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WATER TRANSMISSION INFRASTRUCTURE IMPROVEMENTS PLAN

Water Transmission Impact Fee Methodology

The steps to calculate the Water Transmission Impact Fee can be summarized as follows:

- Determine the need for water transmission facilities necessary to serve new development anticipated during the period of 2025 – 35. The Land Use Assumptions used for the Water Transmission IIP provide a forecast of new development by land use type, location, and relative timing (see supplemental report: *Growth Projections and Land Use Assumptions 2024 Update*, Applied Economics, July 12, 2024).

- Land Use Assumptions are translated to water demand (volume) to inform network capacity and specific facility size requirements. The Water Services Department retained Keen Independent Research to update water demand estimates and calculate Equivalent Demand Units (EDUs) for 'planning' purposes (see supplemental report: *City of Phoenix 2024 Equivalent Demand Unit Study Final Report*, Keen Independent Research LLC, March 2024).

- The WSD Water System Modeling Team uses the land use and water demand forecasts to identify the transmission facilities that are needed during the 10-year infrastructure planning horizon.

- Existing and planned water transmission facility costs are based on the current cost of construction, using generic infrastructure types and quantities (See supplemental report: *Water and Wastewater Unit Cost Study*, Carollo Engineers, June 2024).

- For each impact fee service area, the existing and planned water transmission facility costs, less the amount of any uncommitted existing fund balances, is divided by the total EDUs expected at the end of the 10-year infrastructure planning horizon. This method provides a hybrid 'buy-in, plus 10-year' plan-based cost per EDU.

- As an alternative to estimating system capacity utilization, the city calculates a 'buildout' cost per EDU, or the cost of all water transmission facilities divided by the total EDUs at buildout. This method controls for cost variability attributed to a specific planning horizon and serves as a check to avoid over-burdening one cohort of new development in favor of another. The lesser of the 'buy-in, plus 10-year' and 'buildout' cost per EDU is selected as the potential water transmission gross impact fee.

- An analysis of the existing fund balance is performed to determine the amount, if any, that needs to be applied toward the 10-Year Plan. Any portion of the existing fund balance that is needed or reserved for current service deficiencies or earmarked in the city's approved CIP for an impact fee eligible facility that is not included in the proposed fee update, is not applied to the 10-Year Plan. Any fund balance that does not meet that criteria is divided by the 10-Year EDU to determine the fund balance adjustment (see supplemental report: *2025 Development Impact Fee Update, Draft Fund Balance Adjustment Report, September 2024*, or as amended).

- Alternative revenue offsets are calculated and applied for water rate revenue that is applied toward facilities provided through the water transmission impact fee program. This includes water rate revenue to pay outstanding debt service. The offset per EDU is calculated by dividing the existing debt service by citywide EDUs. Arizona impact fee rules require cities to forecast the alternative revenue generated by new development over the 10-year infrastructure planning horizon. This is done by multiplying the water rate offset per EDU by the anticipated 10-year EDUs in each designated impact fee service area (see supplemental report: *2025 Development Impact Fee Update, Draft Alternative Revenue Offsets Report*, September 2024, or as amended).

- Elimination of the existing Water Development Occupational Fee (DOF) will be proposed in-conjunction with the citywide water treatment impact fee. If approved this will also eliminate the offset that is currently applied for DOF charges.

- The resulting 'net' impact fee per EDU is assessed to all new services connections within the designated impact fee service areas that will place demand on the city's water transmission systems.

LEVEL OF SERVICE (LOS)

Definitions of level of service associated with water services are difficult to summarize because of the numerous metrics used to evaluate potable water treatment and transmission. Once the city legally accepts the transfer of water facilities from a developer, the city is obligated to meet all state and federal regulatory requirements and strives to always provide reliable and high-quality water services to all customers. The city also endeavors to meet a wide range of standards that are not legally required, but which it seeks to attain. For example, the Water Services Department has the following types of objectives that must be considered as being part of the level of service for water transmission:

- Water pressure (normal demand). The city maintains water pressures needed for typical uses and standard plumbing fixtures, which can routinely vary between 40 and 100 pounds per square inch (PSI), depending on the location within any of the City's 26 different water pressure zones.

- Water pressure (emergency demand) and associated water volumes. The city maintains adequate emergency water pressures and volumes during fire events, which can go as high as 3,000 gallons per minute (GPM) at fire-fighting incidents involving commercial or industrial structures.

- Uninterrupted water services. The city maintains system-wide water pressures and volumes at adequate levels during inevitable transmission and transmission line breaks and equipment failures or replacement.

- Water quality standards: water chemistry. The City achieves or exceeds minimum federal and state water quality standards in terms of water chemistry (usually measured in the form of dissolved salts, metals, or organic material at the point of discharge from a treatment plant, of which the City has five).

- Water quality standards: diseases and pathogens. The City also achieves or exceeds minimum water quality standards in terms of the presence of disease and pathogens that are a threat to customers, measured both at the treatment plants and throughout the transmission and transmission network.

- Water quality standards: treatment residuals. The City also achieves or exceeds minimum water quality standards in terms of chlorine residuals and other potentially dangerous compounds that are formed in the transmission and transmission network after water has left treatment plants.

While there are many different parameters that dictate the specific sizes, quantities, and locations of various types of facilities needed in the city's two Water Transmission Impact Fee Service Areas, the assumptions used to establish the proportionate amount of infrastructure required to serve an EDU are summarized below. Additional detail can be found in supplemental report: *City of Phoenix 2024 Equivalent Demand Unit Study Final Report*, Keen Independent Research LLC, March 2024):

Table WT.1 – Water Demand Assumptions and Planning EDU Factors

Land Use	Gal/Unit/Day	EDU Factor
Single-Family	289	**1.00**
Multifamily	162	**0.56**
Retail	52	**0.47**
Office	28	**0.25**
Industrial	57	**0.51**
Public	41	**0.37**
Other/Institutional	59	**0.53**

WATER TRANSMISSION IMPACT FEE SERVICE AREAS

(see supplemental report: Map #4, *Impact Fee Service Area Maps*, July 17, 2024 or as amended)

- Northern (Northwest, Deer Valley, Northeast, Paradise Ridge)
- Southern (Estrella N, Estrella S, Laveen W, Laveen E, Ahwatukee)

LAND USE ASSUMPTIONS

The following tables display the forecasted water transmission 'planning' EDUs for the required geographic areas and time periods.

Table Source Data and Calculation:

- Unit Counts are listed in the Land Use Assumptions Report and come from the Applied Economics study. They represent the amount of growth in housing units or 1,000 square feet of non-residential construction in an impact fee area (see supplemental report: *Growth Projections and Land Use Assumptions 2024 Update*, Applied Economics, July 12, 2024).

- The 'planning' EDU factors come from the Keen Independent study. EDU factors convert dwelling units and non-residential floor area to units equivalent to the average water demand of a single family home (see supplemental report: *City of Phoenix 2024 Equivalent Demand Unit Study Final Report*, Keen Independent Research LLC, March 2024).

- The number of EDUs is calculated by multiplying development units (dwellings and non-residential floor area) from the Applied Economics' study by the 'planning' EDU Factors from the Keen Independent Research study.

Table WT.2 – Northern Impact Fee Service Area, Equivalent Demand Units

	SF	MF	Retail	Office	Industrial	Public	Other	Total
Planning EDU Factor	*1.00*	*0.56*	*0.47*	*0.25*	*0.51*	*0.37*	*0.53*	
Estimate Year	35,505	8,664	2,724	758	2,787	1,345	2,121	53,904
10-Year Growth	17,060	6,554	901	1,248	2,494	349	481	29,087
End of Planning Horizon	52,565	15,219	3,625	2,006	5,281	1,694	2,603	82,993
End of Forecast Horizon	90,197	26,948	6,239	7,380	12,357	2,733	3,288	149,142
Buildout	126,894	32,936	10,554	11,190	23,755	3,136	3,508	211,973

Table WT.3 – Southern Impact Fee Service Area, Equivalent Demand Units

	SF	MF	Retail	Office	Industrial	Public	Other	Total
Planning EDU Factor	*1.00*	*0.56*	*0.47*	*0.25*	*0.51*	*0.37*	*0.53*	
Estimate Year	71,624	7,477	4,620	443	34,228	2,661	896	121,949
10-Year Growth	9,675	3,168	733	93	5,483	129	533	19,814
End of Planning Horizon	81,299	10,644	5,353	536	39,711	2,790	1,429	141,762
End of Forecast Horizon	86,778	12,060	6,293	858	43,665	2,930	1,700	154,284
Buildout	86,908	12,060	6,677	1,002	43,902	3,027	2,011	155,587

WATER TRANSMISSION UNIT COST

Tables WT.4 and WT.5 provide the estimated current cost of construction for existing, ultimate 'build-out' and 10-year planned water transmission improvements that are included in the impact fee program for both service areas. The cost estimates shown are based on the Carollo Engineers' unit cost study. For a detailed breakdown of unit cost estimates, see supplemental report: *Water and Wastewater Unit Cost Study*, Carollo Engineers, June 2024.

Table WT.4 – Northern Impact Fee Service Area, Existing and Planned Facility Cost

Type of Facility	Cost
Existing Transmission Mains	$1,112,602,875
Existing Booster Stations	$213,161,250
Existing Pressure Reducing Stations	$126,430,000
Existing Storage	$204,257,474
Existing Wells	$65,674,250
Total Existing	**$1,722,125,849**
Ultimate Transmission Mains	$766,252,500
Ultimate Booster Stations	$60,687,500
Ultimate Pressure Reducing Stations	$23,029,916
Ultimate Storage	$46,215,000
Ultimate Wells	$121,273,750
Total Ultimate*	**$1,017,458,666**
10-Yr Transmission Mains	$351,021,250
10-Yr Booster Stations	$9,063,750
10-Yr Pressure Reducing Stations	$12,530,666
10-Yr Storage	$29,911,250
10-Yr Wells	$121,273,750
Total 10-Yr	**$523,800,666**

Table WT.5 – Southern Impact Fee Service Area, Existing and Planned Facility Cost

Type of Facility	Cost
Existing Transmission Mains	$987,144,563
Existing Booster Stations	$101,247,500
Existing Pressure Reducing Station	$48,516,250
Existing Storage	$157,690,499
Total Existing	**$1,294,598,812**
Ultimate Transmission Mains	$35,815,625
Ultimate Booster Stations	$0
Ultimate Pressure Reducing Station	$4,735,000
Ultimate Storage	$0
Total Ultimate*	**$40,550,625**
10-Yr Transmission Mains	$35,815,625
10-Yr Booster Stations	$0
10-Yr Pressure Reducing Station	$4,735,000
10-Yr Storage	$0
Total 10-Yr	**$40,550,625**

HYBRID 'BUY-IN, PLUS 10-YEAR PLAN' COST PER EDU

Tables WT.6 and WT.7 provide the total infrastructure improvement plan cost per EDU using the 'buy-in, plus 10-year plan' method. Under this approach, the total cost of construction for all existing water transmission improvements, and the cost of planned improvements for the next 10 years is divided by the total EDUs (existing and 10-year forecast) at the end of the infrastructure planning horizon. These cost estimates are based on the Carollo unit cost study, but include an escalation adjustment of 3% over 4 years. The escalation adjustment is incorporated as a proxy for to convert the cost estimate to January 2028 dollars, or the approximate mid-point before the next IIP update.

Table WT.6 – Northern Impact Fee Service Area, 'Buy-In, Plus 10-Year' Plan Cost per EDU

Type of Facility	Cost
Cost of Existing & 10-Yr Plan Water Mains	$1,463,624,125
Cost of Existing & 10-Yr Plan Booster Stations	$222,225,000
Cost of Existing & 10-Yr Plan Pressure Reducing Stations	$138,960,666
Cost of Existing & 10-Yr Plan Water Storage Facilities	$234,168,724
Cost of Existing & 10- Yr Plan Wells	$186,948,000
Total Existing and 10-Yr Plan Facilities	**$2,245,926,515**
Escalation Factor (4 yrs @ 3%)	*1.1255*
Adjusted Buy-In + 10-Yr Plan Cost	**$2,527,790,292**
End of Planning Horizon EDUs	*82,993*
Cost per EDU	**$30,458**

Table WT.7 – Southern Impact Fee Service Area, 'Buy-In, Plus 10-Year' Plan Cost per EDU

Type of Facility	Cost
Cost of Existing & 10-Yr Plan Water Mains	$1,022,960,188
Cost of Existing & 10-Yr Plan Booster Stations	$101,247,500
Cost of Existing & 10-Yr Plan Pressure Reducing Stations	$53,251,250
Cost of Existing & 10-Yr Plan Water Storage Facilities	$157,690,499
Total Existing and 10-Yr Plan Facilities	**$1,335,149,437**
Escalation Factor (4 yrs @ 3%)	*1.1255*
Adjusted Buy-In + 10 Year Plan Cost	**$1,502,710,691**
End of Planning Horizon EDUs	*141,762*
Cost per EDU	**$10,600**

ULTIMATE 'BUILDOUT PLAN' COST PER EDU

Tables WT.8 and WT.9 provide the total infrastructure improvement plan cost per EDU using the 'buildout plan' method. This approach divides the current construction cost (adjusted to 2028 dollars) of all water transmission improvements through buildout, by the total anticipated EDUs at buildout. If the cost per EDU over a 10-year planning period is greater than the buildout cost per EDU, that may indicate that development in the 10-year planning period is subject to a disproportionate share of system expansion. This may also reflect growth forecasts that require major upfront infrastructure investments, opposed to growth forecasts that can be supported by incremental expansion of existing networks.

Table WT.8 – Northern Impact Fee Service Area, Ultimate 'Buildout' Plan Cost per EDU

Type of Facility	Cost
Cost of Ultimate Planned Water Mains	$1,878,855,375
Cost of Ultimate Planned Booster Stations	$273,848,750
Cost of Ultimate Planned Pressure Reducing Stations	$149,459,916
Cost of Ultimate Planned Water Storage Facilities	$250,472,474
Cost of Ultimate Planned Water Wells	$186,948,000
Total Existing and 10-Yr Plan Facilities	**$2,739,584,515**
Escalation Factor (4 yrs @ 3%)	*1.1255*
Adjusted Ultimate Plan Cost	**$3,083,402,371**
Buildout EDU	*211,973*
Cost per EDU	**$14,546**

Table WT.9 – Southern Impact Fee Service Area, Ultimate 'Buildout' Plan Cost per EDU

Type of Facility	Cost
Cost of Ultimate Planned Water Mains	$1,022,960,188
Cost of Ultimate Planned Booster Stations	$101,247,500
Cost of Ultimate Planned Pressure Reducing Stations	$53,251,250
Cost of Ultimate Planned Water Storage Facilities	$157,690,499
Total Existing and 10-Yr Plan Facilities	**$1,335,149,437**
Escalation Factor (4 yrs @ 3%)	*1.1255*
Adjusted Ultimate Plan Cost	**$1,502,710,691**
Buildout EDU	*155,587*
Cost per EDU	**$9,658**

POTENTIAL CAPITAL COST PER EDU

The potential water transmission capital cost per EDU is the lesser of the 'Buy-in Plus 10-Year Plan' cost per EDU and the 'Buildout Plan' cost per EDU. Using the 'Buildout Plan' as an alternative to estimating system capacity utilization.

Table WT.10 – Northern Impact Fee Service Area, Potential Capital Cost per EDU

Water Plan-Based Fee Method	Cost per EDU
Buy-In + 10-Year Plan	$30,458
Ultimate 'Buildout' Plan	$14,546
Potential Capital Cost per EDU	**$14,546**

Table WT.11 – Southern Impact Fee Service Area, Potential Capital Cost per EDU

Water Plan-Based Fee Method	Cost per EDU
Buy-In + 10-Year Plan	$10,600
Ultimate 'Buildout' Plan	$9,658
Potential Capital Cost per EDU	**$9,658**

Since the potential capital cost per EDU under the 'Buildout Plan' method would result in revenue that exceeds the total 10-Year Plan Cost, and there is no outstanding debt attributed to water transmission improvements in the Southern Impact Fee Service Area, it is necessary to adjust the cost per EDU not to exceed the total 10-Year Plan Cost. In other words, the potential capital cost needs to be capped at the Total 10-Year Plan Cost, divided by the 10-Year EDUs as shown in Table WT.12 below.

Table WT.12 – Southern Impact Fee Service Area, Adjusted Potential Gross Fee

Type of Facility	Quantify	Size	Cost
10-Yr Transmission Mains	8 miles	16-24 "	
10-Yr Booster Stations	0 each	5.0 MGD	
10-Yr Pressure Reducing Station	2 each	2.5 – 3 MGD	
10-Yr Storage	0 each	0.3 – 5.0 MG	
Total 10-Year Plan Facility Cost			**40,550,625**
Escalation Factor (4 years @ 3%)			*1.1255*
Adjusted 10-Year Plan Facility Cost			**45,639,728**
10-Year Growth EDUs			19,814
Cost per EDU			**2,303**

FUND BALANCE ADJUSTMENT AND GROSS FEE PER EDU

The potential capital cost per EDU from Tables WT.10 and WT.12 is adjusted by the qualifying fund balance to determine the Gross Fee per EDU. The fund balance adjustment calculation can be found in supplemental Report: *2025 Development Impact Fee Update, Preliminary Fund Balance Report*, November 2024, or as amended.

Table WT.13 – Water Transmission, Potential Gross Impact Fee per EDU

Water Transmission Impact Fee Service Area	*($ per EDU)* Capital Cost	Fund Balance[1]	Gross Fee
Northern	14,546	355	**14,191**
Southern	2,303	464	**1,838**

POTENTIAL NET IMPACT FEE

The potential net fee per EDU is calculated by subtracting any offset amounts from the potential gross fees from Tables WT.13. For a detailed breakdown of water transmission offsets, see supplemental report: *2025 Development Impact Fee Update, Draft Alternative Revenue Offsets Report*, November 2024, or as amended.

Table WT.14 – Water Transmission, Potential Net Impact Fee per EDU

Water Transmission	*($ per EDU)*			
Impact Fee Service Area	**Gross Fee**	**Debt Offset**	**DOF Offset[1]**	**Net Fee**
Northern	14,191	251	0	**13,940**
Southern	1,839	251	0	**1,588**

1) DOF Offset of $0 is subject to Council approval of eliminating the DOF. If the DOF remains in-place the offset amount will be updated accordingly,

SUMMARY OF PLANNED IMPROVEMENTS

A.R.S. 9-463.05 requires that impact fees collected must be spent on either 1) new projects that serve new development, or 2) to repay debt (interest and principal) incurred to fund the construction of projects that serve new development. It should be noted that A.R.S. 9-463.05 (and impact fee common law) also prohibit impact fee revenues from being spent on operations, maintenance, repair, rehabilitation, environmental or other non-capital expenditures.

For the purpose of this analysis, the following assumptions have been made:

- All forecasted EDUs will be developed in the ten-year planning period 2025-2035, and that all EDUs will pay net fees that are consistent with single family dwellings.
- All future water transmission facilities will be built within the ten-year planning period 2025-2035.

A summary of the planned improvements and costs for the ten-year planning period 2025-2035 for the impact fee service areas are shown in the following tables. The tables provide a summary of planned facilities that are eligible to be funded with water transmission impact fee collections, as calculated within this Chapter.

Table WT.15 – Northern Area Water Transmission Planned Improvements

Type of Facility	Quantify		Size		Amount
10-Yr Transmission Mains	40	miles	16 - 54	in.	
10-Yr Booster Stations	1	ea.	5	MGD	
10-Yr Pressure Reducing Station	3	ea.	5 - 32	MGD	
10-Yr Storage	3	ea.	.3 - 5	MG	
10-Yr Wells	10	ea.	2 - 3.6	MGD	
Combined 10-Year Improvement Cost ($MM)					**$523.8**
Escalation Factor (4 yrs @ 3%)					*1.1255*
10-Year Plan Cost ($MM)					$589.5
Debt Service ($MM)					$58.8
Total Cost ($MM)					**$648.3**
Net 10-Year Impact Fee Revenue ($MM)					($412.8)
Alternative Revenue ($MM)					($7,3)
Fund Balance ($MM)					($10.3)
Borrowing Requirement for Future Development					**$217.9**

Table WT.16 – Southern Area Water Transmission Planned Improvements

Type of Facility	Quantify		Size		Cost
10-Yr Transmission Mains	8	miles	16 - 24	in.	
10-Yr Booster Stations	0	ea.	5	MGD	
10-Yr Pressure Reducing Station	2	ea.	2.5 - 3	MGD	
10-Yr Storage	0	ea.	.3 - 5	MG	
Combined 10-Year Plan Cost ($MM)					**$40.6**
Escalation Factor (4 yrs @ 3%)					*1.1255*
Total 10-Year Plan Cost ($MM)					$45.6
Debt Service ($MM)					$100.2
Total Cost ($MM)					**$145.8**
Anticipated 10-Year Impact Fee Revenue ($MM)					($36.4)
Anticipated Alternative Revenue ($MM)					($5.0)
Fund Balance ($MM)					($9.2)
Borrowing Requirement for Future Development					**$95.2**