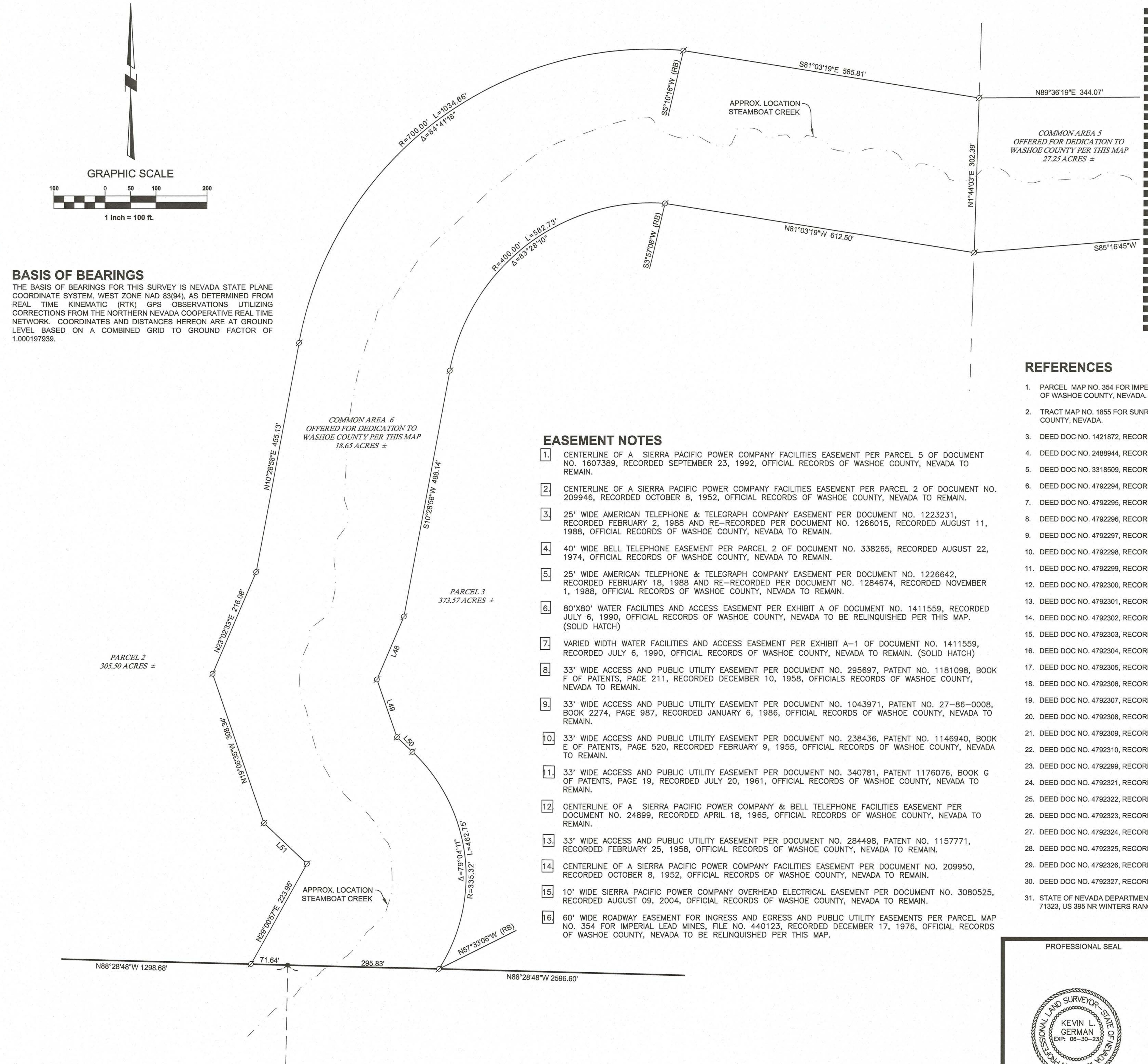

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS NEVADA STATE PLANE COORDINATE SYSTEM, WEST ZONE NAD 83(94), AS DETERMINED FROM REAL TIME KINEMATIC (RTK) GPS OBSERVATIONS UTILIZING CORRECTIONS FROM THE NORTHERN NEVADA COOPERATIVE REAL TIME NETWORK. COORDINATES AND DISTANCES HEREON ARE AT GROUND LEVEL BASED ON A COMBINED GRID TO GROUND FACTOR OF 1.000197939.

LEGEND

- ● FOUND MONUMENT AS NOTED
- ○ SET 5/8" REBAR & PLASTIC CAP OR NAIL & WASHER PLS 20461
- ∅ DIMENSION POINT, NOTHING FOUND OR SET
- ◉ FOUND CENTERLINE MONUMENT AS NOTED
- () RECORD DIMENSION
- (R1) REFERENCE NUMBER
- (RB) RADIAL BEARING
- △ GPS CONTROL POINT
- CROWS FEET
- EXISTING PARCEL LINE TO BE REMOVED
- ADJOINING PARCEL
- TIE
- EASEMENT LINE
- DITCH/CREEK
- FOUND SECTION CORNER AS NOTED
- FOUND 1/4 SECTION CORNER AS NOTED
- CALCULATED 1/4 SECTION CORNER

EASEMENT NOTES

1. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY FACILITIES EASEMENT PER PARCEL 5 OF DOCUMENT NO. 1607389, RECORDED SEPTEMBER 23, 1992, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
2. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY FACILITIES EASEMENT PER PARCEL 2 OF DOCUMENT NO. 209946, RECORDED OCTOBER 8, 1952, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
3. 25' WIDE AMERICAN TELEPHONE & TELEGRAPH COMPANY EASEMENT PER DOCUMENT NO. 1223231, RECORDED FEBRUARY 2, 1988 AND RE-RECORDED PER DOCUMENT NO. 1266015, RECORDED AUGUST 11, 1988, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
4. 40' WIDE BELL TELEPHONE EASEMENT PER PARCEL 2 OF DOCUMENT NO. 338265, RECORDED AUGUST 22, 1974, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
5. 25' WIDE AMERICAN TELEPHONE & TELEGRAPH COMPANY EASEMENT PER DOCUMENT NO. 1226642, RECORDED FEBRUARY 18, 1988 AND RE-RECORDED PER DOCUMENT NO. 1284674, RECORDED NOVEMBER 1, 1988, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
6. 80'X80' WATER FACILITIES AND ACCESS EASEMENT PER EXHIBIT A OF DOCUMENT NO. 1411559, RECORDED JULY 6, 1990, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO BE RELINQUISHED PER THIS MAP. (SOLID HATCH)
7. VARIED WIDTH WATER FACILITIES AND ACCESS EASEMENT PER EXHIBIT A-1 OF DOCUMENT NO. 1411559, RECORDED JULY 6, 1990, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN. (SOLID HATCH)
8. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 295697, PATENT NO. 1181098, BOOK F OF PATENTS, PAGE 211, RECORDED DECEMBER 10, 1958, OFFICIALS RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
9. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 1043971, PATENT NO. 27-86-0008, BOOK 2274, PAGE 987, RECORDED JANUARY 6, 1986, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
10. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 238436, PATENT NO. 1146940, BOOK E OF PATENTS, PAGE 520, RECORDED FEBRUARY 9, 1955, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
11. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 340781, PATENT 1176076, BOOK G OF PATENTS, PAGE 19, RECORDED JULY 20, 1961, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
12. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY & BELL TELEPHONE FACILITIES EASEMENT PER DOCUMENT NO. 24899, RECORDED APRIL 18, 1965, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
13. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 284498, PATENT NO. 1157771, RECORDED FEBRUARY 25, 1958, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
14. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY FACILITIES EASEMENT PER DOCUMENT NO. 209950, RECORDED OCTOBER 8, 1952, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
15. 10' WIDE SIERRA PACIFIC POWER COMPANY OVERHEAD ELECTRICAL EASEMENT PER DOCUMENT NO. 3080525, RECORDED AUGUST 09, 2004, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
16. 60' WIDE ROADWAY EASEMENT FOR INGRESS AND EGRESS AND PUBLIC UTILITY EASEMENTS PER PARCEL MAP NO. 354 FOR IMPERIAL LEAD MINES, FILE NO. 440123, RECORDED DECEMBER 17, 1976, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO BE RELINQUISHED PER THIS MAP.

REFERENCES

1. PARCEL MAP NO. 354 FOR IMPERIAL LEAD MINES, FILE NO. 440123, RECORDED DECEMBER 17, 1976, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
2. TRACT MAP NO. 1855 FOR SUNRISE ESTATES, FILE NO. 611415, RECORDED JUNE 14, 1979, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
3. DEED DOC NO. 1421872, RECORDED AUGUST 21, 1990, BK 312, PG 0817, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
4. DEED DOC NO. 2488944, RECORDED OCTOBER 6, 2000, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
5. DEED DOC NO. 3318509, RECORDED DECEMBER 5, 2005, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
6. DEED DOC NO. 4792294, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
7. DEED DOC NO. 4792295, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
8. DEED DOC NO. 4792296, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
9. DEED DOC NO. 4792297, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
10. DEED DOC NO. 4792298, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
11. DEED DOC NO. 4792299, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
12. DEED DOC NO. 4792300, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
13. DEED DOC NO. 4792301, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
14. DEED DOC NO. 4792302, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
15. DEED DOC NO. 4792303, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
16. DEED DOC NO. 4792304, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
17. DEED DOC NO. 4792305, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
18. DEED DOC NO. 4792306, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
19. DEED DOC NO. 4792307, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
20. DEED DOC NO. 4792308, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
21. DEED DOC NO. 4792309, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
22. DEED DOC NO. 4792310, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
23. DEED DOC NO. 4792299, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
24. DEED DOC NO. 4792321, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
25. DEED DOC NO. 4792322, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
26. DEED DOC NO. 4792323, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
27. DEED DOC NO. 4792324, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
28. DEED DOC NO. 4792325, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
29. DEED DOC NO. 4792326, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
30. DEED DOC NO. 4792327, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
31. STATE OF NEVADA DEPARTMENT OF TRANSPORTATION (NDOT) R/W PLANS, PROJECT NO. EB-STP-NH-395-2(017), E.A. NO. 71323, US 395 NR WINTERS RANCH N TO NEAR MT. ROSE HWY, MILE POST US-395-WA 6.44 TO 13.42, DATED MAY 20, 2002.

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PROFESSIONAL SEAL

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
KEVIN L. GERMAN
EXP: 06-30-23
No. 20461
6-13-22

MERGER & RESUBDIVISION TRACT MAP
OF
ST. JAMES VILLAGE, INC.
A DIVISION OF PORTIONS OF SEC 18, T17N, R20E, SEC 13, 14 & 23 T17N, R20E, MDM
SITUATE IN SECTION 18, TOWNSHIP 17 NORTH, RANGE 20 EAST,
SECTION 13, 14 & 23 TOWNSHIP 17 NORTH, RANGE 20 EAST, MDM
WASHOE COUNTY NEVADA

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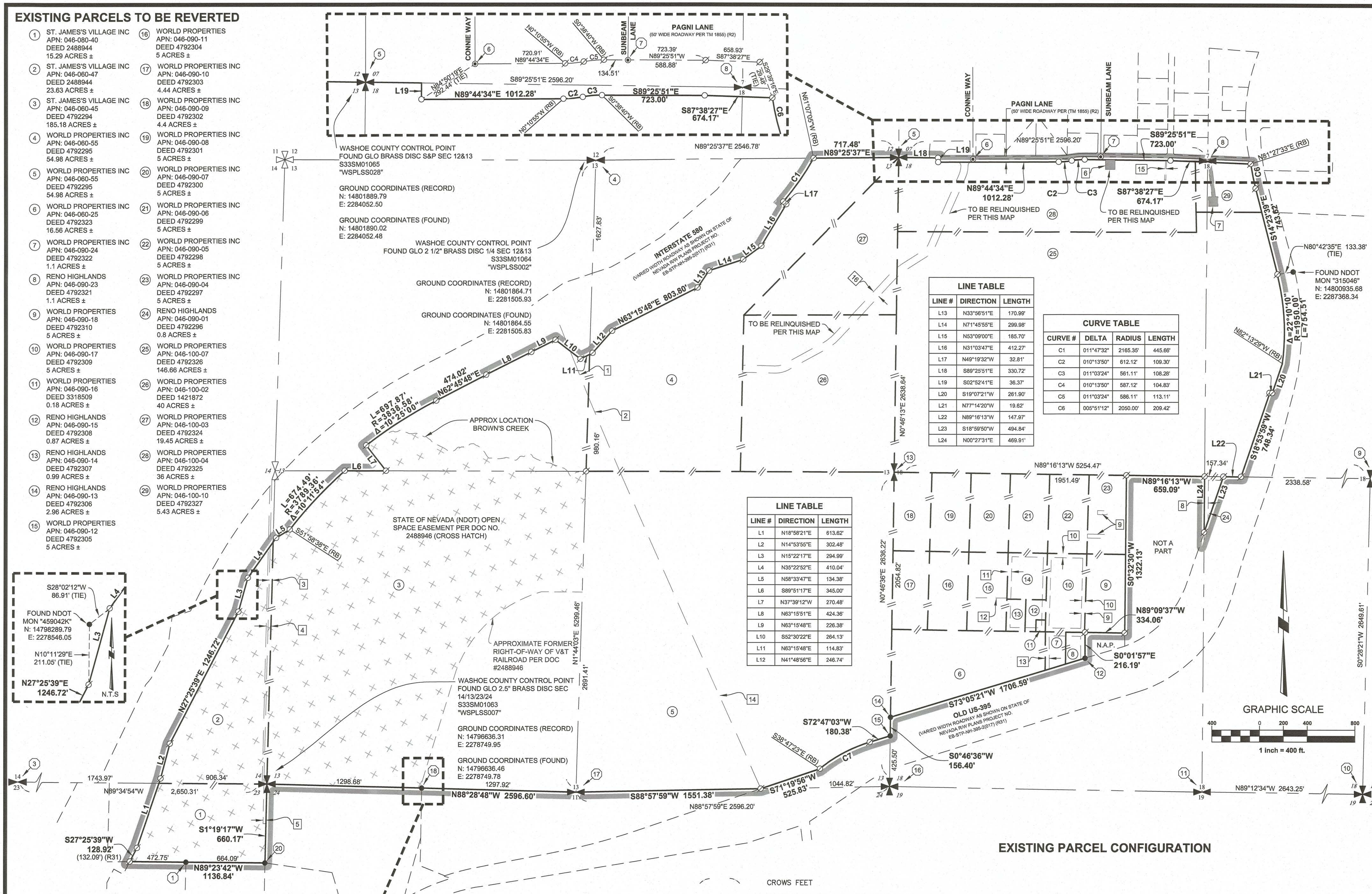
1150 CORPORATE BOULEVARD ▪ RENO, NEVADA 89502
775-856-1150 MAIN ▪ 775-856-1160 FAX ▪ CFARENO.COM

JOB NO.	21126.01
DRAWN BY	DRS
CHECKED BY	KLG
DATE	MAY 2022
SHEET	6 OF 6

EXISTING PARCELS TO BE REVERTED

1. ST. JAMES'S VILLAGE INC, APN: 046-080-40, DEED 2488944, 15.29 ACRES ±
2. ST. JAMES'S VILLAGE INC, APN: 046-060-47, DEED 2488944, 23.63 ACRES ±
3. ST. JAMES'S VILLAGE INC, APN: 046-060-45, DEED 4792294, 185.18 ACRES ±
4. WORLD PROPERTIES INC, APN: 046-060-55, DEED 4792295, 54.98 ACRES ±
5. WORLD PROPERTIES INC, APN: 046-060-55, DEED 4792295, 54.98 ACRES ±
6. WORLD PROPERTIES INC, APN: 046-060-25, DEED 4792323, 16.56 ACRES ±
7. WORLD PROPERTIES INC, APN: 046-090-24, DEED 4792322, 1.1 ACRES ±
8. RENO HIGHLANDS, APN: 046-090-23, DEED 4792321, 1.1 ACRES ±
9. WORLD PROPERTIES, APN: 046-090-18, DEED 4792310, 5 ACRES ±
10. WORLD PROPERTIES, APN: 046-090-17, DEED 4792309, 5 ACRES ±
11. WORLD PROPERTIES, APN: 046-090-16, DEED 3318509, 0.18 ACRES ±
12. RENO HIGHLANDS, APN: 046-090-15, DEED 4792308, 0.87 ACRES ±
13. RENO HIGHLANDS, APN: 046-090-14, DEED 4792307, 0.99 ACRES ±
14. RENO HIGHLANDS, APN: 046-090-13, DEED 4792306, 2.96 ACRES ±
15. WORLD PROPERTIES, APN: 046-090-12, DEED 4792305, 5 ACRES ±
16. WORLD PROPERTIES, APN: 046-090-11, DEED 4792304, 5 ACRES ±
17. WORLD PROPERTIES INC, APN: 046-090-10, DEED 4792303, 4.44 ACRES ±
18. WORLD PROPERTIES INC, APN: 046-090-09, DEED 4792302, 4.4 ACRES ±
19. WORLD PROPERTIES INC, APN: 046-090-08, DEED 4792301, 5 ACRES ±
20. WORLD PROPERTIES INC, APN: 046-090-07, DEED 4792300, 5 ACRES ±
21. WORLD PROPERTIES INC, APN: 046-090-06, DEED 4792299, 5 ACRES ±
22. WORLD PROPERTIES INC, APN: 046-090-05, DEED 4792298, 5 ACRES ±
23. WORLD PROPERTIES INC, APN: 046-090-04, DEED 4792297, 5 ACRES ±
24. RENO HIGHLANDS, APN: 046-090-01, DEED 4792296, 0.8 ACRES ±
25. WORLD PROPERTIES, APN: 046-100-07, DEED 4792326, 146.66 ACRES ±
26. WORLD PROPERTIES, APN: 046-100-02, DEED 1421872, 40 ACRES ±
27. WORLD PROPERTIES, APN: 046-100-03, DEED 4792324, 19.45 ACRES ±
28. WORLD PROPERTIES, APN: 046-100-04, DEED 4792325, 36 ACRES ±
29. WORLD PROPERTIES, APN: 046-100-10, DEED 4792327, 5.43 ACRES ±



LINE TABLE		
LINE #	DIRECTION	LENGTH
L1	N18°58'21"E	613.62'
L2	N14°53'55"E	302.48'
L3	N15°22'17"E	294.99'
L4	N35°22'52"E	410.04'
L5	N58°33'47"E	134.38'
L6	S89°51'17"E	345.00'
L7	N37°39'12"W	270.48'
L8	N63°15'51"E	424.36'
L9	N63°15'48"E	226.38'
L10	S52°30'22"E	264.13'
L11	N63°15'48"E	114.83'
L12	N41°48'56"E	246.74'

LINE TABLE		
LINE #	DIRECTION	LENGTH
L13	N33°56'51"E	170.99'
L14	N71°45'55"E	299.98'
L15	N53°09'00"E	185.70'
L16	N31°03'47"E	412.27'
L17	N49°19'32"W	32.81'
L18	S89°25'51"E	330.72'
L19	S02°52'41"E	36.37'
L20	S19°07'21"W	261.90'
L21	N77°14'20"W	19.62'
L22	N89°16'13"W	147.97'
L23	S18°59'50"W	494.84'
L24	N00°27'31"E	469.91'

CURVE TABLE			
CURVE #	DELTA	RADIUS	LENGTH
C1	011°47'32"	2165.35'	445.66'
C2	010°13'50"	612.12'	109.30'
C3	011°03'24"	561.11'	108.28'
C4	010°13'50"	587.12'	104.83'
C5	011°03'24"	586.11'	113.11'
C6	005°51'12"	2050.00'	209.42'

EXISTING PARCEL CONFIGURATION

BASIS OF BEARINGS

THE BASIS OF BEARINGS FOR THIS SURVEY IS NEVADA STATE PLANE COORDINATE SYSTEM, WEST ZONE NAD 83(94), AS DETERMINED FROM REAL TIME KINEMATIC (RTK) GPS OBSERVATIONS UTILIZING CORRECTIONS FROM THE NORTHERN NEVADA COOPERATIVE REAL TIME NETWORK. COORDINATES AND DISTANCES HEREON ARE AT GROUND LEVEL BASED ON A COMBINED GRID TO GROUND FACTOR OF 1.000197939.

LEGEND

- ● FOUND MONUMENT AS NOTED
- ○ SET 5/8" REBAR & PLASTIC CAP OR NAIL & WASHER PLS 20461
- Ø DIMENSION POINT, NOTHING FOUND OR SET
- ◉ FOUND CENTERLINE MONUMENT AS NOTED
- () RECORD DIMENSION
- (R1) REFERENCE NUMBER
- (RB) RADIAL BEARING
- △ GPS CONTROL POINT
- CROWS FEET
- EXISTING PARCEL LINE TO BE REMOVED
- ADJOINING PARCEL
- TIE
- EASEMENT LINE
- DITCH/CREEK
- FOUND SECTION CORNER AS NOTED
- FOUND 1/4 SECTION CORNER AS NOTED
- CALCULATED 1/4 SECTION CORNER

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PROFESSIONAL SEAL

PROFESSIONAL LAND SURVEYOR - STATE OF NEVADA
KEVIN L. GERMAN
EXP: 06-30-23
No 20461
6-13-22

MERGER & RESUBDIVISION TRACT MAP
OF

ST. JAMES VILLAGE, INC.

A DIVISION OF PORTIONS OF SEC 18, T17N, R20E, SEC 13, 14 & 23 T17N, R20E, MDM
SITUATE IN SECTION 18, TOWNSHIP 17 NORTH, RANGE 20 EAST,
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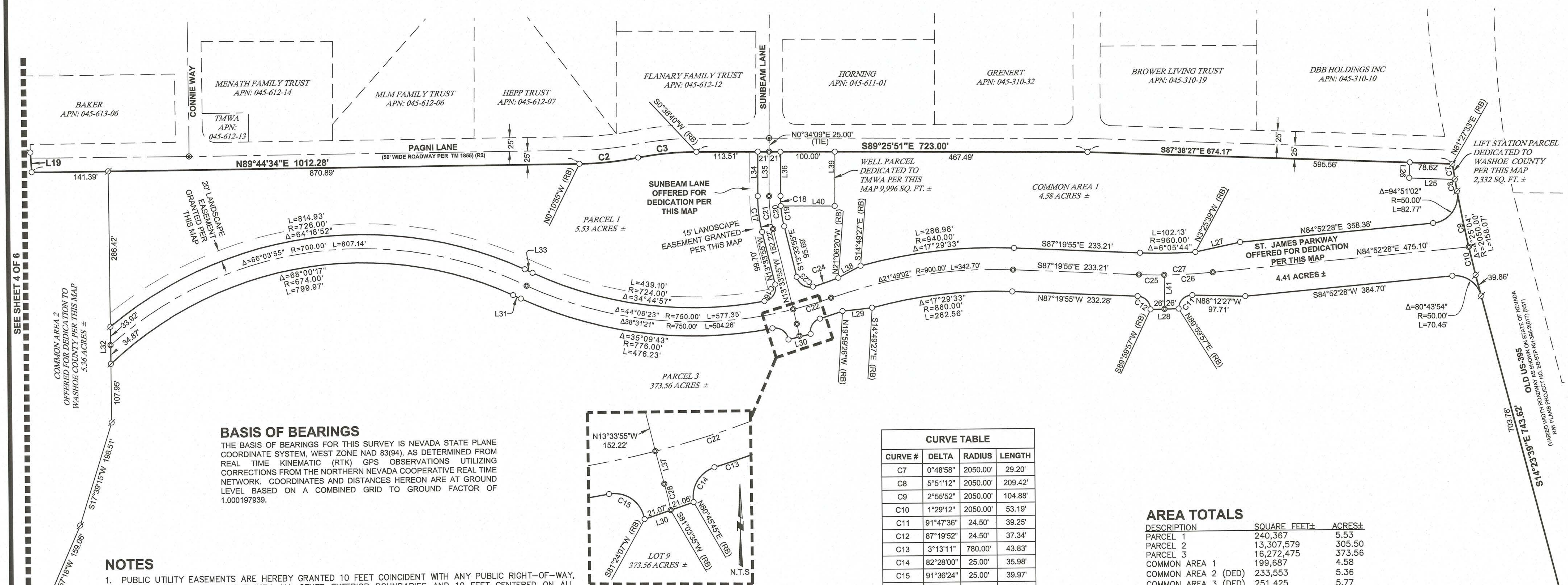
JOB NO.	21126.01
DRAWN BY	DRS
CHECKED BY	KLG
DATE	MAY 2022
SHEET	2 OF 6



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NOTES

1. PUBLIC UTILITY EASEMENTS ARE HEREBY GRANTED 10 FEET COINCIDENT WITH ANY PUBLIC RIGHT-OF-WAY, 5 FEET IN WIDTH COINCIDENT WITH ALL OTHER EXTERIOR BOUNDARIES AND 10 FEET CENTERED ON ALL INTERIOR LOT LINES WITHIN PARCEL 1 ONLY.
2. A PUBLIC UTILITY AND CABLE TV EASEMENT IS ALSO HEREBY GRANTED WITHIN EACH PARCEL FOR THE EXCLUSIVE PURPOSE OF INSTALLING AND MAINTAINING UTILITY AND CABLE TV FACILITIES TO THAT PARCEL AND THE RIGHT TO EXIT THAT PARCEL WITH SAID FACILITIES FOR THE PURPOSE OF SERVING OTHER PARCELS AT LOCATIONS MUTUALLY AGREED UPON BY THE OWNER OF RECORD, AT THAT TIME, AND THE UTILITY AND CABLE TV COMPANIES.
3. PUBLIC UTILITY EASEMENTS SHOWN AND/OR NOTED ON THIS PLAT SHALL INCLUDE USE FOR THE INSTALLATION AND MAINTENANCE OF CABLE TELEVISION AND TRUCKEE MEADOWS WATER AUTHORITY.
4. WITH THE DEVELOPMENT OF EACH PARCEL AND PRIOR TO THE ISSUANCE OF ANY BUILDING PERMIT FOR SAID PARCEL, THE OWNER SHALL DEDICATE WATER RIGHTS TO THE SERVICING UTILITY SUFFICIENT TO SERVE THE DEVELOPMENT, AND SHALL PROVIDE WASHOE COUNTY WITH A WILL-SERVE LETTER.
5. SEWAGE DISPOSAL SHALL BE BY CONNECTION TO A PUBLIC SEWER SYSTEM.
6. ALL REQUIRED IMPROVEMENTS SHALL BE INSTALLED BY THE OWNER IN ACCORDANCE WITH R.M.C. CHAPTER 18 AS PARCELS ARE DEVELOPED.
7. FIRE HYDRANTS SHALL BE INSTALLED AS PER FIRE DEPARTMENT REQUIREMENTS WITH THE ISSUANCE OF BUILDING PERMITS.
8. EACH PARCEL CREATED BY THIS MAP IS REQUIRED TO HAVE A SEPARATE WATER METER AND WATER SERVICE LINE. THE WATER PURVEYOR SHALL HAVE THE RIGHT TO INSTALL A WATER METER IN A PUBLIC UTILITY EASEMENT ADJACENT TO THE STREET TO SERVE EACH PARCEL RESPECTIVELY.
9. FOR EACH PARCEL CREATED BY THIS FINAL MAP, ACCESS AND DRAINAGE IMPROVEMENTS MEETING THE REQUIREMENTS OF WASHOE COUNTY DEVELOPMENT CODE ARE REQUIRED WITH SAID IMPROVEMENTS TO BE INCLUDED WITHIN AN APPROVED RESIDENTIAL BUILDING PERMIT.
10. WASHOE COUNTY WILL PRE ASSIGN ADDRESSES TO BE RELEASED ONCE AN ASSESSOR'S PARCEL NUMBER HAS BEEN ESTABLISHED. IF STRUCTURE PLACEMENT DOES NOT REFLECT THE STREET ON WHICH THE PRE-ASSIGNED ADDRESS IS ISSUED, THE DEVELOPER WILL REQUEST A NEW ADDRESS PRIOR TO ISSUANCE OF A BUILDING PERMIT.
11. ALL PROPERTIES, REGARDLESS IF THEY ARE LOCATED WITHIN OR OUTSIDE OF A FEMA DESIGNATED FLOOD ZONE, MAY BE SUBJECT TO FLOODING. THE PROPERTY OWNER IS REQUIRED TO MAINTAIN ALL DRAINAGE EASEMENTS AND NATURAL DRAINAGES AND NOT PERFORM OR ALLOW UNPERMITTED AN UNAPPROVED MODIFICATIONS TO THE PROPERTY THAT MAY HAVE DETRIMENTAL IMPACTS TO SURROUNDING PROPERTIES.
12. ANY STRUCTURES WITHIN A FEMA FLOOD ZONE MUST COMPLY WITH WASHOE COUNTY DEVELOPMENT CODE ARTICLE 416.
13. OWNERS OF EACH PARCEL SHALL PERPETUATE ALL NATURAL DRAINAGE.
14. NO HABITABLE STRUCTURES SHALL BE LOCATED ON A FAULT THAT WAS ACTIVE DURING THE HOLOCENE EPOCH OF GEOLOGICAL TIME.
15. THE OWNER, BUYERS, ASSIGNS, OR ANY INTEREST HOLDER OF ANY LOTS OR PARCELS SHOWN HEREON, HEREBY AGREE THAT ALL EXISTING IRRIGATION FLOWS CROSSING THESE PARCELS SHALL BE PERPETUATED. ANY LEGAL RIGHTS TO WATER FROM THESE DITCHES SHALL BE HONORED AND THE RIGHT OF ACCESS FOR MAINTENANCE AND OPERATION WILL NOT BE DENIED TO VALID HOLDERS OF THESE RIGHTS.
16. TEMPORARY BLANKET EASEMENT FOR CONSTRUCTION OF ST. JAMES PARKWAY PER DOCUMENT NO. 2747531, RECORDED OCTOBER 11, 2022, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN IN PLACE UNTIL SUCH TIME ST. JAMES PARKWAY ROADWAY, DRAINAGE & UTILITY FACILITIES ARE CONSTRUCTED.
17. THIS MAP DOES NOT PURPORT TO SHOW ALL EASEMENTS OF RECORD.

LINE TABLE		
LINE #	DIRECTION	LENGTH
L25	N87°37'28"W	84.35'
L26	N2°22'32"E	28.61'
L27	N78°21'16"E	84.36'
L28	S88°52'54"W	52.01'
L29	S84°03'33"W	54.85'
L30	S76°31'31"W	42.13'
L31	N65°02'34"W	15.62'
L32	N0°15'58"W	463.16'
L33	S65°15'34"E	15.62'
L34	N0°34'09"E	81.88'
L35	N0°34'09"E	81.88'
L36	N0°34'09"E	81.88'
L37	S13°33'55"W	27.63'
L38	N62°22'17"E	46.82'
L39	S0°33'37"W	100.00'
L40	N89°25'51"W	104.07'
L41	N0°00'03"W	62.79'
L42	N0°46'13"E	94.93'
L43	N57°28'08"E	79.47'
L44	S20°16'10"W	173.41'
L45	S73°39'59"E	113.75'
L46	S83°26'26"W	82.32'
L47	N35°27'03"E	154.92'
L48	S23°02'33"W	133.48'
L49	S19°06'35"E	119.28'
L50	S46°37'16"E	41.81'
L51	N46°37'16"E	115.25'

CURVE TABLE			
CURVE #	DELTA	RADIUS	LENGTH
C7	0°48'58"	2050.00'	29.20'
C8	5°51'12"	2050.00'	209.42'
C9	2°55'52"	2050.00'	104.88'
C10	1°29'12"	2050.00'	53.19'
C11	91°47'36"	24.50'	39.25'
C12	87°19'52"	24.50'	37.34'
C13	3°13'11"	780.00'	43.83'
C14	82°28'00"	25.00'	35.98'
C15	91°36'24"	25.00'	39.97'
C16	93°46'24"	25.00'	40.92'
C17	14°08'04"	271.00'	66.85'
C18	4°32'22"	229.00'	18.14'
C19	9°35'43"	229.00'	38.35'
C20	14°08'04"	229.00'	56.49'
C21	14°08'04"	250.00'	61.67'
C22	5°35'02"	750.00'	73.09'
C23	93°47'42"	25.00'	40.93'
C24	3°44'43"	720.00'	47.06'
C25	2°40'08"	1000.00'	46.58'
C26	5°07'29"	1000.00'	89.44'
C27	7°47'37"	1000.00'	136.02'
C28	4°37'30"	300.00'	24.22'

AREA TOTALS

DESCRIPTION	SQUARE FEET±	ACRES±
PARCEL 1	240,367	5.53
PARCEL 2	13,307,579	305.50
PARCEL 3	16,272,475	373.56
COMMON AREA 1	199,687	4.58
COMMON AREA 2 (DED)	233,553	5.36
COMMON AREA 3 (DED)	251,425	5.77
COMMON AREA 4 (DED)	348,702	8.01
COMMON AREA 5 (DED)	1,187,116	27.25
COMMON AREA 6 (DED)	812,253	18.65
LIFT STATION (DED)	2,331	0.05
TMWA PARCEL (DED)	9,996	0.23
ST. JAMES R/W (DED)	192,006	4.41
TOTAL AREA DIVIDED	33,057,490	758.90

GRAPHIC SCALE

100 0 50 100 200

1 inch = 100 ft.

LEGEND

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- FOUND 1/4 SECTION CORNER AS NOTED
- CALCULATED 1/4 SECTION CORNER

PROFESSIONAL SEAL

PROFESSIONAL LAND SURVEYOR STATE OF NEVADA
KEVIN L. GERMAN
EXP: 06-30-23
№ 20461
6-13-22

MERGER & RESUBDIVISION TRACT MAP OF

ST. JAMES VILLAGE, INC.

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SHEET	3 OF 6

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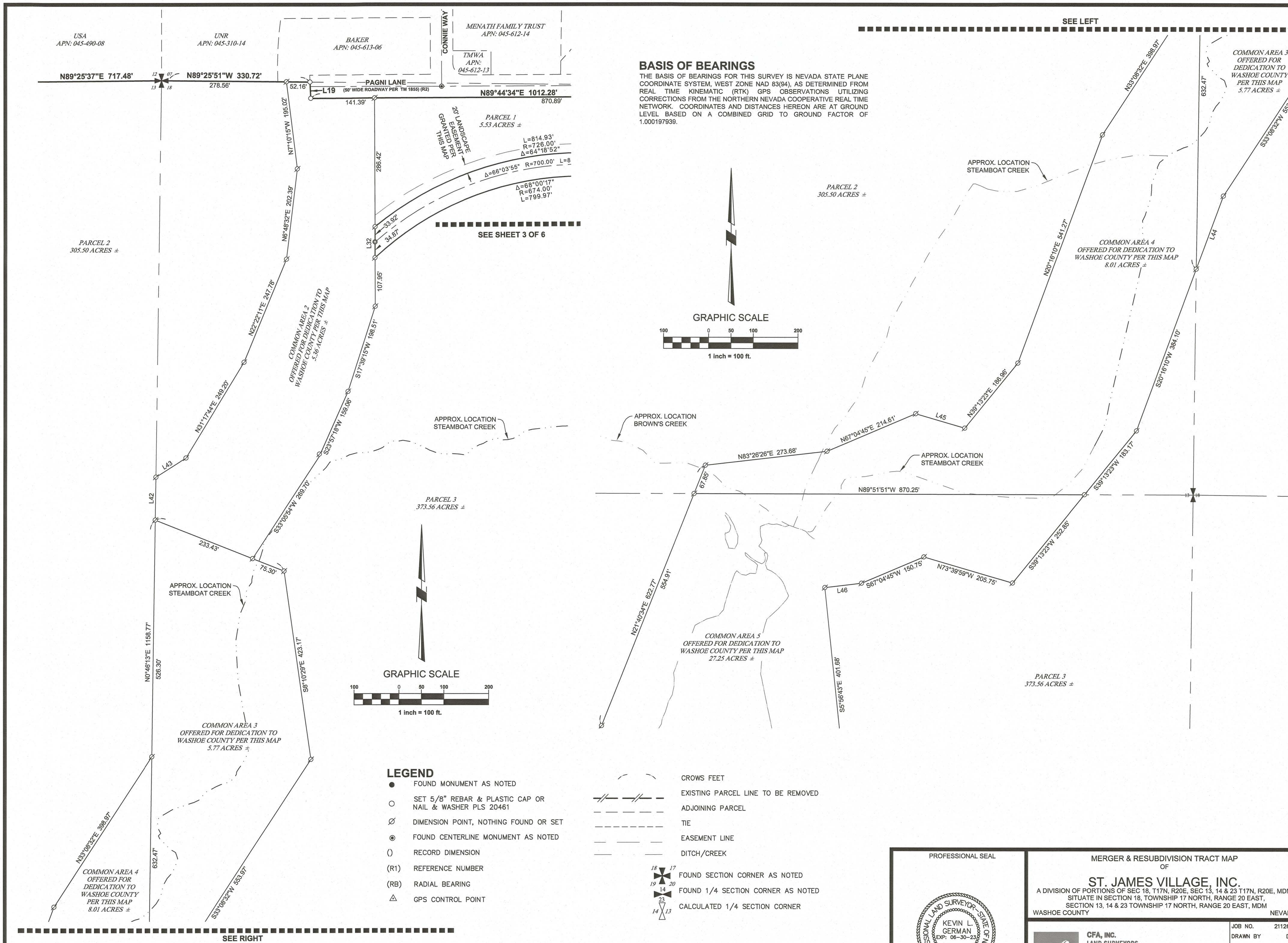

BASIS OF BEARINGS

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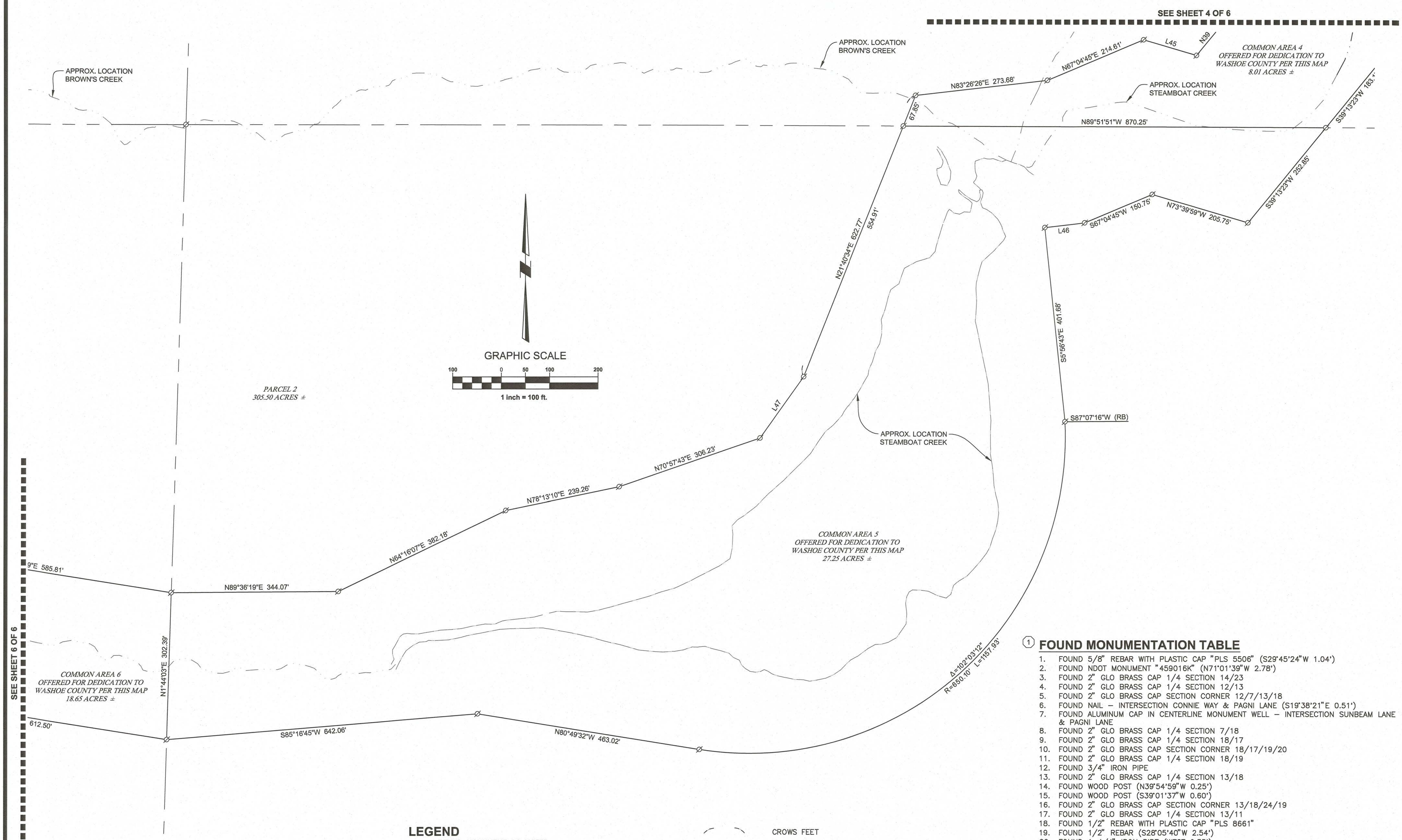

① FOUND MONUMENTATION TABLE

1. FOUND 5/8" REBAR WITH PLASTIC CAP "PLS 5506" (S29°45'24"W 1.04')
2. FOUND NDOT MONUMENT "459016K" (N71°01'39"W 2.78')
3. FOUND 2" GLO BRASS CAP 1/4 SECTION 14/23
4. FOUND 2" GLO BRASS CAP 1/4 SECTION 12/13
5. FOUND 2" GLO BRASS CAP SECTION CORNER 12/7/13/18
6. FOUND NAIL – INTERSECTION CONNIE WAY & PAGNI LANE (S19°38'21"E 0.51')
7. FOUND ALUMINUM CAP IN CENTERLINE MONUMENT WELL – INTERSECTION SUNBEAM LANE & PAGNI LANE
8. FOUND 2" GLO BRASS CAP 1/4 SECTION 7/18
9. FOUND 2" GLO BRASS CAP 1/4 SECTION 18/17
10. FOUND 2" GLO BRASS CAP SECTION CORNER 18/17/19/20
11. FOUND 2" GLO BRASS CAP 1/4 SECTION 18/19
12. FOUND 3/4" IRON PIPE
13. FOUND 2" GLO BRASS CAP 1/4 SECTION 13/18
14. FOUND WOOD POST (N39°54'59"W 0.25')
15. FOUND WOOD POST (S39°01'37"W 0.60')
16. FOUND 2" GLO BRASS CAP SECTION CORNER 13/18/24/19
17. FOUND 2" GLO BRASS CAP 1/4 SECTION 13/11
18. FOUND 1/2" REBAR WITH PLASTIC CAP "PLS 8661"
19. FOUND 1/2" REBAR (S28°05'40"W 2.54')
20. FOUND 1-1/4" IRON PIPE (WEST 0.35')

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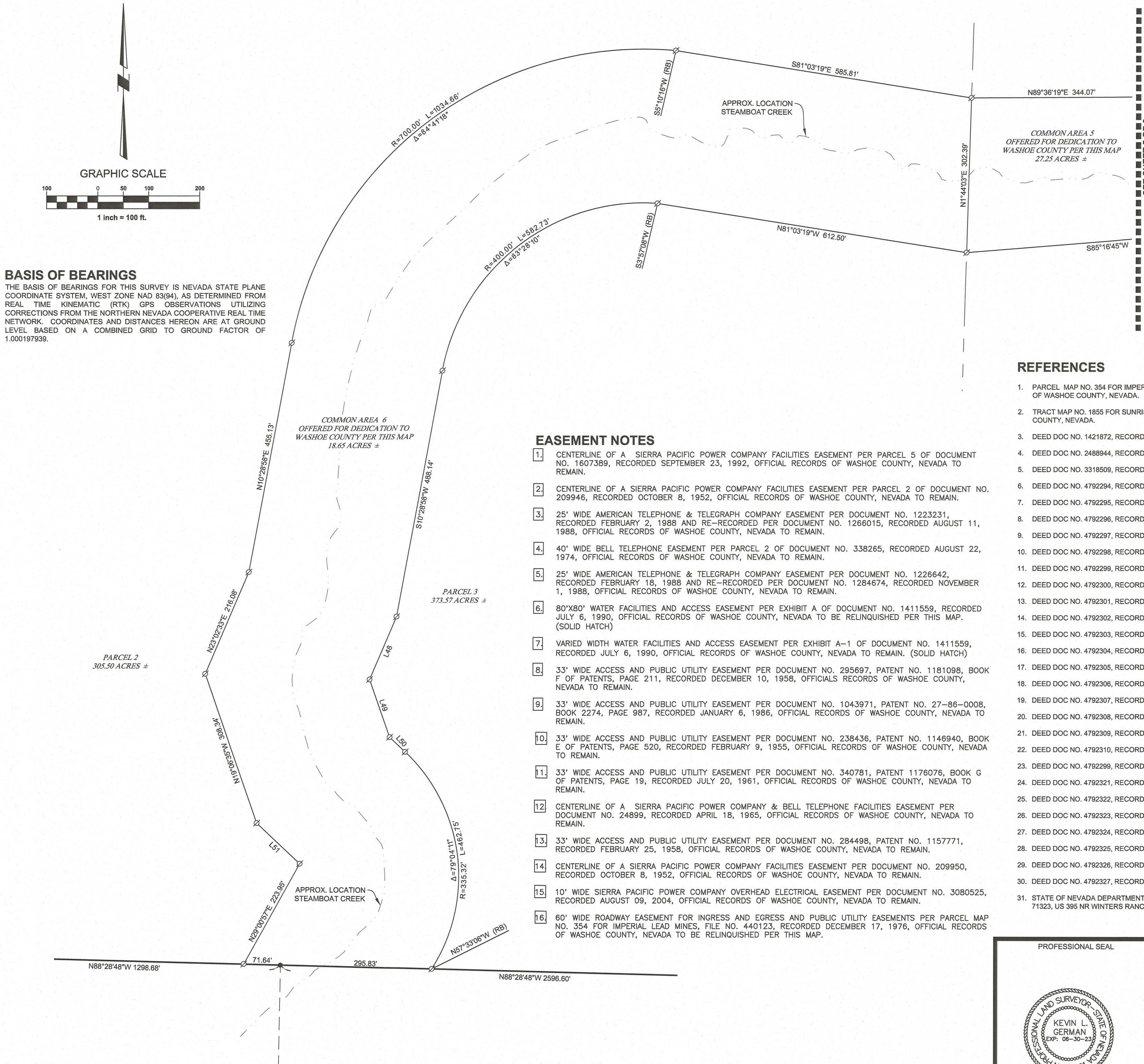

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- 18 17 / 19 20 FOUND SECTION CORNER AS NOTED
- 14 FOUND 1/4 SECTION CORNER AS NOTED
- 23 / 14 13 CALCULATED 1/4 SECTION CORNER

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EASEMENT NOTES

1. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY FACILITIES EASEMENT PER PARCEL 5 OF DOCUMENT NO. 1607389, RECORDED SEPTEMBER 23, 1992, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
2. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY FACILITIES EASEMENT PER PARCEL 2 OF DOCUMENT NO. 209946, RECORDED OCTOBER 8, 1952, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
3. 25' WIDE AMERICAN TELEPHONE & TELEGRAPH COMPANY EASEMENT PER DOCUMENT NO. 1223231, RECORDED FEBRUARY 2, 1988 AND RE-RECORDED PER DOCUMENT NO. 1266015, RECORDED AUGUST 11, 1988, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
4. 40' WIDE BELL TELEPHONE EASEMENT PER PARCEL 2 OF DOCUMENT NO. 338265, RECORDED AUGUST 22, 1974, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
5. 25' WIDE AMERICAN TELEPHONE & TELEGRAPH COMPANY EASEMENT PER DOCUMENT NO. 1226642, RECORDED FEBRUARY 18, 1988 AND RE-RECORDED PER DOCUMENT NO. 1284674, RECORDED NOVEMBER 1, 1988, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
6. 80'X80' WATER FACILITIES AND ACCESS EASEMENT PER EXHIBIT A OF DOCUMENT NO. 1411559, RECORDED JULY 6, 1990, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO BE RELINQUISHED PER THIS MAP. (SOLID HATCH)
7. VARIED WIDTH WATER FACILITIES AND ACCESS EASEMENT PER EXHIBIT A-1 OF DOCUMENT NO. 1411559, RECORDED JULY 6, 1990, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN. (SOLID HATCH)
8. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 295697, PATENT NO. 1181098, BOOK F OF PATENTS, PAGE 211, RECORDED DECEMBER 10, 1958, OFFICIALS RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
9. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 1043971, PATENT NO. 27-86-0008, BOOK 2274, PAGE 987, RECORDED JANUARY 6, 1986, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
10. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 238436, PATENT NO. 1146940, BOOK E OF PATENTS, PAGE 520, RECORDED FEBRUARY 9, 1955, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
11. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 340781, PATENT 1176076, BOOK G OF PATENTS, PAGE 19, RECORDED JULY 20, 1961, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
12. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY & BELL TELEPHONE FACILITIES EASEMENT PER DOCUMENT NO. 24899, RECORDED APRIL 18, 1965, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
13. 33' WIDE ACCESS AND PUBLIC UTILITY EASEMENT PER DOCUMENT NO. 284498, PATENT NO. 1157771, RECORDED FEBRUARY 25, 1958, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
14. CENTERLINE OF A SIERRA PACIFIC POWER COMPANY FACILITIES EASEMENT PER DOCUMENT NO. 209950, RECORDED OCTOBER 8, 1952, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
15. 10' WIDE SIERRA PACIFIC POWER COMPANY OVERHEAD ELECTRICAL EASEMENT PER DOCUMENT NO. 3080525, RECORDED AUGUST 09, 2004, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO REMAIN.
16. 60' WIDE ROADWAY EASEMENT FOR INGRESS AND EGRESS AND PUBLIC UTILITY EASEMENTS PER PARCEL MAP NO. 354 FOR IMPERIAL LEAD MINES, FILE NO. 440123, RECORDED DECEMBER 17, 1976, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA TO BE RELINQUISHED PER THIS MAP.

REFERENCES

1. PARCEL MAP NO. 354 FOR IMPERIAL LEAD MINES, FILE NO. 440123, RECORDED DECEMBER 17, 1976, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
2. TRACT MAP NO. 1855 FOR SUNRISE ESTATES, FILE NO. 611415, RECORDED JUNE 14, 1979, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
3. DEED DOC NO. 1421872, RECORDED AUGUST 21, 1990, BK 312, PG 0817, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
4. DEED DOC NO. 2488944, RECORDED OCTOBER 6, 2000, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
5. DEED DOC NO. 3318509, RECORDED DECEMBER 5, 2005, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
6. DEED DOC NO. 4792294, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
7. DEED DOC NO. 4792295, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
8. DEED DOC NO. 4792296, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
9. DEED DOC NO. 4792297, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
10. DEED DOC NO. 4792298, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
11. DEED DOC NO. 4792299, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
12. DEED DOC NO. 4792300, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
13. DEED DOC NO. 4792301, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
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15. DEED DOC NO. 4792303, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
16. DEED DOC NO. 4792304, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
17. DEED DOC NO. 4792305, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
18. DEED DOC NO. 4792306, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
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21. DEED DOC NO. 4792309, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
22. DEED DOC NO. 4792310, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
23. DEED DOC NO. 4792299, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
24. DEED DOC NO. 4792321, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
25. DEED DOC NO. 4792322, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
26. DEED DOC NO. 4792323, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
27. DEED DOC NO. 4792324, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
28. DEED DOC NO. 4792325, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
29. DEED DOC NO. 4792326, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
30. DEED DOC NO. 4792327, RECORDED MARCH 1, 2018, OFFICIAL RECORDS OF WASHOE COUNTY, NEVADA.
31. STATE OF NEVADA DEPARTMENT OF TRANSPORTATION (NDOT) R/W PLANS, PROJECT NO. EB-STP-NH-395-2(017), E.A. NO. 71323, US 395 NR WINTERS RANCH N TO NEAR MT. ROSE HWY, MILE POST US-395-WA 6.44 TO 13.42, DATED MAY 20, 2002.

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DRAINAGE REPORT

SIERRA REFLECTIONS
CIVIL IMPROVEMENT PLANS

RENO, NV

JUNE 2022

CFA, INC.
1150 CORPORATE BLVD.
RENO, NV 89502

PROFESSIONAL ENGINEER - STATE OF NEVADA
KATHLEEN KNIGHT
Exp: 6/30/23
CIVIL
No. 26935

6/13/22

21126.01

TABLE OF CONTENTS

APPENDICIES

INTRODUCTION

This report presents the storm water drainage and management plan to support the Sierra Reflections Subdivision in Washoe County, Nevada. Sierra Reflections Subdivisions consists of 760 acres of undeveloped land located in the southern part of Pleasant Valley in Washoe County. A Tentative Map (TM06-001 and SW06-001) was approved with conditions in April 2006. Technical Memorandum's from Terraphase Engineering titled "Supplemental Conceptual Drainage Calculations" & "Water Surface Elevations and Floodplain Width for Steamboat and Browns Creek" are referenced throughout this report and the complete version can be found in Appendix A.

The purpose of this study is to ensure that the onsite storm drain system (including channels, culverts & detention basins) can convey the 5 and 100 yr flows in accordance with the Truckee Meadows Regional Drainage Manual. The attached and referenced within Sierra Reflections Supplemental Conceptual Drainage Calculations Technical Memorandum by Terraphase Engineering, Water Surface Elevations and Floodplain Widths for Steamboat and Browns Creek Technical Memorandum by Terraphase Engineering will provide a detailed analysis confirming the onsite retention ponds will retain the 100-year, 24 hour storm event.

EXISTING SITE DESCRIPTION

The Sierra Reflections Subdivision is located in the southern part of Pleasant Valley in Washoe County. The project is currently located on on apn's: 046-060-45, 046-060-47, 046-060-55, 046-080-40, 046-090-01, 046-090-04 through 046-090-18, 046-090-23 through 046-090-26, 046-100-02 through 046-100-04, 046-100-07 & 046-100-10. The site is bordered on the south and east by US Highway 395, bordered on the north by Pagni Lane and on the west by the I-580 freeway. The Vicinity Map (Figure 1) depicts the area of the proposed project.

The existing site is predominantly undeveloped with grade ranges from 1.5 percent to 80 percent in the areas of the creek's banks. The project generally slopes to Browns and Steamboat Creeks which flow west to east through the existing site area. The existing site has coverage areas of minimal to dense native vegetation, pasture grass, minimal trees & shrubs, gravel and occasional outcroppings of rock.

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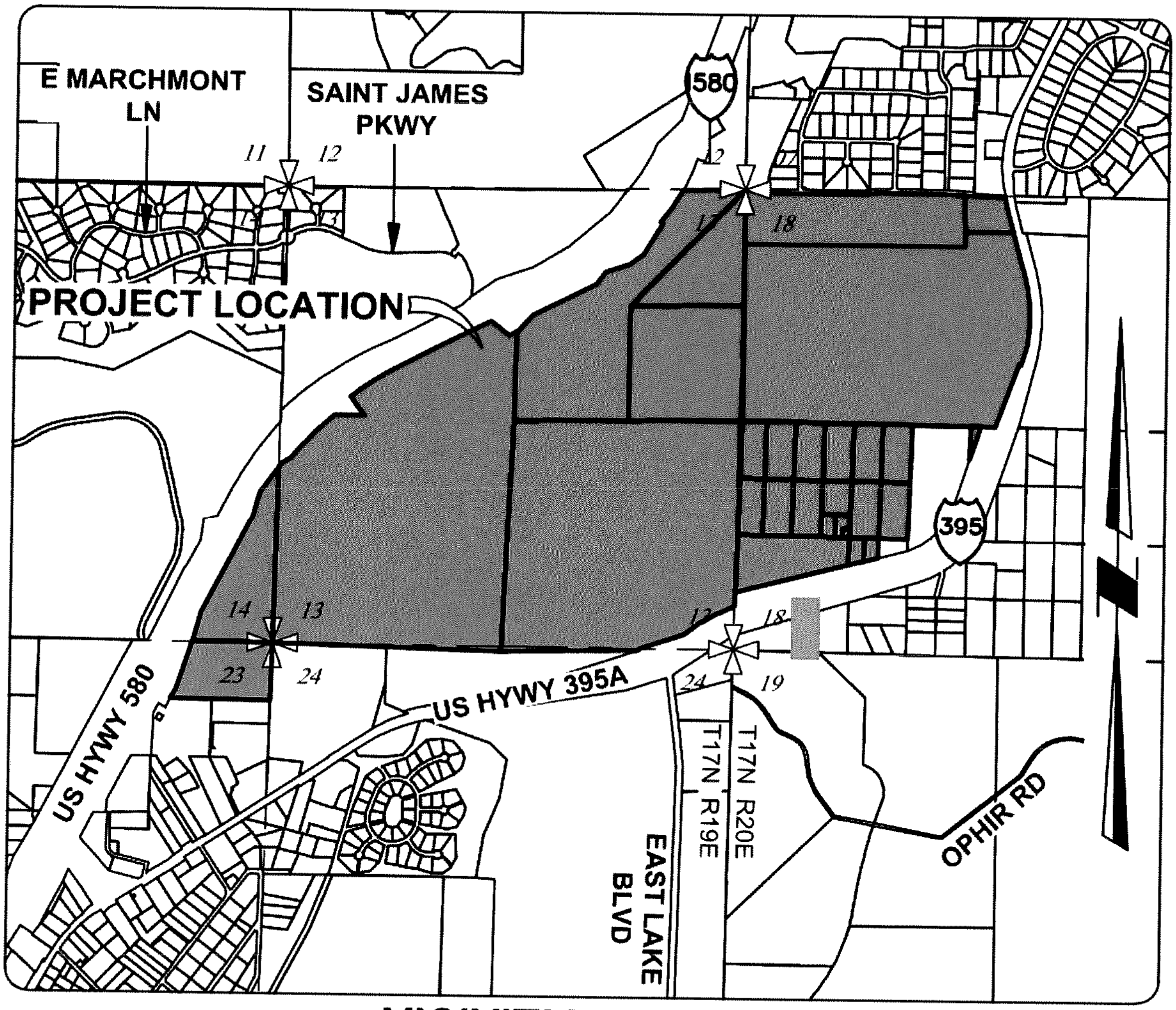


VICINITY MAP
NOT TO SCALE

Figure 1: Vicinity Map

PROJECT DESCRIPTION

Sierra Reflections Subdivision is a proposed residential subdivision consisting of 791 single family homes and 147 townhomes at full build out. There are two main accesses to the proposed subdivision, one off of the Pagni Lane improvements and the connection to US Highway 395 and a new connection at East Lake Boulevard and US Highway 395. The project will consist of multiple stages of development with all streets to public.

FLOOD ZONE

According to FIRM Index Map #32031C3331G through 32031C3334G, dated March 16th, 2009, the site is located within four (4) flood zone area. The majority of the project lies in Flood X, the portion of the project near Steamboat Creek lies within Flood Zone A and the northeast portion of the project lies within Flood Zone AE and Flood Zone Shaded X.

- Zone X, Unshaded; flood areas determined to be outside the 0.2% annual chance floodplain.
- Zone A, special flood hazard area that is subject to flooding byt the 1% annual chance flood. Please see Technical Memorandum titled "Water Surface Elevations and Floodplain Widths for Steamboat and Browns Creek" by Terraphase Engineering in Appendix A for base flood elevations.
- Zone AE, special flood hazard area that is subject to flooding byt the 1% annual chance flood. Please see Technical Memorandum titled "Water Surface Elevations and Floodplain Widths for Steamboat and Browns Creek" by Terraphase Engineering in Appendix A for base flood elevations.
- Zone X, Shaded; areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile, and areas protected by levees from 1% annual chance flood.

A copy of the FIRM Index Map's with an effective date of 3/16/2009 is provided in Appendix B.

EXISTING DRAINAGE

Browns Creek and Steamboat Creek run through the project and flow from the west to the east. Browns Creek is a major drainageway that starts in the Sierra Nevada Mountain Range and flows to Steamboat Creek that drains to the Truckee River Watershed. Steamboat Creek begins in Washoe Lake and it's flow is controlled by the Washoe Lake Dam. For peak flow's and 100-year Water Surface Elevations see Technical Memorandum titled "Water Surface Elevations and Floodplain Widths for Steamboat and Browns Creek" by Terraphase Engineering and shown in Appendix B of this report. The existing site sheet flows and shallow swale towards the east, northeast and south toward the existing Browns and Steamboat Creeks. The I-580 freeway eliminates large amounts of offsite sheet flow and has several discharge points into the proposed project. One of the I-580 discharge points is at Brown's Creek, one at the Browns Creek Diversion structure and the last one at is at a ditch that ties into Browns Creek further downstream. For existing strom drain flow analysis, see Technical Memorandum titled "Sierra Reflections Supplemental Conceptual Drainage Calculations" by Terraphase Engineering and shown in Appendix B of this report.

PROPOSED DRAINAGE

The proposed storm drainage system is designed to maintain existing drainage patterns and minimize concentration of flows. The complete project onsite storm drainage system will consist of curb and gutter, catch basins, storm drain piping, drainage swales, open channels, and detention basins. The onsite 5-year and 100-year storm event will drain to onsite storm drain systems that will terminate in detention basins. Emergency Flow Paths will be provided for storm events that exceed that exceed the capacity of the proposed onsite storm drain system and detention basins. The proposed project includes several detention ponds to reduce the peak 100-year storm event resulting in downstream flows that will not exceed the pre-existing conditions. The proposed offsite drainage system consists of culverts to perpetuate existing drainage through the project. The proposed project is setback from the existing Brown's Creek and Steamboat Creek drainage ways. For proposed strom drain flow analysis, see Technical Memorandum titled "Sierra Reflections Supplemental Conceptual Drainage Calculations" by Terraphase Engineering and shown in Appendix B of this report.

RATIONAL METHOD

The Rational Method is used to estimate the peak runoff resulting from a rain storm of given intensity and frequency falling on a specific watershed. The peak flow is expressed as:

$$Q = C\,i\,A$$

where
- Q = Peak rate of runoff, cubic feet per second
- C = Runoff coefficient
- i = Average rainfall intensity, inches per hour
- A = Watershed area, acres

Washoe County allows the use of the Rational Method for urban and small watersheds 500 acres or less. Runoff computations are made using criteria provided by the Truckee Meadows Regional Drainage Manual. Runoff coefficients were determined from Table 701. Rainfall intensities are determined from the rainfall intensity-duration-frequency (IDF) curves for the Washoe County area and are provided in Appendix D. The initial time of concentration, $T_{c(1)}$, is calculated by the formula:

$$T_{c(1)} = 10 \text{ or } \frac{L}{60 \times V} \text{ (whichever is greater)}$$

where $T_{c(1)}$ = Initial time of concentration, minutes
L = Length from uppermost point of watershed to design point, feet
V = Channel or overland velocity, feet per second

The initial time of concentration models build-up and sheet flow conditions in the uppermost part of the watershed. Except for very small impervious watersheds, the minimum build-up time of 10 minutes is assumed. Therefore, for the first design point, the time of concentration is determined by adding travel time to the build-up time as follows:

$$T_{c(1)} = 10 + \frac{L}{60 \times V}$$

The time of concentration at successive points downstream is calculated by adding total travel time to the initial build-up time:

$$T_{c(n)} = 10 + \sum \frac{L}{60 \times V}$$

where $T_{c(n)}$ = Time of concentration at design point, minutes
$\sum \frac{L}{60 \times V}$ = Total travel time to design point, minutes
L = Length of flow path between design points, feet
V = Velocity, feet per second

Velocities used are 2 - 3 fps for surface flow and 3 - 5 fps for channel and conduit flow.

Rational Method calculations are performed using a spreadsheet containing the appropriate IDF curves and routing parameters. The peak flow for each drainage area is determined based on the runoff coefficient, initial time of concentration, and area.

CONCLUSION

The proposed project when it is at full build out will not increase the exiting established 5 year and 100 year peak flows or flow paths. The detention ponds have been designed to only outlet the existing 5 year and 100 year peak flows and will direct drainage to the existing established flow paths. The project will not increase the 5 year or 100 year peak downstream flows of Browns Creek or Steamboat Creek

REFERENCE

Washoe County, *Truckee Meadows Regional Drainage Manual*, April 2009

Technical Memorandum "Water Surface Elevations and Floodplain Widths for Steamboat and Browns Creek", Dated May 3, 2022, Terraphase Engineering.

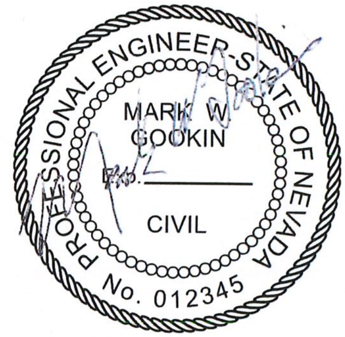
Technical Memorandum "Sierra Reflections Supplemental Conceptual Design Calculations", Dated May 26, 2022, Terraphase Engineering.

APPENDIX A
CIVIL REFERENCE SHEETS

terraphase
engineering

Technical Memorandum

To:	Kathleen Knight, Engineering Manager CFA, Inc. 1150 Corporate Blvd, Reno NV 89502	From:	Mark Gookin, Principal Engineer Terraphase Engineering Inc.
cc:	Kevin German, President Dave Westhoff, Associate Hydrologist		
Date:	May 3, 2022	Project No.:	N012.002
Subject:	**Water Surface Elevations and Floodplain Widths for Steamboat and Browns Creek**		



The following technical memorandum describes methods and results used to evaluate, at a preliminary level, the water surface elevations (WSE) and floodplain widths for Steamboat Creek and Browns Creek through the proposed Sierra Reflections project. This information is prepared for use by CFA in project planning and design. The basis for analysis of existing conditions are the surface files provided via email by CFA. In the project area Steamboat Creek is mapped by FEMA as Zone A and Zone AO, depth 1 foot. Browns Creek does not have a flood zone designation on FEMA's mapping.

Hydraulic Modeling

HEC-RAS software was used to analyze peak flow events of 446 cfs (Browns Creek), 500 cfs (Steamboat Creek upstream from Browns Creek confluence), and 540 cfs (Steamboat Creek downstream from Browns Creek confluence) in order to determine WSE's and floodplain widths. Flow rates employed in our study are those identified in the Sierra Reflection Preliminary Drainage Report (C&M Engineering and Design, 2004) and are consistent with the FEMA Flood Insurance Study for the area. Cross sections are generally spaced 200 feet apart but spaced closer together where necessary to reflect existing site topography. A split flow analysis was modeled at cross section 2800, and it is apparent that flow splits off through multiple poorly defined channels within cross sections 2800 through 1000 (current Zone AO).

Results

The following tables list the water surface elevations and floodplain widths for Steamboat Creek and Browns Creek. Refer to Tables 1 - 3 for HEC-RAS results.

Table 1: HEC-RAS Results for Steamboat Creek Upstream of Confluence

Cross Section	WSE (ft)	Floodplain Width (ft)
1033	5033	42
1032	5033	29
1031	5033	26
1030	5033	45
1029	5032	28
1028	5030	23
1027	5028	26
1026	5026	28
1025	5024	34
1024	5023	63
1023	5021	37
1022	5017	28
1021	5013	28
1020	5009	32
1019	5005	28
1018	5002	29
1017	4998	42
1016	4994	34
1015	4991	30
1014	4988	29
1013	4985	28
1012	4982	36
1011	4980	28
1010	4976	36
1009	4976	83
1008	4975	211
1007	4975	351
1006	4975	376
1005	4975	373
1004	4975	253
1003	4975	129
1002	4974	46
1001	4961	80
1000	4951	83

Table 2: HEC-RAS Results for Browns Creek

Cross Section	WSE (ft)	Flood Plain Width (ft)
3200	5221	27
3100	5209	25
3000	5197	36
2900	5185	34
2800	5172	25
2700	5160	49
2600	5144	57
2500	5132	31
2400	5121	51
2300	5110	75
2200	5098	19
2100	5087	33
2000	5075	50
1900	5059	25
1800	5045	26
1700	5034	45
1600	5021	49
1500	5009	30
1400	4996	60
1300	4985	38

Table 3: HEC-RAS Results for Steamboat Creek Downstream of Confluence

Cross Section	WSE (ft)	Floodplain Width (ft)
3700	4944	151
3600	4936	127
3500	4929	80
3400	4922	68
3300	4914	60
3200	4906	46
3100	4897	42
3000	4889	30
2900	4883	51
2800	4876	97
2700	4876	121

Table 3: HEC-RAS Results for Steamboat Creek Downstream of Confluence

2600	4874	171
2500	4871	302
2400	4963	551
2300	4856	648
2262.6	4852	698
2200	4850	835
2100	4842	908
2056.9	4836	942
2000	4832	950
1947.4	4827	958
1900	4826	970
1850	4823	1012
1800	4822	1024
1700	4819	1086
1600	4817	1063
1540.4	4812	959
1500	4811	899
1400	4807	822
1300	4805	654
1200	4804	647
1100	4802	333
1000	4800	190
900	4796	50
800	4793	50

Conclusions and Recommendations

Figures 1-4 show that the Steamboat Creek floodplains resulting from this study are narrower than those Zone A areas depicted on the FIRM. Hence, it may be advisable to go through the Letter of Map Amendment (LOMA) process to reduce FEMA's floodplain widths which would reduce the FEMA constraints to development.

The area mapped as Zone AO contains many small channels. Fill will need to be installed prior to construction. This may require going through the Conditional Letter of Map Revision based on Fill (CLOMR-F) process prior to installing the fill.

Browns Creek is not mapped on the FIRM, so there is no need to go through the FEMA map revision process for those areas affected by Browns Creek.

Table 4: Storm Drain Sizing

Design Points	Storm Drain	Diameter (ft)	Slope	N-Value	A (ft^2)	P (ft)	R (ft)	Q_{cap}	Q_{100}
A	A1	2	0.01	0.013	3.14	6.28	0.5	22.67	14.08
B	B1	1.5	0.01	0.013	1.77	4.71	0.375	10.53	7.61
C	C1	1.5	0.01	0.013	1.77	4.71	0.375	10.53	5.55
D	D1	2.5	0.01	0.013	4.91	7.85	0.625	41.11	23.37
E	E1	3	0.01	0.013	7.07	9.42	0.75	66.84	36.37
F	F1	3.5	0.01	0.013	9.62	10.99	0.875	100.83	76.00
G	G1	3.5	0.01	0.013	9.62	10.99	0.875	100.83	85.45
H	H1	1.5	0.01	0.013	1.77	4.71	0.375	10.53	9.96
I	I1	2.5	0.01	0.013	4.91	7.85	0.625	41.11	22.83
K	K1	2	0.01	0.013	3.14	6.28	0.5	22.67	12.32
	L1	1.5	0.0686	0.013	1.77	4.71	0.375	27.57	13.16
L	L2	2.5	0.0225	0.013	4.91	7.85	0.625	61.66	43.77
	L3	3.5	0.01	0.013	9.62	10.99	0.875	100.83	72.0
N	N1	1.5	0.01	0.013	1.77	4.71	0.375	10.53	3.61
O	O1	2.5	0.01	0.013	4.91	7.85	0.625	41.11	40.15
P	P1	2	0.01	0.013	3.14	6.28	0.5	22.67	10.65
T	T1	2	0.016	0.013	3.14	6.28	0.5	28.68	14.07
U	U1	4	0.01	0.013	12.56	12.56	1	143.96	124.30
V	V1	2	0.01	0.013	3.14	6.28	0.5	22.67	14.89
W	W1	1.5	0.017	0.013	1.77	4.71	0.375	13.73	6.64
	Y1	2.5	0.01	0.013	4.91	7.85	0.625	41.11	26.91
Y	Y2	3	0.01	0.013	7.07	9.42	0.75	66.84	63.41
	Y3	3.5	0.01	0.013	9.62	10.99	0.875	100.83	76.98
AA	AA1	2	0.01	0.013	3.14	6.28	0.5	22.67	20.61
	BB1	2	0.01	0.013	3.14	6.28	0.5	22.67	18.97
BB	BB2	3	0.01	0.013	7.07	9.42	0.75	66.84	56.42
	BB3	3.5	0.01	0.013	9.62	10.99	0.875	100.83	86.73
CC	CC1	4	0.01	0.013	12.56	12.56	1	143.96	118.62
DD	DD1	3	0.01	0.013	7.07	9.42	0.75	66.84	60.23
EE	EE1	2	0.01	0.013	3.14	6.28	0.5	22.67	16.05
FF	FF1	1.5	0.01	0.013	1.77	4.71	0.375	10.53	10.27
GG	GG1	2	0.01	0.013	3.14	6.28	0.5	22.67	19.01
HH	HH1	2.5	0.01	0.013	4.91	7.85	0.625	41.11	31.23
II	II1	2	0.01	0.013	3.14	6.28	0.5	22.67	19.11
LL	LL1	2	0.01	0.013	3.14	6.28	0.5	22.67	12.93

APPENDIX B
FIRM MAP

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations tables in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations tables should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was State Plane Nevada West FIPS Zone 2703. The **horizontal datum** was NAD 83, GRS80. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

Base map road centerline information shown on this FIRM was provided by the Washoe County GIS Program. This data, dated 2005 or later, was provided in digital format, at a scale of 1:1,200 in urban areas and 1:2,400 in rural areas.

This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to confirm to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables in the Flood Insurance Study Report (which contains authoritative hydraulic data) may reflect stream channel distances that differ from what is shown on this map.

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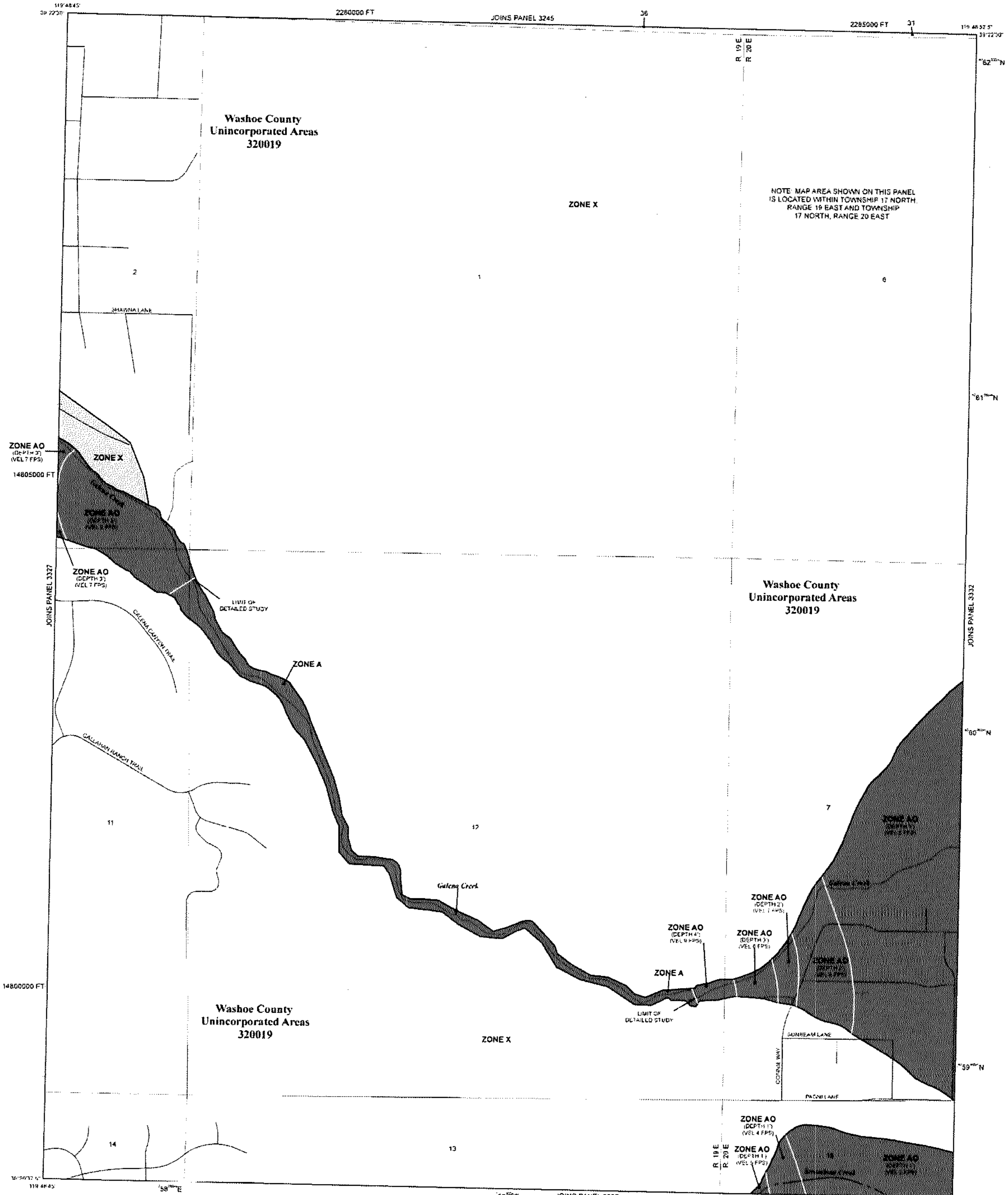
Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels, community map repository addresses, and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, a Flood Insurance Study report, and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://msc.fema.gov.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov.



LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

A — A	Cross section line
23 - - - 23	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
[7]76[000m]N	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks: Nevada State Plane coordinate system, West zone (FIPSZONE 2703), Transverse Mercator projection
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
• M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 30, 1994

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
June 6, 2001 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to add roads and road names, and to incorporate previously issued Letters of Map Revision.
March 16, 2009 - to update corporate limits, to change Base Flood Elevations and Special Flood Hazard Areas, to update map format, to add roads and road names, and to incorporate previously issued Letters of Map Revision.

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your Insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 3331G

FIRM
FLOOD INSURANCE RATE MAP

WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 3331 OF 3475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WASHOE COUNTY	320019	3331	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32031C3331G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency

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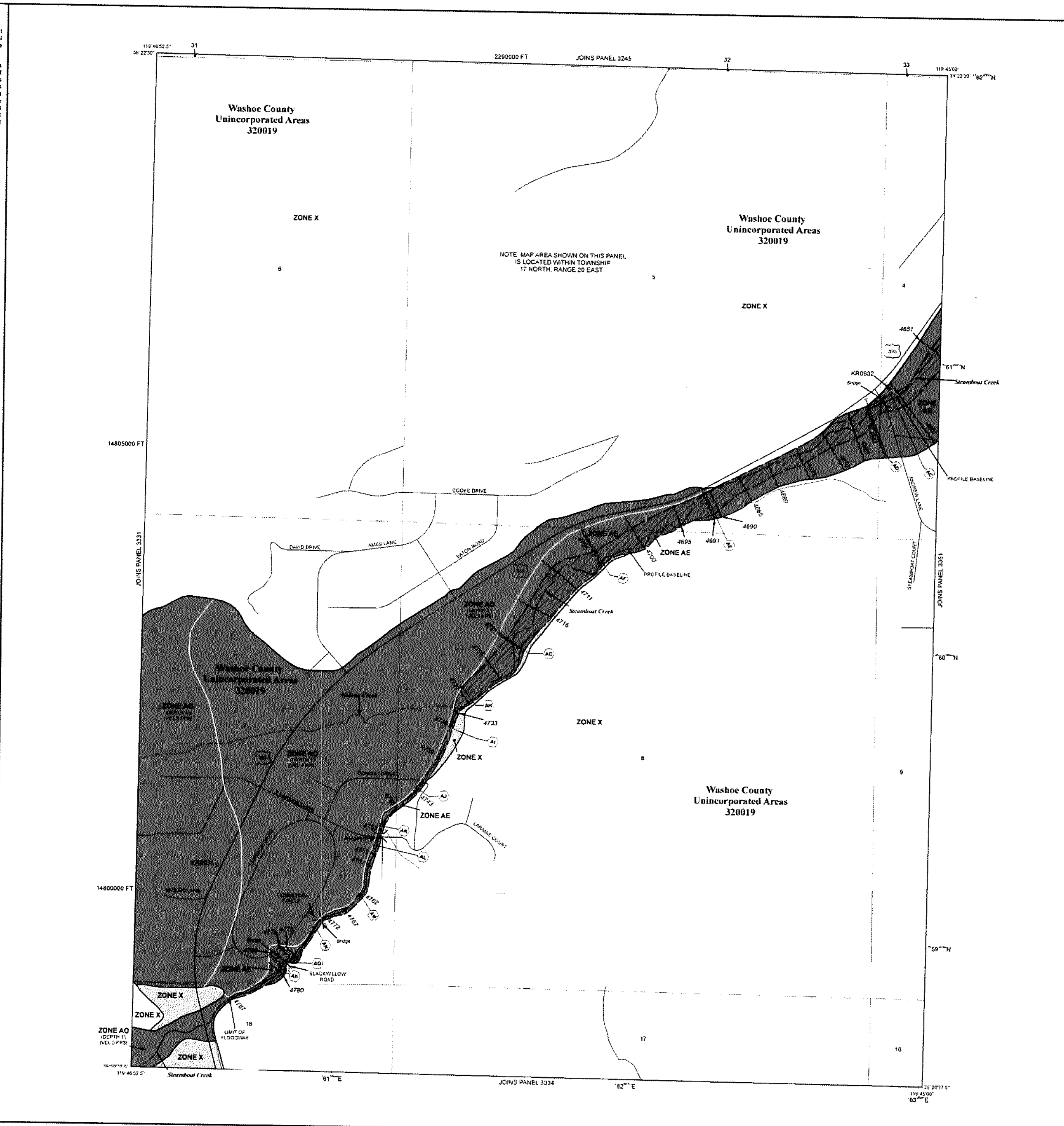

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

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OTHER AREAS

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OTHERWISE PROTECTED AREAS (OPAs)

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	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)——(A)	Cross section line
(23)- - - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4276000m N	1000-meter Universal Transverse Mercator grid values, zone 11
600000 FT	5000-foot grid ticks: Nevada State Plane coordinate system, West zone (FIPSZONE 2703), Transverse Mercator projection
DX5510 x	Bench mark (see explanation in Notes to Users section of this FIRM panel)
•M1.5	River Mile

MAP REPOSITORY
Refer to listing of Map Repositories on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
September 30, 1994

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL
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MAP SCALE 1" = 500'

250 0 500 1000 FEET
150 0 150 300 METERS

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 3332G

FIRM
FLOOD INSURANCE RATE MAP

WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 3332 OF 3475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WASHOE COUNTY	320019	3332	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32031C3332G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency

NOTES TO USERS

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242**, or visit its website at http://www.ngs.noaa.gov.

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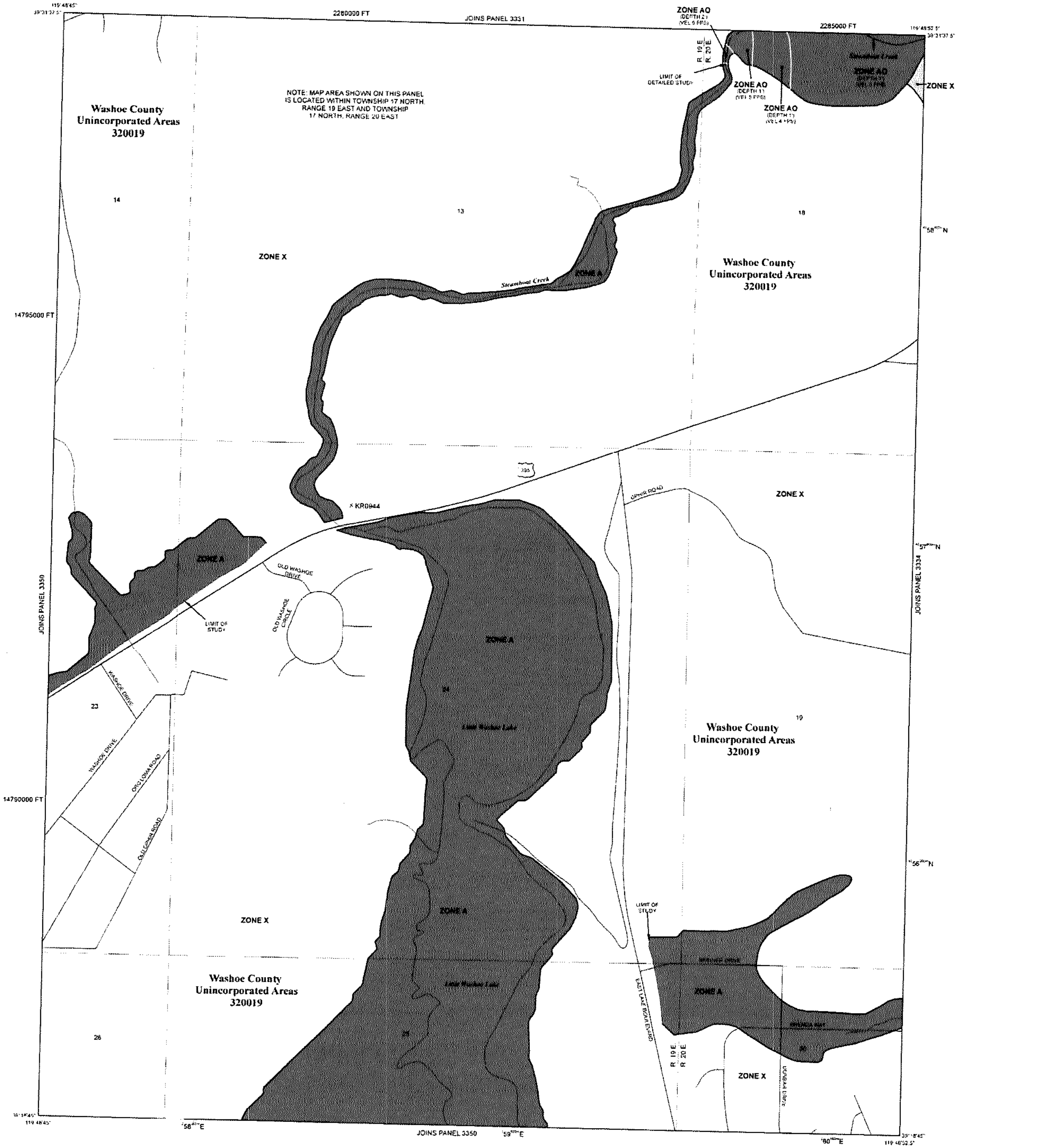

LEGEND

SPECIAL FLOOD HAZARD AREAS SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X — Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X — Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D — Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
~~ 513 ~~~	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988

(A)——(A)	Cross section line
(23)- - -(23)	Transect line
87°07'45", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83), Western Hemisphere
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EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
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MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP — NATIONAL FLOOD INSURANCE PROGRAM

PANEL 3333G

FIRM
FLOOD INSURANCE RATE MAP

WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 3333 OF 3475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WASHOE COUNTY	320019	3333	G

Notice to User: The Map Number shown below should be used when placing map orders; the Community Number shown above should be used on insurance applications for the subject community.

MAP NUMBER
32031C3333G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency

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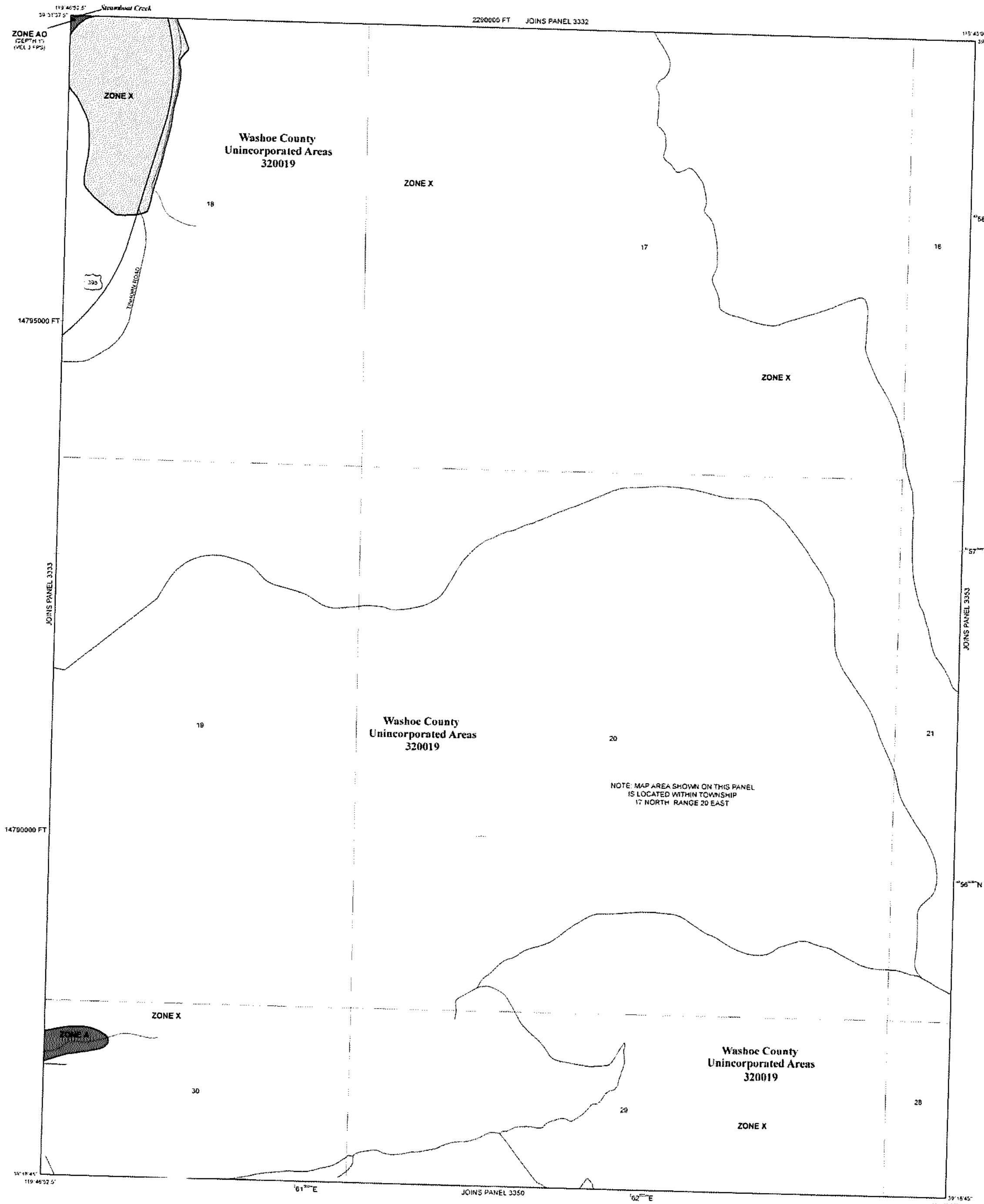

LEGEND

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NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 3334G

FIRM
FLOOD INSURANCE RATE MAP

WASHOE COUNTY, NEVADA
AND INCORPORATED AREAS

PANEL 3334 OF 3475

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WASHOE COUNTY	320019	3334	G

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MAP NUMBER
32031C3334G

MAP REVISED
MARCH 16, 2009

Federal Emergency Management Agency

PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED

SIERRA REFLECTIONS

PLEASANT VALLEY AREA

WASHOE COUNTY, NEVADA

Prepared For

World Properties, USA
4100 Joy Lake Road
Reno, Nevada 89511-9725

Attention: Mr. Fred Woodside, COF

December 22, 2005

Job No. 5344.01-N

Pezonella Associates, Inc.
Consulting Engineers and Geologists
520 EDISON WAY • RENO, NEVADA 89502 • (775) 856-5566

Pezonella Associates, Inc.

Geotechnical & Environmental Engineers & Geologists

520 EDISON WAY • RENO, NEVADA 89502 • (775) 856-5566
FAX • (775) 856-6042
www.pezonella.com

December 22, 2005
Job No. 5344.01-N

World Properties, USA
4100 Joy Lake Road
Reno, Nevada 89511-9725

Attention: Mr. Fred Woodside, COF

Preliminary Geotechnical Investigation
Proposed Sierra Reflections
Pleasant Valley Area
Washoe County, Nevada

This report presents the preliminary geotechnical investigation our firm prepared for the referenced project.

As discussed in the attached report, based on the results of our preliminary investigation, we conclude that, from a geotechnical engineering standpoint, the site is suitable for the intended use of the project. The primary concerns to be considered in the project design and construction are the **presence of bedrock and oversize material**, the **steepness of slopes**, the presence of **earthquake faults**, the presence of **potentially expansive soils**, the potential presence of **shallow ground water**, the potential for **flooding and/or debris flows**, and the presence of **previous exploratory pits**.

We appreciate having been selected to perform this investigation and trust that the results will fulfill project design requirements at this time. If you, or any of your design consultants, have any questions, please contact us.

Respectfully,

PEZONELLA ASSOCIATES, INC.

REGISTERED PROFESSIONAL ENGINEER - STATE OF NEVADA
RAYMOND M. PEZONELLA
CIVIL
12-31-05
NO. 4186

12-22-05

Raymond M. Pezonella
Civil Engineer - 4186

Pezonella Associates, Inc.

PRELIMINARY GEOTECHNICAL INVESTIGATION

PROPOSED

SIERRA REFLECTIONS

PLEASANT VALLEY AREA

WASHOE COUNTY, NEVADA

Prepared For

World Properties, USA
4100 Joy Lake Road
Reno, Nevada 89511-9725

By

Chris D. Betts
Engineering Geologist

Raymond M. Pezonella
Civil Engineer - 4186

Pezonella Associates, Inc.
520 Edison Way
Reno, Nevada 89502
(775) 856-5566

December 22, 2005

Job No. 5344.01-N

TABLE OF CONTENTS

LIST OF ILLUSTRATIONS

I INTRODUCTION

This report presents results of the preliminary geotechnical investigation our firm prepared for the proposed Sierra Reflections be located in Washoe County, Nevada. The project site is included within Sections 13 and 18, Township 17 North and Range 19 and 20 East, in the Pleasant Valley and Washoe City areas. Based on a set of conceptual plans prepared by C & M Engineering and Design, LTD, we understand that development will include construction of isolated building pads for single family residences and townhouses to be serviced by community water, sewer systems and storm drains systems. Associated asphaltic concrete surface roadways and a bridge will complete project development.

We have not received structural information; however, we anticipate that foundation loads will be normal (relatively light for the type of construction proposed). We anticipate that foundations will bottom at least 24 inches below lowest adjacent exterior ground surface and that structural design will be in accordance with the 2003 edition of the International Building Code.

Based on civil design information provided by C & M Engineering and Design, LTD we understand that grading to attain finished pad grades and for site drainage will consist of cuts up to 50 feet and fill up to 25 feet. Depth of utility trench excavation is unknown. We anticipate that any proposed slopes will be constructed at maximum inclinations of two horizontal to one vertical (2:1) or flatter, that retaining walls are anticipated and that any underground utilities existing within proposed structural areas will be relocated.

The purpose of our preliminary investigation was to assess the general subsurface soil conditions across the property, and provide opinions and discussions concerning the suitability of the site for its intended use. Once design parameters, such as building location(s), finish floor elevations, structural loads and grading information have been established, a final level geotechnical report should be performed.

This report is geotechnical in nature and not intended to identify other site constraints such as environmental hazards, wetlands determinations or the potential presence of buried utilities. Information included in this report is specific to development within the limits of the property and, as such, is not intended for off-site development.

Previously, in correspondence dated March 24, 2005, we presented interim results of our work.

II FIELD EXPLORATION AND LABORATORY TESTING

We explored the subsurface soil conditions by excavating 2 trenches with a track-mounted excavator (Link belt 315) to depths of up to about 11 feet below the existing ground surface. To further evaluate the subsurface conditions and to assess potential difficulty associated with earthwork excavations, we also performed a seismic refraction study along the upper reaches of the property. The exploratory trench locations and seismic refraction study, positioned in the field using pace and compass and based on a topographic map provided by C & M Engineering and Design, LTD., are depicted on Plate 1. No greater accuracy is implied. Subsequent to our subsurface exploration, the trenches were surveyed in the field by others.

Our field geologist recorded the location of the trenches and seismic refraction study using the global positioning system (GPS), logged and visually classified the materials encountered, and obtained representative samples for laboratory testing. Logs of the trenches are presented on Plates 2 through 4. The materials encountered are classified in accordance with the Unified Soil Classification System and Rock Classification and Weathering Criteria Chart, which are explained on Plates 5 and 6, respectively.

The samples were returned to our laboratory to confirm their field classifications, to select representative samples for laboratory testing and to determine general engineering design parameters. Results of particle size analysis and Atterberg Limits are presented on the logs and on Plates 7 and 8. Additional tests, Resistivity, pH and SO_4, were performed by an independent laboratory to evaluate the corrosion potential and are presented on the logs.

Results of our seismic refraction study, which indicates material velocity and layer depths, are presented on Plate 9.

III SITE AND SOIL CONDITIONS

The site is undeveloped with the exception of 4 single family residences and a cobble stone structure, and is bound by Pagni Land and undeveloped hillside to the north, U.S. Highway 395 to the east and south, and undeveloped hillside to the west. Due to the foothill terrain of the area, the overall topography grades moderately to steeply downward from the northwest and south-southeast to the central area, where a natural drainage system grades gently downward to the northeast. The surface is covered with sparse to dense sagebrush, weeds, pasture grass, occasional trees and shrubs (abundant along the drainage), gravel, cobbles, boulders, and occasional outcrops of bedrock. Overhead power lines, previous exploratory pits, and a large pond exist in the western portions. Minor amounts of leveled and stockpiled fill, a metal fenced corral, temporary job shacks and storage yard exist within the northeastern area. Dirt and asphaltic concrete surface roads and wire fencing cross the property.

Based on mapping by the U.S. Department of Agriculture, Soil Conservation Service (*Soil Survey of Washoe County, Nevada, South Part*, approved 1980, Sheet No. 30), the material across the site are presented on Plate 12 and consist of the following:

> <u>Wedekind gravelly loam, 8 to 15 percent slopes (# 280):</u> This shallow, well drained soil is on uplands. It formed in colluvium and residuum derived dominantly from andesite. Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is a brown gravelly loam about 2 inches thick. The subsoil is a brown sandy clay loam about 12 inches thick. Highly weathered andesite is at a depth of 14 inches. Depth to highly weathered bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Limitations associated with the use of this unit for urban development, as defined by the soil survey, are the shallowness of this soil over bedrock, high clay content, steepness of slopes and the susceptibility of the soil to frost heaving.

Wedekind gravelly loam, 15 to 30 percent slopes (# 281): This shallow, well drained soil is on uplands. It formed in colluvium and residuum derived dominantly from andesite. Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is a brown gravelly loam about 2 inches thick. The subsoil is a brown sandy clay loam about 12 inches thick. Highly weathered andesite is at a depth of 14 inches. Depth to highly weathered bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. Limitations associated with the use of this unit for urban development, as defined by the soil survey, are the steepness of slopes, shallowness of this soil over bedrock, and susceptibility of the soil to frost heaving.

Wedekind gravelly sandy loam, 30 to 50 percent slopes (# 282): This shallow, well drained soil is on uplands. It formed in colluvium and residuum derived dominantly from andesite. Typically, 15 to 25 percent of the surface is covered with gravel. The surface layer is a brown gravelly sandy loam about 4 inches thick. The subsoil is a brown sandy clay loam about 10 inches thick. Highly weathered andesite is at a depth of 14 inches. Depth to highly weathered bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight. Limitations associated with the use of this unit for urban development, as defined by the soil survey, are the steepness of slopes, and shallowness of this soil over bedrock.

Yuko stony loam, 15 to 30 percent slopes (# 341): This very shallow, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic rock. Typically, 0.1 to 3 percent of the surface is covered with stones. The surface layer is a brown stony loam about 2 inches thick. The subsoil is a yellowish-brown silty clay loam about 6 inches thick. Highly weathered andesite is at a depth of 8 inches. Depth to weathered bedrock ranges from 6 to 14 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 6 to 14 inches. Runoff is medium, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. The main limitations associated with the use of this unit for urban development, as defined by the soil survey, are the steepness of slopes and restricted depth to bedrock.

Pits (# 360): Pits are open excavations from which soil and, in places, some of the bedrock, have been removed. The excavated material has been used as construction material. The underlying material is variable.

Holbrook cobbly loamy sand, 2 to 8 percent slopes (# 482): This very deep, somewhat excessively drained soil is on alluvial fans. It formed in alluvium derived from mixed rock sources. Typically, 25 to 35 percent of the surface is covered with cobbles. The surface layer is a brown cobbly loamy sand about 10 inches thick. The underlying material to a depth of 60 inches is a stratified stony sand through gravelly loam. Permeability is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of soil blowing is slight. This soil is subject to flash flooding during storms of unusually high intensity. Channeling and deposition are common along streambanks. Limitations associated with the use of this soil for urban development, as described by the soil survey, are the potential for flooding and the susceptibility of the soil to frost heave.

Settlemeyer fine sandy loam, 0 to 2 percent slopes (# 510): This very deep, poorly drained soil is on flood plains and alluvial fans. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is a dark gray or black fine sandy loam about 15 inches thick. The upper 24 inches of the underlying material is a grayish brown silty clay loam. The lower part to a depth of 60 inches is a greenish gray, stratified very gravelly loamy fine sand and fine sandy loam. Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water tolerant plants but is limited to 24 to 36 inches for water-sensitive plants. Runoff is slow, the hazard of water erosion is slight. The hazard of soil blowing is slight. The seasonal high water table is at a depth of 20 to 40 inches in late winter and spring. The soil is subject to flash flooding during storms of prolonged high intensity. It is slightly saline and alkali-affected. The main limitations associated with the use of this soil for urban development, as defined by the soil survey, are the high water table, potential for flooding, slow permeability, low load bearing strength and the susceptibility to frost heave.

Settlemeyer-Notus complex (# 513): This map unit is on flood plains. This unit is 45 percent Settlemeyer fine sandy loam, 0 to 2 percent slopes, and 40 percent Notus stony loamy fine sand, 0 to 2 percent slopes. The Settlemeyer soil is on flood plains, and the Notus soil is on flood plains near the channels. Areas of these soils are so intricately intermingled that it is not practical to map them separately at the scale used.

Settlemeyer soil: This soil is very deep and poorly drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is a dark gray or black fine sandy loam about 15 inches thick. The upper 24 inches of the underlying material is a grayish brown silty clay loam. The lower part to a depth of 60 inches is a greenish gray, stratified gravelly loamy fine sand and fine sandy loam. Permeability is moderately slow. Available water capacity is high. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 24 to 36 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 20 to 40 inches in late winter and spring. This soil is subject to flooding during storms of prolonged high intensity. Channeling and deposition are common along streambanks. This soil is slightly saline and alkali-affected.

Notus soil: This soil is very deep and moderately well drained. It formed in alluvium derived from mixed rock sources. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is a light brownish gray stony loamy fine sand about 12 inches thick. The underlying material to a depth of 60 inches is a light brownish gray and light yellowish brown stratified very gravelly coarse sand through sandy loam. Permeability is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 48 to 60 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 48 to 60 inches in late winter and spring. The soil is subject to occasional flooding for brief periods during storms of prolonged high intensity. Channeling and deposition are common along streambanks.

The main limitations associated with the use of this map unit for urban development, as defined by the soil survey, are the potential for flooding to occur, the high water table, the moderately slow permeability, the low load-bearing strength, and the susceptibility to frost heaving.

<u>Dressler loamy sand, 2 to 4 percent slopes (# 520):</u> This very deep, somewhat poorly drained soil is on alluvial fans and flood plains. It formed in alluvium derived dominantly from mixed rock sources. Typically, the surface layer is a grayish brown loamy sand about 19 inches thick. The underlying material to a depth of 60 inches is a pale brown gravelly fine sandy loam and gravelly loamy sand. Permeability is moderately rapid. Available water capacity is moderate. Effective rooting depth is 60 inches for water-tolerant plants but is limited to 30 to 40 inches for water-sensitive plants. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 30 to 40 inches in winter and early spring. This soil is subject to flash flooding during storms of prolonged high intensity. The main limitations associated with the use of this soil for urban development, as defined by the soil survey, are the potential for flooding, high water table and the susceptibility to frost heaving.

<u>Leviathan very stony sandy loam, 2 to 8 percent slopes (# 554):</u> This very deep, well drained soil is on terraces. It formed in fluvial sediments and alluvium from mixed rock sources. Typically, the surface layer is a grayish brown very stony sandy loam about 11 inches thick. The subsoil to a depth of 60 inches is a brown very gravelly sandy clay. Permeability is moderately slow. Available water capacity is moderate. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations associated with this unit, as defined by the soil survey, are the high clay content, moderately slowly permeable subsoil, and frost susceptibility.

<u>Notus stony loamy fine sand (# 640):</u> This very deep soil is on alluvial flood plains. Drainage has been altered. This soil formed in alluvium from mixed rock sources. Slopes are 0 to 4 percent. Typically, about 1 percent of the surface is covered with stones. The surface layer is a light brownish gray stony loamy fine sand about 12 inches thick. The underlying material to a depth of 60 inches is stratified extremely gravelly coarse sand to sandy loam. Permeability is moderately rapid. Available water capacity is very low. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of water erosion is slight. The hazard of soil blowing is slight. A seasonal high water table is at a depth of 48 to 60 inches in late winter and spring. This soil is subject to occasional flooding during storms of prolonged high intensity in late winter and spring. Channeling and deposition are common along the streambanks. A limitation associated with the use of this soil for urban development, as defined by the soil survey, is the potential for flooding.

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Oest very bouldery sandy loam, 2 to 8 percent slopes (# 660). This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Typically, 3 to 10 percent of the surface is covered with boulders. The surface layer is a grayish brown very bouldery sandy loam about 13 inches thick. The subsoil is a brown very gravelly sandy loam about 31 inches thick. The substratum is a pale brown very gravelly loamy sand that extends to 60 inches. Permeability is moderate in the subsoil and rapid in the substratum; available water capacity is moderate; effective rooting depth is more than 60 inches; runoff is medium; and the hazard of water erosion and soil blowing is slight. The main limitations associated with the use of this soil for urban development, as described by the soil survey, are the presence of stones, the rapid permeability and the susceptibility to frost heaving.

Oest bouldery sandy loam, 2 to 8 percent slopes (# 661): This very deep, well drained soil is on alluvial fans and terraces. It formed in alluvium from mixed rock sources. Typically, about 1 percent of the surface is covered with boulders. The surface layer is a grayish brown bouldery sandy loam about 14 inches thick. The subsoil is a brown very gravelly sandy loam about 26 inches thick. The substratum is a pale brown very gravelly loamy sand that extends to 60 inches. Permeability is moderate in the subsoil and rapid in the substratum. Available water capacity is moderate. Effective rooting depth is more than 60 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. Limitations associated with the use of this soil for urban development, as described by the soil survey, are the presence of stones, the rapid permeable substratum, and the susceptibility to frost heaving.

Stodick very stony loam, 30 to 50 percent slopes (# 731): This shallow, well drained soil is on back slopes and side slopes of pediments. It formed in residuum and alluvium derived dominantly from lacustrine sedimentary rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is a pale brown stony loam about 5 inches thick. The subsoil is a light yellowish brown very gravelly clay loam about 9 inches thick. Interbedded tuff, mudstone, and sandstone are at a depth of 14 inches. Depth to sedimentary bedrock ranges from 14 to 20 inches. Permeability is moderately slow. Available water capacity is very slow. Effective rooting depth is 14 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight. The main limitations associated with this soil for use as urban development, as described by the soil survey, are the steepness of slopes and shallowness of soil over bedrock.

<u>Reywat extremely stony loam, 15 to 30 percent slopes (# 861):</u> This shallow, well drained soil is on uplands. It formed in residuum of basic igneous rocks. Typically, 15 to 50 percent of the surface is covered with stones. The surface layer is a grayish brown extremely stony loam about 6 inches thick. The subsoil is a brown very gravelly clay loam about 12 inches thick. Bedrock is at a depth of 18 inches. Depth to bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is high. The hazard of soil blowing is slight. The limitations associated with this unit, as described by the soil survey, are the restricted depth to bedrock and steepness of slopes.

<u>Reywat very cobbly sandy loam, 8 to 15 percent slopes (# 862):</u> This shallow, well drained soil is on uplands. It formed in residuum of basic igneous rocks. Typically, 35 to 50 percent of the surface is covered with cobbles. The surface layer is a grayish brown very cobbly sandy loam about 6 inches thick. The subsoil is a brown very gravelly clay loam about 12 inches thick. Bedrock is at a depth of 18 inches. Depth to bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The main limitation associated with the use of this unit for urban development, as described by the soil survey, is the shallowness of soil over bedrock.

<u>Flex stony sandy loam, 8 to 15 percent slopes (# 903):</u> This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from altered andesite and metavolcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is a light grayish brown stony sandy loam about 3 inches thick. The subsoil is a brown very gravelly sandy clay loam about 7 inches thick. Highly weathered bedrock is at a depth of 10 inches. Depth to weathered bedrock ranges from 6 to 12 inches. Permeability is moderate. Available water capacity is very low. Effective rooting depth is 6 to 12 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The main limitations associated with this unit for use as urban development, as described by the soil survey, are the steepness of slopes, shallowness of the soil over bedrock, and the susceptibility to frost heaving.

<u>Old Camp stony sandy loam, 15 to 30 percent slopes (#930):</u> This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is a pale brown stony sandy loam about 7 inches thick. The subsoil is a brown very cobbly clay loam about 10 inches thick. Hard andesite is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. The main limitations to the use of this soil, as defined by the soil survey, are the steepness of slopes, presence of stone, and the shallowness of soil over bedrock.

Old Camp-Rock outcrop complex, 15 to 50 percent slopes (#931): This map unit is on uplands. This unit is 50 percent Old Camp extremely stony sandy loam, 30 to 50 percent slopes, 20 percent Old Camp stony sandy loam, 15 to 30 percent slopes, and 20 percent Rock outcrop. The Old Camp extremely stony sandy loam is near Rock outcrop on peaks and ridges. The Old Camp stony sandy loam is on rounded ridges and between peaks. Rock outcrop is on peaks and ridges. Areas of the components of this unit are so intricately intermingled that it is not practical to map them separately at the scale used. Included in this unit are about 3 percent Manogue soils on toe slopes and in saddles, 4 percent Xman soils in the less sloping areas and 3 percent Reywat soils on north-facing slopes. The individual units are described as follows:

> Old Camp extremely stony soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rock. Slope is 30 to 50 percent. Typically, 15 to 25 percent of the surface is covered with stones. The surface layer is a pale brown extremely stony sandy loam about 7 inches thick. The subsoil is a brown very cobbly clay loam about 10 inches thick. Hard andesite bedrock is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches.
>
> Old Camp stony soil is shallow and well drained. It formed in residuum derived dominantly from volcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is a pale brown stony sandy loam about 8 inches thick. The subsoil is a brown very cobbly clay about 9 inches thick. Hard andesite bedrock is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches.
>
> Permeability of both Old Camp soils is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is rapid; and the hazard of water erosion is high. The hazard of soil blowing is slight.
>
> Rock outcrops consist of exposed areas of volcanic rock as peaks.
>
> The main limitations to the use of this complex, as defined by the soil survey, are the steepness of slopes, presence of stones, and the shallow depth to bedrock.

Old Camp stony sandy loam, 8 to 15 percent slopes (#932): This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from volcanic rocks. Typically, 1 to 3 percent of the surface is covered with stones. The surface layer is a pale brown stony sandy loam about 7 inches thick. The subsoil is a brown very cobbly clay loam about 10 inches thick. Hard andesite bedrock is at a depth of 17 inches. Depth to hard bedrock ranges from 10 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 10 to 20 inches. Runoff is medium, and the hazard of water erosion is slight. The hazard of soil blowing is slight. The main limitations associated with this unit for urban development, as defined by the soil survey, are the shallow depth to bedrock and presence of stones.

Koontz gravelly loam, 8 to 15 percent slopes (980): This shallow, well drained soil is on uplands. It formed in residuum derived dominantly from metavolcanic rocks. Typically, 20 to 35 percent of the surface is covered with gravel. The surface layer is a brown gravelly loam about 5 inches thick. The subsoil is a brown and yellowish brown very gravelly clay loam about 13 inches thick. Weathered, metamorphosed, tuffaceous sediments occur at a depth of 18 inches. Depth to bedrock ranges from 14 to 20 inches. Permeability is moderately slow. Available water capacity is very low. Effective rooting depth is 14 to 20 inches. Runoff is rapid, and the hazard of water erosion is moderate. The hazard of soil blowing is slight. The main limitations associated with the use of this soil for urban development, as defined by the soil survey, are the steepness of slopes, shallowness of soil over bedrock, and the susceptibility of the soil to frost action.

Xeric Torriorthents-Urban land complex (# 991): This complex is about 45 percent nearly level, well drained Xeric Torriorthents, 45 percent Urban land, and 10 percent included soils. The Xeric Torriorthents portion of this unit consists of artificially filled areas of soil, trash and rock. The soil characteristics are variable, but most of the material is more than 35 percent nonsoil fragments in a loamy matrix. In some areas, however, the matrix is clayey. Many of these areas are planted to lawns or to landscape plants. Urban land is covered by streets, parking lots, buildings, and other structures that so obscure or alter the soils that identification is not feasible. Included in this unit are areas of unidentified soils and miscellaneous dumps. These areas make up about 10 percent of the unit. This complex is used for residential, commercial, and other urban developments.

Based on geologic mapping completed by R. W. Tabor and S. Ellen (*Washoe City Folio, Geologic Map,* Nevada Bureau of Mines and Geology, dated 1975), the underlying materials consist of the following:

Holocene age Artificial fill (Qa).

Holocene age Flood deposits (Qf). Consist of silt, sand, gravel, and boulders deposited by floods. Includes some recent alluvium.

Quaternary age Alluvial fans (Qfsb). This unit consists of silt, sand, and pebbly to bouldery sand. These deposits are well bedded in Pleasant Valley.

Quaternary age Glacial Outwash, undifferentiated (Qgou).

Quaternary age deposits of the Mount Rose fan (Qmb). These deposits are described as consisting of gray to brown silt, sand, gravel, and large boulders. Weakly stratified, with all granitic boulders and some volcanic rocks rotten.

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Quaternary age deposits of the Mount Rose fan (Qms). This deposit consists of intertonguing sand and silt facies.

Tertiary age Kate Peak Formation (Tkb). These deposits are described as consisting of andesite breccia with minor flows.

Our subsurface exploration confirms, in general, the soil and geologic mapping, with the native materials consisting of loose (near surface) to dense silty and clayey sand that contains varying amounts of gravel, cobbles and boulders and carbonate layers, stiff to hard sandy clay with varying amounts of gravel, cobbles and boulders, medium dense to very dense, cemented in parts, silty and clayey gravel with sand, cobbles and boulders, and andesite bedrock that exhibits varying degrees of fracturing, hardness, strength, and weathering to the depths explored.

At the time of our subsurface exploration (February, 2005), no free ground water was recorded in any of the test trenches to the depths explored; however, a wet condition was noted near the eastern terminus of trench A. Based on mapping completed by F. Eugene Rush (*Washoe City Folio, Hydrologic Map,* Nevada Bureau of Mines and Geology, dated 1975), approximate depth to ground water is estimated at 5 feet within the Pleasant Valley area and along the natural drainage.

Our investigation reveals that, overall, the native materials exist in a relatively compact and/or firm density state, exhibit low to high potential for expansion, and low to high supporting capability. The bedrock material is relatively competent and stable; however, it appears to exhibit a high degree of fracturing and weathering. Laboratory test results conducted through an independent laboratory indicate that the native materials exhibit a low to negligible corrosion potential to properly prepared conventional Type II portland cement or to uncoated steel or metal.

Although a complete assessment of the Soil Profile Type in accordance with Table 1615.1.1 (Site Classifications Definitions) of the 2003 International Building Code would require drilling to a depth of 100 feet, we believe that the governing subsurface soils approximate a Site Class of D as defined in the referenced table.

IV GEOLOGIC AND SEISMIC CONSIDERATIONS

To delineate possible faulting and evaluate any other geological hazards on the site, our investigation included a review of available geological literature and maps.

A. Geology

The project site is located within the southwestern foothills of the Truckee Meadows, a complex structural basin that is transitional between the Basin and Range physiographic province to the east and the Sierra Nevada to the west. The geologic structure of the area is characterized by high angle extensional normal faults trending in a north-northeast direction. The Truckee Meadows is a down dropped graben with neighboring horsts to the east and west.

B. Faulting and Seismicity

Based on the mapping completed by R. W. Tabor, S. Ellen, and M. M. Clark (*Washoe City Folio Geologic Hazards Map,* Nevada Bureau of Mines and Geology, Reno Area, dated 1978), several fault traces are illustrated as crossing the project site. The map indicates that the probable last movement along the suspected faults range from possibly less than 50,000 years to less than 12 million years ago; however, 2 of the suspected faults may have been active possibly less than 10,000 years ago (See Plate 10).

Based on mapping by John W. Bell (*Quaternary Fault Map of Nevada,* Nevada Bureau of Mines and Geology, Reno Sheet, dated 1984), the faults in the project area are reported as being Pleistocene in age (between 10,000 and 2 million years old).

Based on guidelines recommended by the Nevada Earthquake Safety Council (*Guidelines for Evaluating Potential Surface Fault Rupture/Land Subsidence Hazards,* Revision 1, dated July 30, 1996*)*, minimum set-back distances of 50 feet shall be provided for any occupied structure from Holocene active faults (a fault that has moved within the last 10,000 years). No critical facility shall be placed directly over the trace of a Late Quaternary active fault (a fault that has moved within the last 130,000 years), and, when necessary, set-back distances from fissures and Late Quaternary and Quaternary active faults (a fault that has moved within the last 1,6000,000 years) will be recommended by a Competent Professional. Based on the results of our subsurface exploration (see Plates 2 and 4), we conclude that earthquake faults do exist across site as indicated on the referenced earthquake hazards map. Based on the reported age of these faults and results of our subsurface exploration, we believe the faults are not considered to be Holocene Active (i.e. one which has moved recently within the last 10,000 years). Based on their inferred age, we believe that construction set-backs are not warranted for the majority of the faults; however, we do recommend construction setbacks on the order of 25 feet (from any occupied structure) be maintained across the 2 fault traces believed to be between 50,000 and 150,000 years old. Although the topographic map provided by C & M Engineering and Design, LTD. depicts the fault traces and construction off-sets across the property, detailed assessment of the fault alignments will require additional subsurface exploration (i.e. trenching).

Based on mapping by Craig M. dePolo, John G. Anderson, Diane M. dePolo, and Jonathan G. Price (*Earthquake Occurrence in the Reno-Carson City Urban Corridor*, Seismological Research Letters, Volume 68, dated May/June 1997), the principle Quaternary fault located to the project site is the Mount Rose Fault Zone. The Nevada Seismological Laboratory indicates an earthquake of magnitude 7.1 is possible along this fault zone (*Reno/Carson Fault Information*, updated January 31, 2003).

C. <u>Liquefaction</u>

Based on the referenced geologic hazards mapping, portions of the site have been delineated as existing in an area of greatest severity for potential shaking. These areas are potentially underlain largely by unconsolidated lake deposits of fine-grained sand, silt, and clay. Depth to ground water is less than 33 feet. Although a detailed analysis of liquefaction potential, which would require additional drilling to depths of at least 40 feet, plus detailed laboratory testing and engineering analysis, was not part of the scope of our work, we believe that mitigation measures regarding liquefaction would be cost prohibitive considering the type of construction proposed. Generally, these types of mitigation measures are reserved for public safety facilities such as fire, police and hospitals or other buildings with high occupancy such as schools. We recommend that the decision to further evaluate the potential for liquefaction and/or to implement any mitigation measures be weighed by the Owner or Developer once a final level geotechnical investigation report has been completed.

D. Slope Stability

Based on the mapping completed by P. A. Glancey and T. L. Katzer (*Washoe City Folio Flood and Related Debris Flow Hazards Map,* Nevada Bureau of Mines and Geology, Reno Area, dated 1977), portions of the property are potentially susceptible to debris flows (see Plate 11). Due to the relatively compact and/or firm density state of the underlying material, our understanding that considerable grading (i.e. filling) will be associated with project development, that maximum slope inclination will be two horizontal to one vertical (2:1) or flatter and protected from erosion, and that earth retaining walls will be provided, we believe that the potential for landslides, rockfalls or debris flows will be greatly reduced.

E. Radon

Radon, a colorless, odorless, radioactive gas derived from the natural decay of uranium, is found in nearly all rocks and soils. The Environmental Protection Agency suggests that remedial action be taken to reduce radon in any structure with average indoor radon of 4.0 pCi/L or more. Based on studies completed by the Nevada Bureau of Mines and Geology in cooperation with the Nevada Division of Health and the U.S. Environmental Protection Agency (*Radon In Nevada*, Nevada Bureau of Mines and Geology, Bulletin 108, 1994), the project site (as well as much of the Reno and Sparks area) is delineated as existing in an area with an average indoor measurement equal to or greater than 4.0 pCi/L.

F. Flooding

Flood Hazard studies completed by the Federal Emergency Management Agency (FEMA) Community Panel Numbers 32031C3231, 3233, and 3234 E, dated September 30, 1994 (based on the National Geodetic Vertical Datum of 1929), and the referenced flood and related debris flow hazards map, portions of the site are located within Flood Hazard AO and Flood Hazard X (shaded). Zone AO is a special flood hazard areas inundated by 100-year flooding with a flood depths of 1 to 3 feet (usually sheet flow on sloping terrain) with average depths determined. For areas of alluvial fan flooding, velocities also determined. Flood Hazard Zone X (shaded) are 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 are areas protected by levees from 100-year flood.

V CONCLUSIONS

Based on the results of our preliminary geotechnical investigation, knowledge of the area and understanding of project development, we conclude that, from a geotechnical engineering standpoint, the site is suitable for its intended use. The primary concerns to be considered in the project design and construction are the **presence of bedrock and oversize material**, the **steepness of slopes**, the presence of **earthquake faults**, the presence of **potentially expansive soils**, the potential presence of **shallow ground water**, the potential for **flooding and/or debris flows**, and the presence of **previous exploratory pits**.

As illustrated on our test boring logs and reported during our site reconnaissance, bedrock material exists at relatively shallow depths across the site. Consideration should be given to the difficulty of earthwork (grading and trenching) associated with these materials. From a preliminary standpoint, based on the results of our field exploration, we believe that the bedrock material is sufficiently fractured and weathered; thus, excavations across the site can be excavated with a Caterpillar 335 track-mounted Backhoe or D10 Dozer (or equal) earthmoving equipment. Although we do not believe that blasting will be necessary, as is inherent with bedrock material, localized areas of resistant material will be encountered which will require the use of special equipment such as a hydraulic rock hammer.

In addition to the difficulty of earthwork operations, consideration should be given to the fact that oversize (gravel, cobbles and boulders) material will be generated during earthwork operations. Consideration should be given to the subsequent reduction of the quantity of material available for use as fill, that oversize material could require off-hauling and/or that import material could be required to balance earthwork quantities or to attain proposed grades. If oversize material is proposed for use as fill, consideration should be given to the fact that screening will be required and that sufficiently large equipment will be necessary to properly place and compact such material (i.e. rock fills). Compaction approval during the placement of rockfills can only be achieved based on visual performance specifications established by the Geotechnical Engineer, which would increase on-site technician time and thus, in turn, increase the cost of inspection services.

The removal of large cobbles or boulders will result in undercutting of excavation sidewalls, and the resulting trench widths would be increased substantially and overbreak can occur. The presence of resistant bedrock could protrude into foundation areas, thereby requiring the drilling and epoxy of reinforcing steel. We anticipate that footings will need to be formed and that the footings could require to be stepped. The presence of oversize material will also affect the difficulty of fine grading operations and the use of a leveling course could be required to provide a smooth surface.

As previously noted, moderate to steep relief exists across the project site. Consideration should be given to the fact that increased earthwork will be necessary to attain level building pads, for accessways and for proper site drainage. Consideration should be given to cost constraints and/or the reduction of property available for development associated with development in areas with moderate to steep relief. The creation of slopes could reduce the amount of property available for development and require that construction off-sets (i.e. 25 feet minimum) be established. Additionally, transition areas could be created where footings bottom on a combination of cut native soils and compacted fill material areas and/or foundations may require to be stepped.

As previously mentioned, based on our investigation, we believe the earthquake faults illustrated as crossing the site are not considered to be Holocene Active (i.e. one which has moved recently within the last 10,000 years). Based on their inferred age, we believe that construction set-backs are not warranted for the majority of the faults; however, we do recommend construction setbacks on the order of 25 feet (from any occupied structure) be maintained across the 2 fault traces believed to be between 50,000 and 150,000 years old. Although the topographic map provided by C & M Engineering and Design, LTD. depicts the fault traces and construction off-sets across the property, detailed assessment of the fault alignments will require additional subsurface exploration (i.e. trenching).

Our investigation reveals that portions of the underlying material exhibit a potential for expansion. Expansive materials are subject to substantial volume changes (shrink and swell) with changes in moisture content. Changes in moisture content can occur as a result of seasonal variations in precipitation, landscape irrigation, broken or leaking water pipes and sewer lines, and/or poor site drainage. These volume changes can cause differential movements (settlement or heave) of foundations, interior slabs-on-grade, exterior flatwork (i.e. walkways, stoops and patios) and pavement sections.

One method to reduce the potential for movement is to remove (overexcavate) the expansive materials to a sufficient depth and replace them with approved compacted fill, thereby reducing the thickness of the expansive layer, providing surcharge, and maintaining moisture at a suitable and near constant level. In conjunction with overexcavation and filling, moisture conditioning of the exposed materials to a slightly over optimum moisture content will be needed.

Studies and experience have shown that minor movement of components can be expected, even if the recommended removal is followed, whenever underlying expansive materials are allowed to remain. Therefore, the intent of our recommendations is to control this movement without exceeding economic feasibility; however, the Owner or Developer should weigh the benefits of deeper removal.

In addition to their expansive characteristics, clayey soils also exhibit a lower Resistance Value and Modulus of Subgrade Reaction (k) than granular material. To reduce the thickness of aggregate base and to minimize future maintenance, within slab-on-grade, exterior flatwork and pavement areas, portions of these soils should be removed and replaced with approved compacted fill subbase.

Based on our investigation, we believe that free ground water will be encountered across portions of the site at relatively shallow depths. Consideration should be given to any deep over-excavations or trenches which may approach ground water elevations or areas of high moisture content such as the zone within 36 inches above ground water and any stabilization measures which may be necessary to achieve recommended compaction. Mobility and the use of vibratory or rubber tire equipment may be restricted in these areas.

Overbreak of trench sidewalls may occur and stabilization and/or dewatering may be needed to facilitate construction. Consideration should be given to any local ordinances which place constraints on the discharge of ground water and/or that permits may be required. Consideration should also be given to time constraints associated with the required drying of trench backfill prior to its reuse. Where the presence of ground water restricts compaction effort, free draining, crushed gravel may be necessary for reuse as backfill and, with the Manufacturer's approval, pipe bedding. During inclement weather, water may also become perched above any clayey, or other slowly permeable layer, resulting in a saturated near surface condition for prolonged periods and creating additional limitations on equipment mobility. As the presence of long-term moisture can create detrimental conditions, foundation drain systems should be considered to prevent the accumulation of any water against stemwalls or within crawlspaces. Waterproofing of below grade walls and protection of slabs-on-grade where moisture sensitive floor coverings are utilized should also be considered.

As previously mentioned, portions of the site are potentially susceptible to flooding and/or debris flow. Consideration should be given to both local and federal regulations which may impose construction constraints (such as requiring minimum finish floor elevations or ordinances banning basements within areas designated as lying in flood zones). Due to the constant revisions associated with flood zoning, the site delineation with respect to flood zoning should be verified with the most current mapping at the time of building permit application. Based on our understanding that considerable grading (i.e. filling) will be associated with project development, we believe that the potential for landslides, rockfalls or debris flows will be greatly reduced.

As noted during our site reconnaissance, previous exploratory pits exist along the western portions of the property. Consideration should be given to open pits which may be present, and/or the potential for loose fill material to exist associated with the backfill of remnant openings. Loose backfill can results in movement of structural components supported on these materials and, as such, within development areas, the backfill should be removed for its full depth and replaced with compacted, fill material as subsequently recommended.

The soil survey suggests that variable permeable soil, low load bearing strength, and susceptibility to frost heave may be additional constraints associated with the use of the underlying soils for urban development. Based on our understanding that the project site will utilize community water, sewer and storm drain systems, we do not believe that variable permeability will impact site development; however, permeability testing should be considered if retention/detention basins are proposed. Based on our anticipation that foundations will bottom at least 24 inches below lowest exterior ground surface and that proper site drainage and select subbase and aggregate base material will be provided in exterior flatwork and pavement areas, we do not believe that low load-bearing strength or frost action will adversely impact development.

As previously mentioned, studies regarding the presence of radon gas suggest the project site, as well as much of northern Nevada, is in an area which could exceed the action levels established by the Environmental Protection Agency. Determinations regarding the potential presence of radon gas should be considered prior to site development.

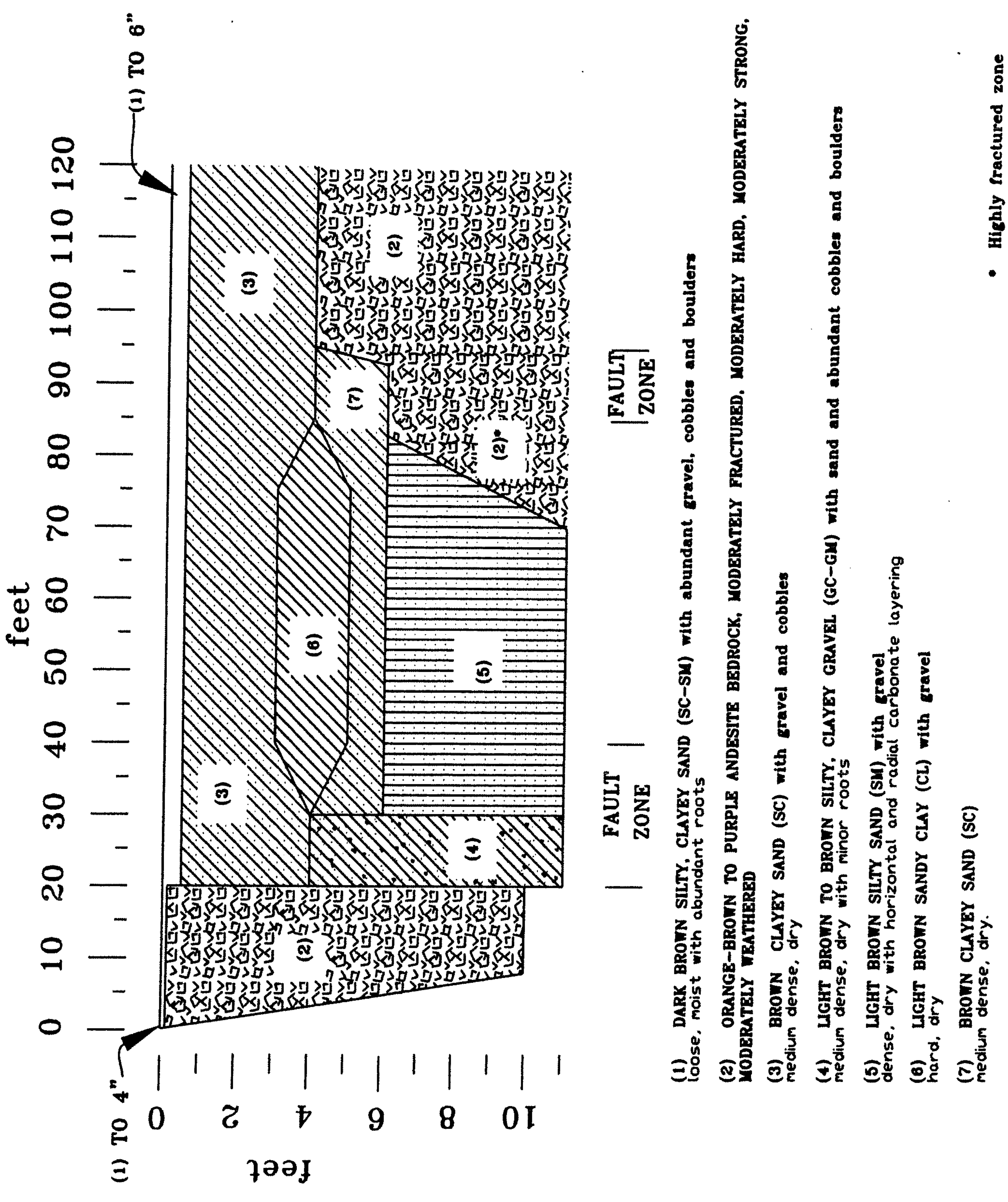
We recommend that the decision to further evaluate the potential for liquefaction and/or to implement any mitigation measures be weighed by the Owner or Developer once a final level geotechnical investigation report has been completed.

There are no other apparent geologic hazards which will place unusual constraints on the project; however, faults in the region are capable of generating strong earthquakes and strong ground shaking associated with earthquakes should be expected to occur during the life of the project.

VI ADDITIONAL GEOTECHNICAL ENGINEERING SERVICES

As previously mentioned, once design parameters, such as building location(s), finish floor elevations, structural loads and grading information have been established, a final geotechnical report will be provided.

VII ILLUSTRATIONS



Job No. 5344.01-N	FAULT TRENCH CROSS SECTION /appr./09-06-05	
Pezonella Associates, Inc Consulting Engineers 520 Edison Way Reno, Nevada 89502 PHONE (775) 856-5566 FAX (775) 856-6042	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA	Plate No. 2

*** Plasticity Chart**
(See Plate 8)
pH=7.32
SO_4=.049 ppm
Resistivity=12,345 Ohm-cm.

**** Particle Size**
Distribution Report
(See Plate 7)
pH=7.63
SO_4=3.39 ppm
Resistivity=7,874 Ohm-cm.

LOG OF STATION 400 + 00

Depth (ft) / Sample

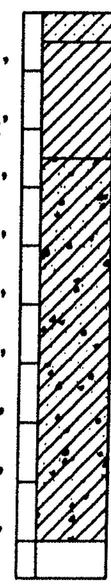
BROWN SANDY CLAY (CL) with gravel and cobbles hard, dry

ORANGE-BROWN SILTY GRAVEL (GM) with sand and cobbles very dense (cemented), dry

No Free Water Encountered

LOG OF STATION 800 + 00

Depth (ft) / Sample



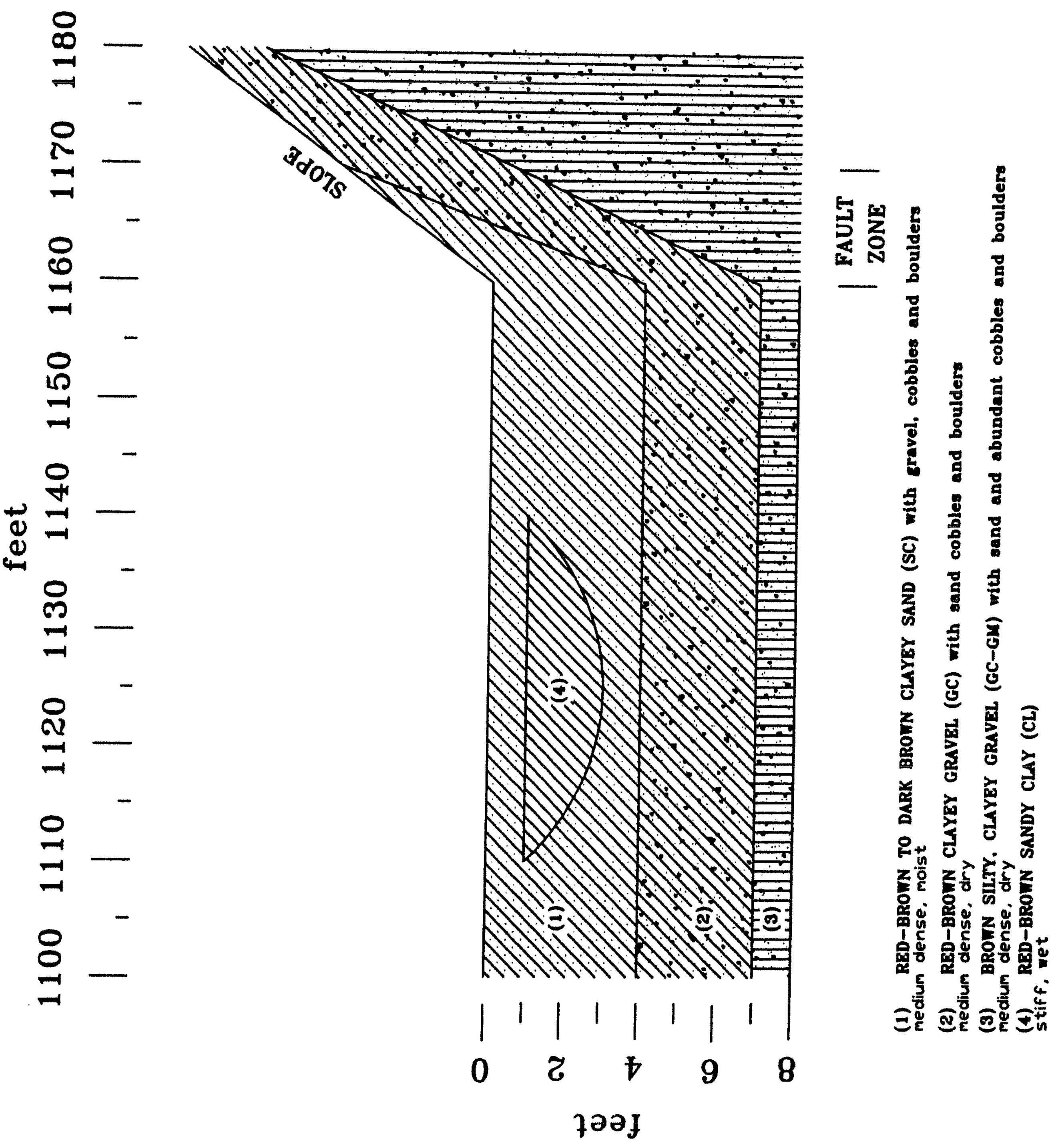
DARK BROWN CLAYEY SAND (SC) with gravel, cobbles and boulders loose, moist with roots

BROWN SANDY CLAY (CL) with gravel, cobbles and boulders hard, dry

BROWN SILTY, CLAYEY GRAVEL (GC-GM) with sand and abundant cobbles and boulders very dense (cemented), dry

No Free Water Encountered

Job No. 5344.01-N	TRENCH A - A' STATION LOGS /appr./09-06-05
Pezonella Associates, Inc Consulting Engineers 520 Edison Way Reno, Nevada 89502 PHONE (775) 856-6566 FAX (775) 856-6042	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA — Plate No. 3



Job No. 5344.01-N	FAULT TRENCH CROSS SECTION /appr./09-06-05
Pezonella Associates, Inc Consulting Engineers 520 Edison Way Reno, Nevada 89502 PHONE (775) 856-5566 FAX (775) 856-6042	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA — Plate No. 4

MAJOR DIVISIONS				TYPICAL NAMES
COARSE GRAINED SOILS (MORE THAN HALF IS LARGER THAN #200 SIEVE)	GRAVELS MORE THAN HALF COURSE FRACTION IS LARGER THAN No. 4 SIEVE SIZE	CLEAN GRAVELS WITH LITTLE OR NO FINES	GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
			GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH OVER 12% FINES	GM	SILTY GRAVELS, POORLY GRADED GRAVEL-SAND SILT MIXTURES
			GC	CLAYEY GRAVELS, POORLY GRADED GRAVEL-SAND-CLAY MIXTURES
	SANDS MORE THAN HALF COURSE FRACTION IS SMALLER THAN No. 4 SIEVE SIZE	CLEAN SANDS WITH LITTLE OR NO FINES	SW	WELL GRADED SANDS, GRAVELLY SANDS
			SP	POORLY GRADED SANDS, GRAVELLY SANDS
		SANDS WITH OVER 12% FINES	SM	SILTY SANDS, POORLY GRADED SAND-SILT MIXTURES
			SC	CLAYEY SANDS, POORLY GRADED SAND-CLAY MIXTURES
FINE GRAINED SOILS (MORE THAN HALF IS SMALLER THAN #200 SIEVE)	SILTS AND CLAY LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
			CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS SILTY CLAYS, LEAN CLAYS
			OL	INORGANIC CLAYS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SANDY OR SILTY SOILS, ELASTIC SILTS
			CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
			OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
BEDROCK				ANDESITE

UNIFIED SOIL CLASSIFICATION SYSTEM

SAMPLE DESIGN

■ "Undisturbed" Sample

☒ Bulk or Classification Sample

STRENGTH TESTS

VANE SHEAR TEST
F = Field
L = Laboratory

UNCONFINED COMPRESSION TEST

1000 DIRECT SHEAR TEST
CD = Consolidated Drain

Stress Normal to Shear Plane (psf)

1000 TRIAXIAL COMPRESSION TEST
UU = Unconsolidated - Undrained
CU = Consolidated - Undrained
CD = Consolidated - Drained

1/2 Deviator Stress
Confining Stress

KEY TO TEST DATA

Job No. 5344.01-N

SIERRA REFLECTIONS /appr./09-06-05

Pezonella Associates, Inc
Consulting Engineers
520 Edison Way Reno, Nevada 89502
PHONE (775) 856-5566 FAX (775) 856-6042

SOIL CLASSIFICATION CHART AND KEY TO TEST DATA

Plate No. 5

FRACTURING – Fractures include joints, faults and shears. Joints are fractures (no relative movement of rock on either side) and can be regular or irregular and discontinuous. Faults or shears are fractures on which movement has taken place.

Intensity	Fracture Spacing (ft)
Crushed	Less than 0.05
Intensely fractured	0.05 – 0.1
Closely fractured	0.1 – 0.5
Moderately fractured	0.5 – 1.0
Little fractured	1.0 – 4.0
Massive	Greater than 4.0

HARDNESS – Hardness and strength are in many ways interrelated and the meaning of the term depends on the use to which it is put. Hardness is evaluated with a pocket knife on an unfractured specimen. When equating mass hardness, the degree of fracturing should always be considered.

A. Soft – reserved for plastic material only

B. Low Hardness – can be gouged deeply or carved with a pocket knife

C. Moderately Hard – can be readily scratched by a knife blade, scratch leaves heavy traces of dust and is readily visible after the powder has been blown away.

D. Hard – can be scratched with difficulty, scratch produces little powder and is often faintly visible.

E. Very Hard – cannot be scratched with pocket knife, leaves metallic streak.

STRENGTH – The strength of rock visually evaluated in the field is somewhat subjective in that it depends upon the observer's interpretation and of the response of unfractured specimens to hammer blows. Consistency between observers can be evaluated through laboratory test results.

A. Plastic – material deforms with hammer blows without fracturing

B. Friable– crumbles by rubbing with fingers.

C. Moderately Strong – specimen will withstand few heavy hammer blows before breaking.

D. Strong – Specimen will withstand a few heavy ringing hammer blows and usually yields large fragments.

E. Very Strong – Rock will resist heavy ringing hammer blows and will yield with difficulty only dust and small flying fragments.

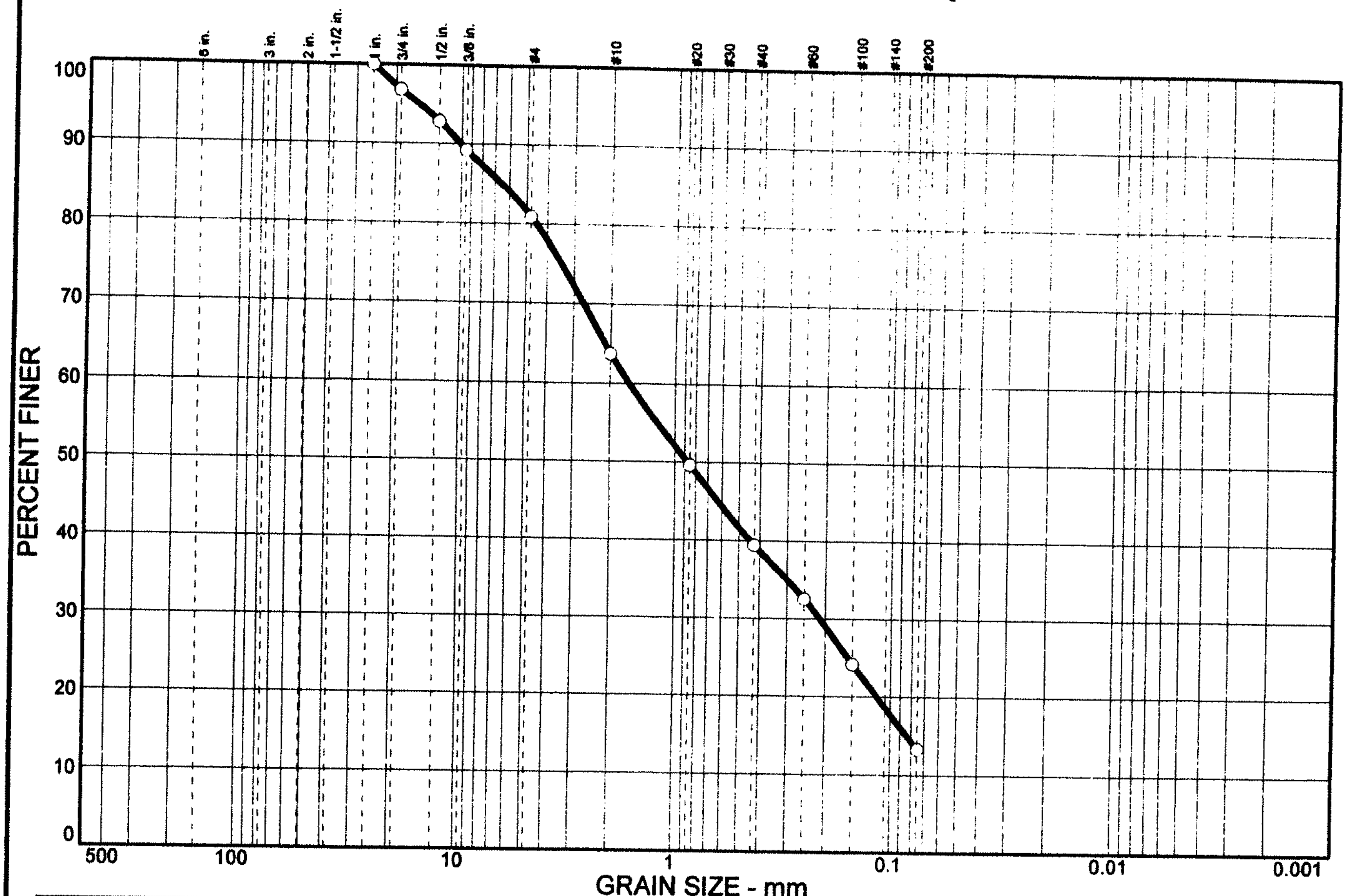
WEATHERING –

	DEEP	MODERATE	LITTLE	FRESH
DECOMPOSITION	moderate to complete	affects only slight change in minerals	no megascopic decomposition of minerals	unaffected by weathering agents
DISCOLORATION	deep and thorough	moderate or localized and intense	slight and intermittent or localized	unaffected by weathering agents
FRACTURE CONDITION Minerals Present	all fractures extensively coated with oxides, carbonates, or clay or silt	moderately coated	few stains on fracture surfaces	unaffected by weathering agents

NOTE: The physical and chemical disintegration and decomposition of rocks and minerals by natural processes such as oxidation reduction, hydration, solution, carbonation, and freezing and thawing.

Job No. 5344.01-N	ROCK AND WEATHERING CLASSIFICATION CRITERIA	/appr./09-06-05
Pezonella Associates, Inc Consulting Engineers 520 Edison Way Reno, Nevada 89502 PHONE (775) 856-5566 FAX (775) 856-6042	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA	Plate No. 6

Particle Size Distribution Report



% COBBLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0.0	3.2	15.9	17.2	24.3	26.1	13.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1 in.	100.0		
3/4 in.	96.8		
1/2 in.	92.8		
3/8 in.	89.2		
#4	80.9		
#10	63.7		
#20	49.6		
#40	39.4		
#60	32.5		
#100	24.1		
#200	13.3		

* (no specification provided)

Soil Description

Brown silty sand (SM) with gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{85}= 6.53 D_{60}= 1.64 D_{50}= 0.873
D_{30}= 0.213 D_{15}= 0.0840 D_{10}=
C_u= C_c=

Classification

USCS= (SM) AASHTO=

Remarks

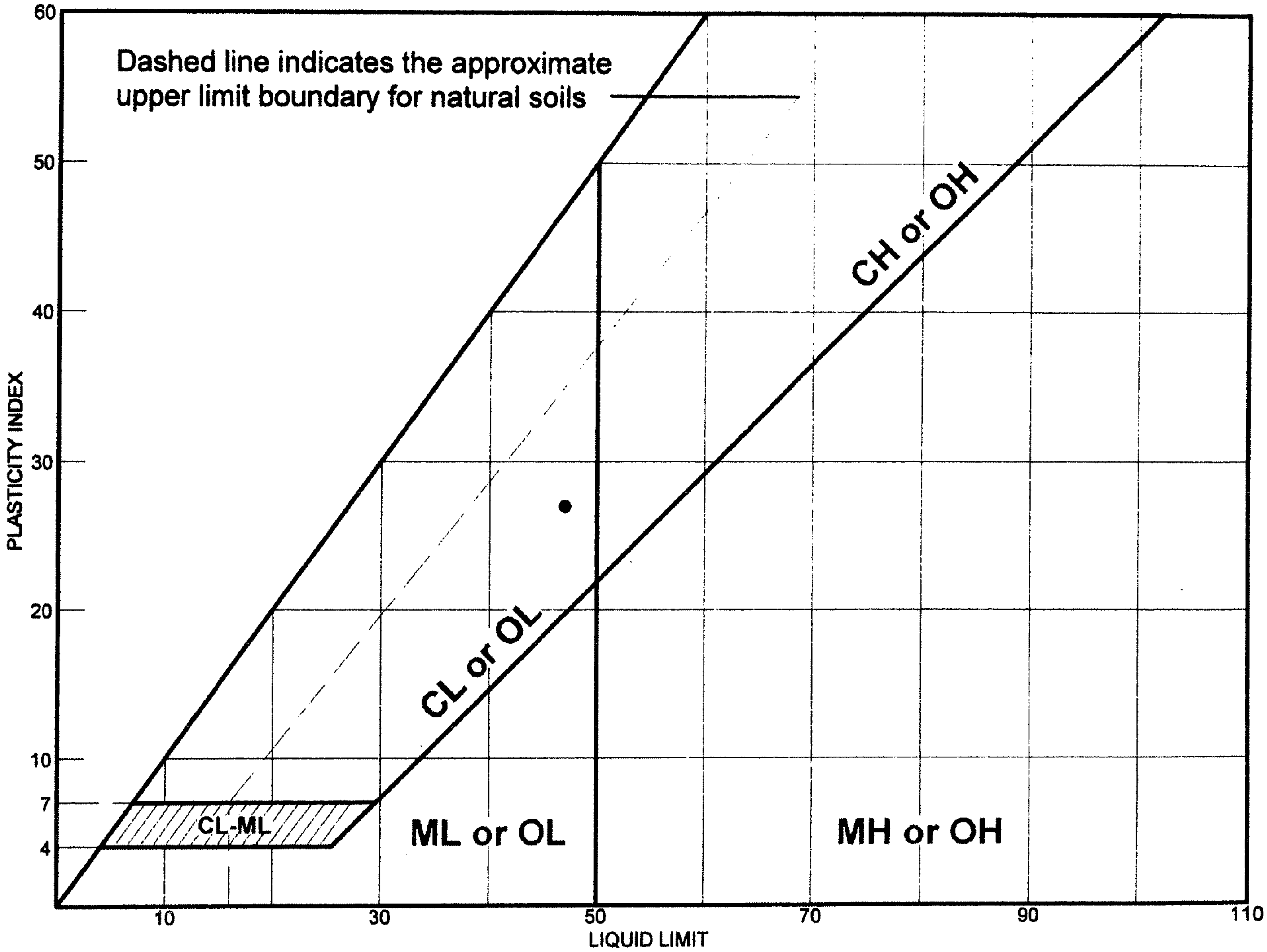
Non-plastic. Material would not break down during soaking and washing

Sample No.: 065 **Source of Sample:** Fault #1, Trench A-A', Station 400.00 **Date:** 02-25-05
Location: **Elev./Depth:** 4.5 feet

PEZONELLA ASSOCIATES, INC.

Client:
Project: Sierra Reflections
Project No: 5344.01-N **Plate** 7

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Brown sandy clay (CL)	47	20	27		57.1	(CL)

Project No. 5344.01-N **Client:**

Project: Sierra Reflections

● **Source:** Fault #1, Trench A-A', **Sample No.:** 066 **Elev./Depth:** 2.0 feet

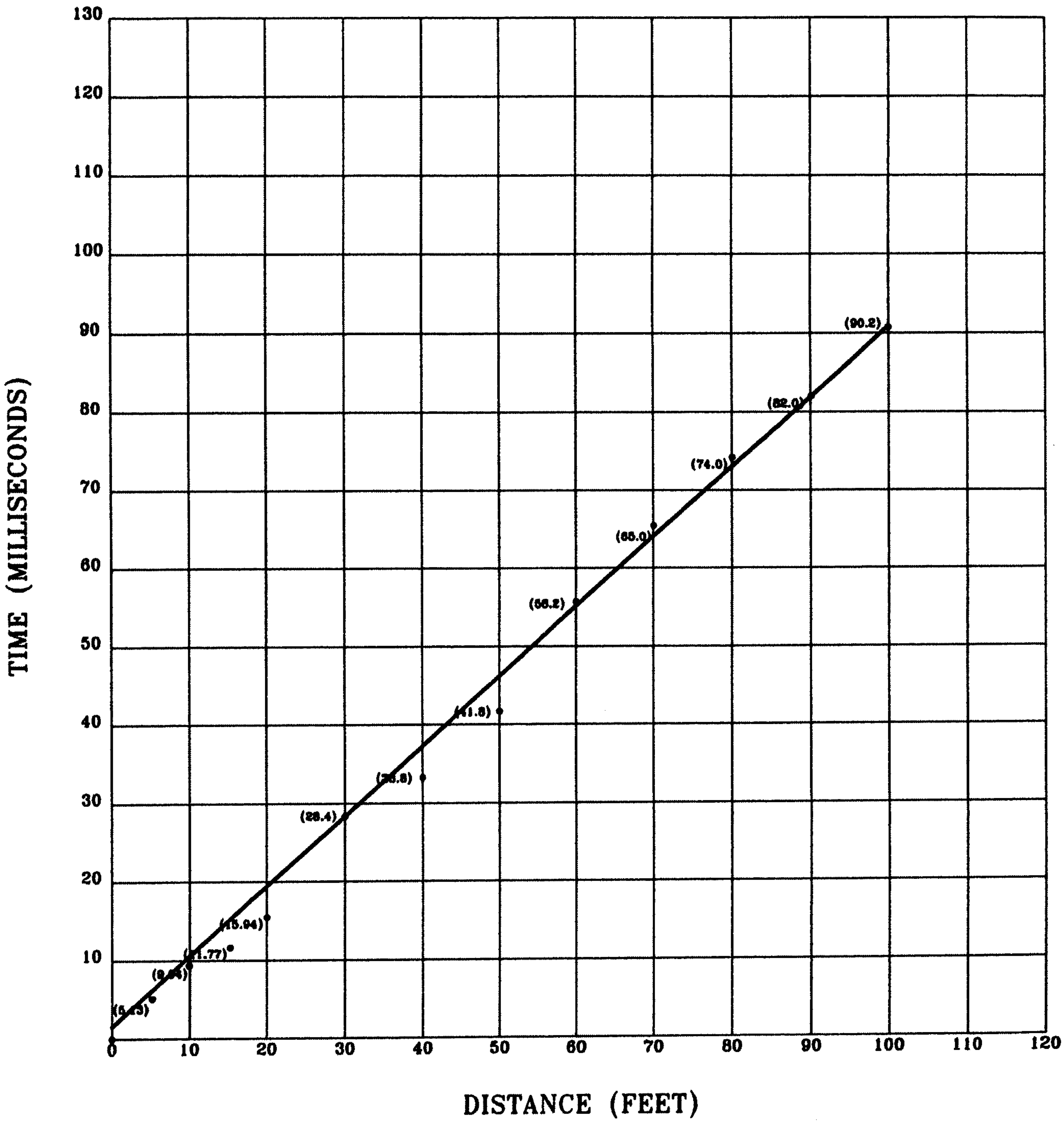
Remarks:

●

LIQUID AND PLASTIC LIMITS TEST REPORT

PEZONELLA ASSOCIATES, INC.

Plate 8



V = Velocity of Primary Wave

D_i = Depth to Velocity Transition

D_1 N/A

D_2 ______

V_1 1,119 ft/sec

V_2 ______

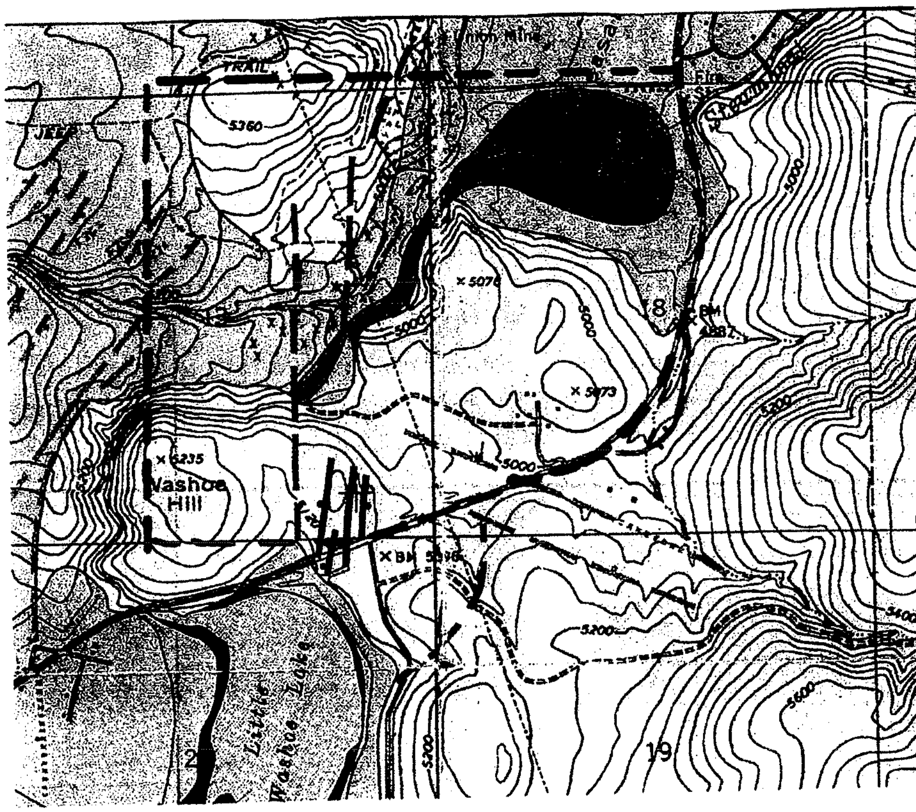
V_3 ______

GPS: 39° 20.357' N 119° 47.297' W

0 feet to 100 feet SW to NE

Job No. 5344.01-N	SEISMIC PROFILE C - C'	CDB/appr./09-06-05
Pezonella Associates, Inc Consulting Engineers 520 Edison Way Reno, Nevada 89502 PHONE (775) 856-6586 FAX (775) 856-6042	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA	Plate No. 9

Map below from Nevada Bureau of Mines and Geology Washoe City Folio, Geologic Hazards Map



LEGEND

RED — Approximate site boundaries

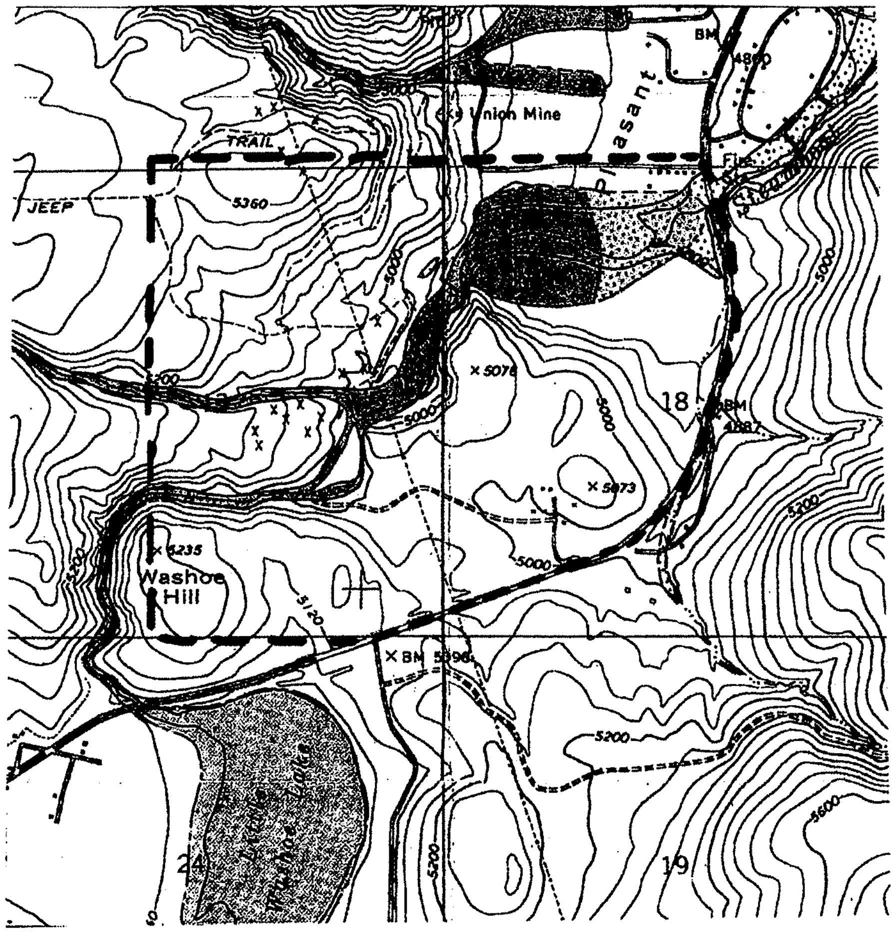
OCHRE — Last movement probably less than 50,000 - 150,000 years ago. Possibly less than 10,000 years ago.
SOLID: Location definite
DASHED: Location inferred

CHARTREUSE — Last movement probably less than 800,000 years ago. Possibly less than 50,000 - 150,000 years ago.
SOLID: Location definite
DASHED: Location inferred

BLACK — Last movement probably less than 12 million years ago. No evidence of recent movement.
SOLID: Location definite
DASHED: Location inferred

Job No. 5344.01-N	GEOLOGIC HAZARDS	/appr./09-06-05
Pezonella Associates, Inc Consulting Engineers	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA	Plate No. 10

Map below from Nevada Bureau of Mines and Geology
Washoe City Folio, Flood and Related Debris Flow Hazards Map



LEGEND

RED
Approximate site boundaries

PINK
Abundant debris movement including numerous boulders — area probably subject to large quantities of debris, including numerous large boulders, during intense flooding; may receive substantial quantities of mostly fine-grained debris during moderate and minor flooding

ORANGE
Abundant debris movement including few boulders — area probably subject to large quantities of debris, including mostly fine-grained sediment with possibly some boulders, during intense flooding; may receive small quantities of fine-grained sediment during moderate and minor flooding

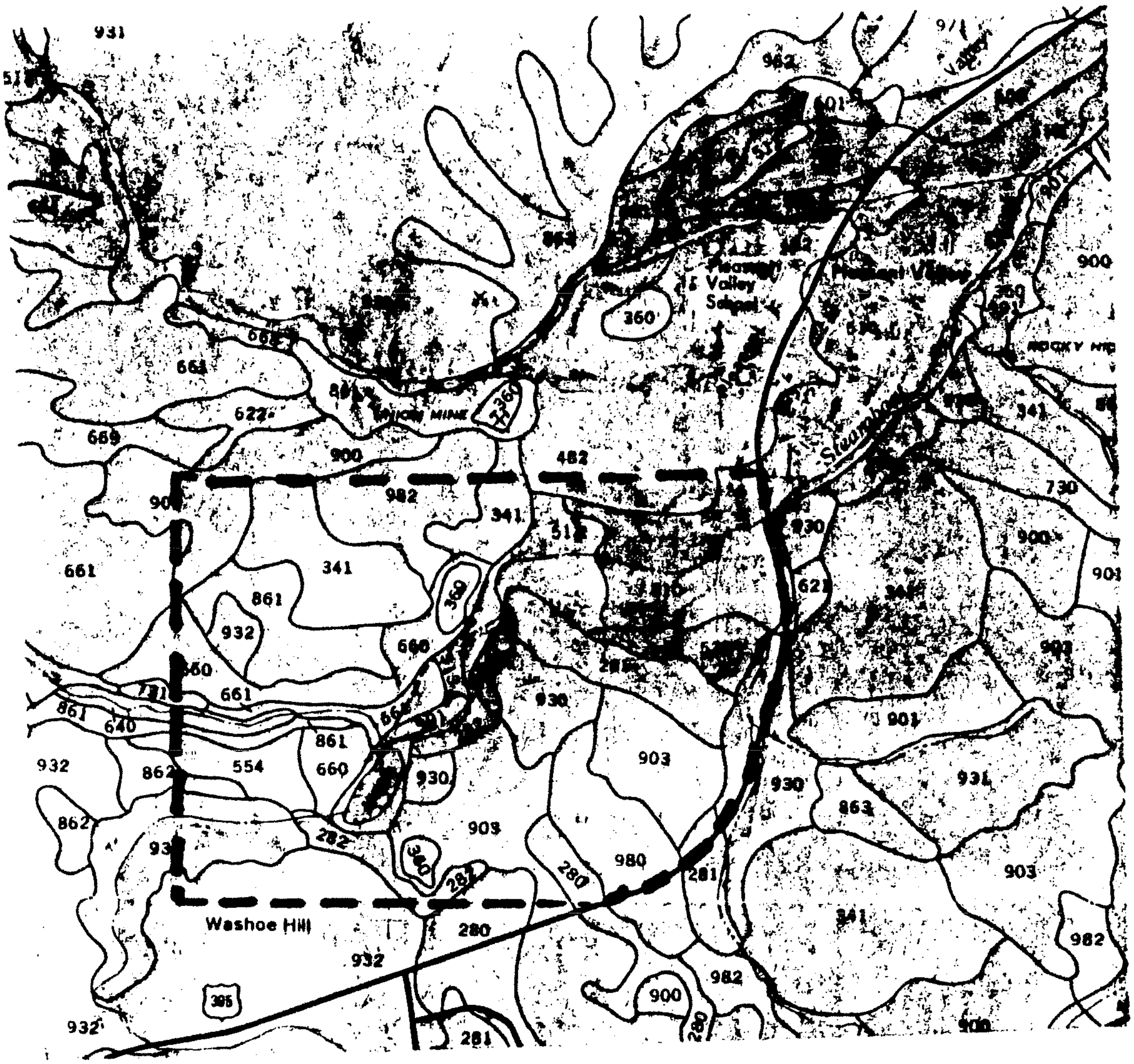
TAN
Light to moderate debris movement of fine-grained sediment — area probably subject to small to moderate quantities of mostly fine-grained debris during intense flooding; may receive minor amounts of fine-grained sediment during moderate and minor flooding

Increasing Potential Hazard

Approximate boundary of debris movement area when different from flood-plain boundaries

Job No. 5344.01-N	FLOOD HAZARDS	/appr./09-06-05
Pezonella Associates, Inc Consulting Engineers	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA	Plate No. 11

Map below from U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE
SHEET No. 30
WASHOE COUNTY, SOUTH PART, NEVADA



LEGEND

▬▬▬▬▬▬ Approximate site boundaries

Job No. 5344.01-N	SOIL SURVEY	/appr./09-06-05
Pezonella Associates, Inc Consulting Engineers 580 Edison Way Reno, Nevada 89502 PHONE (775) 856-5566 FAX (775) 856-6042	SIERRA REFLECTIONS WASHOE COUNTY, NEVADA	Plate No. 12

VIII GLOSSARY OF TEST PROCEDURES

ASTM Test Designation: C 136: *Standard Test Methods for Sieve Analysis of Fine and Coarse Aggregates.*

ASTM Test Designation: D 1140: *Standard Test Methods for Amount of Material in Soils Finer Than the No. 200 (75-um) Sieve.*

ASTM Test Designation: D 2487: *Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).*

ASTM Test Designation: D 4318: *Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.*

IX DISTRIBUTION

Unbound original and two bound copies to:

World Properties, USA
4100 Joy Lake Road
Reno, Nevada 89511-9725
Attention: Mr. Fred Woodside, COF
Telephone: (775) 849-9070
Facsimile: (775) 849-3919

&

One unbound copy to:

C & M Engineering and Design, LTD
9498 Double R Boulevard, Suite B
Reno, Nevada 89521
Attention: Mr. Sam Chacon, PE
Telephone: (775) 856-3312
Facsimile: (775) 856-3318

SANITARY SEWER REPORT

SIERRA REFLECTIONS SUBDIVISION

WASHOE COUNTY, NV

JUNE 2022

EST. 1981

CFA, INC.
1150 CORPORATE BLVD.
RENO, NV 89502

PROFESSIONAL ENGINEER - STATE OF NEVADA
KATHLEEN
KNIGHT
Exp: 6/30/23
CIVIL
No. 26935

6/13/22

21126.01

INTRODUCTION

This report presents the results of the sanitary sewer analysis for the Sierra Reflections Subdivision, located in between Interstate 580 and US 395A, just north of Little Washoe Lake. (Reference Vicinity Map – Appendix B). The project site is zoned as a mix of Medium Density Suburban (MDS), Medium Density Rural (MDR), and General Rural (GR). Site improvements will include 944 single family homes, public roadways, and storm drain and sanitary sewer infrastructure on approximately 631.5 acres. Sewer waste generated from this project will discharge to an existing 8-inch PVC public sanitary sewer main located in Copperleaf Drive and owned by the City of Reno (COR).

EXISTING SITE DESCRIPTION

The existing site consists of 25 mostly undeveloped parcels containing unpaved roads and several abandoned buildings. Steamboat Creek and Browns Creek cross through the project site.

PROPOSED DEVELOPMENT DESCRIPTION

The Sierra Reflections subdivision consists of 944 single-family residences, a public roadway network, site improvements and utilities to include a sanitary sewer system and lift station.

DESIGN CRITERIA & ANALYSIS

Design criteria for this analysis was taken from the *Washoe County Community Development Services Department, "Engineering Design Standards Section 2 – Gravity Sewer Collection Design Standards"*, Revised March 2016. A peak sewage contribution of 764,640 gallons per day (gpd) has been calculated for the project based on the design criteria of 270 gallons per unit per day for 944 units with a peaking factor of 3 (See Table 1 for Calculations). Pipe flow characteristics were computed using the Manning equation with an "n" value of 0.012. The depth of the design peak flow is not to exceed 0.8D where D is the inside diameter of the pipe (80% capacity), and the velocity is to be no less than 2.5 feet per second (fps) when flowing half full.

EXISTING SANITARY SEWER SYSTEM

Currently the proposed development has zero (0) sewer contribution however the existing 462 parcels upstream of the proposed development contribute a calculated 374,220 gpd to the existing 8" sanitary sewer main (main) in St. James Pkwy which meets the Washoe County requirement not to exceed 80% capacity. All FlowMaster pipe calculations can be found in Appendix A.

PROPOSED SYSTEM

The proposed development will consist of 944 single family residences divided into 3 sections (see Appendix C) with the following parameters:

Section Number	# of Residences	Peak Flow (gpd)	Sewer Main Size	Min Pipe Slope
1	614	497,340	8"	0.5%
2	225	182,250	8"	0.5%

21126.01

3	105	85,050	8"	2%
Total	944	779,220		

All proposed sanitary sewer mains will be fed by laterals and connect to the proposed 10" main in St. James Parkway before feeding into the proposed lift station.

CONCLUSIONS

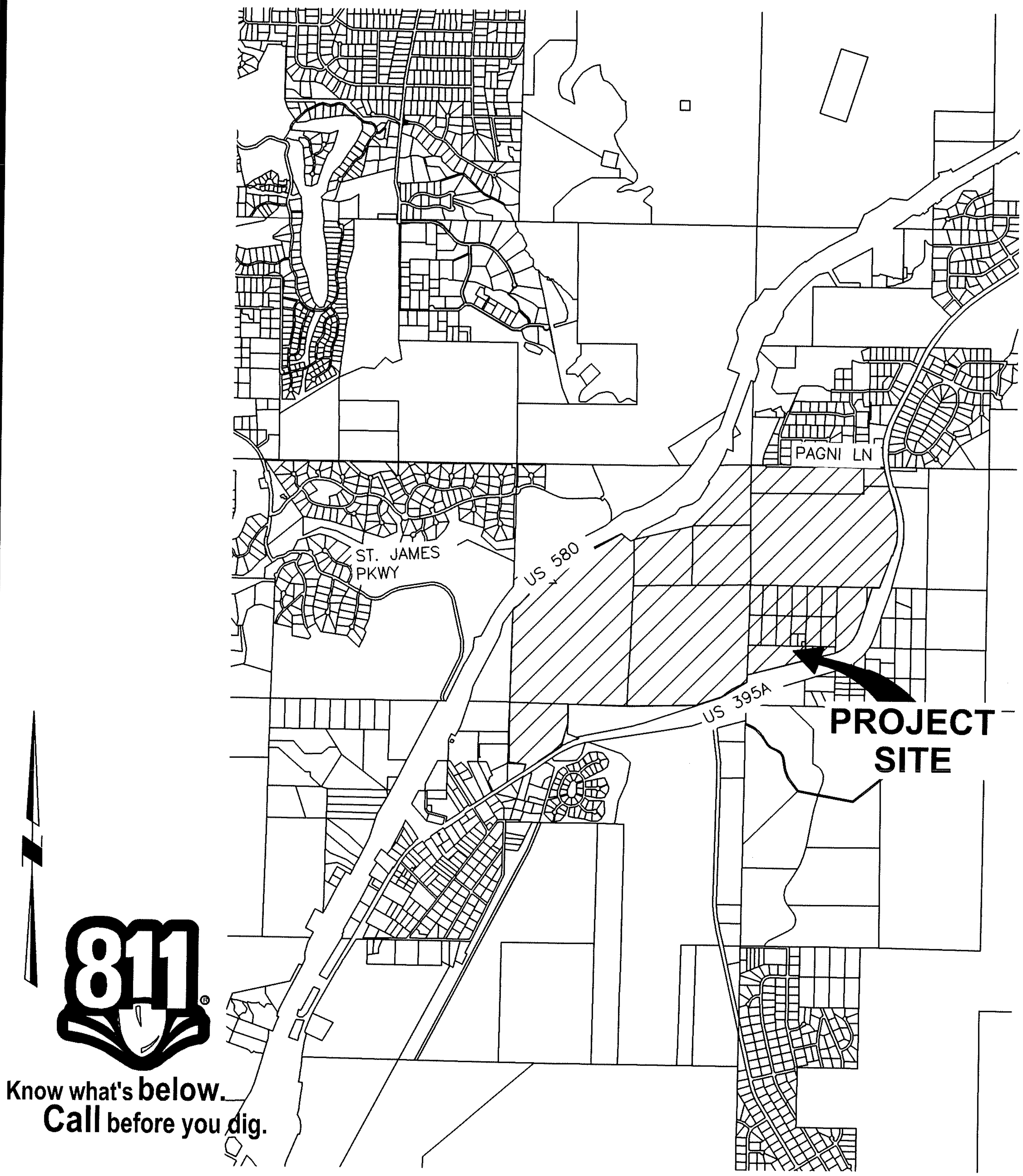
The proposed sanitary improvements for the Sierra Reflections Subdivision will be constructed per Washoe County standards. Based on our analysis, we conclude that the proposed 8" and 10" mains will have adequate capacity to convey the projected flows at appropriate velocities and pipe capacities the 80%. The 10" main having a peak flow of 1,138,860 gpd while having a max capacity flow of 2,224,023 gpd. Furthermore, we expect the existing infrastructure, from site to interceptor, will have adequate capacity to convey the increased sewage from the Sierra Reflections Subdivision.

APPENDIX A
CALCULATIONS

SIERRA REFLECTIONS SUBDIVISION Report

Label	Channel Slope (%)	Diameter (in)	Discharge (gal/day)	Percent Full (%)	Velocity (ft/s)
10IN MAX 2.2%	2.20000	10.00	1138860.00	50.0	6.46
10IN 80% 2.2%	2.20000	10.00	2224023.34	80.0	7.36
8IN MAX 2%	2.00000	8.00	1169543.28	80.0	6.04
8IN 80% 2%	2.00000	8.00	454410.00	42.7	4.94
EX 8IN 80% 2%	2.00000	8.00	374220.00	38.4	4.69
EX 8IN MAX 2%	2.00000	8.00	1169543.28	80.0	6.04
8IN MAX 0.5%	0.50000	8.00	584771.64	80.0	3.02
8IN 80% 0.5%	0.50000	8.00	679590.00	80.0	3.02
10IN MIN SLOPE 0.5%	0.20542	10.00	679590.00	80.0	2.25
8IN 80% MIN%	0.67529	8.00	679590.00	80.0	3.51
10IN MAX 0.5%	0.50000	10.00	1060261.53	80.0	3.51
10IN 80% 0.5%	0.50000	10.00	679590.00	57.4	3.25

APPENDIX B
VICINITY MAP



X:\PROJECTS\21126.01\DWG\ENGR\EXHIBITS\SEWER VICINITY 2.DWG <APOROLI> 6/13/2022 12:29 PM

cfa
1150 CORPORATE BLVD.
RENO, NV 89502
(775) 856-1150

MONTEBELLO APARTMENTS

VICINITY MAP

WASHOE COUNTY, NEVADA

SHEET 1 OF 1

APPENDIX C
PROPOSED SEWER INFRASTRUCTURE AND CONNECTION

811
Know what's **below.**
Call before you dig.

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RENO, NV 89502
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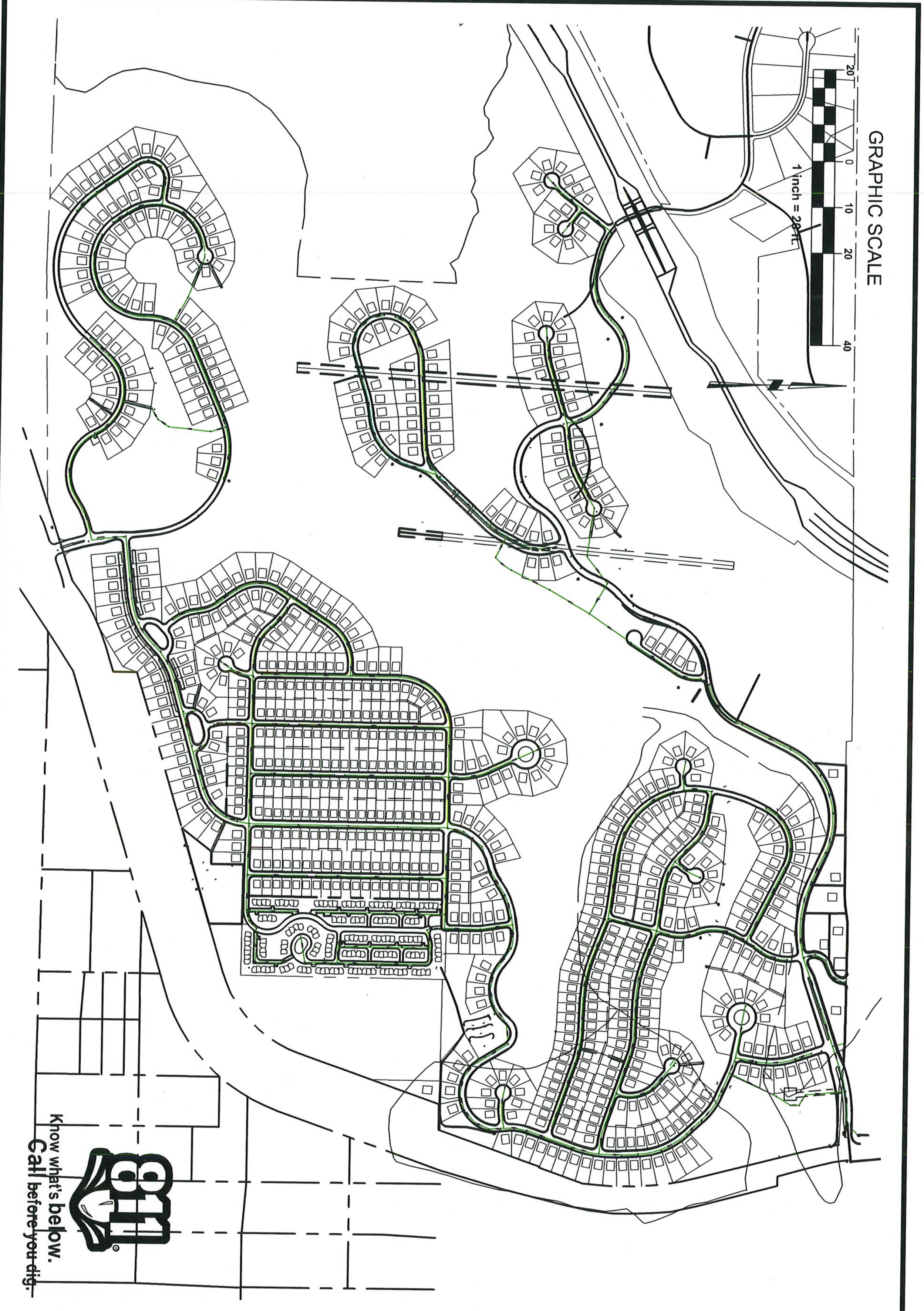
SIERRA REFLECTIONS SUBDIVISION

VICINITY MAP

SHEET 1 OF 1



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SHEET 1 OF 1

JOB NO. 21126.01
DESIGNED BY AP
CHECKED BY KK
DATE 6-10-2022

SIERRA REFLECTIONS SUBDIVISION

PROPOSED SEWER EXHIBIT

SANITARY SEWER REPORT

WASHOE COUNTY NEVADA

cfa
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RENO, NV 89502
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TRAFFIC IMPACT STUDY

FOR

Sierra Reflections – Phase 1

April 29, 2022

PREPARED FOR:

St. James Village, Inc.

PREPARED BY:

HEADWAY
TRANSPORTATION

PROFESSIONAL ENGINEER-STATE OF NEVADA
LOREN
EDWARD
CHILSON
Exp: 12.31.22
CIVIL
No. 15619

4.29.22

Headway Transportation, LLC
5482 Longley Lane, Suite B, Reno, Nevada 89511
775.322.4300
www.HeadwayTransportation.com

YOUR QUESTIONS ANSWERED QUICKLY

Why did you perform this study?

This Traffic Impact Study evaluates the potential traffic impacts associated with the proposed Sierra Reflections project (both phase 1 and buildout) in Washoe County, Nevada. The development of up to six (6) single-family lots was evaluated in phase 1 ("existing plus phase1 project" analysis).

The primary purpose of this study, however, is to determine the long-term configuration of the Pagni Lane (future St. James Parkway)/US 395 Alternate intersection with the buildout of Sierra Reflections and the buildout of St. James Village (with the completion of St. James Parkway connecting the two projects). The buildout scenario was evaluated in the "future plus buildout project" traffic impact analysis, for planning purposes, to assist in determining what traffic controls or mitigations may be needed to reduce potential impacts at the Pagni Lane (future St. James Parkway)/US 395 Alternate intersection.

What does the project consist of?

The project consists of an initial phase of up to six (6) one-acre single family lots (Phase 1), and a future buildout of a total of 938 dwelling units within Sierra Reflections (791 SFR homes and 147 attached townhomes).

How much traffic will the project generate?

The project is anticipated to generate approximately 8,451 Daily, 613 AM peak hour, and 819 PM peak hour trips to the external roadway network.

How will project traffic affect the roadway network?

Under Existing Plus (Phase 1) Project conditions, the study intersection is expected to operate within policy level of service thresholds with all movements functioning at LOS B or better.

Under Future Year Plus (buildout) Project conditions, the St. James Parkway approach is expected to deteriorate to LOS E. While this is still within policy level of service thresholds for side street approach operations at unsignalized intersections, improvements to the intersection should be made given the high vehicle volumes on the St. James Parkway approach and the high vehicle speeds on US 395 Alternate.

Are any improvements recommended?

No improvements to the study intersection are recommended for Phase 1.

In the interim period (following the completion of Phase 1, but prior to the side street approach reaching LOS D), the existing Pagni Lane approach is recommended to be widened and restriped to include two

eastbound turning lanes. This will provide an interim LOS benefit to the existing Pagni Lane intersection approach prior to the recommended buildout improvement.

For buildout of Sierra Reflections, a traffic signal or roundabout improvement is recommended at the St. James Parkway/US 395 Alternate intersection due to the anticipated high vehicle volumes on the St. James Parkway approach and the high vehicle speeds on US 395 Alternate. St. James Parkway is recommended to be aligned to intersect with US 395 Alternate between the existing Pagni Lane intersection and Steamboat Creek to enable either a traffic signal or roundabout to be constructed without impacting adjacent private properties.

A traffic signal should not be installed until MUTCD traffic signal warrants are met. A roundabout could be installed unrelated to traffic signal criteria but would not be necessary until the side street approach at Pagni Lane or St. James Parkway exceeded LOS D. The preliminary roundabout concept is shown in **Figure 8**.

In addition, the project will pay standard Regional Road Impact Fees (RRIFs) of approximately $4.25 million (based on the current fee schedule) as mitigation for impacts on the regional roadway network.

LIST OF FIGURES

LIST OF APPENDICES

INTRODUCTION

This report presents the findings of a Traffic Impact Study completed to assess the potential traffic impacts on the Pagni Lane/US 395 Alternate intersection associated with the Sierra Reflections project in Washoe County, Nevada. This traffic impact study has been prepared to document existing traffic conditions, quantify traffic volumes generated by the proposed project (and a portion of the neighboring St. James Village project), identify potential impacts, document findings, and make recommendations to mitigate impacts, if any are found. The location of the project is shown on **Figure 1** and the preliminary site plan for the overall project is shown on **Figure 2**.

Study Area and Evaluated Scenarios

The project consists of an initial phase of up to six (6) one-acre single family lots (Phase 1), analyzed with existing traffic volumes and existing lane configurations and traffic controls to verify operations meet standards. The project also consists of a future buildout of a total of 938 dwelling units within Sierra Reflections (791 SFR homes and 147 attached townhomes).

The project is located in Pleasant Valley, west of US 395 Alternate, east of Interstate 580, and north of Washoe Lake. The study intersection was identified based on a condition of the project's First Final Map which requires long-term planning of the Pagni Lane (future St. James Parkway)/US 395 Alternate intersection. This study intersection is shown on **Figure 1**.

The following intersection is included in this study:

- Pagni Lane (future St. James Parkway)/US 395 Alternate

This study includes analysis of both the weekday AM and PM peak hours as these are the periods of time in which peak traffic is anticipated to occur. The evaluated development scenarios are:

- Existing Conditions
- Existing Plus Project Conditions (up to 6 SFR lots for first tentative map – Phase 1)
- Future Year Conditions (20-year horizon)
- Future Year Plus Project Conditions (buildout of Sierra Reflections & St. James Village)

ANALYSIS METHODOLOGY

Level of service (LOS) is a term commonly used by transportation practitioners to measure and describe the operational characteristics of intersections, roadway segments, and other facilities. This term equates seconds of delay per vehicle at intersections to letter grades "A" through "F" with "A" representing optimum conditions and "F" representing breakdown or over capacity flows.

Intersections

The complete methodology for intersection level of service analysis is established in the *Highway Capacity Manual (HCM), 6th Edition* published by the Transportation Research Board (TRB). **Table 1** presents the delay thresholds for each level of service grade at signalized and unsignalized intersections.

Table 1: Level of Service Definition for Intersections

Level of Service	Brief Description	Average Delay (seconds per vehicle)	
		Signalized Intersections	Unsignalized Intersections
A	Free flow conditions.	< 10	< 10
B	Stable conditions with some affect from other vehicles.	10 to 20	10 to 15
C	Stable conditions with significant affect from other vehicles.	20 to 35	15 to 25
D	High density traffic conditions still with stable flow.	35 to 55	25 to 35
E	At or near capacity flows.	55 to 80	35 to 50
F	Over capacity conditions.	> 80	> 50

Source: *Highway Capacity Manual, 6th Edition*

Level of service calculations were performed for the study intersections using the Synchro 11 software package or SIDRA for roundabout analysis, with analysis and results reported in accordance with *HCM* methodology.

Level of Service Policy

<u>Nevada Department of Transportation</u>

The Nevada Department of Transportation (NDOT) *Traffic Impact Study Requirements* publication states:

> *Level of service "C" will be the design objective for capacity and under no circumstances will less than level of service "D" be accepted for site and non-site traffic*

Hence, LOS "D" was used as the threshold criteria for this analysis.

Traffic engineering practitioners recognize that LOS E/F conditions for the side street approach, during the peak hour(s), does not necessarily indicate an intersection failure or the need for mitigation. This condition (LOS E/F for a minor side-street approach) commonly exists throughout urban and suburban areas and is manageable in most cases.

EXISTING CONDITIONS

Roadway Facilities

A brief description of the key roadways in the study area is provided below.

US 395 Alternate is generally a north-south, four-lane (two lanes in each direction with center turn lane in the study area) highway that connects Reno and Carson City via access to Interstate 580 to the north in Reno and Interstate 580 to the south in Washoe Valley. US 395 Alternate "Old US 395" is classified as a Minor Arterial by NDOT. The posted speed limit in the project area is 50 mph.

Pagni Lane in the project area is generally an east-west local roadway with two lanes (one lane in each direction) which provides access to existing Pleasant Valley residential areas located west of US 395 Alternate. The *2050 RTP* classifies Pagni Lane as a Local Road. The posted speed limit is 25 mph.

Bicycle & Pedestrian Facilities

Class 2 bike lanes, approximately 5 feet wide, exist in both direction along US 395 Alternate. No other pedestrian or bicycle facilities are present in the project area.

Transit Facilities

There is currently no public transit service in the project area.

Crash History

Vehicle crash data is available from NDOT and includes information from the October 2015 to October 2020 five-year period (the most current data available). There was one (1) reported accident during this time period, which involved one vehicle that veered off the road and sustained property damage only. Driving too fast for conditions was listed as the primary factor of the crash. The detailed record of this crash received from NDOT is included in this report as **Appendix A.**

Traffic Volumes

AM and PM peak hour traffic volumes were collected at the study intersection in February of 2022. To adjust for monthly variations in traffic volume, a factor of 1.036 was applied to the raw count data so that the volumes would be representative of average annual weekday volumes. This adjustment factor was based on data from NDOT's Automatic Traffic Recorder (ATR) No. 0312350 located on US 395 Alternate just north of the East Lake Boulevard intersection. The adjusted existing AM and PM peak hour intersection turning movement volumes are shown on **Figure 3.**

Intersection Level of Service Analysis

Existing AM and PM peak hour intersection level of service analysis was performed for the study intersection using Synchro 11 analysis software. The existing intersection lane configurations and controls are shown on **Figure 3.** The existing center turn lane on US 395 Alternate functions as a two-stage left turn for traffic turning left from Pagni Lane onto US 395 Alternate. **Table 2** shows the existing conditions level of service results, and the technical calculations are provided in **Appendix B.**

Table 2: Existing Intersection Level of Service

Int. ID	Intersection	Control	AM		PM	
			Delay[1]	LOS	Delay[1]	LOS
1	Pagni Lane	Side Street Stop				
	Eastbound Approach		10.8	B	12.5	B
	US 395 Alternate					
	Northbound Left		7.8	A	8.7	A

Notes: 1. Delay is reported in seconds per vehicle for the worst approach/movement for side street stop-controlled intersections.
Source: Headway Transportation, 2022

As shown in the **Table 2**, the existing study intersection currently operates at LOS B or better (within policy level of service thresholds) during the AM and PM peak hours.

PROJECT CONDITIONS

Trip Generation

Trip generation rates from *Trip Generation Manual, 11th Edition* published by the Institute of Transportation Engineers (ITE) were used to develop trip generation estimates for the proposed project based on the Multifamily Housing and Single-Family Housing rates. **Table 3** shows the Daily, AM peak hour, and PM peak hour trip generation estimates.

Table 3: Trip Generation Estimates

Land Use (ITE Code)	Size[1]	Trips[2]				
		Daily	AM	AM In/Out	PM	PM In/Out
Phase 1 (6 Single Family Homes)						
Single Family Housing (210)	6 du	57	4	1 / 3	6	4 / 2
Build Out of Sierra Reflections						
Multifamily Housing (220)	147 du	991	59	14 / 45	75	47 / 28
Single Family Housing (210)	785 du	7,403	550	143 / 407	738	465 / 273
Total Project Trips:		8,451	613	158 / 455	819	516 / 303
50% of St. James Village Buildout (444 single family homes total)						
Single Family Housing (210)	222 du	2,093	155	40 / 115	209	132 / 77
Total Non-Project Trips:		2,093	155	40 / 115	209	132 / 77

Notes: 1. du = dwelling units; 2. Trips were calculated based on the following rates per du: SFH = Daily – 9.43; AM – 0.70 (26% in / 74% out); PM – 0.94 (63% in / 37% out); MFH = Daily – 6.74; AM – 0.40 (24% in / 76% out); PM – 0.51 (63% in / 37% out)

Source: Headway Transportation, 2022

As shown in **Table 3**, the Sierra Reflections project is expected to generate 8,451 Daily, 613 AM peak hour, and 819 PM peak hour trips.

Buildout at St. James Village includes a connection of St. James Parkway through Sierra Reflections to US 395 Alternate. At buildout of St. James Village (444 SFR units), it was assumed that 50 percent (222 SFR units) would use St. James Parkway to access US 395 Alternate. It is anticipated that 2,093 Daily, 155 AM peak hour, and 209 PM peak hour non-project trips would be generated from the buildout of St. James Village to US 395 Alternate.

Trip Distribution

It was assumed that 100% of the Phase 1 trips would be distributed to the existing Pagni Lane/US 395 Alternate intersection.

At buildout, 60 percent of the Sierra Reflections trips were assigned to the St. James Parkway/US 395 Alternate intersection (the study intersection) and 40 percent of the Sierra Reflections trips were assigned to a second proposed access to/from Sierra Reflections at the East Lake Boulevard/US 395 Alternate intersection (not a part of this study). This distribution was based on review of the proposed Sierra Reflections site plan and the St. James Parkway connection to St. James Village.

Additionally at buildout, 100% of the non-project trips from St. James Village (assumed to access US 395 Alternate through Sierra Reflections via St. James Parkway), were assigned to the St. James Parkway/US 395 Alternate intersection.

Project trips were distributed to the adjacent roadway network based on existing traffic volumes, the locations of complimentary land uses, and anticipated travel patterns. Project trips at St. James Parkway/US 395 Alternate were distributed based on the following:

- 85 percent to/from the north via US 395 Alternate
- 15 percent to/from the south via US 395 Alternate

Figure 4 shows the project trip distribution and assignment.

Project Access

Access to the project would ultimately occur via two intersections with US 395 Alternate. Initially (in Phase 1), access to the project would be entirely to and from the Pagni Lane/US 395 Alternate intersection. As Sierra Reflections develops to the south, a second (new) access would be constructed, forming the fourth leg to the US 395 Alternate/East Lake Boulevard intersection. Analysis of this second access, however, is not a part of this Phase 1 traffic study and will be addressed in future phases.

EXISTING PLUS PROJECT CONDITIONS

Traffic Volumes

Phase 1 project trips (**Figure 4**) were added to the existing traffic volumes (**Figure 3**) to develop the Existing Plus Project conditions traffic volumes, shown on **Figure 5**.

Intersection Level of Service

AM and PM peak hour intersection level of service analysis was performed for the study intersection based on the Existing Plus (Phase 1) Project traffic volumes, the existing peak hour factors from the counts, and the lane configurations and controls shown on **Figure 5**. **Table 4** shows the level of service results, and the technical calculations are provided in **Appendix C**.

Table 4: Existing Plus (Phase 1) Project Intersection Level of Service

Int. ID	Intersection	Control	AM		PM	
			Delay[1]	LOS	Delay[1]	LOS
1	Pagni Lane	Side Street Stop				
	Eastbound Approach		10.9	B	11.6	B
	US 395 Alternate					
	Northbound Left		7.8	A	8.3	A

Notes: 1. Delay is reported in seconds per vehicle for the worst approach/movement for side street stop-controlled intersections.
Source: Headway Transportation, 2022

As shown in the **Table 4**, all turning movements at the study intersection are expected to operate at LOS B or better (within policy level of service thresholds) during the AM and PM peak hours with the addition of Phase 1 (up to 6 SFR lots) project traffic.

FUTURE YEAR CONDITIONS

The Future Year analysis estimates operating conditions for the 20-year horizon.

Planned Roadway Improvements

The RTC's *2050 RTP* outlines programmed roadway projects of regional significance. The project list is split into three time periods: 2021-2025 (first five years of the plan), 2026- 2030 (second five years of the plan), and 2031-2050 (remaining years of the plan). The following roadway improvements are programmed within the project vicinity:

RTP Complete Street Project Listing (2031-2050)

- East Lake Boulevard – Bike Lanes or Multi-Use Path from US 395 Alternate to I-580 Interchange

Traffic Volume Forecasts

As shown in **Table 5**, the Washoe County RTC Travel Demand Model predicts 1.45 percent per year growth on US 395 Alternate just north of Pagni Lane and 1.15 percent per year growth just south of Pagni Lane. This results in an average 20-year growth rate of 1.3 percent per year on US 395 Alternate in the project area, equating to a 20-year growth factor of 1.26. This growth factor was applied to the existing traffic volumes to develop the Future Year (20-year horizon) background traffic volumes. **Figure 6** shows the Future Year (No Project) traffic volumes at the study intersection.

Table 5: RTC Model Growth Rates

Location -->	**US 395 Alt. N/O Pagni Lane**	**US 395 Alt. S/O Pagni Lane**
Demand Model Volumes		
2020 RTC Model	6,966	6,440
2050 RTC Model	10,000	8,664
Model Difference 2050-2020	3,034	2,224
Growth % per year	1.45%	1.15%
20 Year Growth Factor	1.29	1.23
Adjusted Average 20-Year Factor	**1.26**	**1.26**

Intersection Level of Service

AM and PM peak hour intersection level of service analysis was performed for the study intersection using Synchro analysis software. **Table 6** shows the Future Year conditions level of service results, and the technical calculations are provided in **Appendix D**.

Table 6: Future Year Intersection Level of Service

Int. ID	Intersection	Control	AM		PM	
			Delay[1]	LOS	Delay[1]	LOS
1	Pagni Lane	Side Street Stop				
	Eastbound Approach		11.3	B	12.8	B
	US 395 Alternate					
	Northbound Left		7.9	A	8.8	A

Notes: 1. Delay is reported in seconds per vehicle for the worst approach/movement for side street stop-controlled intersections.
Source: Headway Transportation, 2022

As shown **Table 6**, all turning movements at the study intersection are expected to operate at LOS B or better (within policy level of service thresholds) under Future Year (no project) conditions.

FUTURE YEAR PLUS PROJECT CONDITIONS

Traffic Volumes

Buildout project trips (**Figure 4**) were added to the Future Year traffic volumes (**Figure 6**) to develop the Future Year Plus Project condition traffic volumes, shown on **Figure 7**.

Intersection Level of Service

AM and PM peak hour intersection level of service analysis was performed for several improvement alternatives at the study intersection based on the Future Year Plus Project traffic volumes. **Table 7** shows the level of service results, and the technical calculations are provided in **Appendix E**.

Table 7: Future Year Plus Project Intersection Level of Service

Int. ID	Intersection	Control	AM Delay[1]	AM LOS	PM Delay[1]	PM LOS
1	St. James Parkway Eastbound Approach	Side Street Stop	37.1	E	43.3	E
	US 395 Alternate Northbound Left		8.3	A	11.1	B
	With 2 EB Lanes on St. James Parkway					
1	St. James Parkway Eastbound LT	Side Street Stop	30.9	D	38.9	E
	Eastbound RT		9.5	A	10.6	B
	US 395 Alternate Northbound Left		8.3	A	11.1	B
	With Full Traffic Signal and 2 EB Lanes on St. James Parkway					
1	St. James Parkway/US 395 Alternate Overall	Signal	12.5	B	11.5	B
	With Roundabout					
1	St. James Parkway /US 395 Alternate	Multilane Roundabout	Delay (v/c)[2]	LOS	Delay (v/c)[2]	LOS
	Northbound Approach (US 395A)		9.9 (0.384)	A	7.2 (0.280)	A
	Southbound Approach (US 395A)		5.3 (0.202)	A	9.5 (0.501)	A
	Eastbound Approach (St. James Parkway)		10.9 (0.515)	B	10.5 (0.412)	B

Notes: 1. Delay is reported in seconds per vehicle for each approach for roundabout intersections, for the overall intersection for signalized intersections, and for the worst approach/movement for side street stop-controlled intersections.
2. (v/c) = volume/capacity ratio
Source: Headway Transportation, 2022

As shown in **Table 7**, under future plus project conditions, the intersection of St. James Parkway/US 395 Alternate operates at LOS E on the St. James Parkway approach in both the AM and PM peak hours. If the St. James Parkway approach was widened to provide separate lanes for left-turning and right-turning vehicles, the right-turn movement would operate at LOS A, however the left-turn movement would still operate at LOS E in the PM peak hour and LOS D in the AM peak hour. While LOS E and LOS D on side street approaches at stop-controlled approaches is within policy level LOS thresholds, these operating conditions are less than ideal in this case given the high side street traffic volume on St. James Parkway and the high mainline vehicle speeds along US 395 Alternate.

The installation of a traffic signal was evaluated, and it was determined to function at an overall LOS B in both the AM and PM peak hours. Traffic signal installation would be subject to meeting MUTCD traffic signal warrant criteria.

Alternatively, the installation of a multilane roundabout was evaluated, and a multilane roundabout was determined to function at LOS B or better on all approaches in the AM and PM peak hours with reasonable volume to capacity ratios (less than 0.6 v/c). A conceptual multilane roundabout layout is included in this report as **Figure 8** and would be configured to allow for two circulating lanes in the northbound and southbound directions and single lane circulation in the eastbound and westbound directions.

A high tee configuration was also considered, but dismissed due to its impacts to the Rawhide Drive/US 395 Alternate intersection. The proximity of this intersection (approximately 300 feet north of Pagni Lane) would require restrictions to the left-turning movements in and out of Rawhide Drive to accommodate the high tee configuration northbound acceleration lane from Pagni Lane/St. James Parkway and the associated acceleration lane taper requirements.

Recommended Improvements

Phase 1

Under existing plus project (Phase 1) conditions, the existing stop control and existing lane configurations at Pagni Lane are recommended to remain, as the level of service for all turning movements would be LOS B or better.

Interim

Following the development of Phase 1 but prior to reaching LOS D on the side street approach, the existing Pagni Lane approach is recommended to be widened and restriped for two eastbound lanes as an interim improvement. This improvement would provide an interim operational benefit to both the left and right turning movements on the existing Pagni Lane approach in the period of time before the recommended buildout improvement is implemented.

Buildout

Under buildout conditions, traffic signal and roundabout improvement options were both evaluated, and it was determined that the implementation of either improvement would meet NDOT's LOS policy. Even though traffic engineering practitioners recognize that LOS E conditions for the side street approach during the peak hour does not necessarily indicate an intersection failure or the need for mitigation, improvements are recommended in this case for safety reasons considering the high side street volumes and the high travel speeds on US 395 Alternate. St. James Parkway is recommended to be aligned to the south to intersect with US 395 Alternate between the existing Pagni Lane intersection and Steamboat

Creek. This would enable either a traffic signal or roundabout to be constructed without impacting adjacent private properties.

Therefore, it is recommended that one of the following two improvement options be considered as the final intersection configuration improvement at the St. James Parkway/US 395 Alternate intersection:

- **Traffic Signal:** A traffic signal would improve safety and traffic operations at the St. James Parkway/US 395 Alternate intersection to an overall LOS B in the future buildout scenario, however, it would not be warranted (and therefore NDOT may not allow it to be activated) until a significant amount of the project has been developed and MUTCD traffic signal warrants are met. The intersection would experience deteriorating level of service operations on the St. James Parkway approach until then.
- **Roundabout:** A multilane roundabout would improve traffic operations at the St. James Parkway/US 395 Alternate intersection to LOS B or better in the future buildout scenario, however, the construction of a roundabout would require highway widening and possibly require right-of-way acquisition/dedication, but would also improve safety as well as operations and may be preferred by NDOT due to anticipated safety benefits. A roundabout would offer more flexibility as to the timing of how soon the improvements could be implemented.

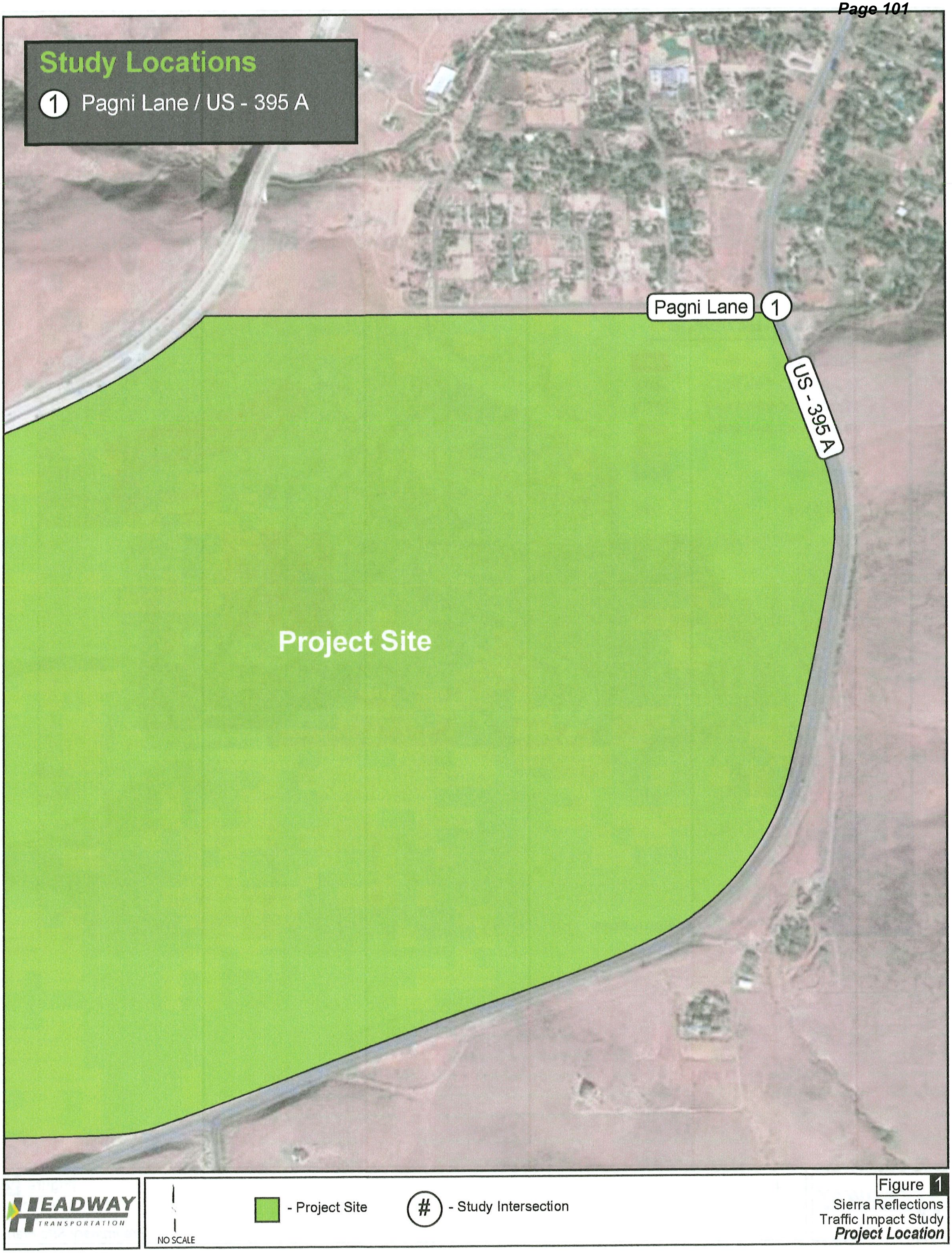
A traffic signal should not be installed until MUTCD traffic signal warrants are met. A roundabout could be installed unrelated to traffic signal criteria but would not be necessary until the side street approach at Pagni Lane or St. James Parkway exceeded LOS D. The preliminary roundabout concept is shown in **Figure 8**.

CONCLUSIONS

The following is a list of our key findings and recommendations:

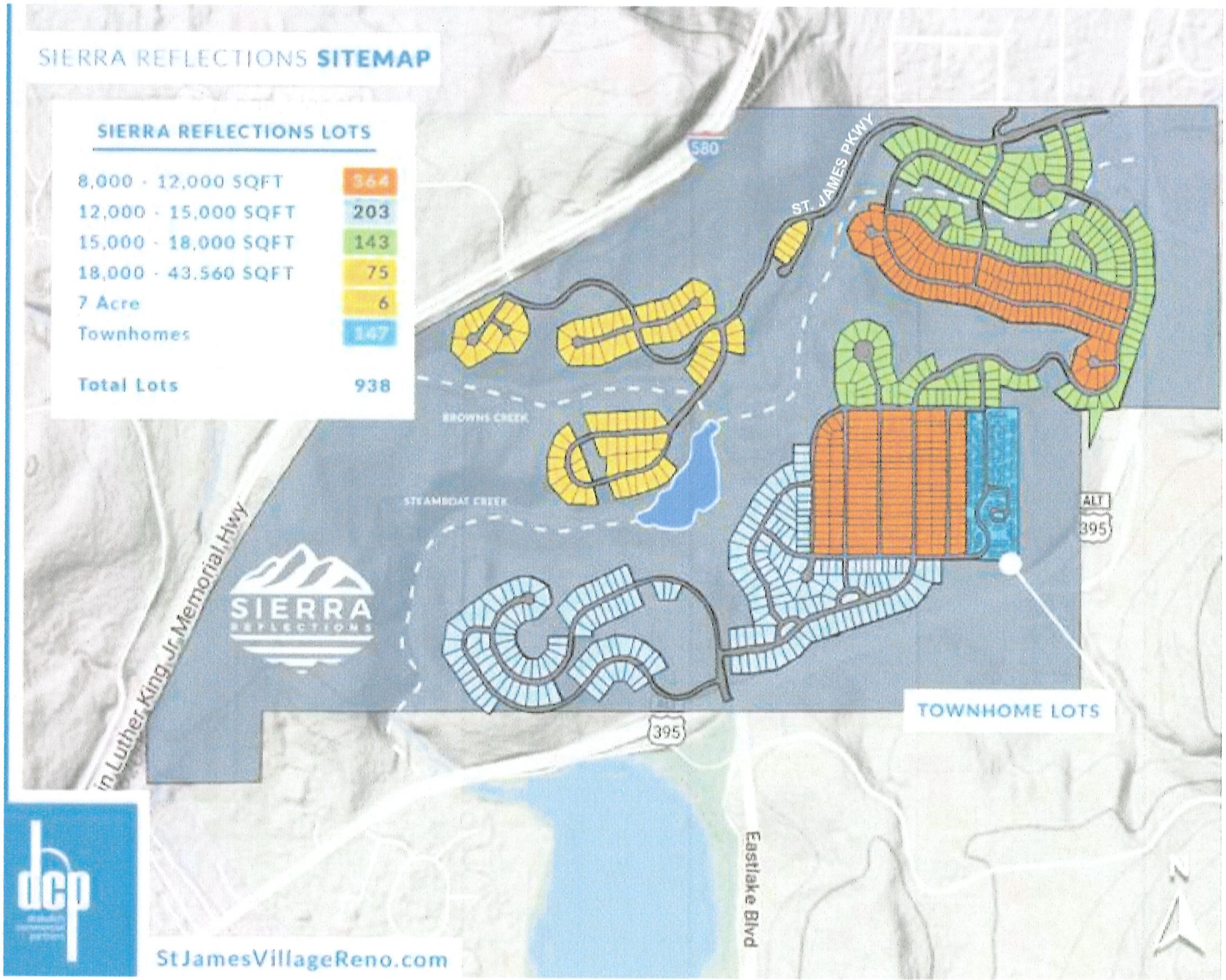
- The proposed project includes 938 residential units comprised of 791 Single Family Dwelling Units and 147 Townhome Units (up to 6 one-acre lot SFR lots would be constructed in Phase 1) and is anticipated to generate 8,451 Daily, 613 AM peak hour, and 819 PM peak hour trips on the external roadway network.
- With the construction of St. James Parkway connecting Sierra Reflections with St. James Village at buildout, the non-project trip generation from an additional 222 Single Family Dwelling Units (50 percent of the St. James Village buildout total) was assumed to use St. James Parkway to travel through Sierra Reflections to US 395 Alternate and is anticipated to generate 2,093 Daily, 155 AM peak hour, and 209 PM peak hour trips at the St. James Parkway/US 395 Alternate intersection at buildout.

- Under Existing and Existing Plus (Phase 1) Project conditions, the study intersection is expected to operate within policy level of service thresholds (LOS B or better on all approaches) with the existing stop control at Pagni Lane. No improvements to the study intersection are recommended for the construction of Phase 1.
- Under Future Year Plus Project conditions, the minor approach to the study intersection would function at LOS E. Following the construction of Phase 1 but prior to reaching side street LOS D, two eastbound lanes on the St. James Parkway approach are recommended as an interim improvement as this would improve the operating conditions until the buildout improvement was implemented.
- A "high tee" intersection configuration was considered, but determined not feasible due to its impacts to the Rawhide Drive/US 395 Alternate intersection. The proximity of this intersection (approximately 300 feet north of Pagni Lane) would require restrictions to the left-turning movements in and out of Rawhide Drive to accommodate the high tee configuration at Pagni Lane or St. James Parkway and the associated acceleration lane and lane taper requirements.
- For buildout of Sierra Reflections, a traffic signal or roundabout improvement is recommended at the St. James Parkway/US 395 Alternate intersection to improve level of service on the St. James Parkway approach and to ensure safer operations between high-speed (50 MPH posted speed) US 395 Alternate traffic and the future residential development traffic. A traffic signal should not be installed until MUTCD traffic signal warrants are met. A roundabout could be installed unrelated to traffic signal criteria but would not be necessary until the side street approach at Pagni Lane or St. James Parkway exceeded LOS D. The preliminary roundabout concept is shown in **Figure 8**.
- Align St. James Parkway between existing Pagni Lane and Steamboat Creek to enable either a traffic signal or roundabout to be constructed without impacting adjacent private properties.
- The project will pay standard Regional Road Impact Fees (RRIFs) based on 791 Single Family dwelling units and 147 multifamily dwelling units (estimated at a total of approximately $4.25M based on the current fee schedule) as mitigation for its impacts on the regional roadway network.



HEADWAY TRANSPORTATION

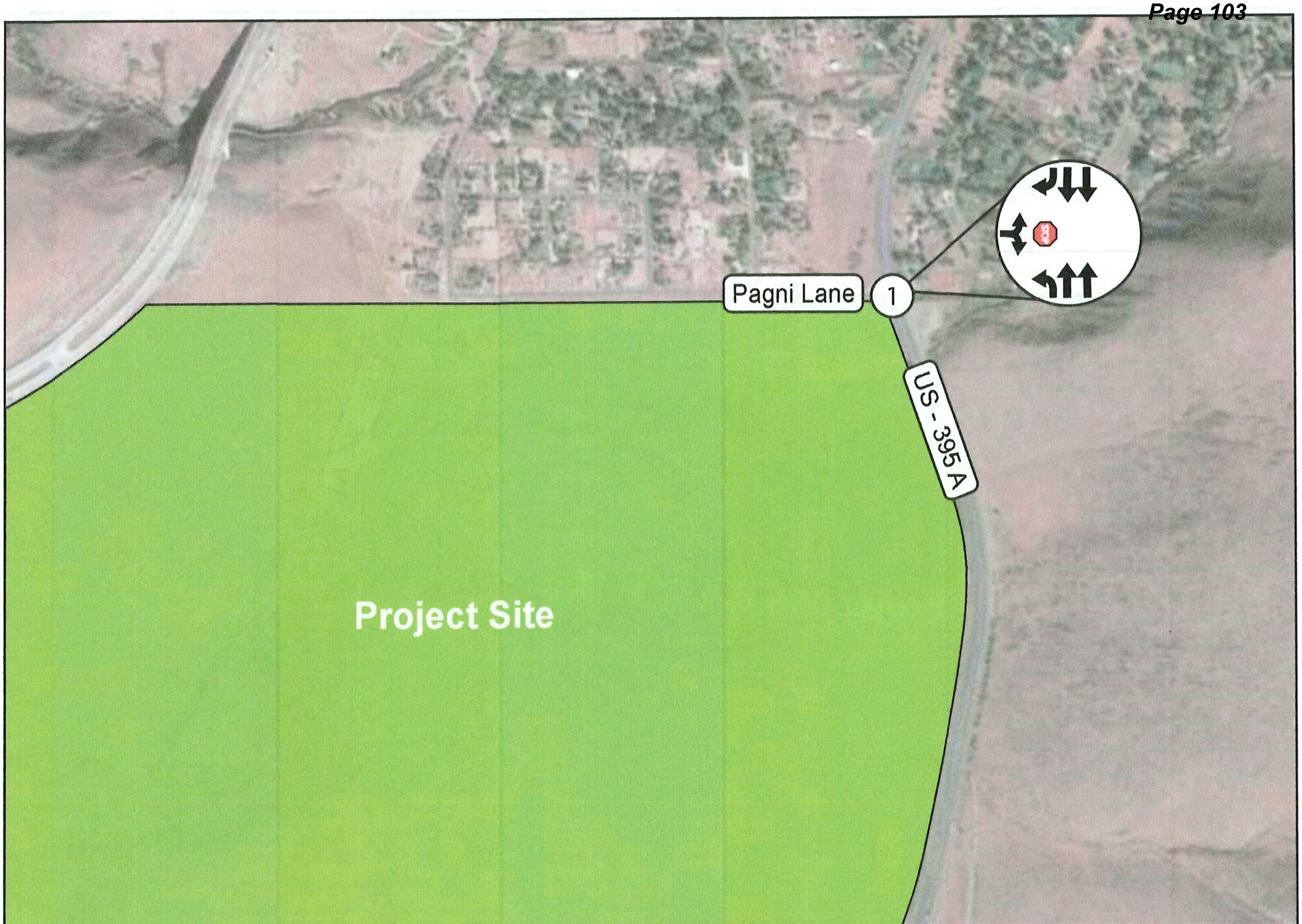
Figure 1
Sierra Reflections
Traffic Impact Study
Project Location



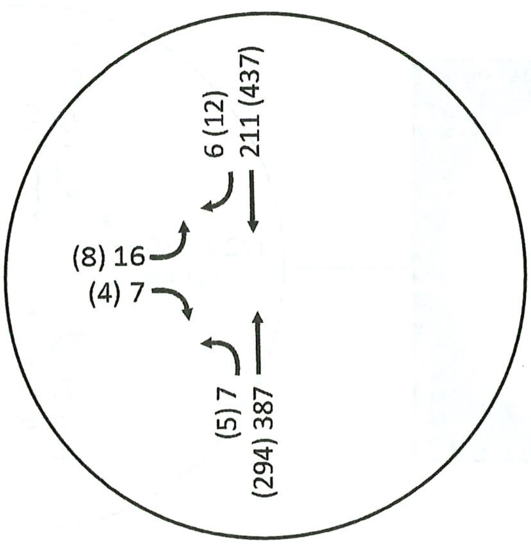
HEADWAY TRANSPORTATION

NO SCALE

Figure 2
Sierra Reflections
Traffic Impact Study
Preliminary Site Plan



1 *US-395 Alternate / Pagni Lane*



HEADWAY TRANSPORTATION

NO SCALE

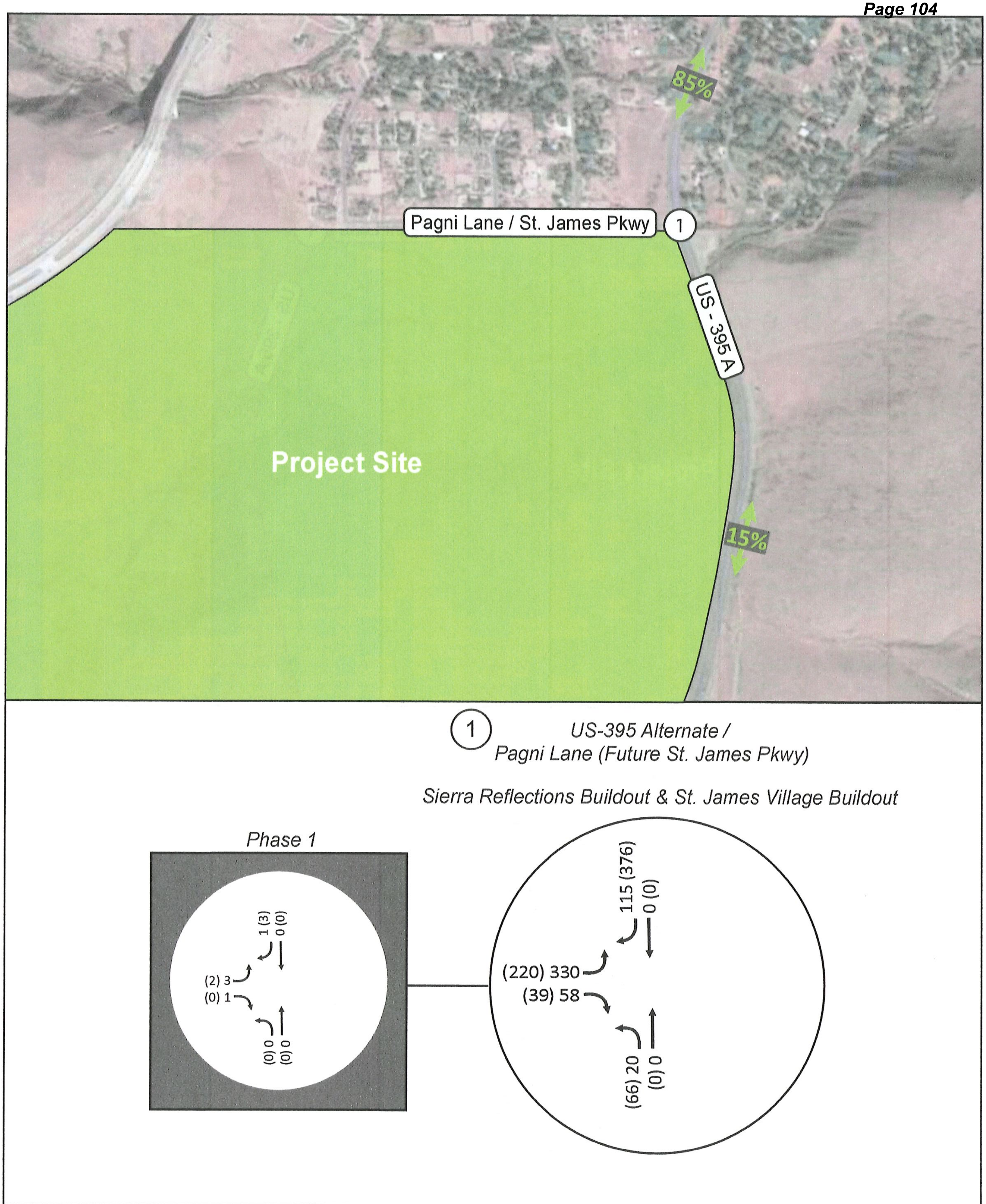
AM Peak Hour Volume (PM Peak Hour Volume)

- Project Site
- Study Intersection
STOP - Stop

Figure 3

Sierra Reflections
Traffic Impact Study

Existing Traffic Volumes, Lane Configurations, and Controls



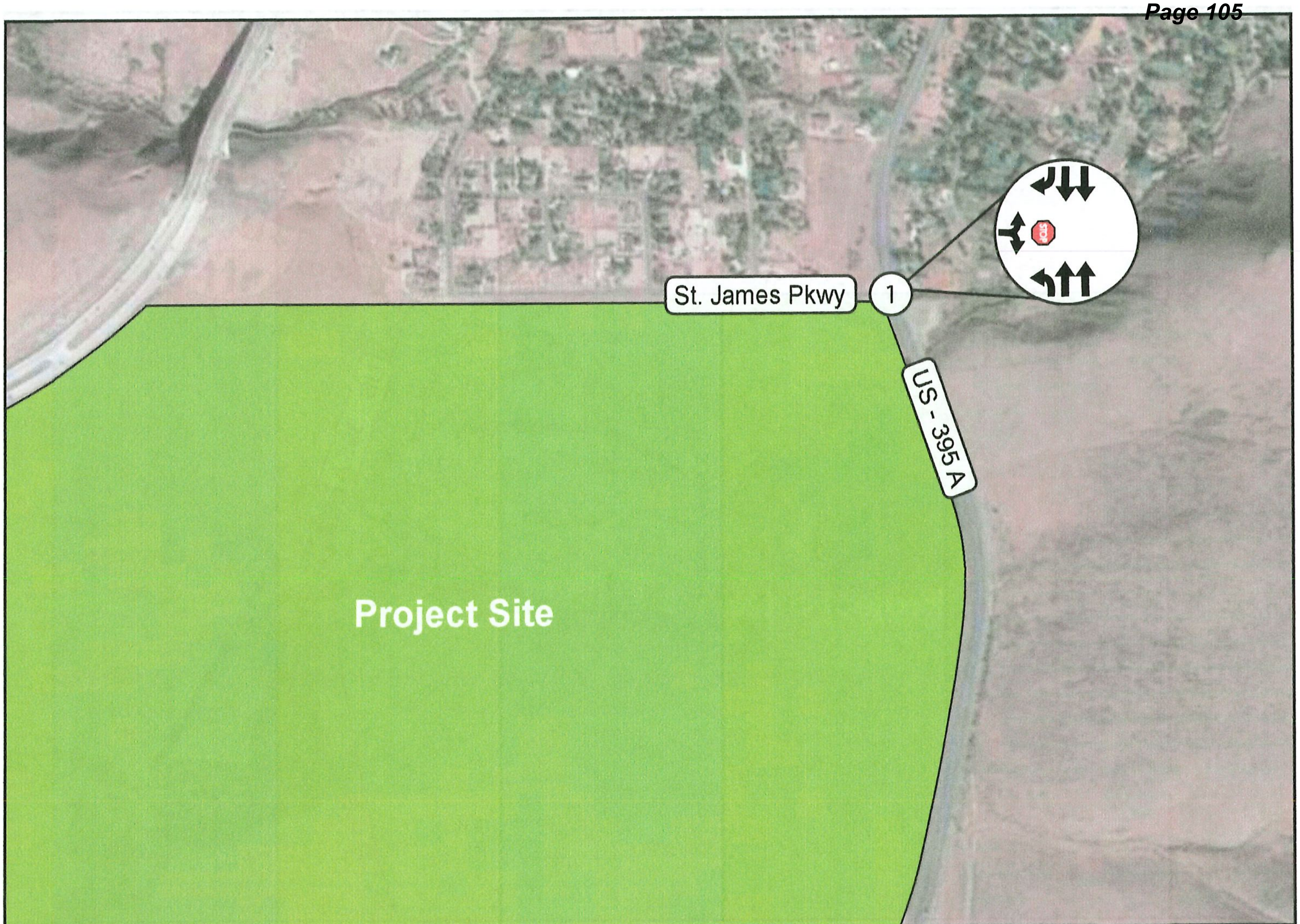
HEADWAY TRANSPORTATION

AM Peak Hour Volume (PM Peak Hour Volume)

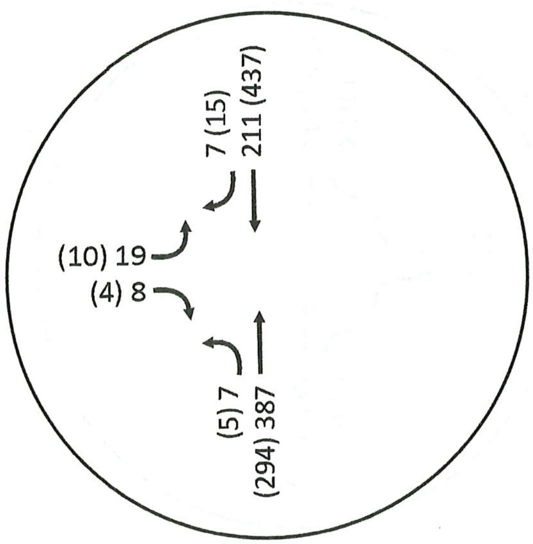
- Project Site
(#) - Study Intersection
XX% - Trip Distribution

NO SCALE

Figure 4
Sierra Reflections
Traffic Impact Study
Project Trip Distribution & Assignment



1 *US-395 Alternate / St. James Pkwy*



HEADWAY TRANSPORTATION

NO SCALE

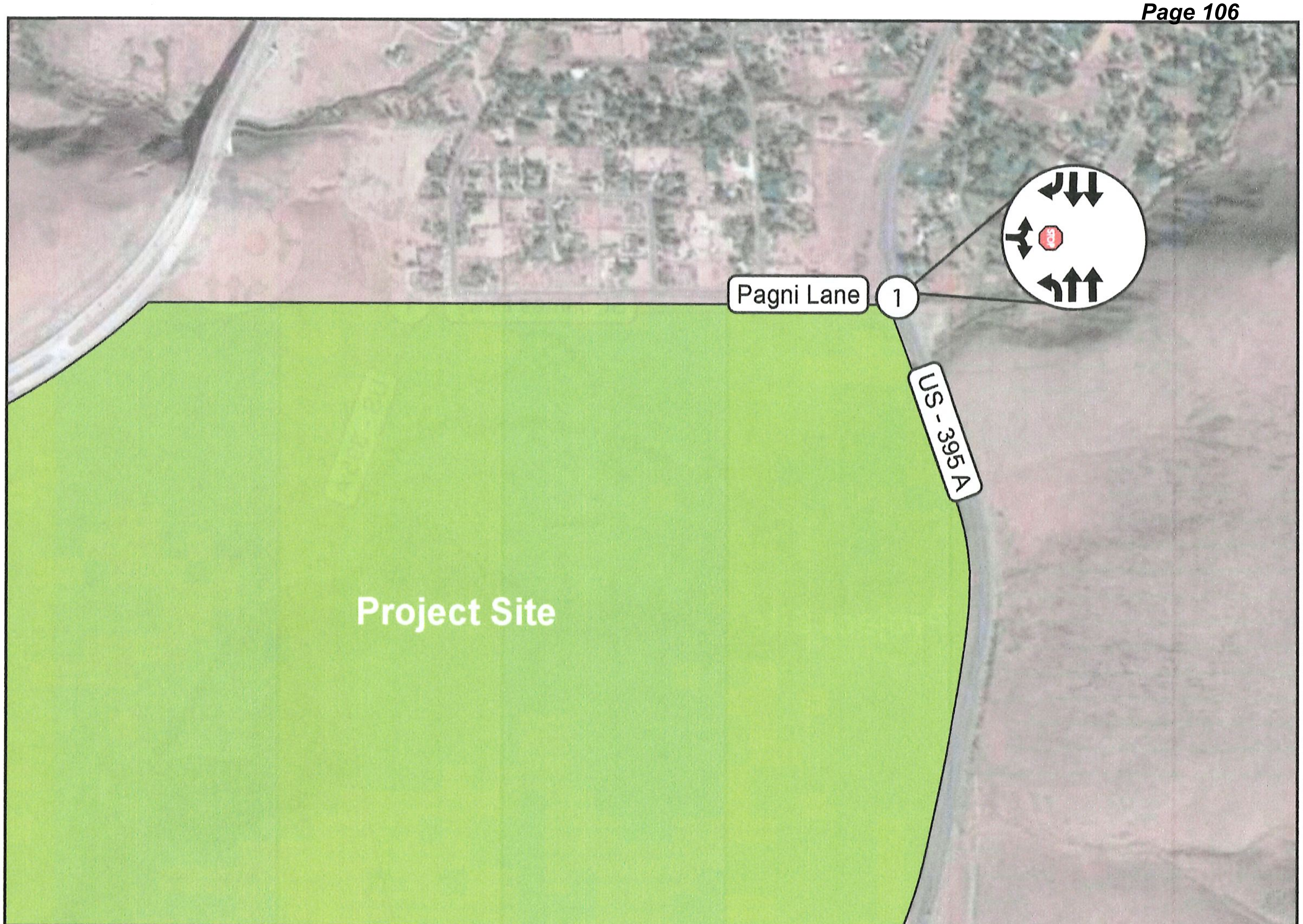
AM Peak Hour Volume (PM Peak Hour Volume)

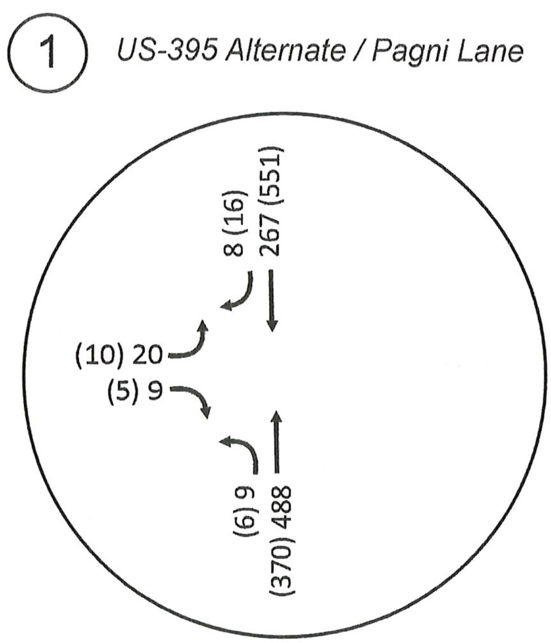
- Project Site
(#) - Study Intersection
STOP - Stop

Figure 5

Sierra Reflections
Traffic Impact Study

Existing Plus Project (Phase 1) Traffic Volumes, Lane Configurations, and Controls





NO SCALE

AM Peak Hour Volume (PM Peak Hour Volume)

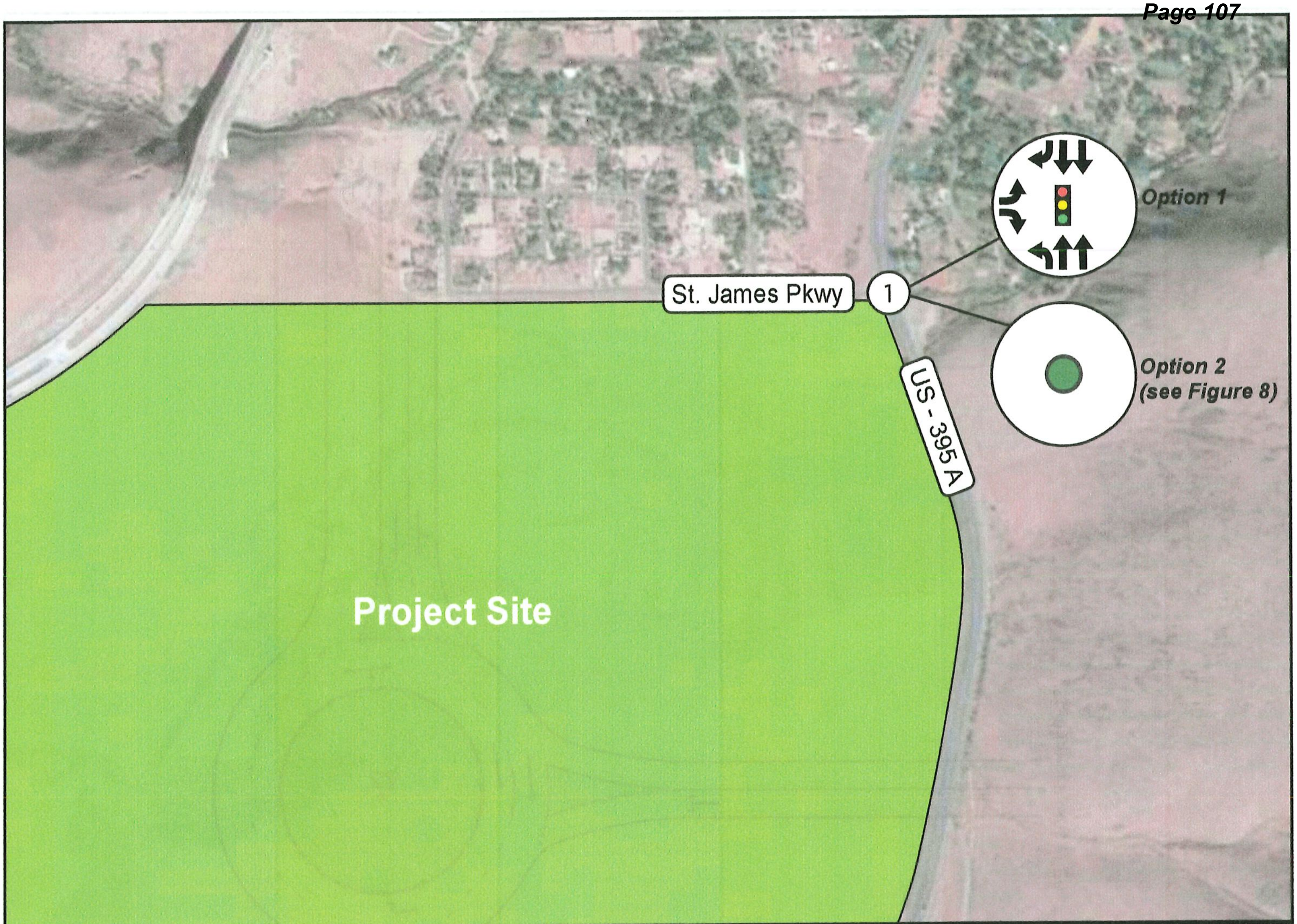
- Project Site
(#) - Study Intersection
- Stop

HEADWAY TRANSPORTATION

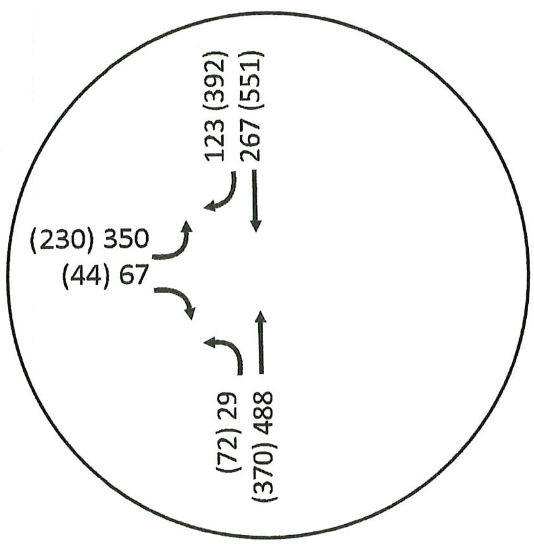
Figure 6

Sierra Reflections
Traffic Impact Study

Future Year Traffic Volumes, Lane Configurations, and Controls



1 *US-395 Alternate / St. James Pkwy*



AM Peak Hour Volume (PM Peak Hour Volume)

- Project Site
(#) - Study Intersection
- Signal
- Roundabout

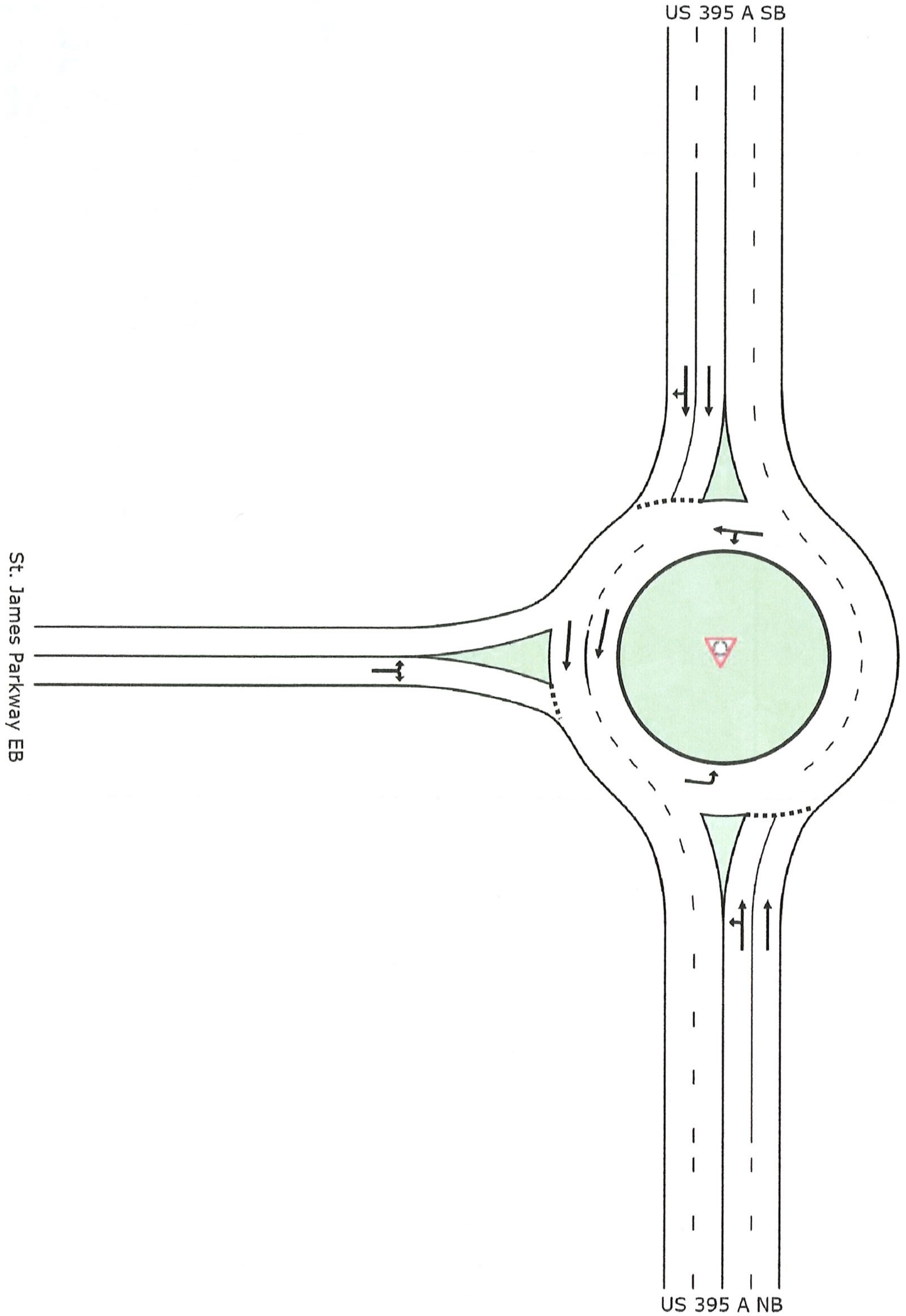
NO SCALE

HEADWAY TRANSPORTATION

Figure 7

Sierra Reflections
Traffic Impact Study

Future Year Plus Project (Buildout) Traffic Volumes, Lane Configurations, and Controls



HEADWAY TRANSPORTATION

NO SCALE

Figure 8
Sierra Reflections
Traffic Impact Study
Conceptual Roundabout Configuration

APPENDIX A
NDOT CRASH DATA

Appendix A

INTERSECTION DETAIL
US395AN @ PAGNI LN
01 OCT 15 - 01 OCT 20

COUNTY: WASHOE

Crash Severity	Crash Date	Crash Year	Crash Time	Primary Street	Distance	Dir	Secondary Street	Weather	Fatalities	Injured	Property Damage Only	Injury Type	Crash Type	Total Vehicles
PROPERTY DAMAGE ONLY	16-Dec-2017	2017	07:15 AM	US395AN	175	S	PAGNI LN	CLOUDY			PDO		NON-COLLISIO	1
									Sum: 0	Sum: 0	Count: 1			
									Total:	1				

V1 Type	V1 Dir	V1 Driver Age	V1 Lane Num	V1 Action	V1 Driver Factors	V1 Driver Distracted	V1 Vehicle Factors	V1 Most Harmful Event	V1 All Events
HARDTOP, 2 DOOR	S	34		GOING STRAIGHT	APPARENTLY NORMAL		DRIVING TOO FAST FOR CONDITIONS: FAILURE TO KEEP IN PROPER LANE OR RUNNING OFF ROAD: RAN OFF ROAD: UNSAFE LANE CHANGE		FENCE/WALL: TREE/SHRUB

First Harmful Event	Nonmotorist Factors	Factors Roadway	Lighting	HWY Factors	Agency	Accident Num	Accident Rec Num
		DRY	DAYLIGHT	, ICY, SNOW, SL	NHP	HP1712015	2417387

APPENDIX B
EXISTING LOS CALCULATIONS

HCM 6th TWSC
2: US 395 Alt & Pagni Lane
04/26/2022

Intersection						
Int Delay, s/veh	0.5					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	16	7	7	387	211	6
Future Vol, veh/h	16	7	7	387	211	6
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	19	8	8	455	248	7

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	492	124	255	0	-	0
Stage 1	248	-	-	-	-	-
Stage 2	244	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.18	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.24	-	-	-
Pot Cap-1 Maneuver	501	897	1293	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	498	897	1293	-	-	-
Mov Cap-2 Maneuver	576	-	-	-	-	-
Stage 1	759	-	-	-	-	-
Stage 2	768	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.8	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1293	-	646	-	-
HCM Lane V/C Ratio	0.006	-	0.042	-	-
HCM Control Delay (s)	7.8	-	10.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection						
Int Delay, s/veh	0.2					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	5	6	370	551	16
Future Vol, veh/h	10	5	6	370	551	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	5	6	385	574	17

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	779	287	591	0	-	0
Stage 1	574	-	-	-	-	-
Stage 2	205	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	333	710	981	-	-	-
Stage 1	527	-	-	-	-	-
Stage 2	809	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	331	710	981	-	-	-
Mov Cap-2 Maneuver	428	-	-	-	-	-
Stage 1	524	-	-	-	-	-
Stage 2	809	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.5	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	981	-	493	-	-
HCM Lane V/C Ratio	0.006	-	0.032	-	-
HCM Control Delay (s)	8.7	-	12.5	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX C
EXISTING PLUS (PHASE 1) PROJECT LOS CALCULATIONS

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	19	8	7	387	211	7
Future Vol, veh/h	19	8	7	387	211	7
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	85	85	85	85	85	85
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	22	9	8	455	248	8

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	492	124	256	0	-	0
Stage 1	248	-	-	-	-	-
Stage 2	244	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.18	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.24	-	-	-
Pot Cap-1 Maneuver	501	897	1291	-	-	-
Stage 1	764	-	-	-	-	-
Stage 2	768	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	498	897	1291	-	-	-
Mov Cap-2 Maneuver	576	-	-	-	-	-
Stage 1	759	-	-	-	-	-
Stage 2	768	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	10.9	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1291	-	644	-	-
HCM Lane V/C Ratio	0.006	-	0.049	-	-
HCM Control Delay (s)	7.8	-	10.9	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection	
Int Delay, s/veh	0.3

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	4	5	294	437	15
Future Vol, veh/h	10	4	5	294	437	15
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	96	96	96	96	96	96
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	10	4	5	306	455	16

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	618	228	471	0	-	0
Stage 1	455	-	-	-	-	-
Stage 2	163	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	421	775	1087	-	-	-
Stage 1	606	-	-	-	-	-
Stage 2	849	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	419	775	1087	-	-	-
Mov Cap-2 Maneuver	500	-	-	-	-	-
Stage 1	603	-	-	-	-	-
Stage 2	849	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.6	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1087	-	556	-	-
HCM Lane V/C Ratio	0.005	-	0.026	-	-
HCM Control Delay (s)	8.3	-	11.6	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX D
FUTURE YEAR LOS CALCULATIONS

HCM 6th TWSC
2: US 395 Alt & Pagni Lane 04/26/2022

Intersection	
Int Delay, s/veh	0.5

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	20	9	9	488	267	8
Future Vol, veh/h	20	9	9	488	267	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	22	10	10	530	290	9

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	575	145	299	0	-	0
Stage 1	290	-	-	-	-	-
Stage 2	285	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.18	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.24	-	-	-
Pot Cap-1 Maneuver	444	870	1245	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	732	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	440	870	1245	-	-	-
Mov Cap-2 Maneuver	533	-	-	-	-	-
Stage 1	722	-	-	-	-	-
Stage 2	732	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	11.3	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1245	-	606	-	-
HCM Lane V/C Ratio	0.008	-	0.052	-	-
HCM Control Delay (s)	7.9	-	11.3	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.2	-	-

HCM 2010 TWSC
2: US 395 Alt & Pagni Lane

04/29/2022

Intersection	
Int Delay, s/veh	0.2

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	10	5	6	370	551	16
Future Vol, veh/h	10	5	6	370	551	16
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	11	5	7	402	599	17

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	814	300	616	0	-	0
Stage 1	599	-	-	-	-	-
Stage 2	215	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	316	696	960	-	-	-
Stage 1	511	-	-	-	-	-
Stage 2	800	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	314	696	960	-	-	-
Mov Cap-2 Maneuver	413	-	-	-	-	-
Stage 1	507	-	-	-	-	-
Stage 2	800	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12.8	0.1	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	960	-	478	-	-
HCM Lane V/C Ratio	0.007	-	0.034	-	-
HCM Control Delay (s)	8.8	-	12.8	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0	-	0.1	-	-

APPENDIX E
FUTURE YEAR PLUS (BUILDOUT) PROJECT LOS CALCULATIONS

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection	
Int Delay, s/veh	11.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	350	67	29	488	267	123
Future Vol, veh/h	350	67	29	488	267	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	380	73	32	530	290	134

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	619	145	424	0	-	0
Stage 1	290	-	-	-	-	-
Stage 2	329	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.18	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.24	-	-	-
Pot Cap-1 Maneuver	416	870	1118	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	404	870	1118	-	-	-
Mov Cap-2 Maneuver	504	-	-	-	-	-
Stage 1	707	-	-	-	-	-
Stage 2	695	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	37.1	0.5	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1118	-	541	-	-
HCM Lane V/C Ratio	0.028	-	0.838	-	-
HCM Control Delay (s)	8.3	-	37.1	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	0.1	-	8.7	-	-

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection	
Int Delay, s/veh	7.6

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	230	44	72	370	551	392
Future Vol, veh/h	230	44	72	370	551	392
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	0	-	-	0
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	250	48	78	402	599	426

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	956	300	1025	0	-	0
Stage 1	599	-	-	-	-	-
Stage 2	357	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	256	696	673	-	-	-
Stage 1	511	-	-	-	-	-
Stage 2	679	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 226	696	673	-	-	-
Mov Cap-2 Maneuver	344	-	-	-	-	-
Stage 1	452	-	-	-	-	-
Stage 2	679	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	43.3	1.8	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	673	-	374	-	-
HCM Lane V/C Ratio	0.116	-	0.796	-	-
HCM Control Delay (s)	11.1	-	43.3	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	0.4	-	6.8	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection	
Int Delay, s/veh	8.9

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	350	67	29	488	267	123
Future Vol, veh/h	350	67	29	488	267	123
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	500	-	-	500
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	4	4	4	4	4	4
Mvmt Flow	380	73	32	530	290	134

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	619	145	424	0	-	0
Stage 1	290	-	-	-	-	-
Stage 2	329	-	-	-	-	-
Critical Hdwy	6.88	6.98	4.18	-	-	-
Critical Hdwy Stg 1	5.88	-	-	-	-	-
Critical Hdwy Stg 2	5.88	-	-	-	-	-
Follow-up Hdwy	3.54	3.34	2.24	-	-	-
Pot Cap-1 Maneuver	416	870	1118	-	-	-
Stage 1	728	-	-	-	-	-
Stage 2	695	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	404	870	1118	-	-	-
Mov Cap-2 Maneuver	504	-	-	-	-	-
Stage 1	707	-	-	-	-	-
Stage 2	695	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	27.5	0.5	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	1118	-	504	870	-	-
HCM Lane V/C Ratio	0.028	-	0.755	0.084	-	-
HCM Control Delay (s)	8.3	-	30.9	9.5	-	-
HCM Lane LOS	A	-	D	A	-	-
HCM 95th %tile Q(veh)	0.1	-	6.5	0.3	-	-

HCM 6th TWSC
2: US 395 Alt & Pagni Lane

04/26/2022

Intersection						
Int Delay, s/veh	6.2					

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	230	44	72	370	551	392
Future Vol, veh/h	230	44	72	370	551	392
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	500	-	-	500
Veh in Median Storage, #	1	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	250	48	78	402	599	426

Major/Minor	Minor2		Major1		Major2	
Conflicting Flow All	956	300	1025	0	-	0
Stage 1	599	-	-	-	-	-
Stage 2	357	-	-	-	-	-
Critical Hdwy	6.84	6.94	4.14	-	-	-
Critical Hdwy Stg 1	5.84	-	-	-	-	-
Critical Hdwy Stg 2	5.84	-	-	-	-	-
Follow-up Hdwy	3.52	3.32	2.22	-	-	-
Pot Cap-1 Maneuver	256	696	673	-	-	-
Stage 1	511	-	-	-	-	-
Stage 2	679	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	~ 226	696	673	-	-	-
Mov Cap-2 Maneuver	344	-	-	-	-	-
Stage 1	452	-	-	-	-	-
Stage 2	679	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	34.4	1.8	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	EBLn2	SBT	SBR
Capacity (veh/h)	673	-	344	696	-	-
HCM Lane V/C Ratio	0.116	-	0.727	0.069	-	-
HCM Control Delay (s)	11.1	-	38.9	10.6	-	-
HCM Lane LOS	B	-	E	B	-	-
HCM 95th %tile Q(veh)	0.4	-	5.5	0.2	-	-

Notes

~: Volume exceeds capacity $: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon

HCM 6th Signalized Intersection Summary
2: US 395 Alt & Pagni Lane

04/26/2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	↰	↱	↰	↑↑	↑↑	↱
Traffic Volume (veh/h)	350	67	29	488	267	123
Future Volume (veh/h)	350	67	29	488	267	123
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1841	1841	1841	1841	1841	1841
Adj Flow Rate, veh/h	380	73	32	530	290	134
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	4	4	4
Cap, veh/h	459	408	63	1945	1501	669
Arrive On Green	0.26	0.26	0.04	0.56	0.43	0.43
Sat Flow, veh/h	1753	1560	1753	3589	3589	1560
Grp Volume(v), veh/h	380	73	32	530	290	134
Grp Sat Flow(s),veh/h/ln	1753	1560	1753	1749	1749	1560
Q Serve(g_s), s	10.1	1.8	0.9	3.9	2.6	2.7
Cycle Q Clear(g_c), s	10.1	1.8	0.9	3.9	2.6	2.7
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	459	408	63	1945	1501	669
V/C Ratio(X)	0.83	0.18	0.51	0.27	0.19	0.20
Avail Cap(c_a), veh/h	656	584	177	1945	1501	669
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.2	14.1	23.4	5.7	8.8	8.8
Incr Delay (d2), s/veh	6.0	0.2	6.2	0.3	0.3	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.4	0.0	0.4	0.8	0.7	0.7
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	23.2	14.3	29.6	6.1	9.1	9.5
LnGrp LOS	C	B	C	A	A	A
Approach Vol, veh/h	453			562	424	
Approach Delay, s/veh	21.7			7.4	9.2	
Approach LOS	C			A	A	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		32.0		17.4	6.3	25.7
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		27.5		18.5	5.0	18.0
Max Q Clear Time (g_c+I1), s		5.9		12.1	2.9	4.7
Green Ext Time (p_c), s		3.1		0.9	0.0	1.7
Intersection Summary						
HCM 6th Ctrl Delay			12.5			
HCM 6th LOS			B			

HCM 6th Signalized Intersection Summary
2: US 395 Alt & Pagni Lane

04/26/2022

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	230	44	72	370	551	392
Future Volume (veh/h)	230	44	72	370	551	392
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00	1.00	1.00			1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No	No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870
Adj Flow Rate, veh/h	250	48	78	402	599	426
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	2	2	2	2	2	2
Cap, veh/h	333	296	123	2187	1591	710
Arrive On Green	0.19	0.19	0.07	0.62	0.45	0.45
Sat Flow, veh/h	1781	1585	1781	3647	3647	1585
Grp Volume(v), veh/h	250	48	78	402	599	426
Grp Sat Flow(s),veh/h/ln	1781	1585	1781	1777	1777	1585
Q Serve(g_s), s	6.0	1.2	1.9	2.2	5.1	9.2
Cycle Q Clear(g_c), s	6.0	1.2	1.9	2.2	5.1	9.2
Prop In Lane	1.00	1.00	1.00			1.00
Lane Grp Cap(c), veh/h	333	296	123	2187	1591	710
V/C Ratio(X)	0.75	0.16	0.64	0.18	0.38	0.60
Avail Cap(c_a), veh/h	705	627	215	2187	1591	710
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.5	15.5	20.6	3.8	8.3	9.5
Incr Delay (d2), s/veh	3.4	0.3	5.4	0.2	0.7	3.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.5	1.1	0.8	0.3	1.3	2.6
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	20.9	15.8	26.0	4.0	9.0	13.2
LnGrp LOS	C	B	C	A	A	B
Approach Vol, veh/h	298			480	1025	
Approach Delay, s/veh	20.1			7.6	10.8	
Approach LOS	C			A	B	
Timer - Assigned Phs		2		4	5	6
Phs Duration (G+Y+Rc), s		32.5		13.0	7.6	24.9
Change Period (Y+Rc), s		4.5		4.5	4.5	4.5
Max Green Setting (Gmax), s		28.0		18.0	5.5	18.0
Max Q Clear Time (g_c+I1), s		4.2		8.0	3.9	11.2
Green Ext Time (p_c), s		2.3		0.7	0.0	2.9
Intersection Summary						
HCM 6th Ctrl Delay			11.5			
HCM 6th LOS			B			

MOVEMENT SUMMARY

Site: AM FUTPP St. James/US 395 A

Future AM Plus Project
Roundabout

Movement Performance - Vehicles											
Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 395 A NB											
3	L2	32	4.0	0.384	9.9	LOS A	1.6	42.0	0.55	0.53	31.4
8	T1	530	4.0	0.384	9.9	LOS A	1.6	42.0	0.55	0.53	31.6
Approach		562	4.0	0.384	9.9	LOS A	1.6	42.0	0.55	0.53	31.6
North: US 395 A SB											
4	T1	290	4.0	0.202	5.3	LOS A	0.8	20.7	0.13	0.05	33.9
14	R2	134	4.0	0.202	5.3	LOS A	0.8	20.7	0.13	0.05	33.0
Approach		424	4.0	0.202	5.3	LOS A	0.8	20.7	0.13	0.05	33.6
West: Pagni Lane EB											
5	L2	380	4.0	0.515	10.9	LOS B	2.1	55.3	0.44	0.41	29.7
12	R2	73	4.0	0.515	10.9	LOS B	2.1	55.3	0.44	0.41	29.2
Approach		453	4.0	0.515	10.9	LOS B	2.1	55.3	0.44	0.41	29.6
All Vehicles		1439	4.0	0.515	8.9	LOS A	2.1	55.3	0.39	0.35	31.5

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6

MOVEMENT SUMMARY

Site: PM FUTPP St. James/US 395 A

Future PM Plus Project
Roundabout

Movement Performance - Vehicles

Mov ID	OD Mov	Demand Flows Total veh/h	Demand Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	95% Back of Queue Distance ft	Prop. Queued	Effective Stop Rate per veh	Average Speed mph
South: US 395 A NB											
3	L2	78	2.0	0.280	7.2	LOS A	1.2	29.3	0.42	0.34	32.2
8	T1	402	2.0	0.280	7.2	LOS A	1.2	29.3	0.42	0.34	32.8
Approach		480	2.0	0.280	7.2	LOS A	1.2	29.3	0.42	0.34	32.7
North: US 395 A SB											
4	T1	599	2.0	0.501	9.5	LOS A	3.0	76.6	0.32	0.18	31.9
14	R2	426	2.0	0.501	9.5	LOS A	3.0	76.6	0.32	0.18	31.1
Approach		1025	2.0	0.501	9.5	LOS A	3.0	76.6	0.32	0.18	31.6
West: St. James PArkway EB											
5	L2	250	2.0	0.412	10.5	LOS B	1.4	36.7	0.52	0.54	29.9
12	R2	48	2.0	0.412	10.5	LOS B	1.4	36.7	0.52	0.54	29.5
Approach		298	2.0	0.412	10.5	LOS B	1.4	36.7	0.52	0.54	29.9
All Vehicles		1803	2.0	0.501	9.1	LOS A	3.0	76.6	0.38	0.28	31.6

Level of Service (LOS) Method: Delay & v/c (HCM 2010).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 2010).
Roundabout Capacity Model: US HCM 2010.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SIDRA INTERSECTION 6