million taking into account the escalation of cost based on the ENR index. The new planning level cost for the infrastructure within the Study Area is \$121.0 million which accounts for a cost increase of \$109.6 million due to the upsize of pipe diameter, extension of sewer trunks, and inclusion of additional projects compared to the CSP. The City is planning to utilize their Annual Sewer Upsize-Development Program to pay for a portion of these projects through coordination with planned development. Additionally, the WWFP has defined \$34,537,000 of planned WWTP capital improvements over the 20-year planning horizon.

Table 13
Sewer Planning Level Capital Cost Summary – 20-year Planning Horizon

Description	Pipe Size (inch)	Pipe Length (feet)	Total Planned Cost	CSP Cost ¹	Cost Delta from CSP
New Gravity Sewer Main	12	27,000	\$15,855,000	-	\$15,855,000
	15	8,100	\$6,232,000		\$6,232,000
	18	13,600	\$7,912,000		\$7,912,000
	21	300	\$165,000		\$165,000
	30	3,400	\$3,209,000		\$3,209,000
	36	21,800	\$15,585,000		\$15,585,000
	42	21,300	\$23,173,000		\$23,173,000
Lift Station – (WWTP) ²	-	-	\$7,450,000	-	\$7,450,000
Lift Station – (Northeast) ²	-	-	\$6,898,000	-	\$6,898,000
WWFP Facility Capital Improvement Projects	-	-	\$34,537,000	-	\$34,537,000
CSP Gravity Sewer Main ³	21	5,341		\$2,884,000	-\$2,884,000
	30	9,171		\$6,302,000	-\$6,302,000
Lift Station – Northwest Area	-	-		\$2,213,000	-\$2,213,000
Total Cost			\$121,016,000	\$11,399,000	\$109,617,000

Notes:

1. CSP costs were escalated using ENR CCI values.
2. Cost assumes to include the force main identified in **Table 9**.
3. These are listed separately due to the changes to basins and corridors. A direct correlation wasn't feasible.





















Summary

This UGA expansion analysis identifies infrastructure needed to provide water and sewer service to the Study Area. The results showed that a combined increase of \$52.7 million is anticipated for the 6-year planning horizon, based on the assumptions presented, for the City's 2019–2024 CIP for the water and sewer utilities. For the 20-year planning horizon a total improvement cost of \$36.1 and \$121.0 million is anticipated for water and sewer utilities respectively. A substantial portion of the cost will be borne by developers because the Study Area is mainly under private ownership. Additionally, the City's annual water and sewer Upsize-Development Programs are in place to enable the City to extend and improve infrastructure when opportunities exist to coordinate with private development and/or other City projects.

HCM Signalized Intersection Capacity Analysis

35: Road 100 & I-182 EB Off Ramp

06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1155	0	750	0	0	0	0	705	225	295	635	0
Future Volume (vph)	1155	0	750	0	0	0	0	705	225	295	635	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
Lane Util. Factor	0.95	0.95	1.00					0.95	1.00	1.00	1.00	
Frt	1.00	1.00	0.85					1.00	0.85	1.00	1.00	
Flt Protected	0.95	0.95	1.00					1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1665	1665	1568					3471	1553	1752	1845	
Flt Permitted	0.95	0.95	1.00					1.00	1.00	0.17	1.00	
Satd. Flow (perm)	1665	1665	1568					3471	1553	310	1845	
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	1242	0	806	0	0	0	0	758	242	317	683	0
RTOR Reduction (vph)	0	0	73	0	0	0	0	0	184	0	0	0
Lane Group Flow (vph)	621	621	733	0	0	0	0	758	58	317	683	0
Heavy Vehicles (%)	3%	3%	3%	0%	0%	0%	4%	4%	4%	3%	3%	3%
Turn Type	Prot	NA	Perm					NA	Perm	pm+pt	NA	
Protected Phases	7	4						2		1	6	
Permitted Phases			4						2	6		
Actuated Green, G (s)	36.5	36.5	36.5					19.3	19.3	34.5	34.5	
Effective Green, g (s)	36.5	36.5	36.5					19.3	19.3	34.5	34.5	
Actuated g/C Ratio	0.46	0.46	0.46					0.24	0.24	0.43	0.43	
Clearance Time (s)	4.5	4.5	4.5					4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0					3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	759	759	715					837	374	326	795	
v/s Ratio Prot	0.37	0.37						0.22		0.13	c0.37	
v/s Ratio Perm			c0.47						0.04	c0.29		
v/c Ratio	0.82	0.82	1.02					0.91	0.16	0.97	0.86	
Uniform Delay, d1	18.9	18.9	21.8					29.5	23.9	18.8	20.6	
Progression Factor	1.00	1.00	1.00					1.00	1.00	1.11	1.03	
Incremental Delay, d2	6.9	6.9	40.1					15.2	0.9	40.5	11.0	
Delay (s)	25.7	25.7	61.8					44.7	24.8	61.4	32.2	
Level of Service	C	C	E					D	C	E	C	
Approach Delay (s)		39.9			0.0			39.9			41.4	
Approach LOS		D			A			D			D	
Intersection Summary												
HCM 2000 Control Delay			40.3		HCM 2000 Level of Service				D			
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			80.0		Sum of lost time (s)				13.5			
Intersection Capacity Utilization			87.4%		ICU Level of Service				E			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

35: Road 100 & I-182 EB Off Ramp

06/15/2018



Lane Group	EBL	EBT	EBR	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	621	621	806	758	242	317	683
v/c Ratio	0.82	0.82	1.02	0.91	0.43	0.97	0.86
Control Delay	29.8	29.8	58.6	45.9	6.4	64.8	33.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.8	29.8	58.6	45.9	6.4	64.8	33.7
Queue Length 50th (ft)	271	271	~369	193	0	129	288
Queue Length 95th (ft)	#473	#473	#612	#298	54	#266	#503
Internal Link Dist (ft)		681		459			795
Turn Bay Length (ft)	230		180		200		
Base Capacity (vph)	759	759	788	837	558	326	795
Starvation Cap Reductn	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0
Reduced v/c Ratio	0.82	0.82	1.02	0.91	0.43	0.97	0.86

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.


95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

HCM Signalized Intersection Capacity Analysis

30: Road 100 & I-182 WB Off Ramp

06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations				↰		↱		↕			↕	↱
Traffic Volume (vph)	0	0	0	355	0	315	0	1405	0	0	580	920
Future Volume (vph)	0	0	0	355	0	315	0	1405	0	0	580	920
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5		4.5		4.5			4.5	4.0
Lane Util. Factor				1.00		1.00		0.95			0.95	1.00
Frt				1.00		0.85		1.00			1.00	0.85
Flt Protected				0.95		1.00		1.00			1.00	1.00
Satd. Flow (prot)				1787		1599		3574			3574	1599
Flt Permitted				0.95		1.00		1.00			1.00	1.00
Satd. Flow (perm)				1787		1599		3574			3574	1599
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	0	0	0	374	0	332	0	1479	0	0	611	968
RTOR Reduction (vph)	0	0	0	0	0	21	0	0	0	0	0	0
Lane Group Flow (vph)	0	0	0	374	0	311	0	1479	0	0	611	968
Heavy Vehicles (%)	0%	0%	0%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type				Prot		Perm		NA			NA	Free
Protected Phases				3				2			6	
Permitted Phases						8						Free
Actuated Green, G (s)				21.4		21.4		49.6			49.6	80.0
Effective Green, g (s)				21.4		21.4		49.6			49.6	80.0
Actuated g/C Ratio				0.27		0.27		0.62			0.62	1.00
Clearance Time (s)				4.5		4.5		4.5			4.5	
Vehicle Extension (s)				3.0		3.0		3.0			3.0	
Lane Grp Cap (vph)				478		427		2215			2215	1599
v/s Ratio Prot				c0.21				c0.41			0.17	
v/s Ratio Perm						0.19						0.61
v/c Ratio				0.78		0.73		0.67			0.28	0.61
Uniform Delay, d1				27.1		26.7		9.9			7.0	0.0
Progression Factor				1.00		1.00		0.36			0.31	1.00
Incremental Delay, d2				8.2		6.1		0.8			0.2	1.3
Delay (s)				35.3		32.7		4.4			2.4	1.3
Level of Service				D		C		A			A	A
Approach Delay (s)		0.0			34.1			4.4			1.7	
Approach LOS		A			C			A			A	
Intersection Summary												
HCM 2000 Control Delay			8.9									
HCM 2000 Volume to Capacity ratio			0.70									
Actuated Cycle Length (s)			80.0									
Intersection Capacity Utilization			66.0%									
Analysis Period (min)			15									
c Critical Lane Group												

Queues

30: Road 100 & I-182 WB Off Ramp

06/15/2018



Lane Group	WBL	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	374	332	1479	611	968
v/c Ratio	0.78	0.74	0.67	0.28	0.61
Control Delay	38.7	34.3	4.8	2.6	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	38.7	34.3	4.8	2.6	4.1
Queue Length 50th (ft)	171	137	160	18	51
Queue Length 95th (ft)	246	209	m203	40	422
Internal Link Dist (ft)			270	380	
Turn Bay Length (ft)	300	300			
Base Capacity (vph)	598	554	2215	2215	1599
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.63	0.60	0.67	0.28	0.61
























Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

18: Road 100 & Sandifur Parkway

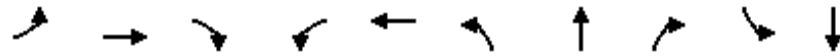
06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	85	245	600	70	85	230	760	730	80	645	50
Future Volume (vph)	70	85	245	600	70	85	230	760	730	80	645	50
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00		0.97	0.95	1.00	1.00	0.95	
Frt	1.00	1.00	0.85	1.00	0.92		1.00	1.00	0.85	1.00	0.99	
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3467	1721		3433	3574	1599	1787	3532	
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3467	1721		3433	3574	1599	1787	3532	
Peak-hour factor, PHF	0.92	0.92	0.92	0.96	0.92	0.96	0.92	0.96	0.96	0.96	0.96	0.92
Adj. Flow (vph)	76	92	266	625	76	89	250	792	760	83	672	54
RTOR Reduction (vph)	0	0	180	0	52	0	0	0	510	0	7	0
Lane Group Flow (vph)	76	92	86	625	113	0	250	792	250	83	719	0
Heavy Vehicles (%)	2%	2%	2%	1%	2%	1%	2%	1%	1%	1%	1%	2%
Turn Type	Split	NA	Perm	Split	NA		Prot	NA	Perm	Prot	NA	
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4						2			
Actuated Green, G (s)	10.8	10.8	10.8	19.2	19.2		7.8	26.3	26.3	5.7	24.2	
Effective Green, g (s)	10.8	10.8	10.8	19.2	19.2		7.8	26.3	26.3	5.7	24.2	
Actuated g/C Ratio	0.14	0.14	0.14	0.24	0.24		0.10	0.33	0.33	0.07	0.30	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5		4.5	4.5	4.5	4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	
Lane Grp Cap (vph)	238	251	213	832	413		334	1174	525	127	1068	
v/s Ratio Prot	0.04	0.05		c0.18	0.07		0.07	c0.22		0.05	c0.20	
v/s Ratio Perm			c0.05						0.16			
v/c Ratio	0.32	0.37	0.40	0.75	0.27		0.75	0.67	0.48	0.65	0.67	
Uniform Delay, d1	31.3	31.5	31.7	28.2	24.7		35.1	23.2	21.4	36.2	24.4	
Progression Factor	1.00	1.00	1.00	1.00	1.00		0.85	0.81	1.05	1.00	1.00	
Incremental Delay, d2	0.8	0.9	1.3	3.9	0.4		6.9	2.4	2.4	11.5	3.4	
Delay (s)	32.1	32.4	32.9	32.0	25.1		36.9	21.1	24.9	47.6	27.8	
Level of Service	C	C	C	C	C		D	C	C	D	C	
Approach Delay (s)		32.7			30.6			24.9			29.9	
Approach LOS		C			C			C			C	
Intersection Summary												
HCM 2000 Control Delay			28.0			HCM 2000 Level of Service			C			
HCM 2000 Volume to Capacity ratio			0.68									
Actuated Cycle Length (s)			80.0			Sum of lost time (s)			18.0			
Intersection Capacity Utilization			65.4%			ICU Level of Service			C			
Analysis Period (min)			15									
c Critical Lane Group												

Queues

18: Road 100 & Sandifur Parkway

06/15/2018



Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	76	92	266	625	165	250	792	760	83	726
v/c Ratio	0.32	0.37	0.68	0.75	0.36	0.86	0.65	0.73	0.54	0.65
Control Delay	32.9	33.9	17.3	34.9	17.0	54.9	22.9	6.2	51.4	28.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.9	33.9	17.3	34.9	17.0	54.9	22.9	6.2	51.4	28.5
Queue Length 50th (ft)	36	44	27	144	38	62	175	16	39	162
Queue Length 95th (ft)	66	77	89	#229	93	m#123	#282	79	#116	#273
Internal Link Dist (ft)		182			1633		305			402
Turn Bay Length (ft)	130		130	175		200			175	
Base Capacity (vph)	398	419	517	857	476	291	1218	1046	155	1120
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.22	0.51	0.73	0.35	0.86	0.65	0.73	0.54	0.65

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCS7 Two-Way Stop-Control Report

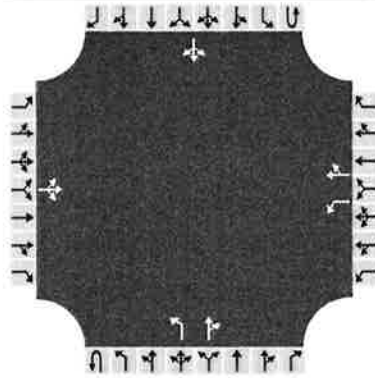
General Information

Analyst	Montgomery
Agency/Co.	JUB Engineers
Date Performed	6/13/2018
Analysis Year	2018
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	UGA Capital Facilities Analysis

Site Information

Intersection	Road 100/Burns Road
Jurisdiction	City of Pasco
East/West Street	Burns Road
North/South Street	Road 100
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Major Street: North-South

Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		1	1	0	0	1	1	0	0	0	1	0
Configuration			LTR			L		TR		L		TR			LTR	
Volume, V (veh/h)		5	20	80		35	10	5		115	130	30		5	135	0
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Left Only								1							

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			117			39		17		128				6		
Capacity, c (veh/h)			682			390		481		1423				1391		
v/c Ratio			0.17			0.10		0.04		0.09				0.00		
95% Queue Length, Q ₉₅ (veh)			0.6			0.3		0.1		0.3				0.0		
Control Delay (s/veh)			11.4			15.2		12.8		7.8				7.6		
Level of Service, LOS			B			C		B		A				A		
Approach Delay (s/veh)	11.4					14.5				3.3				0.3		
Approach LOS	B					B										

HCS7 Two-Way Stop-Control Report

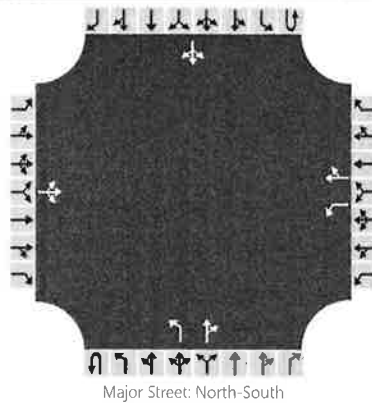
General Information

Analyst	Montgomery
Agency/Co.	JUB Engineers
Date Performed	6/13/2018
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	UGA Capital Facilities Analysis

Site Information

Intersection	Road 100/Burns Road
Jurisdiction	City of Pasco
East/West Street	Burns Road
North/South Street	Road 100
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		1	1	0	0	1	1	0	0	0	1	0
Configuration			LTR			L		TR		L		TR			LTR	
Volume, V (veh/h)		5	30	130		85	35	15		160	165	60		5	205	5
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			183			94		56		178				6		
Capacity, c (veh/h)			546			170		335		1326				1308		
v/c Ratio			0.34			0.55		0.17		0.13				0.00		
95% Queue Length, Q ₉₅ (veh)			1.5			2.9		0.6		0.5				0.0		
Control Delay (s/veh)			14.9			49.6		17.9		8.1				7.8		
Level of Service, LOS			B			E		C		A				A		
Approach Delay (s/veh)	14.9				37.7				3.4				0.2			
Approach LOS	B				E											

HCS7 Two-Way Stop-Control Report

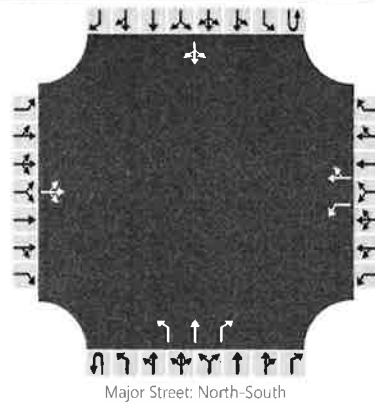
General Information

Analyst	Montgomery
Agency/Co.	JUB Engineers
Date Performed	6/13/2018
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	UGA Capital Facilities Analysis

Site Information

Intersection	Rd 100/Burns Rd Mitigated
Jurisdiction	City of Pasco
East/West Street	Burns Road
North/South Street	Road 100
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		1	1	0	0	1	1	1	0	0	1	0
Configuration			LTR			L		TR		L	T	R			LTR	
Volume, V (veh/h)		5	30	130		85	35	15		160	165	60		5	205	5
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		




















Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			183			94		56		178				6		
Capacity, c (veh/h)			546			179		350		1326				1308		
v/c Ratio			0.34			0.52		0.16		0.13				0.00		
95% Queue Length, Q ₉₅ (veh)			1.5			2.6		0.6		0.5				0.0		
Control Delay (s/veh)			14.9			45.3		17.2		8.1				7.8		
Level of Service, LOS			B			E		C		A				A		
Approach Delay (s/veh)	14.9				34.8				3.4				0.2			
Approach LOS	B				D											

HCM Signalized Intersection Capacity Analysis

9: Road 68 & I-182 EB Off Ramp

06/15/2018

														
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR		
Lane Configurations								 			 			
Traffic Volume (vph)	1245	0	470	0	0	0	0	750	290	0	795	0		
Future Volume (vph)	1245	0	470	0	0	0	0	750	290	0	795	0		
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900		
Total Lost time (s)	4.5	4.5	4.5					4.5			4.5			
Lane Util. Factor	0.95	0.95	1.00					0.95			0.95			
Frt	1.00	1.00	0.85					0.96			1.00			
Flt Protected	0.95	0.95	1.00					1.00			1.00			
Satd. Flow (prot)	1681	1681	1583					3391			3539			
Flt Permitted	0.95	0.95	1.00					1.00			1.00			
Satd. Flow (perm)	1681	1681	1583					3391			3539			
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97		
Adj. Flow (vph)	1284	0	485	0	0	0	0	773	299	0	820	0		
RTOR Reduction (vph)	0	0	33	0	0	0	0	41	0	0	0	0		
Lane Group Flow (vph)	642	642	452	0	0	0	0	1031	0	0	820	0		
Heavy Vehicles (%)	2%	2%	2%	0%	0%	0%	2%	2%	2%	2%	2%	2%		
Turn Type	Prot	NA	Perm					NA			NA			
Protected Phases	7	4						2			6			
Permitted Phases			4											
Actuated Green, G (s)	51.5	51.5	51.5					39.5			39.5			
Effective Green, g (s)	51.5	51.5	51.5					39.5			39.5			
Actuated g/C Ratio	0.52	0.52	0.52					0.40			0.40			
Clearance Time (s)	4.5	4.5	4.5					4.5			4.5			
Vehicle Extension (s)	3.0	3.0	3.0					3.0			3.0			
Lane Grp Cap (vph)	865	865	815					1339			1397			
v/s Ratio Prot	c0.38	0.38						c0.30			0.23			
v/s Ratio Perm			0.29											
v/c Ratio	0.74	0.74	0.55					0.77			0.59			
Uniform Delay, d1	19.0	19.0	16.5					26.3			23.8			
Progression Factor	1.00	1.00	1.00					1.00			1.21			
Incremental Delay, d2	3.5	3.5	0.8					4.3			1.5			
Delay (s)	22.5	22.5	17.3					30.6			30.3			
Level of Service	C	C	B					C			C			
Approach Delay (s)		21.1			0.0			30.6			30.3			
Approach LOS		C			A			C			C			
Intersection Summary														
HCM 2000 Control Delay			25.9									HCM 2000 Level of Service	C	
HCM 2000 Volume to Capacity ratio			0.75											
Actuated Cycle Length (s)			100.0								9.0			
Intersection Capacity Utilization			123.6%										ICU Level of Service	H
Analysis Period (min)			15											
c Critical Lane Group														

Queues

9: Road 68 & I-182 EB Off Ramp

06/15/2018










Lane Group	EBL	EBT	EBR	NBT	SBT
Lane Group Flow (vph)	642	642	485	1072	820
v/c Ratio	0.74	0.74	0.57	0.78	0.59
Control Delay	25.6	25.6	17.3	29.4	30.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	25.6	25.6	17.3	29.4	30.6
Queue Length 50th (ft)	323	323	174	291	266
Queue Length 95th (ft)	477	477	273	373	326
Internal Link Dist (ft)		917		1768	150
Turn Bay Length (ft)	515		525		
Base Capacity (vph)	865	865	848	1379	1397
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.74	0.74	0.57	0.78	0.59
Intersection Summary					

HCM Signalized Intersection Capacity Analysis

12: Road 68 & I-182 WB Off Ramp

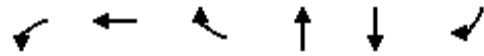
06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	0	0	285	0	1200	0	1745	0	0	1290	770
Future Volume (vph)	0	0	0	285	0	1200	0	1745	0	0	1290	770
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)				4.5	4.5	4.0		4.5			4.5	4.5
Lane Util. Factor				0.95	0.95	1.00		0.95			0.95	1.00
Frt				1.00	1.00	0.85		1.00			1.00	0.85
Flt Protected				0.95	0.95	1.00		1.00			1.00	1.00
Satd. Flow (prot)				1681	1681	1583		3539			3539	1583
Flt Permitted				0.95	0.95	1.00		1.00			1.00	1.00
Satd. Flow (perm)				1681	1681	1583		3539			3539	1583
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	0	0	310	0	1304	0	1897	0	0	1402	837
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	230
Lane Group Flow (vph)	0	0	0	155	155	1304	0	1897	0	0	1402	607
Turn Type				Prot	NA	Free		NA			NA	Perm
Protected Phases				3	8			2			6	
Permitted Phases						Free						6
Actuated Green, G (s)				18.5	18.5	100.0		72.5			72.5	72.5
Effective Green, g (s)				18.5	18.5	100.0		72.5			72.5	72.5
Actuated g/C Ratio				0.18	0.18	1.00		0.72			0.72	0.72
Clearance Time (s)				4.5	4.5			4.5			4.5	4.5
Vehicle Extension (s)				3.0	3.0			3.0			3.0	3.0
Lane Grp Cap (vph)				310	310	1583		2565			2565	1147
v/s Ratio Prot				0.09	0.09			0.54			0.40	
v/s Ratio Perm						c0.82						0.38
v/c Ratio				0.50	0.50	0.82		0.74			0.55	0.53
Uniform Delay, d1				36.6	36.6	0.0		8.2			6.3	6.1
Progression Factor				1.00	1.00	1.00		0.73			1.82	10.90
Incremental Delay, d2				1.3	1.3	5.0		1.3			0.5	0.9
Delay (s)				37.9	37.9	5.0		7.3			11.9	67.8
Level of Service				D	D	A		A			B	E
Approach Delay (s)		0.0			11.3			7.3			32.8	
Approach LOS		A			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			18.3									
HCM 2000 Level of Service											B	
HCM 2000 Volume to Capacity ratio			0.91									
Actuated Cycle Length (s)			100.0									
Sum of lost time (s)											9.0	
Intersection Capacity Utilization			114.6%									
ICU Level of Service											H	
Analysis Period (min)			15									
c Critical Lane Group												

Queues

12: Road 68 & I-182 WB Off Ramp

06/15/2018



Lane Group	WBL	WBT	WBR	NBT	SBT	SBR
Lane Group Flow (vph)	155	155	1304	1897	1402	837
v/c Ratio	0.50	0.50	0.82	0.74	0.55	0.61
Control Delay	43.0	43.0	5.0	7.5	12.1	5.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	43.0	5.0	7.5	12.1	5.2
Queue Length 50th (ft)	94	94	0	245	340	61
Queue Length 95th (ft)	162	162	0	282	m357	m74
Internal Link Dist (ft)		901		104	1189	
Turn Bay Length (ft)	290		200			455
Base Capacity (vph)	310	310	1583	2565	2565	1377
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.50	0.50	0.82	0.74	0.55	0.61

























Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

3: Road 68 & Burden BLVD

06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	90	210	320	745	190	115	440	1250	990	185	905	25
Future Volume (vph)	90	210	320	745	190	115	440	1250	990	185	905	25
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.0	4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	0.97	1.00	1.00	0.97	0.95	1.00	0.97	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (prot)	1770	1863	1583	3433	1863	1583	3433	3539	1583	3400	3491	
Flt Permitted	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	
Satd. Flow (perm)	1770	1863	1583	3433	1863	1583	3433	3539	1583	3400	3491	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	93	216	330	768	196	119	454	1289	1021	191	933	26
RTOR Reduction (vph)	0	0	76	0	0	72	0	0	0	0	2	0
Lane Group Flow (vph)	93	216	254	768	196	47	454	1289	1021	191	957	0
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	3%	3%
Turn Type	Split	NA	pt+ov	Split	NA	pt+ov	Prot	NA	Free	Prot	NA	
Protected Phases	8	8	8.5	7	7	7.1	5	2		1	6	
Permitted Phases									Free			
Actuated Green, G (s)	15.7	15.7	33.9	23.8	23.8	37.1	13.7	33.7	100.0	8.8	28.8	
Effective Green, g (s)	15.7	15.7	33.9	23.8	23.8	37.1	13.7	33.7	100.0	8.8	28.8	
Actuated g/C Ratio	0.16	0.16	0.34	0.24	0.24	0.37	0.14	0.34	1.00	0.09	0.29	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	277	292	536	817	443	587	470	1192	1583	299	1005	
v/s Ratio Prot	0.05	0.12	0.16	c0.22	0.11	0.03	0.13	c0.36		0.06	c0.27	
v/s Ratio Perm									c0.64			
v/c Ratio	0.34	0.74	0.47	0.94	0.44	0.08	0.97	1.08	0.64	0.64	0.95	
Uniform Delay, d1	37.5	40.2	26.0	37.4	32.4	20.4	42.9	33.1	0.0	44.1	34.9	
Progression Factor	1.00	1.00	1.00	1.21	1.21	3.92	0.94	0.92	1.00	1.08	0.71	
Incremental Delay, d2	0.7	9.4	0.7	17.7	0.7	0.1	24.1	46.3	1.2	4.1	17.8	
Delay (s)	38.2	49.6	26.7	62.9	39.8	80.0	64.6	76.9	1.2	51.8	42.8	
Level of Service	D	D	C	E	D	E	E	E	A	D	D	
Approach Delay (s)		36.1			60.6			46.9			44.3	
Approach LOS		D			E			D			D	
Intersection Summary												
HCM 2000 Control Delay			47.8				HCM 2000 Level of Service			D		
HCM 2000 Volume to Capacity ratio			1.00									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			87.1%				ICU Level of Service			E		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

3: Road 68 & Burden BLVD

06/15/2018



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	93	216	330	768	196	119	454	1289	1021	191	959
v/c Ratio	0.33	0.74	0.54	0.94	0.44	0.18	0.97	1.08	0.64	0.64	0.95
Control Delay	40.1	55.3	20.1	65.4	44.0	19.6	67.0	76.9	1.5	57.4	44.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	40.1	55.3	20.1	65.4	44.0	19.6	67.0	76.9	1.5	57.4	44.2
Queue Length 50th (ft)	52	130	104	~277	114	29	144	~483	0	64	226
Queue Length 95th (ft)	99	208	187	#402	179	72	m#234	#619	7	85	#432
Internal Link Dist (ft)	1182				1079				1189		1438
Turn Bay Length (ft)	260			300	340			55	340		
Base Capacity (vph)	318	335	646	815	442	661	470	1193	1583	306	1007
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.64	0.51	0.94	0.44	0.18	0.97	1.08	0.64	0.62	0.95

Intersection Summary

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.






















Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

25: Road 68 & Wrigley

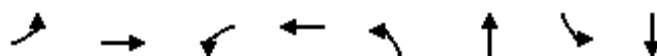
06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	140	30	105	110	35	90	150	755	50	60	770	75
Future Volume (vph)	140	30	105	110	35	90	150	755	50	60	770	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00		1.00	1.00		1.00	0.95		1.00	0.95	
Frt	1.00	0.88		1.00	0.89		1.00	0.99		1.00	0.99	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1805	1679		1805	1695		1787	3541		1787	3526	
Flt Permitted	0.41	1.00		0.50	1.00		0.20	1.00		0.32	1.00	
Satd. Flow (perm)	776	1679		942	1695		384	3541		610	3526	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	152	33	114	120	38	98	163	821	54	65	837	82
RTOR Reduction (vph)	0	103	0	0	90	0	0	4	0	0	6	0
Lane Group Flow (vph)	152	44	0	120	46	0	163	871	0	65	913	0
Heavy Vehicles (%)	0%	0%	0%	0%	0%	0%	1%	1%	1%	1%	1%	1%
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	3	8		7	4		1	6		5	2	
Permitted Phases	8			4			6			2		
Actuated Green, G (s)	19.4	9.8		16.6	8.4		59.3	59.3		54.0	54.0	
Effective Green, g (s)	19.4	9.8		16.6	8.4		59.3	59.3		54.0	54.0	
Actuated g/C Ratio	0.19	0.10		0.17	0.08		0.59	0.59		0.54	0.54	
Clearance Time (s)	4.5	4.5		4.5	4.5		4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	249	164		227	142		368	2099		384	1904	
v/s Ratio Prot	c0.06	0.03		0.04	0.03		0.04	c0.25		0.01	c0.26	
v/s Ratio Perm	c0.06			0.04			0.22			0.08		
v/c Ratio	0.61	0.27		0.53	0.33		0.44	0.42		0.17	0.48	
Uniform Delay, d1	35.6	41.8		37.3	43.1		11.1	11.0		11.8	14.3	
Progression Factor	1.00	1.00		1.00	1.00		0.38	0.26		0.46	0.47	
Incremental Delay, d2	4.4	0.9		2.2	1.3		0.3	0.2		0.2	0.8	
Delay (s)	40.0	42.7		39.5	44.5		4.6	3.1		5.6	7.5	
Level of Service	D	D		D	D		A	A		A	A	
Approach Delay (s)		41.3			42.1			3.3			7.3	
Approach LOS		D			D			A			A	
Intersection Summary												
HCM 2000 Control Delay			13.1				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.52									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)			18.0		
Intersection Capacity Utilization			62.1%				ICU Level of Service			B		
Analysis Period (min)			15									
c Critical Lane Group												

Queues

25: Road 68 & Wrigley

06/15/2018



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	152	147	120	136	163	875	65	919
v/c Ratio	0.61	0.55	0.53	0.59	0.44	0.41	0.16	0.48
Control Delay	43.0	20.5	40.2	25.3	5.5	3.2	7.7	8.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	43.0	20.5	40.2	25.3	5.5	3.2	7.7	8.0
Queue Length 50th (ft)	83	20	64	23	9	24	12	115
Queue Length 95th (ft)	132	75	106	78	m10	m48	31	172
Internal Link Dist (ft)		480		398		1438		1122
Turn Bay Length (ft)	95		130		200		240	
Base Capacity (vph)	256	427	232	393	448	2133	398	1910
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.34	0.52	0.35	0.36	0.41	0.16	0.48

























Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

HCM Signalized Intersection Capacity Analysis

14: Road 68 & Sandifur Parkway

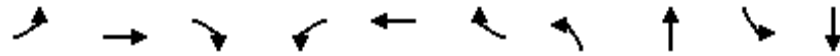
06/15/2018

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	295	265	190	145	50	345	455	190	90	450	75
Future Volume (vph)	70	295	265	190	145	50	345	455	190	90	450	75
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	0.96		1.00	0.98	
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1787	1881	1599	1787	1881	1599	1787	3416		1787	3498	
Flt Permitted	0.66	1.00	1.00	0.23	1.00	1.00	0.34	1.00		0.28	1.00	
Satd. Flow (perm)	1246	1881	1578	832	1881	1599	879	3416		869	3500	
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	72	304	273	196	149	52	356	469	196	93	464	77
RTOR Reduction (vph)	0	0	170	0	0	37	0	42	0	0	13	0
Lane Group Flow (vph)	72	304	103	196	149	15	356	623	0	93	528	0
Heavy Vehicles (%)	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%	1%
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	pm+pt	NA		pm+pt	NA	
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2			6		
Actuated Green, G (s)	26.1	22.0	22.0	37.0	28.4	28.4	54.0	44.6		35.1	30.2	
Effective Green, g (s)	26.1	22.0	22.0	37.0	28.4	28.4	54.0	44.6		35.1	30.2	
Actuated g/C Ratio	0.26	0.22	0.22	0.37	0.28	0.28	0.54	0.45		0.35	0.30	
Clearance Time (s)	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5		4.5	4.5	
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	347	413	347	408	534	454	649	1523		350	1056	
v/s Ratio Prot	0.01	c0.16		c0.05	0.08		c0.11	0.18		0.01	0.15	
v/s Ratio Perm	0.05		0.07	0.13		0.01	c0.19			0.08		
v/c Ratio	0.21	0.74	0.30	0.48	0.28	0.03	0.55	0.41		0.27	0.50	
Uniform Delay, d1	28.5	36.3	32.5	23.7	27.8	25.9	21.4	18.8		29.4	28.7	
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	0.33	0.15		1.00	1.00	
Incremental Delay, d2	0.3	6.7	0.5	0.9	0.3	0.0	0.9	0.8		0.4	1.7	
Delay (s)	28.8	43.0	33.0	24.6	28.1	25.9	7.9	3.6		29.8	30.4	
Level of Service	C	D	C	C	C	C	A	A		C	C	
Approach Delay (s)		37.2			26.1			5.1			30.3	
Approach LOS		D			C			A			C	
Intersection Summary												
HCM 2000 Control Delay			21.8									
HCM 2000 Volume to Capacity ratio			0.62									
Actuated Cycle Length (s)			100.0							18.0		
Intersection Capacity Utilization			75.0%									
Analysis Period (min)			15									
c Critical Lane Group												

Queues

14: Road 68 & Sandifur Parkway

06/15/2018



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	72	304	273	196	149	52	356	665	93	541
v/c Ratio	0.20	0.77	0.54	0.49	0.28	0.09	0.55	0.41	0.24	0.48
Control Delay	21.6	49.8	12.1	26.3	29.0	0.3	9.4	3.3	16.6	30.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	49.8	12.1	26.3	29.0	0.3	9.4	3.3	16.6	30.0
Queue Length 50th (ft)	30	181	28	87	74	0	48	36	28	147
Queue Length 95th (ft)	56	262	97	133	120	0	77	56	57	212
Internal Link Dist (ft)	5399			1853			1122			770
Turn Bay Length (ft)	140		100	170		255	175		165	
Base Capacity (vph)	356	487	570	403	594	617	687	1625	387	1131
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.20	0.62	0.48	0.49	0.25	0.08	0.52	0.41	0.24	0.48
Intersection Summary										

HCS7 Two-Way Stop-Control Report

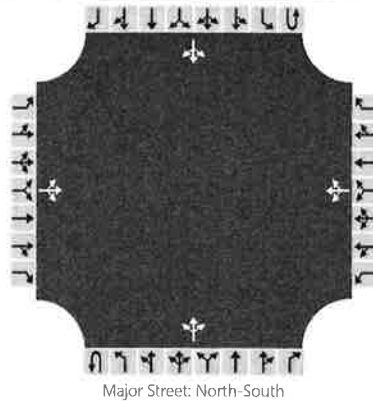
General Information

Analyst	Montgomery
Agency/Co.	JUB Engineers
Date Performed	6/13/2018
Analysis Year	2018
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	UGA Capital Facilities Analysis

Site Information

Intersection	Rd 68/Burns Rd
Jurisdiction	City of Pasco
East/West Street	Burns Road
North/South Street	Road 68
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		20	5	45		5	5	0		50	295	0		5	275	20
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			78				12			56				6		
Capacity, c (veh/h)			478				284			1225				1225		
v/c Ratio			0.16				0.04			0.05				0.00		
95% Queue Length, Q ₉₅ (veh)			0.6				0.1			0.1				0.0		
Control Delay (s/veh)			14.0				18.2			8.1				8.0		
Level of Service, LOS			B				C			A				A		
Approach Delay (s/veh)	14.0				18.2				1.6				0.2			
Approach LOS	B				C											

HCS7 Two-Way Stop-Control Report

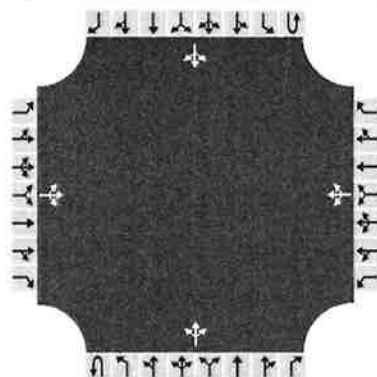
General Information

Analyst	Montgomery
Agency/Co.	JUB Engineers
Date Performed	6/13/2018
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	UGA Capital Facilities Analysis

Site Information

Intersection	Rd 68/Burns Rd
Jurisdiction	City of Pasco
East/West Street	Burns Road
North/South Street	Road 68
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	0	1	0	0	0	1	0
Configuration			LTR				LTR				LTR				LTR	
Volume, V (veh/h)		35	10	105		15	20	5		80	370	5		5	320	25
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			167				45				89				6	
Capacity, c (veh/h)			389				204				1168				1135	
v/c Ratio			0.43				0.22				0.08				0.01	
95% Queue Length, Q ₉₅ (veh)			2.1				0.8				0.2				0.0	
Control Delay (s/veh)			21.0				27.6				8.3				8.2	
Level of Service, LOS			C				D				A				A	
Approach Delay (s/veh)	21.0				27.6				2.1				0.2			
Approach LOS	C				D											

HCS7 Two-Way Stop-Control Report

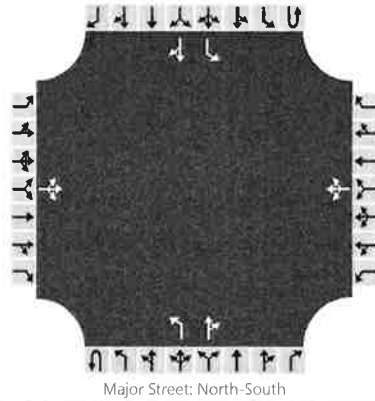
General Information

Analyst	Montgomery
Agency/Co.	JUB Engineers
Date Performed	6/13/2018
Analysis Year	2024
Time Analyzed	PM Peak Hour
Intersection Orientation	North-South
Project Description	UGA Capital Facilities Analysis

Site Information

Intersection	Rd 68/Burns Rd Mitigated
Jurisdiction	City of Pasco
East/West Street	Burns Road
North/South Street	Road 68
Peak Hour Factor	0.90
Analysis Time Period (hrs)	0.25

Lanes



Vehicle Volumes and Adjustments

Approach	Eastbound				Westbound				Northbound				Southbound			
Movement	U	L	T	R	U	L	T	R	U	L	T	R	U	L	T	R
Priority		10	11	12		7	8	9	1U	1	2	3	4U	4	5	6
Number of Lanes		0	1	0		0	1	0	0	1	1	0	0	1	1	0
Configuration			LTR				LTR			L		TR		L		TR
Volume, V (veh/h)		35	10	105		15	20	5		80	370	5		5	320	25
Percent Heavy Vehicles (%)		3	3	3		3	3	3		3				3		
Proportion Time Blocked																
Percent Grade (%)	0				0											
Right Turn Channelized	No				No				No				No			
Median Type/Storage	Undivided															

Critical and Follow-up Headways

Base Critical Headway (sec)		7.1	6.5	6.2		7.1	6.5	6.2		4.1				4.1		
Critical Headway (sec)		7.13	6.53	6.23		7.13	6.53	6.23		4.13				4.13		
Base Follow-Up Headway (sec)		3.5	4.0	3.3		3.5	4.0	3.3		2.2				2.2		
Follow-Up Headway (sec)		3.53	4.03	3.33		3.53	4.03	3.33		2.23				2.23		

Delay, Queue Length, and Level of Service

Flow Rate, v (veh/h)			167				45				89				6	
Capacity, c (veh/h)			395				208				1168				1135	
v/c Ratio			0.42				0.22				0.08				0.01	
95% Queue Length, Q ₉₅ (veh)			2.1				0.8				0.2				0.0	
Control Delay (s/veh)			20.6				27.0				8.3				8.2	
Level of Service, LOS			C				D				A				A	
Approach Delay (s/veh)	20.6				27.0				1.5				0.1			
Approach LOS	C				D											



Why is moving forward important?

Identifying preferred improvements now provides the City with a level of certainty regarding the cost of future development.

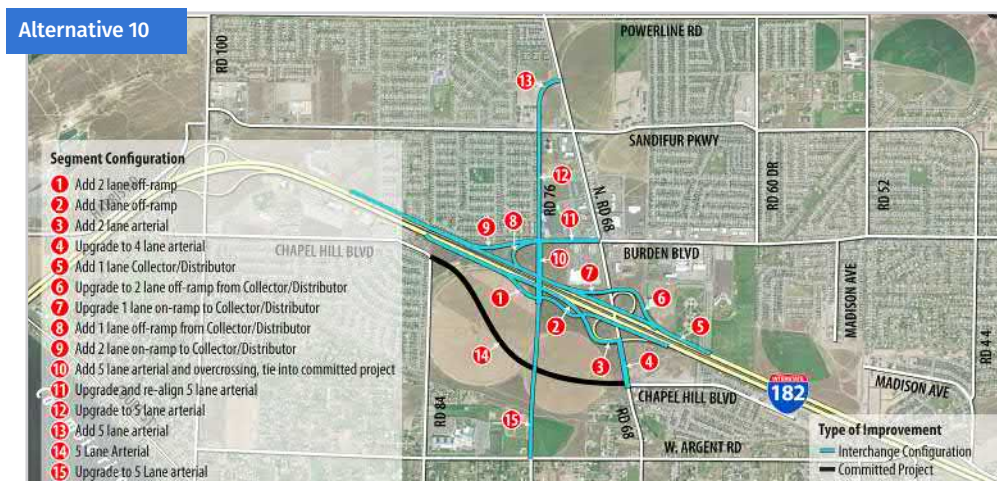
For more information please contact:

Mary Heather Ames, PE
City of Pasco Public Works
p. (509) 545-3444
e. amesm@pasco-wa.gov

www.pasco-wa.gov

The Selected Alternatives

The process outline recommended for this project showed that local alternatives alone will not improve current and future congestion. Therefore, the remaining alternatives (5, 6, and 10) should be studied in more detail through the development of an Interchange Justification Report. Alternative 4 will also be included in the study as a local improvement option, as will Alternative 13 for further development and screening. Alternative 9 is a committed project and will be evaluated under a separate study.



Pasco has experienced recession-defying growth over the past 16 years, more than doubling its population from 32,066 in 2000 to an estimated 70,560 as of April 2016. This growth has resulted in high levels of congestion throughout the City.

75-80%

The estimated population increase projected over the next 25 years.

What is the City doing to improve mobility and prepare for growth?

The City conducted a Feasibility Traffic Study for Interchanges as the first phase of a multiphased project to identify, recommend, approve, and design a solution to the traffic congestion throughout the City of Pasco. The following is a summary of the process.



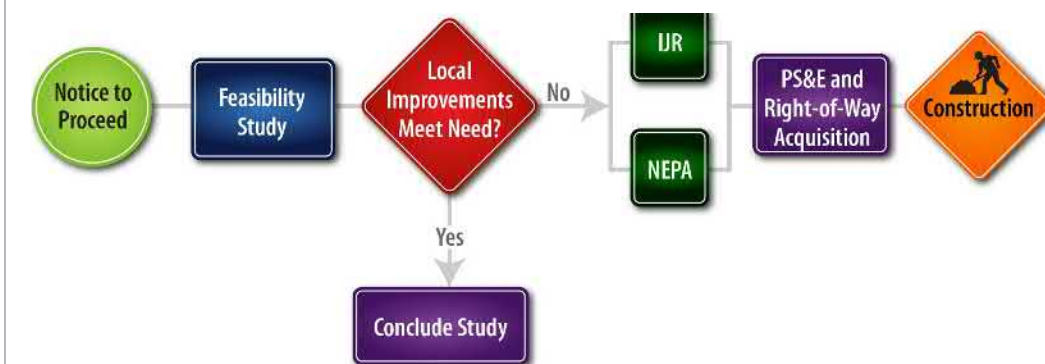
Congestion has impacted Interstate 182 (I-182) and the local corridors that provide access to regional facilities. Current planning efforts estimate additional population growth between 75 and 80 percent over the next 25 years. Additionally, the City's centric location has made it home to several regional facilities, including the Tri-Cities Regional Airport, the Columbia Basin College, the Trade, Recreation and Agricultural Center (TRAC), and the Gesa Stadium; which draws even more traffic to the area.

In 2016, the City conducted a Feasibility Traffic Study for Interchanges as the first phase of a multi-phased project to identify, recommend, approve, and design a solution to the traffic congestion throughout the City of Pasco.

What process must be followed to propose changes to I-182?

Working with the Federal Highway Administration (FHWA) and Washington State Department of Transportation (WSDOT), the City developed a project process to study and evaluate the direction of the Feasibility Traffic Study for Interchanges.

Project Process



As a first step the study and analyses would focus on identifying local improvements to meet current and projected transportation network needs. If the analyses indicates that local improvements alone can solve congestion problems within the local and regional networks, the study would conclude without further action. However, should the analyses demonstrate that local improvements alone cannot meet transportation needs, then WSDOT and FHWA would allow further study to identify and propose access modifications to the regional network. Future analyses and study would be conducted through an Interchange Justification Report (IJR).



Who will make the decisions?

To assist in the development and review, the City of Pasco established two committees: an Executive Committee and a Technical Advisory Committee. Composed of local and regional experts, these committees assisted in the planning and technical development of the study.

Agencies represented on the committees include:

- City of Pasco Officials and Staff
- Port of Pasco
- Columbia Basin College Board
- WSDOT South Central Region
- Federal Highway Administration
- Benton-Franklin Council of Governments
- Benton-Franklin Transit
- The City of Kennewick
- The City of Richland

How has growth kept up with the existing travel demand forecasting models?

To assess the current and future transportation needs, this study relied on new traffic counts and compared these to the Benton-Franklin Council of Governments base year Travel Demand Model (TDM) developed in year 2010, which is the adopted Metropolitan Planning Organization (MPO) model for the region.

The analysis demonstrated that Pasco's accelerated population growth has exceeded the projected traffic growth. Focusing on some of the key project area corridors and bottlenecks, Table 1 compares the Regional Transportation Plan (RTP) 2010 Base, 2020 No-Build, and 2030 No-Build model PM peak hour volumes to the existing 2015 counts. All but one of the I-182 ramp current (2015) volumes at the Road 68/I-182 interchange exceed the 2020 RTP projections, and in the case of the westbound off-ramp are rapidly approaching the 2030 projection.

Corridor		Traffic Volume Source			
Roadway	Location	2010 RTP	2015 Counts ^a	2020 RTP	2030 RTP
Road 68 (NB)	South of Burden Boulevard	1,546	2,274	1,484	2,521
Road 68 (NB)	South of Burden Boulevard	1,348	1,701	1,494	2,043
Road 100 (NB)	North of I-182 WB Ramps	1,053	1,040	1,464	1,792
Road 100 (SB)	North of I-182 WB Ramps	693	745	1,049	1,480
I-182 EB Off-Ramp	At Road 68 Interchange	964	1,344	1,042	1,800
I-182 WB Off-Ramp	At Road 68 Interchange	816	1,194	994	1,338
I-182 EB On-Ramp	At Road 68 Interchange	624	843	706	994
I-182 WB On-Ramp	At Road 68 Interchange	621	767	782	1,045
I-182 EB Off-Ramp	At Road 100 Interchange	1,571	1,382	N/A ^b	2,246
I-182 WB Off-Ramp	At Road 100 Interchange	413	460	451	617
I-182 EB On-Ramp	At Road 100 Interchange	309	373	318	416
I-182 WB On-Ramp	At Road 100 Interchange	930	770	1,220	1,703
^a Counts highlighted in red already exceed the 2020 model projections. ^b Network error in 2020 model for this ramp movement.		NB = Northbound SB = Southbound	EB = Eastbound WB = Westbound		

What does the new Travel Demand Model show?

The City's project team worked with the City, BFCG, and WSDOT to develop methodology to update the BFCG's model design year from 2030 to 2040. The analysis demonstrated that Pasco's accelerated population growth has exceeded the projected traffic growth. The updated 2040 model showed significant volume growth throughout the entire project study area. However, the Road 100 and Road 68 interchange areas, as well as the key intersection to the north, were determined to be critical for solution identification. All of the study intersections failed to meet operating standards under future baseline conditions. Ramp operations are particularly concerning, as they all functioned with volume to capacity (v/c) ratios exceeding 1.0. Therefore, they are likely to see heavy queuing, which would end up backing onto the freeway. Other key findings of the TDM effort point to significant capacity deficiencies on Road 100 and Road 68, including the interchange areas and the arterial corridors extending to Powerline Road in year 2040. The origin and destination analysis also indicated that a majority of the interchange volumes at Roads 100 and 68 are regional trips.

What alternatives are being considered?

In addition to the No-Build alternative, the feasibility study identified and evaluated a total of 13 build alternatives all geared at improving mobility and decreasing congestion. The first alternative developed (Alternative 1) was developed by the project team to address FHWA and WSDOT's request to evaluate potential congestion relief that could be achieved by completing the City of Pasco's local transportation grid. Other alternatives were developed by the design team and the Technical Advisory Committee (TAC) during a brainstorming meeting. The 13 alternatives considered were categorized into five groups: No-Build, Local Improvements, Existing Interchange Revisions, New Ramps and Interchanges, and New Columbia River Crossings (CRC). Improvements proposed by each of these alternatives are described below.

How were alternatives evaluated?

A two-tiered screening process was devised to analyze the benefits and viability of each of the study alternatives. The first tier in the screening process (Level 1) was qualitative in nature and geared at eliminating alternatives that were deemed to be fatally flawed. Alternatives that successfully passed the Level 1 screening analysis would then be subjected to a quantitative analysis.

What where the results of the alternatives screening?

Most of the options did not make it past the first screening level. As seen in the table below, alternatives that received a "No" answer to any of the three questions posed by the Level 1 screening review were deemed to be fatally flawed.

Alternatives	Meet Project Mission Statement	Feasible / Consistent Costs	Likely IJR / NEPA Approval
Alt. 1 – Baseline Local	No	No	Yes/No
Alt. 2 – Local Roadway Widening	No	No	Yes/No
Alt. 3 – New Local Roadways	No	No	Yes/No
Alt. 4 – All Local Network Improvements	No	No	Yes/No
Alt. 5 – Partial Clover Interchange at Rd 100	Yes	Yes	Yes/Yes
Alt. 6 – Partial Clover Interchange at Rd 68	Yes	Yes	Yes/Yes
Alt. 7 – New Off-Ramp at Rd 44	No	Yes	No/Yes
Alt. 8 – New Off-Ramp at Rd 60	No	Yes	No/Yes
Alt. 9 – New Foster Wells Interchange	Yes	Yes	Yes/Yes
Alt. 10 – Split Diamond Interchange at Rd 68	Yes	Yes	Yes/Yes
Alt. 11 & 12 – CRC Overcrossings	No	No	NA/No
Alt. 13 – New Ramps, Interchange at Rd 44/Argent	TBD	TBD	TBD

All alternatives that solely focused on local improvements were deemed to be flawed, answering the key question of the feasibility study. Additionally, alternatives that proposed access modifications to I-182 did show measurable mobility and congestion relief improvements. Therefore, the TAC recommended those options (shown on the next page), as well as others be studied in more detail.



What happens with the alternative designs now?

Following the process outline recommended for this project and demonstrating that local alternatives alone will not improve current and future congestion, the City will study these remaining alternatives in more detail.

Agencies selected the following for future study:

- Alternative 5 – Road 100 Interchange Improvements, Additional Loop Ramps
- Alternative 6 – Road 68 Interchange Improvements, Full Clover
- Alternative 10 – Split Diamond Interchange

These alternatives are shown in detail on the following page.