ARD ENGINEERING
21370 SW Langer Farms Pkwy
Suite 142, Sherwood, OR 97140

October 20, 2022

Mark Grenz
Multi/Tech Engineering Services
1155 13th Street SE
Salem, OR 97302

REGISTERED PROFESSIONAL ENGINEER
54983PE
DIGITALLY SIGNED
JULY 10, 2002
MICHAEL T. ARD
RENEWS: 12/31/2023

RE: J & J Estates – Site Access Analysis

Dear Mr. Grenz,

This letter is written to provide information regarding safety and operations for the proposed driveway that will serve J & J Estates on Mildred Lane SE between Marstone Court SE and Woodside Drive SE. A property located on the southeast side of Mildred Lane SE is proposed for development with a three-lot residential subdivision, with shared access to the three lots at a single driveway on the Mildred Lane SE frontage. Since the site does not have frontage on any other streets it is necessary to take access from this roadway.

Area Description

Mildred Lane SE is classified by the City of Salem as an Arterial roadway. It has a two-lane cross-section, with one travel lane in each direction and bike lanes on both sides of the roadway. Existing sidewalks are also in place along both sides of the roadway, and street illumination is provided. The posted speed limit on Mildred Lane SE is 25 mph in the site vicinity. The horizontal curve in the roadway along the site frontage has a centerline radius of approximately 280 feet, which also corresponds to a design speed of approximately 25 mph. However, it should be noted that City of Salem design standards require a minimum design speed of 45 mph for Arterial roadways.

Sight Distance Measurements

The subject property is located on the inside of a horizontal curve which limits sight lines in both directions. Since vehicles approaching from the south do so in the nearest motor vehicle travel lane, sight lines to the south are more limited by the horizontal curve than those to the northeast. Accordingly, the site access was moved to the south end of the subject property where optimal sight lines to the south can be achieved.

Based on field measurements, a driveway located at the south end of the subject property was determined to have 480 feet of intersection sight distance to the south, as measured from a position 14.5 feet behind the edge of the traveled way 3.5 feet above the driveway centerline to an oncoming driver's eye position 3.5

feet above the oncoming (northbound) travel lane. Intersection sight distance to the northeast was measured to be 368 feet from this location.

The minimum required intersection sight distance for a design speed of 45 mph is 500 feet in each direction. Accordingly, the proposed site plan is not projected to meet the full intersection sight distance standard for the city's design speed of 45 mph.

Design Speed

According to *A Policy on Geometric Design of Highways and Streets, 7th Edition*, published by the American Association of State Highway and Transportation Officials, the design speed used for evaluation of sight distance should be based on the posted speed limit, the statutory speed limit, or the 85th percentile speed of traffic. For this roadway, the posted speed limit is 25 mph and the design speed of the horizontal curve on which the site will take access is also approximately 25 mph. Although selection of a design speed of 45 mph will result in a conservative analysis, it is unlikely given the existing roadway environment and horizontal curvature that vehicles are actually travelling at that design speed. However, vehicles often travel at speeds in excess of posted speed limits, and also commonly travel at speeds in excess of the design speed for a horizontal curve. Additionally, the limits of sight distance extend past the horizontal curve in the roadway, allowing higher approach speeds from both directions. Accordingly, an accurate assessment of the safety and operations for a new driveway should properly be based on speed data collected at the limits of sight distance in each direction.

Speed data was collected using a radar speed gun for westbound traffic at the limits of sight distance to the northeast and for northbound traffic at the limits of sight distance to the south. The measured 85th percentile speeds were 32 mph for westbound traffic and 33 mph for northbound traffic. Worksheets showing the actual observed travel speeds, average travel speeds, and 85th percentile speeds are included in the attached technical appendix.

Required Sight Lines

The minimum required intersection sight distance is calculated based on a desired gap time of 7.5 seconds at the 85th percentile design speed. For the measured speed of 32 mph for westbound traffic, the minimum intersection sight distance required to avoid interruptions to the flow of through traffic was calculated to be 355 feet. The minimum required stopping sight distance for safety at this design speed was calculated to be 220 feet. Since the actual sight distance measurement of 368 feet is in excess of these minimums, the proposed access will have adequate sight distance to the northeast for safe and efficient access at the proposed driveway location.

For the measured speed of 33 mph for northbound traffic, the minimum intersection sight distance required to avoid interruptions to the flow of through traffic was calculated to be 365 feet. The minimum required stopping sight distance for safety at this design speed was calculated to be 230 feet. Since the actual sight distance measurement of 480 feet is in excess of these minimums, the proposed access will also have adequate sight distance to the south for safe and efficient access at the proposed driveway location.

Clear Sight Triangles

Although the measured sight lines are currently available, the required sight line to the northeast extends across the frontage of the subject property. Accordingly, it will be necessary to restrict vegetation and construction within the affected area of the site frontage to ensure that adequate sight lines are maintained following development of the subject property. A diagram showing the affected portion of the property is provided in the attached technical appendix. Any vegetation or structures within this area should be restricted to a height no greater than 40 inches above the roadway elevation to ensure that the view of oncoming vehicles is not occluded in the future. Trees and utility poles may be permitted within the clear sight triangle provided that their diameters are insufficient to fully obstruct the view of oncoming traffic from the driver's eye position within the driveway, and provided that low branches are trimmed and maintained to provide clear sight lines to at least 8 feet above the elevation of the sidewalk along the site frontage.

Conclusions

Based on the analysis, adequate sight lines can be achieved for the proposed driveway that will serve the 3-lot J & J Estates residential development. The driveway should be located at the south end of the subject property to maximize sight lines, and vegetation and structures should be restricted within the required sight lines to ensure safe and efficient operation.

If you have any questions regarding this analysis or if you need any further assistance, please feel free to contact me at any time.

Sincerely,

Michael Ard, PE
Principal Engineer

Appendix

Speed Study Summary - Radar Data

Location: On Mildred Lane SE, 350' NE of Marstone Court
Direction: Westbound
Date: 9/25/2022
Time: 3:30 PM
Weather: Clear/Dry
Notes: None

85th Percentile Speed: **32 mph**
Average Speed: 29 mph

Recorded Speeds:*

1 mph ------- 0	26 mph ------- 6	51 mph ------- 0
2 mph ------- 0	27 mph ------- 13	52 mph ------- 0
3 mph ------- 0	28 mph ------- 12	53 mph ------- 0
4 mph ------- 0	29 mph ------- 13	54 mph ------- 0
5 mph ------- 0	30 mph ------- 7	55 mph ------- 0
6 mph ------- 0	31 mph ------- 8	56 mph ------- 0
7 mph ------- 0	32 mph ------- 7	57 mph ------- 0
8 mph ------- 0	33 mph ------- 4	58 mph ------- 0
9 mph ------- 0	34 mph ------- 2	59 mph ------- 0
10 mph ------- 0	35 mph ------- 3	60 mph ------- 0
11 mph ------- 0	36 mph ------- 2	61 mph ------- 0
12 mph ------- 0	37 mph ------- 2	62 mph ------- 0
13 mph ------- 0	38 mph ------- 1	63 mph ------- 0
14 mph ------- 0	39 mph ------- 0	64 mph ------- 0
15 mph ------- 0	40 mph ------- 0	65 mph ------- 0
16 mph ------- 0	41 mph ------- 0	66 mph ------- 0
17 mph ------- 0	42 mph ------- 0	67 mph ------- 0
18 mph ------- 0	43 mph ------- 0	68 mph ------- 0
19 mph ------- 0	44 mph ------- 0	69 mph ------- 0
20 mph ------- 0	45 mph ------- 0	70 mph ------- 0
21 mph ------- 0	46 mph ------- 0	71 mph ------- 0
22 mph ------- 2	47 mph ------- 0	72 mph ------- 0
23 mph ------- 2	48 mph ------- 0	73 mph ------- 0
24 mph ------- 9	49 mph ------- 0	74 mph ------- 0
25 mph ------- 7	50 mph ------- 0	75+ mph ------- 0

* Speed data observations include free-flowing traffic only (i.e. no following vehicles)

Speed Study Summary - Radar Data

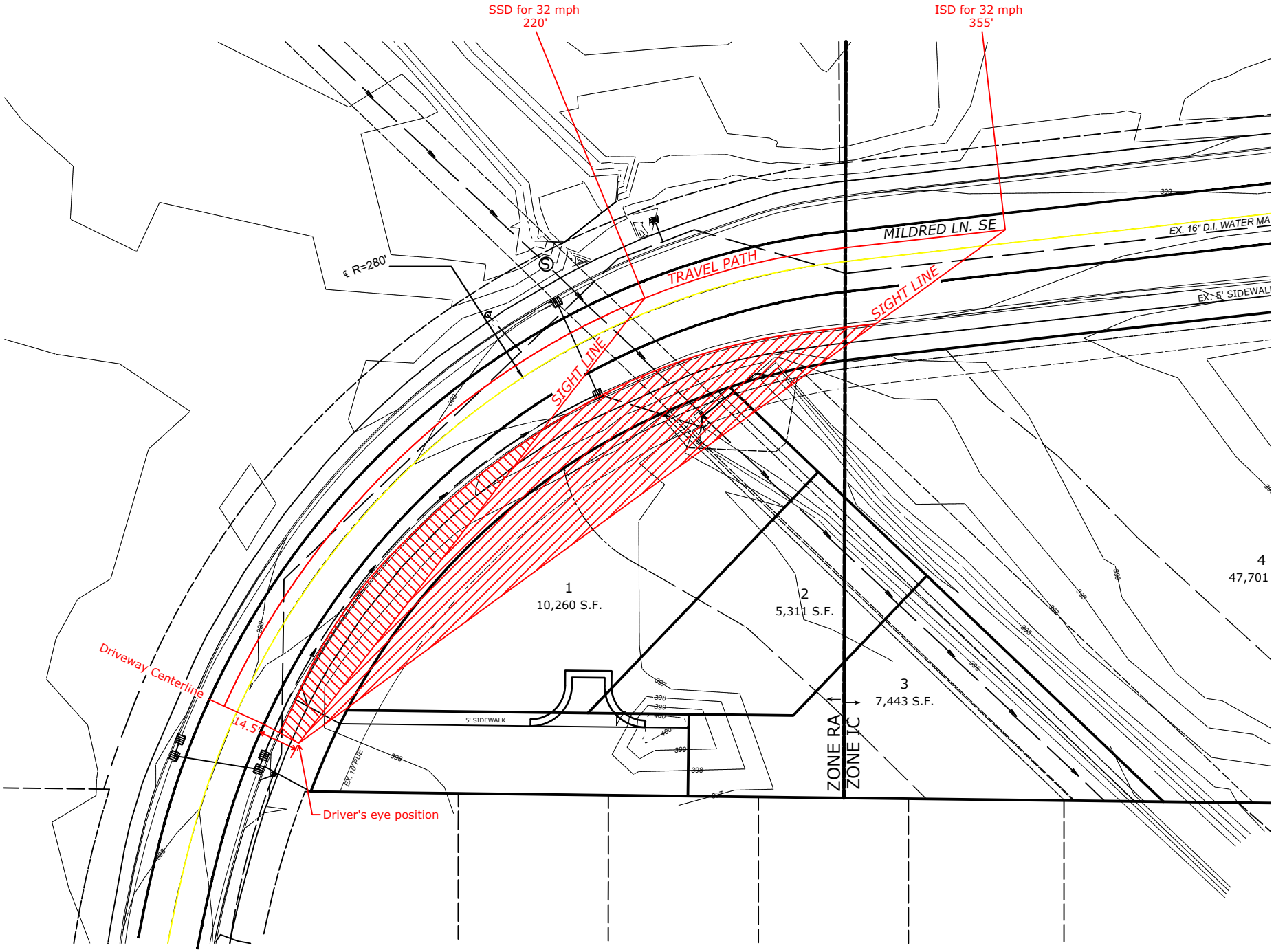
Location: On Mildred Lane SE, 50' N of Rhinestone Court
Direction: Northbound
Date: 9/25/2022
Time: 3:30 PM
Weather: Clear/Dry
Notes: None

85th Percentile Speed: **33 mph**
Average Speed: 30 mph

Recorded Speeds:*

1 mph ------- 0	26 mph ------- 4	51 mph ------- 0
2 mph ------- 0	27 mph ------- 9	52 mph ------- 0
3 mph ------- 0	28 mph ------- 17	53 mph ------- 0
4 mph ------- 0	29 mph ------- 7	54 mph ------- 0
5 mph ------- 0	30 mph ------- 15	55 mph ------- 0
6 mph ------- 0	31 mph ------- 12	56 mph ------- 0
7 mph ------- 0	32 mph ------- 8	57 mph ------- 0
8 mph ------- 0	33 mph ------- 8	58 mph ------- 0
9 mph ------- 0	34 mph ------- 3	59 mph ------- 0
10 mph ------- 0	35 mph ------- 3	60 mph ------- 0
11 mph ------- 0	36 mph ------- 3	61 mph ------- 0
12 mph ------- 0	37 mph ------- 3	62 mph ------- 0
13 mph ------- 0	38 mph ------- 1	63 mph ------- 0
14 mph ------- 0	39 mph ------- 0	64 mph ------- 0
15 mph ------- 0	40 mph ------- 0	65 mph ------- 0
16 mph ------- 0	41 mph ------- 0	66 mph ------- 0
17 mph ------- 0	42 mph ------- 0	67 mph ------- 0
18 mph ------- 0	43 mph ------- 0	68 mph ------- 0
19 mph ------- 0	44 mph ------- 0	69 mph ------- 0
20 mph ------- 0	45 mph ------- 0	70 mph ------- 0
21 mph ------- 1	46 mph ------- 0	71 mph ------- 0
22 mph ------- 0	47 mph ------- 0	72 mph ------- 0
23 mph ------- 0	48 mph ------- 0	73 mph ------- 0
24 mph ------- 1	49 mph ------- 0	74 mph ------- 0
25 mph ------- 5	50 mph ------- 0	75+ mph ------- 0

* Speed data observations include free-flowing traffic only (i.e. no following vehicles)


SSD for 32 mph
220'
ISD for 32 mph
355'
MILDRED LN. SE
EX. 16" D.I. WATER MA
EX. 5' SIDEWALI
℄ R=280'
TRAVEL PATH
SIGHT LINE
SIGHT LINE
1
10,260 S.F.
2
5,311 S.F.
3
7,443 S.F.
4
47,701
ZONE RA
ZONE IC
Driveway Centerline
14.5'
Driver's eye position
5' SIDEWALK
EX. 10" P.U.E.