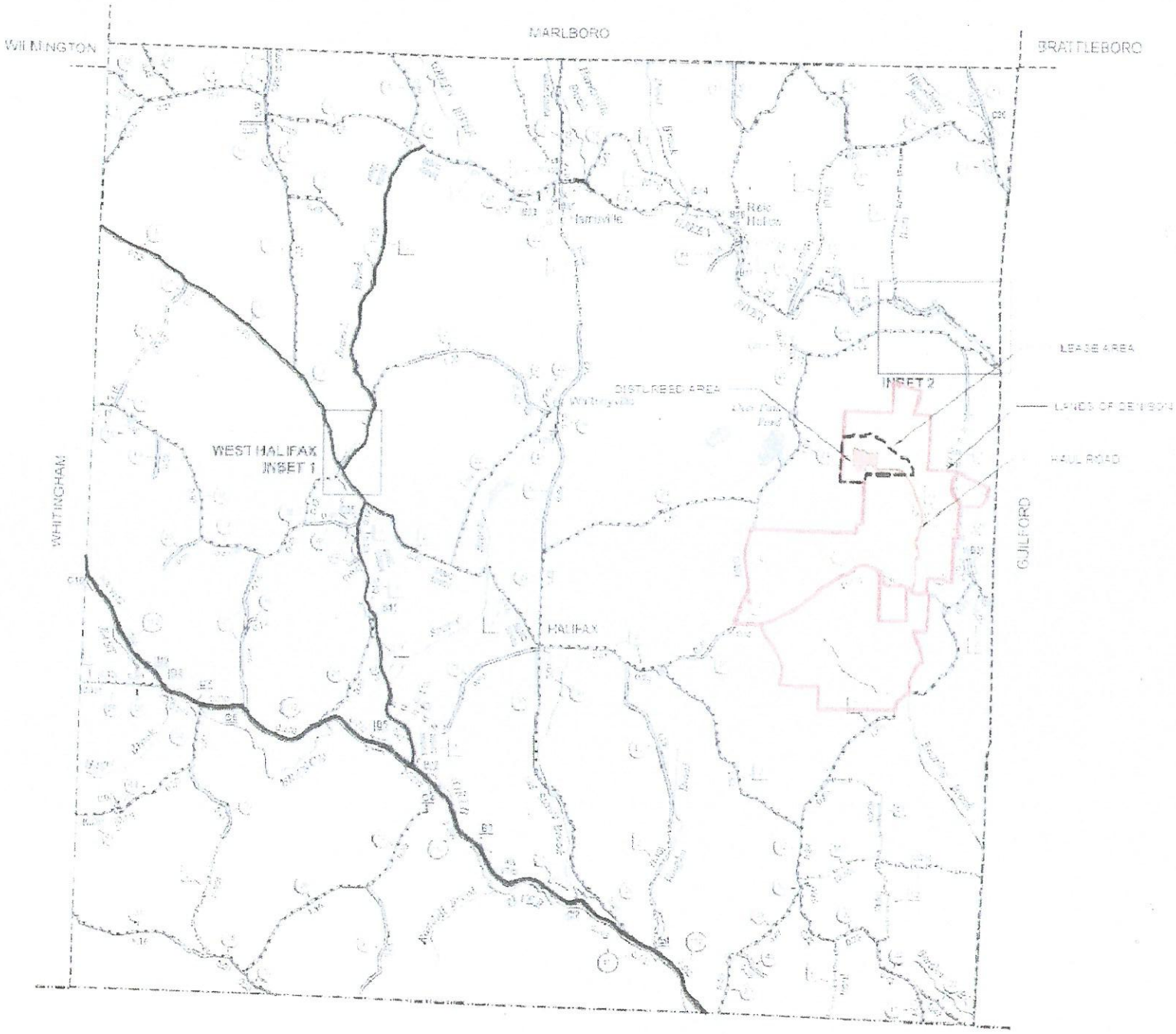
Traffic Issues at Proposed Jerry Pratt Ashfield Stone/Denison Quarry

Presented 7/28/2015

Michael Oman, Principal
Oman Analytics
Planning for Transportation and Community

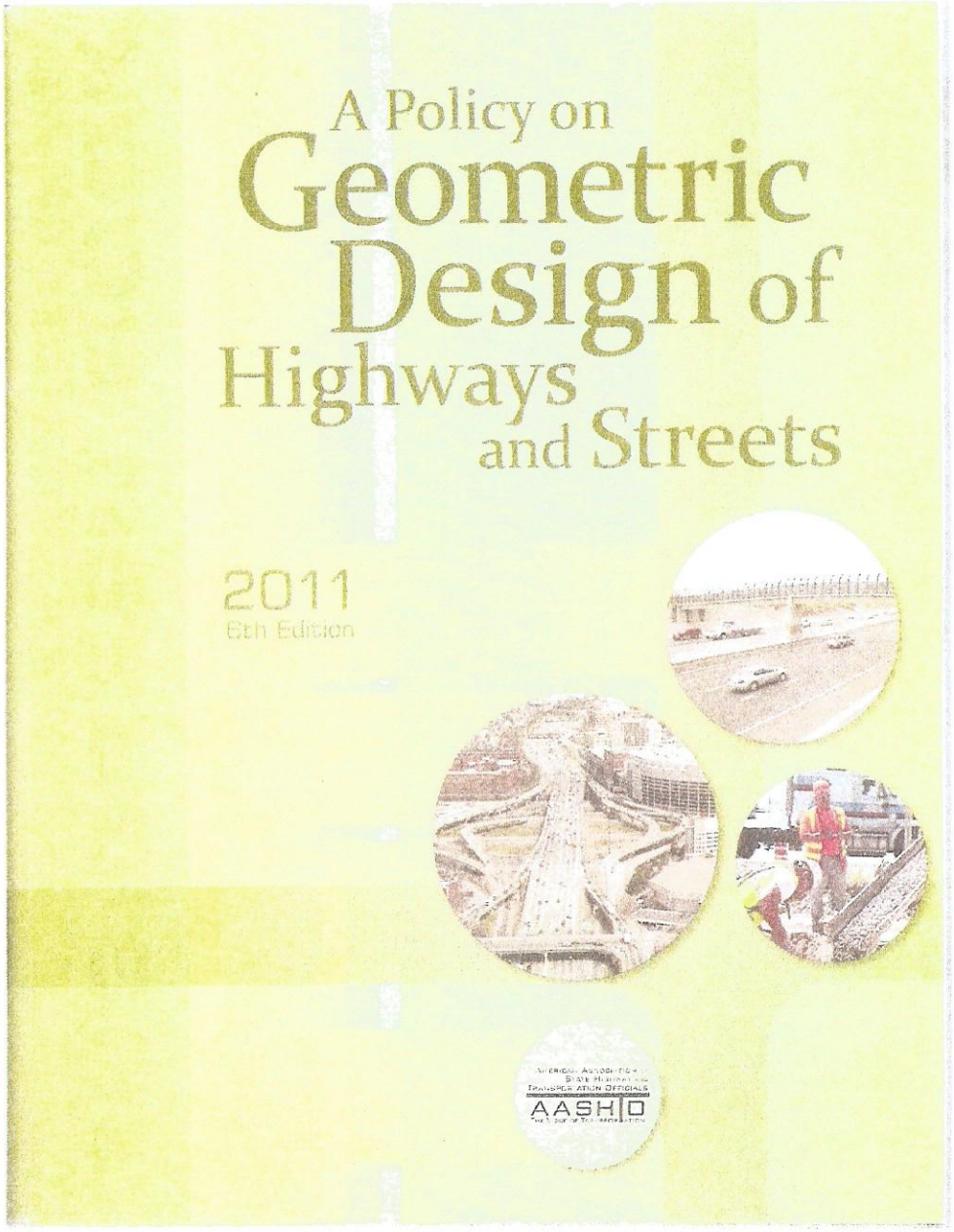

WILMINGTON
MARLBORO
BRATTLEBORO
WHITINGHAM
GUILFORD
HALIFAX
WEST HALIFAX
INSET 1
INSET 2
DISTURBED AREA
LEASE AREA
LEVEL OF DEVELOPMENT
HAUL ROAD

Quarry Impacts

- Safety
- Roadway deterioration ("wear & tear")
- Roadway maintenance, especially on access and class 4 roads

Safety

- Stopping Sight Distance (SSD)
- Intersection Sight Distance (ISD)
- Roadway width per Vermont State Design Standards



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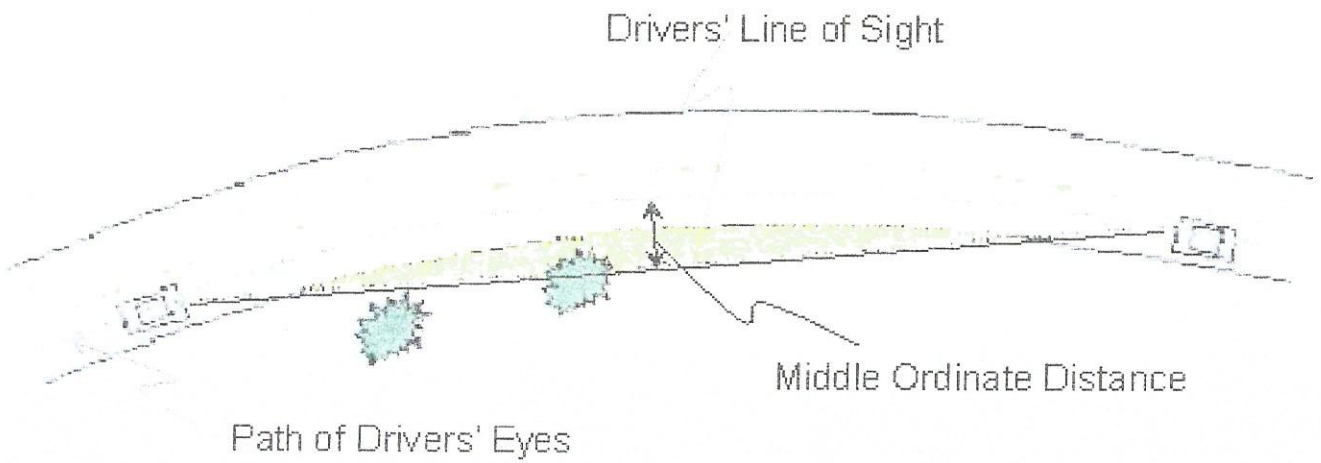
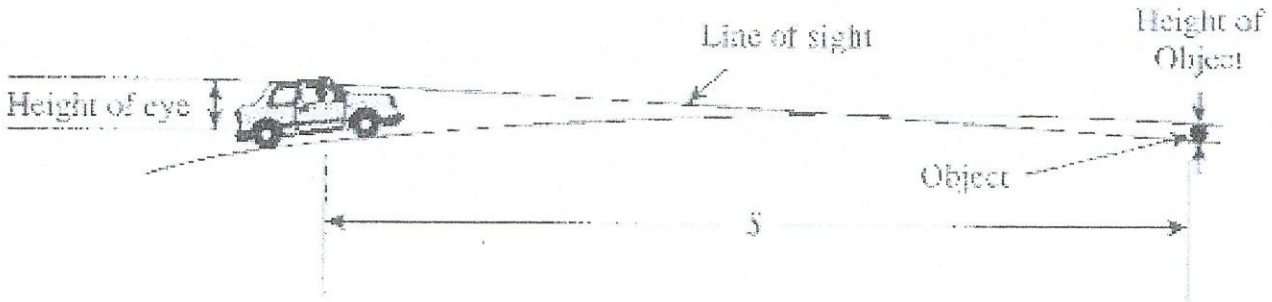
Stopping Sight Distance (SSD)

- Length of visible roadway necessary to allow a driver to stop before reaching a stationary object in his/her path, i.e. distance needed to avoid collision with obstacles in the road
- Should be available at every point along a roadway (AASHTO p 3-2)

Stopping Sight Distance





Stopping Sight Distance (SSD)

Metric					US Customary				
Design speed (km/h)	Brake reaction distance (m)	Braking distance on level (m)	Stopping sight distance Calculated (m)	Stopping sight distance Design (m)	Design speed (mph)	Brake reaction distance (ft)	Braking distance on level (ft)	Stopping sight distance Calculated (ft)	Stopping sight distance Design (ft)
20	13.9	4.6	18.5	20	15	55.1	21.6	76.7	80
30	20.9	10.3	31.2	35	20	73.5	38.4	111.9	115
40	27.8	18.4	46.2	50	25	91.9	60.0	151.9	155
50	34.8	28.7	63.5	65	30	110.3	86.4	196.7	200
60	41.7	41.3	83.0	85	35	128.6	117.6	246.2	250
70	48.7	56.2	104.9	105	40	147.0	153.6	300.6	305
80	55.6	73.4	129.0	130	45	165.4	194.4	359.8	360
90	62.6	92.9	155.5	160	50	183.8	240.0	423.8	425
100	69.5	114.7	184.2	185	55	202.1	290.3	492.4	495
110	76.5	138.8	215.3	220	60	220.5	345.5	566.0	570
120	83.4	165.2	248.6	250	65	238.9	405.5	644.4	645
130	90.4	193.8	284.2	285	70	257.3	470.3	727.6	730
					75	275.6	539.9	815.5	820
					80	294.0	614.3	908.3	910

Note: Brake reaction distance predicated on a time of 2.5 s; deceleration rate of 3.4 m/s^2 [11.2 ft/s^2] used to determine calculated sight distance.

from ASSHTO *A Policy on Geometric Design of Highways and Streets*. 2001

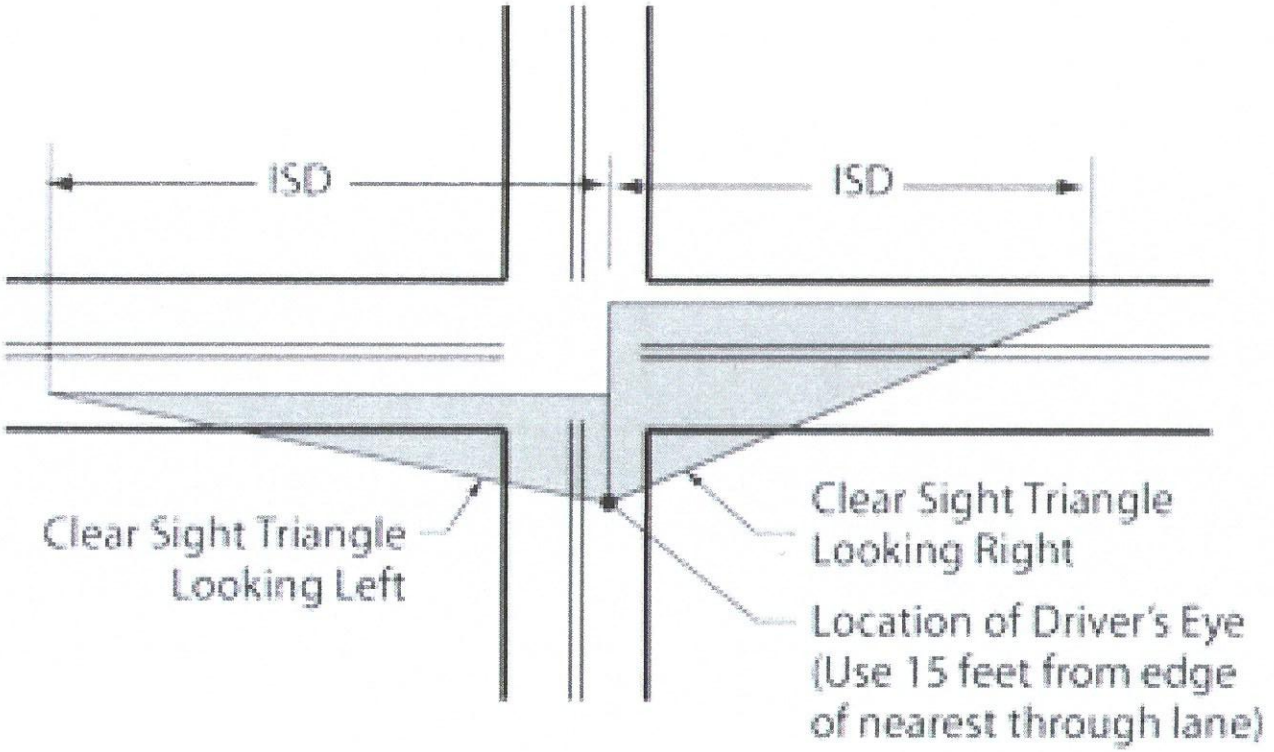
Required @ 35 mph: 250 ft

Barn at Jacksonville Stage Rd

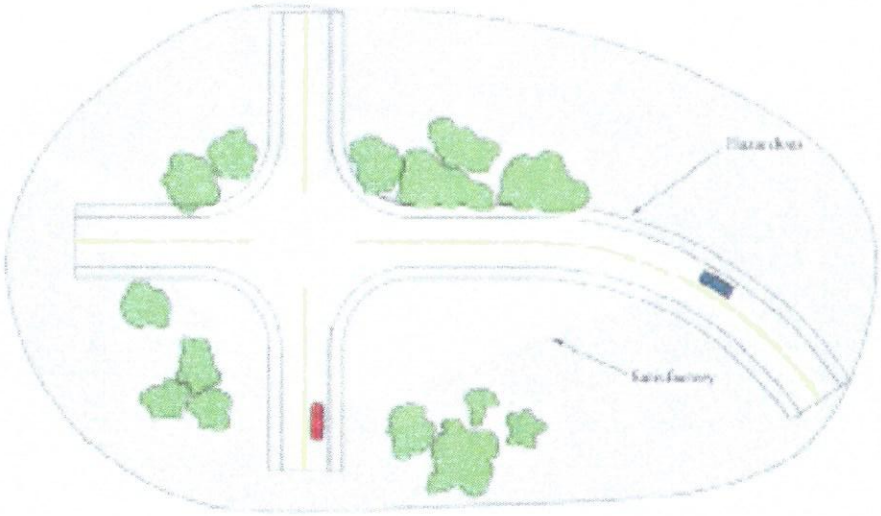
Intersection Sight Distance

- Reduce vehicular conflicts at an intersection
- Distances sufficient for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. AASHTO p.9-21

Intersection Sight Distance



Intersection Sight Distance

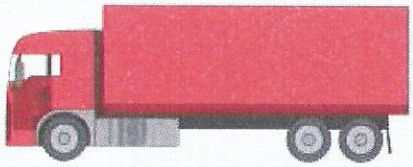
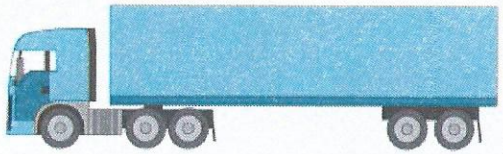


AASHTO ISD Cases

- B1: Left turn from minor road
- B2: Right turn from minor road
- B3: Crossing maneuver from minor road

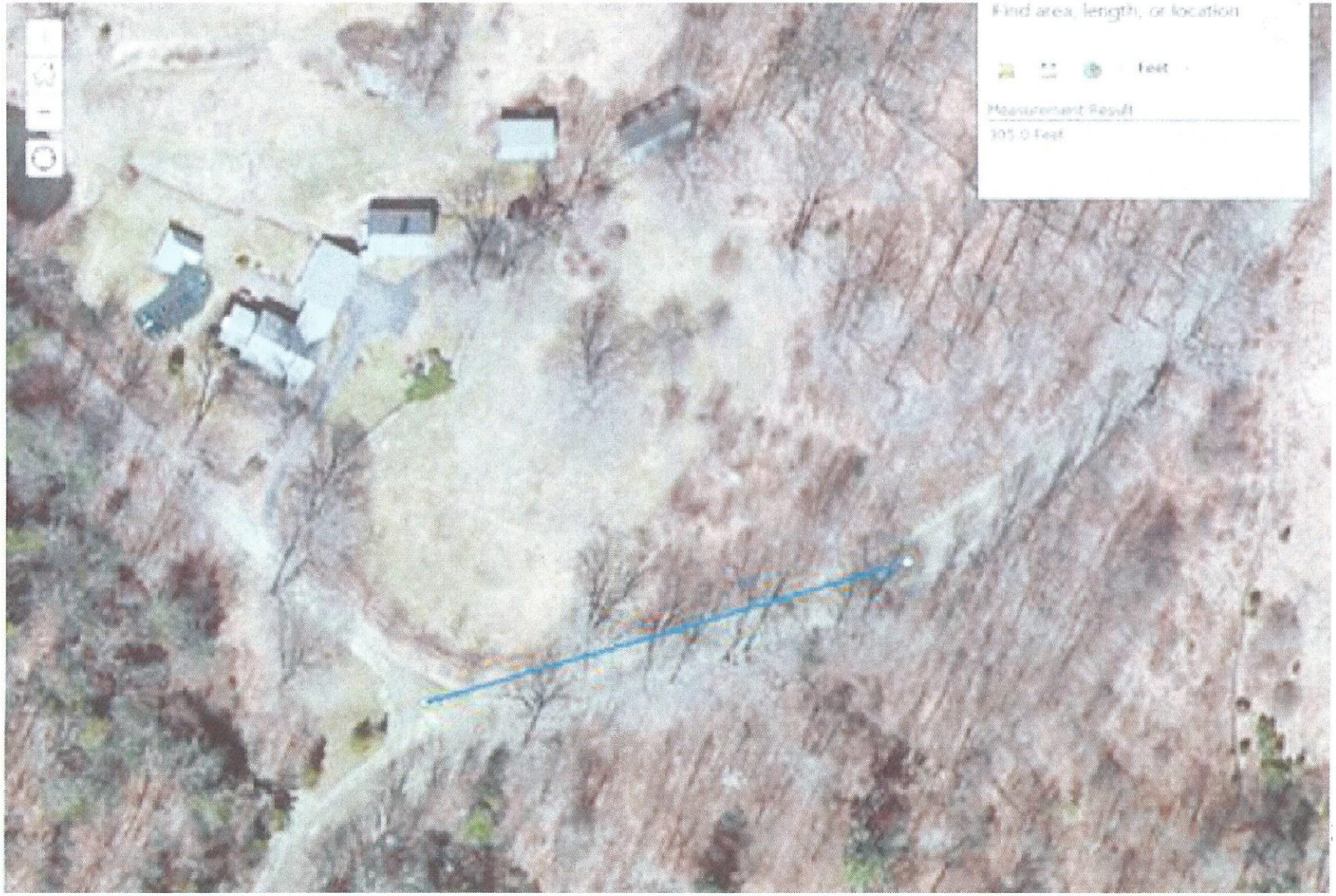
Minimum Sight Distance

Intersection Sight Distance Case B-2

Vehicle	Vehicle	Gap (sec)	ISD @ 35 mph (ft)
Passenger Car		6.5	335
Single Unit Truck		8.5	440
Combination Truck		10.5	540

Stopping Sight Distance @ 35 mph: 250 ft

RSG Sight Distance



Sight Distance

Location	Available (ft)	Required (ft)
ISD Jacksonville Stage/Class 4	305	440
SSD Jacksonville Stage	110 - 140	250
SSD Stark Mountain	140 - 170	250

Roadway Geometry

Width per VTrans State Design Standards
Based on speed and volume categories

Traffic Counts

Stark Mountain Rd
Mon July 21st - Fri July 25th 2014
Green River Bridge open

Windham Regional Commission
139 Main St. Suite 505
Brattleboro, Vt 05301
802.257.4547
windhamregional.org

Site Code: Halifax
Station ID: Hal02-14
counter 50 meters N of Sanders Rd
tube A closest to to Sanders Rd

Start Time	21-Jul-14 Direction 1	21-Jul-14 Direction 2	22-Jul-14 Direction 1	22-Jul-14 Direction 2	23-Jul-14 Direction 1	23-Jul-14 Direction 2	24-Jul-14 Direction 1	24-Jul-14 Direction 2	25-Jul-14 Direction 1	25-Jul-14 Direction 2	26-Jul-14 Direction 1	26-Jul-14 Direction 2	27-Jul-14 Direction 1	27-Jul-14 Direction 2	Week Average Direction 1	Week Average Direction 2
12:00 AM	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	0
01:00	0	0	0	0	0	1	0	0	0	0	*	*	*	*	0	0
02:00	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	0
03:00	0	0	0	0	0	0	0	0	0	0	*	*	*	*	0	0
04:00	0	0	0	0	0	0	1	0	0	0	*	*	*	*	0	0
05:00	0	0	0	0	0	1	0	0	0	1	*	*	*	*	0	0
06:00	1	1	1	3	1	1	1	1	1	1	*	*	*	*	0	0
07:00	2	2	1	1	1	2	2	2	1	1	*	*	*	*	1	1
08:00	1	4	1	6	3	1	0	2	0	5	*	*	*	*	1	2
09:00	1	1	1	0	3	4	2	5	0	2	*	*	*	*	1	4
10:00	1	1	0	2	2	4	0	1	0	2	*	*	*	*	1	2
11:00	4	2	2	1	4	3	3	3	5	3	*	*	*	*	1	2
12:00 PM	2	0	4	4	2	1	3	2	4	1	*	*	*	*	4	2
01:00	5	3	2	0	2	2	3	1	0	0	*	*	*	*	3	2
02:00	4	3	0	2	0	3	1	1	0	0	*	*	*	*	2	1
03:00	1	3	3	1	3	1	1	0	0	0	*	*	*	*	1	2
04:00	4	4	3	2	0	3	1	1	0	0	*	*	*	*	2	1
05:00	2	4	4	1	2	3	1	3	0	0	*	*	*	*	2	2
06:00	0	3	2	4	4	6	1	3	0	0	*	*	*	*	2	2
07:00	1	1	3	1	0	0	1	2	0	0	*	*	*	*	1	3
08:00	2	2	2	2	1	0	5	0	0	0	*	*	*	*	1	1
09:00	0	0	3	1	0	0	1	0	0	0	*	*	*	*	2	1
10:00	2	0	1	0	0	0	0	2	0	0	*	*	*	*	1	0
11:00	0	0	0	0	0	1	1	1	0	0	*	*	*	*	1	0
Total	33	34	33	31	29	37	28	30	11	16	0	0	0	0	27	28
Day	67		64		66		58		27		0		0		55	
AM Peak	11:00	08:00	11:00	08:00	11:00	09:00	11:00	09:00	11:00	08:00	-	-	-	-	11:00	09:00
Vol.	4	4	2	6	4	4	3	5	5	6	-	-	-	-	4	4
PM Peak	13:00	16:00	12:00	12:00	18:00	18:00	20:00	17:00	12:00	12:00	-	-	-	-	12:00	18:00
Vol.	5	4	4	4	4	6	5	3	4	1	-	-	-	-	3	3

Comb. Total	67	64	66	58	27	0	0	55

ADT ADT 56 AADT 56

Average Daily Traffic Volumes

Road	ADT
Jacksonville Stage	81
Stark Mountain	56

Source: Windham Regional Commission

Vermont State Design Standards

Table 6.3 Minimum Width (feet) of Lanes/Shoulders for Rural Local Roads

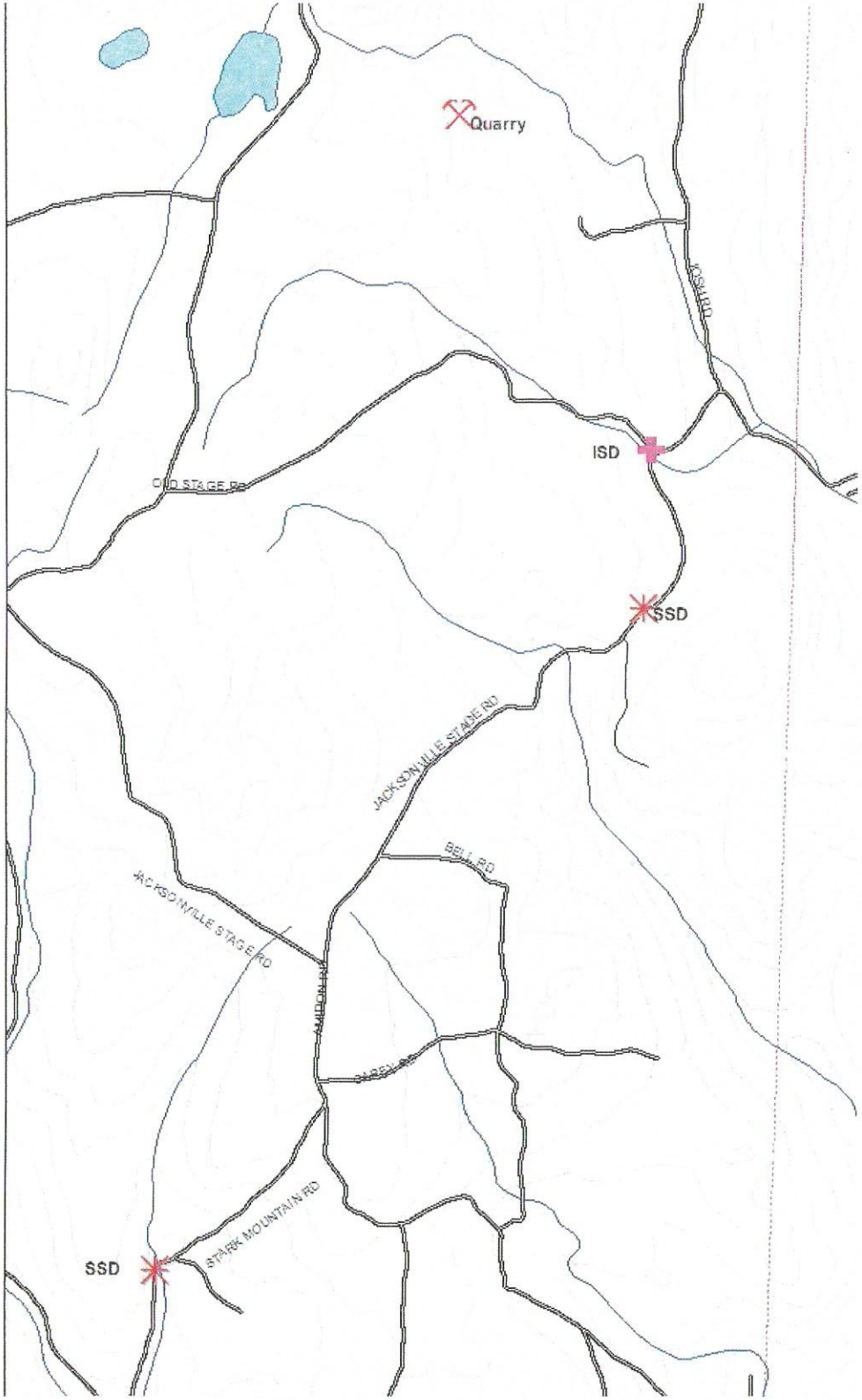
Speed (mph)	ADT 0-25	ADT 25-50	ADT 50-100	ADT 100-400	ADT 400-1500	ADT 1500-2000	ADT Over 2000
25	7/0	8/0	9/0	9/2	9/2	10/3	11/3
30	7/0	8/0	9/0	9/2	9/2	10/3	11/3
35	7/0	8/0	9/0	9/2	9/2	10/3	11/3
40	7/0	8/0	9/2	9/2	9/2	10/3	11/3
45	-	-	9/2	9/2	9/2	10/3	11/3
50	-	-	9/2	9/2	10/2	10/3	11/3

http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/publications/VermontStateDesignStandards.pdf

Roadway Width

	Jacksonville Stage	Stark Mountain
Per Applicant	18.5 - 25	16.5 - 19
Measured	16 & 17	13 - 17

VTrans Local Road Standard 35 mph ADT 50 – 100 = 18'


Quarry
ISD
SSD
SSD
OLD STAGE RD
JACKSONVILLE STAGE RD
JACKSONVILLE STAGE RD
BELL RD
STARK MOUNTAIN RD

Effectiveness of Traffic Signs on Local Roads

Minnesota DoT Transportation Research Synthesis, 2010
(http://www.dot.state.mn.us/research/TRS/2010/TRS1002.pdf)

- Traffic sign effectiveness appears to be more a matter of perception and opinion than of fact based on evidence.
- Research from FHWA, NCHRP, TRB and the ITE includes studies that show particular signs to have minimal impact on safety, and studies that point out that the effectiveness of the signs has simply not been vigorously tested.
- Studies from Kansas and Washington state found that the use of particular types of warning signs (such as deer crossing and ice warning) are minimally effective.

WARNING SIGNS TRAFFIC POLICY

City of Edina

"Overuse of warning signs, especially for conditions which are apparent, tends to breed disrespect for signs in general, and they lose their effectiveness. *Warning signs many times have an initial positive effect but soon lose the attention of regular passers-by*."

https://edinamn.gov/edinafiles/files/Advisory_Boards/Traffic/Traffic%20Signs/TrafficSigns_Warning.PDF

Roadway Deterioration "Wear and Tear"

Based on equivalent single axle loading (ESAL) i.e. the number of equivalent applications of one single axle supporting an 18,000 pound load

Truck weight distribution

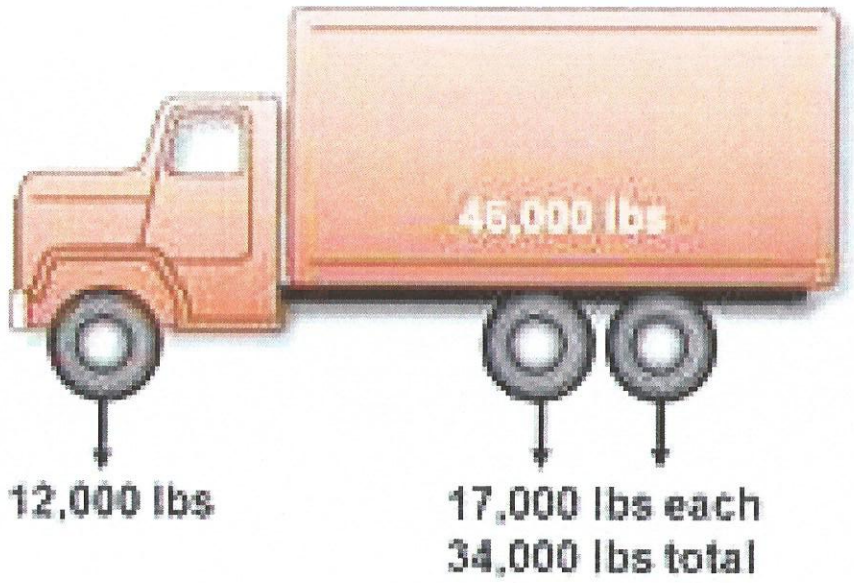


Table 16.6 Axle-Load Equivalence Factors for Flexible Pavement, $p_t = 2.0$*

Single Axles						
Axle-Load, kips	Structural number SN					
	1	2	3	4	5	6
2	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002
4	0.002	0.003	0.002	0.002	0.002	0.002
6	0.01	0.01	0.01	0.01	0.01	0.01
8	0.03	0.04	0.04	0.03	0.03	0.03
10	0.08	0.08	0.09	0.08	0.08	0.08
12	0.16	0.18	0.19	0.18	0.17	0.17
14	0.32	0.34	0.35	0.35	0.34	0.33
16	0.59	0.60	0.61	0.61	0.60	0.60
18	1.00	1.00	1.00	1.00	1.00	1.00
20	1.61	1.59	1.56	1.55	1.57	1.60
22	2.49	2.44	2.35	2.31	2.35	2.41
24	3.71	3.62	3.43	3.33	3.40	3.51
26	5.36	5.21	4.88	4.68	4.77	4.96
28	7.54	7.31	6.78	6.42	6.52	6.83
30	10.38	10.03	9.24	8.65	8.73	9.17
32	14.00	13.51	12.37	11.46	11.48	12.17
34	18.55	17.87	16.30	14.97	14.87	15.63
36	24.20	23.30	21.16	19.28	19.02	19.93
38	31.14	29.95	27.12	24.55	24.03	25.10
40	39.57	38.02	34.34	30.92	30.04	31.25

Tandem Axles						
Axle-Load, kips	Structural number SN					
	1	2	3	4	5	8
10	0.01	0.01	0.01	0.01	0.01	0.01
12	0.01	0.02	0.02	0.01	0.01	0.01
14	0.02	0.03	0.03	0.03	0.02	0.02
16	0.04	0.05	0.05	0.05	0.04	0.04
18	0.07	0.08	0.08	0.08	0.07	0.07
20	0.10	0.12	0.12	0.12	0.11	0.10
22	0.16	0.17	0.18	0.17	0.16	0.16
24	0.23	0.24	0.26	0.25	0.24	0.23
26	0.32	0.34	0.36	0.35	0.34	0.33
28	0.45	0.46	0.49	0.48	0.47	0.46
30	0.61	0.62	0.65	0.64	0.63	0.62
32	0.81	0.82	0.84	0.84	0.83	0.82
34	1.06	1.07	1.08	1.08	1.08	1.07
36	1.38	1.38	1.38	1.38	1.38	1.38
38	1.76	1.75	1.73	1.72	1.73	1.74
40	2.22	2.19	2.15	2.13	2.16	2.18
42	2.77	2.73	2.64	2.62	2.66	2.70
44	3.42	3.36	3.23	3.18	3.24	3.31
46	4.20	4.11	3.92	3.83	3.91	4.02
48	5.10	4.98	4.72	4.58	4.68	4.83

* From "Guide for Design of Pavement Structures," American Association of State Highway and Transportation Officials.

(Likeness only)

Equivalent Single Axle Loadings (ESAL/day)

Condition	Configuration	ESAL (#)	Car
Loaded (GVW = 69,000)	Tri-axle	4.44	10,2(
Empty (GVW = 29,000)	Tandem	0.40	9(
Total	Mixed	4.84	11,1(

* Passenger car equivalents (4,000 lb)


HALIFAX

Equivalent Single Axle Loadings (ESAL/day)

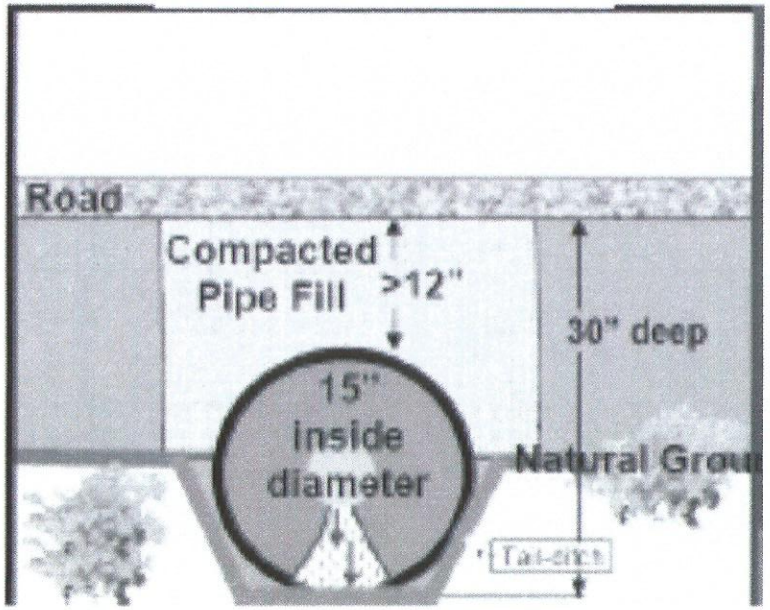
Condition	Configuration	ESAL (#)	Cars*
Loaded (GVW = 69,000)	Tandem	15.28	35,172
Empty (GVW = 29,000)	Tandem	0.40	904
Total	Tandem	15.68	36,076

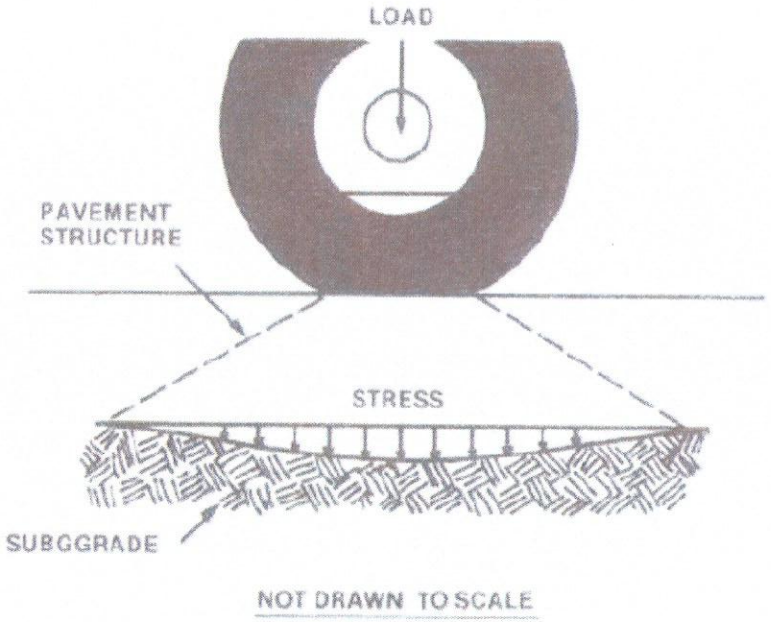
* Passenger car equivalents (4,000 lb)

Vermont Weight Limits 23 VSA § 1392

	Maximum Weight (pounds)	
Truck Type	Statutory	Special Permit
Tandem Axle	55,000	60,000
Tri-Axle	60,000	69,000

Culverts


Road
Compacted
Pipe Fill
>12"
30" deep
15"
inside
diameter
Natural Grou


LOAD
PAVEMENT
STRUCTURE
STRESS
SUBGGRADE
NOT DRAWN TO SCALE

Added Costs

	Jacksonville Stage	Stark Mountain	Amidon
Existing ESAL	471	522	496
Quarry ESAL	673	673	673
Existing Cost	$42,675	$18,575	$6,670
Increase	1.43	1.29	1.36
Additional Cost	$60,972	$23,954	$9,042

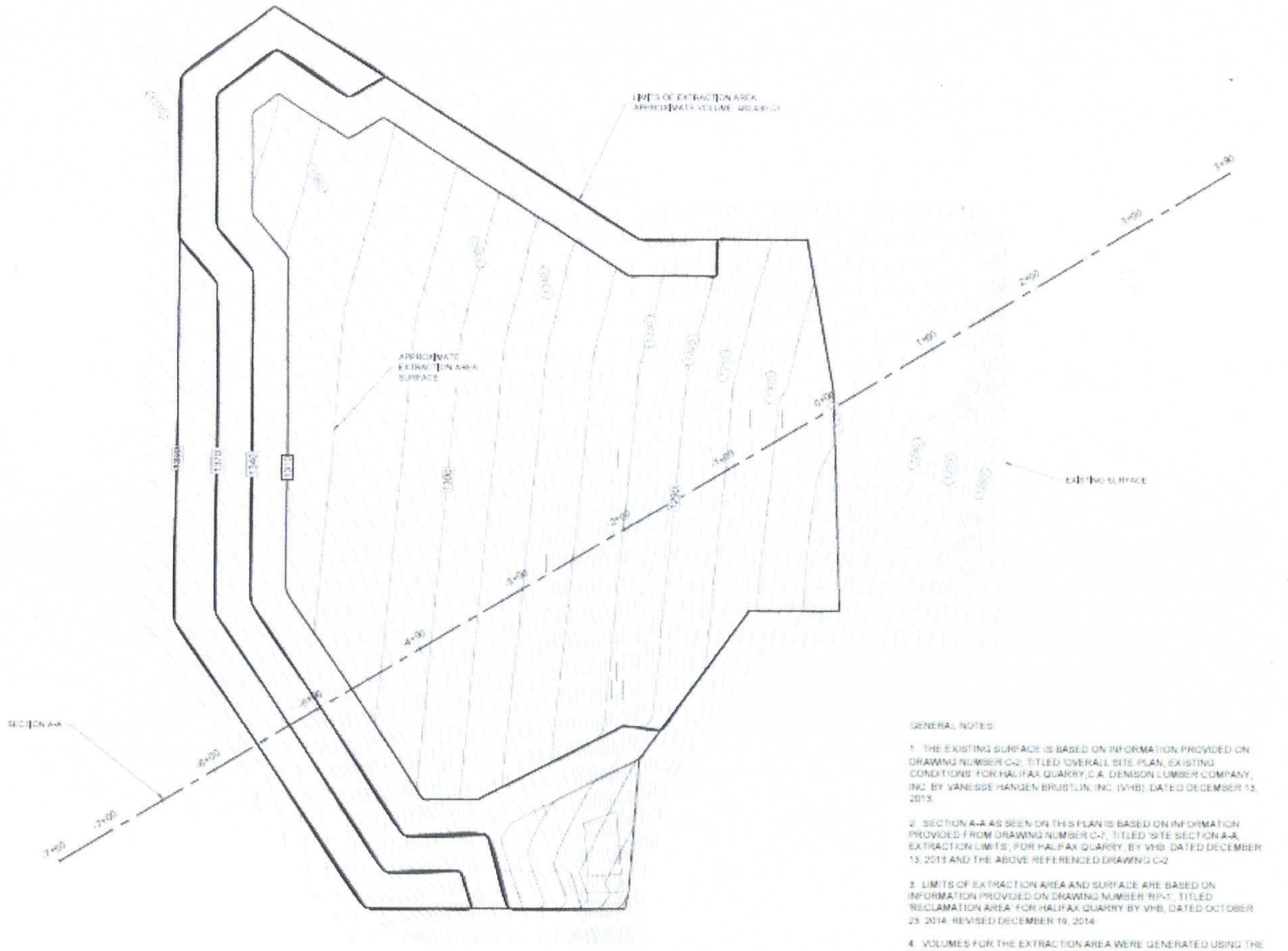
Total Additional Annual Roadway Maintenance Cost $93,968

Costs not Included

- Geometric repairs
  - roadway width
  - stopping and intersection sight distance
- Culvert/drainage standards
  - replace damaged culverts
  - adequate cover depth

Conclusions

- Existing roadways on haul route unsafe for significant heavy vehicle traffic due to:
  - insufficient stopping sight distance at identified locations on Jacksonville Stage Rd and Stark Mountain Rd
  - insufficient intersection sight distances for the type of vehicle used for product transport at the intersection of Old Stage Rd with Jacksonville Stage Rd
  - Inadequate roadway width for the level of traffic to be carried; compounded by the inadequate sight distance and absence of lane markings
- High impact on roadways due to very heavy vehicles; greatly increased roadway maintenance costs.



C1 PROPOSED SURFACE

Scale: 1:80

GENERAL NOTES:

1. THE EXISTING SURFACE IS BASED ON INFORMATION PROVIDED ON DRAWING NUMBER C-2, TITLED 'OVERALL SITE PLAN, EXISTING CONDITIONS' FOR HALIFAX QUARRY, C.A. DENISON LUMBER COMPANY, INC. BY VANESSE HANGEN BRUSTLIN, INC. (VHB), DATED DECEMBER 13, 2013.

2. SECTION A-A AS SEEN ON THIS PLAN IS BASED ON INFORMATION PROVIDED FROM DRAWING NUMBER C-7, TITLED 'SITE SECTION A-A, EXTRACTION LIMITS', FOR HALIFAX QUARRY, BY VHB, DATED DECEMBER 13, 2013 AND THE ABOVE REFERENCED DRAWING C-2.

3. LIMITS OF EXTRACTION AREA AND SURFACE ARE BASED ON INFORMATION PROVIDED ON DRAWING NUMBER 'RP-1', TITLED 'RECLAMATION AREA' FOR HALIFAX QUARRY BY VHB, DATED OCTOBER 23, 2014, REVISED DECEMBER 19, 2014.

4. VOLUMES FOR THE EXTRACTION AREA WERE GENERATED USING THE EXTRACTION AREA LIMITS (RP-1) WITH ELEVATION AND STATION DATA PROVIDED ON DRAWINGS C-2 AND C-7. NO SITE OR SURVEY WORK WAS PERFORMED BY MSK ENGINEERING IN THE DETERMINATION OF THE EXTRACTION VOLUME.

Quarry Buildout and Traffic

	CY	Loads/day
Applicant	144,348	2.0
Schedule A	246,000	3.4
Calculated	482,430	6.7

Assumptions

- 166 operating days/year
- 50 year life
- 2.3 tons/CY

Questions