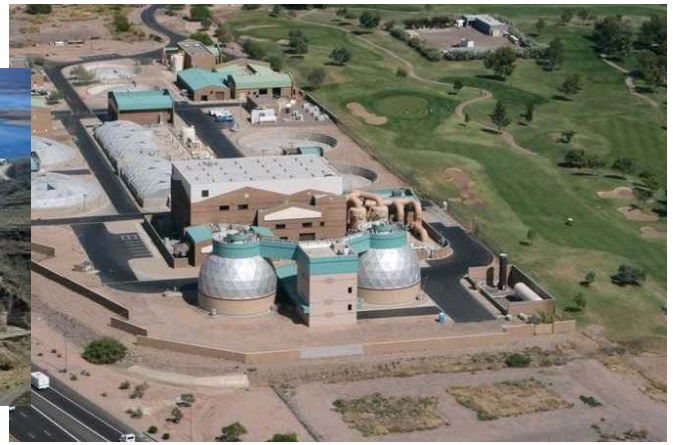
Everest Holdings

PHOENIX METRO AREA INFRASTRUCTURE





THE UNSEEN CITY

The June 2014 issue of FutureStructure included an article, The Unseen City, by Wellington E. Webb (former Mayor or Denver). Webb describes how the FutureStructure is dependent on three primary factors:

Soft Infrastructure -planning, regulations, laws, policies, human capital, research and inspiration

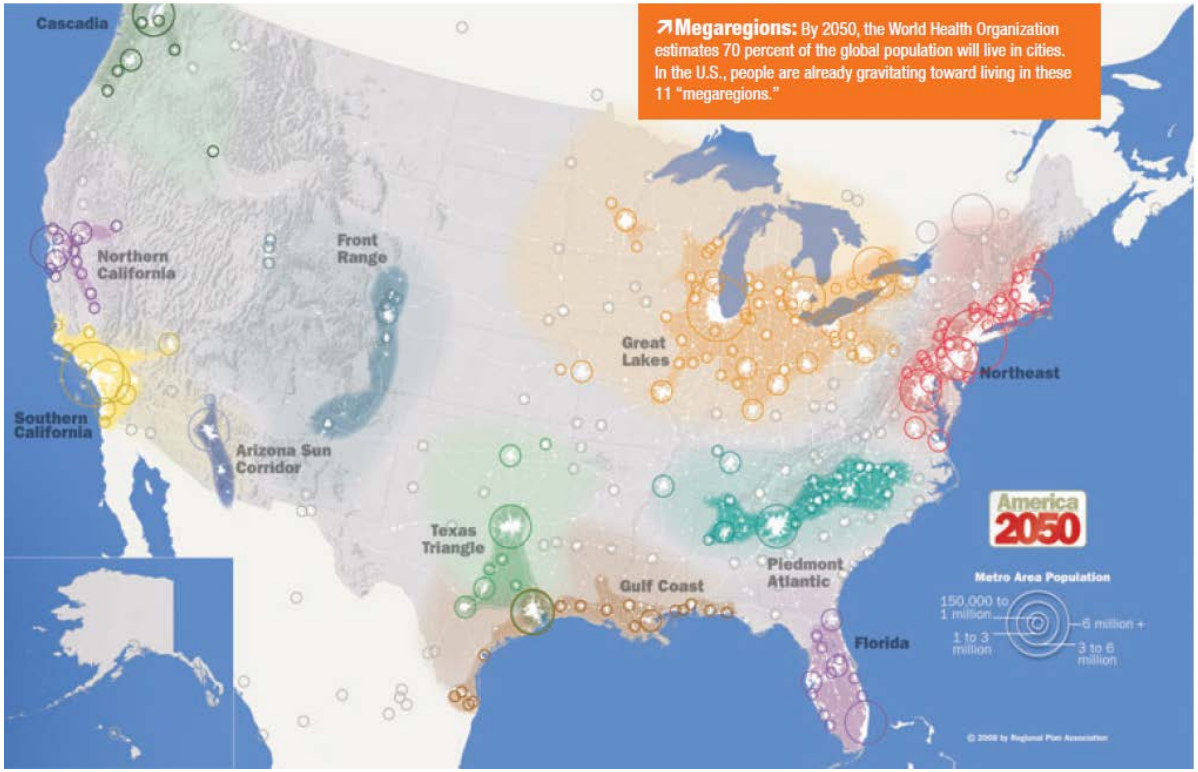
Hard Infrastructure-the built/planned roads, utilities, energy, water, buildings, bridges and rails

Technology-Connecting the hard and soft infrastructure

THE UNSEEN CITY

According to Webb's article,

- "The 19th century was a century of empires. The 20th century was a century of nation states. The 21st century will be a century of cities"
- "In 1950, there were 83 cities with populations exceeding 1 million people; by 2007, this number had risen to 468. And by 2050, the World Health Organization estimates 70 percent of the global population will live in cities."

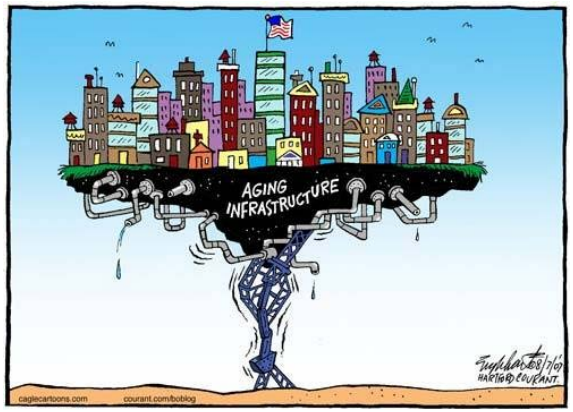


PHOENIX METRO AREA INFRASTRUCTURE

This presentation will focus on the Phoenix metro area's hard infrastructure including roadways, water and sewer including current facilities and future expansion

PHOENIX METRO AREA INFRASTRUCTURE

HOW TO CREATE THE INFRASTRUCTURE FOR PHOENIX METRO'S POPULATION GROWTH



Phoenix metro historical population

Year	Population	% change
1960	726,183	
1970	1,039,807	43.2%
1980	1,599,970	53.9%
1990	2,238,480	39.9%
2000	3,251,876	45.3%
2010	4,192,887	28.9%
2020	5-5.5Million (estimated)	
2030	6-6.5 Million (estimated)	

PHOENIX METRO AREA INFRASTRUCTURE

1903 (formed Salt River Water Users Assoc.)

1922

1927

1946 (constructed 1973-93)

Soft infrastructure is composed of planning, rules, laws, etc… that afford the exponential growth in the Phoenix metro area

1993

1980

1967

PHOENIX METRO AREA INFRASTRUCTURE

HOW DOES THIS RELATE TO US?

WHEN LOOKING AT RAW LAND…NEED TO FACTOR IN

- **DOES IT FIT WITHIN THE EXISTING INFRASTRUCTURE**

- **BUILD NEW INFRASTRUCTURE**

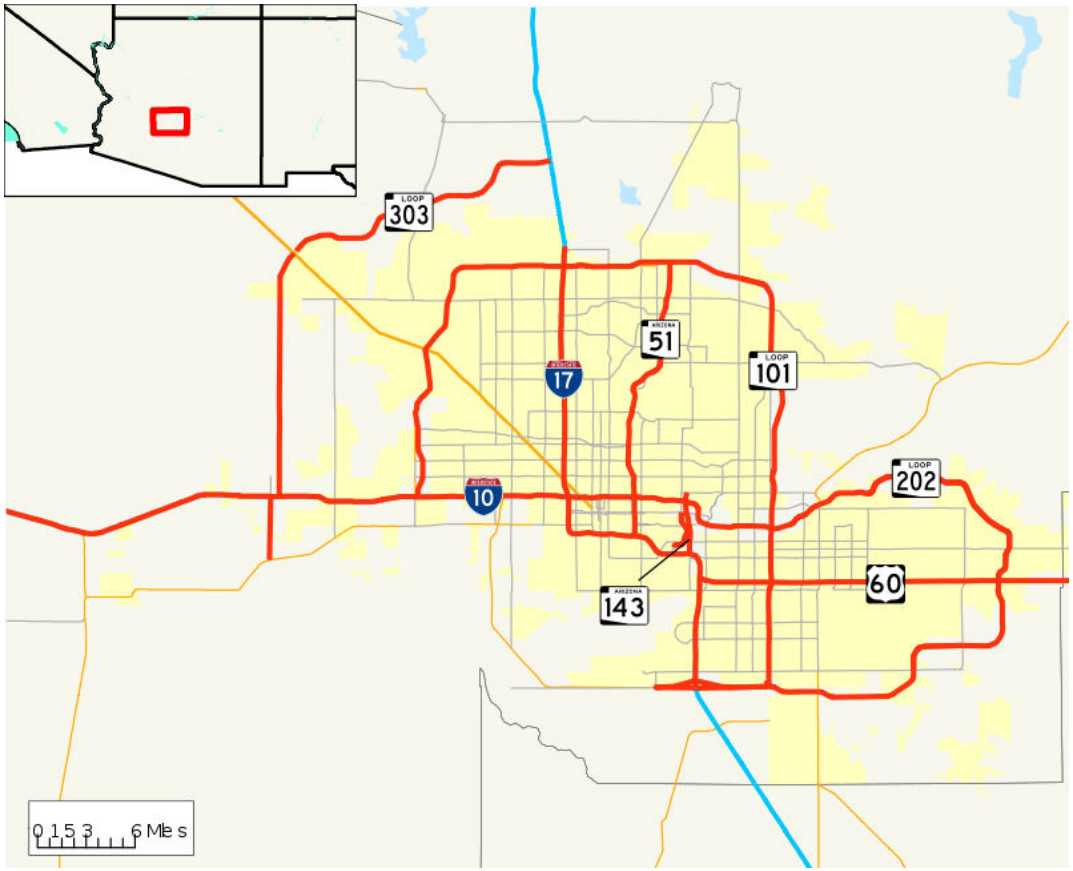
  OR

- **LET THE INFRASTRUCTURE COME TO YOU**

PHOENIX METRO AREA INFRASTRUCTURE

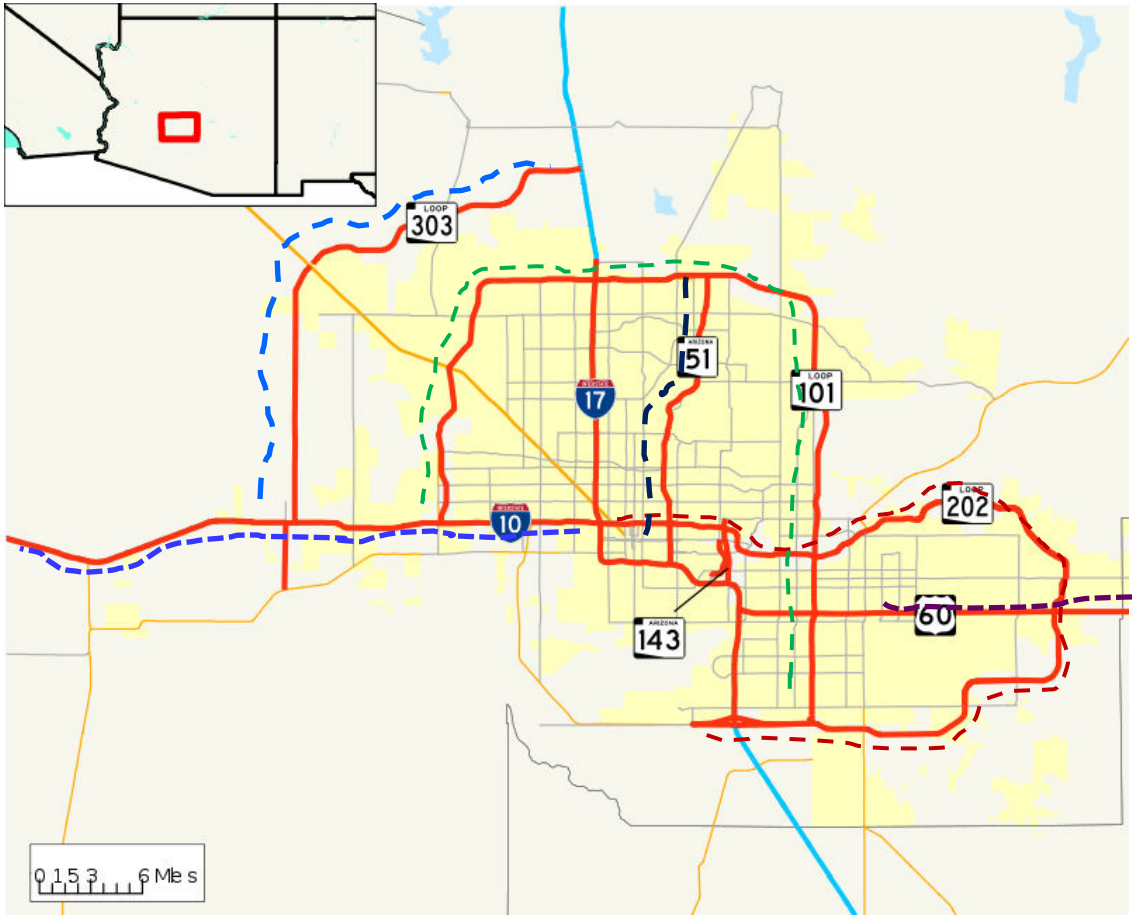
ROADWAYS

PHOENIX METRO AREA ROADWAYS



Current Phoenix highway system

PHOENIX METRO ROADWAYS



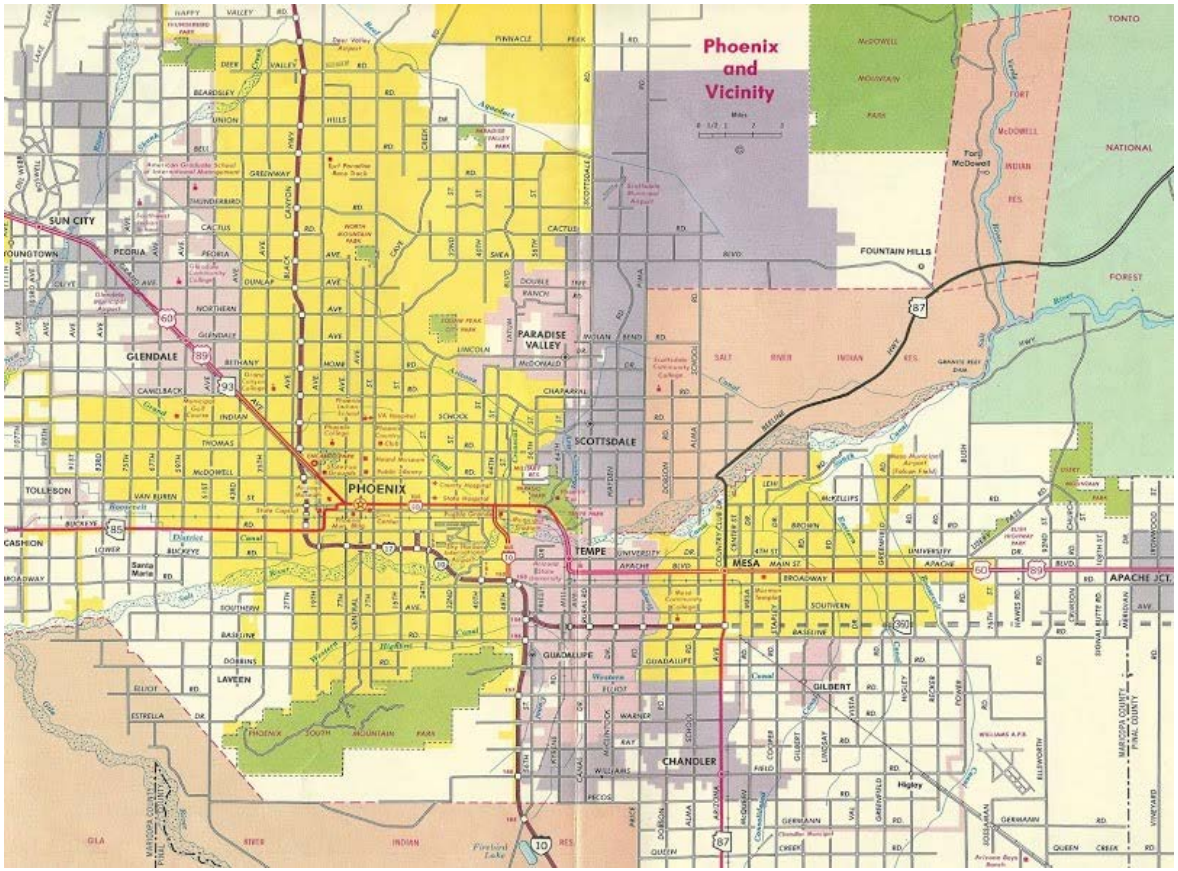
Highways constructed in the last 30 years

PHOENIX METRO ROADWAYS

PHŒNIX, The county seat of Maricopa County, is situated in the Salt River Valley, 28 miles north of Maricopa Station, on the Southern Pacific Railroad. The town is embowered in shade trees and shrubbery, has streams of living water through every street, is surrounded by orchards, gardens and vineyards, and is one of the handsomest in the West. The streets face the cardinal points, are broad and spacious and lined with trees. The County Courthouse, in the center of a square and surrounded by trees, is a handsome two-story brick, surmounted by a tower. The School House is a large and commodious brick structure, of two stories, almost hidden in a cottonwood grove. The Methodists, Baptists and Catholics have tasteful places of worship. There are several large mercantile establishments, a steam flouring mill with daily capacity of 130 barrels, two ice factories and a planing mill. The Odd Fellows, Masons Workmen, Knights of Pythias, Good Templars and Chosen Friends have flourishing organizations. Two newspapers, the *Herald* and *Gazette*, have daily and weekly editions. The altitude is 1800 feet above the sea level and the climate is one of the healthiest in the world. Snow never falls and roses are in bloom in December. Phoenix is the center of an extensive and fertile valley almost 50 miles in length by 10 in width, and containing over 300,000 acres. Every variety of grain, grasses, fruits and vegetables give a prolific yield. For fruits, grape culture and wine making the soil and climate are especially adapted. Everything is grown by irrigation. Eight canals convey the water from the Salt River over the land. The Arizona canal is one of the largest works of the kind in the United States; it is over 40 miles in length, 36 feet wide on the bottom and 58 feet on top, is 7 feet deep and has a capacity of 46,000 miner's inches. It has reclaimed and made valuable over 100,000 acres of rich land. The office of the company is at Phoenix; the President is Hon. Clark Churchill and the Chief Engineer is Charles A. Marriner. The Territorial Insane Asylum is situated near the town, also the extensive and beautiful grounds of the Arizona Industrial exposition. The Normal school is situated nine miles up the river. A branch road from the Southern Pacific will be completed to Phoenix by January 1, 1886. The town is rapidly growing, and its charming situation will yet make it the leading city of Arizona. Population about 3,500

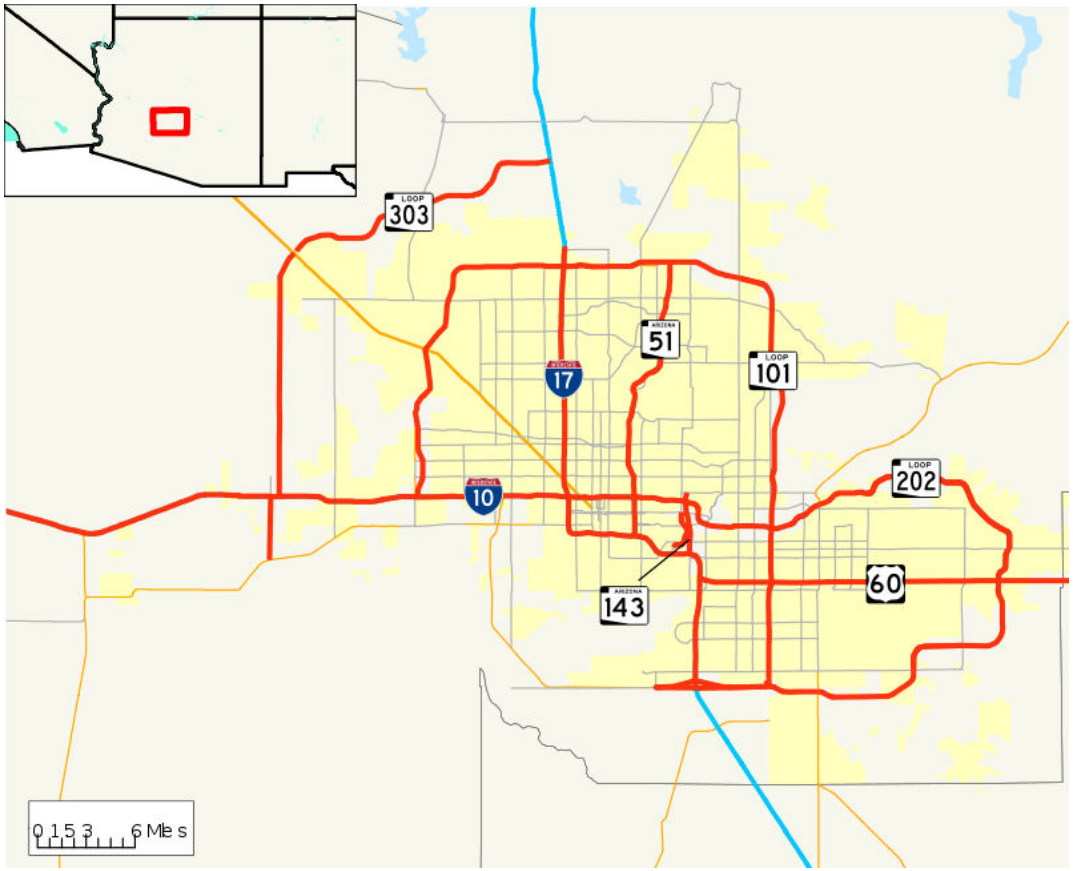
Phoenix roadway map in the 80's (1880's)

PHOENIX METRO ROADWAYS



Phoenix roadways early 1980's
(1985-only 70 freeway miles existed)

PHOENIX METRO AREA ROADWAYS

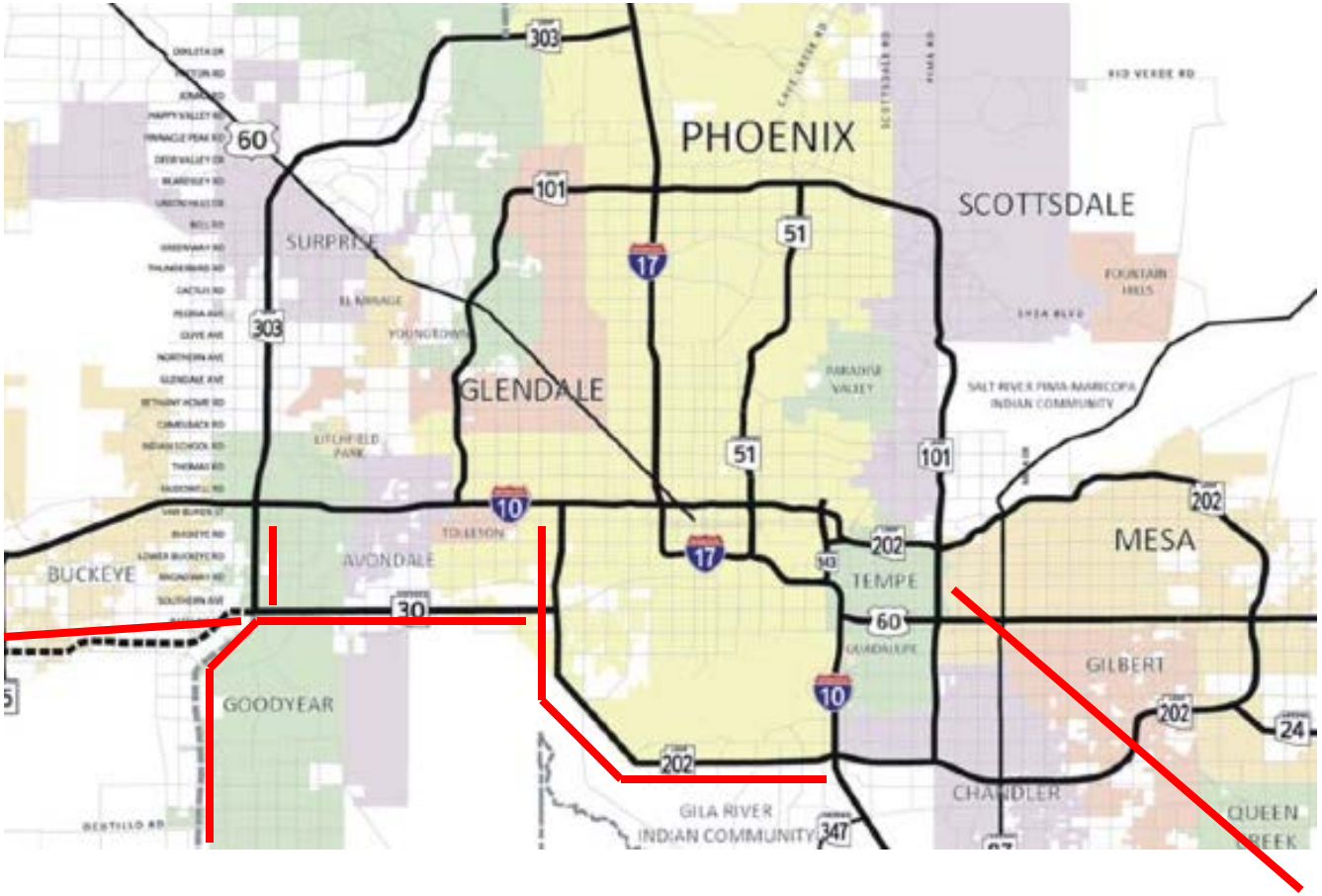


Current Phoenix highway system
(by 2006-161 freeway miles & growing)

PHOENIX METRO ROADWAYS

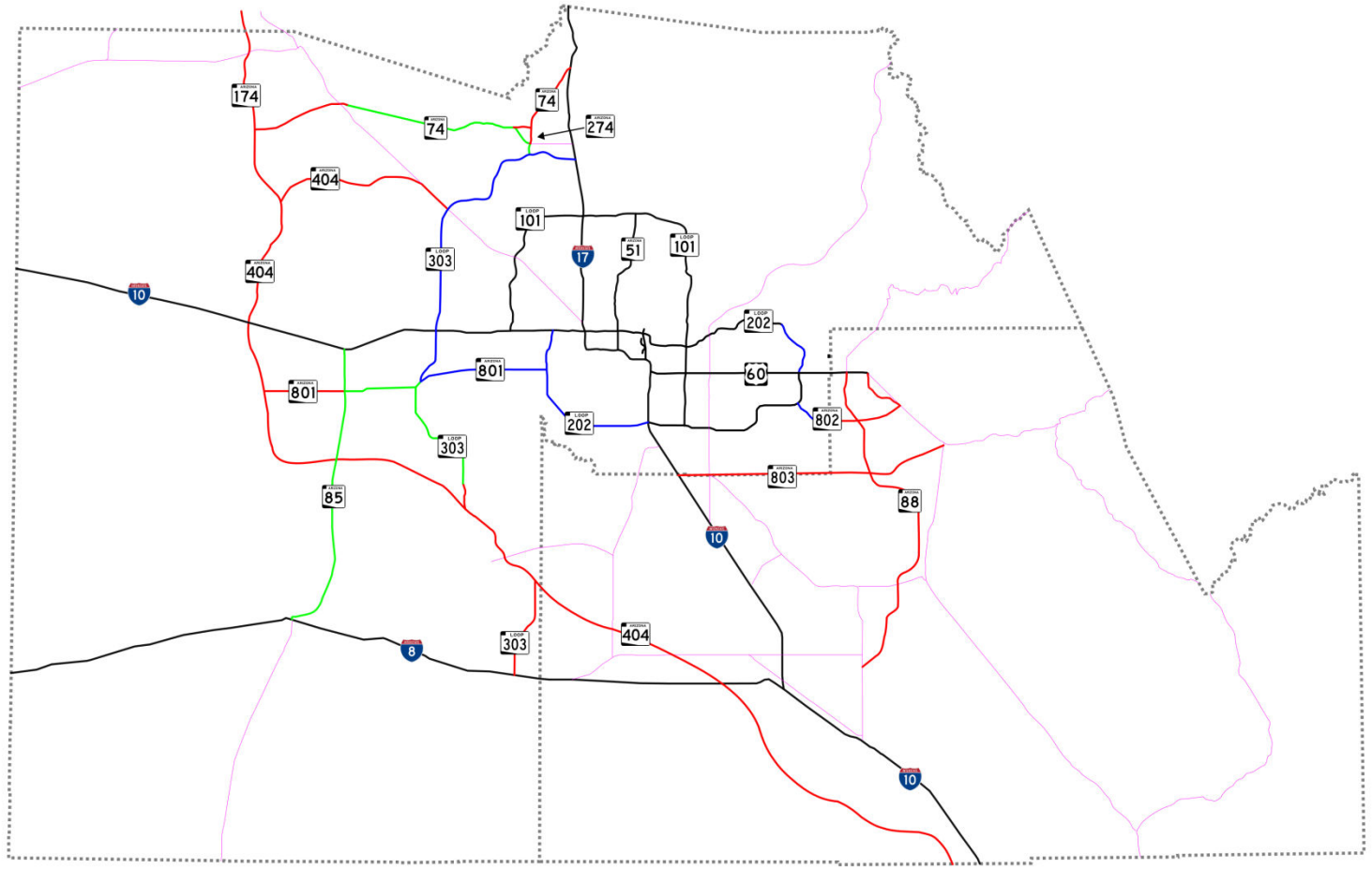
HOW DO WE EXPAND FOR FUTURE GROWTH?

PHOENIX METRO ROADWAYS

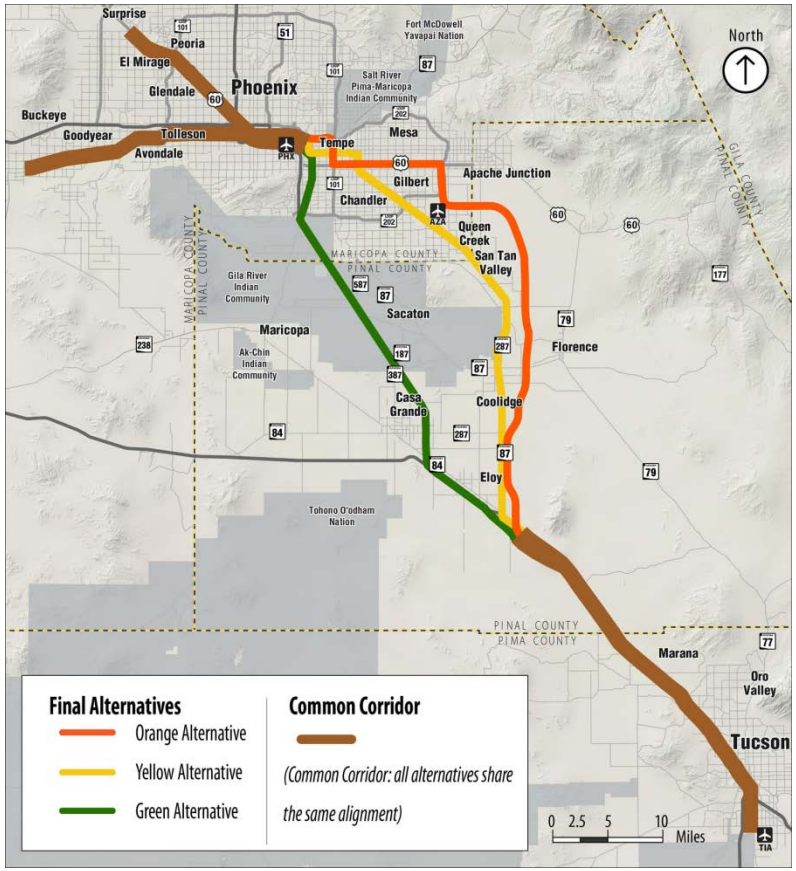


Proposed freeways

PHOENIX METRO ROADWAYS

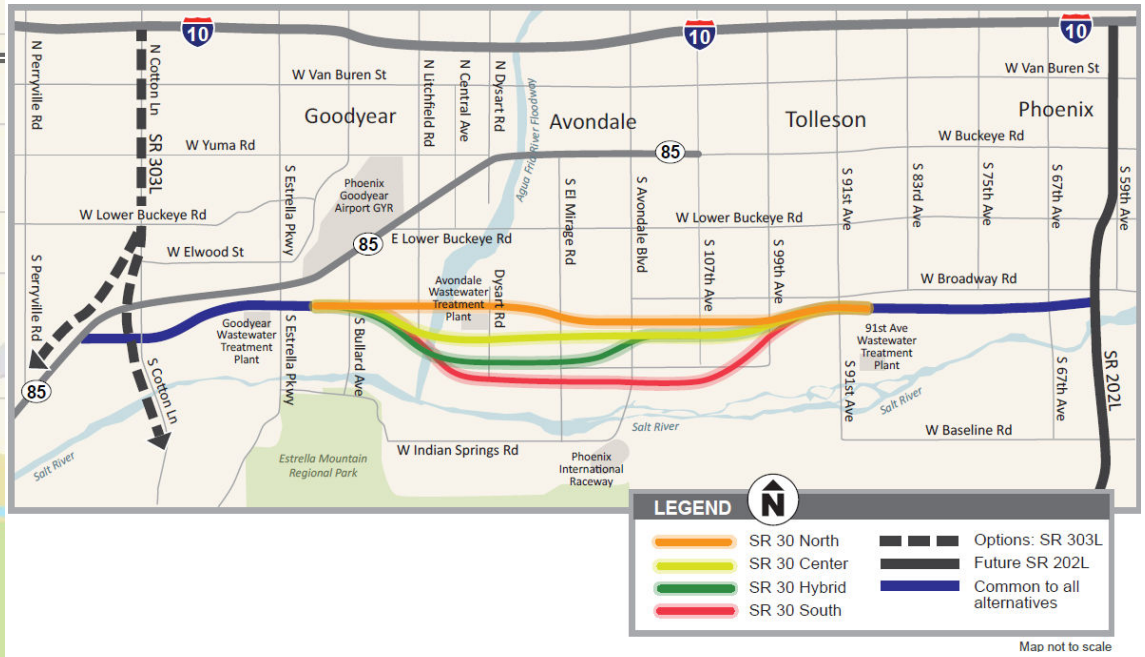


PHOENIX METRO ROADWAYS



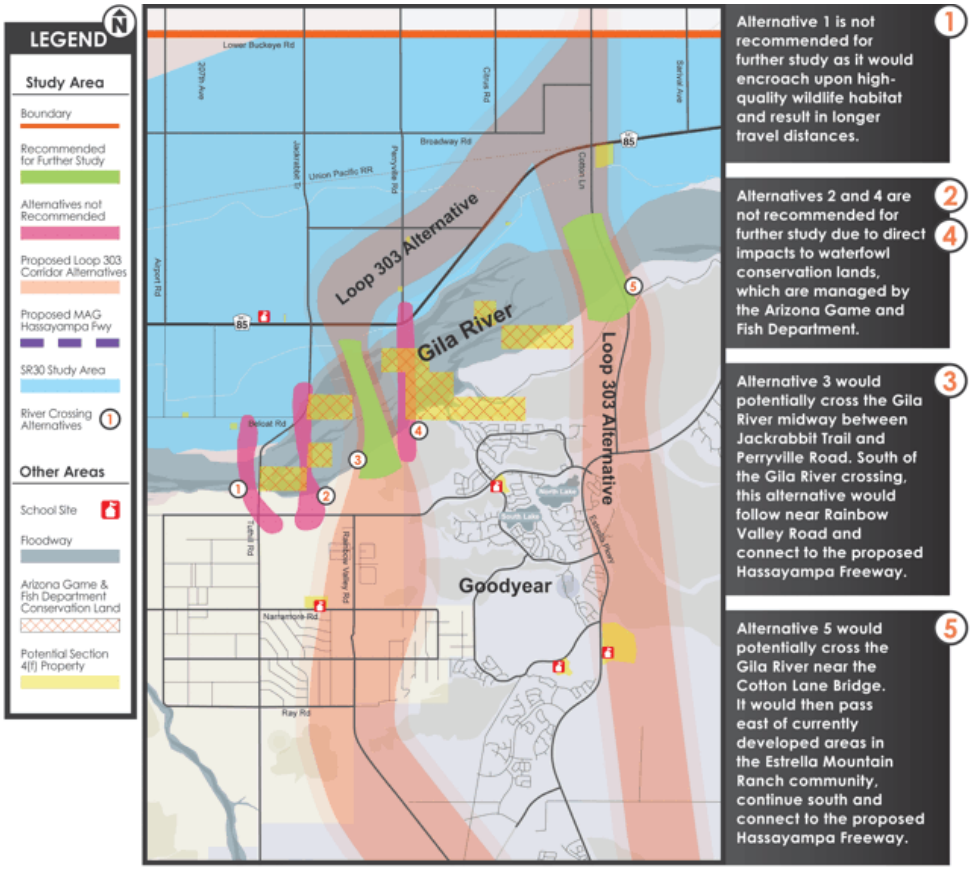
North-South Corridor (Tucson to Phoenix)

PHOENIX METRO ROADWAYS



Southwest Valley sections of Loop 303 & Highway 801/SR30

PHOENIX METRO ROADWAYS



Loop 303 continuing south

PHOENIX METRO ROADWAYS

I-11 freeway from Las Vegas-Phoenix-Mexico

PHOENIX METRO ROADWAYS

Summary of Dollars by Freeway (Cost in Thousands)

		2015	2016	2017	2018	2019	Total
RTPFP	I-10, PAPAGO	$8,900	$13,400	$0	$4,160	$0	$26,460
	I-10, MARICOPA	$0	$0	$11,700	$8,000	$176,800	$196,500
	US 60, GRAND AVENUE	$52,000	$0	$0	$0	$0	$52,000
	US 60, SUPERSTITION	$0	$1,900	$0	$0	$500	$2,400
	SR 85	$0	$5,300	$0	$0	$0	$5,300
	SR 101L, PIMA	$297	$3,634	$0	$0	$0	$3,931
	SR 202L, SANTAN	$500	$6,300	$5,120	$0	$0	$11,920
	SR 202L, SOUTH MOUNTAIN	$656,900	$235,500	$341,900	$386,440	$0	$1,620,740
	SR 303L, BOB STUMP MEMORIAL	$11,800	$66,000	$0	$4,160	$19,720	$101,680
	Total	$730,397	$332,034	$358,720	$402,760	$197,020	$2,020,931
SYSTEMWIDE	SYSTEMWIDE	$36,060	$35,660	$38,140	$35,140	$34,890	$179,890
	Total	$36,060	$35,660	$38,140	$35,140	$34,890	$179,890
Total		$766,457	$367,694	$396,860	$437,900	$231,910	$2,200,821

ADOT budgeted amounts 2015-2019

PHOENIX METRO ROADWAYS

A TRANSPORTATION PLAN FOR 2035

Table A-1: Potential New State Roads

County	Facility	From-To	Length (Miles)	Estimated Cost (2009 $Millions)	Lanes
Coconino	SR-89 Bypass	I-40 to north of Townsend-Winona Road.	3	$55	4
Maricopa	Hassayampa Freeway	White Tank Freeway to I-10 (Buckeye)	19	$861	6
Maricopa	Hassayampa Freeway	White Tank Freeway to US-93	35	$1,624	6
Maricopa	SR 202L (So. Mountain)	I-10 West to I-10 East	24	$1,920	8
Maricopa	SR 303L	SR 801 to I-17	39	$1,797	4
Maricopa	SR 303L	Hassayampa Fwy to SR 801	31	$691	4
Maricopa	SR 801	SR-303L to SR-202L (S Mountain)	14	$1,582	4
Maricopa	SR 801	SR-303L to SR-85	10		4
Maricopa	SR-74	US-60 to Hassayampa Freeway	45	$584	4
Maricopa	White Tank Freeway	Hassayampa Fwy to US-60/SR-303L	17	$931	6
Maricopa/Pinal	SR 802	SR-202L (Santan) to Pinal N-S FWY	9	$513	8
Mohave	SR 95 Bypass	I-40 – SR68	29	$888	4
Pima	SR 210 Extension	Palo Verde Rd to I-10	5	$409	4
Pinal	Montgomery Freeway	Hassayampa Fwy to I-8	10	$284	4
Pinal	Pinal N-S Corridor	US-60 to I-10	6.9	$365	8
Pinal	SR 238	Hassayampa Fwy to SR 347	15	$426	8
Pinal	SR 303S	Hassayampa Fwy to I-8	24	$337	6
Yavapai	Western Bypass	I-40-US-89	35	$1,079	4
Yavapai	Great Western Extension	SR 89A to SR-89 at Route 5	9	$216	4
Yavapai	Chino Valley Extension	Outer Loop Road to SR-89	11	$265	4
Yavapai	Fain Road Extension	SR-169 to Fain Road	24	$193	4
Yavapai	Fain Road Extension II	I-17 to Fain Road	8	150	4
Yuma	East Yuma Freeway	SR-195 – CA State Line	25	$619	4
TOTAL			448	$15,789	

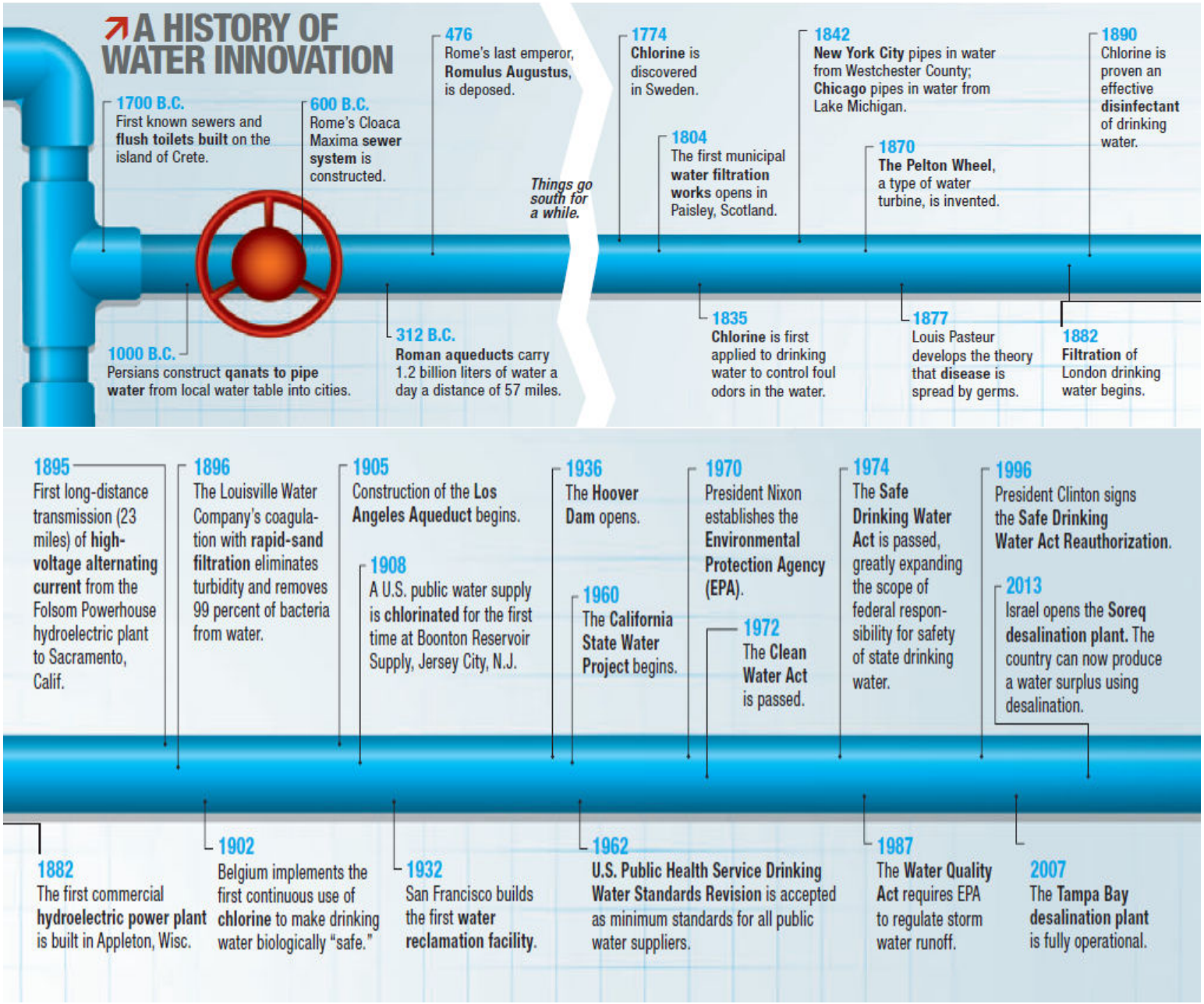
PHOENIX METRO WATER FACILITIES

PHOENIX METRO WATER FACILITIES

WE CURRENTLY HAVE ADEQUATE WATER

BUT

IS IT EXTENDED TO THE OUTLYING AREAS


A HISTORY OF WATER INNOVATION
1700 B.C.
First known sewers and flush toilets built on the island of Crete.
600 B.C.
Rome's Cloaca Maxima sewer system is constructed.
476
Rome's last emperor, Romulus Augustus, is deposed.
Things go south for a while.
1774
Chlorine is discovered in Sweden.
1804
The first municipal water filtration works opens in Paisley, Scotland.
1842
New York City pipes in water from Westchester County; Chicago pipes in water from Lake Michigan.
1870
The Pelton Wheel, a type of water turbine, is invented.
1890
Chlorine is proven an effective disinfectant of drinking water.
1000 B.C.
Persians construct qanats to pipe water from local water table into cities.
312 B.C.
Roman aqueducts carry 1.2 billion liters of water a day a distance of 57 miles.
1835
Chlorine is first applied to drinking water to control foul odors in the water.
1877
Louis Pasteur develops the theory that disease is spread by germs.
1882
Filtration of London drinking water begins.
1895
First long-distance transmission (23 miles) of high-voltage alternating current from the Folsom Powerhouse hydroelectric plant to Sacramento, Calif.
1896
The Louisville Water Company's coagulation with rapid-sand filtration eliminates turbidity and removes 99 percent of bacteria from water.
1905
Construction of the Los Angeles Aqueduct begins.
1908
A U.S. public water supply is chlorinated for the first time at Boonton Reservoir Supply, Jersey City, N.J.
1936
The Hoover Dam opens.
1960
The California State Water Project begins.
1970
President Nixon establishes the Environmental Protection Agency (EPA).
1972
The Clean Water Act is passed.
1974
The Safe Drinking Water Act is passed, greatly expanding the scope of federal responsibility for safety of state drinking water.
1996
President Clinton signs the Safe Drinking Water Act Reauthorization.
2013
Israel opens the Soreq desalination plant. The country can now produce a water surplus using desalination.
1882
The first commercial hydroelectric power plant is built in Appleton, Wisc.
1902
Belgium implements the first continuous use of chlorine to make drinking water biologically "safe."
1932
San Francisco builds the first water reclamation facility.
1962
U.S. Public Health Service Drinking Water Standards Revision is accepted as minimum standards for all public water suppliers.
1987
The Water Quality Act requires EPA to regulate storm water runoff.
2007
The Tampa Bay desalination plant is fully operational.

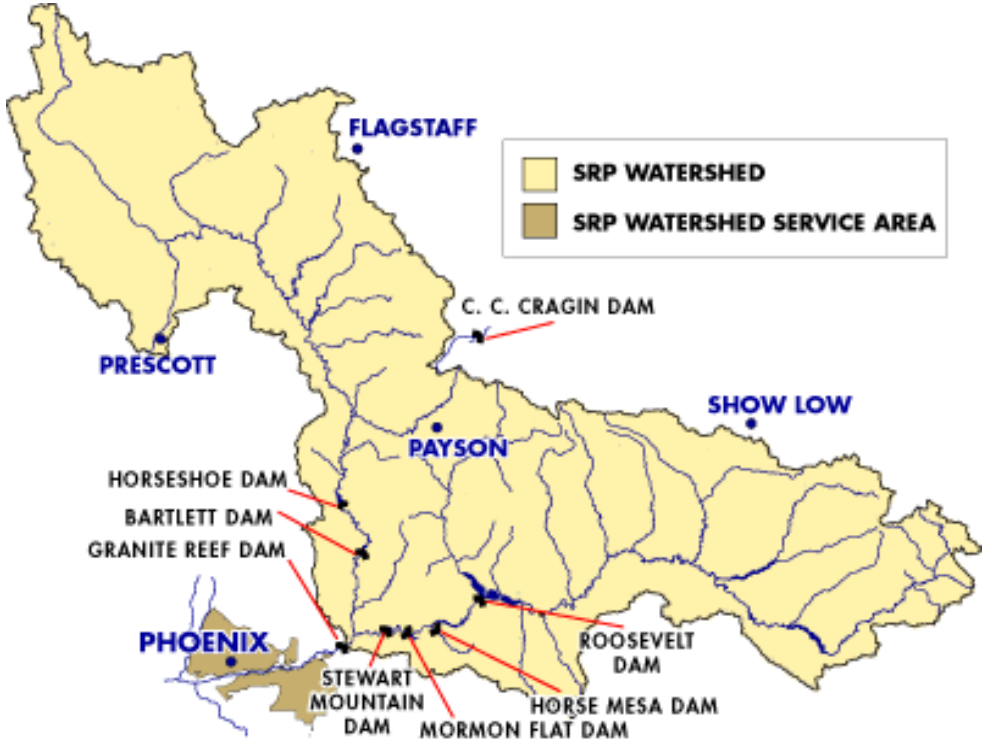
PHOENIX METRO WATER FACILITIES

The Valley water supply is provided through both surface water and ground water. Surface water is from the rivers, streams, reservoirs that are monitored/maintained by Central Arizona Project (CAP) and Salt River Project (SRP). The groundwater (wells) is governed by Arizona Department of Water Resources (ADWR) and spread out into several Active Management Areas (AMA's) with various regulations governing withdrawal (Certificate of Assured Water Supply-CAWS) and recharge (Central Arizona Ground Replenishment District -CAGRD). Unless the Provider is a municipality, they are governed by the Arizona Corporation Commission (ACC) as well as Maricopa Association of Governments (MAG)

PHOENIX METRO WATER FACILITIES

SURFACE WATER

PHOENIX METRO WATER FACILITIES



Salt River dams
Theodore Roosevelt Dam and Lake
Horse Mesa Dam and Apache Lake
Mormon Flat Dam and Canyon Lake
Stewart Mountain Dam and Saguaro Lake

Verde River dams
Horseshoe Dam and Reservoir
Bartlett Dam and Reservoir
Granite Reef Diversion Dam

East Clear Creek dams
C.C. Cragin Dam and Reservoir

SRP Reservoirs delivering 800,000 acre feet of water and providing over 2 million acre feet of storage capacity

PHOENIX METRO WATER FACILITIES

CAP Canal-336 miles providing 1.5 Million AF/year from the Colorado River

PHOENIX METRO WATER FACILITIES

GROUNDWATER

PHOENIX METRO WATER FACILITIES

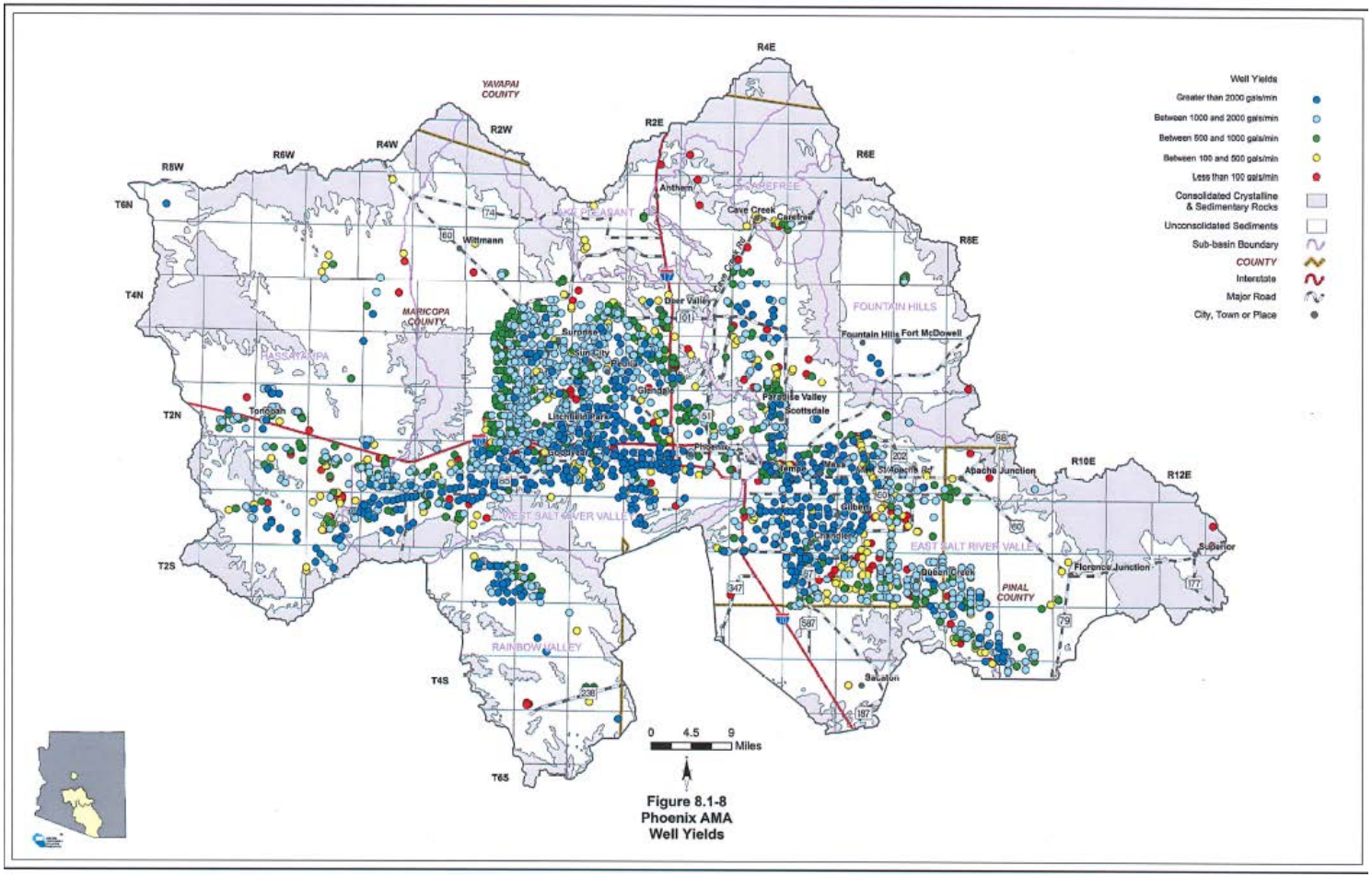
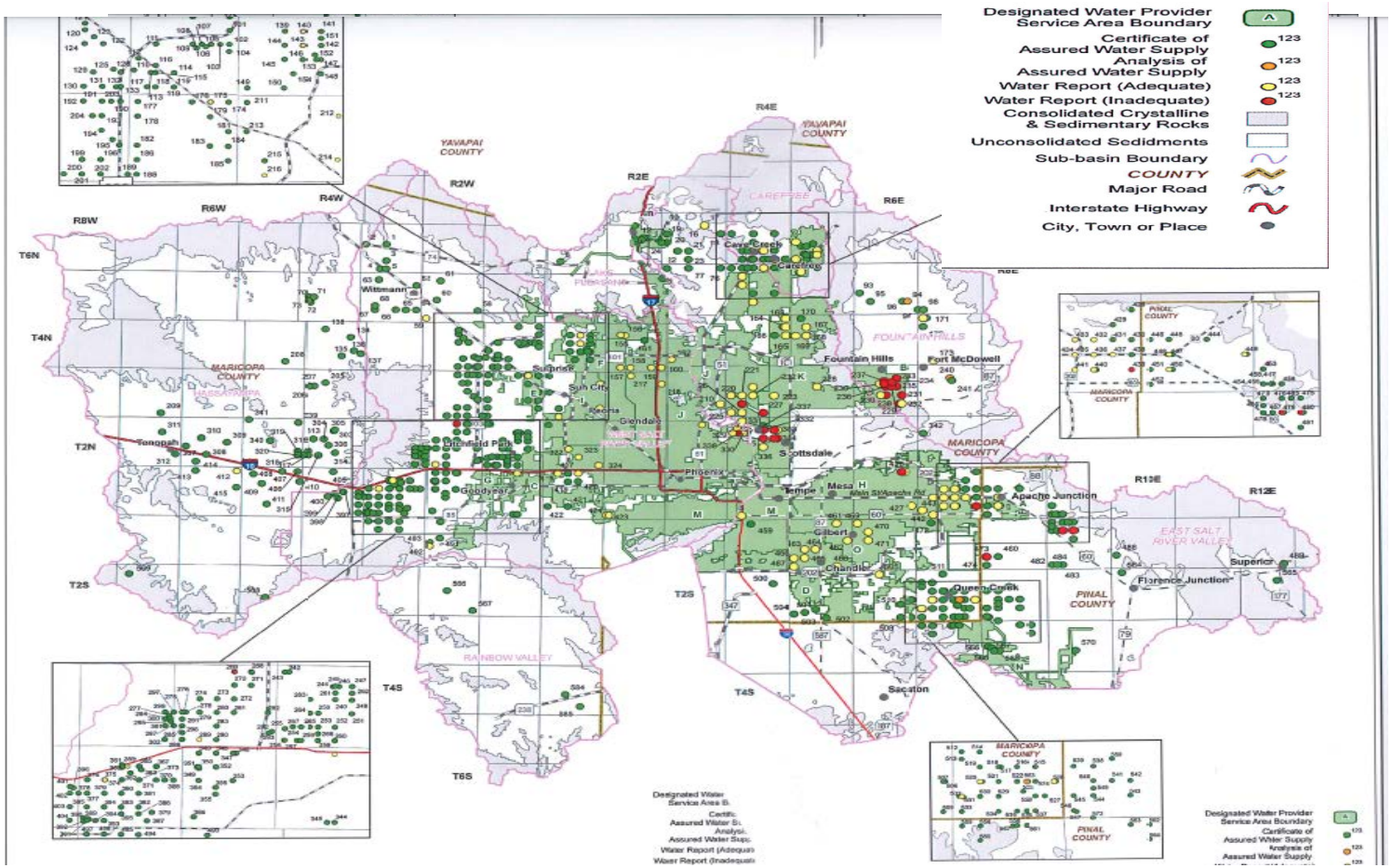


Figure 8.1-8
Phoenix AMA
Well Yields

Potable wells within the Phoenix AMA (5,000 & COUNTING)

PHOENIX METRO WATER FACILITIES



Certificates (CAWS) issued within Phoenix AMA

PHOENIX METRO WATER FACILITIES

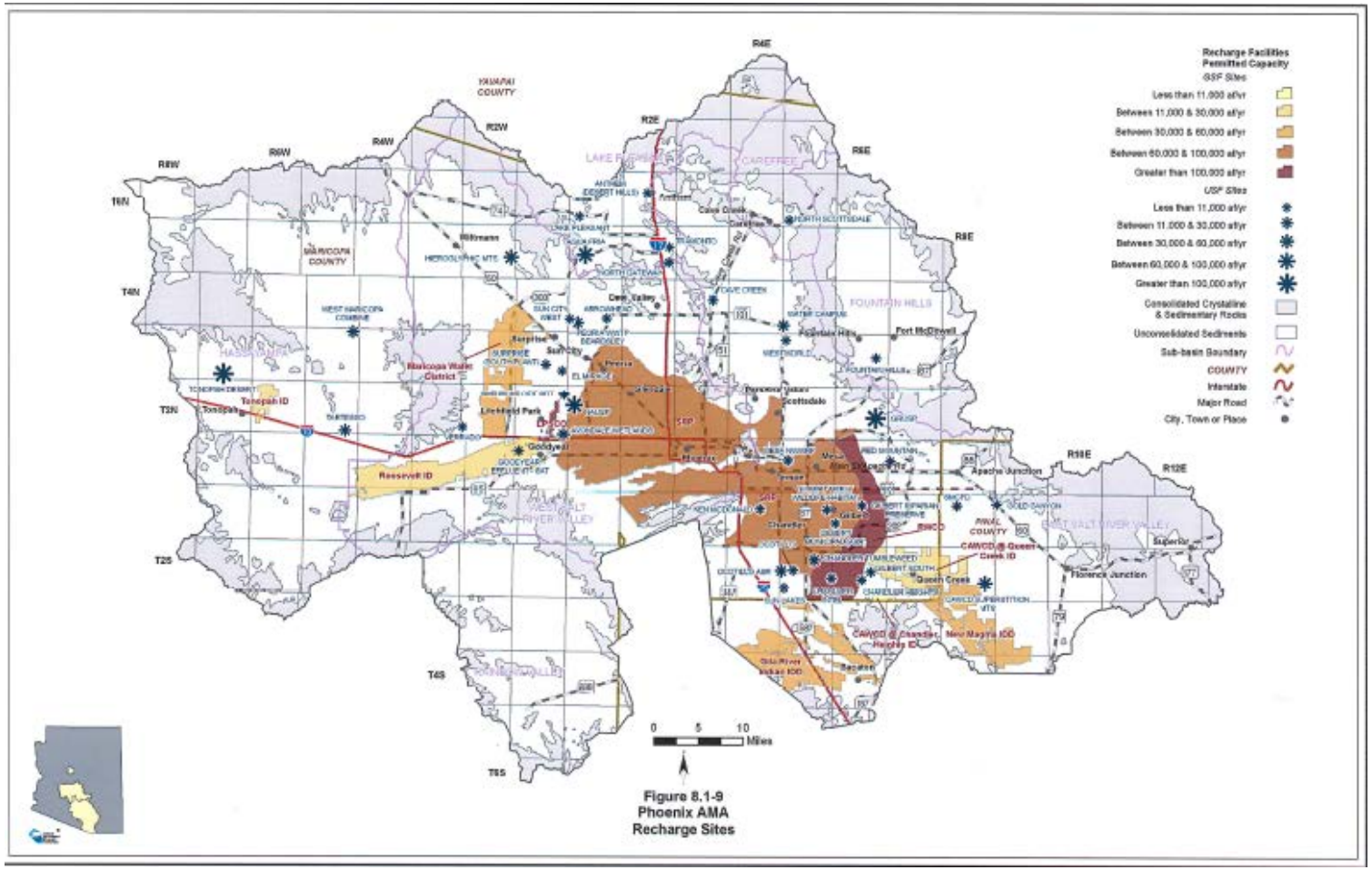


Figure 8.1-9
Phoenix AMA
Recharge Sites

Recharge sites within the Phoenix AMA

PHOENIX METRO WATER FACILITIES

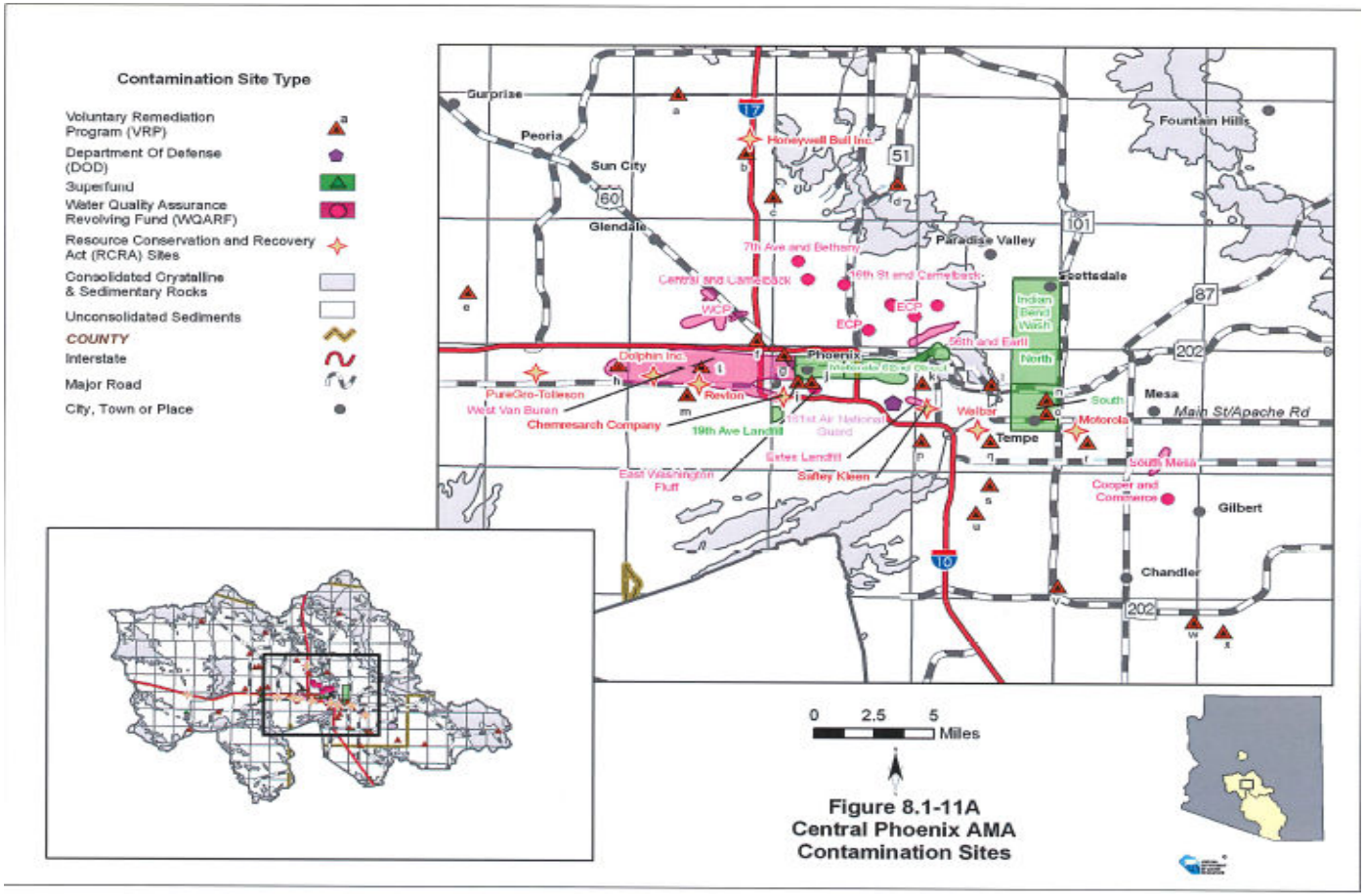


Figure 8.1-11A
Central Phoenix AMA
Contamination Sites

Contamination sites within the Phoenix AMA

PHOENIX METRO WATER FACILITIES

Table 8.1-10 Cultural Water Demand in the Phoenix AMA[1]

Year	Estimated and Projected Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)[2]						Data Source
				Well Pumpage			Non-Groundwater[3]			
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Agricultural[4]	Municipal	Industrial	Agricultural[4]	
1971		4,202[5]	3,189[5]	1,785,000			956,000			ADWR (1994a)
1972										
1973										
1974										
1975										
1976										
1977				1,473,000			1,073,000			
1978										
1979										
1980	1,471,074									
1981	1,548,026	966	335	1,278,000			980,000			
1982	1,624,991									
1983	1,701,968									
1984	1,778,957									
1985	1,855,960									
1986	1,930,480	1,051	1,336	1,272,521			1,182,600			ADWR (2009)
1987	2,009,280									
1988	2,057,140									
1989	2,135,901									
1990	2,150,726									
1991	2,199,760	1,041	2,065	224,500	67,400	514,800	522,500	55,500	774,500	
1992	2,288,101									
1993	2,350,317									
1994	2,404,332									
1995	2,571,732									
1996	2,675,544	2,633	2,212	254,800	78,400	519,700	685,400	67,400	745,800	
1997	2,768,160									
1998	2,847,060									
1999	2,948,434									
2000	3,118,049									
2001	3,213,086	3,642	1,546	295,600	88,800	429,900	742,900	73,600	622,700	
2002	3,307,260									
2003	3,405,497									
2004	3,513,969									
2005	3,650,464									
2010	4,341,229									
2020	5,561,461									
2025	6,151,663									
2030	6,763,848									
WELL TOTALS:		13,535	10,683							

Notes:

[1] Does not include evaporation losses from stockponds and reservoirs or effluent.
[2] Includes Indian Demand
[3] Non-Groundwater supplies may include surface water, CAP, effluent, spill water or tailings water.
[4] Agricultural demand includes use by small exempt irrigation rights.
[5] Includes all wells through 1980.

PHOENIX METRO WATER FACILITIES

WHAT DOES ALL THIS MEAN

PHOENIX METRO WATER FACILITIES

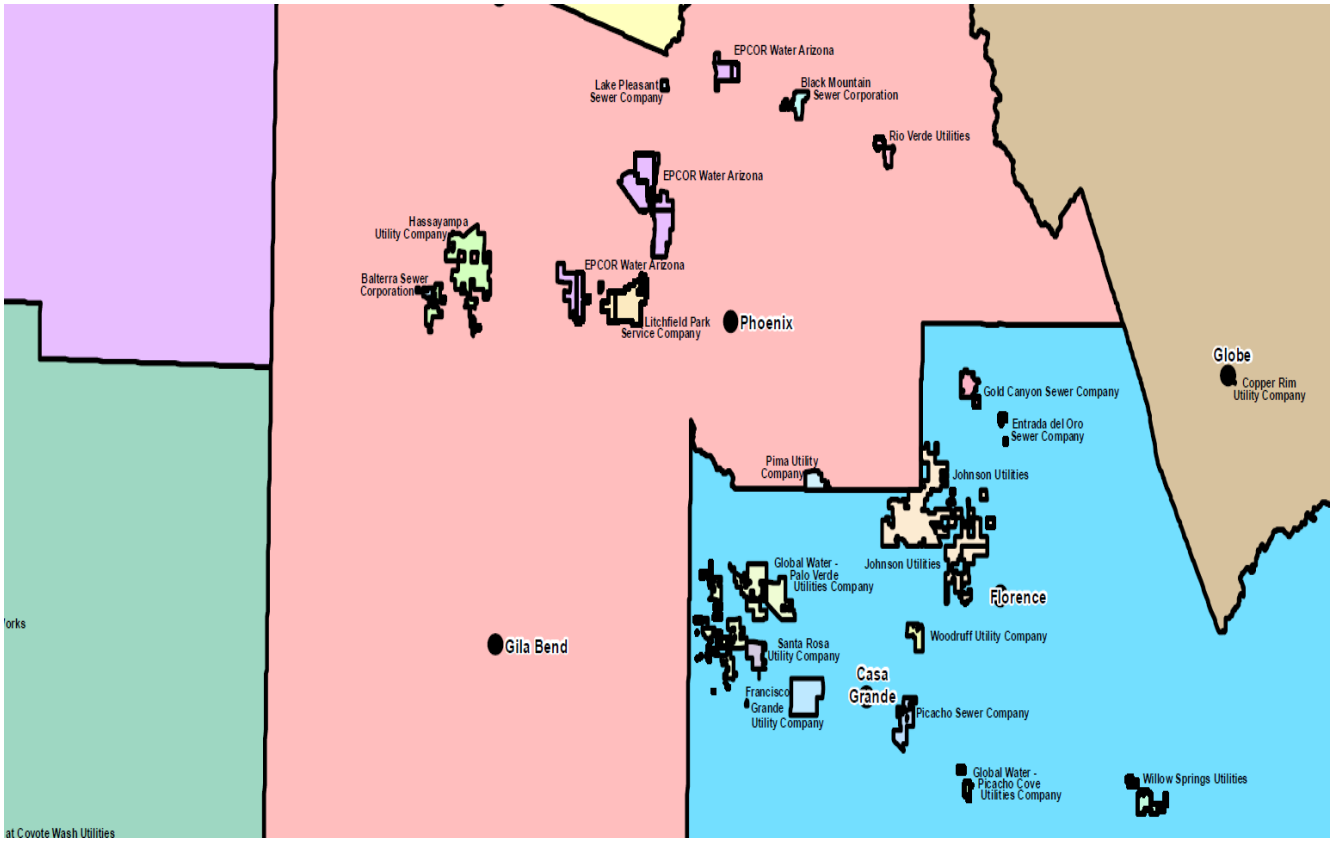
Phoenix metro population (including Maricopa and Pinal County)	**4,192,887**	
Water Usage	**Water Use Residential**	**Water Use System Total**
Water usage (gallons/person/day)	**150**	**210**
Daily Water usage	**628,933,050**	**880,506,270**
Water usage/year	**229,560,563,250**	**321,384,788,550**
Acre feet usage/year	**704,495**	**986,292**
Water Supply		
CAP Water (AF contracted to municipal water suppliers)	**300,210**	**27%**
SRP Water (AF supplied to municipalities)	**500,000**	**44%**
Wells (AF municipal wells in the Phoenix AMA)	**295,600**	**26%**
Wells (AF municipal wells in the Pinal AMA)	**32,968**	**3%**
Total Water Supplied		**1,128,778**
Water Storage		
SRP reservoirs	**2,000,000**	
Underground Storage	**517,520**	
Lake Pleasant	**811,784**	
Total water storage		**3,329,304**
Recharge Sites	**862,378**	

PHOENIX METRO WATER FACILITIES

THROUGH CONSERVATION MEASURES (I.E. RECHARGE FACILITIES, UNDERGROUND STORAGE, WATER SAVING DEVICES, ETC….), EXPANDING CAPACITY (WELLS, EFFLUENT WATER) AND UTILIZATION OF C.A.P. WATER, THE PHOENIX METRO AREA SHOULD BE WELL POSITIONED FOR FUTURE GROWTH

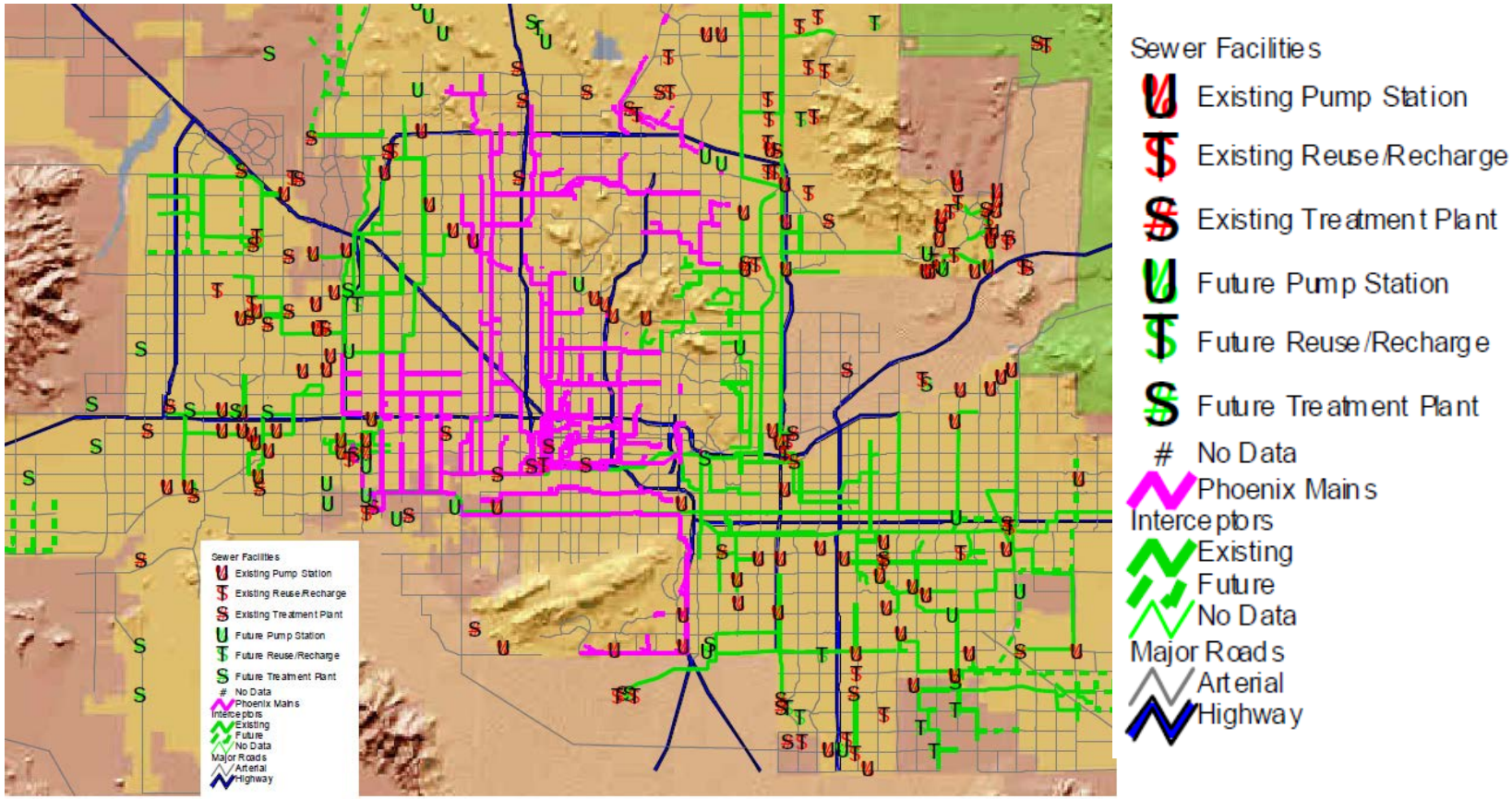
WASTEWATER

PHOENIX METRO SEWER FACILITIES



ACC Sewer providers within Phoenix Metro area

PHOENIX METRO SEWER FACILITIES



Sewer treatment plants, lift stations and recharge facilities

QUESTIONS??