

Infrastructure Report

Nolte Engineering, Inc.



FINAL REPORT FOR THE
NORTHEAST LINE LIGHT RAIL STATIONS PLAN

Project # TG76
City Agreement #2006-0198

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INTRODUCTION

Project Description

The Northeast Line Light Rail Stations Plan is intended to set forth the vision of an active, thriving transit-oriented residential and commercial neighborhood which maximizes the advantages of the proximity to the existing three Light Rail Stations – Globe, Del Paso/Arden, & Royal Oaks. The Plan establishes proposed mixed land uses, goals, and policies that will guide future development.

This report is presented to be a comprehensive conceptual assessment of the proposed plan build-out infrastructure needs and a preliminary opinion of probable costs for the infrastructure. This study is a preliminary engineering, planning level effort that will aid the City and local developers in attracting transit-oriented development funding assistance and provide potential developers with information to evaluate their probable infrastructure costs.

The Northeast Line Light Rail Stations Plan study area encompasses a study impact area of roughly 570 acres, with a development focus within a quarter mile radius surrounding each of the existing three light rail stations. Newly envisioned land uses for these areas will present added infrastructure demands. Existing sanitary sewer, storm drainage, water, electrical power, telecommunications, natural gas and street improvement infrastructure capacity has been analyzed and modifications proposed to adequately serve these new demands.



LAND USE

A proposed development intensity land use analysis has been prepared for the Plan area by the project planners Moore, Iacofano & Goltsman, Inc. (MIG). The land use analysis proposes higher intensity land uses for selected parcels surrounding the general area of each of the three existing light rail stations - Globe, Del Paso/Arden, & Royal Oaks.

It is envisioned that the sites will develop as either multi-family residential or mixed use multi-family residential/non residential (commercial). The land use analysis proposes five different levels of development intensities (A-E) for the selected parcels. Each of the five development intensities were given a “Low” and “High” range for expected density of multi-family residential dwelling units per acre (DU/AC) and commercial floor area ratio (FAR). The following summarizes the assumptions used in the analysis:

Development Intensity A: Residential - Low = 40 DU/AC, High = 60 DU/AC
Non Residential - Low = 0.3 FAR, High = 0.4 FAR

Development Intensity B: Residential - Low = 40 DU/AC, High = 60 DU/AC
Non Residential – None Proposed

Development Intensity C: Residential - Low = 25 DU/AC, High = 40 DU/AC
Non Residential – None Proposed

Development Intensity D: Residential - Low = 15 DU/AC, High = 25 DU/AC
Non Residential - Low = 0.45 FAR, High = 0.6 FAR

Development Intensity E: Residential - Low = 25 DU/AC, High = 40 DU/AC
Non Residential - Low = 0.3 FAR, High = 0.4 FAR

Projections of the number of multi-family residential units and the gross square feet of non residential for land use were developed. Table II-1 presents the results of the land use development intensity analysis.

For the purposes of the infrastructure analysis, the Technical Advisory Committee asked that only the “High” range be analyzed.



**Table II-1
 Proposed Land Use Development Intensity**

	Total Developable Area (Acres)	Residential (Dwelling Units)		Non Residential (Acres)		Non Residential (Square Feet)	
		Low	High	Low	High	Low	High
Globe Station							
Development Intensity A	5.55	222	333	1.67	2.22	72,567	96,756
Development Intensity B	6.89	276	413	0.00	0.00	0	0
Development Intensity C	9.66	242	387	0.00	0.00	0	0
Development Intensity D							
Development Intensity E							
Total for Globe Station	22.11	739	1,133	1.67	2.22	72,567	96,756
Del Paso - Arden Station							
Development Intensity A	5.34	214	320	1.60	2.14	69,763	93,017
Development Intensity B							
Development Intensity C	4.06	102	162	0.00	0.00	0	0
Development Intensity D	1.70	25	42	0.76	1.02	33,294	44,392
Development Intensity E							
Total for Del Paso/Arden Station	11.10	341	525	2.37	3.15	103,057	137,409
Royal Oaks Station							
Development Intensity A							
Development Intensity B	27.69	1,107	1,661	0.00	0.00	0	0
Development Intensity C	3.39	85	136	0.00	0.00	0	0
Development Intensity D							
Development Intensity E	13.13	328	525	3.94	5.25	171,579	228,772
Total for Royal Oaks Station	44.21	1,521	2,322	3.94	5.25	171,579	228,772
Total For All Stations	77.41	2,600	3,980	7.97	10.63	347,203	462,937



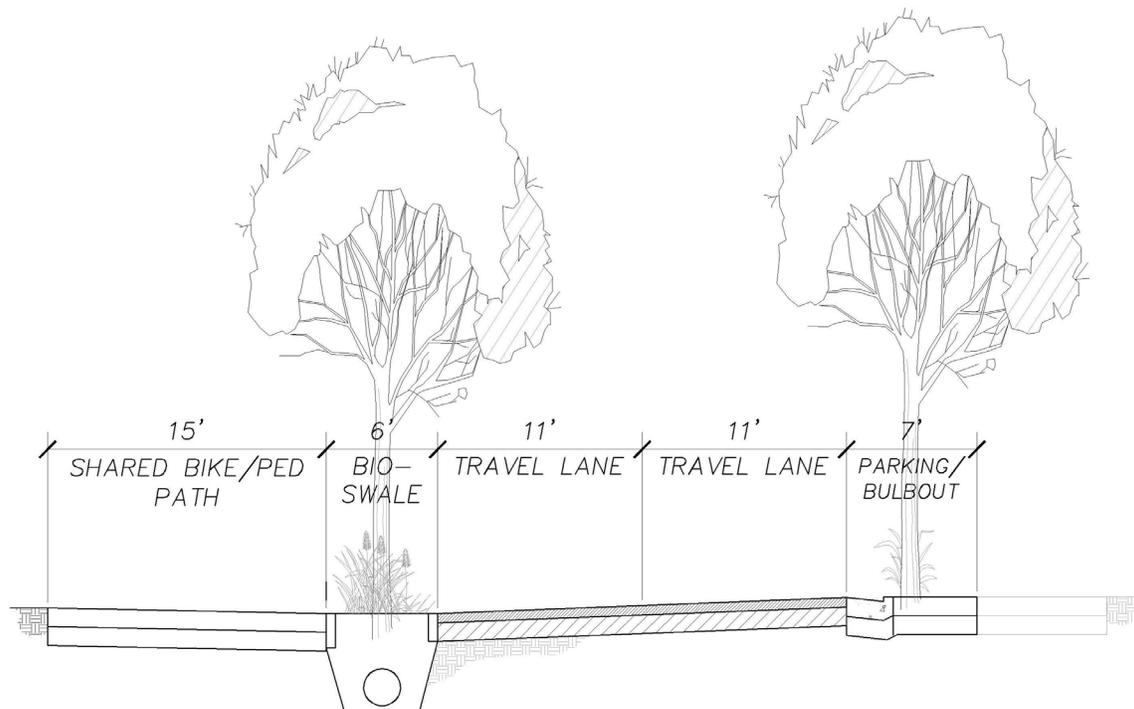
STREETSCAPE

General Information

The Circulation and Pedestrian Access portion of the Northeast Line Light Rail Stations Plan has been prepared by Moore Iacofano & Goltsman, Inc. (MIG). Working directly with the City of Sacramento Planning and Transportation staff as well as the Northeast Line Light Rail Stations Technical Steering Committee, MIG developed a streetscape master plan for the plan area together with a set of illustrative typical plan and sections for each of the proposed modifications to the existing streets. For the purposes of this infrastructure study, the typical street sections developed by MIG were used to develop conceptual cost estimates for the plan. The following is a brief description of each of the modifications to the street sections. For a more detailed description and full color illustrations of the streetscape plan the reader is referred to the MIG plan.

Acoma Street: The existing street has a 50 foot wide right-of-way. The typical existing street section has a narrow four foot sidewalk on one side of the street with a wide paved travel area. The proposed section adds a large 15 foot shared bike and pedestrian path to one side of the street, adds a 6 foot storm drainage/planter strip, narrows the travel lanes to one 11 foot lane in each direction, and adds a 7 foot parking area/intermittent bulb-out planter area. The addition of the City's standard historic acorn style street lights is also proposed.

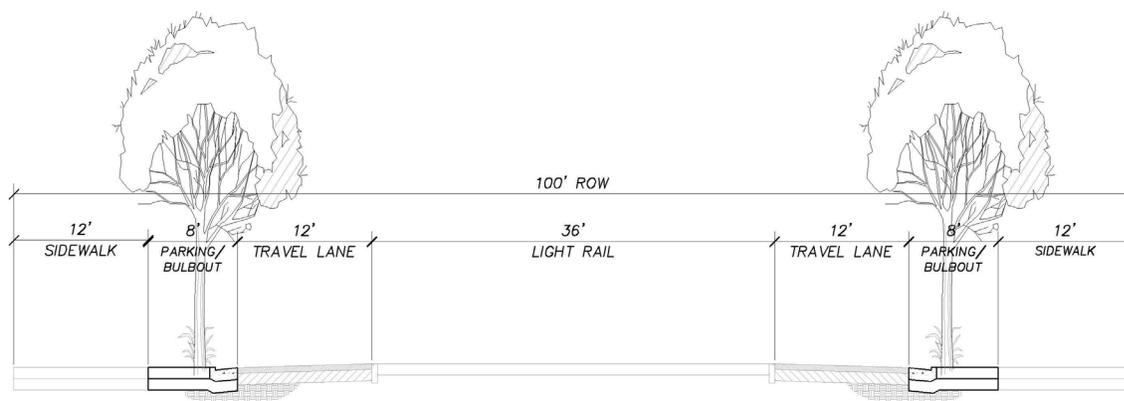
Proposed Acoma Street Section





Del Paso Boulevard: The existing boulevard has a 100 foot wide right-of-way. The typical existing street section has single dedicated travel lane and a shared travel lane with the light rail tracks in each direction. There are parking lanes on both sides of the street. The proposed modifications to the street section are to add intermittent bulb-out planter areas with trees within the existing 8 foot parking areas along the length of the street. The addition of the City's standard historic acorn style street lights is also proposed. A new fully signalized traffic light is proposed at the intersection of Southgate Road/Colfax Street and Del Paso Boulevard.

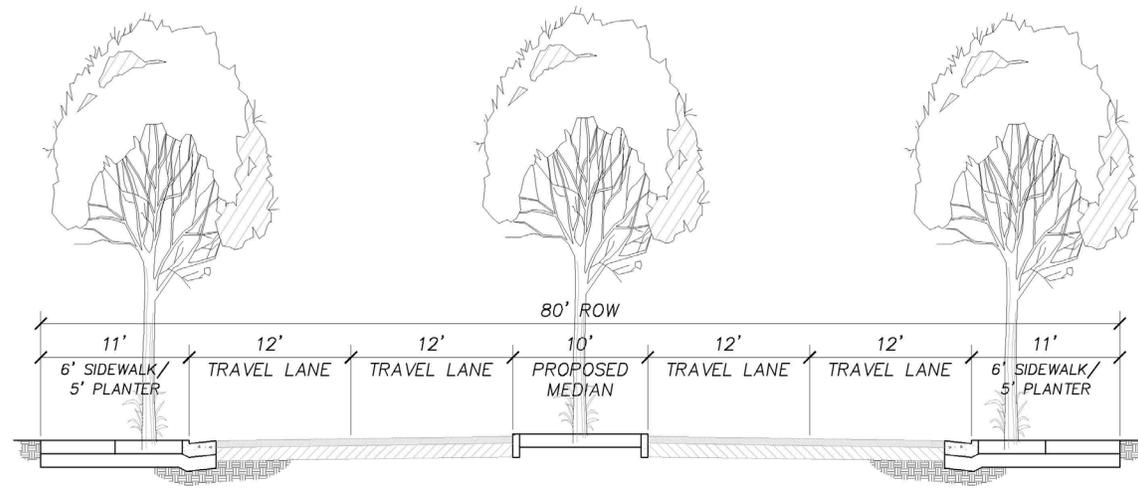
Proposed Del Paso Boulevard Section



Arden Way - East of Royal Oaks: The existing thoroughfare has an 80 foot wide right-of-way. The existing street section has two travel lanes in each direction with on-street parking lanes on both sides of the street and 5 foot sidewalks. The proposed modifications will eliminate the parking lanes and provide a widened sidewalk and planter area. It also includes a 10 foot center landscape median. The addition of the City's standard historic acorn style street lights is also proposed. A new fully signalized traffic light is proposed at the intersection of Boxwood Street and Arden Way.

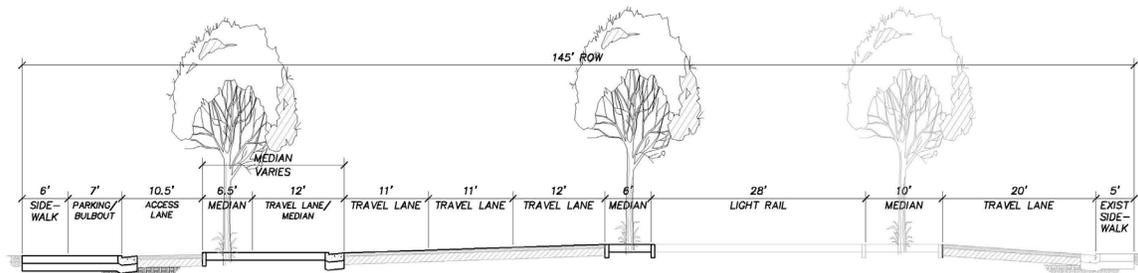


Arden Way - East of Royal Oaks Section



Arden Way - Oxford to Royal Oaks: The existing thoroughfare has a 145 foot wide total right-of-way with the inclusion of the light rail tracks and the frontage road. The existing street section has two travel lanes in each direction on the main roadway and one lane in each direction on the frontage street. The main street and the frontage street are separated by the light rail tracks on the south side of the main roadway. The proposed modifications include the addition of a median that will create an access lane and bulb-out landscaping/parking area on the north side of the main roadway. The addition of the City’s standard historic acorn style street lights is also proposed. A new pedestrian-only signalized crossing is proposed at the intersection of Cantalier Street and Arden Way.

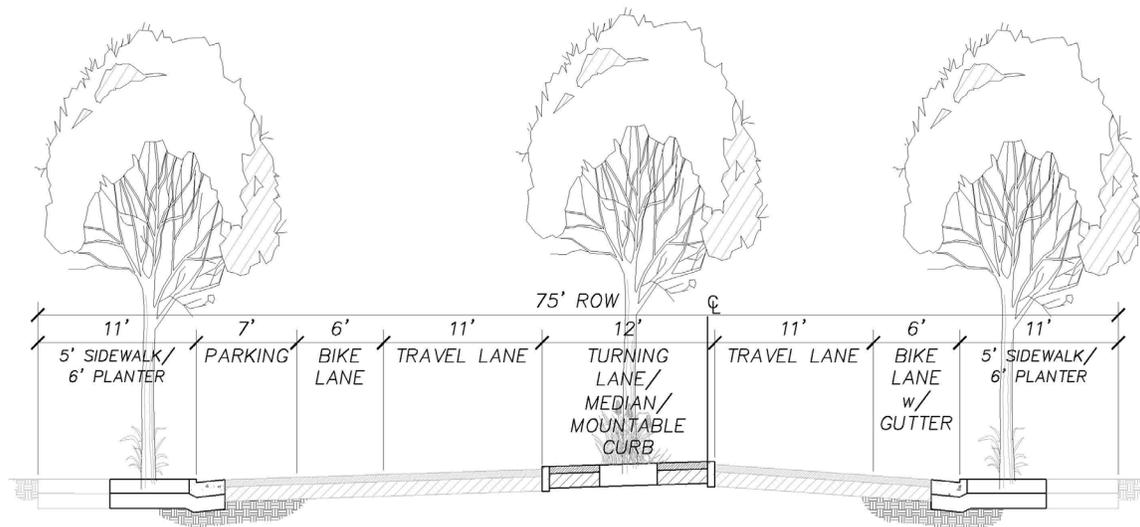
Arden Way - Oxford to Royal Oaks Section





Royal Oaks Drive: The existing roadway has a 75 foot right-of-way. The existing street section has a single travel lane in each direction with a center two-way turning lane. Bike lanes and parking lanes also exist on both sides of the street. The proposed modifications include the creation of a separated sidewalk by providing a landscape area on each side of the roadway, and a landscaped center median/turning lane with mountable curbs. The addition of the City's standard historic acorn style street lights is also proposed.

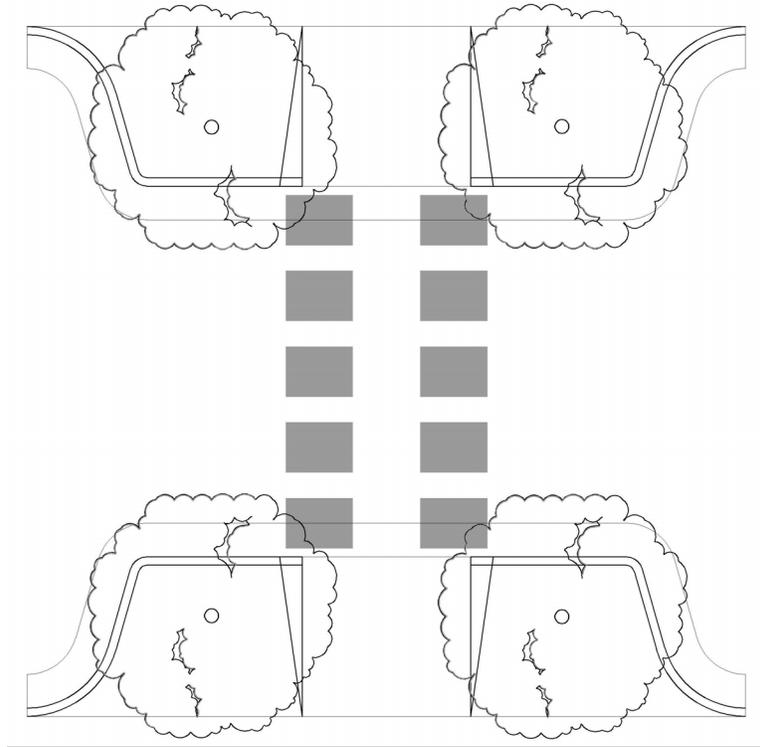
Royal Oaks Drive Section



Mid-Block Street Crossings: The grid street pattern in the Dixie neighborhood consists of series of long north-south streets between Calvados and Dixie Avenues. The proposed modifications are to add mid-block street crossings to provide safe passage for pedestrians and will also aid in traffic calming. The crossings consist of bulb-out landscape planter areas with ramps and pavement striping.

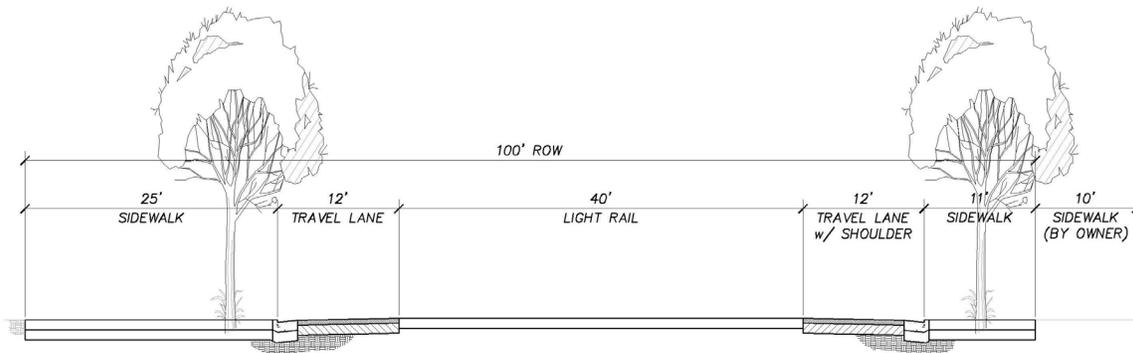


Mid-Block Street Crossings



Globe Station Transit Area: The area in the immediate vicinity of the Globe Light Rail Station is proposed to be improved to provide a gateway statement as travelers enter the North Sacramento area. The proposed improvements include decorative pavement and sidewalk across the entire width of the street and platform together with a vertical art feature to mark the entrance to the North Sacramento area.

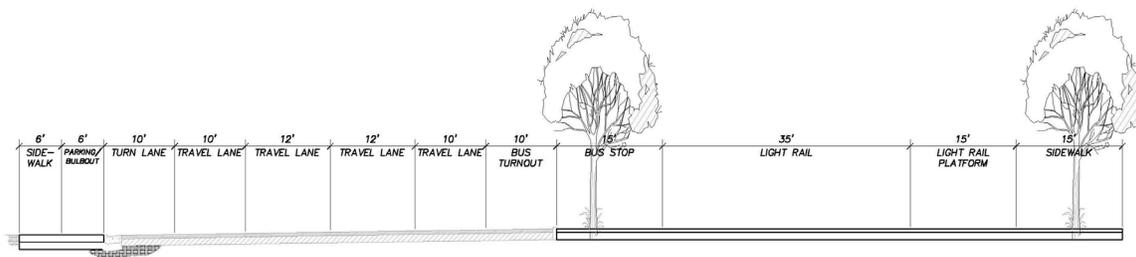
Globe Station Transit Area





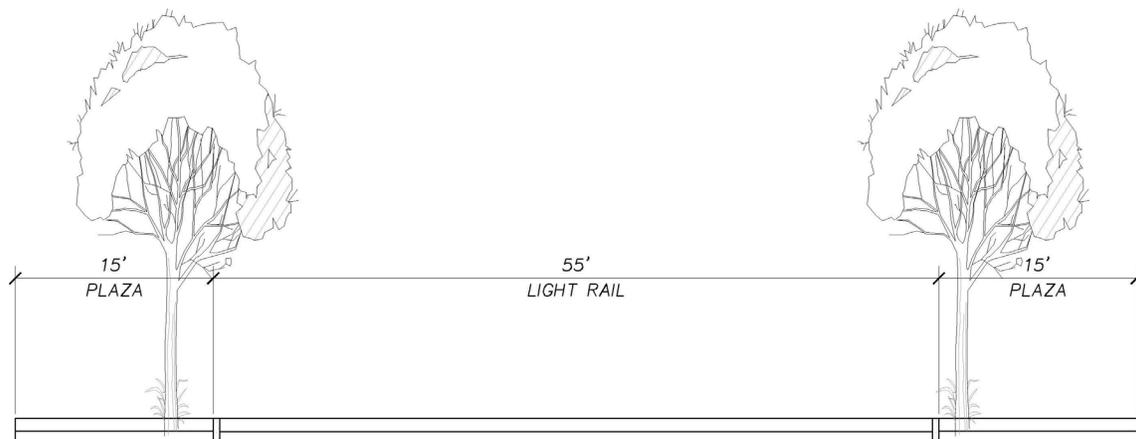
Arden / Del Paso Station Transit Area: The area in the immediate vicinity of the Arden / Del Paso Light Rail Station is proposed to be improved with the addition of decorative pavement surrounding the tracks from Del Paso to Oxford Street. A bulb-out planter / parking area is proposed for the north side of the street. A new pedestrian only signalized crossing is proposed in the middle of this area to provide easier access from the station to the neighborhood to the north.

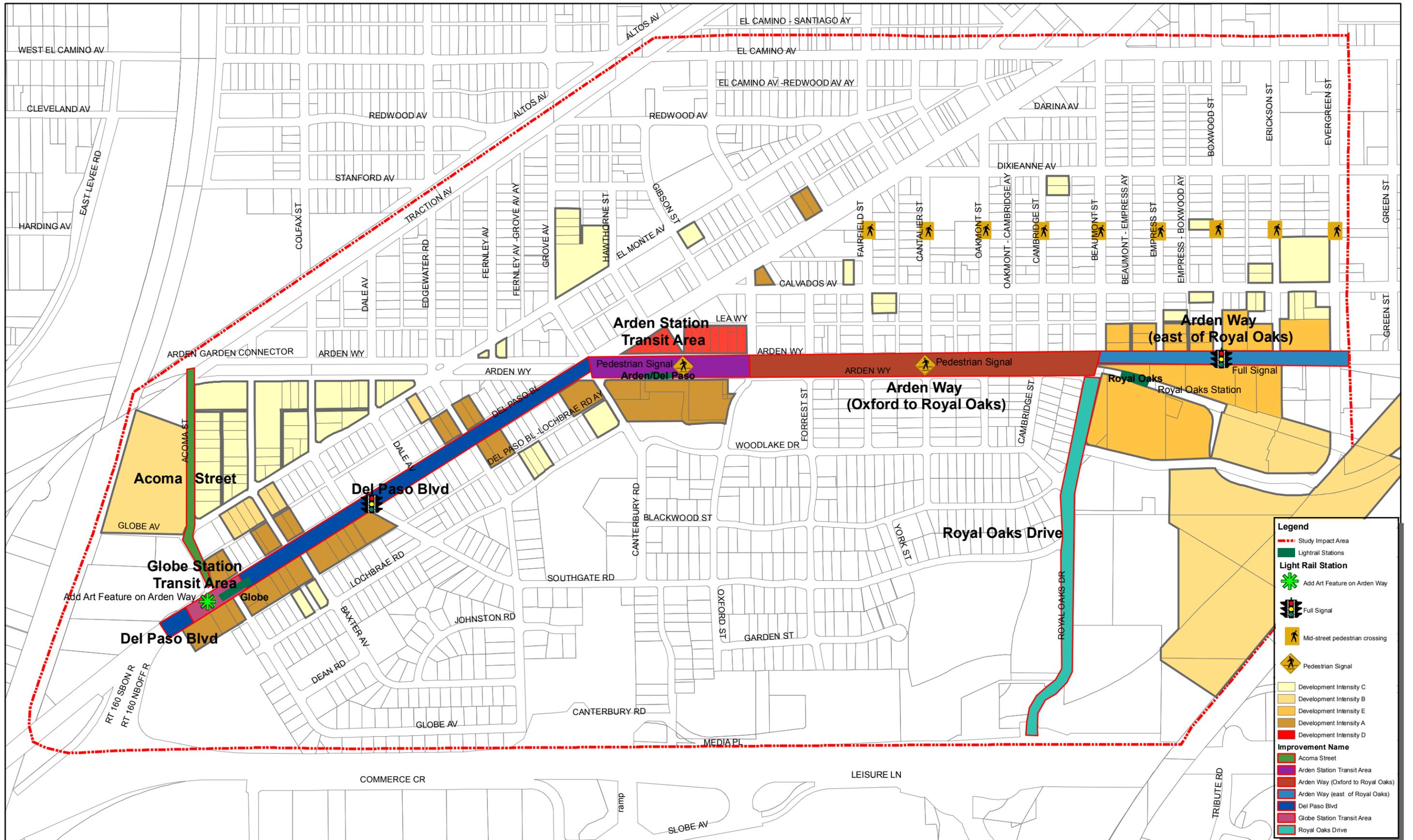
Arden / Del Paso Station Transit Area



Royal Oaks Station Transit Area: The area in the immediate vicinity of the Royal Oaks Light Rail Stations is proposed for an elevated plaza with decorative pavement and tree planters along the length of the Station.

Royal Oaks Station Transit Area

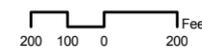




NORTHEAST LINE LIGHT RAIL STATIONS PLAN - STREETScape PLAN

FIGURE III-1

March 30th, 2007



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Legend

- - - Study Impact Area
- Light Rail Station
- ✱ Add Art Feature on Arden Way
- Full Signal
- Mid-street pedestrian crossing
- Pedestrian Signal
- Development Intensity C
- Development Intensity B
- Development Intensity E
- Development Intensity A
- Development Intensity D

Improvement Name

- Acoma Street
- Arden Station Transit Area
- Arden Way (Oxford to Royal Oaks)
- Arden Way (east of Royal Oaks)
- Del Paso Blvd
- Globe Station Transit Area
- Royal Oaks Drive



SANITARY SEWER

General Information

Wastewater treatment within the City of Sacramento is provided by the Sacramento Regional County Sanitation District (SRCSD). SRCSD operates all regional interceptors and wastewater treatment plants serving the City except for the Combined Sewer System (CSS) treatment facilities which are operated by the City of Sacramento. Local and trunk wastewater collection is provided by either the County Sanitation District 1 (CSD-1) or the City of Sacramento depending on the area of the City. The City provides wastewater collection to approximately two thirds of the area within the City Limits. This is comprised of two distinct areas, one for the CSS and the other for separated sewer systems.

The Sacramento Regional Wastewater Treatment Plant (SRWTP) owned and operated by SRCSD is located just south of the City Limits. The SRCSD maintains regional interceptors that convey sewage to the treatment plant. Currently, improvements are being made to the system in anticipation of future growth and to help relieve the existing interceptor system. The Lower Northwest Interceptor (LNWI) and the Upper Northwest Interceptor (UNWI) are currently under construction and will convey flows from the Northeast, Gibson Ranch, Rio Linda, McClellan, Natomas and a portion of the North Highlands sewerage basins. These projects will provide relief for the existing interceptor system as well as capacity for future growth.

The areas served by the City's separated system are delineated into dozens of sewer basins. Wastewater from the basins is pumped into the City's combined system or to the SRWTP. The City maintains 44 pumping stations throughout the City. There are a variety of problems affecting the City's separated system including infiltration/inflow, surcharged pipes, illegal taps and lack of facilities.

A Development Fee is associated with the tapping of the sanitary main. This fee is charged on all projects which require a new sewer tap or increase in size of an existing tap. Only projects located in the City sewer service area are subject to the fee. The current fees depend on tap size and range from \$124 for a four inch service to \$1,112 for a twelve inch service. A complete listing of the City's sewer and water fees is available on the City's website under the Utilities Department homepage (www.cityofsacramento.org/utilities).

There is a second fee associated with sanitary sewer system. It is the Facility Impact Fee levied by the Sacramento Regional County Sanitary District (SRCSD). This fee pays for planning, designing, construction and other related costs for wastewater conveyance, treatment and disposal facilities for the system's expansion.

The Facility Impact Fee currently is calculated by multiplying the ESDs generated by the development by the fee of \$2700 per Equivalent Single Family Dwelling (ESD) for infill projects. It is possible in certain cases to receive a credit of 1 ESD per parcel as credit for previously paid fees. The County's policy determines when the credit is allowed. The County has published their method of calculating the ESDs for the different types of development. Additional information is also available on line (www.srcsd.com).



Existing Conditions

The Northeast Line Light Rail Stations Plan project area is primarily served by two separate Sewerage Collection Basins, Basins G304 & G305. The Basins are generally divided through the project area following Canterbury Road, Woodlake Drive, Cambridge Street, Beaumont Street and El Camino Avenue/Darina Avenue Alley.

Sewerage Collection Basin 84 located west of the Plan project area is collected at Sump 84 and conveyed to the Basin G304 system through a four inch forcemain that enters the system near the north end of Acoma Street. A small portion of the northeast corner of the project area is located in Basin G303.

The existing collection systems within the Plan project area range in size from six inches to eighteen inches in diameter. These mains are generally located within the streets or alleys. Exceptions to this include portions of the Globe and Woodlake areas where some sections of the service mains are located at the rear property line between two adjacent residential homes.

A 72 inch County interceptor main crosses the Plan project area in a north-south direction entering from the north at the El Camino/Del Paso/Beaumont intersection following Beaumont Street south and then along Royal Oaks Drive south until it crosses Highway 160 and leaves the Plan project area. This interceptor serves large portions of the North Sacramento, Natomas, Rio Linda, and Antelope/Elverta areas.

There is also an existing sewer pump station owned by the County Sanitation District located in the south end of Basin G304. Before the construction of the 72 inch interceptor this pump station used to pump Basin 304 into the Downtown system. With the construction of the 72 inch interceptor, basins 304 & 305 were combined south of Highway 160 on Commerce Circle and taken directly to the interceptor. The pump station is only operated by the County in emergency or operational situations when reduced flow in the interceptor line is necessary.

Proposed Conditions

The development of the Plan area is expected to increase the sanitary sewer flows due to the increase in the residential, office, and commercial uses. The addition of nearly 4000 new residences and over 450,000 square feet of non-residential uses will overwhelm the existing sewer system. Significant improvements together with the rerouting of the existing system will be needed to insure adequate capacity for the proposed development.

Within the Plan area, the main system has key points along each of the two major Basin collection systems. For Basin G304 the key points are located along Edgewater Road. For Basin G305 the key points are along Royal Oaks Drive.

The City of Sacramento Design Standards for sewer generation rates (Section 9 – Sanitary Sewer Design Standards) contain average daily flow rates for residential and non-residential uses. The



sewer demands were generated assuming 1 ESD (Equivalent Single Family Dwelling Units) for each of the existing single family residences which is an average flow rate of 400 gallons per day. For the non-residential properties, an assumption of an average floor area ration (FAR) of 0.5 was used. Using the recommended 0.2 ESDs per 1000 square feet for general office buildings this equates to an average flow of 1742 gallons per day per acre which is comparable to other area sewer generation rates. Each of the proposed development residential units was assumed to be multi-family housing which equates to 0.75 ESD per unit. The proposed non-residential development was assumed to have a generation rate of 0.2 ESDs per 1000 square feet. A peaking factor using the City's Standard Plate 9-2 was then applied to the combined average flow rate to determine the design flow for each pipeline.

The maximum flow rate capacity for each pipeline size was determined using the size of the pipe and the minimum pipe slope for a velocity of two feet per second. For the purposes of this report, it was assumed that each pipeline in the existing system was constructed at the minimum slope. The peak flow rates determined at each key point was compared to the existing pipeline capacity. If the existing pipeline capacity was greater than the calculated peak flow rate, the pipeline was determined to have sufficient capacity for the increase in flows. If the calculated peak flow rate was greater than the capacity of the existing pipeline, then the pipeline was recommended for replacement with a larger pipeline of adequate capacity.

The results of this analysis found the main collection lines for both the Basin G304 and Basin G305 where undersized for the expected increased in sewer flows from the potential development.

Basin G304 : With the proposed development in the Globe and Del Paso Arden Stations areas, the main collection pipeline located in Edgewater Road will need to be upsized from the current 15 to 18 inch pipeline to a proposed 18 to 24 inch pipeline. The system will extend into the El Monte Triangle area to serve the proposed development. As this system leaves the project area it would also need to be upsized. An analysis of the system South of Highway 160 found that by rerouting a short length of the system on Commerce Circle to connect directly to the existing main located in Slobe Avenue/Leisure Lane a significant portion of the downstream system would not need to be upsized. This assumes that the rerouting of the existing G305 system in Royal Oaks Drive is also implemented which would reduce the flows into this system.

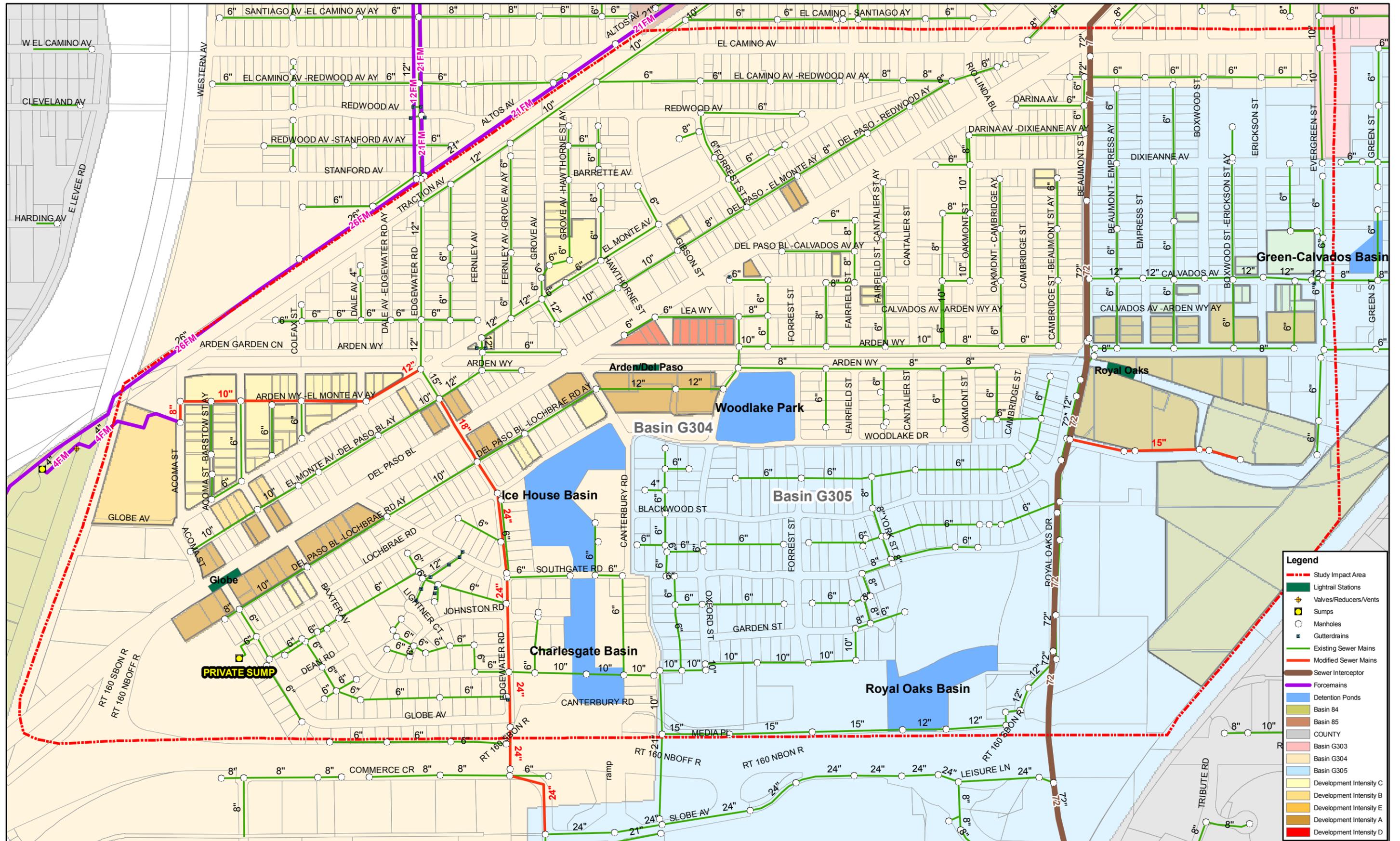
The Technical Review Committee for the project asked how much potential development along the Del Paso Corridor could develop before the existing system would need to be upsized. Fortunately, this area is served by an existing ten inch main located in the Del Paso/Lochbrae Alley. An estimate of the existing flow rates in the system was made where this system connects to the main collection pipeline at the intersection of Edgewater and Del Paso/Lochbrae. It was found that the main collection pipeline had an excess capacity of approximately 207 ESDs at this point. This would potentially allow up to 276 multi-family units to be constructed before this pipeline would need to be upsized.



Basin G305 : The main collection pipeline located in Royal Oaks Drive does not have sufficient capacity for the increased flows from the proposed development around the Royal Oaks Station. Rather than upsize the entire length of the main pipeline from the Royal Oaks Drive / Evergreen Street intersection all the way to where it leaves the Plan area at Canterbury Road at Highway 160, it is instead recommended to create a new direct connection to the 72 inch interceptor at the Royal Oaks Drive / Evergreen Street intersection. The existing twelve inch pipeline north of the intersection and the proposed fifteen inch pipeline in Evergreen Street would both be connected directly to the 72 inch interceptor at this point. This will eliminate the need to upsize a considerable length of pipeline and will also reduce the flows into the downstream system thus allowing the G304 modifications noted above.

It was found that several of the pipes were undersized and would need to be upsized to carry the increased flows. It was assumed that the existing pipelines are all constructed at the minimum slope as accurate invert elevations of these pipelines are not known. It may be that some of the existing pipes have slopes that are greater than the minimum slopes assumed. If this is the case, then the pipes may have sufficient capacity. It is recommended that a more detailed design study of the system capacity utilizing topographic field invert elevations be performed prior to the replacement of any pipelines.

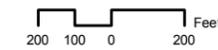
The replacement of these pipelines could be phased on a project by project basis as needed. Each project would analyze the impacts to the system due to the project's increased sewer flows and replace those sections of pipeline that do not have sufficient capacity. However, it may be necessary to form an Assessment District to collect fees or reimbursement to avoid having the burden of the majority of the system replacement fall on one project.



NORTHEAST LINE LIGHT RAIL STATIONS PLAN- SEWER PLAN

FIGURE IV - 1

March 30th, 2007



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STORM DRAINAGE

General Information

The City of Sacramento is served by a combined sewer/storm drainage system in the older Central City referred to as the combined sewer system (CSS). The remainder of the City is served by a system of 120 drainage basins. Drainage from most of these basins flows to local rivers or creeks or drainage channels through pumping. The City owns and operates 105 storm drainage pumping stations throughout the City. The drainage canals and local creeks ultimately drain into the Sacramento and American Rivers.

In certain portions of the City, existing drainage facilities are inadequate for the areas they serve. The City has ranked basins according to flooding severity and criticality. Based on these rankings, the City has completed master plans for the most critical areas and has designated infrastructure that would need to be improved to eliminate flooding in these areas. In addition to these critical areas, as new and infill areas of the City are developed, additional drainage facilities will be needed to adequately service these areas.

The North Sacramento area has drainage issues ranging from street and property flooding to possible future flood hazard and public safety hazards. Existing systems are inadequate to convey runoff from the area to the creeks and canals. Facility improvements that have been suggested to improve these problems include flood proofing, upgraded and new pipelines, pump stations, and new detention basins. This area has a history of flooding issues due to the inadequate capacity of Arcade and Hagginwood Creeks.

Existing Conditions

In general, the majority of the project area drainage system is more than 40 years old. In the intervening years since the system was constructed, the City of Sacramento storm drainage design standards have been revised to provide a higher level of service. The existing system no longer meets minimum level of service consistent with current design standards.

There have been numerous reported instances of street flooding within the Northeast Line Light Rail Stations Plan project area. Modeling studies indicate that there will likely be localized structure flooding during the projected 100-year storm event.

The Plan project area is located primarily within two separate Drainage Basin Areas, Basins 151 & 153. These two Basins are generally divided along the Del Paso Boulevard corridor. The Plan area northwesterly of Del Paso Boulevard drains to Sump 153 located near the western end of Stanford Avenue which pumps into the Natomas East Main Drainage Canal. The Plan area southeasterly of Del Paso Boulevard drains to Sump 151 located east of Lathrop Way which pumps into the American River. A small portion of the Plan project area at the southwestern end of Del Paso Road at Highway 160 is located in Basin 83 area and drains into Sump 83 located at



the east end of Del Paso Boulevard near the intersection of the Union Pacific Railroad tracks. There is also a small portion of the Plan project area southwest of the intersection of Del Paso Boulevard and West El Camino that is located within Drainage Basin 154 which drains to Sump 154 located near the intersection of Arcade Creek and the Natomas East Main Drainage Canal.

Proposed Improvements

As mentioned above, the Plan area already experiences flooding problems. However, the proposed development within the Northeast Line Light Rail Stations plan area are not expected to increase the drainage runoff from the area since most of the proposed development areas already contain a high percentage of impervious surfacing from existing buildings and paved parking lots.

A detailed drainage study of the Basin 151 was performed in 1996 by West Yost Associates as a consultant to the City's Utility Department. The Study based on full build out of the Basin 151 area found that the existing system provided approximately a 2-year level of flood protection for the area. The existing areas of flooding for the 10-year storm and 100-year storm were approximated in the Study for the Basin 151 area and are shown in the 10-Year & 100-Year Floodplain exhibit. The flooding is generally located in the low areas around the Ice House and Charles gates basins in the West Basin 151 watershed area and the Royal Oaks and conveyance system in the East Basin 151 watershed area.

The Basin 151 Study contained recommendations which have been adopted as the City's Drainage Master Plan for the Basin 151 area. The recommendations included rehabilitation of the existing pump station, water quality/flood control basins, flood proofing existing structures, and collection system upgrades to reduce the level of flooding in the area by providing an improved drainage system.

Due to the high cost of the complete drainage system improvements (approximately \$22 million in 1996), the Basin 151 Study also gave recommendations for prioritization of the improvements. The rehabilitation of the pump station had the highest priority, followed by the East Basin (Royal Oaks) detention and the southernmost West Basin (Charlesgate), then floodproofing, smaller flood control basins, and finally the conveyance elements of the system.

To date, the improvements to the Basin 151 pump station have been performed, and some improvements to the collection system downstream of Highway 160 have been implemented. However, the majority of the recommended drainage system improvements within the Northeast Line Light Rail Study area have not been accomplished. Since the Basin 151 Study found that the existing system only provided a two year storm level of protection, the system requirements are extensive.

The proposed improvements contained in this report for the Northeast Line Light Rail Stations area relies heavily on the recommendations and infrastructure improvements found in the Basin 151 Study. Only those improvements within the Plan area have been included in the analysis. Improvements outside of the plan area (north and east of Evergreen Street) have not been



included. It is expected that these improvements will be accounted for in the Swanston Station Plan.

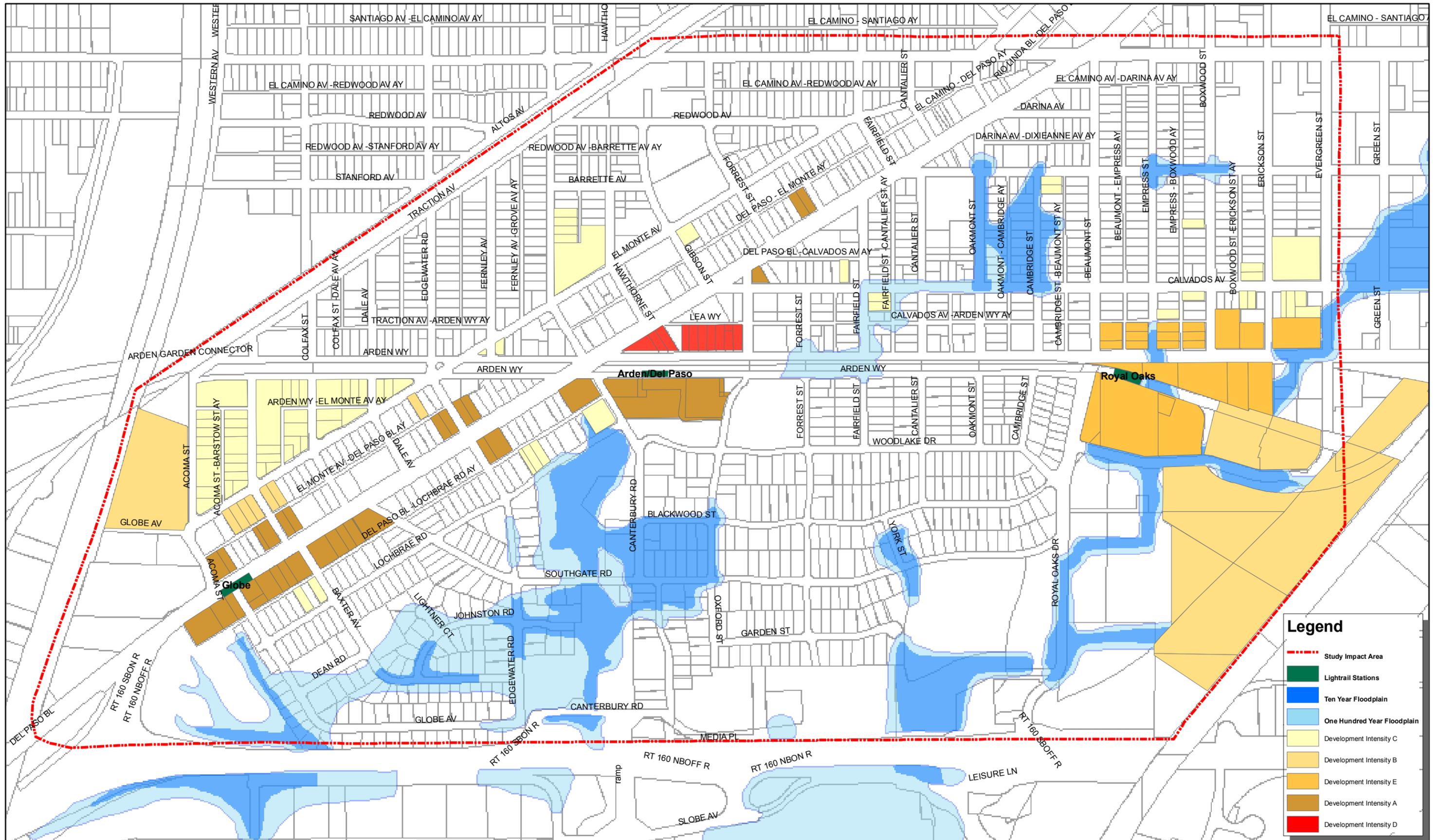
In addition to the recommendations from the Basin 151 Study, a conceptual planning drainage study of the Acoma Triangle area was performed for this report due to the high concentration of proposed development in this area. The study utilized the Hydrology Standards contained in the Sacramento City/County Drainage Manual (December 1996) for this analysis. The peak 10-year storm flow rates were determined utilizing the 10-Year Peak Flow rates from the Sacramento Method Rainfall Zone 2 (Figure 2-14), an assumed imperviousness of 80%, and the basin subshed areas. Proposed pipe sizes were determined using Manning's Equation and a minimum flow rate of two feet per second in the pipe. A detailed topographic survey of the Plan Area was considered beyond the scope of this work, and therefore these pipe sizes will need to be verified when more accurate information is available during the design of the system. The recommended pipe sizing, detention basin location, and areas where floodproofing is required is contained in the Proposed Storm Drainage exhibit.

Extreme Flood Event

The Northeast Line Light Rail Stations plan area is not currently within a 100-year floodplain area as defined by Federal Emergency Management Agency (FEMA). The FEMA Flood Insurance Rate Maps (FIRMS) were recently revised in 2005 due to completed levee/drainage system improvements within the Sacramento area as certified by FEMA. The Plan area is currently within Zone X which is defined as:

“Areas of 500-year flood; areas of 100-year flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 100-year flood.”

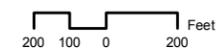
However, the 1998 FIRM maps of the area showed a very different flood designation for the area. The 1998 maps assumed a levee breach would occur which would cause flooding over the majority of the Plan area in a 100-year flood event. While the recent improvements to the levee system provide a level of protection from the 100-year event, it should be noted that an extreme event such as the 500-year flood or unexpected levee failure would result in flooding of the area.



NORTHEAST LINE LIGHT RAIL STATIONS PLAN- 100 YEAR FLOODPLAIN

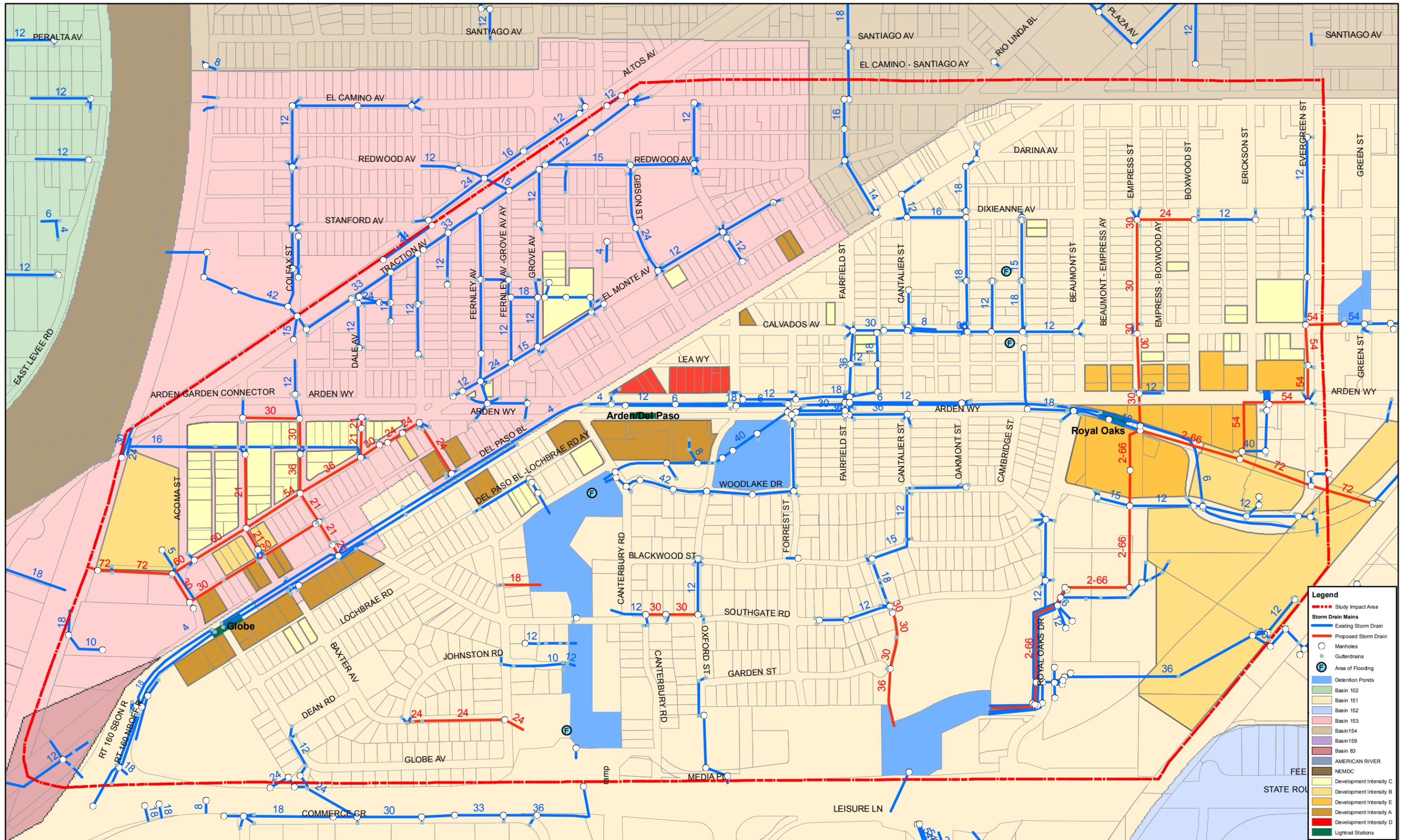
FIGURE V - 1

March 30th, 2007



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NORTHEAST LINE LIGHT RAIL STATIONS PLAN - STORM DRAIN PLAN

FIGURE V-2

March 30th, 2007

200 100 0 200 Feet

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WATER SUPPLY

General Information

The City of Sacramento provides domestic water to the Northeast Line Light Rail Stations Plan project area. Two water treatment plants, the Sacramento River Water Treatment Plant (SRWTP) and the E.A. Fairbairn Water Treatment Plant (FWTP) provide domestic water to the City of Sacramento. The water treatment plants divert water from both the Sacramento River and the American River respectively.

The total reliable sustainable treatment capacity currently is approximately 360 million gallons per day (mgd). The capacity of the SRWTP was recently expanded in 2003 from 110 mgd (million gallons per day) to approximately 160 mgd and included the construction of a new intake structure on the Sacramento River to comply with current fish screen requirements. The FWTP was also recently expanded in 2005 from 90 mgd to 200 mgd. It is anticipated that one or both of the plants will undergo further expansion as needed to meet projected future water demands. The ultimate maximum combined capacity of the two plants is approximately 600 mgd.

In addition to the surface water diverted from the two rivers, the City also operates 33 active municipal groundwater supply wells. These are utilized typically for water supply contribution during peak days. The wells have a total capacity of approximately 34 mgd.

The City maintains ten enclosed water storage reservoirs with a total capacity of 42 million gallons. This water is used to meet the water demand for fire flows, emergencies, and peak hours where they exceed the maximum day supply rates. In addition to the reservoirs, the treatment plants together maintain an on-site storage of over 32 million gallons.

The City operates pumping facilities throughout the area. There are 18 high lift service pumps at the SRWTP and FWTP. The City also maintains pumping facilities at nine of the City's storage reservoirs. These pump stations are of varying sizes and capacities.

The City differentiates the water mains into two distinct categories, water distribution mains and water transmission mains. Water distribution mains are smaller pipelines located in the streets and alleys utilized for water services. Water transmission mains are larger pipelines utilized to convey water to the distribution mains.

It is the City's policy to utilize the water distribution mains only for water services, fire services and fire hydrants. These pipes are typically 4 inches to 12 inches in diameter. If no smaller pipe is available, existing water mains 14 inches and 16 inches in diameter may be considered distribution mains. These pipes may be tapped only with the approval of the City of Sacramento Department of Utilities.

Transmission mains are 18 inches and larger in diameter. They are used to convey large volumes of water from the treatment plants to selected points throughout the distribution system. They are



also utilized to transfer water to and from the storage reservoirs to meet fluctuating daily and seasonal demands. These mains cannot be tapped for water services, fire services or fire hydrants. Considering each service tap is a potential weakening of the water main, the City currently has the policy to restrict the installation of service taps until after a project has been reviewed and approved by the City. This is to restrict the number of taps to the mains to those that are in the ultimate location per an approved development plan. This lessens the number of service taps that are abandoned due to changes in the development plans.

The implementation of the water improvements is typically the responsibility of future developers. The City's policy is to require the developer to construct any infrastructure necessary to support their project. To determine if water needs for a project can be met; a water supply test is performed on the existing system. If the existing water system is sufficient to meet the needs, no infrastructure upgrades are necessary. If the existing is found to be insufficient for the projects needs, the developer will be required to construct necessary infrastructure improvements.

However the current City policy could prove burdensome to a small developer whose project exceeds the capacity of the water system. That one project would be responsible for major infrastructure improvements; therefore, creating the possibility of a financial hardship where the project would no longer be viable. One possible mitigation for this problem could include the developer entering into agreements with adjacent developers to construct the required facilities as a small assessment district.

The infrastructure improvements required for all new development will need to meet current City standards. Looped water main systems are typically required due to the unreliability of dead end mains. Additional water main installation may also be required depending on the existing system layout. The City's meter program will require all new water services to be metered.

Temporary source of water for construction is easily acquired two different ways. First, the contractor can purchase a construction service. This utilizes the ultimate water service tap. Secondly, the contractor can purchase rights to use water from an adjacent fire hydrant.

For additional information, the document titled "Department of Utilities Water Distribution System – Commonly Used Criteria", which summarizes the City's planning and design criteria is located in the Appendix.



Existing Conditions

The Northeast Line Light Rail Stations Plan project area is generally served by an extensive system of service mains ranging in size from four to eight inches in diameter. The system in the Plan project area was generally constructed between the 1920s to 1960s. A 30 inch transmission main serving the North Sacramento area from the SRWTP enters the area at the west end of Del Paso Boulevard and continues through the area northeasterly along Acoma Street, El Monte Avenue, and Fernley Avenue where it leaves the project area following the alignment of the Sacramento Northern Parkway. This main is identified as a Critical Water Main by the City Utilities Department.

Two City distribution wells are within the Plan project area, Well No. 110 and Well No. 111. Well No. 110 is located near the intersection of Canterbury Road and Southgate Road. Well No. 111 is located near the intersection of Forrest Street and Calvados Avenue. A third City distribution well, Well No. 112, is located just outside the Plan project area on the south side of Calvados Avenue between Evergreen Street and Green Street. This well has been identified by the City as a critical infrastructure item.

The existing corridors along Del Paso Boulevard and Arden Way are both well served by twelve inch distribution mains. The Woodlake neighborhood is also generally well served by a system of eight and twelve inch watermains. However, in the Globe/El Monte area and the Dixieanne neighborhood the existing distribution system consisting of small four and six inch mains is considered generally undersized to meet the current design fire flow criteria. Extensive modifications of upsizing the existing mains to a system of eight, ten and twelve inch mains are envisioned for both of these areas. The area south of Royal Oaks consists of a sparse system of eight inch mains due to the low intensive uses of parking/storage facility that currently exists. This area is expected to need a revised system of larger eight and twelve inch mains if redevelopment of this area occurs. An existing six inch main would be allowed to remain only if located on the end of a cul-de-sac and if no fire hydrant is served by this section of main.

The City Utilities Department has also identified a need for a future Transmission Main, possibly as large as an 84 inch, within the Plan project area. The preliminary alignment for the Transmission Main crosses the Plan project area in a west-east direction generally following the alignment of Redwood Avenue and Dixianne Avenue.

Proposed System

The proposed development surrounding each station will provide different challenges in providing adequate domestic water and fire flow. This discussion of the proposed system is therefore divided into a discussion of the general area around each station. It should be noted that the upgrades to the existing system proposed are necessary for the increased density proposed for the development areas. Upgrades to the existing system beyond these areas are considered part of ongoing maintenance work to the system. It is envisioned that existing



undersized mains would be replaced with larger mains as the end of their useful lifespan is reached.

Globe Station: The proposed development in the Globe Station area is mainly located in the El Monte Triangle area to the northwesterly of the Station. This area is served well by a 30 inch transmission main located in El Monte Avenue and a twelve inch mains located on the northwesterly side of Del Paso Boulevard and the south side of Arden Way. The improvements to the existing system in this area include a system of eight inch mains in El Monte Avenue, Acoma Street, Baxter Avenue, Colfax Street, and Dale Avenue to link the twelve inch mains together and provide a grid system of larger mains to provide adequate fire service to the area. Frequent direct connections of smaller mains to the existing 30 inch transmission main are discouraged by the City Utilities Department. Therefore, a parallel eight inch main is proposed in El Monte Avenue. In addition, to serve the area of development southeasterly of the Globe Station, it is proposed to upsize the existing watermain located in the Del Paso Bl./Lochbrae Road Alley to an eight inch main from Globe Avenue to Canterbury Road.

Del Paso - Arden Station: The proposed development in the Del Paso – Arden Station area is mainly centered on both sides of Arden Way at the Station. To serve the development on the south side of Arden and eight inch looped main is proposed that connects to the existing eight inch main at the Canterbury Road/Wood Lake Drive intersection and follows Canterbury to Arden connecting to the new eight inch main at the Del Paso Bl./Lochbrae Road Alley, and then along the south side of Arden eastward to an existing twelve inch main at Oxford Street.

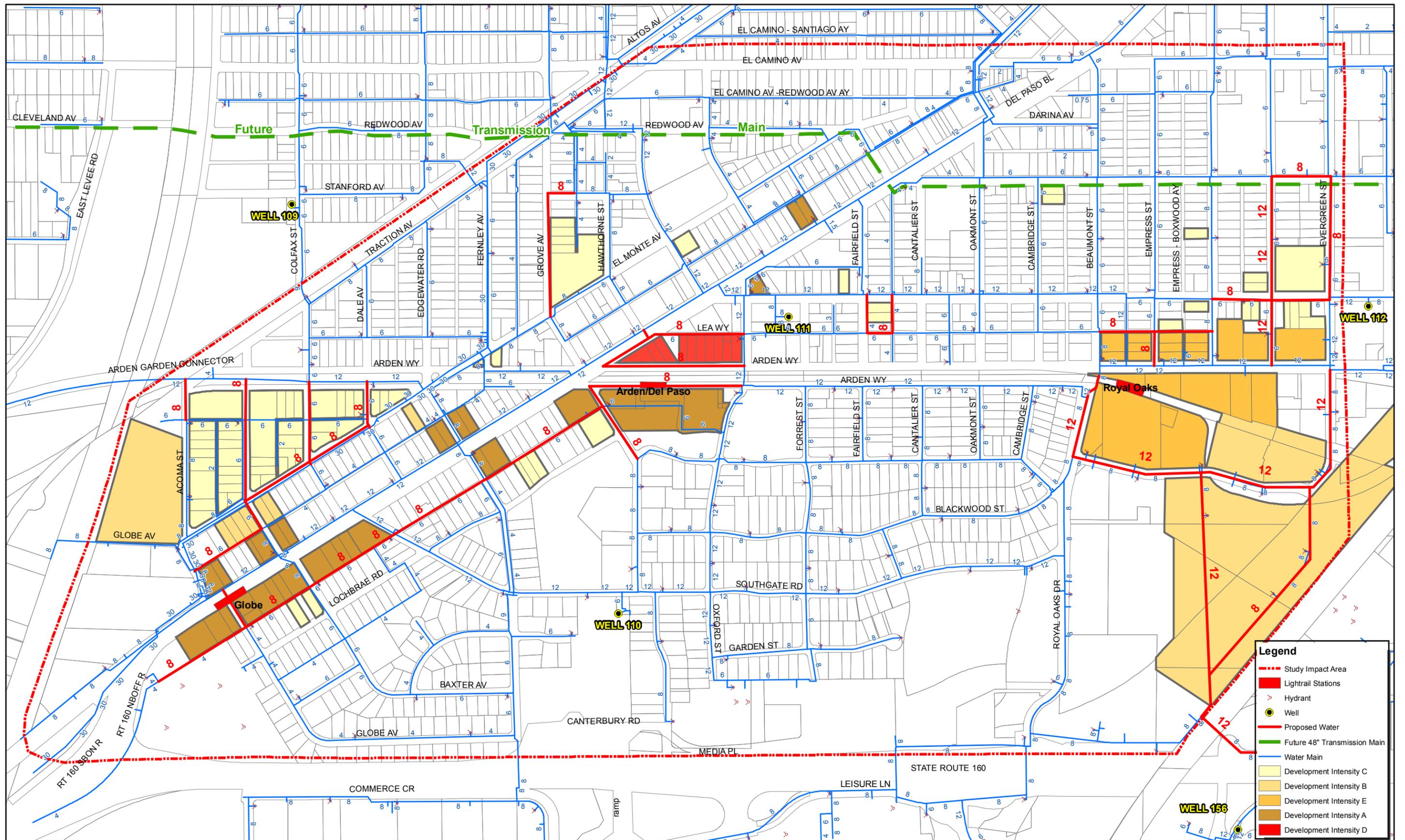
The development on the north side of Arden Way is also a proposed eight inch loop that circles the development. It connects to an existing twelve inch main located in Oxford Street and follows Lea Way westward to Del Paso replacing the exiting six inch main, then southwesterly to Arden Way, and then along the north side of Arden Way easterly to Oxford Street where it connects back to the existing twelve inch main. Dual eight inch mains are proposed in this area of Arden Way due to the width of street. There is also a new eight inch main proposed on Grove Avenue and Barrett Avenue to serve the development area on the northerly side of El Monte between Grove Avenue and Hawthorne top create an eight inch looped system around this area. An eight inch main is proposed to replace the existing six inch main in the El Monte / Del Paso Alley between Forrest Street and Winnipeg Street to serve the proposed development at the corner of Winnipeg and Del Paso. And lastly, an eight inch looped main is proposed around the development area south of Calvados Avenue between Fairfield and the Fairfield/Cantelier Alley connecting to the existing twelve inch main in Calvados Avenue.

Royal Oaks Station: The proposed development in the Royal Oaks Station Area is divided by Arden Way. To serve the proposed development area north of Arden Way, it is proposed to replace the system of existing six inch watermain with eight inch mains. These mains are located on Empress Street between Arden & Calvados, Calvados Avenue between the Beaumont/Empress Alley & Evergreen, Erickson Street between Arden & Dixieanne, Evergreen Street between Calvados & Dixieanne, and Dixieanne Avenue between Erickson & Evergreen. These improvements will connect to the existing twelve inch main in Arden Way and Evergreen Street and will create a grid system of eight inch mains throughout the proposed development



area. The small proposed development area on Boxwood Street is served by an existing eight inch main. The small area of development on Cambridge Street at Dixieanne is surrounded by an existing six inch main system and is not located near a larger main system. Development of these two parcels may be difficult if they are expected to provide a looped eight inch main system on Cambridge/Dixieanne/Beaumont Streets and therefore these mains have not been included in the proposed upgrades.

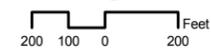
To serve the proposed development area south of Arden Way it is proposed to replace the existing eight inch main in Evergreen Street with a twelve inch main which will provide a loop around the immediate station area. The large development area south of Evergreen Street is proposed to have a twelve inch main and an eight inch main running through the development area. The location of these mains is purely conceptual at this time since the exact development street pattern is unknown. The system is proposed to connect to the existing eight inch main at the southern end of the end of the development area near the Leisure Lane/Highway 160 overcrossing. It is conservatively proposed to upgrade the existing eight inch main in Fee Drive to the east with a twelve inch main to provide a completed twelve inch looped system to serve this area



NORTHEAST LINE LIGHT RAIL STATIONS PLAN - PROPOSED WATER UTILITIES

FIGURE VI - 1

March 30th, 2007



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NATURAL GAS

General Information

The Pacific Gas & Electric Company (PG&E) supplies natural gas to the Sacramento area. During the winter, approximately 70 percent is imported from Canada and the balance is supplied from California production wells. During the summer, this ratio is reversed. Also during the summer, gas prices are lower so gas is stored in underground holders for use during winter peak use periods.

In the Northeast Line Light Rail Stations Plan area there is a high and low pressure distribution systems. High pressure system pipelines, generally four inch diameter and larger, carry gas at approximately 40 pounds per square inch (psi). Low pressure system pipelines, generally two inch diameter, carry gas at seven inch water column (about 0.25 psi). Service is generally provided from the low pressure system unless usage exceeds about 3000 cubic feet per hour; however, in this area the system is all high pressure. Regulators are used to reduce high pressure to low pressure.

Existing Conditions

The high pressure gas system in the Northeast Line Light Rail Stations Plan area, generally is served by a grid system throughout the Plan area. A twelve inch transmission main is located on the west side of the Plan area running along the old railroad/Traction Avenue corridor. An eight inch high pressure main crosses the Plan area connecting to the twelve inch main at Edgewater Road south to Arden Way where it turns and follows the Arden Way corridor eastward and leaves the project area at the eastern boundary. Several small diameter (two to four inch) connections exist into the neighborhoods to the north and east. Three larger six inch mains enter the Plan area, one at DelPaso/Hwy160, the second at Canterbury/160, and the third at Royal Oaks/160.

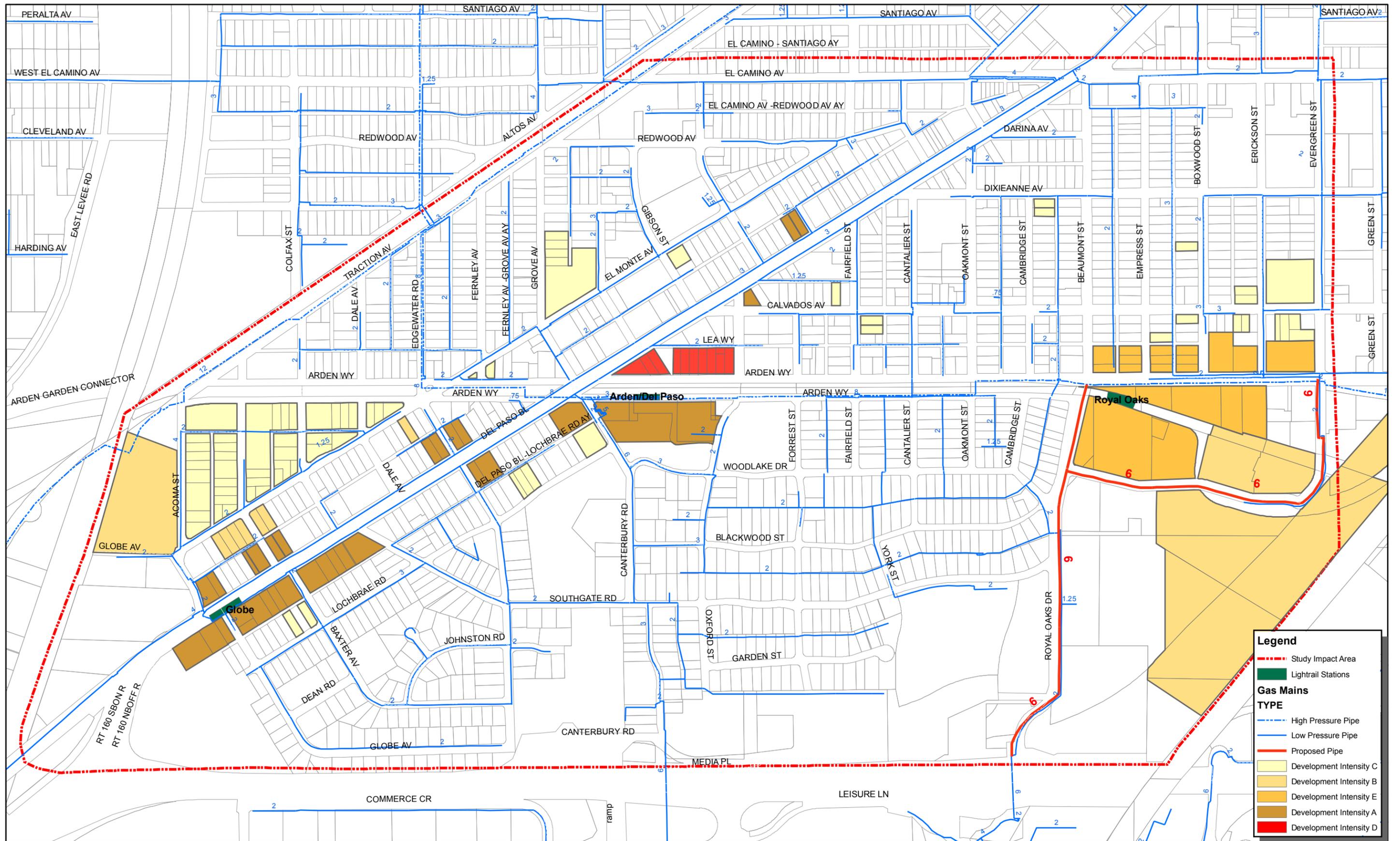
Proposed Improvements

PG&E has stated the existing gas infrastructure in the Line Light Rail Stations Plan area should be adequate to serve the level of development proposed in the majority of the Globe Station and Del Paso – Arden Station areas with relatively minor additions, unless an unusually large gas user locates in the area. In that case, facilities will be upgraded as necessary in order to accommodate the user.

However, with the development of the Royal Oaks Station area it is anticipated that a new transmission main loop will be needed to serve the development south of the Lightrail Tracks where currently only a deadend two inch main exists located in Evergreen Street as well as a two inch main located in Royal Oaks Drive. It is anticipated that a six inch transmission main will need to be looped from the the Arden/Evergreen intersection along Evergreen Street to Royal Oaks and south to the existing six inch main at Royal Oaks/Hwy 160.



If the user is a core (non-interruptible) customer in the service area and will accept service at seven inch water column pressure, the company is generally obligated by Public Utilities Commission regulations to provide service without additional cost for service. If the user is a non-core (interruptible) user, or needs an elevated pressure service for large volume use, there are charges for service according to the company's new business tariffs.



Legend

- - - Study Impact Area
- Lightrail Stations
- Gas Mains**
- TYPE**
- - - High Pressure Pipe
- Low Pressure Pipe
- Proposed Pipe
- Development Intensity C
- Development Intensity B
- Development Intensity E
- Development Intensity A
- Development Intensity D

NORTHEAST LINE LIGHT RAIL STATIONS PLAN - NATURAL GAS PLAN

FIGURE VII - 1

March 30th, 2007

0 100 200 Feet

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ELECTRICAL

General Information

The Sacramento Municipal Utility District (SMUD) provides electrical service to customers located within the Northeast Line Light Rail Stations Plan area. Power is transmitted to the Northeast Line Light Rail Stations Plan area by a series of 69 kilovolt (kV) transmission lines that feed overhead/underground 12 kV & 4 kV distribution systems. Within the project area, the 69kV transmission lines are located along the south side of Arden Way, along the west side of Evergreen Street, and along the El Monte-Del Paso Alley.

Existing Conditions (Facilities)

There are three existing substations located within the plan area. The El Monte Substation is located on the southerly side of El Monte Avenue between Gibson Street and Forrest Street. This substation is a 69-4kV substation. The Dixianne – Evergreen Substation is located on the southerly side of Dixianne Avenue between Erickson Street and Evergreen Street. This substation is also a 69-4kV substation. The Evergreen – Royal Oaks Substation is located south of Arden Way between Evergreen Street and Royal Oaks Drive. This substation is a 69-12kV substation and feeds the majority of the project area via an existing overhead/underground distribution system. The portion of the Plan area north of Arden Way is generally served by a 4kV overhead distribution system.

Regulatory Context

The energy consumption of new buildings in California is regulated by State Building Energy Efficiency Standards, Title 24. These are contained in the California Code of Regulations, Title 24, Part 2, Chapter 2-53. Enforcement of the regulations is addressed in the California Code of Regulations, Title 20, Chapter 2, Subchapter 4, Article 1. Title 24 applies to all new construction of both residential and non-residential buildings, and regulates energy consumed for heating, cooling, ventilation, water heating, and lighting.

Proposed Improvements

Based on proposed land use projections for the Northeast Line Light Rail Stations Plan, SMUD estimates that the additional electrical load from development may be approximately 15 to 23 megawatts at final build out. With typical system improvements SMUD's distribution system should be able to handle this new load growth.

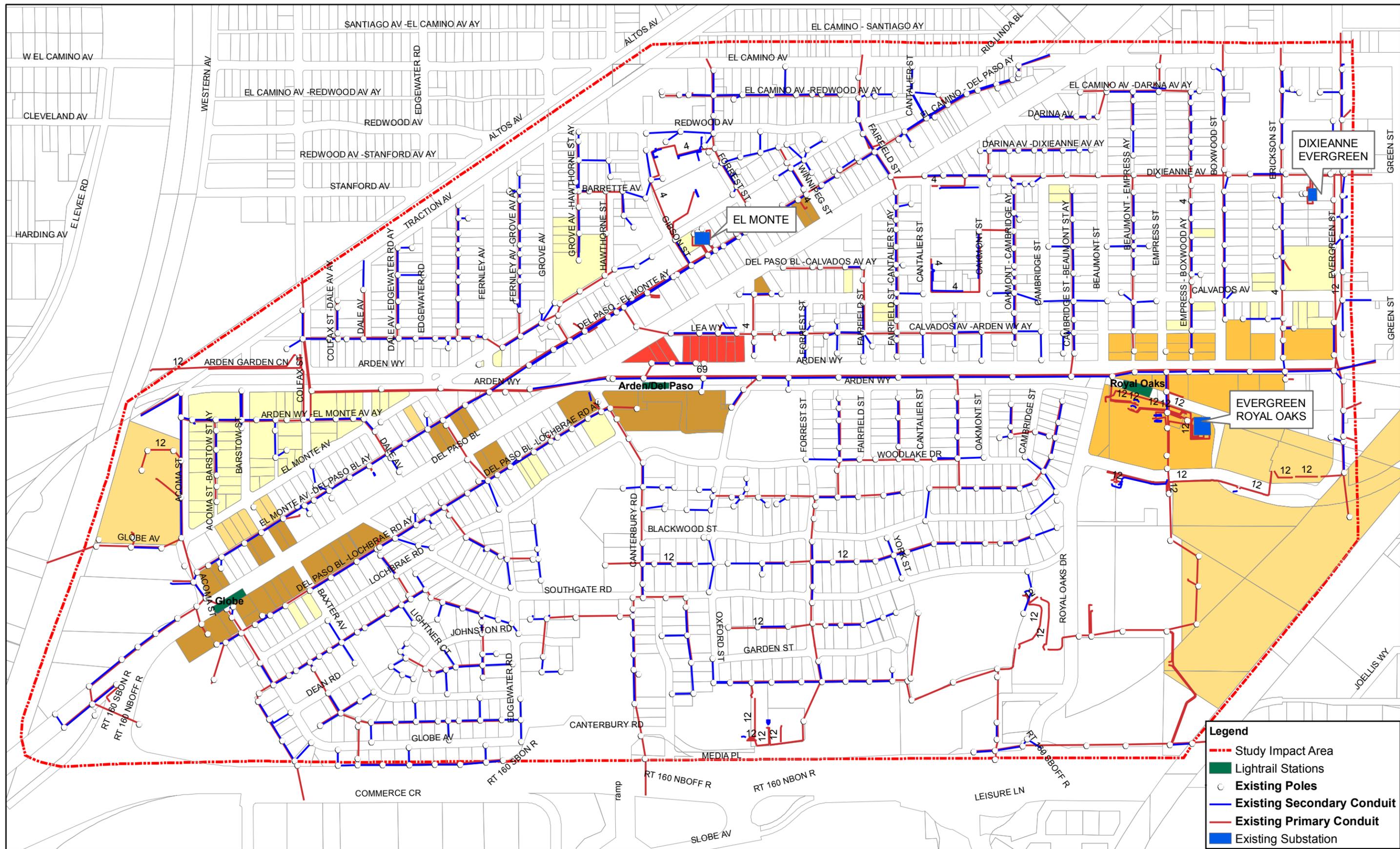
The Evergreen - Royal Oaks Substation is located on a 0.2 acre parcel just south of the Light Rail Tracks within the middle of proposed development for the area. The development of the area around the substation will need to include proper building setbacks, screening, etc. to the station as well as the transmission lines leading to the station.



SMUD is examining the possibility of ultimately cutting-over the existing 4kV system north of Arden Way to a 12 kV system. However, since the majority of the proposed development is located within the 12 kV system service areas, or within the 4kV service area immediately adjacent to the north side of Arden Way, the cutting-over of the 4kV system is not expected to impede development. SMUD will review each application for service for new development individually and determine the best strategy to serve each individual project's needs.

It is expected that future development in the Northeast Line Light Rail Stations Plan area will be served from the 12 kV distribution systems. The existing overhead distribution system will remain in order to maintain service to existing customers; however, portions of this system may be placed underground in segments as new buildings or street widening improvements are constructed.

In accordance with SMUD's Rule & Regulations 16, developers are required to perform all necessary excavating and backfilling, furnish and install the underground duct system per SMUD's design, transfer ownership and grant easements for all such facilities, and pay 100 percent of the estimated cost of the utilities facility installation prior to installment by SMUD.



NORTHEAST LINE LIGHT RAIL STATIONS PLAN - ELECTRICAL PLAN

FIGURE VIII-1

March 30th, 2007

200 100 0 200 Feet

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PROBABLE ESTIMATE OF CONSTRUCTION COSTS

The costs presented here to construct the infrastructure necessary for the Northeast Line Light Rail Stations Plan area are intended to be planning level only. They include the general costs for the overall buildout of the proposed development of the plan area using today's dollars. This estimate is not intended to be utilized for the actual costs for specific projects. The final costs for each specific project will need to be estimated separately and could be considerably different than those shown here due to the uncertainty of the order, timing and scope of the actual development to be constructed. The estimates have been developed solely to give interested parties a magnitude of the scale of the costs of improvements.

The unit costs are based on actual costs of recent development within the Del Paso Boulevard area, planning level costs utilized by various City departments as well as engineering judgment. Final unit costs for each specific project will depend on the actual labor and materials costs for the conditions at the time of construction. These conditions might include the scope of the development and the schedule of the completion of the project.

The estimates are generally separated into the corresponding infrastructure report for the different utilities. For each utility the estimates have been divided either along the major boundaries as for sewer and storm drainage, or by the corresponding Station area. Assumptions and clarifications for the costs are noted at the bottom of the individual sheets.

The unit costs for the storm drainage improvements utilized the 1996 Master Storm Drainage report as a basis and were increased using the ENR cost index from 1996 yearly average (ENR = 5,620) to February 2007 values (ENR = 7,880).

The Streetwork improvements are based on the conceptual street sections prepared by MIG. The unit cost per foot was developed for each section and multiplied by the length of street within the plan area. For the typical mid-block crossing, a total of nine locations were assumed for the estimate. An estimate has also been included for the decorative pavement treatment of the Globe Station Transit area. Right-of-way acquisition has not been included in the estimates since it is expected that the improvements will be constructed within the existing road right-of-way.



CONSTRUCTION COST ESTIMATE SUMMARY

A. STREETWORK	\$19,569,360
B. SEWER SYSTEM	
East	\$273,139
West	\$1,234,617
C. DRAINAGE SYSTEM	
Shed 151 East	\$7,559,047
Shed 151 West	\$4,301,480
Shed 153	\$2,337,660
D. WATER DISTRIBUTION SYSTEM	
Globe Station Area	\$1,507,359
Arden - Del Paso Station Area	\$1,466,859
Royal Oaks Station Area	\$2,715,188
TOTAL CONSTRUCTION (A-D)	\$40,964,708



STREETWORK COSTS

DESCRIPTION	QUAN TITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
A. STREETWORK				
1. Acoma Street	1,250	LF	\$770	\$962,500
				35% Contingency \$336,900
				Subtotal <u>\$1,299,400</u>
				15% Engineering \$194,900
				10% Construction Management \$129,900
Total Acoma Street				<u>\$1,624,200</u>
<hr/>				
2. Del Paso Blvd				
Roadway Section A	1,100	LF	\$310	\$341,000
Traffic Signal	1	EA	\$500,000	\$500,000
4 Decorative Crosswalks	304	LF	\$300	\$91,200
			Subtotal	<u>\$932,200</u>
				35% Contingency \$326,300
				Subtotal <u>\$1,258,500</u>
				15% Engineering \$188,800
				10% Construction Management \$125,900
Total Section A				<u>\$1,573,200</u>
Roadway Section B	1,350	LF	\$310	\$418,500
				35% Contingency \$146,500
				Subtotal <u>\$565,000</u>
				15% Engineering \$84,800
				10% Construction Management \$56,500
Total Section B				<u>\$706,300</u>
Total Del Paso Blvd				<u>\$2,279,500</u>



3. Arden Way (East of Royal Oaks)	1,400	LF	\$670	\$938,000
Traffic Signal	1	EA	\$500,000	\$500,000
4 Decorative Crosswalks	232	LF	\$300	\$69,600
			Subtotal	<u>\$1,507,600</u>
			35% Contingency	\$527,700
			Subtotal	<u>\$2,035,300</u>
			15% Engineering	\$305,300
			10% Construction Management	\$203,500
Total Arden Way (East of Royal Oaks)				<u>\$2,544,100</u>

4. Arden Way (Oxford to Royal Oaks)

Roadway Section A	1,000	LF	\$950	\$950,000
Pedestrian Light	1	EA	\$200,000	\$200,000
7 Decorative Crosswalks	474	LF	\$300	\$142,200
			Subtotal	<u>\$1,292,200</u>
			35% Contingency	\$452,300
			Subtotal	<u>\$1,744,500</u>
			15% Engineering	\$261,700
			10% Construction Management	\$174,500
Total Section A				<u>\$2,180,700</u>
Roadway Section B	1,000	LF	\$950	\$950,000
Pedestrian Light	1	EA	\$200,000	\$200,000
			Subtotal	<u>\$1,150,000</u>
			35% Contingency	\$402,500
			Subtotal	<u>\$1,552,500</u>
			15% Engineering	\$232,900
			10% Construction Management	\$155,300
Total Section B				<u>\$1,940,700</u>
Total Arden Way (Oxford to Royal Oaks)				<u>\$4,121,400</u>

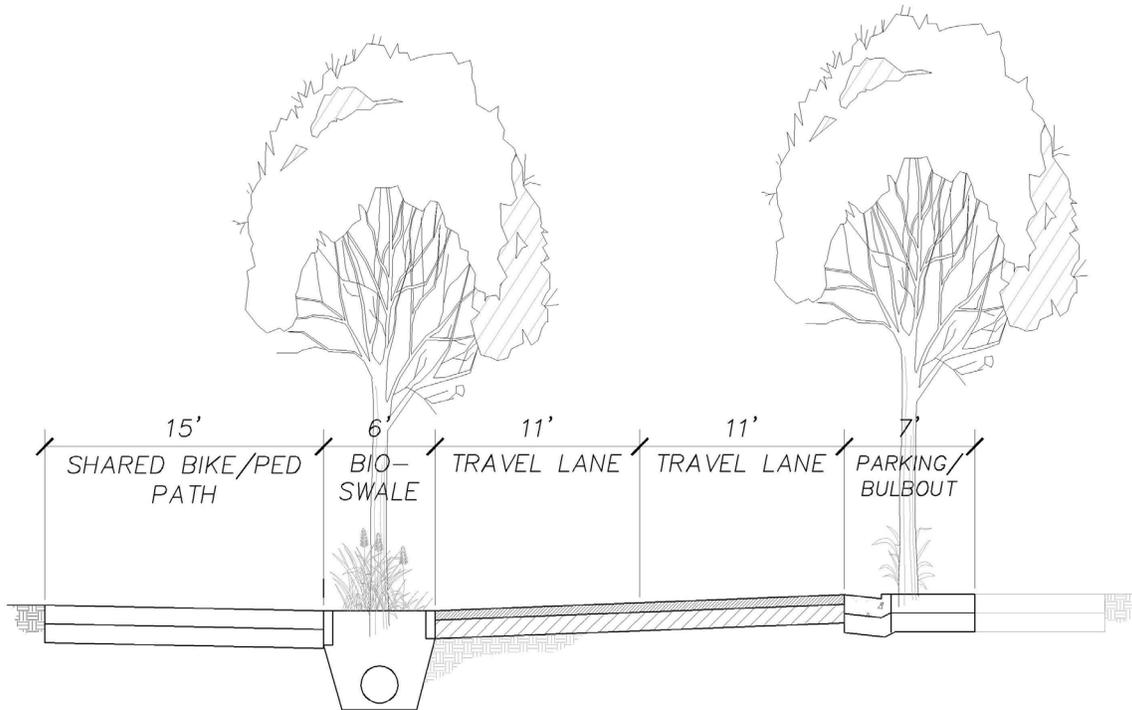
City of Sacramento
Northeast Line Light Rail Stations Plan



5.	Royal Oaks Drive	2,000	LF	\$650	\$1,300,000
				35% Contingency	\$455,000
				Subtotal	<u>\$1,755,000</u>
				15% Engineering	\$263,300
				10% Construction Management	\$175,500
	Total Royal Oaks Drive				<u>\$2,193,800</u>
<hr/>					
6.	Mid-Street Crossing	9	EA	\$26,540	\$238,860
				35% Contingency	\$83,600
				Subtotal	<u>\$322,460</u>
				15% Engineering	\$48,400
				10% Construction Management	\$32,200
	Total Mid-Street Crossing				<u>\$403,060</u>
<hr/>					
7.	Globe Station Transit Area	350	LF	\$2,840	\$994,000
	Art Feature	1	EA	\$100,000	\$100,000
				Subtotal	<u>\$1,094,000</u>
				35% Contingency	\$382,900
				Subtotal	<u>\$1,476,900</u>
				15% Engineering	\$221,500
				10% Construction Management	\$147,700
	Total Globe Station Transit Area				<u>\$1,846,100</u>
<hr/>					
8.	Arden / Del Paso Station Transit Area	800	LF	\$2,400	\$1,920,000
				35% Contingency	\$672,000
				Subtotal	<u>\$2,592,000</u>
				15% Engineering	\$388,800
				10% Construction Management	\$259,200
	Total Arden / Del Paso Station Transit Area				<u>\$3,240,000</u>



ACOMA STREET



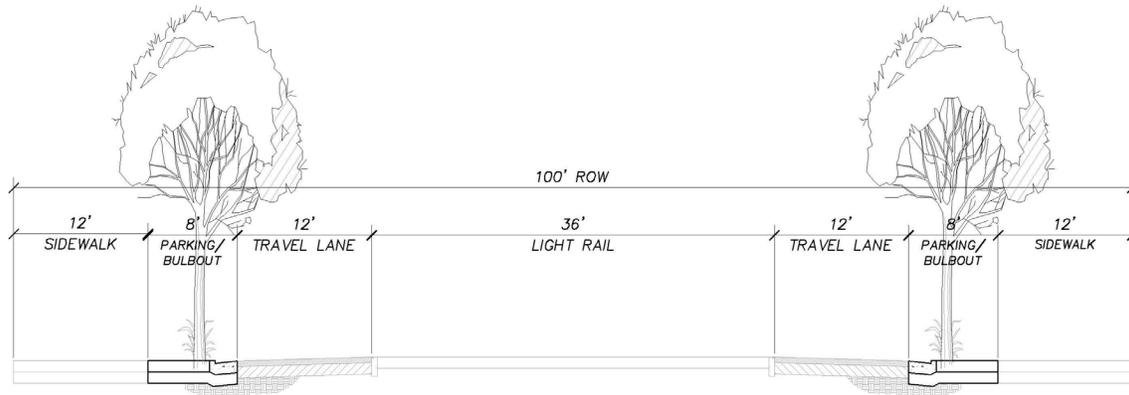
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	3.7	CY	\$28.00	\$103.60
2. 4" A.C.	22	SF	\$3.50	\$77.00
3. 12" A.B.	22	SF	\$2.00	\$44.00
4. Curb and Gutter No.4	1	LF	\$35.00	\$35.00
5. Sidewalk	18.5	SF	\$12.00	\$222.00
6. Street Light	0.02	EA	\$6,000.00	\$120.00
7. Median Curb	0	LF	\$12.00	\$0.00
8. Striping	1	LF	\$2.00	\$2.00
9. Landscaping	5	SF	\$10.00	\$50.00
10. Trees	0.06	EA	\$400.00	\$24.00
11. 6' Bioswale	1	LF	\$75.00	\$75.00
12. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00
Total Street Costs per LF				\$770.00

Assumptions:

- Two feet depth of earthwork over entire cross section.
- Curb and gutter to be replaced on one side of the street, where bulbouts are constructed (.5' per ft).
- Sidewalk to be constructed on one side of the street (15') and as part of the bulbout on the other side of the street (average of 3.5').
- Street light to be added every 100 feet on each side of the street.
- One tree per 50 feet will be added on each side of the street.
- A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.
- Bioswale unit costs includes curbing and drainage.



DEL PASO BOULEVARD



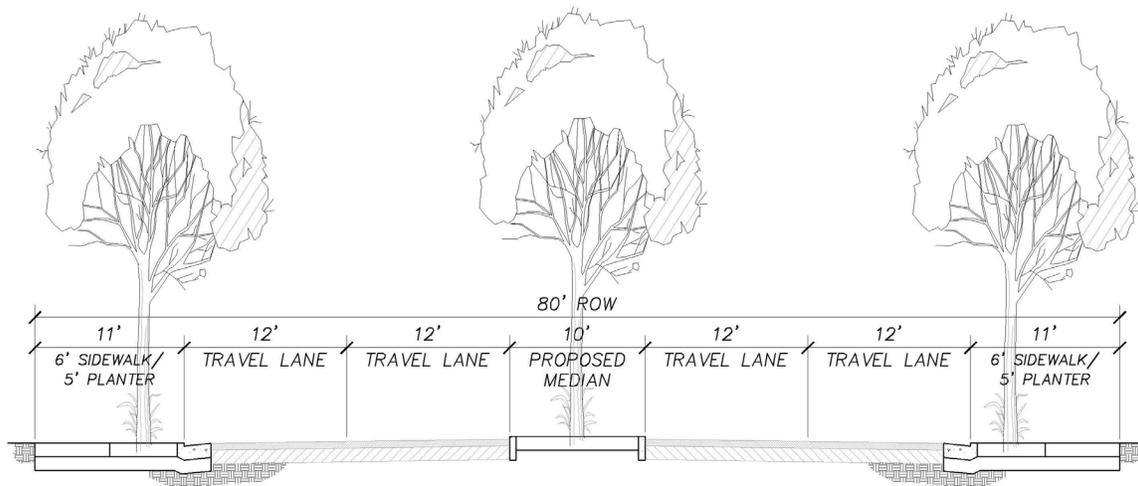
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	0.6	CY	\$28.00	\$16.52
2. 6" A.C.	0	SF	\$4.50	\$0.00
3. 18" A.B.	0	SF	\$3.00	\$0.00
4. Curb and Gutter No.4	1	LF	\$35.00	\$35.00
5. Sidewalk	8	SF	\$12.00	\$96.00
6. Street Light	0.02	EA	\$6,000.00	\$120.00
7. Median Curb	0	LF	\$12.00	\$0.00
8. Striping	0	LF	\$2.00	\$0.00
9. Landscaping	0	SF	\$10.00	\$0.00
10. Trees	0.06	EA	\$400.00	\$24.00
11. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00
Total Street Costs per LF				<u>\$310.00</u>

Assumptions:

1. Two feet depth of earthwork over modified portion of the cross section. One side of street to be modified at a given location along the street (8' of bulbout).
2. Curb, gutter, and sidewalk on one of the two sides of the road will be replaced at a given location.
3. Additional Street Lights to be places every 100 feet on each side of the road.
4. One tree per 50 feet will be added on each side of the street with construction of bulbout, and in the road median.
5. A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



ARDEN WAY - EAST OF ROYAL OAKS



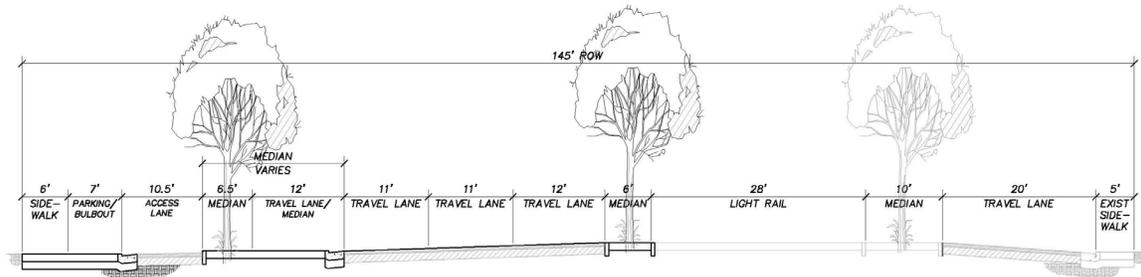
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	2.7	CY	\$28.00	\$74.76
2. 6" A.C.	0	SF	\$4.50	\$0.00
3. 18" A.B.	0	SF	\$3.00	\$0.00
4. Curb and Gutter No.4	2	LF	\$35.00	\$70.00
5. Sidewalk	12	SF	\$12.00	\$144.00
6. Street Light	0.02	EA	\$6,000.00	\$120.00
7. Median Curb	2	LF	\$12.00	\$24.00
8. Striping	2	LF	\$2.00	\$4.00
9. Landscaping	19	SF	\$10.00	\$190.00
10. Trees	0.06	EA	\$400.00	\$24.00
11. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00
Total Street Costs per LF				<u>\$670.00</u>

Assumptions:

1. Two feet depth of earthwork over modified portion of the cross section (11' sidewalk/planter, 2' gutter, 10' median, 2' gutter, and 11' sidewalk/planter).
2. Street light to be added every 100 feet on each side of the street.
3. One tree per 50 feet will be added on each side of the street on and in the median.
4. A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



ARDEN WAY - OXFORD TO ROYAL OAKS



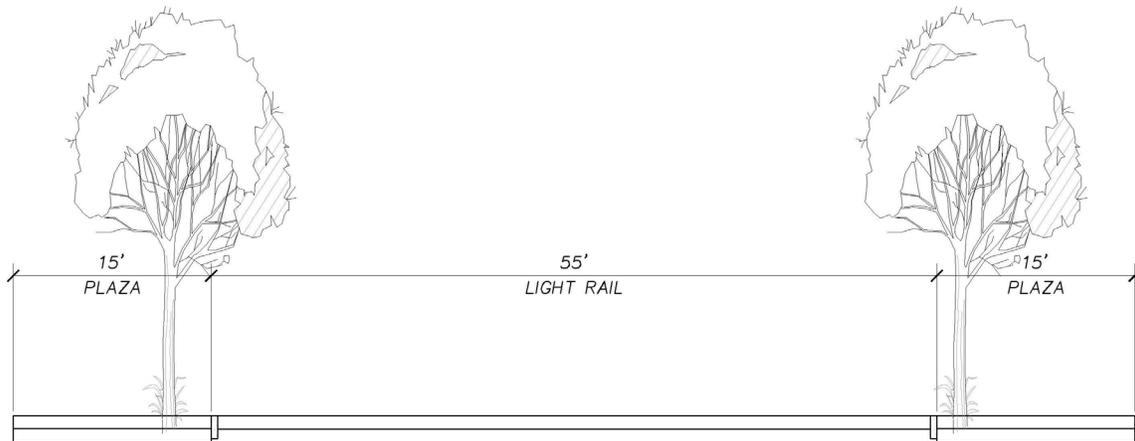
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	2.5	CY	\$28.00	\$70.56
2. 6" A.C.	1.4	SF	\$4.50	\$6.30
3. 18" A.B.	1.4	SF	\$3.00	\$4.20
4. Curb and Gutter No.4	1.5	LF	\$35.00	\$52.50
5. Sidewalk	11.6	SF	\$12.00	\$139.20
6. Street Light	0.04	EA	\$6,000.00	\$240.00
7. Median Curb	2	LF	\$12.00	\$24.00
8. Striping	4	LF	\$2.00	\$8.00
9. Landscaping	36	SF	\$10.00	\$360.00
10. Trees	0.04	EA	\$400.00	\$16.00
11. Drainage	0.0025	LF	\$8,000.00	\$20.00
12. Slurry Seal	34	SF	\$0.25	\$8.50
Total Street Costs per LF				<u>\$950.00</u>

Assumptions:

- Two feet depth of earthwork over modified portion of the cross section (6' sidewalk, 7' parking/bulbout, 2' gutter, 6.5' median, 2' gutter, and 6' median).
- A.C. required for 7' parking for 20% of the street.
- A.B. required for 7' parking and gutter for 20% of the street.
- 6' of sidewalk to be replaced along entire length of the street, as well as 7' of bulbout added for 80% of the length of the street.
- Street light to be added every 100 feet on each side of the street, as well as in the median and along the access lane.
- One tree per 50 feet will be added on 2 of the 3 medians.
- A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



ROYAL OAKS DRIVE



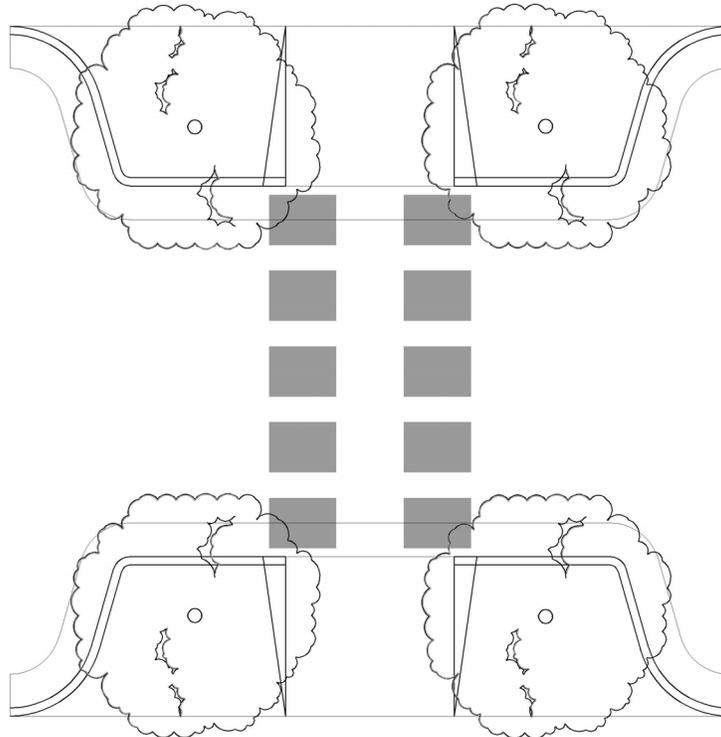
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	2.1	CY	\$28.00	\$58.80
2. 4" A.C.	0	SF	\$3.50	\$0.00
3. 12" A.B.	0	SF	\$2.00	\$0.00
4. Specialty Paving	7	LF	\$25.00	\$175.00
5. Curb and Gutter No.4	2	LF	\$35.00	\$70.00
6. Sidewalk	0	SF	\$12.00	\$0.00
7. Street Light	0.02	EA	\$6,000.00	\$120.00
8. Mountable Median Curb	2	LF	\$12.00	\$24.00
9. Striping	3	LF	\$2.00	\$6.00
10. Landscaping	15	SF	\$10.00	\$150.00
11. Trees	0.06	EA	\$400.00	\$24.00
12. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00
Total Street Costs per LF				<u>\$650.00</u>

Assumptions:

1. Two feet depth of earthwork over modified portion of the cross section (6' planter, 2' gutter, 12' turning lane, 2' gutter, and 6' planter).
2. Existing sidewalk on both sides of street to remain.
3. One streetlight to be placed every 50' on each side of the street, as well as in the median.
4. 5.5' feet of landscaping on each side of the street, and 4 feet in the median.
5. One tree per 50 feet will be added on each side of the street and in the median.
6. A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



MID STREET CROSSING – PER CROSSING



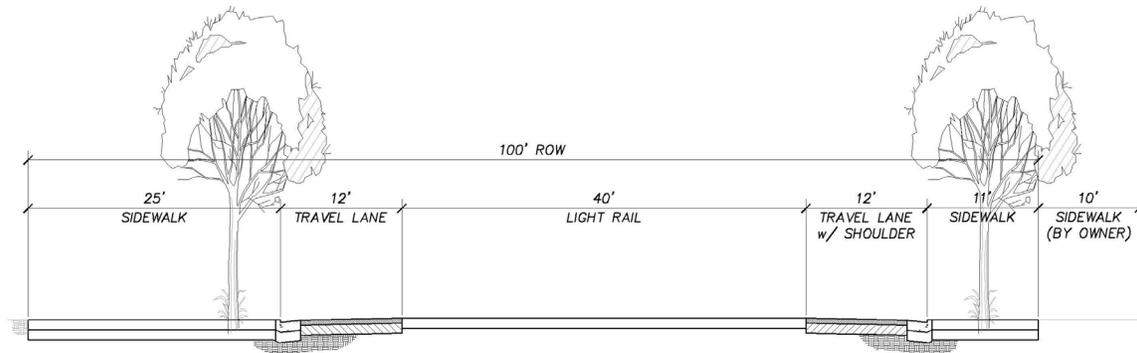
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	63.3	CY	\$28.00	\$1,771.28
2. 4" A.C.	0	SF	\$3.50	\$0.00
3. 12" A.B.	0	SF	\$2.00	\$0.00
4. Curb and Gutter No.4	108	LF	\$35.00	\$3,780.00
5. Sidewalk	586	SF	\$12.00	\$7,032.00
6. Street Light	0	EA	\$6,000.00	\$0.00
7. Median Curb	0	LF	\$12.00	\$0.00
8. Striping	1	LS	\$360.00	\$360.00
9. Landscaping	0	SF	\$10.00	\$0.00
10. Trees	4	EA	\$400.00	\$1,600.00
11. Modification of Existing Drainage	1	EA	\$12,000.00	\$12,000.00
Total Street Costs per LF				<u>\$26,540.00</u>

Assumptions:

1. Two feet depth of earthwork over modified portion of the cross section (2 bulbouts).
2. Sidewalk on each side of street for mid-street crossing a trapezoid shape, with lengths of 30 and 34 feet, and a width of 7 feet.
3. Curb length includes curb along crossing ramp.
4. Striping is ten 3 feet by 3 feet squares for crosswalk.
5. Two trees per each pipe side of crossing.
6. 2 DI's, 50 feet of pipe, and a manhole required to modify existing drainage.



GLOBE STATION TRANSIT AREA



Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	7.4	CY	\$28.00	\$207.48
2. Decorative Paving	61	SF	\$25.00	\$1,525.00
3. Decorative Sidewalk	35	SF	\$25.00	\$875.00
4. 6" A.B.	0	SF	\$3.50	\$0.00
5. 12" A.B.	61	SF	\$2.00	\$122.00
6. Curb and Gutter No.4	2	LF	\$35.00	\$70.00
7. Street Light	0	EA	\$6,000.00	\$0.00
8. Median Curb	0	LF	\$12.00	\$0.00
9. Striping	2	SF	\$2.00	\$4.00
10. Landscaping	0	SF	\$10.00	\$0.00
11. Trees	0.04	EA	\$400.00	\$16.00
12. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00

Total Street Costs per LF

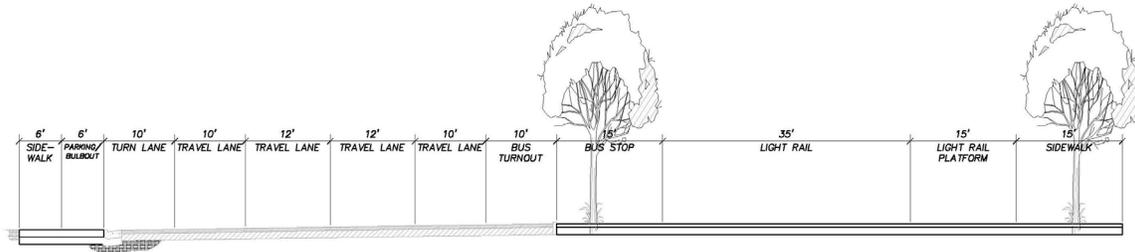
\$2,840.00

Assumptions:

1. Two feet depth of earthwork over entire cross section.
2. Decorative Paving over Light Rail (40'), Travel Lanes (2x12'), except for Curb and Gutter (2'x2').
3. 25' of Decorative Sidewalk on one side of the street, and 3' on the other side.
4. A.B. under decorative paving.
5. Median curb of each side of light rail platform.
6. One tree per 50 feet will be added on each side of the street.
7. A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



ARDEN / DEL PASO STATION TRANSIT AREA



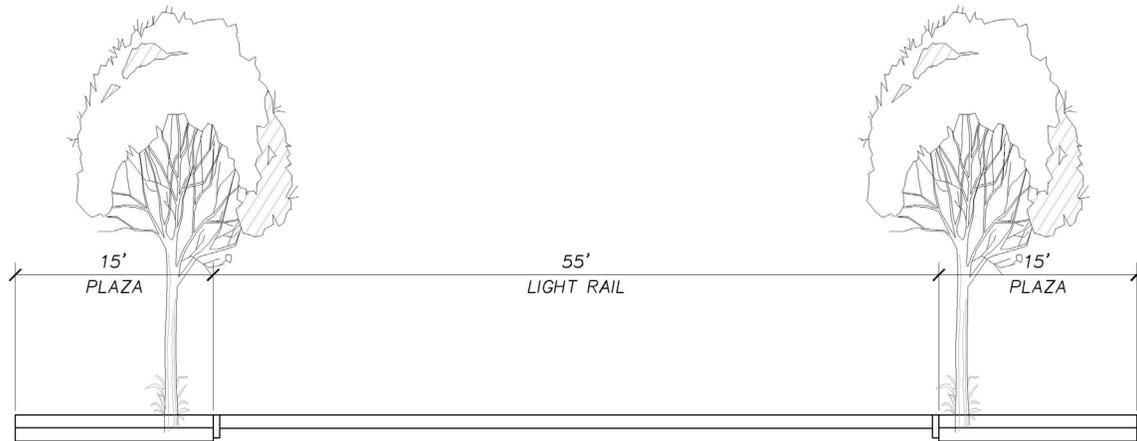
Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	6.8	CY	\$28.00	\$190.68
2. Decorative Paving	78	SF	\$25.00	\$1,950.00
3. Sidewalk	9	SF	\$12.00	\$108.00
4. 6" A.B.	0	SF	\$3.50	\$0.00
5. 12" A.B.	0	SF	\$2.00	\$0.00
6. Curb and Gutter No.4	0	LF	\$35.00	\$0.00
7. Street Light	0.02	EA	\$6,000.00	\$120.00
8. Median Curb	0	LF	\$12.00	\$0.00
9. Striping	0	SF	\$2.00	\$0.00
10. Landscaping	0	SF	\$10.00	\$0.00
11. Trees	0.04	EA	\$400.00	\$16.00
12. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00
Total Street Costs per LF				<u>\$2,400.00</u>

Assumptions:

1. Two feet depth of earthwork over modified portion of the cross section (6' sidewalk, 6' parking/bulbout, 80' light rail).
2. Decorative Paving over Light Rail.
3. 6' of sidewalk along with an average of 3' of sidewalk (6' of bulbout for 50% of the street length) on one side of the street.
4. One streetlight per 100 feet will be added on each side of the street.
5. One tree per 50 feet will be added on each side of the street.
6. A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



ROYAL OAKS STATION TRANSIT AREA



Description	Quantity	Unit of Measure	Unit Price	Amount
1. Earthwork	2.2	CY	\$28.00	\$62.16
2. Decorative Paving	85	SF	\$25.00	\$2,125.00
3. Decorative Sidewalk	0	SF	\$25.00	\$0.00
4. 6" A.B.	0	SF	\$3.50	\$0.00
5. 12" A.B.	0	SF	\$2.00	\$0.00
6. Curb and Gutter No.4	0	LF	\$35.00	\$0.00
7. Street Light	0	EA	\$6,000.00	\$0.00
8. Median Curb	0	LF	\$12.00	\$0.00
9. Striping	0	SF	\$2.00	\$0.00
10. Landscaping	0	SF	\$10.00	\$0.00
11. Trees	0.06	EA	\$400.00	\$24.00
12. Modification of Existing Drainage	0.0025	LF	\$8,000.00	\$20.00

Total Street Costs per LF

\$2,230.00

Assumptions:

1. Two feet depth of earthwork over entire cross section.
2. Three trees per 50 feet of station.
3. A drain inlet, 25' of pipe, and a manhole will be installed every 400 feet.



EAST SEWER SYSTEM COSTS

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
B. SEWER SYSTEM				
1. Sewer Manhole	7	EA	\$5,980.00	\$41,860
2. Sewer Pipe, 8"	0	LF	\$80.00	\$0
3. Sewer Pipe, 10"	0	LF	\$90.00	\$0
4. Sewer Pipe, 12"	0	LF	\$105.00	\$0
5. Sewer Pipe, 15"	1,000	LF	\$120.00	\$120,000
6. Sewer Pipe, 18"	0	LF	\$130.00	\$0
7. Sewer Pipe, 21"	0	LF	\$140.00	\$0
8. Sewer Pipe, 24"	0	LF	\$150.00	\$0
9. Service	0	EA	\$500.00	\$0
		Subtotal		\$161,860
		35% Contingency		\$56,651
		Subtotal		<u>\$218,511</u>
		15% Engineering		\$32,777
		10% Construction Management		\$21,851
		SEWER SYSTEM SUBTOTAL		\$273,139



WEST SEWER SYSTEM COSTS

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
B. SEWER SYSTEM				
1. Sewer Manhole	25	EA	\$5,980.00	\$149,500
2. Sewer Pipe, 8"	295	LF	\$80.00	\$23,600
3. Sewer Pipe, 10"	165	LF	\$90.00	\$14,850
4. Sewer Pipe, 12"	1,075	LF	\$105.00	\$112,875
5. Sewer Pipe, 15"	0	LF	\$120.00	\$0
6. Sewer Pipe, 18"	420	LF	\$130.00	\$54,600
7. Sewer Pipe, 21"	1,635	LF	\$140.00	\$228,900
8. Sewer Pipe, 24"	420	LF	\$150.00	\$63,000
9. Sewer Pipe, 27"	480	LF	\$160.00	\$76,800
10. Service	15	EA	\$500.00	\$7,500
		Subtotal		\$731,625
		35% Contingency		\$256,069
		Subtotal		<u>\$987,694</u>
		15% Engineering		\$148,154
		10% Construction Management		\$98,769
		SEWER SYSTEM SUBTOTAL		\$1,234,617



DRAINAGE SYSTEM COSTS - SHED 151 EAST

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
C. DRAINAGE SYSTEM				
1. Storm Drain Pipe, 18"	0	LF	\$85.00	\$0
2. Storm Drain Pipe, 24"	330	LF	\$115.00	\$37,950
3. Storm Drain Pipe, 30"	1,370	LF	\$140.00	\$191,800
4. Storm Drain Pipe, 36"	340	LF	\$170.00	\$57,800
5. Storm Drain Pipe, 48"	0	LF	\$235.00	\$0
6. Storm Drain Pipe, 54"	1,370	LF	\$275.00	\$376,750
7. Storm Drain Pipe, 60"	0	LF	\$310.00	\$0
8. Storm Drain Pipe, 66"	3,110	LF	\$350.00	\$1,088,500
9. Storm Drain Pipe, 72"	1,400	LF	\$385.00	\$539,000
10. Manhole, 12"-24"	1	EA	\$2,845.00	\$2,845
11. Manhole, 30"-36"	7	EA	\$2,820.00	\$19,740
12. Manhole, 42"-48"	0	EA	\$3,350.00	\$0
13. Manhole, 54"-60"	6	EA	\$3,690.00	\$22,140
14. Manhole, 66"-72"	21	EA	\$4,100.00	\$86,100
Detention Basin Improvements				
15. Northern West Basin	0	EA	\$1,258,140.00	\$0
Detention Basin Improvements				
16. Southern West Basin	0	EA	\$1,029,815.00	\$0
Detention Basin Improvements				
17. East Basin	1	EA	\$2,056,810.00	\$2,056,810
18. Flood Proofing (House)	0	EA	\$35,055.00	\$0
19. Flood Proofing (Building)	0	EA	\$70,110.00	\$0
		Subtotal		\$4,479,435
		35% Contingency		\$1,567,802
		Subtotal		<u>\$6,047,237</u>
		15% Engineering		\$907,086
		10% Construction Management		\$604,724
TOTAL STORM DRAIN SHED 151 EAST				\$7,559,047



DRAINAGE SYSTEM COSTS - SHED 151 WEST

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
C. DRAINAGE SYSTEM				
1. Storm Drain Pipe, 18"	260	LF	\$85.00	\$22,100
2. Storm Drain Pipe, 24"	700	LF	\$115.00	\$80,500
3. Storm Drain Pipe, 30"	300	LF	\$140.00	\$42,000
4. Storm Drain Pipe, 36"	0	LF	\$170.00	\$0
5. Storm Drain Pipe, 48"	0	LF	\$235.00	\$0
6. Storm Drain Pipe, 54"	0	LF	\$275.00	\$0
7. Storm Drain Pipe, 60"	0	LF	\$310.00	\$0
8. Storm Drain Pipe, 66"	0	LF	\$350.00	\$0
9. Storm Drain Pipe, 72"	0	LF	\$385.00	\$0
10. Manhole, 12"-24"	1	EA	\$2,845.00	\$2,845
11. Manhole, 30"-36"	3	EA	\$2,820.00	\$8,460
12. Manhole, 42"-48"	0	EA	\$3,350.00	\$0
13. Manhole, 54"-60"	0	EA	\$3,690.00	\$0
14. Manhole, 66"-72"	0	EA	\$4,100.00	\$0
Detention Basin Improvements				
15. Northern West Basin	1	EA	\$1,258,140.00	\$1,258,140
Detention Basin Improvements				
16. Southern West Basin	1	EA	\$1,029,815.00	\$1,029,815
Detention Basin Improvements				
17. East Basin	0	EA	\$2,056,810.00	\$0
18. Flood Proofing (House)	1	EA	\$35,055.00	\$35,055
19. Flood Proofing (Building)	1	EA	\$70,110.00	\$70,110
Subtotal				\$2,549,025
35% Contingency				\$892,159
Subtotal				<u>\$3,441,184</u>
15% Engineering				\$516,178
10% Construction Management				\$344,118
TOTAL STORM DRAIN SHED 151 WEST				\$4,301,480



DRAINAGE SYSTEM COSTS - SHED 153

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
C. DRAINAGE SYSTEM				
1. Storm Drain Pipe, 18"	0	LF	\$85.00	\$0
2. Storm Drain Pipe, 24"	1,775	LF	\$115.00	\$204,125
3. Storm Drain Pipe, 30"	1,755	LF	\$140.00	\$245,700
4. Storm Drain Pipe, 36"	630	LF	\$170.00	\$107,100
5. Storm Drain Pipe, 48"	0	LF	\$235.00	\$0
6. Storm Drain Pipe, 54"	370	LF	\$275.00	\$101,750
7. Storm Drain Pipe, 60"	500	LF	\$310.00	\$155,000
8. Storm Drain Pipe, 66"	0	LF	\$350.00	\$0
9. Storm Drain Pipe, 72"	490	LF	\$385.00	\$188,650
10. Manhole, 12"-24"	10	EA	\$2,845.00	\$28,450
11. Manhole, 30"-36"	7	EA	\$2,820.00	\$19,740
12. Manhole, 42"-48"	0	EA	\$3,350.00	\$0
13. Manhole, 54"-60"	3	EA	\$3,690.00	\$11,070
14. Manhole, 66"-72"	2	EA	\$4,100.00	\$8,200
Detention Basin Improvements				
15. Northern West Basin	0	EA	\$1,258,140.00	\$0
Detention Basin Improvements				
16. Southern West Basin	0	EA	\$1,029,815.00	\$0
Detention Basin Improvements				
17. East Basin	0	EA	\$2,056,810.00	\$0
18. Flood Proofing (House)	9	EA	\$35,055.00	\$315,495
19. Flood Proofing (Building)	0	EA	\$70,110.00	\$0
Subtotal				\$1,385,280
35% Contingency				\$484,848
Subtotal				<u>\$1,870,128</u>
15% Engineering				\$280,519
10% Construction Management				\$187,013
TOTAL STORM DRAIN SHED 153				\$2,337,660



WATER DISTRIBUTION COSTS – GLOBE STATION

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
D. WATER DISTRIBUTION SYSTEM				
1. Water, 12" (Incl. fittings)	0	LF	\$140.00	\$0
2. Water, 8" (Incl. fittings)	5,355	LF	\$150.00	\$803,250
3. Fire Hydrant	18	LF	\$5,000.00	\$90,000
	Subtotal			\$893,250
	35% Contingency			\$312,638
	Subtotal			<u>\$1,205,888</u>
	15% Engineering			\$180,883
	10% Construction Management			\$120,589
TOTAL WATER (GLOBE STATION)				\$1,507,359



WATER DISTRIBUTION SYSTEM COSTS DEL PASO – ARDEN STATION

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
D. WATER DISTRIBUTION SYSTEM				
1. Water, 12" (Incl. fittings)	0	LF	\$140.00	\$0
2. Water, 8" (Incl. fittings)	5,195	LF	\$150.00	\$779,250
3. Fire Hydrant	18	LF	\$5,000.00	\$90,000
	Subtotal			\$869,250
	35% Contingency			\$304,238
	Subtotal			<u>\$1,173,488</u>
	15% Engineering			\$176,023
	10% Construction Management			\$117,349
TOTAL WATER (DEL PASO - ARDEN STATION)				\$1,466,859



WATER DISTRIBUTION SYSTEM COSTS ROYAL OAKS STATION

DESCRIPTION	QUANTITY	UNIT OF MEASURE	UNIT PRICE	AMOUNT
D. WATER DISTRIBUTION SYSTEM				
1. Water, 12" (Incl. fittings)	5,600	LF	\$140.00	\$784,000
2. Water, 8" (Incl. fittings)	4,400	LF	\$150.00	\$660,000
3. Fire Hydrant	33	LF	\$5,000.00	\$165,000
	Subtotal			\$1,609,000
	35% Contingency			\$563,150
	Subtotal			<u>\$2,172,150</u>
	15% Engineering			\$325,823
	10% Construction Management			\$217,215
TOTAL WATER (ROYAL OAKS STATION)				\$2,715,188



APPENDIX A

Land Use Calculations



APPENDIX A – LAND USE CALCULATIONS

Globe Station

AREA (SQ FT)	AREA (ACS)	APN	LANDUSE_DE	ZONE	Dev_Type	Res_Low	Res_High	NonRes_Low	NonRes_High	NonRes_Low	NonRes_High
3706.26371	0.085	275-0161-008	SMALL RETAIL	C-2-SPD	A	3	5	0.026	0.034	1112	1483
11199.10269	0.257	275-0161-007	LIGHT INDUSTRIAL	C-2-SPD	A	10	15	0.077	0.103	3360	4480
26674.88007	0.612	275-0260-008	SMALL RETAIL	C-2	A	24	37	0.184	0.245	8002	10670
10754.79895	0.247	275-0165-018		C-2-SPD	A	10	15	0.074	0.099	3226	4302
12508.50801	0.287	275-0161-014	HEAVY INDUSTRIAL	C-2-SPD	A	11	17	0.086	0.115	3753	5003
14989.85393	0.344	275-0163-006	CEMETARY/MORTUARY	C-2-SPD	A	14	21	0.103	0.138	4497	5996
7526.52037	0.173	275-0162-001	VACANT/OFFICE	C-2-SPD	A	7	10	0.052	0.069	2258	3011
15093.71871	0.347	275-0162-004	VETERINARIAN	C-2-SPD	A	14	21	0.104	0.139	4528	6037
9168.49491	0.210	275-0165-003		C-2-SPD	A	8	13	0.063	0.084	2751	3667
5098.83856	0.117	275-0163-002	LOW RISE APARTMENT < 4 STORIES	C-2-SPD	A	5	7	0.035	0.047	1530	2040
7304.59349	0.168	275-0164-013	LIGHT INDUSTRIAL	C-2-SPD	A	7	10	0.050	0.067	2191	2922
10050.71992	0.231	275-0163-001	VACANT/RETAIL	C-2-SPD	A	9	14	0.069	0.092	3015	4020
14794.43068	0.340	275-0163-003	VACANT/OFFICE	C-2-SPD	A	14	20	0.102	0.136	4438	5918
7527.97401	0.173	275-0163-005		C-2-SPD	A	7	10	0.052	0.069	2258	3011
7533.13738	0.173	275-0165-002		C-2-SPD	A	7	10	0.052	0.069	2260	3013
7606.94303	0.175	275-0163-004	VACANT/OFFICE	C-2-SPD	A	7	10	0.052	0.070	2282	3043
18531.29888	0.425	275-0165-019	PARKING LOT	C-2-SPD	A	17	26	0.128	0.170	5559	7413
6621.93193	0.152	275-0161-013	LIGHT INDUSTRIAL	C-2-SPD	A	6	9	0.046	0.061	1987	2649
7256.27135	0.167	275-0164-014	LIGHT INDUSTRIAL	C-2-SPD	A	7	10	0.050	0.067	2177	2903
603.60259	0.014	275-0165-017		C-2	A	1	1	0.004	0.006	181	241
7568.00765	0.174	275-0122-008	VACANT/RETAIL	C-2-SPD	A	7	10	0.052	0.069	2270	3027
22346.51844	0.513	275-0165-016	SMALL RETAIL	C-2-SPD	A	21	31	0.154	0.205	6704	8939
7422.50529	0.170	275-0122-007	VACANT/RETAIL	C-2-SPD	A	7	10	0.051	0.068	2227	2969
246916.43919	5.668	275-0111-006		M-1-SPD	B	227	340				
8029.47329	0.184	275-0161-016	VACANT/INDUSTRIAL	M-1-SPD	B	7	11				
7449.57396	0.171	275-0164-002	LIGHT INDUSTRIAL	C-2-SPD	B	7	10				
7617.04243	0.175	275-0161-017	VACANT/INDUSTRIAL	M-1-SPD	B	7	10				
7406.16140	0.170	275-0161-004	VACANT/RECREATIONAL	M-1-SPD	B	7	10				
7378.88234	0.169	275-0161-006	RESIDENTIAL/SINGFAM/SUBDIV	M-1-SPD	B	7	10				
7371.64339	0.169	275-0164-001	LIGHT INDUSTRIAL	C-2-SPD	B	7	10				
7852.60653	0.180	275-0122-004	VACANT/OFFICE	C-2-SPD	B	7	11				
5379.77286	0.124	275-0121-002	VACANT/RESIDENTIAL	C-2-SPD	C	3	5				
3343.54527	0.077	275-0113-010	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	C	2	3				
21707.96949	0.498	275-0114-015	VACANT/RETAIL	C-2-SPD	C	12	20				
4435.26015	0.102	275-0113-012	RESIDENTIAL/FOURPLEX	C-2-SPD	C	3	4				
7212.03949	0.166	275-0114-006	VACANT/RETAIL	C-2-SPD	C	4	7				
7059.86940	0.162	275-0113-004	HEAVY INDUSTRIAL	C-2-SPD	C	4	6				
9296.62141	0.213	275-0112-027	LIGHT INDUSTRIAL	M-1-SPD	C	5	9				
9494.73286	0.218	275-0114-013	LIGHT INDUSTRIAL	C-2-SPD	C	5	9				
6751.09303	0.155	275-0113-015	VACANT/RECREATIONAL	M-1-SPD	C	4	6				
7454.36355	0.171	275-0163-007	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	4	7				
6307.29539	0.145	275-0121-001	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	C	4	6				
42756.04344	0.982	275-0112-001	VACANT/INDUSTRIAL	M-1-SPD	C	25	39				
7108.21423	0.163	275-0112-017	LIGHT INDUSTRIAL	M-1-SPD	C	4	7				
10168.77658	0.233	275-0113-023	RESIDENTIAL/SINGFAM/NONSUB	C-2-SPD	C	6	9				
3510.46015	0.081	275-0113-013	VACANT/RECREATIONAL	M-1-SPD	C	2	3				
4298.67769	0.099	275-0113-014	VACANT/RECREATIONAL	M-1-SPD	C	2	4				
7486.40286	0.172	275-0113-003	HEAVY INDUSTRIAL	C-2-SPD	C	4	7				
7041.35668	0.162	275-0114-005	VACANT/RETAIL	C-2-SPD	C	4	6				
7118.10622	0.163	275-0113-005	HEAVY INDUSTRIAL	C-2-SPD	C	4	7				
6645.73737	0.153	275-0112-007	LIGHT INDUSTRIAL	M-1-SPD	C	4	6				
10242.45544	0.235	275-0113-024	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	C	6	9				
13424.83972	0.308	275-0112-005	VACANT/INDUSTRIAL	M-1-SPD	C	8	12				
10597.17432	0.243	275-0112-026	LIGHT INDUSTRIAL	M-1-SPD	C	6	10				
6848.42017	0.157	275-0121-003	CITY	C-2-SPD	C	4	6				
10037.81656	0.230	275-0114-014	VACANT/INDUSTRIAL	C-2-SPD	C	6	9				
7119.03007	0.163	275-0113-011	RESIDENTIAL/DUPLEX	C-2-SPD	C	4	7				
8912.89822	0.205	275-0112-011	LIGHT INDUSTRIAL	M-1-SPD	C	5	8				
6738.71376	0.155	275-0112-002	LIGHT INDUSTRIAL	M-1-SPD	C	4	6				
7604.66902	0.175	275-0163-009	VACANT/RESIDENTIAL	R-1	C	4	7				
6992.89030	0.161	275-0112-015	HEAVY INDUSTRIAL	M-1-SPD	C	4	6				
8758.77745	0.201	275-0114-007	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	C	5	8				
6569.20436	0.151	275-0112-004	LIGHT INDUSTRIAL	M-1-SPD	C	4	6				
6473.26218	0.149	275-0112-008	RESIDENTIAL/SINGFAM/SUBDIV	M-1-SPD	C	4	6				
6694.47535	0.154	275-0112-003	LIGHT INDUSTRIAL	M-1-SPD	C	4	6				
6498.42533	0.149	275-0112-006	VACANT/RECREATIONAL	M-1-SPD	C	4	6				
6845.83050	0.157	275-0113-016	HEAVY INDUSTRIAL	M-1-SPD	C	4	6				
6946.31092	0.159	275-0112-020	HEAVY INDUSTRIAL	M-1-SPD	C	4	6				
53371.06382	1.225	275-0113-022	LIGHT INDUSTRIAL	M-1-SPD	C	31	49				
4713.01176	0.108	275-0112-009	RESIDENTIAL/SINGFAM/SUBDIV	M-1-SPD	C	3	4				
7219.26005	0.166	275-0114-004	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	C	4	7				
4633.30714	0.106	275-0112-010	LIGHT INDUSTRIAL	M-1-SPD	C	3	4				
7036.13136	0.162	275-0112-021	HEAVY INDUSTRIAL	M-1-SPD	C	4	6				
22133.27586	0.508	275-0112-025	LIGHT INDUSTRIAL	M-1-SPD	C	13	20				
22.10510						739	1133	1.7	2.2	72566.7	96755.6



Del Paso / Arden Station

AREA	AREA (ACS)	APN	LANDUSE_DE	ZONE	Dev_Type	Res_Low	Res_High	NonRes_Low	NonRes_High	NonRes_Low	NonRes_High
46241.36821		1.06 275-0134-008	CITY	R-1	A	42	64	0.318	0.425	13872	18497
7790.11569		0.18 275-0124-009	RESTAURANT	C-2-SPD	A	7	11	0.054	0.072	2337	3116
614.33386		0.01 275-0134-007	CITY	R-1	A	1	1	0.004	0.006	184	246
15458.50131		0.35 275-0125-028	VACANT/OFFICE	C-2-SPD	A	14	21	0.106	0.142	4638	6183
7394.34622		0.17 275-0125-001	VACANT/OFFICE	C-2-SPD	A	7	10	0.051	0.068	2218	2958
695.35928		0.02 275-0134-006	CITY	R-1	A	1	1	0.005	0.006	209	278
18577.48239		0.43 275-0134-003	CITY	R-1	A	17	26	0.128	0.171	5573	7431
24196.07864		0.56 275-0134-010	CITY	R-1	A	22	33	0.167	0.222	7259	9678
7699.67567		0.18 275-0093-005	SMALL RETAIL	C-2-SPD	A	7	11	0.053	0.071	2310	3080
7024.02676		0.16 275-0093-004	SMALL RETAIL	C-2-SPD	A	6	10	0.048	0.064	2107	2810
6059.36712		0.14 275-0095-016	SMALL RETAIL	C-2-SPD	A	6	8	0.042	0.056	1818	2424
1946.89661		0.04 275-0134-004	CITY	R-1	A	2	3	0.013	0.018	584	779
49591.96653		1.14 275-0134-012	CITY	R-1	A	46	68	0.342	0.455	14878	19837
3654.38386		0.08 275-0134-011	CITY	R-1	A	3	5	0.025	0.034	1096	1462
27839.70489		0.64 275-0125-029	RESTAURANT	C-2-SPD	A	26	38	0.192	0.256	8352	11136
7759.33631		0.18 275-0124-010	RESTAURANT	C-2-SPD	A	7	11	0.053	0.071	2328	3104
75384.48272		1.73 275-0085-013	VACANT/RESIDENTIAL	C-2	C	43	69				
4167.59998		0.10 275-0084-016	VACANT/RETAIL	C-2-SPD	C	2	4				
6494.04387		0.15 275-0095-007	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	4	6				
7685.36187		0.18 275-0125-023	PARKING LOT	R-3	C	4	7				
1057.25676		0.02 275-0082-001	VACANT/RETAIL	C-2-SPD	C	1	1				
6502.17503		0.15 275-0145-012	RESIDENTIAL/DUPLEX	R-1	C	4	6				
4251.65894		0.10 275-0125-024	PARKING LOT	R-3	C	2	4				
6337.44124		0.15 275-0085-009	VACANT/RESIDENTIAL	R-1	C	4	6				
7573.76036		0.17 275-0125-022	PARKING LOT	R-3	C	4	7				
6317.06702		0.15 275-0085-010	VACANT/RESIDENTIAL	R-1	C	4	6				
6649.49630		0.15 275-0028-004	VACANT/RESIDENTIAL	R-1	C	4	6				
6519.86828		0.15 275-0145-013	VACANT/RESIDENTIAL	R-1	C	4	6				
10114.43233		0.23 275-0091-001	VACANT/RETAIL	R-1	C	6	9				
6459.11745		0.15 275-0085-011	VACANT/RESIDENTIAL	R-1	C	4	6				
21353.05374		0.49 275-0125-016	LOW RISE APARTMENT < 4 STORIES	R-3	C	12	20				
6132.34581		0.14 275-0131-014	OFFICE GENERAL	C-2-SPD	D	2	4	0.063	0.084	2760	3679
9591.12809		0.22 275-0131-020	SERVICE STATION	C-2-SPD	D	3	6	0.099	0.132	4316	5755
1665.19067		0.04 275-0131-008	NO USE	C-2-SPD	D	1	1	0.017	0.023	749	999
5720.36923		0.13 275-0131-009	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	D	2	3	0.059	0.079	2574	3432
6036.53224		0.14 275-0131-017	LIGHT INDUSTRIAL	C-2-SPD	D	2	3	0.062	0.083	2716	3622
7659.94704		0.18 275-0131-007	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	D	3	4	0.079	0.106	3447	4596
7146.04615		0.16 275-0131-011	RESIDENTIAL CONVERION TO OFFICE	C-2-SPD	D	2	4	0.074	0.098	3216	4288
7454.07982		0.17 275-0131-010	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	D	3	4	0.077	0.103	3354	4472
7499.94778		0.17 275-0131-013		C-2-SPD	D	3	4	0.077	0.103	3375	4500
7631.19020		0.18 275-0131-016	SMALL RETAIL	C-2-SPD	D	3	4	0.079	0.105	3434	4579
7449.56573		0.17 275-0131-012	RESIDENTIAL/SINGFAM/SUBDIV	C-2-SPD	D	3	4	0.077	0.103	3352	4470
	11.09725					341	525	2.4	3.2	103056.7	137409.0



Royal Oaks Station

APN	LANDUSE DESIGNATION	ZONE	Dev_Type	Res_Low	Res_High	NonRes_Low	NonRes_High	NonRes_L	NonRes_High
275-0240-092	OFFICE LARGE SINGLE TENANT	OB-LI	B	125	188				
275-0240-088	STATE	OB-LI	B	20	31				
277-0144-022	STATE	M-1-LI	B	89	133				
275-0240-087	STATE	OB-LI	B	225	337				
277-0134-023	LARGE RETAIL	M-1	B	19	29				
275-0240-074	LARGE RETAIL	OB-LI	B	70	105				
275-0240-094	HEAVY INDUSTRIAL	OB-LI	B	56	83				
275-0240-089	STATE	OB-LI	B	42	63				
275-0240-045	POST OFFICE	OB-LI	B	101	152				
277-0134-024	SPECIAL DISTRICT	M-1	B	22	33				
275-0240-052	POST OFFICE	OB-LI	B	91	137				
275-0240-051	STATE	OB-LI	B	200	299				
275-0240-029	STATE	OB-LI	B	47	71				
277-0132-006	HEAVY INDUSTRIAL	M-1	C	3	4				
277-0131-012	LOW RISE APARTMENT < 4 STORIES	R-1	C	4	6				
277-0133-006	INDUSTRIAL/MULTI-TENANT	M-1	C	5	9				
277-0133-002	RESIDENTIAL/SINGFAM/SUBDIV	M-1	C	3	4				
277-0133-008	INDUSTRIAL/MULTI-TENANT	M-1	C	3	5				
277-0073-009	VACANT/INDUSTRIAL	M-1	C	39	62				
275-0104-023	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	3	5				
275-0104-024	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	3	5				
277-0133-003	INDUSTRIAL/MULTI-TENANT	M-1	C	4	7				
277-0132-005	HEAVY INDUSTRIAL	M-1	C	3	4				
277-0072-027	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	4	6				
277-0071-008	VACANT/RESIDENTIAL	R-1	C	4	6				
277-0131-002	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	4	6				
277-0072-026	RESIDENTIAL/SINGFAM/SUBDIV	R-1	C	4	6				
277-0134-021	SERVICE STATION	M-1	E	12	20	0.149	0.199	6510	8679
275-0240-071	OFFICE GENERAL	OB-R	E	1	2	0.018	0.023	765	1021
275-0240-090	OFFICE LARGE SINGLE TENANT	OB-LI	E	41	66	0.495	0.661	21582	28776
277-0134-004	LARGE RETAIL	M-1	E	18	28	0.211	0.281	9173	12231
277-0131-007	LIGHT INDUSTRIAL	C-2	E	3	5	0.039	0.052	1711	2281
275-0155-005	VACANT/RESIDENTIAL	R-1	E	4	6	0.045	0.060	1957	2610
277-0131-017	VACANT/RESIDENTIAL	R-1	E	4	6	0.048	0.065	2109	2812
275-0155-013	OFFICE GENERAL	C-2	E	8	12	0.091	0.122	3975	5300
277-0132-011	LIGHT INDUSTRIAL	M-1	E	12	19	0.139	0.185	6047	8063
277-0134-005	LARGE RETAIL	M-1	E	23	36	0.271	0.361	11805	15740
275-0240-072	OFFICE GENERAL	OB-LI	E	76	122	0.913	1.217	39756	53008
275-0155-004	VACANT/RESIDENTIAL	R-1	E	4	6	0.046	0.061	1993	2657
277-0134-003	LARGE RETAIL	M-1	E	30	48	0.364	0.485	15835	21113
277-0133-005		M-1	E	27	44	0.328	0.438	14297	19063
277-0131-016	VACANT/RESIDENTIAL	R-1	E	4	6	0.044	0.058	1899	2532
277-0134-020	VACANT/RETAIL	M-1	E	6	9	0.068	0.090	2952	3936
275-0155-006	USED CAR SALES	R-1	E	3	5	0.040	0.054	1759	2346
275-0155-007	VACANT/RETAIL	C-2	E	3	5	0.041	0.055	1781	2374
277-0132-009	LIGHT INDUSTRIAL	M-1	E	18	29	0.214	0.286	9331	12442
275-0240-070	OFFICE GENERAL	OB-R	E	15	25	0.185	0.246	8043	10723
277-0131-005	RESIDENTIAL/SINGFAM/SUBDIV	R-1	E	4	6	0.047	0.063	2069	2758
277-0131-006	RESIDENTIAL/SINGFAM/SUBDIV	R-1	E	4	6	0.044	0.059	1918	2558
275-0240-076	SPECIAL DISTRICT	OB-LI	E	5	8	0.060	0.080	2608	3477
277-0131-008	RESTAURANT	C-2	E	3	5	0.039	0.052	1704	2272
				1521	2322	3.9	5.3	171579	228772



Assumptions

	FAR		DU/AC	
	Low	High	Low	High
A	0.3	0.4	40	60
B	x	x	40	60
C	x	x	25	40
D	0.45	0.6	15	25
E	0.3	0.4	25	40



APPENDIX B

Sanitary Sewer Calculations



APPENDIX B – SANITARY SEWER DEMAND CALCULATIONS

Sanitary sewer flow determinations for this study were calculated utilizing the City of Sacramento's Sanitary Sewers Design Standards section of the Design and Procedures Manual dated September 1, 1990 (Standards). Section 9.1.2 - Infill and ESD (Equivalent Single Family Dwelling) of the Standards (reprinted in this Appendix) shows equivalent ESDs for each of the various types of development anticipated in the Plan Area. The actual sanitary demand is calculated by multiplying the Equivalent ESD with the anticipated square footage of development or number of dwelling units for each block. A peaking factor is then applied. Since the majority of the piping is an existing system, infiltration is expected to remain the same for both existing and proposed development conditions.

The following shows the method used to calculate the sanitary sewer flow mentioned in the Sanitary Sewer section:

1. Determine the proposed build out development for the project (see the Land Use section). The following calculations are for the pipe segment pC9 in the Central Development Area.
2. Apply a general factor of 0.2 ESDs per 1000 square feet of gross floor area for office/commercial buildings to the development (factor from Section 9.1.2, City of Sacramento Standards). (One ESD = 400 gallon per day (gpd).

$$(6,220 \text{ square feet of commercial}) \times (0.2 \text{ ESD's}/1000 \text{ square feet}) = 1.24 \text{ ESD}$$

3. Apply a factor of 0.75 ESDs per dwelling unit (du) to the residential development (factor from Section 9.1.2, City of Sacramento Standards).

$$211 \times .75 \text{ ESDs}/\text{du} = 15.75 \text{ ESD}$$

4. Apply a FAR of .5 to existing commercial lots. Apply a general factor of 0.2 ESDs per 1000 square feet of gross floor area for office/commercial buildings to the development.

$$(.5 \text{ FAR}) \times (68,030 \text{ square feet of commercial}) \times (0.2 \text{ ESD's}/1000 \text{ square feet}) = 6.80 \text{ ESD}$$

5. Apply 1 ESD per existing residential units (0 in this case).
6. Acquire pre-peaked upstream flow. (306.83 ESD in this case).

7. Calculate the combined total ESD's

$$1.24 + 15.75 + 6.80 + 0 + 306.83 = 330.62 \text{ ESD's}$$



8. Calculate the total average flow rate based on the criteria of 400 gallons per day (gpd) per ESD.

$$400 \text{ gpd/ESD} \times 330.62 \text{ ESD} = 132,248 \text{ gpd or } 0.1322 \text{ mgd (million gallons per day)}$$

9. Apply a peaking factor of 3.15 (from Plate 9-2, City of Sacramento Standards) and round up.

$$0.1322 \text{ mgd} \times 3.22 = 0.4257 \text{ mgd}$$

10. Convert back to ESD's

$$425,700 / 400 = 1066 \text{ ESD's}$$



APPENDIX C

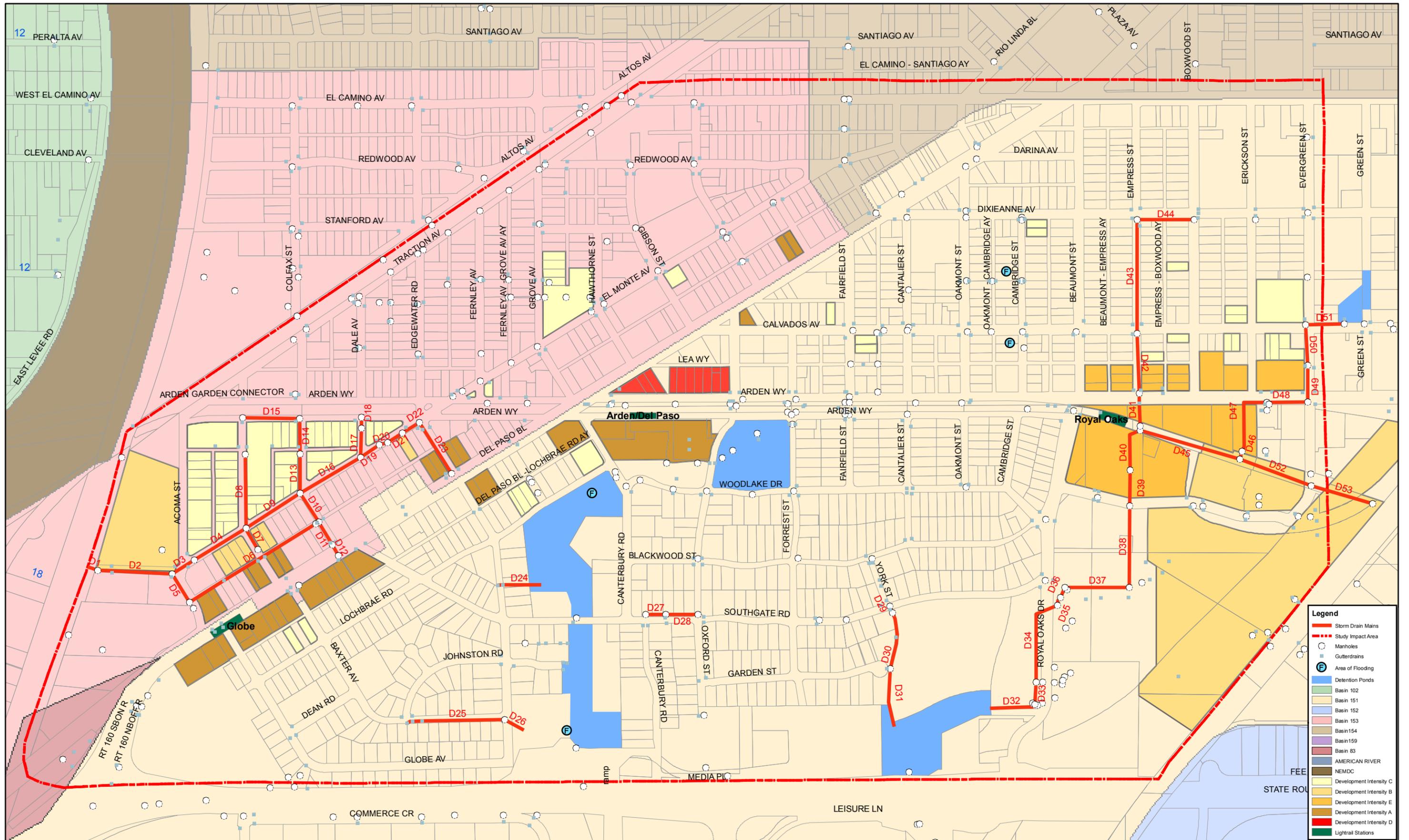
- C.1 Storm Drain Pipe Quantity Exhibit and Table**
- C.2 Sanitary Sewer Pipe Quantity Exhibit and Table**
- C.3 Water Pipe Quantity Exhibit and Table**



APPENDIX C.1

STORM DRAIN PIPE QUANTITY EXHIBIT AND TABLE

Pipe name	Pipe Length	Pipe Diameter	Pipe name	Pipe Length	Pipe Diameter
D1	60	72"	D28	184	30"
D2	81	72"	D29	40	30"
D3	150	60"	D30	185	30"
D4	350	60"	D31	336	36"
D5	192	30"	D32	266	2-66"
D6	234	30"	D33	127	2-66"
D7	140	21"	D34	521	2-66"
D8	425	21"	D35	51	2-66"
D9	370	54"	D36	61	2-66"
D10	196	21"	D37	370	2-66"
D11	151	21"	D38	466	2-66"
D12	71	21"	D39	205	2-66"
D13	225	36"	D40	267	2-66"
D14	203	30"	D41	129	30"
D15	328	30"	D42	343	30"
D16	403	36"	D43	55	30"
D17	167	21"	D44	327	24"
D18	62	21"	D45	597	2-66"
D19	129	30"	D46	47	54"
D20	48	30"	D47	415	54"
D21	101	24"	D48	236	54"
D22	116	24"	D49	210	54"
D23	345	24"	D50	235	54"
D24	30	18"	D51	222	54"
D25	31	24"	D52	437	72"
D26	125	24"	D53	369	72"
D27	116	30"			



NORTHEAST LINE LIGHT RAIL STATIONS PLAN

STORM DRAIN PIPE QUANTITIES

March 30th, 2007

200 100 0 200 Feet

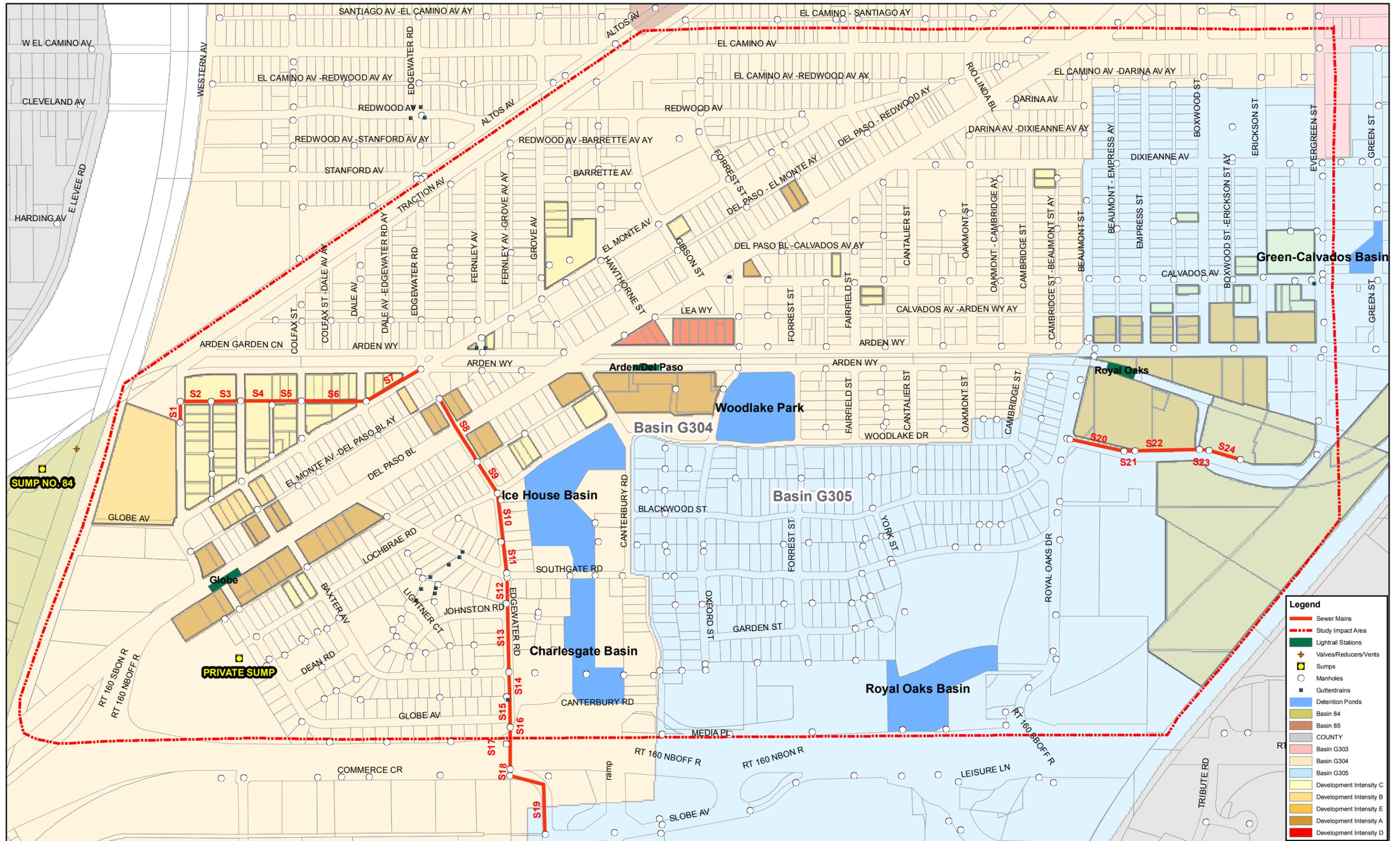
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E
W



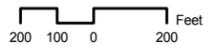
APPENDIX C.2

SANITARY SEWER PIPE QUANTITY EXHIBIT AND TABLE

Pipe Name	Pipe Length	Pipe diameter
S1	120	8"
S2	173	8"
S3	169	10"
S4	177	12"
S5	168	12"
S6	366	12"
S7	362	12"
S8	418	18"
S9	211	24"
S10	282	24"
S11	174	24"
S12	151	24"
S13	384	24"
S14	140	24"
S15	173	24"
S16	96	24"
S17	142	24"
S18	39	24"
S19	0	24"
S20	335	15"
S21	62	15"
S22	366	15"
S23	55	15"
S24	185	15"



NORTHEAST LINE LIGHT RAIL STATIONS PLAN
SEWER PIPE QUANTITIES
 March 30th, 2007



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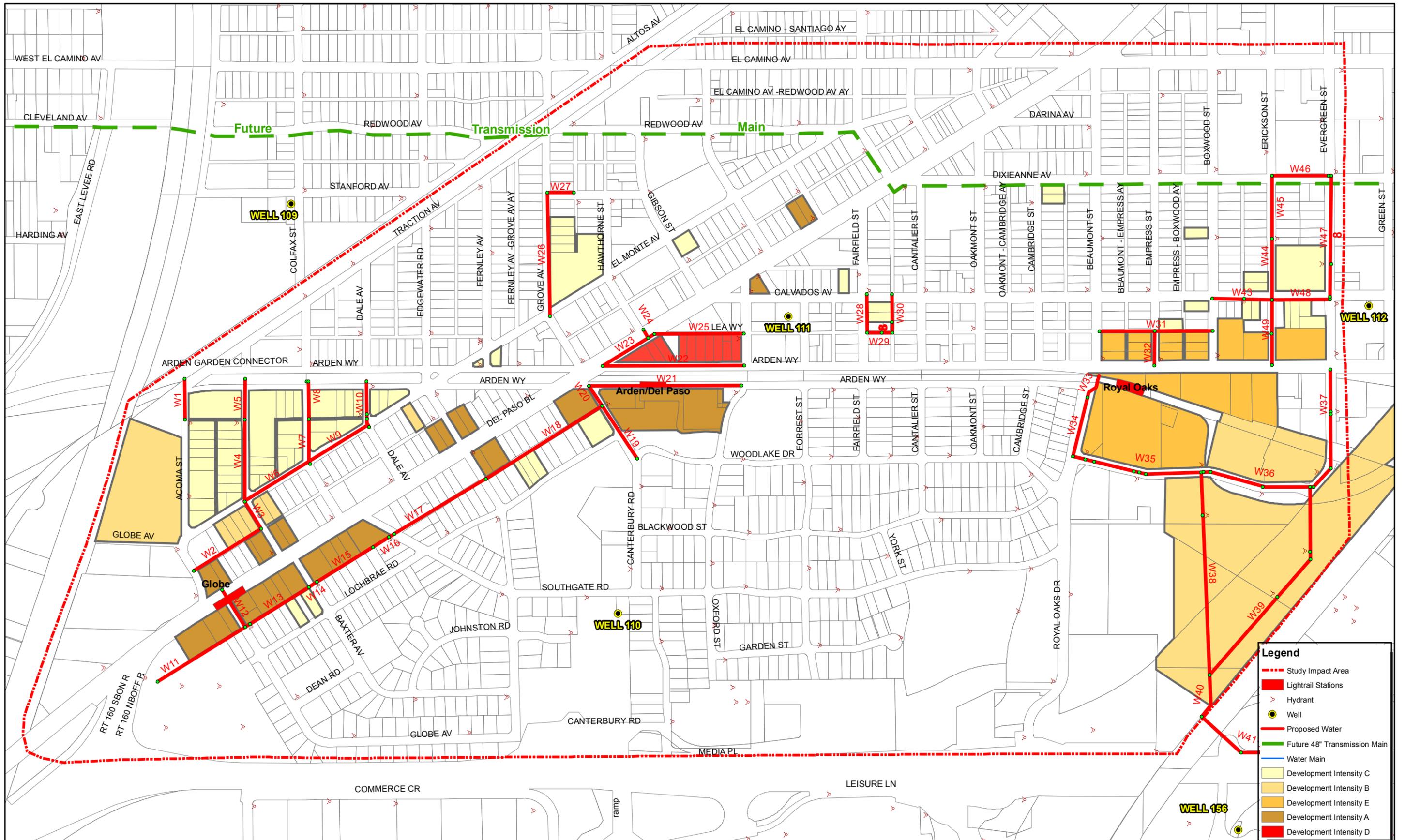




APPENDIX C.3

WATER PIPE QUANTITY EXHIBIT AND TABLE

Pipe Name	Pipe Length	Pipe Diameter	Pipe Name	Pipe Length	Pipe Diameter
W1	230	8"	W26	697	8"
W2	447	8"	W27	149	8"
W3	181	8"	W28	217	8"
W4	462	8"	W29	142	8"
W5	230	8"	W30	218	8"
W6	425	8"	W31	636	8"
W7	250	8"	W32	194	8"
W8	216	8"	W33	148	12"
W9	396	8"	W34	344	12"
W10	264	8"	W35	737	12"
W11	583	8"	W36	628	12"
W12	247	8"	W37	719	12"
W13	426	8"	W38	1145	12"
W14	53	8"	W39	1273	8"
W15	379	8"	W40	254	12"
W16	133	8"	W41	608	12"
W17	606	8"	W42	448	12"
W18	776	8"	W43	336	8"
W19	356	8"	W44	345	12"
W20	135	8"	W45	354	12"
W21	862	8"	W46	336	8"
W22	798	8"	W47	698	8"
W23	342	8"	W48	328	8"
W24	54	8"	W49	368	12"
W25	507	8"			



NORTHEAST LINE LIGHT RAIL STATIONS PLAN

WATER PIPE QUANTITIES

March 30th, 2007

200 100 0 200 Feet

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