



PROJECT

FIVE PALMS
SUBDIVISION
LANDSCAPE IMPROVEMENTS

PROJECT ADDRESS

RAY ELLISON BLVD.
SAN ANTONIO, TX 78242

OWNER | CLIENT

M&S ENGINEERING, INC
376 LANDA ST
NEW BRAUNFELS, TX 78130

OWNER'S REPRESENTATIVE

GARY FREELAND
830.629.2988
gfreeland@msengr.com

SUBCONSULTANT

REVISIONS

NO.	DATE	DESCRIPTION
1	04.03.19	CITY COMMENTS

ISSUE SETS

NO.	DATE	DESCRIPTION
1	02.08.19	PERMIT SET

SHEET INFORMATION

PROJECT NO.

18120

DATE ISSUED

FEBRUARY, 08 2019

SHEET NAME

TREE PRESERVATION
PLAN

SHEET NUMBER

TP 1.1

TREE PRESERVATION

TREE PRESERVATION: (Tree Survey Method)

MITIGATION CALCULATIONS

UNDERSTORY TREE:	0 TOTAL INCHES
REQUIRED SIGNIFICANT MITIGATION:	0" REQ. MITIGATION
SIGNIFICANT TREE:	534 TOTAL INCHES
534 INCH. X 35% REQUIRED TO BE PRESERVED :	186.9 INCH. (35%)
SIGNIFICANT TREE INCH. PRESERVED:	110 INCH. (20.5%)
REQUIRED SIGNIFICANT MITIGATION:	76.9" REQ. MITIGATION
HERITAGE TREE:	404 TOTAL INCHES
404 INCH. X 100% REQUIRED TO BE PRESERVED :	404 INCH. (100%)
HERITAGE TREE INCH. PRESERVED:	143 INCH. (35.3%)
REQUIRED MITIGATION: 56 INCH. X 1:1 =	56" REQUIRED MITIGATION
REQUIRED MITIGATION: 205 INCH. X 3:1 =	615" REQUIRED MITIGATION
TOTAL REQUIRED HERITAGE MITIGATION =	671" REQUIRED MITIGATION
TOTAL REQUIRED MITIGATION ON SITE:	747.9" REQUIRED MITIGATION - 67" UNDERSTORY TREES = 680.9 INCHES REQUIRED

TOTAL MITIGATION PROVIDED:	90 TREES
2 NEW TREES ON EACH OF THE 45 LOTS =	270 INCHES
90 TREES X 3" CAL. TREES =	
[3 CAL. INCHES PER LOT PER UDC REQUIREMENT OF	
(2) 1-1/2" CAL. TREES PER LOT] =	<135 INCHES>
TOTAL MITIGATION FOR LOTS PROVIDED:	135 INCHES
TOTAL 3" CALIPER TREES NOT PLANTED IN LOTS =	15 TREES
15 TREES X 3" CAL. TREES	45 INCHES
TOTAL MITIGATION PROVIDED:	180 INCHES

MITIGATION CALCULATIONS

TREE FUND APPLIED TOWARD
REMAINING MITIGATION: 680.9" REQUIRED MITIGATION - 180" MITIGATION PROVIDED = 500.9"
TREE MITIGATION FUND: 500.9" (NOT MITIGATED) X (\$200/INCH) = **\$100,180 (PLUS FEES)**
** REFERENCE LP 2.1 FOR PROPOSED MITIGATION INCH CALCULATIONS AND TREE TYPES **

TREE PRESERVATION LEGEND



TREE PRESERVATION-FLOODPLAIN

TREE PRESERVATION: (Tree Survey Method)

MITIGATION CALCULATIONS

SIGNIFICANT TREE:	0 TOTAL INCHES
0 INCH. X 80% REQUIRED TO BE PRESERVED :	0 INCH.
SIGNIFICANT TREE INCH. PRESERVED:	0 INCH. (100%)
REQUIRED MITIGATION:	0" REQUIRED MITIGATION
HERITAGE TREE:	0 TOTAL INCHES
68 INCH. X 100% REQUIRED TO BE PRESERVED :	68 INCH.
HERITAGE TREE INCH. PRESERVED:	68 INCH. (100%)
REQUIRED MITIGATION: 0 INCH. X 1:1 =	0" REQUIRED MITIGATION

TOTAL REQUIRED MITIGATION ON SITE: 0" REQUIRED MITIGATION



TREE PRESERVATION-ENVIRON. AREA

TREE PRESERVATION: (Tree Survey Method)

MITIGATION CALCULATIONS

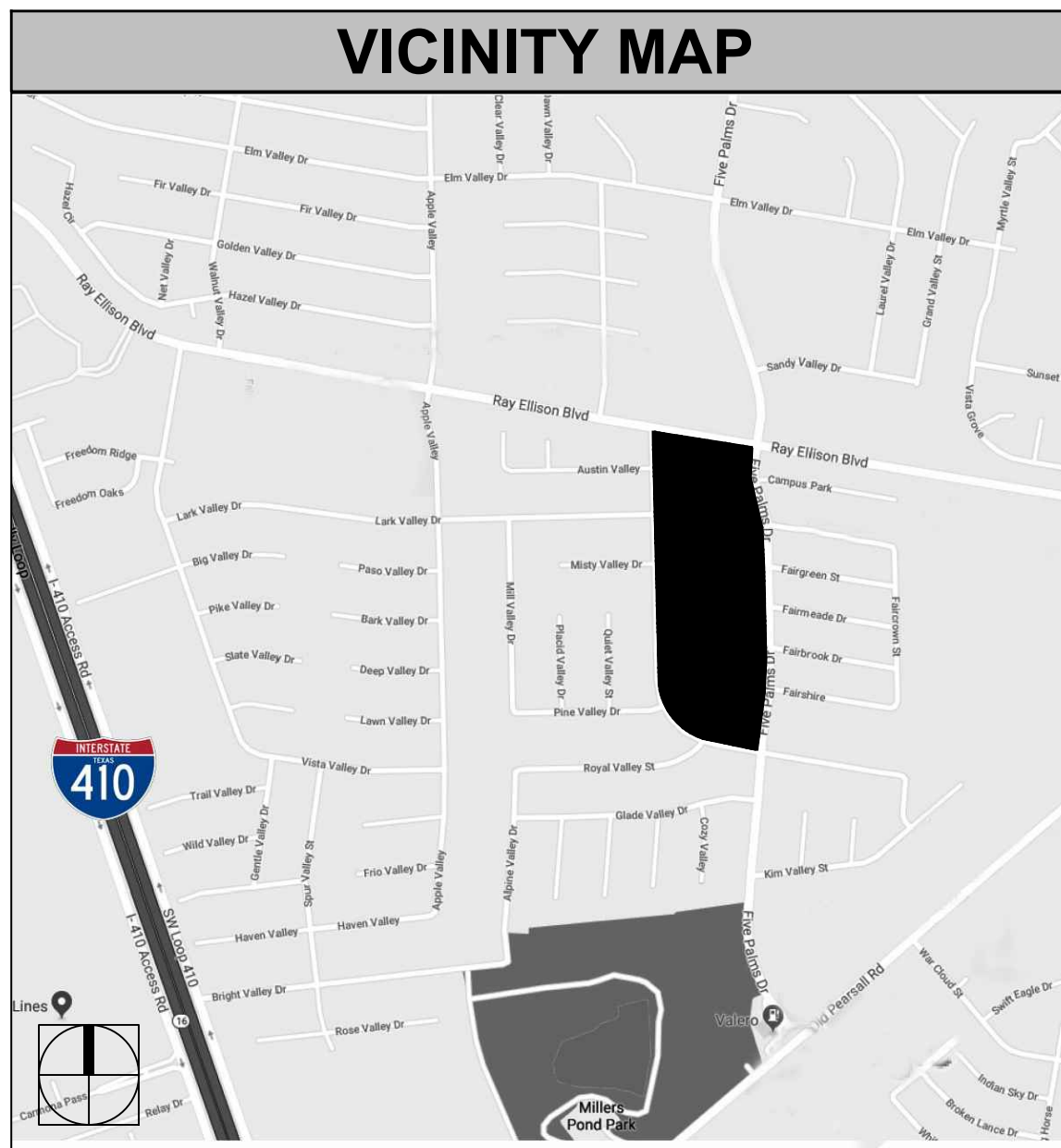
SIGNIFICANT TREE:	14 TOTAL INCHES
14 INCH. X 80% REQUIRED TO BE PRESERVED :	11 INCH.
SIGNIFICANT TREE INCH. PRESERVED:	14 INCH. (100%)
REQUIRED MITIGATION:	0" REQUIRED MITIGATION

HERITAGE TREE:	49 TOTAL INCHES
49 INCH. X 100% REQUIRED TO BE PRESERVED :	49 INCH.
HERITAGE TREE INCH. PRESERVED:	49 INCH. (100%)
REQUIRED MITIGATION: 0 INCH. X 3:1 =	0" REQUIRED MITIGATION

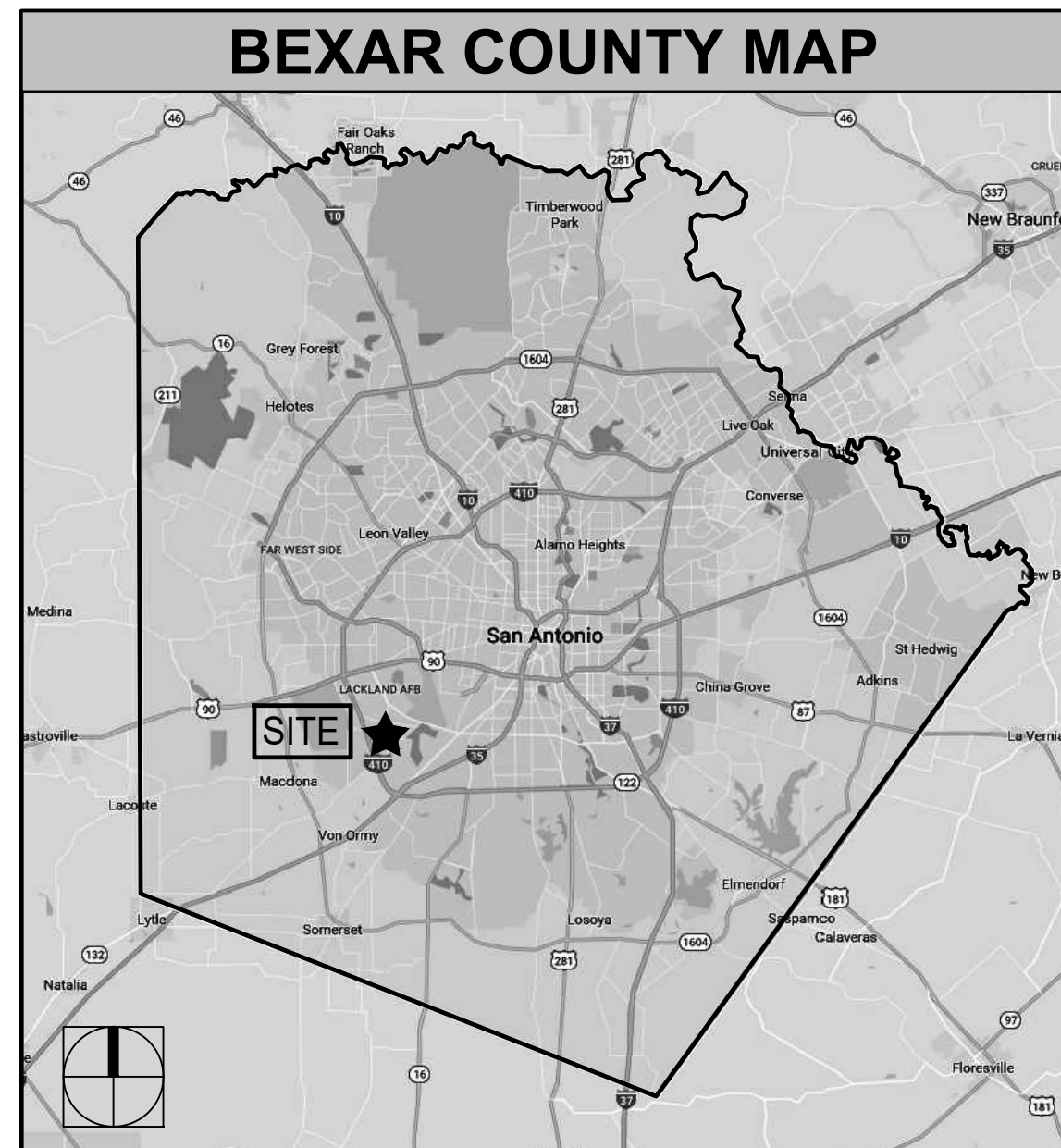
TOTAL REQUIRED MITIGATION ON SITE: 0" REQUIRED MITIGATION



VICINITY MAP



BEXAR COUNTY MAP



TREE PRESERVATION PLAN

1 PLAN

0 20' 40' 80' 160'

SCALE: 1"=80'



FIVE PALMS TREE INVENTORY															
Tag #	Species	Caliper	Understory Species* 5.0" - 11.5"		Significant Tree 6" - 23.5"		Significant Tree** 10.0" - 23.5"		Heritage 3:1		Heritage 1:1		Additional Inches Preserved for Mitigation ***	Exempt Tree	
			Removed	Preserved	Removed	Preserved	Removed	Preserved	Removed	Preserved	Removed	Preserved			
5433	HACKBERRY	6													
5434	HACKBERRY	6													
5435	LIGUSTRUM	7													
5436	HACKBERRY	7													
5437	HACKBERRY	8													
5438	HACKBERRY	6													
5439	HACKBERRY	6													
5440	MESQUITE	13												ROW	
5441	MESQUITE	15												EASEMENT	
5442	HACKBERRY	6													
5443	HACKBERRY	8													
5444	MESQUITE	13					13								
5445	HACKBERRY	9													
5446	HACKBERRY	8													
5447	HACKBERRY	6													
5448	HACKBERRY	7													
5449	HACKBERRY	6													
5450	HACKBERRY	6													
5451	HACKBERRY	7													
5452	HACKBERRY	7													
5453	MESQUITE	26									26				
5454	HACKBERRY	6													
5455	HACKBERRY	6													
5456	HACKBERRY	7													
5457	LIGUSTRUM	6													
5460	MESQUITE	16					16								
5462	MESQUITE	12												EASEMENT	
5463	MESQUITE	8													
5464	MESQUITE	10												ROW	
5465	MESQUITE	6													
5466	HACKBERRY	6													
5467	HACKBERRY	7													
5468	MESQUITE	10												EASEMENT	
5469	MESQUITE	6													
5470	HACKBERRY	7													
5471	MESQUITE	10					10								
5472	MESQUITE	12					12								
5473	MESQUITE	8													
5474	MESQUITE	10					10								
5475	HACKBERRY	6													
5476	HACKBERRY	7													
5477	HACKBERRY	8													
5478	MESQUITE	11					11								
5479	MESQUITE	13					13								
5480	MESQUITE	8													
5481	MESQUITE	23					23								
5482	MESQUITE	23					23								
5483	HACKBERRY	18												EASEMENT	
5484	MESQUITE	6													
5485	HACKBERRY	7													
5486	HACKBERRY	7												EASEMENT	
5487	HACKBERRY	10					10								
5488	HACKBERRY	8													
5489	HACKBERRY	7												ROW	
5490	MESQUITE	20												ROW	
5491	HACKBERRY	8												ROW	
5492	HACKBERRY	11					11								
5493	MESQUITE	11					11								
5494	MESQUITE	6												EASEMENT	
5495	HACKBERRY	6													
5496	MESQUITE	8													
5497	HACKBERRY	8												ROW	
5498	HACKBERRY	10					10								
5499	MESQUITE	9												ROW	
5500	HACKBERRY	12												EASEMENT	
5501	HACKBERRY	9												ROW	
5502	HACKBERRY	14						14							
Sub. Tot. Inches=			0	0	23	37	401	73	205	143	56	0	67		
				0		60		474		348		56			
Total inches by category=															
Preservation percentage=				#DIV/0!	Significant Preservation			21%	Heritage Preservation			35%			
Mitigation required (Commercial) =				0	Commercial (inches)			103.6							
Mitigation required (Residential) =				0	Residential (inches)			76.9	Heritage Mitigation (inches)			671			



FIVE PALMS TREE INVENTORY - FLOODPLAIN													
Tag #	Species	Understory Species* 5.0" - 11.5"		Significant Tree 6" - 23.5"		Significant Tree** 10.0" - 23.5"		Heritage 3:1		Heritage 1:1		Additional Inches Preserved for Mitigation ***	
		Caliper	Removed	Preserved	Removed	Preserved	Removed	Preserved	Removed	Preserved	Removed		Preserved
444	OAK	37								37			
445	OAK	31								31			
Sub. Tot. Inches=			0	0	0	0	0	0	68	0	0	0	
				0		0		0	68		0		
Total inches by category=													
Preservation percentage=			#DIV/0!		Significant Preservation		#DIV/0!		Heritage Preservation		100%		
Mitigation required (Commercial) =			0		Commercial (inches)		0						
Mitigation required (Residential) =			0		Residential (inches)		0		Heritage Mitigation (inches)		0		
No category to fall below 10% preservation;													
Preserved- Tree to remain that meets root protection zone requirements described in section 35-523 of the UDC.													
Mitigation 1:1 for significant trees below minimum preservation requirements; 3:1 for heritage trees below 100% preservation													
* Small species: Condalia, Redbud, Tx. Mountain Laurel, Tx. Persimmon, Hawthorn, Possumhaw - these are mitigated at 1:1 for Heritage Trees													
** Ashe Juniper, Huisache, Mesquite, Arizona Ash, Hackberry protected at 10" dbh and mitigated at 1:1 for heritage trees													
*** Mitigation Trees: Unprotected-sized trees to be used for mitigation calculations; subtract inches from mitigation owed													

FIVE PALMS TREE INVENTORY- ENVIRONMENTAL SENSITIVE AREA														
Tag #	Species	Caliper	Understory Species* 5.0" - 11.5"		Significant Tree 6" - 23.5"		Significant Tree** 10.0" - 23.5"		Heritage 3:1		Heritage 1:1		Additional Inches Preserved for Mitigation ***	
			Removed	Preserved	Removed	Preserved	Removed	Preserved	Removed	Preserved	Removed	Preserved	Preserved	
1679	OAK	49								49				
5202	LIGUSTRUM	17.5												
5203	LIGUSTRUM	7												
5204	LIGUSTRUM	7												
5502	HACKBERRY	14					14							
5503	MESQUITE	6												
Sub. Tot. Inches=			0	0	0	0	0	14	0	49	0	0	0	0
				0		0		14		49		0		
Total inches by category=														
Preservation percentage=				#DIV/0!		Significant Preservation	100%	Heritage Preservation	100%					
Mitigation required (Commercial) =				0		Commercial (inches)	-8.4							
Mitigation required (Residential) =				0		Residential (inches)	-9.1	Heritage Mitigation (inches)	0					

No category to fall below 10% preservation;
Preserved- Tree to remain that meets root protection zone requirements described in section 35-523 of the UDC.
Mitigation 1:1 for significant trees below minimum preservation requirements; 3:1 for heritage trees below 100% preservation
* Small species: Condalia, Redbud, Tx. Mountain Laurel, Tx. Persimmon, Hawthorn, Possumhaw - these are mitigated at 1:1 for Heritage Trees
** Ashe Juniper, Huisache, Mesquite, Arizona Ash, Hackberry protected at 10" dbh and mitigated at 1:1 for heritage trees
*** Mitigation Trees: Unprotected-sized trees to be used for mitigation calculations; subtract inches from mitigation owed



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04-03-2019

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18120

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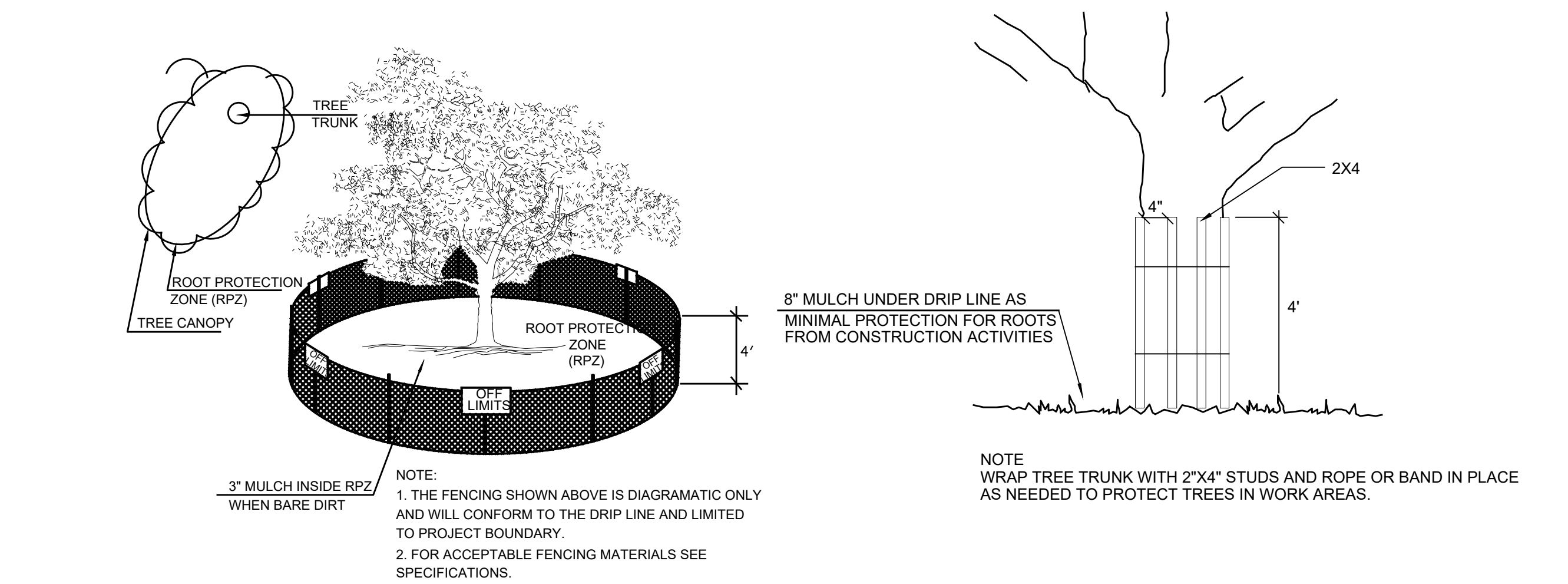
FEBRUARY, 08 2019

SHEET NAME

TREE PRESERVATION
LIST

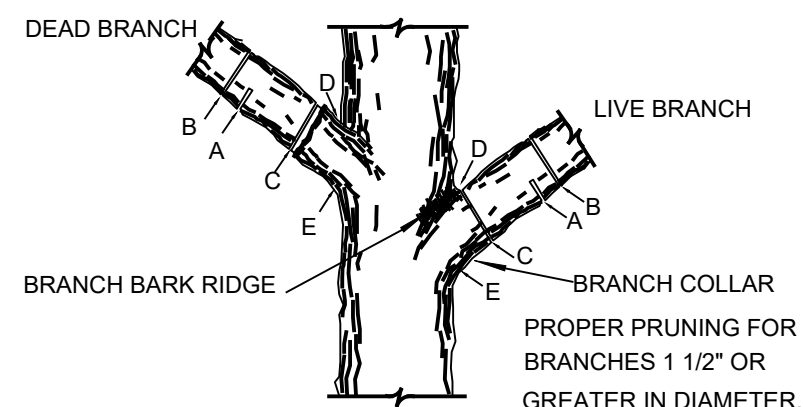
SHEET NUMBER

TP 2.2



1 **EXISTING TREE PROTECTION**
ELEVATION - PLAN - 3D VIEW NOT TO SCALE

4 **LEVEL II B TREE PROTECTION**
ELEVATION NOT TO SCALE



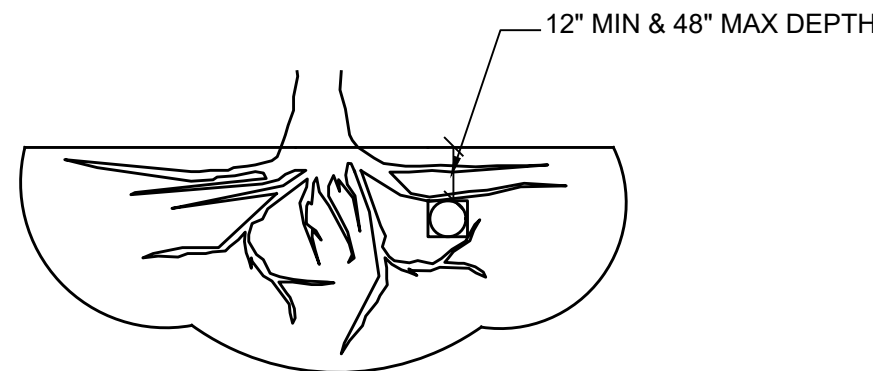
NOTE: DO NOT CUT FROM D to E.

- A. FIRST CUT - TO PREVENT THE BARK FROM BEING PEELED WHEN THE BRANCH FALLS.
B. SECOND CUT - TO REDUCE THE WEIGHT OF BRANCH.
C. FINAL CUT - ALLOW FOR HEALING COLLAR BUT NO STUBS
D. BRANCH RIDGES - INDENT PROPERLY BRANCH RIDGES WHICH ARE SITE FOR DECAY.

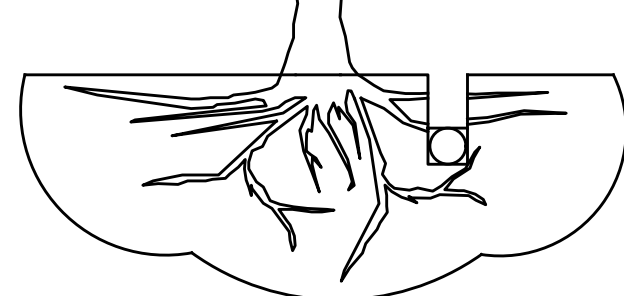
FOR OAKS ONLY: PAINT ALL WOUNDS OR CUTS WITH PRUNING PAINT WITHIN 20 MIN TO PREVENT THE SPREAD OF OAK WILT.

TREES THAT ARE MARKED TO BE PRESERVED ON A SITE PLAN AND FOR WHICH UTILITIES MUST PASS TROUGH THEIR ROOT PROTECTION ZONES MAY REQUIRE TUNNELING AS OPPOSED TO OPEN TRENCHES. THE DECISION TO TUNNEL WILL BE DETERMINED ON A CASE BY CASE BASIS BY THE ENGINEER.

TUNNELS SHALL BE DUG THROUGH THE ROOT PROTECTION ZONE IN ORDER TO MINIMIZE ROOT DAMAGE.

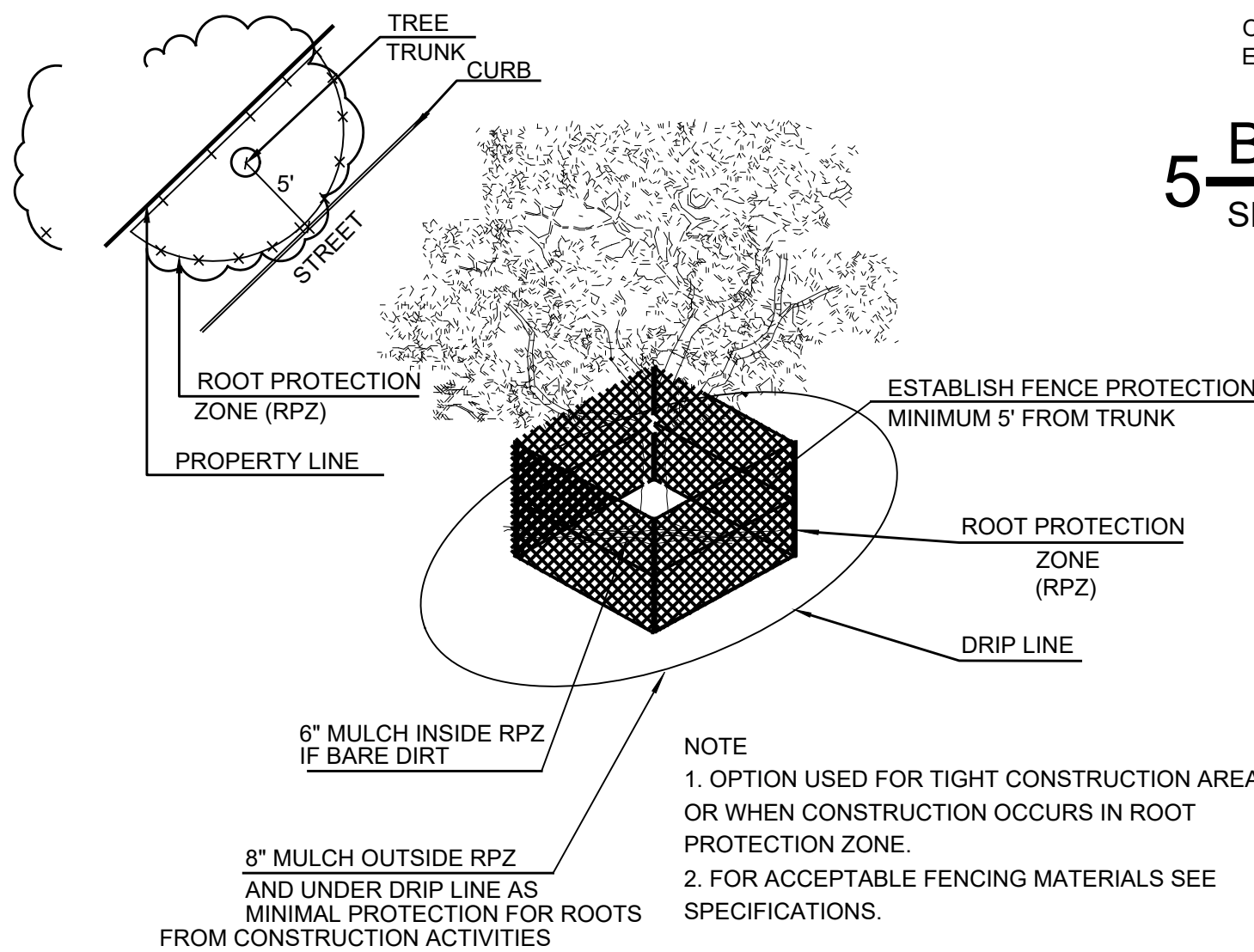


TUNNEL TO MINIMIZE ROOT DAMAGE (TOP) AS OPPOSED TO SURFACE-DUG TRENCHES IN ROOT PROTECTION ZONE WHEN THE 5' MINIMUM DISTANCE FROM TRUNK CAN NOT BE ACHIEVED.



OPEN TRENCHING MAY BE USED IF EXPOSED TREE ROOTS DO NOT EXCEED 3" OR ROOTS CAN BE BENT BACK.

5 **BORING THROUGH TREE ROOT (RPZ)**
SECTION NOT TO SCALE



3 **LEVEL II A TREE PROTECTION**
ELEVATION NOT TO SCALE

EXISTING TREE NOTES

1. ALL THE TREES WITH A DIAMETER GREATER THAN 3 INCHES AFFECTED BY CONSTRUCTION SHALL HAVE THE LIMBS AND ROOTS TRIMMED AND PRUNED ACCORDING TO TREE PRUNING, SOIL AMENDING AND FERTILIZATION, UNLESS SPECIFIED TREES SHALL RECEIVE PROTECTION AS SHOWN ON TREE PROTECTION DETAIL ON THIS SHEET.

2. ALL TREES SHALL REMAIN UNLESS NOTED ON THE PLANS.

3. NO SITE PREPARATION WORK SHALL BEGIN IN AREAS WHERE TREE PRESERVATION AND TREATMENT MEASURES HAVE NOT BEEN COMPLETED AND APPROVED BY CITY INSPECTOR.

4. TREE PROTECTION FENCING SHALL BE REQUIRED. TREE PROTECTION FENCING SHALL BE INSTALLED, MAINTAINED AND REPAIRED BY THE CONTRACTOR DURING SITE CONSTRUCTION.

5. THE CONTRACTOR SHALL AVOID CUTTING ROOTS LARGER THAN THREE INCHES IN DIAMETER WHEN EXCAVATING NEAR EXISTING TREES. EXCAVATION IN THE VICINITY OF TREES SHALL PROCEED WITH CAUTION. THE CONTRACTOR SHALL CONTACT THE CITY INSPECTOR.

6. THE ROOT PROTECTION ZONE IS THAT AREA SURROUNDING A TREE, AS MEASURED BY A RADIUS FROM THE TREE TRUNK, IN WHICH NO EQUIPMENT, VEHICLES OR MATERIALS MAY OPERATE OR BE STORED. THE REQUIRED RADIUS LENGTH IS 1 FOOT PER DIAMETER INCH OF THE TREE. FOR EXAMPLE, A 10-INCH DIAMETER TREE WOULD HAVE A 5-FOOT RADIUS ROOT PROTECTION ZONE AROUND THE TREE. ROOTS OR BRANCHES THAT ARE IN CONFLICT WITH THE CONSTRUCTION SHALL BE CUT CLEANLY ACCORDING TO PROPER PRUNING METHODS. LIVE OAK WOUNDS SHALL BE PAINTED OVER, WITHIN 20 MINUTES TO PREVENT OAK WILT.

7. ACCESS TO FENCED AREAS WILL BE PERMITTED ONLY WITH THE APPROVAL OF THE ENGINEER OR CITY INSPECTOR.

8. GRADING, IF REQUIRED, SHALL BE LIMITED TO A 3 INCH CUT OR FILL WITHIN THE FENCED ROOT ZONE AREAS.

9. TREES, SHRUBS OR BUSHES TO BE CLEARED FROM PROTECTED ROOT ZONE AREAS SHALL BE REMOVED BY HAND AS DIRECTED BY THE PROJECT MANAGER OR CITY INSPECTOR.

10. TREES DAMAGED OR LOST DUE TO CONTRACTOR'S NEGLIGENCE DURING CONSTRUCTION SHALL BE MITIGATED TO THE ENGINEER'S SATISFACTION.

11. EXPOSED ROOTS SHALL BE COVERED AT THE END OF EACH DAY USING TECHNIQUES SUCH AS COVERING WITH SOIL, MULCH OR WET BURLAP.

12. ANY TREE REMOVAL SHALL BE APPROVED BY THE CITY ARBORIST PRIOR TO ITS REMOVAL.



04-03-2019

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TREE PRESERVATION NOTES & DETAILS

SHEET NUMBER

TP 2.3

NOTE:
ALL PROPOSED TREES LOCATED ON WEST OR SOUTH SIDE OF BUILDINGS TO
RECEIVE ENERGY CONSERVATION CREDIT

TREE CANOPY ORDINANCE

MANDATORY CRITERIA:
1. FINAL TREE CANOPY. ALL SITES MUST PROVIDE A MINIMUM FINAL TREE CANOPY COVER AS LISTED BELOW FOR THE ENTIRE GROSS PROJECT AREA OUTSIDE OF THE REGULATORY FLOODPLAIN.
IDENTIFY "FINAL TREE CANOPY" PERCENT (%) BASED ON THE LAND USE AND AS NOTED ON SECTION (e). SINGLE FAMILY 38% FOR THE PURPOSE OF THIS SUBMITTAL APPROVAL. NOTE: LABEL (*) SHALL RECEIVE ENERGY CONSERVATION CREDIT.

SITE AREA = 600,505 SF		
CANOPY AREA REQUIRED =	600,505 SF X 38% =	228,191 SF REQUIRED
EXISTING TREES		
(7) LIVE OAK - 875 SF @ 100%		6,125 SF
(9) HACKBERRY - 875 SF @ 100%		7,875 SF
(7) MESQUITE - 550 SF @ 100%		3,850 SF
EXISTING TREES: ENERGY CONSERVATION CREDIT		
(1) HACKBERRY - 875 SF @ 150% X 100%		1,312.5 SF
PROPOSED TREES		
(6) BUR OAK - 1200 SF @ 90%		6,480 SF
(15) PECAN - 1200 SF @ 90%		16,200 SF
(12) MEXICAN SYCAMORE - 1200 SF @ 90%		12,960 SF
(16) SHUMARD OAK - 1200 SF @ 90%		17,280 SF
PROPOSED TREES: ENERGY CONSERVATION CREDIT		
(20) BUR OAK - 1200 SF @ 150% X 90%		32,400 SF
(14) MEXICAN SYCAMORE - 1200 SF @ 150% X 90%		22,680 SF
(22) SHUMARD OAK - 1200 SF @ 150% X 90%		35,640 SF
TOTAL TREE CANOPY COVERAGE		162,802.5 SF (27.1%)
TREE CANOPY COVERAGE FUND:		
REMAINING SF NEEDED:		65,388.5 SF
(65,388.5/788)*1.5 =		124.4" REQUIRED
124.4" X \$200 = \$24,880 TOWARDS TREE CANOPY FUND		

TREE LEGEND

	BO	BUR OAK QUERCUS MACROCARPA
	PE	PECAN CARYA ILLINOINENSIS
	RO	SHUMARD RED OAK QUERCUS SHUMARDII
	MS	MEXICAN SYCAMORE PLATANUS MEXICANA



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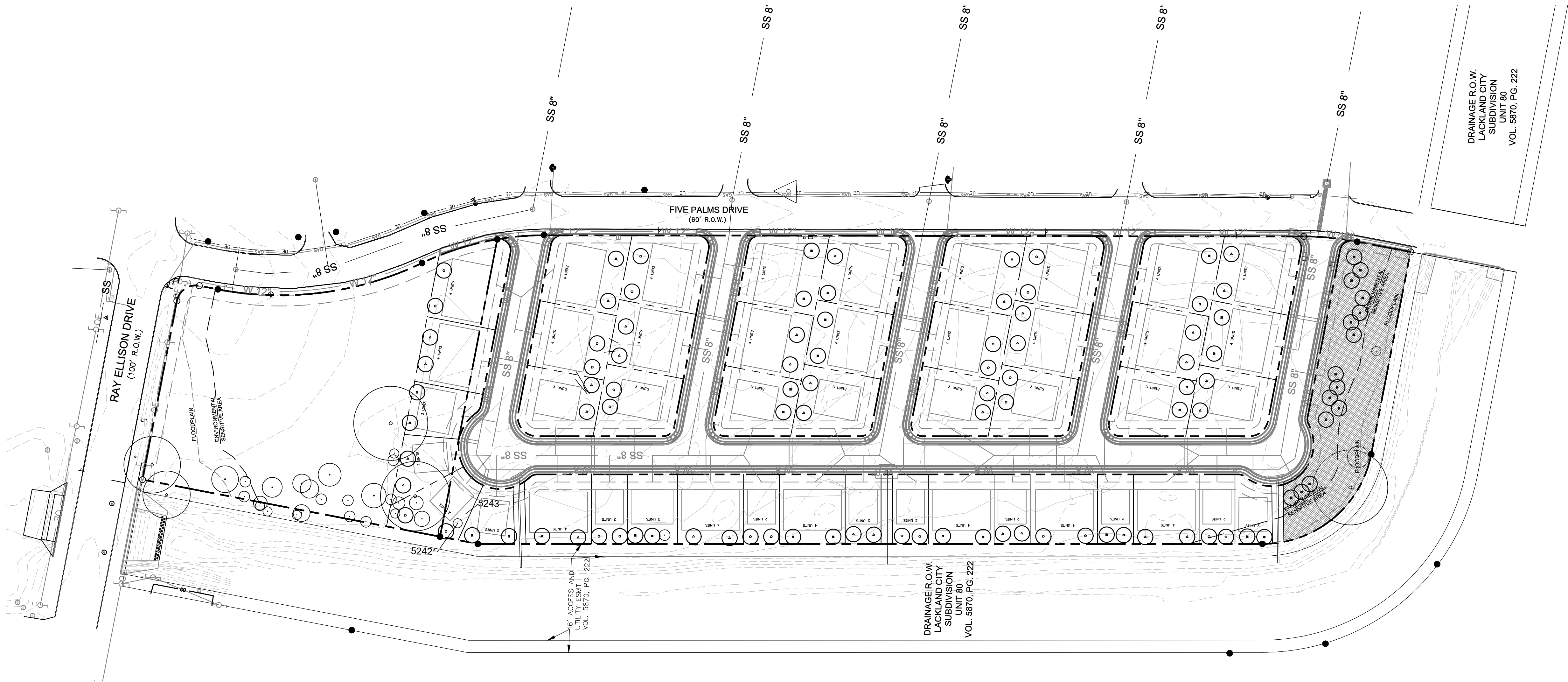
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SHEET NAME

PLANTING PLAN

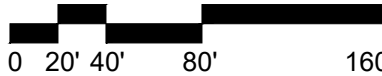
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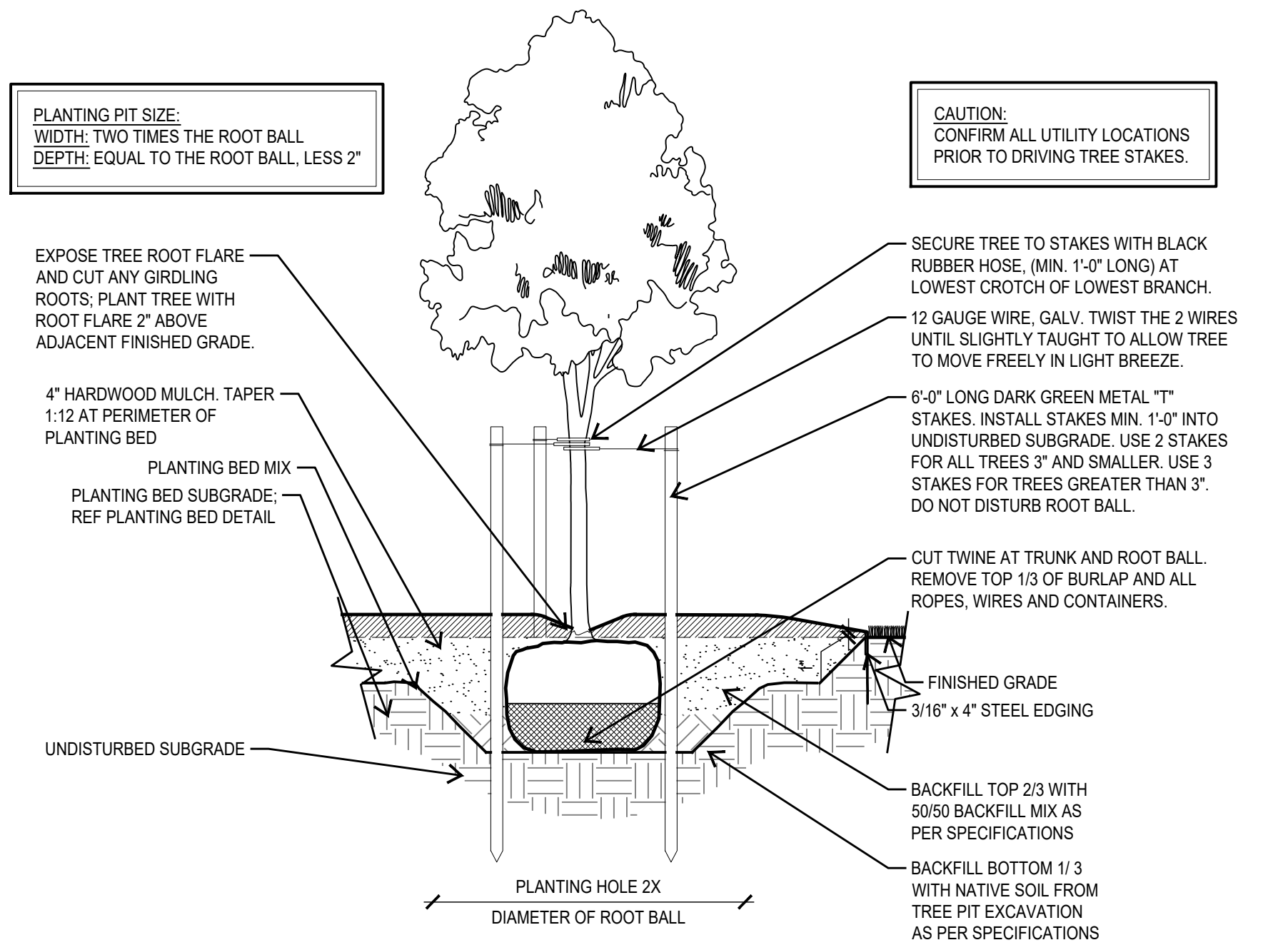
1 LANDSCAPE PLANTING PLAN

PLAN



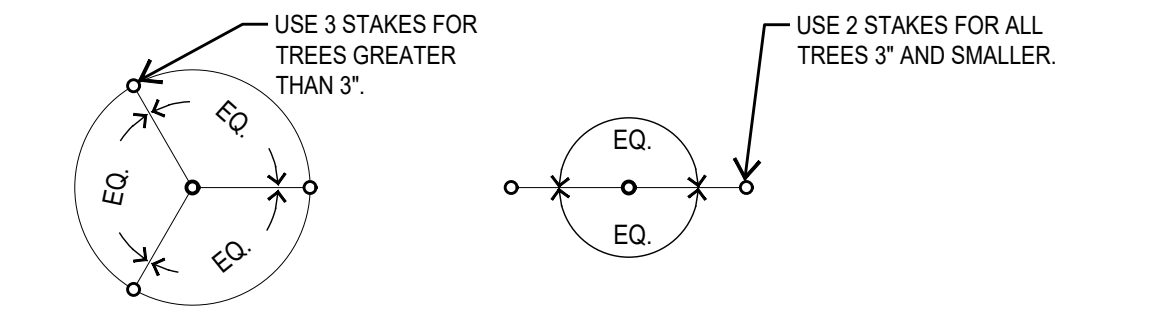
SCALE: 1"=80'





1 TYPICAL TREE PLANTING SECTION

SCALE: 1/2"=1'-0"



2 TYPICAL TREE STAKING PLAN

SCALE: 1/2"=1'-0"

PLANT LIST

TREES

CALLOUT	QUANTITY	COMMON NAME BOTANICAL NAME	SIZE	REMARKS
BO	26	BURR OAK QUERCUS MACROCARPA	3" CAL; MIN 12' HT; MIN 5' SPRD.	SINGLE TRUNK CONTAINER SPECIMEN; STRAIGHT TRUNK WITH FULL AND UNIFORM CANOPY; PARK GRADE NOT ACCEPTABLE
MS	26	MEXICAN SYCAMORE PLATANUS MEXICANA	3" CAL; MIN 20' HT; MIN 5' SPRD.	SINGLE TRUNK CONTAINER SPECIMEN; STRAIGHT TRUNK WITH FULL AND UNIFORM CANOPY; PARK GRADE NOT ACCEPTABLE
PE	15	PECAN CARYA ILLINOINENSIS	3" CAL; MIN 12' HT; MIN 5' SPRD.	SINGLE TRUNK CONTAINER SPECIMEN; STRAIGHT TRUNK WITH FULL AND UNIFORM CANOPY; PARK GRADE NOT ACCEPTABLE
RO	38	SHUMARD RED OAK QUERCUS SHUMARDII	3" CAL; MIN 12' HT; MIN 5' SPRD.	SINGLE TRUNK CONTAINER SPECIMEN; STRAIGHT TRUNK WITH FULL AND UNIFORM CANOPY; PARK GRADE NOT ACCEPTABLE

MITIGATION TREES

CALLOUT	QUANTITY	COMMON NAME BOTANICAL NAME	TREE SIZE	INCHES APPLIED TO LOT	TOTAL MITIGATED
BO	26	BURR OAK	3"	1.5"	39"
MS	26	MEXICAN SYCAMORE	3"	1.5"	39"
RO	38	SHUMARD RED OAK	3"	1.5"	57"
PE	15	PECAN	3"	3"	45"
				TOTAL MITIGATION	180"

GENERAL NOTES

LANDSCAPE CONTRACTOR SHALL ACCEPT THE SITE IN ITS EXISTING CONDITION AND SHALL TIE NEW WORK TO EXISTING CONDITIONS AND CONTROLS (SUCH AS EXISTING GRADES AND WALK ELEVATIONS) AS NECESSARY TO MEET THE INTENT OF THE PLANS.

BEFORE PROCEEDING WITH ANY WORK IN AN AREA, LANDSCAPE CONTRACTOR SHALL VERIFY ALL DIMENSIONS, LAYOUTS AND SIZES AND SHALL NOTIFY LANDSCAPE ARCHITECT OF ANY DISCREPANCIES BETWEEN PLANS AND ACTUAL SITE CONDITIONS. IF ANY UTILITIES OR OBSTRUCTIONS ARE DISCOVERED DURING CONTRACT WHICH MAY NOT HAVE BEEN KNOWN DURING DESIGN, CONTRACTOR SHALL STOP WORK AND IMMEDIATELY NOTIFY LANDSCAPE ARCHITECT BEFORE PRECEDING. LANDSCAPE CONTRACTOR SHALL BE LIABLE FOR ALL MODIFICATIONS AND DAMAGE IF WORK PROCEEDS IN EITHER OF THE ABOVE SITUATIONS WITHOUT NOTIFYING LANDSCAPE ARCHITECT. PRIOR TO ANY EXCAVATION, LANDSCAPE CONTRACTOR SHALL CONTACT APPROPRIATE AUTHORITIES INCLUDING, BUT NOT LIMITED TO, TEXAS ONE CALL SYSTEM AT 1-800-245-4545 TO LOCATE EXISTING UNDERGROUND UTILITIES.

LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL COSTS ASSOCIATED WITH ANY DAMAGE TO ANY UTILITIES OR PROPERTY THAT MAY OCCUR IN THE EXECUTION OF HIS CONTRACT WORK. WHEN WORK REQUIRES CROSSING EXISTING WALKS OR CURBS WITH EQUIPMENT, LANDSCAPE CONTRACTOR SHALL PROVIDE APPROVED BRIDGE MATERIAL SUCH AS WOOD PLANKS AND EARTH TO PREVENT DAMAGE TO FINISHED WORK. LANDSCAPE CONTRACTOR SHALL COORDINATE HIS WORK WITH OTHER CONTRACTORS THAT MAY BE WORKING ON THE SITE SIMULTANEOUSLY AND SHALL COORDINATE STAGING OF HIS WORK WITH OWNER AND LANDSCAPE ARCHITECT. ALL TRASH AND DEBRIS GENERATED FROM CONTRACT OPERATIONS SHALL BE REMOVED ON A DAILY BASIS. ALL WORK SHALL BE IN COMPLIANCE WITH ALL APPLICABLE CODES AND ORDINANCES. LANDSCAPE CONTRACTOR SHALL BE RESPONSIBLE FOR JOB SITE SAFETY IN CONJUNCTION WITH HIS CONTRACT WORK.

MATERIALS

- A.) PLANT MATERIALS:
- CERTIFIED IN ACCORDANCE WITH TDA REQUIREMENTS.
 - SPECIES AND SIZE AS INDICATED IN PLANT SCHEDULE. LARGER SIZE MAY BE SUBSTITUTED WITHOUT ADDITIONAL COST TO OWNER, PROVIDED ROOT BALL OR SPREAD INCREASES PROPORTIONATELY.
 - WHERE MATERIALS ARE PLANTED IN MASSES, PROVIDE PLANTS OF UNIFORM SIZE.
 - GROWN IN CLIMATIC CONDITIONS SIMILAR TO THOSE AT SITE. FREE FROM DISEASE, INSECT INFESTATIONS, DEFECTS INCLUDING WEAK OR BROKEN LIMBS, CROTCHES, AND DAMAGED TRUNKS, ROOTS OR LEAVES, SUN SCALD, FRESH BARK ABRASIONS, EXCESSIVE ABRASIONS, AND OBJECTIONABLE DISFIGUREMENTS.
 - EXHIBIT NORMAL GROWTH HABITS; VIGOROUS, HEALTHY, FULL, WELL-PROPORTIONED, AND SYMMETRICAL.
 - TREE TRUNKS TO BE STURDY AND EXHIBIT HARDENED SYSTEMS AND VIGOROUS AND FIBROUS ROOT SYSTEMS, NOT ROOT OR POT BOUND.
 - NOT PRUNED, TRIMMED, OR TOPPED.
 - CONTAINER-GROWN STOCK; GROWN IN CONTAINERS FROM SEEDING.
- B.) MULCH:
- SHREDDED, COMPOSTED HARDWOOD BARK OF VARYING LENGTH BY NEW EARTH LLC OR APPROVED SUBSTITUTE. PARTIALLY DECOMPOSED; FREE FROM STICKS, STONES, CLAY, AND GROWTH AND GERMINATION-INHIBITING INGREDIENTS.
- C.) MIXES:
- PLANT BED MIX: PLANT BED MIX (BACKFILL MIX) SHALL BE NEW EARTH'S 4 WAY MIX AS PRODUCED BY NEW EARTH LLC PH. 210-661-5180. DOCUMENTATION OF PURCHASE OF THIS SPECIFIC MIX SHALL BE SUBMITTED TO LANDSCAPE ARCHITECT. IF EQUAL IS PROPOSED, CONTRACTOR SHALL SUBMIT SAMPLE AND COMPLETE ANALYSIS WITH TEST RESULTS AND METHOD OF PRODUCTION FOR EVALUATION AS AN EQUAL SUBSTITUTE.

PREPARATION

- LANDSCAPE CONTRACTOR SHALL RECEIVE THE SITE AT APPROXIMATELY FINISH GRADE LESS ANY SETTLEMENT THAT MAY HAVE OCCURRED SINCE SITE CONSTRUCTION AND BACKFILLING. THIS GRADE SHALL BE RAKED TO REMOVE ALL DEBRIS INCLUDING STICKS, CLODS, AND STONES AND SHALL BE FINE GRADED TO ELIMINATE ALL HUMPS, RUTS, DEPRESSIONS AND ABRUPT CHANGES IN GRADE AND ANY AREA THAT COULD CAUSE WATER TO POND.
- A.) IF VEGETATION IS GROWING IN PLANTING/LAWN AREA, APPLY HERBICIDE AT RATES RECOMMENDED BY MANUFACTURER. ALLOW TO DIE, AND THEN GRUB OUT ROOTS TO MINIMUM 1/2 INCH DEPTH.
- B.) MARK LOCATION OF TREES AND OUTLINES OF PLANTS BEDS USING COLORED WOOD STAKES OR FLAGS PRIOR TO BEGINNING PLANTING; OBTAIN LANDSCAPE ARCHITECT'S APPROVAL PRIOR TO PROCEEDING.

- PLANTING TREES
- A.) REMOVE CONTAINERS WITHOUT DAMAGE TO ROOTS.
- B.) REMOVE BOTTOM OF PLANT BOXES PRIOR TO PLACING TREES; REMOVE SIDES AFTER PLACEMENT AND PARTIAL BACKFILLING. PREVENT DAMAGE TO ROOTS.
- C.) REMOVE UPPER THIRD OF BURLAP FROM BALLED AND BURLAP TREES AFTER PLACEMENT.
- D.) PLACE PLANT UPRIGHT AND PLUMB IN CENTER OF HOLE. PULL ANY WEEDS GROWING IN TREE BALL AND EXPOSE ROOT FLARE (THIS WILL BE THE TOP MOST IDENTIFIABLE ROOT). REMOVE ANY GIRDLING ROOTS AND SET PLANT SO THAT ROOT FLARE IS 1" ABOVE FINISH GRADE. ORIENT PLANT FOR BEST APPEARANCE. BACKFILL THE BOTTOM 1/3 OF THE EXCAVATION WITH SOIL CUT FROM EXCAVATION OF PIT AND THOROUGHLY WATER THIS SOIL TO SETTLE IN. BACKFILL THE REMAINDER OF THE EXCAVATION WITH A 50/50 MIX OF NEW EARTH'S 4 WAY MIX AND NATIVE SOIL EXCAVATED FROM THE PIT. PLACE PLANT HEALTH CARE GROUP'S "TREE SAVER" IN BACKFILL AS PER P.H.C.G. DIRECTION AND APPLICATION RATES. LIGHTLY TAMP AND WATER SOIL TO REMOVE ALL AIR POCKETS. FOR PLANTS OUTSIDE OF PLANTING BEDS, CONSTRUCT 3 INCH HIGH WATER CONTAINMENT RING AROUND PLANT. SPREAD MULCH TO MINIMUM 4 INCH DEPTH OVER PLANT BASIN.
- E.) ADJUST PLANT HEIGHT IF SETTLEMENT OCCURS AFTER BACKFILL AND STAKE AS DETAILED.
- TWO TO THREE WEEKS FOLLOWING PLANTING, INJECT PLANT HEALTH CARE INJECTABLE INOCULANT AROUND ROOT BALL FOLLOWING MANUFACTURER'S DIRECTIONS AND APPLICATION RATES. CONTACT LANDSCAPE ARCHITECT TO OBSERVE THIS OPERATION.
- F.) TRIM PLANTS TO REMOVE DEAD AND INJURED BRANCHES ONLY. TREAT CUTS OVER 3/4 INCH DIAMETER WITH TREE PAINT.
- G.) BRACE PLANTS OVER 65 GALLONS SIZE IMMEDIATELY AFTER PAINTING.
- FOR TREES 2" CAL. AND GREATER PROVIDE STAKING AS DETAILED. POSITION TO PREVENT HAZARDS TO PEDESTRIANS.
 - DO NOT RESTRICT PLANT MOVEMENT UNDER LIGHT WIND LOADS OR DAMAGE BARK.



04-03-2019

PROJECT FIVE PALMS SUBDIVISION LANDSCAPE IMPROVEMENTS

PROJECT ADDRESS
RAY ELLISON BLVD.
SAN ANTONIO, TX 78242

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NEW BRAUNFELS, TX 78130

OWNER'S REPRESENTATIVE
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SUBCONSULTANT

REVISIONS		
NO.	DATE	DESCRIPTION
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ISSUE SETS		
NO.	DATE	DESCRIPTION
1	02.08.19	PERMIT SET

SHEET INFORMATION	
PROJECT NO.	18120
DATE ISSUED	FEBRUARY, 08 2019
SHEET NAME	

PLANTING LIST & DETAILS

SHEET NUMBER



04/3/2019

PROJECT

FIVE PALMS
SUBDIVISION
LANDSCAPE IMPROVEMENTS

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SHEET INFORMATION

PROJECT NO.

18120

DATE ISSUED

FEBRUARY, 08 2019

SHEET NAME

LANDSCAPE
IRRIGATION NOTES
& LEGEND

SHEET NUMBER

LI 1.0

WATERING SCHEDULE

PRECIPITATION RATE (IN/HR)	WATER DESIRED (IN/WK)	TIME/CYCLE (MIN)	NUMBER OF ZONES	TOTAL TIME MIN. HRS	
MP ROTATOR SPRAY (.44)	.80	107.0	2	214	3.57
TREE BUBBLERS (3.87)	.80	12.0	2	24	.40
TOTAL SYSTEM HOURS OF OPERATION PER WEEK:					3.97
NOTE: A TYPICAL SCHEDULE WOULD ALLOW WATERING TO OCCUR TWO TIMES PER WEEK. TOTAL WATERING TIME WOULD BE DIVIDED BY THE NUMBER OF WATERING DAYS. THIS SCHEDULE IS DESIGNED FOR SUMMER WATER USAGE AND ESTABLISHMENT OF NEW PLANTING.					

PRESSURE CALCULATIONS @ Zone #3

DESIGN STATISTICS FOR CALCULATIONS	
TOTAL ZONE FLOW:	16.0 g.p.m
ELECTRIC VALVE SIZE:	1"
STATIC PRESSURE LESS 10% (STATIC @ 65 psi):	58.5 p.s.i.
ACCUMULATIVE LOSSES FROM CITY MAIN TO FURTHEST HEAD:	
SPRINKLER HEAD REQUIREMENT:	30.0 p.s.i.
ZONE PIPE/FITTING LOSS:	2.8 p.s.i.
1" ELECTRIC VALVE LOSS: :	3.0 p.s.i.
ELEVATION NET LOSS: (n/a):	0.0 p.s.i.
SYSTEM MAINLINE LOSS (1 1/2" SCH 40 LOOP):	1.6 p.s.i.
BACKFLOW PREVENTOR LOSS (1"):	4.0 p.s.i.
WATER METER LOSS (1"):	9.4 p.s.i.
MASTER ELECTRIC VALVE LOSS (1.5"):	1.5 p.s.i.
TYPE K COPPER SERVICE LOSS:	n/a
TOTAL NET LOSS:	22.3 p.s.i.
DESIGN PRESSURE:	52.3 p.s.i.
NOTE: ACTUAL STATIC WATER PRESSURE WAS UNAVAILABLE AT THE TIME OF IRRIGATION DESIGN. 65 PSI IS USED AS A STANDARD PRESSURE FOR DESIGN. PRESSURE MUST BE CONFIRMED 65 OR GREATER BY IRRIGATION CONTRACTOR BEFORE ANY INSTALLATION. PIPE HAS BEEN SIZE TO INSURE THAT VELOCITY DOES NOT EXCEED 5 FPS. DO NOT CHANGE PIPE SIZE IN THE FIELD WITHOUT CONSULTING SYSTEM DESIGNER.	

Statement of Conformance:
I, JOSEPH A. FERDIN, LICENSED IRRIGATOR #0022076, HEREBY CERTIFIES THAT THIS IRRIGATION DESIGN CONFORMS TO THE DESIGN AND INSTALLATION PARAMETERS OF THE IRRIGATION DESIGN AND EQUIPMENT STANDARDS SET OUT 35-510(J) AND 35-511(C) (6) OF THE CITY OF SAN ANTONIO UNIFIED DEVELOPMENT CODE.

Joseph A Ferdin TX LI # 22076

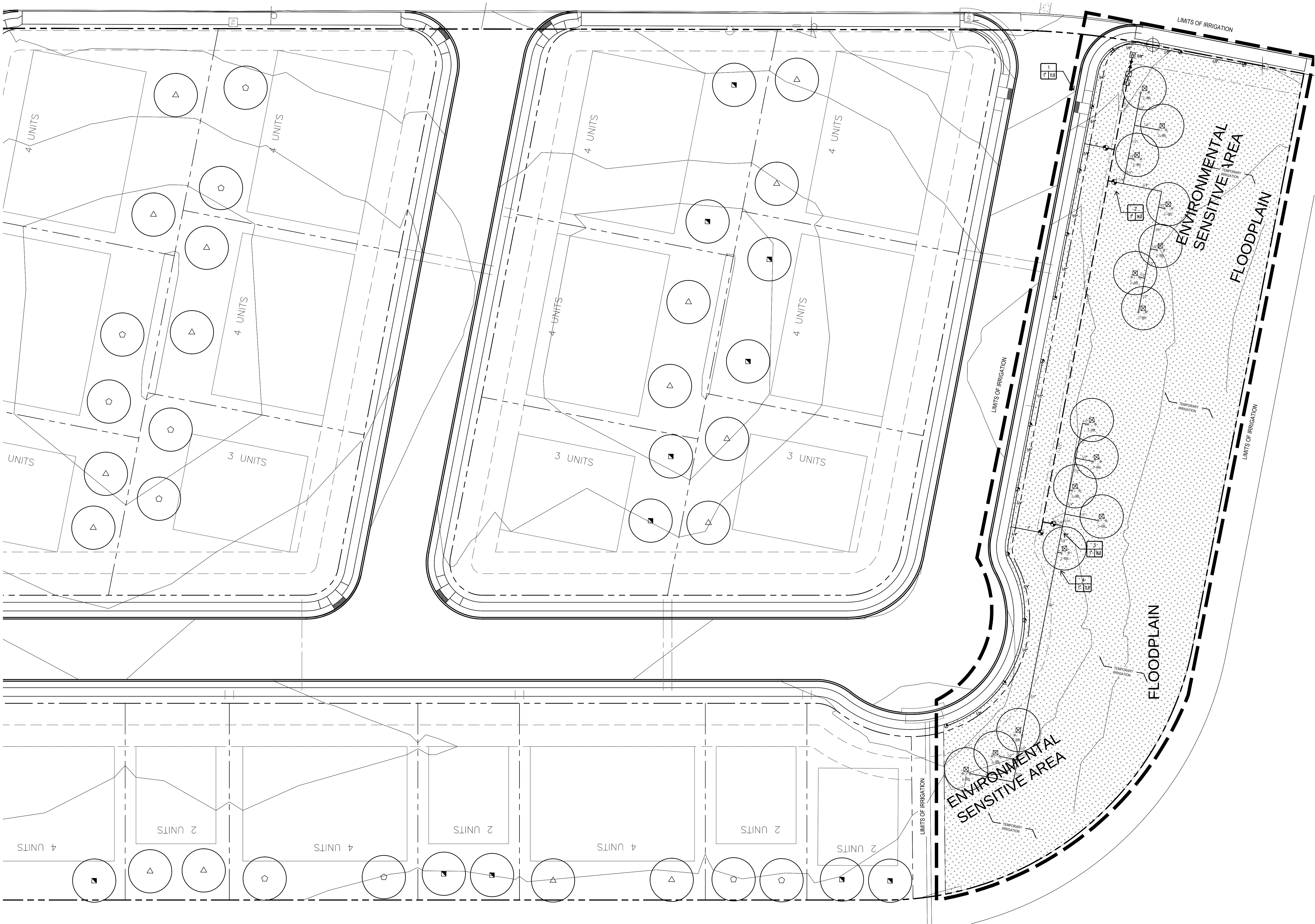
IRRIGATION CONSTRUCTION NOTES

1. IT IS THE IRRIGATION CONTRACTORS SOLE RESPONSIBILITY TO CONFIRM THE ACTUAL ONSITE WATER PRESSURE FROM THE SOURCE. IF WATER PRESSURE IS LESS THAN MANDATED THEN IMMEDIATELY NOTIFY THE OWNERS REPRESENTATIVE. IF ACTUAL SITE STATIC PRESSURE EXCEEDS DESIGN PRESSURE BY 15 P.S.I. IN ANY ZONE, A PRESSURE REDUCING VALVE SHALL BE INSTALLED.
2. DO NOT WILLFULLY PROCEED WITH CONSTRUCTION AS DESIGN WHEN IT IS OBVIOUS THAT UNKNOWN OBSTRUCTIONS AND/OR GRADE DIFFERENCES EXIST THAT MAY NOT HAVE BEEN KNOWN DURING DESIGN. SUCH CONDITIONS SHALL BE IMMEDIATELY BROUGHT TO THE ATTENTION OF THE OWNERS REPRESENTATIVE. THE IRRIGATION CONTRACTOR SHALL ASSUME FULL RESPONSIBILITY FOR ALL NECESSARY REVISIONS DUE TO FAILURE TO GIVE SUCH NOTIFICATION.
3. THE IRRIGATION CONTRACTOR IS REQUIRED BY LAW TO NOTIFY TEXAS ONE CALL (800-245-4545) 72 HOURS PRIOR TO ANY EXCAVATION. IRRIGATION CONTRACTOR SHALL BE RESPONSIBLE FOR MAKING THEMSELVES FAMILIAR WITH ALL UNDERGROUND UTILITIES AND PIPES. IRRIGATION CONTRACTORS SHALL TAKE SOLE RESPONSIBILITY FOR ANY COSTS INCURRED DUE TO DAMAGE OF SAID UTILITIES WHETHER OR NOT TEXAS ONE CALL IS NOTIFIED.
4. DUE TO SCALE OF DRAWINGS, IT IS NOT POSSIBLE TO INDICATE ALL OFFSETS, FITTINGS, SLEEVES, ETC. WHICH MAY BE REQUIRED. IRRIGATION CONTRACTOR SHALL CAREFULLY INVESTIGATE THE STRUCTURAL AND FINISHED CONDITIONS AFFECTING ALL OF HIS WORK AND PLAN HIS WORK ACCORDINGLY. FURNISHINGS SUCH FITTINGS, ETC AS MAY BE REQUIRED TO MEET SUCH CONDITIONS. DRAWINGS ARE GENERALLY DIAGRAMMATIC AND INDICATIVE OF THE WORK TO BE INSTALLED. THE WORK SHALL BE INSTALLED IN SUCH A MANNER AS TO AVOID CONFLICTS BETWEEN IRRIGATION SYSTEM, PLANTING, AND ARCHITECTURAL FEATURES. THIS DESIGN IS DIAGRAMMATIC. ALL PIPING, VALVES, ETC., SHOWN WITHIN PAVED AREAS IS FOR DESIGN CLARIFICATION ONLY AND SHALL BE INSTALLED IN PLANTING AREAS AND WITHIN PROPERTY LINES.
5. LATERAL PIPE SHALL BE INSTALLED AT MIN. DEPTH OF 12" WITH MAINLINE PIPE / WIRE TO BE INSTALLED AT A MINIMUM OF 18". NO MACHINE TRENCHING IS TO BE DONE WITHIN DRIPLINE OF TREES. TRENCHING IS TO BE DONE BY HAND OR BY TUNNELING UNDER ROOT SYSTEM BY METHOD APPROVED BY OWNER'S REPRESENTATIVE. PIPING LAYOUT IS DIAGRAMMATIC AND PIPING SHALL BE ROUTED AROUND EXISTING PLANT MATERIAL TO AVOID DAMAGE TO EXISTING PLANTS. DO NOT CUT ANY ROOT OVER 3/4" DIAMETER. ANY CUTS MADE SHALL BE CLEAN AND WITHOUT FRAYED ENDS.
6. IRRIGATION CONTRACTOR SHALL BE RESPONSIBLE FOR SLEEVES WHEREVER PIPING OR CONDUIT PASSES, UNDER ALL PAVING, THROUGH WALLS, ETC.. ALL SLEEVE LOCATIONS MAY NOT BE SHOWN ON PLAN, COORDINATE WITH ARCHITECTURAL AND CIVIL DRAWINGS, GENERAL CONTRACTOR, AND OTHER SUBCONTRACTORS AS REQUIRED. ALL SLEEVES SHALL BE SCH 40 PVC, SIZED TWICE THE DIAMETER OF PIPE OR COMBINATION OF PIPES ENCLOSED WITHIN THE SLEEVE.
7. ALL PIPE CONNECTIONS SHALL BE PRIMED WITH AN APPROVED COLOR PRIMER BEFORE BEING CHEMICAL WELDED.
8. IT IS THE IRRIGATION CONTRACTORS RESPONSIBILITY TO COORDINATE PIPING WITH THE LANDSCAPE SUBCONTRACTOR TO AVOID CONFLICT WITH PLANTING BEDS. IT WILL BE THE RESPONSIBILITY OF THE IRRIGATION SUBCONTRACTOR TO MOVE PIPING TO ALLOW PROPER ADJUSTMENTS TO ENSURE PROPER COVERAGE AT NO ADDITIONAL COST TO THE OWNER.
9. ALL ROTORS SHALL BE LOCATED 12" FROM PAVEMENT, CURBS OR EDGE OF STRUCTURE. ALL SPRAY HEADS SHALL BE LOCATED 6" FROM PAVEMENT, CURBS OR EDGE OF STRUCTURE.
10. USE RIGID SCH 80 PVC SWING JOINT ASSEMBLIES TO CONNECT ALL ROTARY HEADS AND QUICK COUPLERS.
11. ALL SPRAY HEADS SHALL BE CONNECTED WITH A 12" MINIMUM LENGTH OF 1/2" FLEX PVC.
12. ALL LANDSCAPE PLANTING AREAS IRRIGATED WITH DRIP SHOULD BE INSTALLED AT 18" SPACING.
13. ALL TURF AREAS IRRIGATED WITH DRIP SHOULD BE INSTALLED 12" SPACING.
14. ALL IRRIGATION WIRES SHALL BE UL LISTED FOR DIRECT BURIAL AND BE A MINIMUM #14 GAUGE. WIRE SPLICES SHALL INCLUDE DBY CONNECTORS AS RECOMMENDED BY 3M COMPANY.
15. ELECTRIC POWER SHALL BE PROVIDED TO CONTROLLER LOCATION BY GENERAL CONTRACTOR. IRRIGATION CONTRACTOR SHALL PROVIDE FINAL HARD-WIRE TO CONTROLLERS.
16. VALVE BOXES SHALL BE INSTALLED FLUSH WITH GRADE, SUPPORTED BY BRICKS IF NECESSARY. INSTALL 3" OF PEA GRAVEL BELOW THE VALVE. USE 12" X 17" RECTANGULAR VALVE BOXES WITH A PURPLE LID FOR QUICK COUPLING VALVES AND 10" ROUND BOXES FOR ELECTRIC VALVES UNLESS NOTED OTHERWISE.
17. VALVE AND CIRCUIT SHALL BE SEPARATED BASED ON WATER USE, SO THAT TURF AREAS ARE WATERED SEPARATELY FROM SHRUB AND GROUNDCOVER AREAS. IRRIGATION HEADS IN THE TURF AREAS WILL BE VALVED SEPARATELY FROM SHRUB AND/OR GROUNDCOVER AREAS. IT IS RECOMMENDED THAT SEASONAL COLOR AREAS BE WATERED SEPARATELY. UNDER NO CIRCUMSTANCES ARE ZONE TYPES TO BE COMBINED.
18. FINAL LOCATION OF CONTROLLER, WATER METER, BACKFLOW DEVICE, MASTER VALVE, FLOW SENSOR, AND WEATHER SENSOR SHALL BE APPROVED BY GENERAL CONTRACTOR, LANDSCAPE ARCHITECT, OR AN OWNERS REPRESENTATIVE.
19. AFTER AWARD OF CONTRACT AND BEFORE ANY IRRIGATION SYSTEM MATERIALS ARE ORDERED FROM SUPPLIERS OR DELIVERED TO THE JOB SITE, SUBMIT TO THE OWNER A COMPLETE LIST OF ALL IRRIGATION SYSTEM MATERIALS, OR PROCESSES PROPOSED TO BE FURNISHED AND INSTALLED AS PART OF THIS CONTRACT. THE LANDSCAPE ARCHITECT OR OWNERS'S AUTHORIZED REPRESENTATIVE WILL ALLOW NO SUBSTITUTIONS WITHOUT PRIOR WRITTEN ACCEPTANCE.
20. IRRIGATION CONTRACTOR WILL SUPPLY A COMPLETE AS BUILT DRAWING TO INCLUDE EXACT LOCATION OF ALL MAINLINE, VALVES, CONTROLLERS, QUICK COUPLERS, POINT OF CONNECTION, AND WIRE PATH. IRRIGATION CONTRACTOR WILL SUPPLY A COMPLETE SET OF OPERATION AND MAINTENANCE MANUALS.
21. PROVIDE A COLORED LAMINATED ZONE MAP AND INSTALL AT THE CONTROLLER.
22. THE IRRIGATION CONTRACTOR SHALL COMPLY WITH ALL LOCAL AND STATE MANDATED IRRIGATION ORDINANCES AND SHALL SECURE ALL NECESSARY PERMITS AND PAY ALL ASSOCIATED FEES UNLESS OTHERWISE NOTED. ANY DISCREPANCIES SHALL BE DISCUSSED PRIOR TO CONSTRUCTION.

IRRIGATION LEGEND

KEY	EXPLANATION
	5/8" DEDICATED IRRIGATION METER
	1" DOUBLE CHECK BACKFLOW DEVICE IN SEPARATE VALVE BOX PER LOCAL CODES.
	1" MASTER VALVE, HUNTER ICV-101G NORMALLY CLOSED VALVE
	MP ROTATOR NOZZLE-M8-MP800SR, MC-MP CORNER, MR/MS/ML - MP SIDESTRIPS AND ENDSTRIPS
	NOTE: ALL MP ROTATOR HEADS ARE TO BE INSTALLED ON HUNTER PRO5-06-PRS-CV-R FOR TURF AREAS AND HUNTER PROS-12-PRS40-CV-R SPRAYS FOR PLANTING BEDS
	TREE BUBBLER ASSEMBLY - ON 6" POP UP
	IRRIGATION CONTROLLER HUNTER PRO C. FINAL LOCATION TO BE DETERMINED AFTER CONSULTING WITH LANDSCAPE ARCHITECT
	WEATHER SENSOR HUNTER SOLAR-SYNC. FINAL LOCATION TO BE DETERMINED AFTER CONSULTING WITH LANDSCAPE ARCHITECT
	HUNTER ICV-AS-ADJ SERIES - REMOTE CONTROL VALVE
	MANUAL ISOLATION VALVE - SIZE OF MAINLINE
	MAIN LINE - USE SCH-40 PVC PIPE AS DESIGNATED ON PLANS
	LATERAL LINE - SIZE AS NOTED ON PLANS. USE CLASS 315 ON 1/2" PIPE AND CLASS 200 IPS PVC ON 3/4" AND LARGER PIPE.
	IRRIGATION SLEEVE - USE 2 SIZES LARGER THAN TOTAL DIAMETER OF PIPE/S DESIGNATED FOR CROSSING PAVING. VALVE WIRING MAY RUN IN THE SAME SLEEVES. USE SCH 40 PVC PIPE.

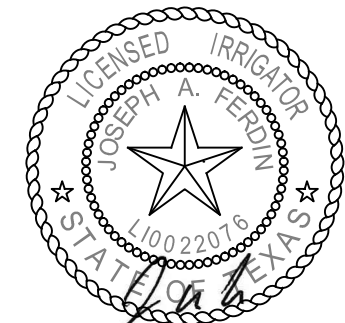
-
- ZONE IDENTIFICATION
- IRRIGATION ZONE SIZE IN GALLONS PER MINUTE
- ZONE SIZE



1 IRRIGATION PLAN
PLAN



201 GROVETON | SATX 78210
210.314.5582 | MPSTUD.IO



04/3/2019

PROJECT

**FIVE PALMS
SUBDIVISION**
LANDSCAPE IMPROVEMENTS

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SHEET INFORMATION

PROJECT NO.

18120

DATE ISSUED

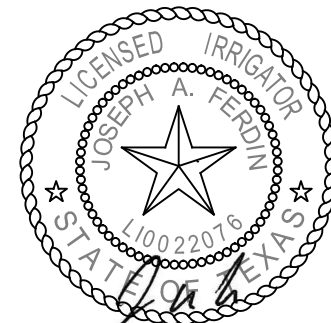
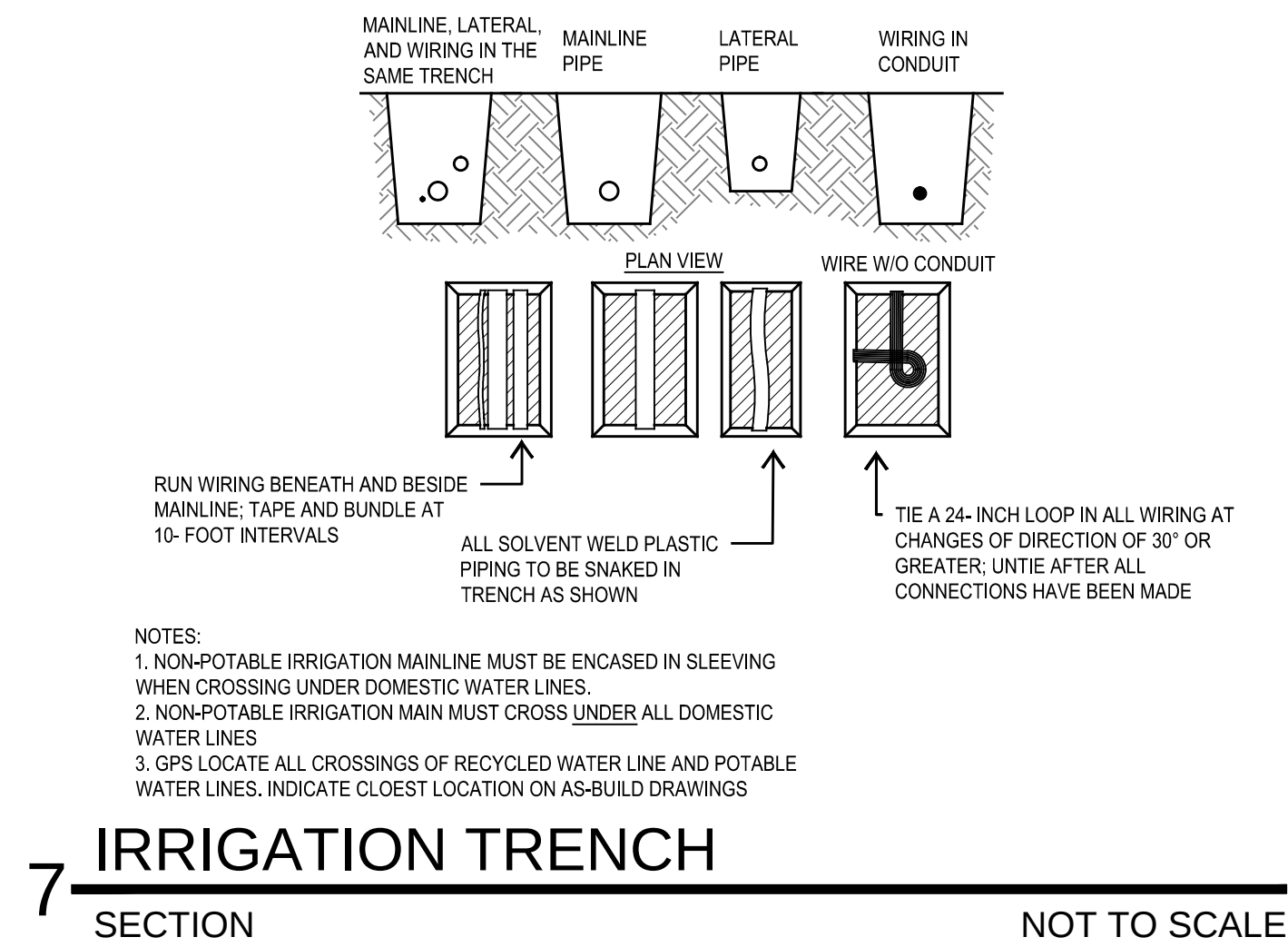
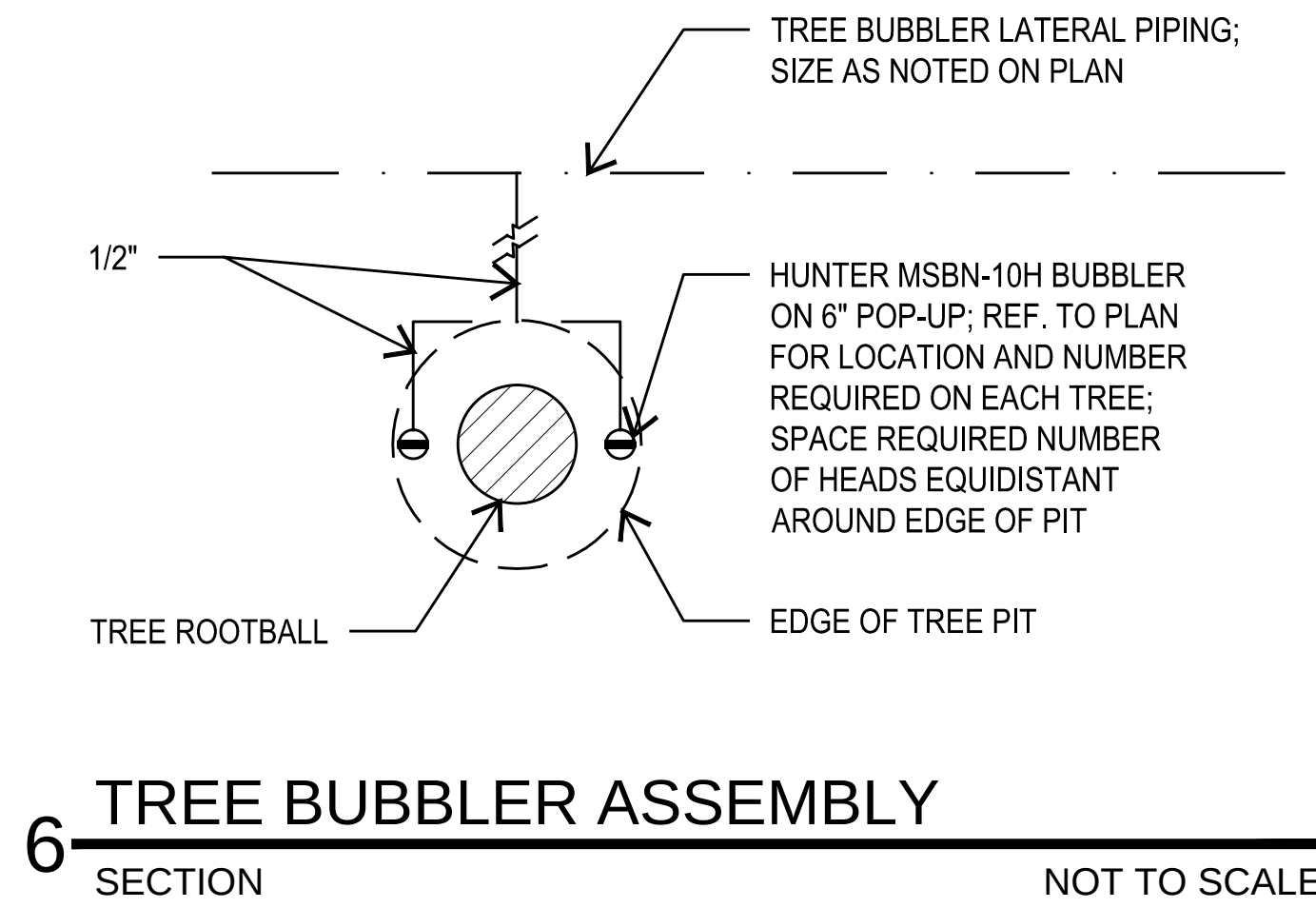
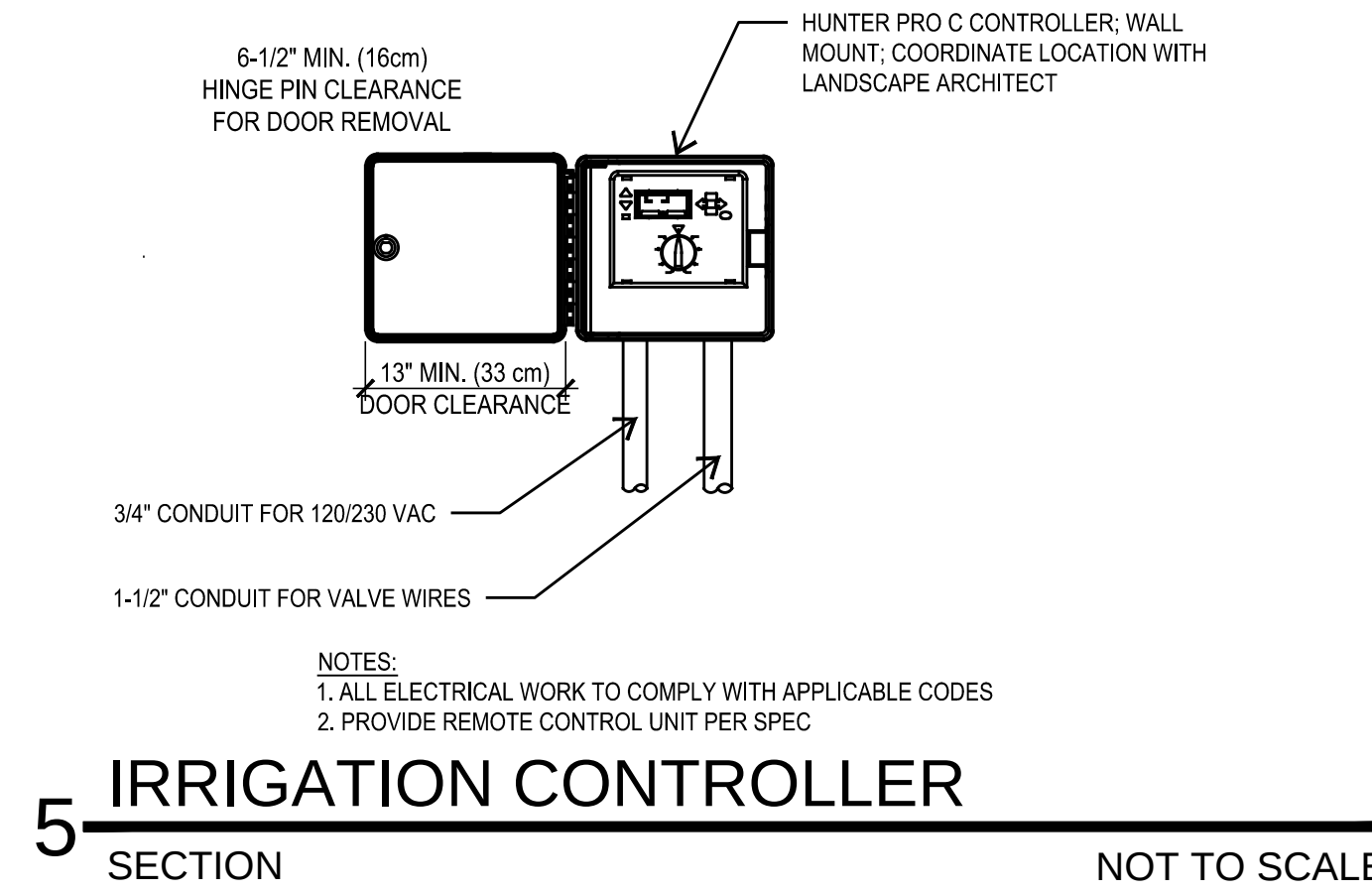
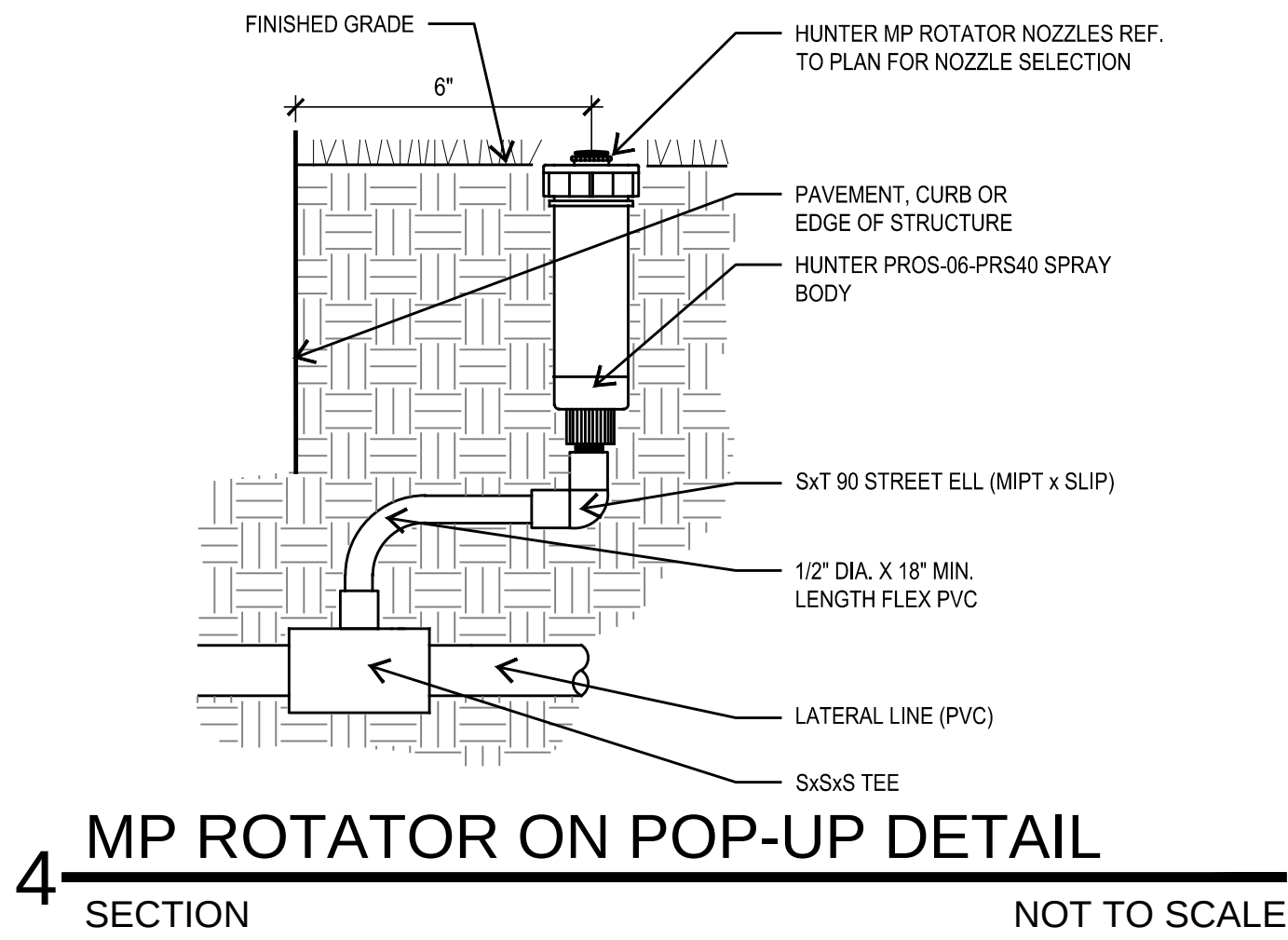
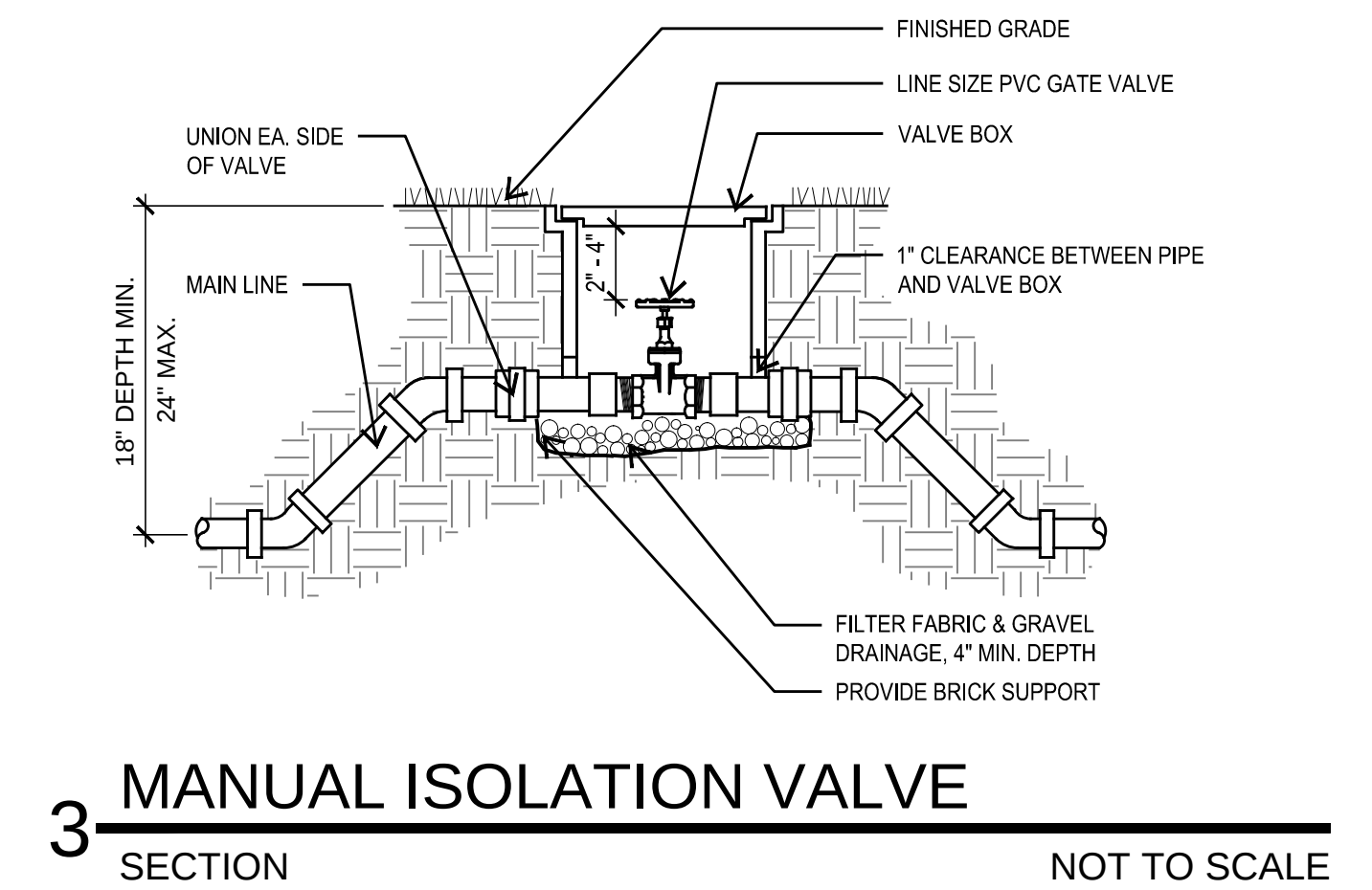
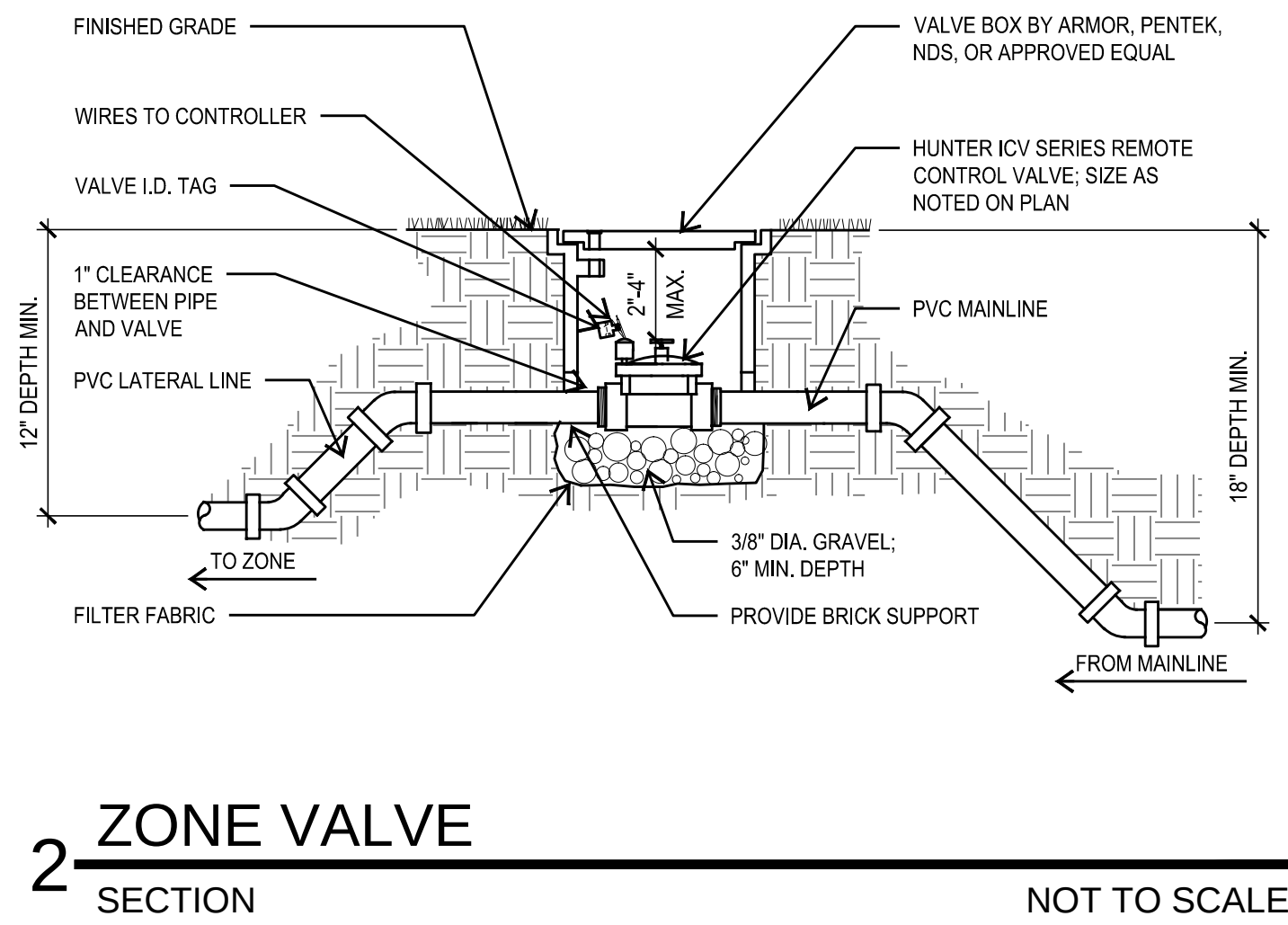
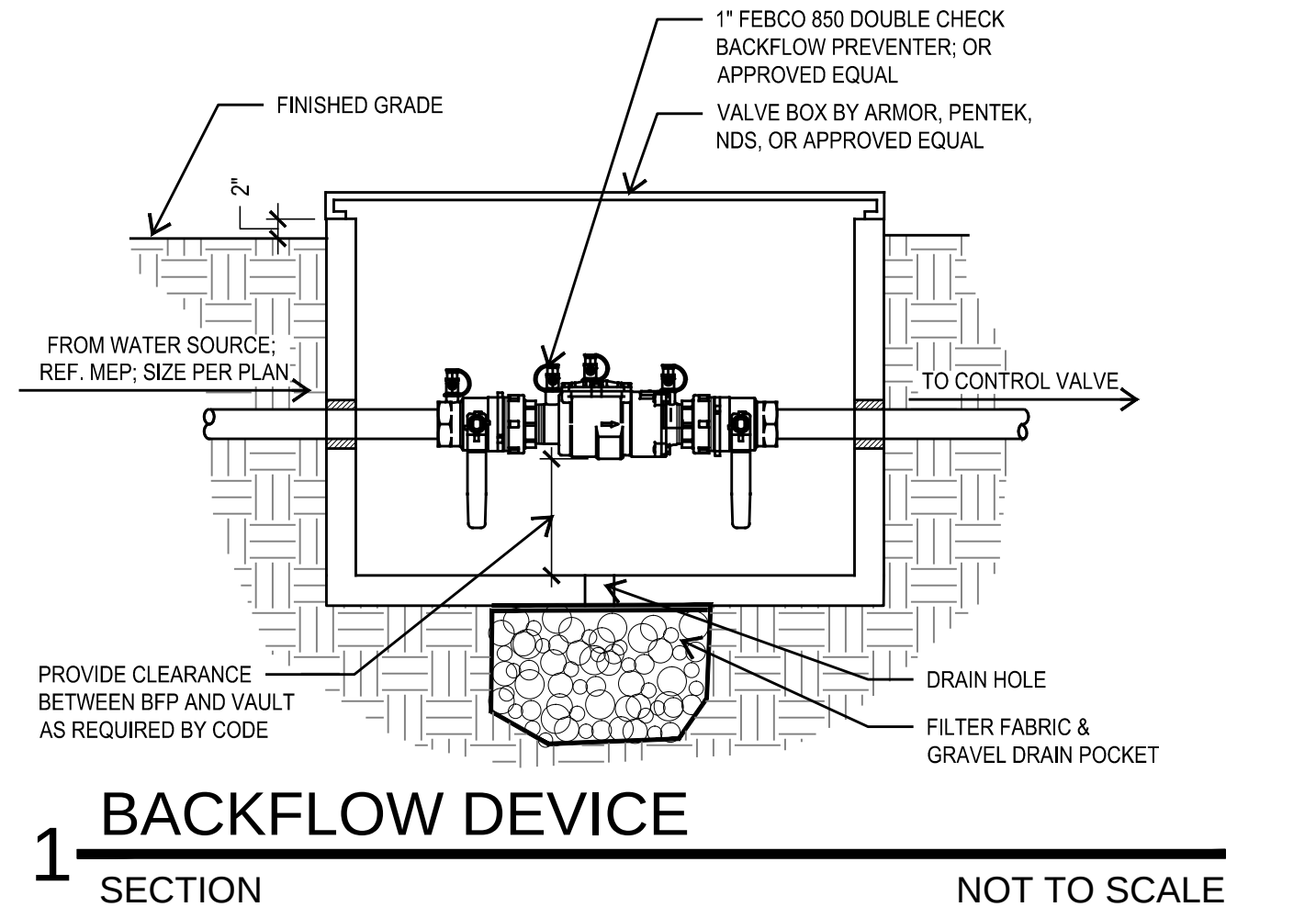
FEBRUARY, 08 2019

SHEET NAME

**LANDSCAPE
IRRIGATION PLAN**

SHEET NUMBER

LI 1.1



04/3/2019

PROJECT

**FIVE PALMS
SUBDIVISION**
LANDSCAPE IMPROVEMENTS

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SHEET NAME

**LANDSCAPE
IRRIGATION DETAILS**

SHEET NUMBER

LI 2.1