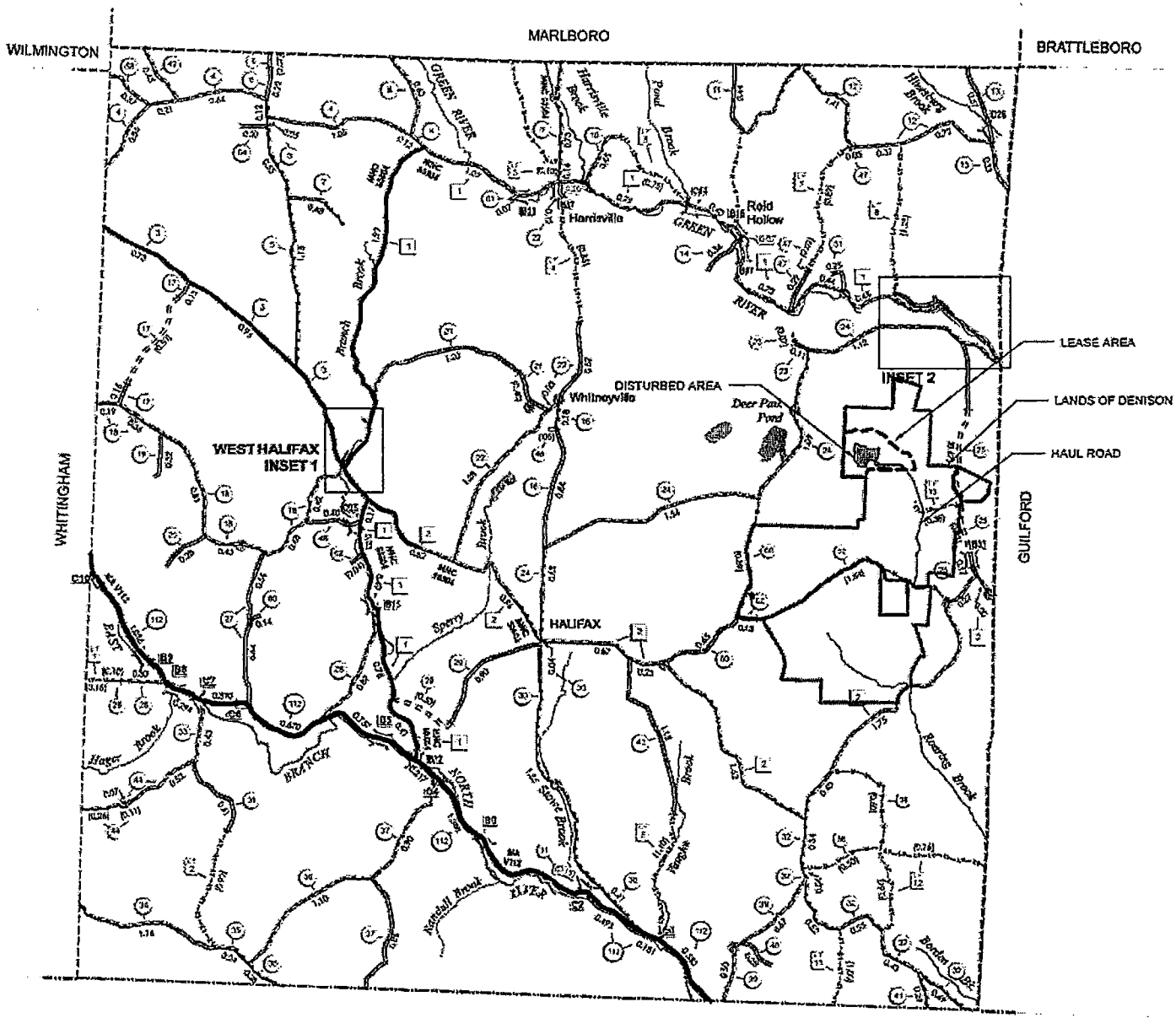
Traffic Issues at Proposed Jerry Pratt Ashfield Stone/Denison Quarry

Presented 3/6/2015

Michael Oman, Principal
Oman Analytics
Planning for Transportation and Community

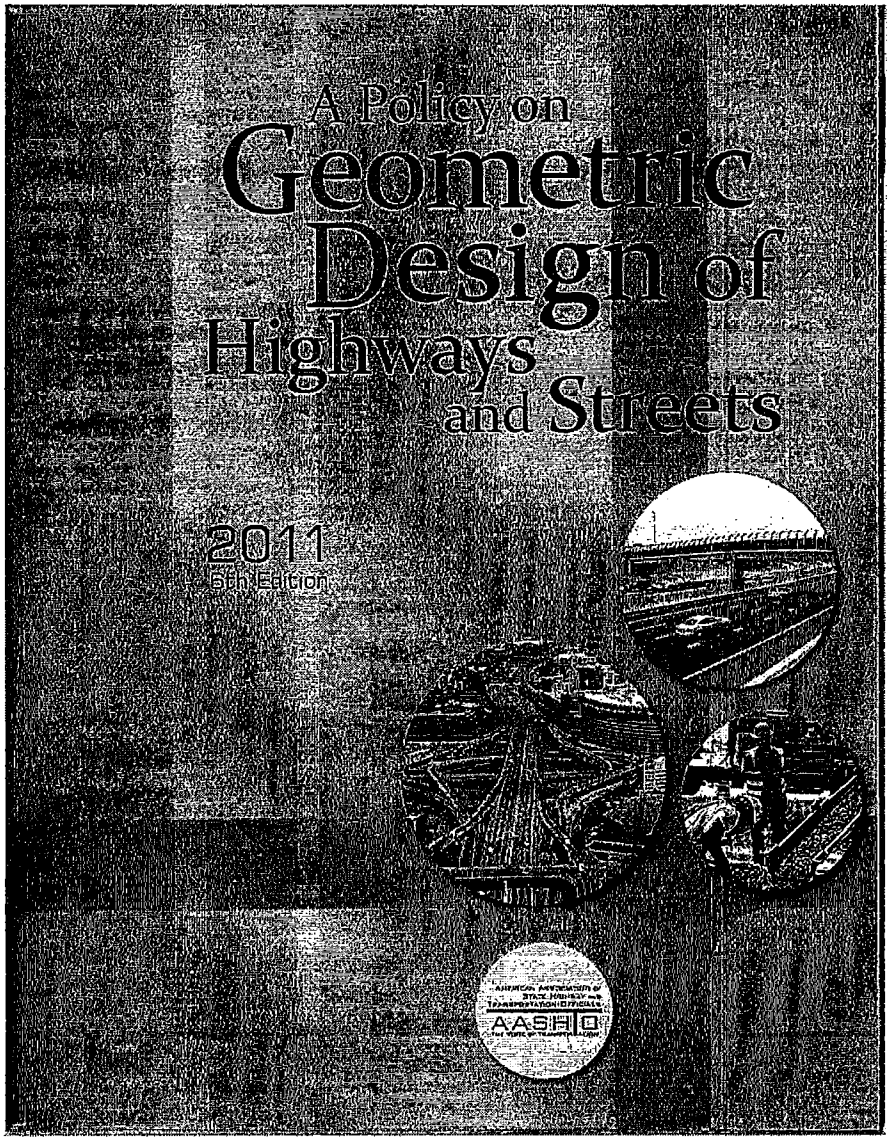

WILMINGTON
MARLBORO
BRATTLEBORO
WHITINGHAM
GUILFORD
WEST HALIFAX
INSET 1
INSET 2
DISTURBED AREA
LEASE AREA
LANDS OF DENISON
HAUL ROAD
HALIFAX
Harrisville
Whitneyville
Reid Hollow
Deer Park Pond
GREEN RIVER
NORTH BRANCH
Sperry Brook
Hager Brook
Marshall Brook
Beaver Brook
Borden Brook

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



VERMONT STATE DESIGN STANDARDS

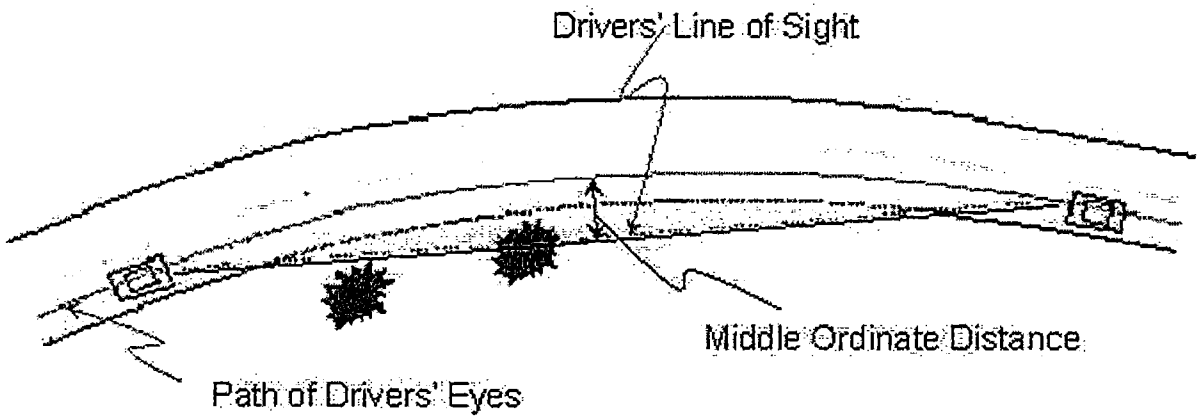
Table of Contents

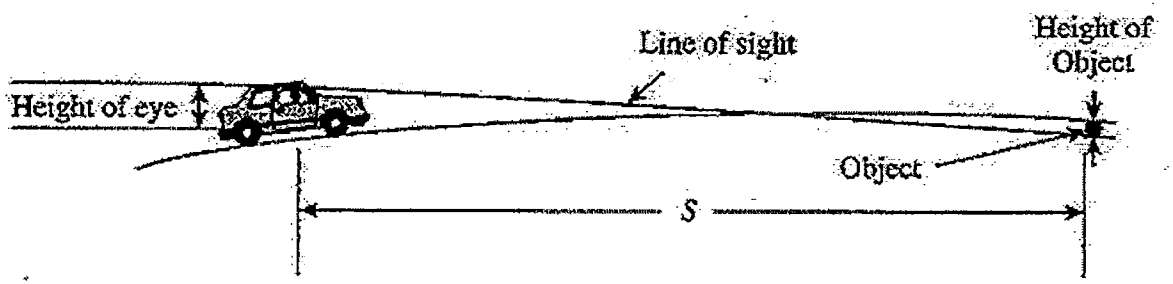
October 22, 1997 **Page**

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



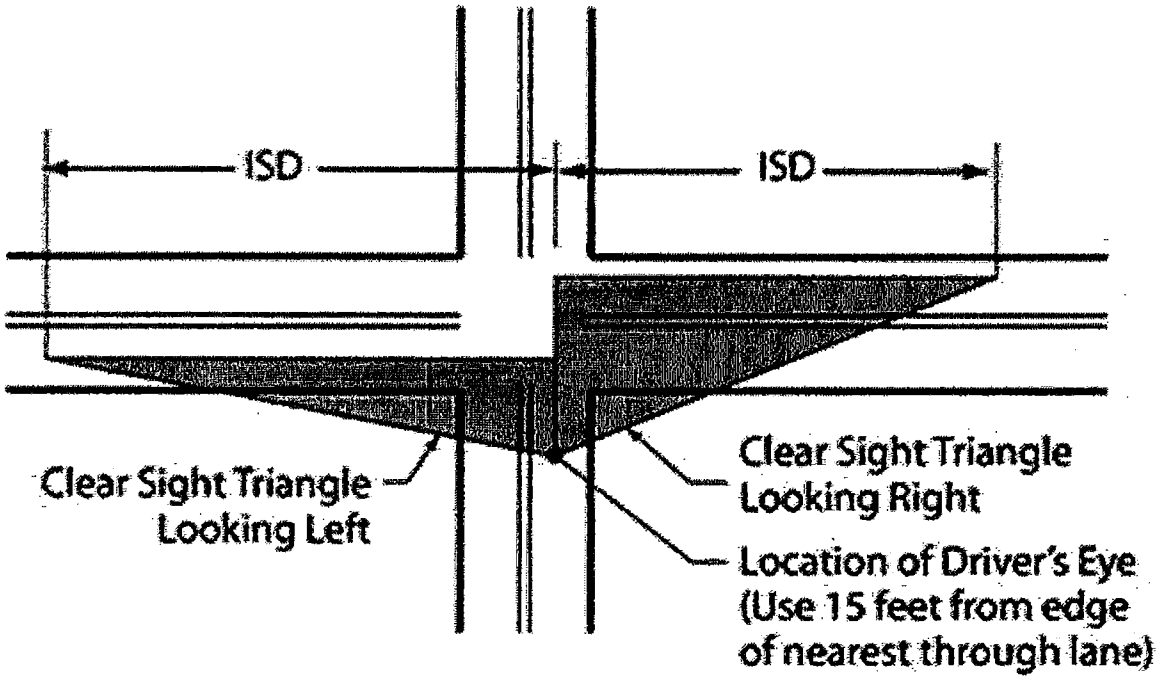


Required @ 35 mph: 250 ft

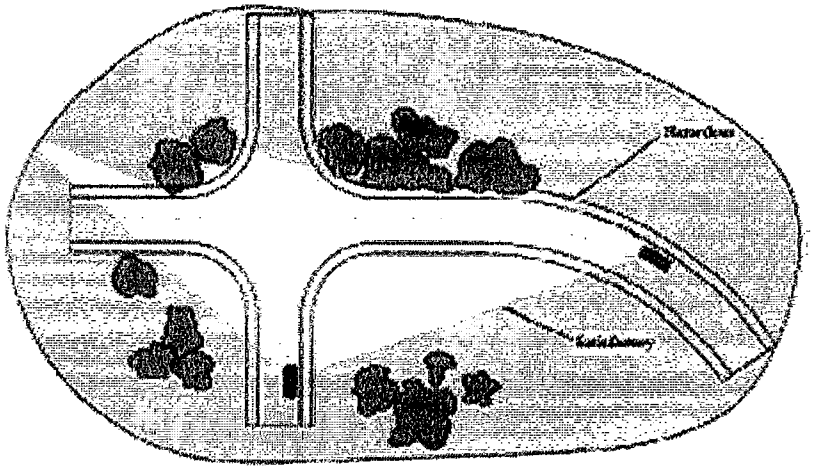
Intersection Sight Distance

- 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

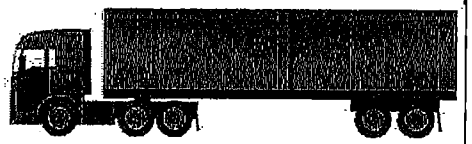


AASHTO ISD Cases

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

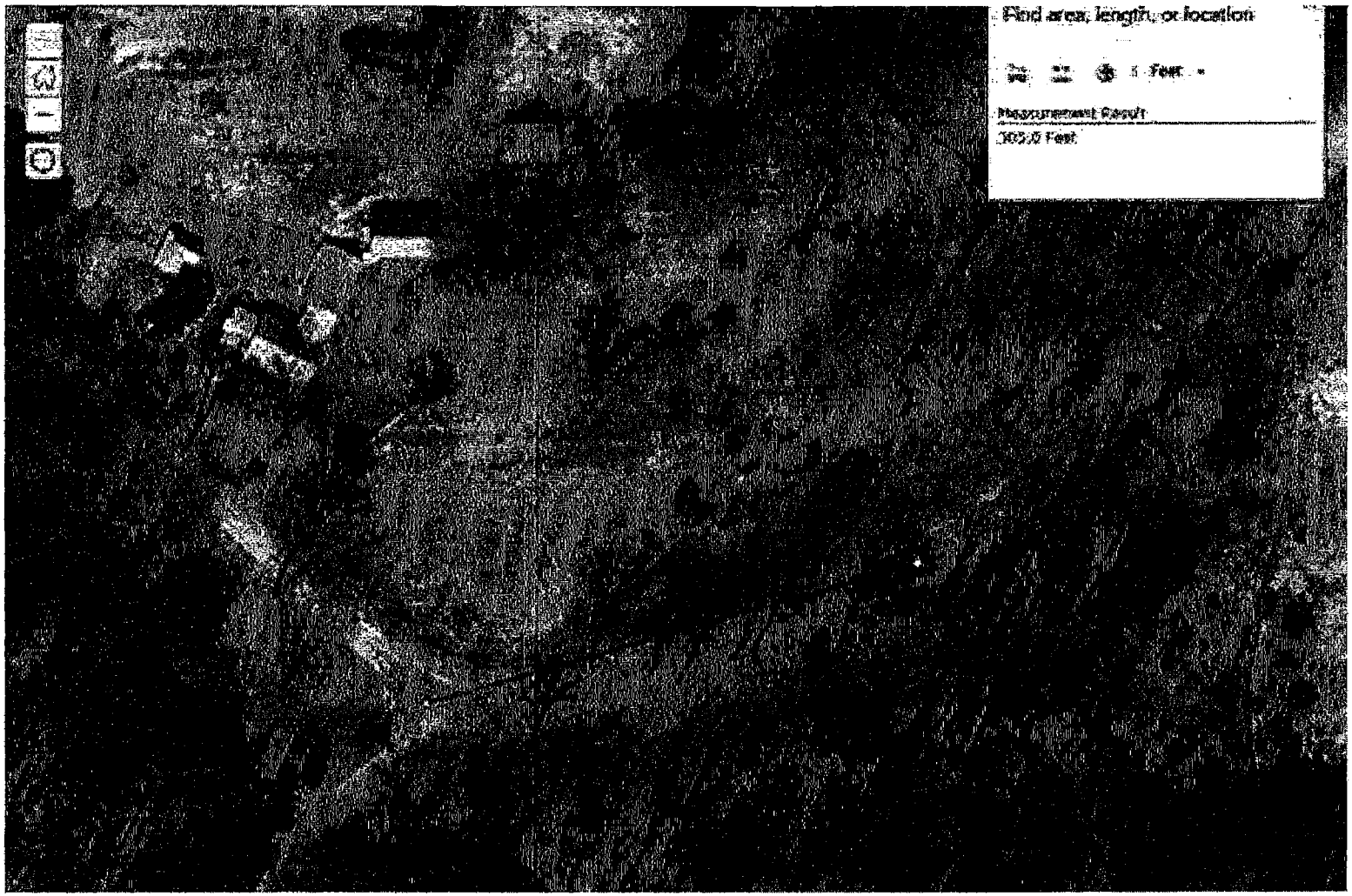
Minimum Sight Distance

Intersection Sight Distance

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

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

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

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

Start	21-Jul-14		22-Jul-14		23-Jul-14		24-Jul-14		25-Jul-14		26-Jul-14		27-Jul-14		Week Average	
Time	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	Direction 2	Direction 1	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	*	*	*	*	1	1
07:00	2	2	1	1	1	2	2	2	1	1	*	*	*	*	1	2
08:00	1	4	1	6	3	1	0	2	0	5	*	*	*	*	1	4
09:00	1	1	1	0	3	4	2	5	0	2	*	*	*	*	1	2
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	*	*	*	*	4	2
12:00 PM	2	0	4	4	2	1	3	2	4	1	*	*	*	*	3	2
01:00	5	3	2	0	2	2	3	1	0	0	*	*	*	*	2	1
02:00	4	3	0	2	0	3	1	1	0	0	*	*	*	*	1	2
03:00	1	3	3	1	3	1	1	0	0	0	*	*	*	*	2	1
04:00	4	4	3	2	0	3	1	1	0	0	*	*	*	*	2	2
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	*	*	*	*	1	3
07:00	1	1	3	1	0	0	1	2	0	0	*	*	*	*	1	1
08:00	2	2	2	2	1	0	5	0	0	0	*	*	*	*	2	1
09:00	0	0	3	1	0	0	1	0	0	0	*	*	*	*	1	0
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	*	*	*	*	0	0
Total	33	34	33	31	28	37	28	30	11	18	0	0	0	0	27	28
Day	67		64		65		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	08:00
Vol.	4	4	2	6	4	4	3	5	5	5	-	-	-	-	4	4
PM Peak	13:00	16:00	12:00	12:00	16:00	16:00	20:00	17:00	12:00	12:00	-	-	-	-	12:00	16:00
Vol.	5	4	4	4	4	6	5	3	4	1	-	-	-	-	3	3

Comb. Total	67	64	65	58	27	0	0	55

ADT ADT 56 AADT 56

Average Daily Traffic Volumes

Road	ADT
Jacksonville Stage	81
Stark Mountain	56

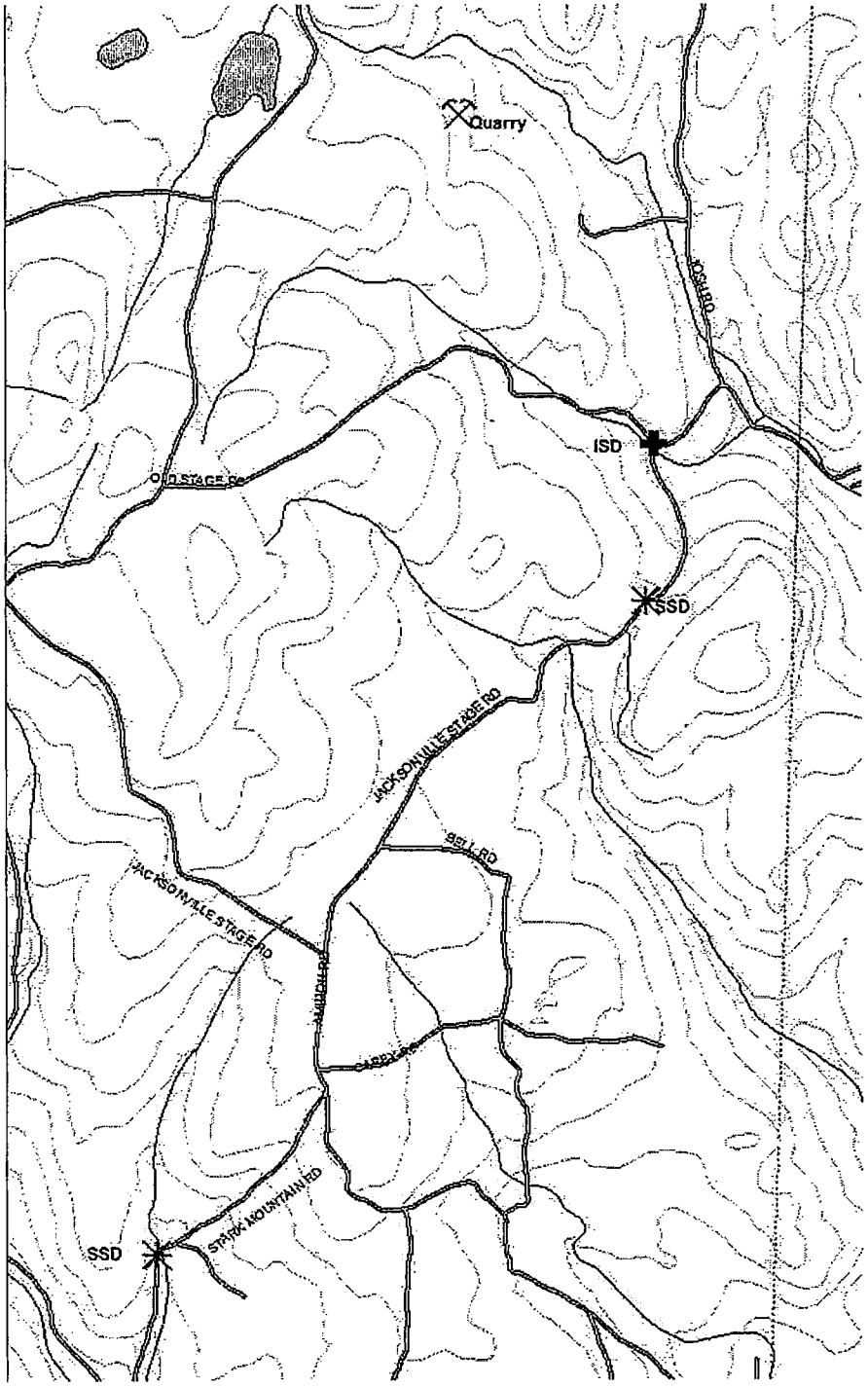
Source: Windham Regional Commission

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

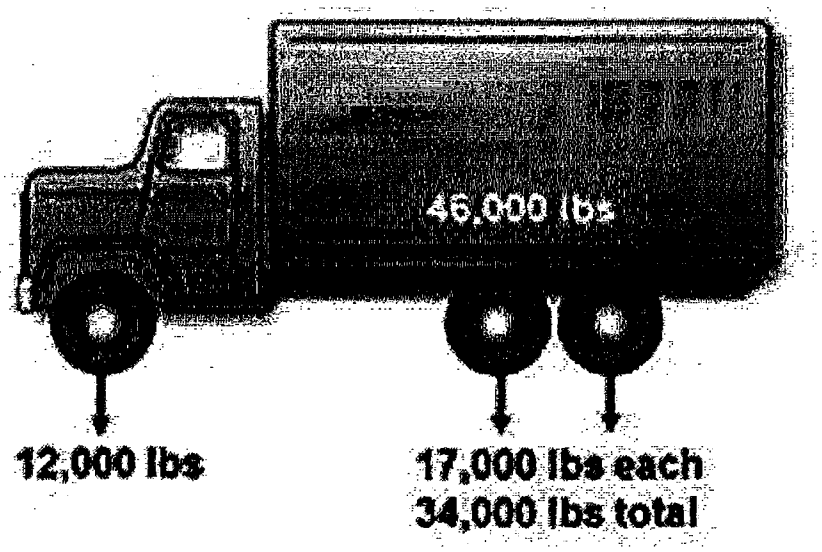
Barn at Jacksonville Stage Rd


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

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



Flexible Pavement ESAL Equation

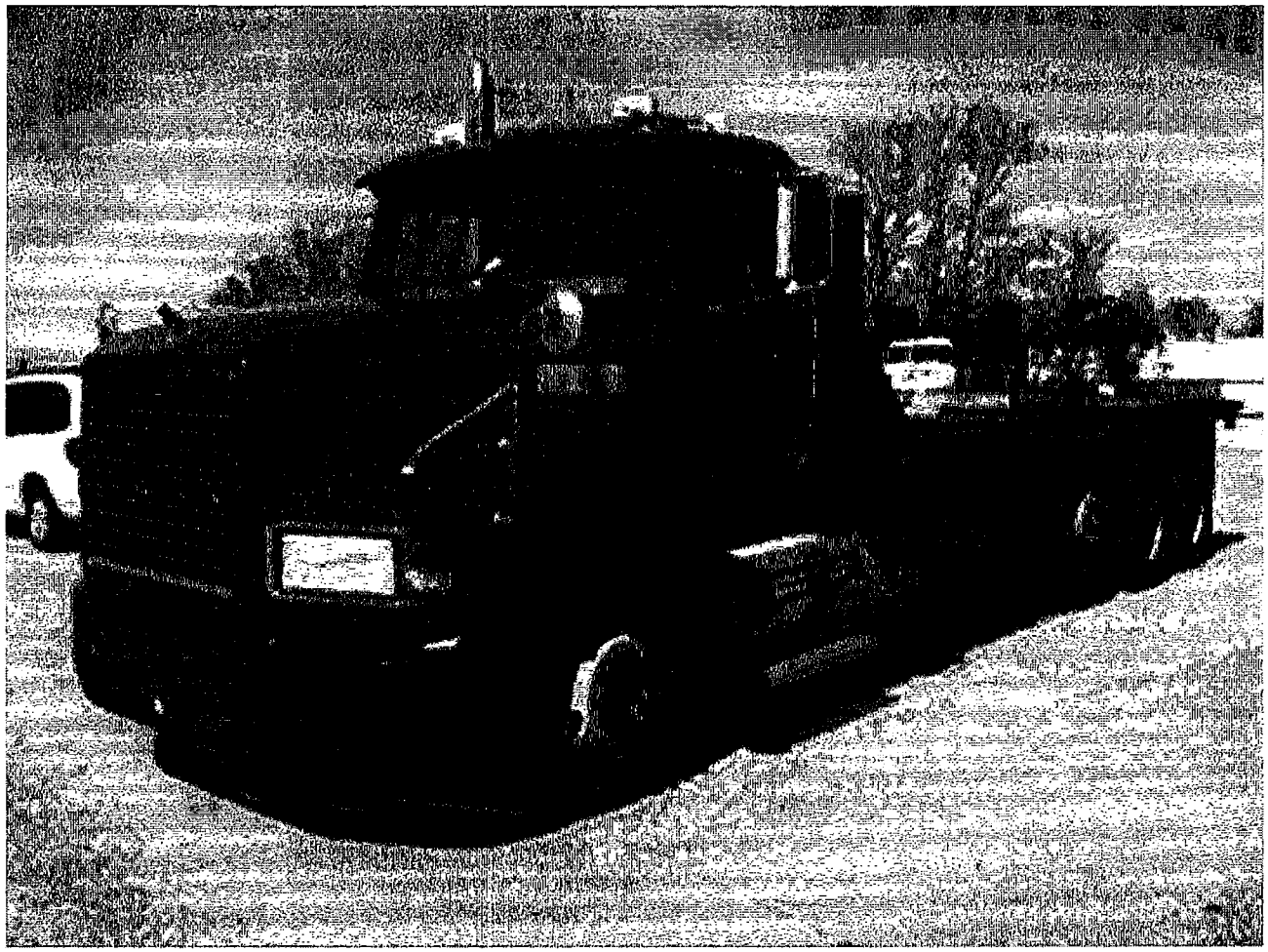
$$\frac{W_x}{W_{18}} = \left[\frac{L_{18}+L_{2s}}{L_x+L_{2x}}\right]^{4.79}\left[\frac{10^{G/\beta_x}}{10^{G/\beta_{18}}}\right][L_{2x}]^{4.33}$$

Where:

- W = axle applications inverse of equivalency factors (where W_{18} = number of 18,000 lb (80 kN) single axle loads)
- L_x = axle load being evaluated (kips)
- L_{18} = 18 (standard axle load in kips)
- L_2 = code for axle configuration
  - 1 = single axle
  - 2 = tandem axle
  - 3 = triple axle (added in the 1986 AASHTO *Guide*)
  - x = axle load equivalency factor being evaluated
  - s = code for standard axle = 1 (single axle)
- G = $\log\left(\frac{4.2-p_t}{4.2-1.5}\right)$ — a function of the ratio of loss in serviceability at time, t, to the potential loss taken at a point where $p_t = 1.5$
- p_t = "terminal" serviceability index (point at which the pavement is considered to be at the end of its useful life)
- β = $0.4+\left(\frac{0.081(L_x+L_{2x})^{3.23}}{(SN+1)^{5.19}L_{2x}^{3.23}}\right)$ — function which determines the relationship between serviceability and axle load applications

  SN = structural number

http://classes.engr.oregonstate.edu/cce/spring2014/ce492/Modules/04_design_parameters/flexible_esal.htm

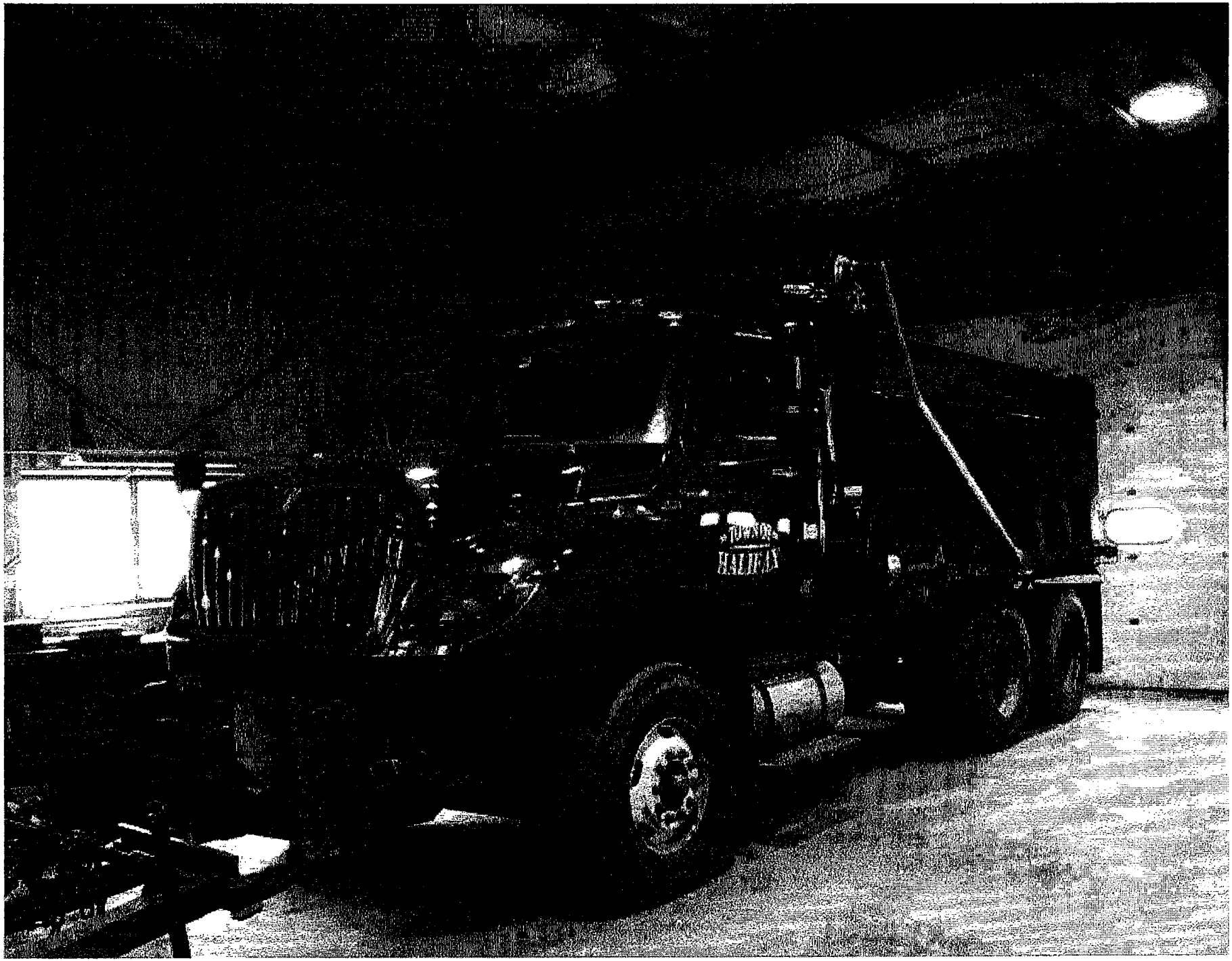


(Likeness only)

Equivalent Single Axle Loadings (ESAL/day)

Condition	Configuration	ESAL (#)	Cars*
Loaded (GVW = 69,000)	Tri-axle	4.44	10,204
Empty (GVW = 29,000)	Tandem	0.40	904
Total	Mixed	4.84	11,108

* Passenger car equivalents (4,000 lb)



Equivalent Single Axle Loadings (ESAL/day)

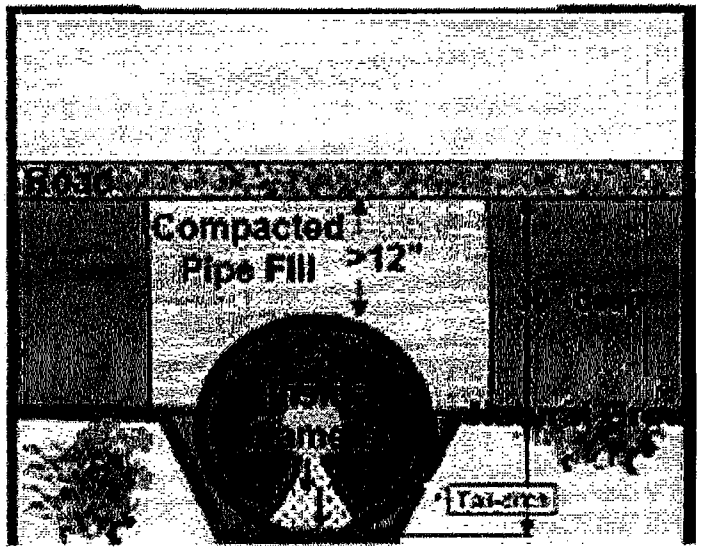
Condition	Configuration	ESAL (#)	Cars*
Loaded (GVW = 69,000)	Tandem	15.28	35,172
Empty (GVW = 29,000)	Tandem	0.40	904
Total	Tandem	15.68	36,076

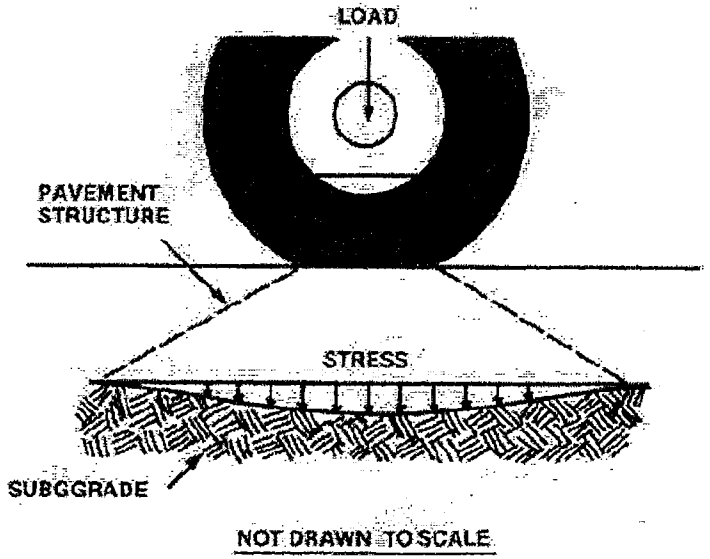
* Passenger car equivalents (4,000 lb)

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


Compacted
Pipe Fill
>12"


LOAD
PAVEMENT
STRUCTURE
STRESS
SUBGGRADE
NOT DRAWN TO SCALE

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

Conditions

- Improve roadways to appropriate standard including culverts, especially cover depth
- Limit haul trips to two per day
- Limit hauls to May,1 to Nov, 15
- Maintain access roads including class 4 and access road to Town standards

Per Applicant

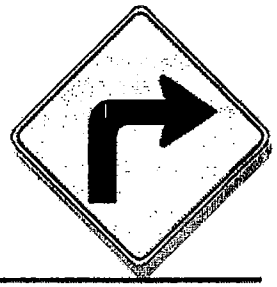
- Schedule B
  - Criterion 5i: "Loaded project trucks have been limited to two per day."
  - Criterion 5k: "Town Highway 2 is a Town-maintained gravel road. The roadway is sufficient to support the addition of up to two proposed loaded trucks per day."
- Exhibit 30 MEMORANDUM CONCERNING HIGHWAY CONDITIONS
  - "The Applicant proposes to limit truck [sic] to two loaded trucks per day."
  - "The possibility of seeing multiple vehicles on the roads at the same time is made even more unlikely by the proposed limit of 2 loaded trucks per day."

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