

Route 5 South Study

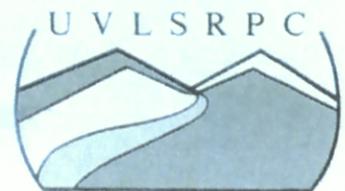
Town of Hartford, VT

May 2001



Prepared By

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ROUTE 5 SOUTH STUDY

TABLE OF CONTENTS

I.	<u>INTRODUCTION</u>	1
II.	<u>SUMMARY OF THE PLANNING PROCESS</u>	3
III.	<u>EXISTING CONDITIONS</u>	3
	A. LOCATION	3
	B. EXISTING ROAD NETWORK	3
	C. EXISTING ZONING	4
	D. EXISTING LAND OWNERSHIP PATTERNS	5
	E. EXISTING LAND USE/LAND COVER	5
	F. DEERYARDS	8
	G. PRIME AGRICULTURAL SOILS	8
	H. SOILS-BASED SLOPES	8
	I. WETLANDS	10
	J. STREAMS	13
	K. SUITABILITY OF SOILS FOR SEPTIC SYSTEMS	13
	L. SCENIC RESOURCES	17
	M. UTILITIES	19
IV.	<u>DEVELOPMENT SUITABILITY ANALYSIS</u>	20
	A. SUITABILITY FOR INDUSTRIAL-COMMERCIAL DEVELOPMENT	20
	B. SUITABILITY FOR RESIDENTIAL DEVELOPMENT	23
	C. CONCLUSIONS OF THE SUITABILITY ANALYSIS	24
V.	<u>INPUT FROM PUBLIC MEETING ON JANUARY 11, 2001</u>	25
VI.	<u>ALTERNATIVE FUTURE LAND USE SCENARIOS</u>	27
	A. FUTURE LAND USE SCENARIO #1	28
	B. FUTURE LAND USE SCENARIO #2	30
VII.	<u>WATER & WASTEWATER SERVICES FOR EXISTING AND FUTURE DEVELOPMENT</u>	32
	A. ON-SITE WATER AND WASTEWATER SERVICES	33
	B. PUBLIC WATER AND WASTEWATER SERVICES	33

VIII.	<u>TRANSPORTATION SERVICE FOR FUTURE DEVELOPMENT</u>	40
	A. INTRODUCTION	40
	B. TRAFFIC	41
	C. TRAFFIC FROM DEVELOPMENT ALTERNATIVES	44
	D. CONGESTION ANALYSIS	51
	E. SAFETY ANALYSIS	53
	F. SUMMARY OF ANALYSIS	54
IX.	<u>INPUT FROM PUBLIC MEETING ON MARCH 15, 2001</u>	55
X.	<u>RECOMMENDATIONS</u>	56
	A. LAND USE	56
	B. UTILITIES	65
	C. TRANSPORTATION	66
	D. ZONING:	69
XI.	<u>APPENDIXES</u>	74
	APPENDIX A: Soil-Based Minimum Lot Size	74
	APPENDIX B: Future Land Use Scenarios by Parcel	76
	APPENDIX D: Detailed Public Comments from the January 11, 2001 Meeting	82
	APPENDIX E: Route 5 South Brainstorming Session - October 13, 2000	86
	APPENDIX F: Ancillary Septic System Ratings Classes	88
	APPENDIX G: Estimated Cost to Extend Water Service Above the Existing Water Service Elevation of 610 Feet	89
	APPENDIX H: Cost Estimate to Extend Utility Services to the entire Route 5 South Corridor	90
	APPENDIX I: Detailed Public Comments from the March 15, 2001 Meeting	92
	APPENDIX J: Trip Generation	93
	APPENDIX K: Traffic Distribution	94
	APPENDIX L: Pass-by Trip Analysis	95

Route 5 South Study

I. INTRODUCTION

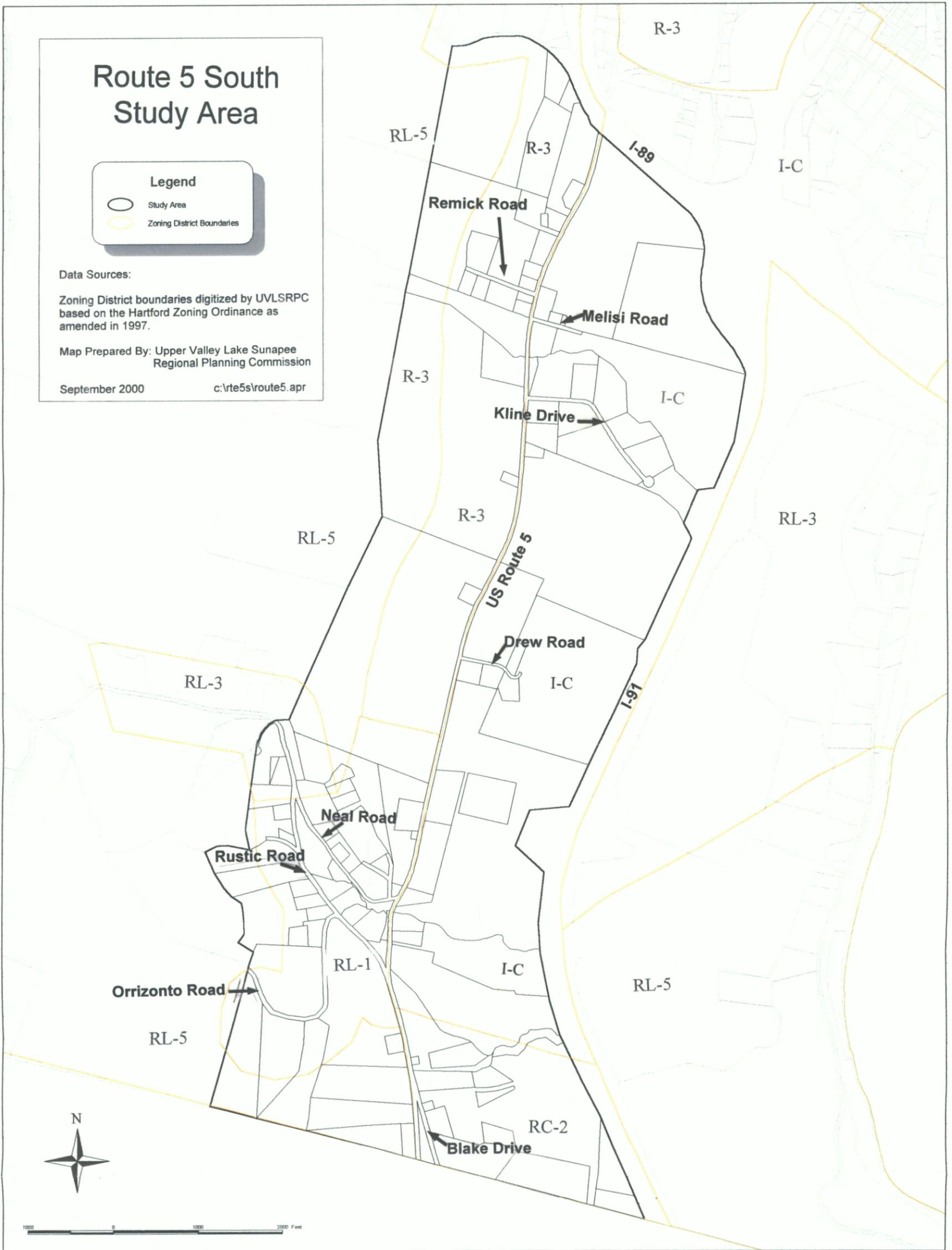
At the request of the Town of Hartford, the Upper Valley Lake Sunapee Regional Planning Commission has conducted a land use and transportation study of the Route 5 South corridor. The main focus of the study was to ascertain the development feasibility of the corridor and to make recommendations relative to future land uses, utilities, transportation and zoning issues. Funding for the study was provided by a Vermont Municipal Planning Grant and resources made available by the Regional Planning Commission from Scenic Byway funding and Vermont Agency of Transportation funding,

The Route 5 South Study Area as shown on Map 1 encompasses that part of the Route 5 corridor in Hartford, Vermont extending from I-89 on the north to the Hartland town line on the south. The eastern boundary is I-91. The western boundary line runs about one-third of a mile west of and parallel to Route 5.

This area has many of the features that make it prime for development, including Industrial/Commercial (I/C) zoning for much of the area, close proximity to public utilities that have the capacity to serve the area, good road access to a state highway, relatively close access to the interstate highway system and relatively flat topography for much of the area. In combination, these features make this area attractive for development. With the build-out of other areas in the Upper Valley zoned and developing for industrial/commercial uses, the pressure to develop, in particular the I/C zoned portion of the Route 5 corridor, will only increase in the future.

The Town of Hartford faces many questions as it contemplates development in this corridor. Is the area suitable for development of the uses permitted by the existing zoning? Are there natural resource assets and regulatory constraints which affect the future development of the Study Area? What part and how much of the Study Area is suitable for urban type development? Do the natural and scenic resource assets suggest that a preservation program would be more appropriate for much of this corridor rather than development? What types of uses would be appropriate and should be encouraged for the future development of this corridor?

Map 1



II. SUMMARY OF THE PLANNING PROCESS

The first step of the study was to inventory and map information on natural resource opportunities and constraints, current land use/land cover, soils, the transportation system, utilities, zoning, topography, property ownership and scenic resources.

The next step was to evaluate the suitability of developing the area as zoned, based on the existing natural resource opportunities and constraints. The purpose of this analysis was to identify how much and what parts of the Study Area are suitable for development, and the locations that may be more suitable for preservation.

The conclusions of this development suitability analysis were presented at a public meeting on January 11, 2001. UVLSRPC and Town staff also met with some of the large parcel owners to ascertain their development plans.

Based on this development suitability analysis, public input past developer's interests in specific types of development and what could be developed under current zoning, two alternative future land use scenarios were crafted and analyzed. A preliminary report including draft recommendations was prepared.

The analysis of these two alternative future land use scenarios and the draft recommendations were presented at a second public meeting on March 15, 2001.

Based on the feedback received at this public meeting, a final report was prepared and presented to the Hartford Town Officials.

III. EXISTING CONDITIONS

- A. **LOCATION:** The Route 5 South Study Area, as shown on Map 1, is bounded on the north by I-89, on the south by the Hartland town line, on the east by I-91 and on the west by a line running about one-third of a mile west of and parallel to Route 5. The Study Area Map (Map 1) shows the existing road network, zoning, and property boundaries within and surrounding the Study Area.
- B. **EXISTING ROAD NETWORK:** Route 5, a state maintained highway, is the major component of the road system in the study area connecting Hartford to the north with Hartland and other towns to the south. Route 5 is a north-south arterial road running the length of the Connecticut River Valley in Vermont and is a designated Scenic Byway. From north to south, Wright Reservoir Road, Remick Road, Melisi Road, Kline Drive, Drew Road, Neal Road, Rustic Road, and Blake Drive all connect with Route 5 within the Study Area. With the exceptions of Neal and Rustic Roads, these are all relatively short dead-end roads feeding off Route 5.

The segment of US Route 5 within the Study Area is a two-lane highway, approximately 2.4 miles long. Travel lanes are typically 12 feet wide, and shoulders average 1-2 feet wide. The posted speed limit for this stretch of road is 50 Miles Per Hour (MPH). To the north is the intersection of Interstates 91 and 89 and to the south the Town of Hartland and access to Interstate 91.

The current pavement condition is characterized by the Vermont Agency of Transportation (VTrans) as fluctuating between fair, acceptable, and poor throughout the study area. This segment was last paved in 1994 and is not programmed for work in the most recent VTrans Pavement Management Report.

There are approximately 54 access points along the 2.4-mile stretch of Route 5 within the study area. This equals roughly 23 driveway or road entrances accessing Route 5 per mile. Many of these access points offer poor sight distances.

- C. **EXISTING ZONING:** As reflected on Map 1, the east side of the Route 5 corridor is zoned Industrial-Commercial (I-C) from I-89 to the southern end of the Town's landfill and recycling center site. As implied by the name of the district, this district permits a variety of commercial and industrial uses, but excludes residential development. The east side of Route 5 from the landfill south to the Hartland town line is zoned Residential Commercial Two (RC-2). This is a one acre residential district with on-site water supply and sewage disposal that permits some commercial uses by conditional use. With off-lot water supply and sewage disposal, the RC-2 district permits minimum lot sizes of 8,000 square feet (about 1/5 acre) and with Town water supply or sewage disposal, the RC-2 district permits minimum lot sizes of 20,000 square feet (about 1/2 acre). From I-89 to roughly opposite the Windsor County Sheriff's driveway access, the west side of the Route 5 corridor is zoned Residential Three (R-3) for about the first 1,000 feet in depth off Route 5, with the area behind that zoned Rural Lands Five (RL-5). The Residential Three (R-3) district permits one acre lots with on-site water supply or sewage disposal and 12,000 square foot lots (about 1/4 acre) or 9,000 square feet per dwelling unit with Town water supply and sewage disposal. The Rural Lands Five (RL 5) permits residential lots with a minimum lot size of five (5) acres. From there south, the west side of Route 5 is zoned a combination of Rural Lands One (RL-1), Rural Lands Three (RL-3), and Rural Lands Five (RL-5). The Rural Lands One (RL-1) district permits residential lots with a minimum lot size of one acre while the Rural Lands Three (RL-3) district permits residential lots with a minimum lot size of three acres. A breakdown of the Study Area by zone district is provided in the Table 1.

Table 1: Breakdown of the Study Area by Zoning District

Zoning District Name	Symbol	Acres	% of Study Area
Industrial-Commercial	I-C	449	42%
Residential Three	R-3	189	18%
Residential Commercial Two	RC-2	91	8%
Rural Lands One	RL-1	140	13%
Rural Lands Three	RL-3	21	2%
Rural Lands Five	RL-5	183	17%
	TOTAL	1073 ac	100%

- D. EXISTING LAND OWNERSHIP PATTERNS:** Smaller sized parcels exist in proximity to the existing dead-end roads off Route 5 and along some of the Route 5 frontage, but much of the Study Area is still held in relatively large land holdings. Within the existing area zoned Industrial-Commercial (I-C) on the east side of Route 5, nine parcels comprise a total of 362 acres. On the west side of Route 5, there are also several parcels within the Study Area which are part of larger land holdings extending outside the boundary of the Study Area. Four of these properties total 1,179 acres.
- E. EXISTING LAND USE/LAND COVER:** A 1994 orthophoto provided an aerial view of the Study Area and environs. A copy of this orthophoto is available for viewing in the office of the Hartford Department of Planning and Development Services, and at the office of the Upper Valley Lake Sunapee Regional Planning Commission. This orthophoto was used as the starting point to map the land use/land cover within the Study Area, which is depicted on Map 2. A windshield survey was conducted to update the land use information to its current status.

A breakdown of the land area and the percentage of the total Study Area occupied by each land use/land cover type is presented in Table 2 to follow. The predominant land uses/land cover types existing within the Study Area include forest, agricultural pasture/open, single family residential and solid waste facilities.

Table 2: Land Use/Land Cover within the Route 5 South Study Area

Land Use/Land Cover Type	Land Area in Acres	Land Use as a Percentage of the Total Study Area
Forest	537.2 ac.	50.0%
Agricultural	253.5 ac.	23.6%
Residential	117.3 ac.	10.9%
Brush	53.0 ac.	5.0%
Solid Waste Facilities	46.0 ac.	4.3%
Commercial/Industrial	32.0 ac.	3.0%
Roads	30.2 ac.	2.8%
Miscellaneous	3.8 ac.	0.4%
TOTAL	1,073 ac.	100%

Undeveloped land uses predominate the Study Area currently with about four out of each five acres falling within this category. One-half of the Study Area is covered by forests, and about one-quarter is being used for agricultural purposes.

Developed land uses total about one-fifth of the Study Area, with residential development accounting for about half of the developed land. Commercial/industrial land uses account for only about 3% of the Study Area currently.

Map 2

Route 5 South Study Land Use



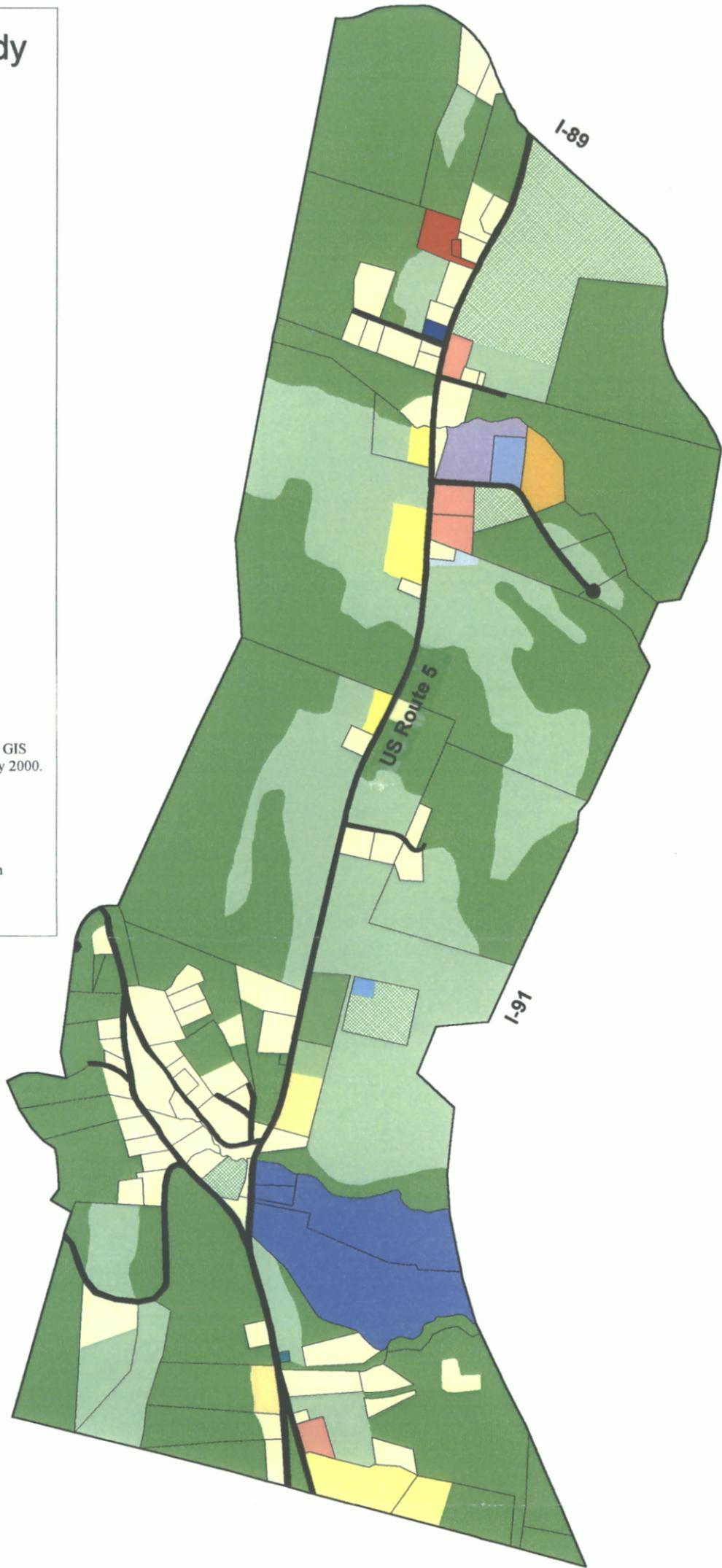
Data Sources:

Parcels digitized by MicroData as part of Vermont GIS Digital Parcel Mapping Program; updated February 2000.

Land uses mapped by UVLSRPC based on 1:5000 orthophotos and field survey.

Map Prepared By: Upper Valley Lake Sunapee Regional Planning Commission

November 2000; Revised February 2001



F. **DEERYARDS:** Deeryard information was obtained from the Department Fish & Wildlife of the Vermont Agency of Natural Resources, and is depicted on Map 3: Natural Resources. Two deeryards which overlap the southern end of the Study Area cover about 12.4 acres and represent about 1.1% of the Study Area. Additionally, there is a large deeryard located outside the Study Area on the east side of the I-91 corridor starting across the interstate east of Kline Drive extending to the southern extent of the Study Area and beyond.

G. **PRIME AGRICULTURAL SOILS:** Map 3: Natural Resources also outlines the extensive amount of prime agricultural soils which exist within the Study Area. Information on prime agricultural soils was provided by the Vermont Natural Resource Conservation Service. Prime agricultural soils include soils of national significance and soils of statewide importance. These two categories were chosen because they are considered as prime agricultural soils in the Vermont Act 250 process. In total, about 391 acres of prime agricultural soils exist within the Study Area representing 36.4% of the total Study Area.

The Agricultural Resource Map (Map 16) shows the overlap of current agricultural land use and the prime agricultural soils described above. As reflected on this map, there is a lot of overlap particularly between the Wright Farm (Lot #s 14-0045-000 & 14-0066-000) on the north and the Town of Hartford (former Maxfield) property (Lot # 14-0109-000) on the south.

H. **SOILS-BASED SLOPES:** The relative steepness of the topography within the Study Area is shown on Map 4: Soils-Based Slopes which identifies the slopes into four categories. This map is based on the soils information provided in the Interim Soil Survey Report for Windsor County, Vermont by the USDA Soil Conservation Service in August, 1993. Table 3 provides a breakdown of the acreage and percentage of the total Study Area covered by each slope category.

The slope of the land is an important factor in determining where development will occur especially commercial, industrial or higher density residential development. Commercial or industrial development seldom occurs on slopes over 8% due to the high cost and environmental impacts of regrading the land to accommodate the relatively large buildings and associated on-site parking needs. Residential development can occur on slopes in excess of 8% with the density of development decreasing as the steepness of the slope increases. Slopes in excess of 25% are best left as undisturbed open space portions of very low density residential lots.

Over one-third of the Study Area has slopes in the 0-8% category. However, much of the area north of the Kline Drive subdivision falling into this category is already developed and, as we will see later on the Development Suitability Map, a majority of the remaining areas with slopes under 8% are classified as prime agricultural soils.

Map 3

Route 5 South Study Natural Resources

Legend

- Parcels in Study Area
- Parcels Surrounding Study Area
- Prime Agricultural Soils
- Deeryards

Data Sources:

Parcels digitized by MicroData as part of Vermont GIS Digital Parcel Mapping Program; updated February 2000.

Prime Agricultural Soils provided by Natural Resource Conservation Service.

Deeryards digitized by VT Agency of Natural Resources, Dept. of Fish & Wildlife, 1997.

Map Prepared By: Upper Valley Lake Sunapee Regional Planning Commission

November 2000 c:\rte5s\route5.apr\natural resources layout

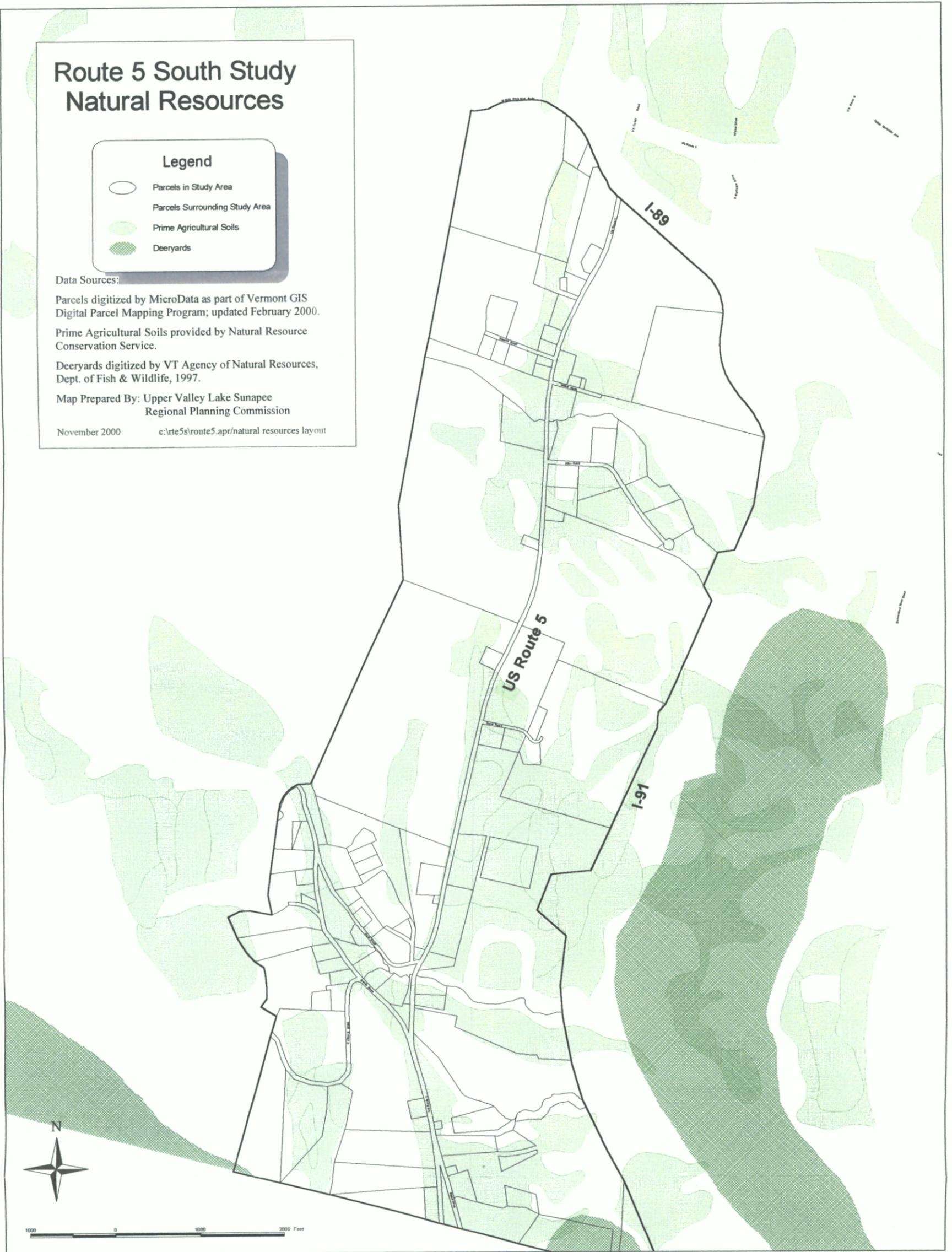


Table 3: Soils-Based Slopes within the Study Area

Soils-Based Slope Category	Land Area in Acres	Percentage of Total Study Area
0-8% Slope	381 ac.	35.5%
8-15% Slope	101 ac.	9.4%
15% and Steeper Slope	536 ac.	50%
No Slope Available	55 ac.	5.1%
Total	1,073 ac.	100%

Another statistic which jumps out here is the fact that 50% of the Study Area has slopes in excess of 15%. As noted above, these areas may be suitable for lower density residential development or left as open space.

Slope information was not available for those sites which have been disturbed from their natural condition. These include the KRIF property (Lot # 14-0039-000) immediately south of I-89 on the east side of Route 5. Much of this site has experienced extensive regrading from its original topography when the interstate system was constructed. The other property included in this category is the Town of Hartford Landfill site (Lot #s 14-0103-000, 14-0104-000, 14-0105-000, & 14-0106-000) which has also experienced extensive disturbance of the natural landscape through a combination of dredging and filling.

- I. **WETLANDS:** Two categories of wetland information, hydric soils and wetlands, are provided on Map 5: Development Limitations. These two categories were chosen because they are considered as wetlands in the Act 250 process. First the wetlands as identified by the National Wetland Inventory Maps are depicted. Second, hydric soils are shown based on the soils information provided in the Interim Soil Survey Report for Windsor County, Vermont by the USDA Soil Conservation Service in August, 1993. Hydric soils are indicative of wetlands, but need on-site investigations to ascertain if the hydrology and vegetation characteristics are present to qualify as wetlands. Since on-site investigation of these areas of hydric soils goes beyond the scope of this study, areas designated as hydric soils were assumed to be wetlands for this study. Within the Study Area, a total of 17 acres of wetlands were classified as such by the National Wetland Inventory Maps representing 1.6% of the total Study Area. Hydric soils accounted for 84 acres within the Study Area which represents 7.9% of the total Study Area.

Map 4

Route 5 South Study Soil-Based Slopes

Legend

- Parcels in Study Area
- Parcels Surrounding Study Area

Slope %

- 0-8% Slope
- 8-15% Slope
- 15% and Steeper
- No Slope Available

Data Sources:

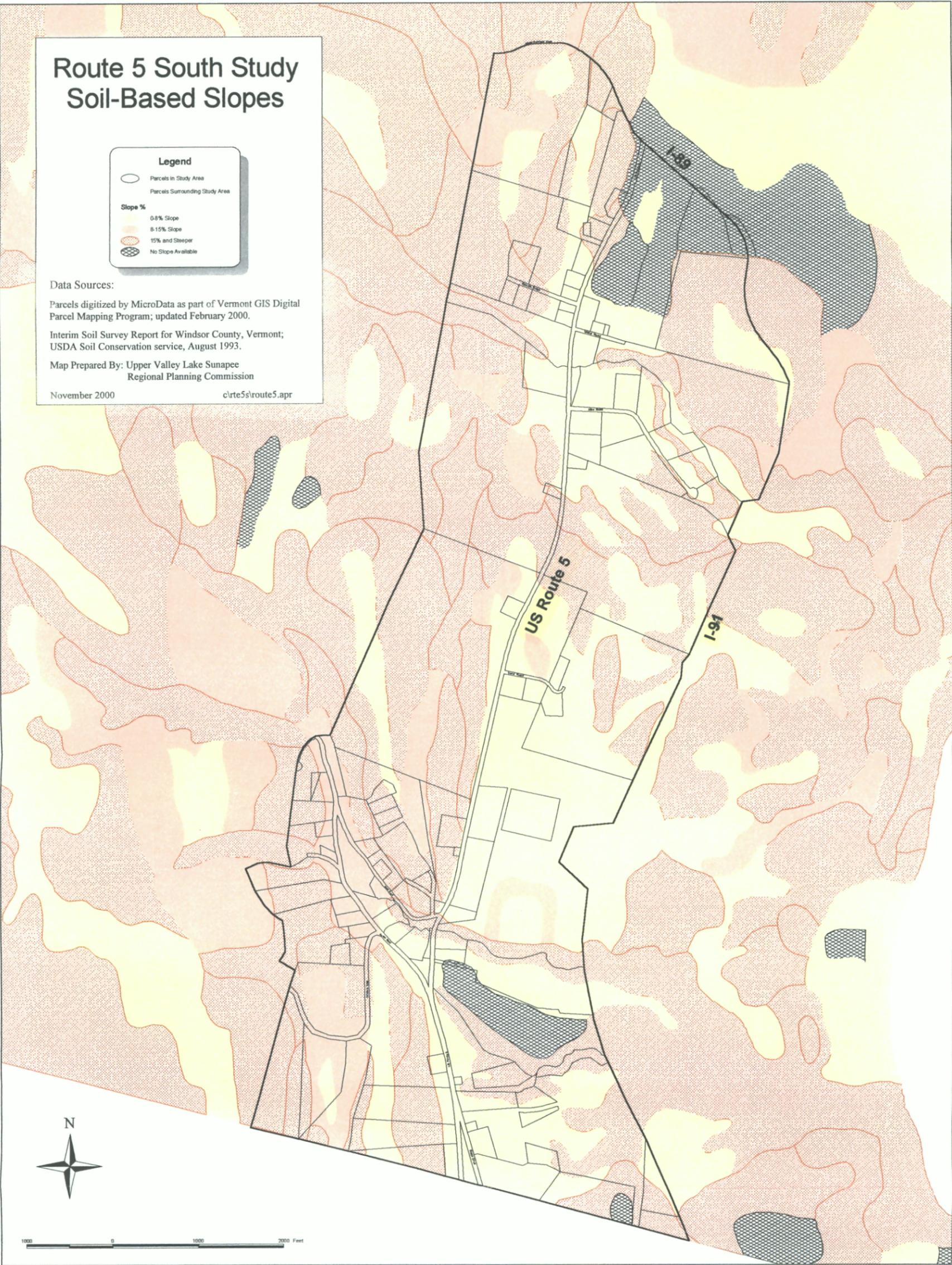
Parcels digitized by MicroData as part of Vermont GIS Digital Parcel Mapping Program; updated February 2000.

Interim Soil Survey Report for Windsor County, Vermont; USDA Soil Conservation Service, August 1993.

Map Prepared By: Upper Valley Lake Sunapee Regional Planning Commission

November 2000

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Map 5

Route 5 South Study Development Limitations

Legend

- Parcels in Study Area
- Parcels Surrounding Study Area
- ~ 20 Foot Contours
- ☉ Hydric Soils
- ☉ Wetlands
- ☉ Slopes Over 15%

Data Sources:

Parcels digitized by MicroData as part of Vermont GIS Digital Parcel Mapping Program, updated February 2000.

Soils data provided by Natural Resource Conservation Service.

20 foot contours developed by Edelstein Technology Group, South Pomfret, VT, for UVLSRPC utilizing USGS DEM X42 files provided by VCGI.

Wetlands provided by National Wetlands Inventory.

**Map Prepared By: Upper Valley Lake Sunapee
Regional Planning Commission**

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J. STREAMS: The streams or drainage courses located within and adjacent to the Study Area to their confluence with the Connecticut River are shown on the Stream Buffer Map (Map 6). Streams shown on this map were identified and digitized from 1:5,000 orthophotos with assistance from the Natural Resource Conservation Service. This map depicts a 100 foot wide natural buffer on each side of the streams. This standard is based on the prevailing scientific research which indicates a natural vegetative buffer of at least this width is needed to filter pollutants and maintain water quality. This natural buffer can be incorporated as part of a lot, but needs to remain in a natural, undeveloped condition. Water flows from the Study Area all end up in the Connecticut River which is classified as impaired waters. Stormwater flows from development within the Study Area need to be managed so they do not add pollution to downstream impaired waters such as the Connecticut River.

K. SUITABILITY OF SOILS FOR SEPTIC SYSTEMS: The suitability of soils for septic systems are shown on Map 7. The soil types were mapped by the Natural Resource Conservation Service and the ratings are based on the Ancillary Soil Interpretation Ratings for On-site Sewage Disposal in Vermont prepared by the Natural Resource Conservation Service in January, 1997.

This rating system of the suitability of soils for septic systems includes the categories summarized below. Please refer to APPENDIX F for a detailed description of these categories.

- 1) **CONVENTIONAL & CONVENTIONAL/SOIL REPLACEMENT:** Conventional systems can normally be installed in these soils; may involve soil replacement to slow percolation.
- 2) **MOUND:** Mound system typically required in these soils.
- 3) **TEST, MOUND, CURTAIN DRAIN:** On-site monitoring required to establish suitability for septic systems; if acceptable, mound system or curtain drain normally specified.
- 4) **MARGINALLY SUITABLE:** Generally unsuitable depending on the depth to bedrock and slope.
- 5) **NOT SUITED:** Generally too rocky, shallow, wet, steep, or subject to flooding or otherwise unsuitable.
- 6) **NOT RATED:** Water, or little or no identifiable soil material, i.e. has been excavated or covered.

Map 6

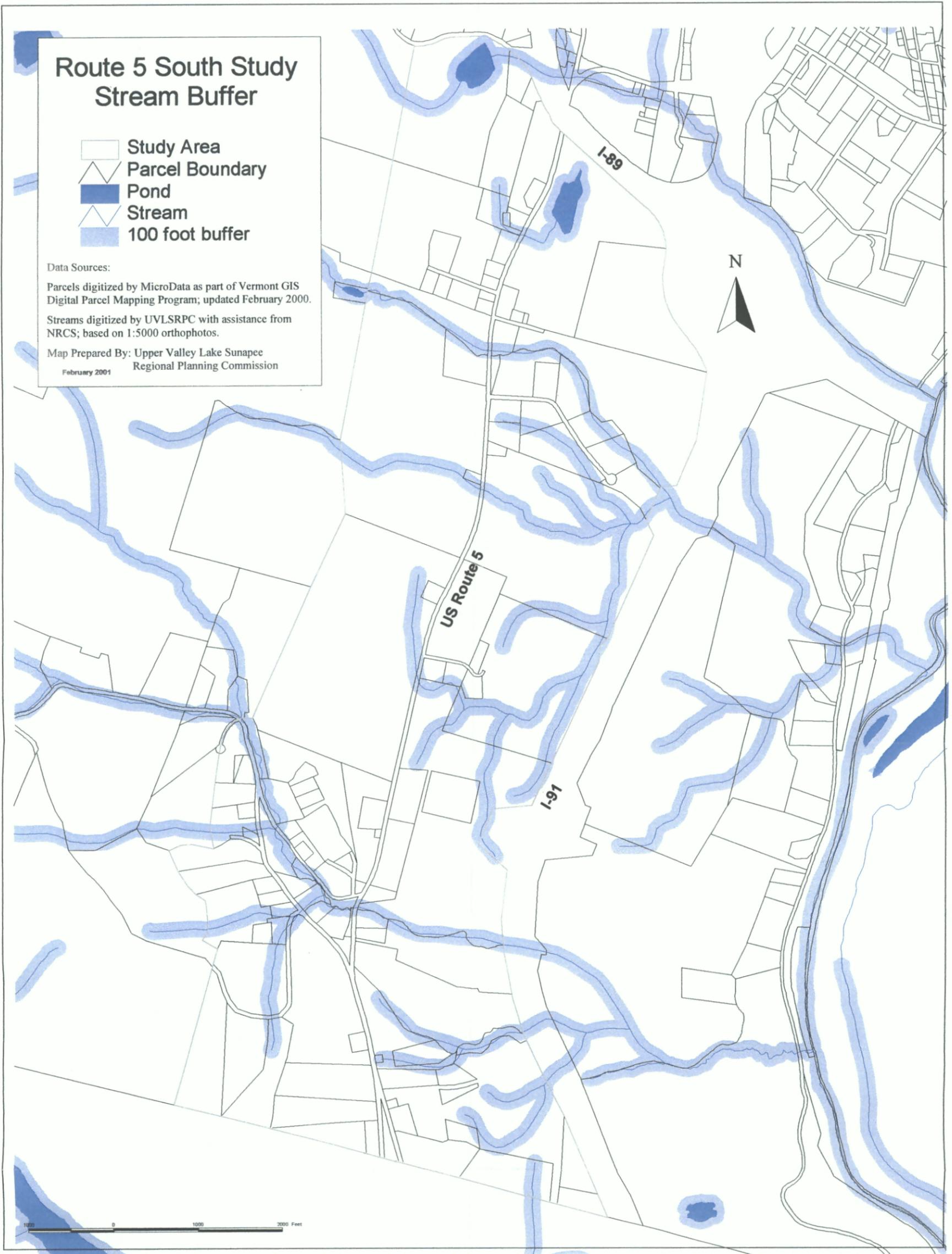


Table 4 summarizes the amount of land area in each of the categories and the percentage of the total Study Area for each category. Generally, the more favorable ratings occur along both sides of the Route 5 corridor at the northern end of the Study Area and between Route 5 and I-91 south of the I-91 Rest Area. The area along Route 5 between these two areas of more favorable ratings includes relatively large areas rated as marginally suited or not suited for septic systems.

About thirty-nine percent (39%) of the Study Area is suitable for on-site sewage disposal systems, with another seventeen percent (17%) potentially suitable. Forty percent (40%) of the Study Area is marginal or unsuitable, with four percent (4%) not rated.

Table 4: Suitability of Soils for Septic Systems

Septic System Suitability Category	Land Area in Acres	Percentage of Total Study Area
Conventional & Conventional/Soil Replacement	264 ac.	25%
Mound	146 ac.	14%
Test, Mound, Curtain Drain	181 ac.	17%
Marginally Suitable	196 ac.	18%
Not Suited	236 ac.	22%
Not Rated	50 ac.	4%
Total	1,073 ac.	100%

Map 7

Route 5 South Study Suitability of Soils for Septic System

Legend

- Parcels in Study Area
- Parcels Surrounding Study Area
- CONVENTIONAL & CONVENTIONAL/SOIL REPLACEMENT
Conventional systems can normally be installed in these soils; may involve soil replacement to slow percolation
- MOUND: Mound system typically required in these soils
- TEST, MOUND, CURTAIN DRAIN
On-site monitoring required to establish suitability for septic systems; if acceptable, mound system or curtain drain normally specified
- MARGINALLY SUITABLE
Generally unsuitable depending on depth to bedrock and slope
- NOT SUITED
Generally too rocky, shallow, wet, or steep, or subject to flooding or otherwise unsuitable
- NOT RATED
Water, or little or no identifiable soil material, i.e. has been excavated or covered

Footnotes

- Areas with bedrock at less than 24 inches are not suitable
- This map unit has a slope limitation requiring site modification
- Areas with slope greater than 20% are not suitable

Data Sources:

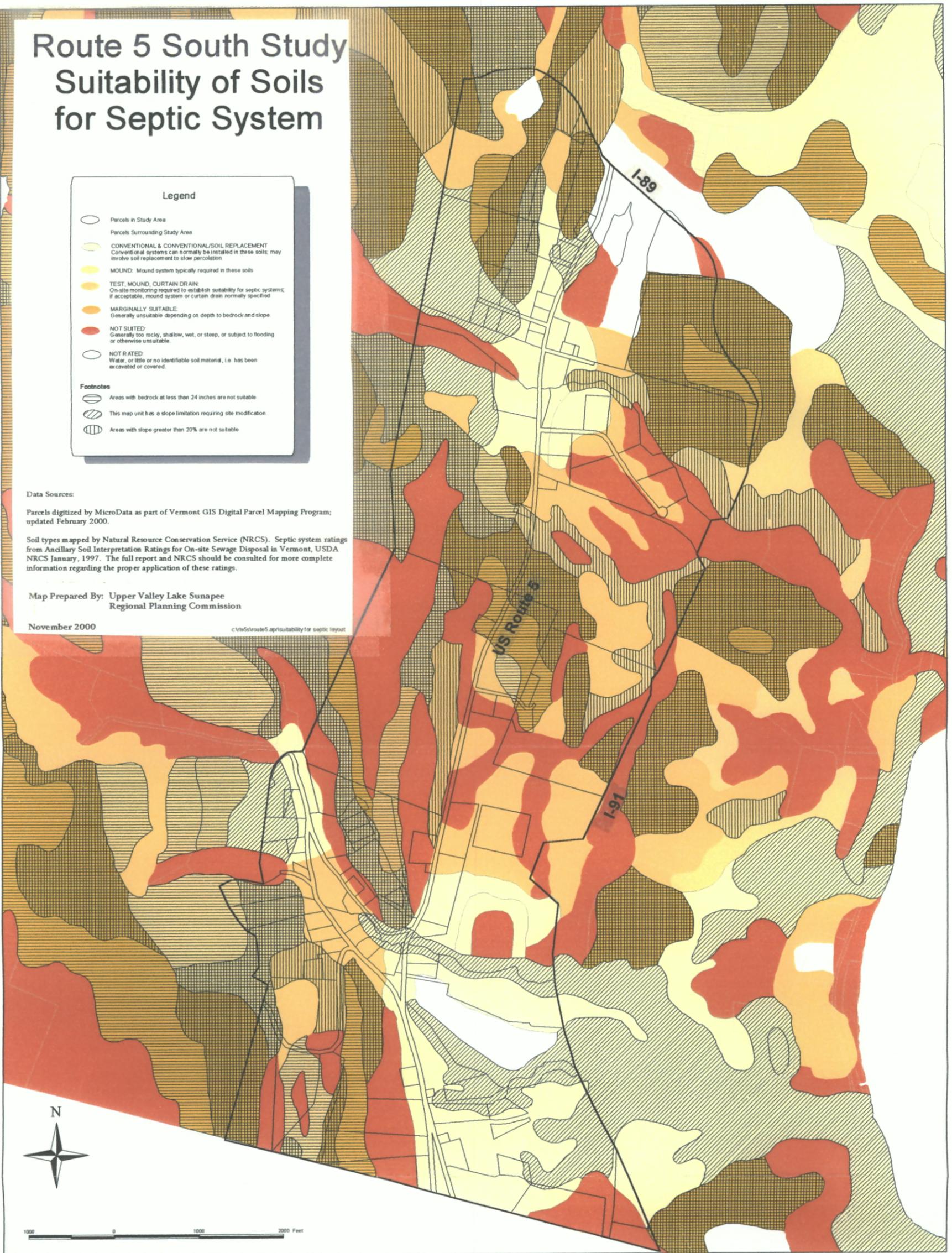
Parcels digitized by MicroData as part of Vermont GIS Digital Parcel Mapping Program; updated February 2000.

Soil types mapped by Natural Resource Conservation Service (NRCS). Septic system ratings from Ancillary Soil Interpretation Ratings for On-site Sewage Disposal in Vermont, USDA NRCS January, 1997. The full report and NRCS should be consulted for more complete information regarding the proper application of these ratings.

Map Prepared By: Upper Valley Lake Sunapee
Regional Planning Commission

November 2000

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- L. **SCENIC RESOURCES:** A scenic resource assessment was done for the Study Area and is displayed on Map 8. Photographs of the most scenic parts of the Study Area were taken and shown on the map. Route 5 is a designated Scenic Byway under the Vermont Scenic Byway Program.

The most outstanding scenic area within the Study Area is the Wright Farm which straddles both sides of Route 5 just south of Kline Drive. The hillside rising to the west from Route 5 includes a combination of field and forest cover, which combined with the farmstead and the large white barn in particular, creates an outstanding scenic resource.

Further to the south, the property owned by Valley Land Corporation opposite Drew Road on the west side of Route 5 offers another splendid scenic resource. Similar to the Wright farm, this property features an open field for most of the Route 5 frontage which rises gently to the west up the hillside. Again, this property offers an interesting mix of field and forest cover combined with a sugar house.

A third area exhibiting scenic assets is the former Maxfield property now owned by the Town of Hartford. Most of this property is relatively flat open fields with forested land on the fringes. This property is highly visible from both Route 5 and the I-91 Rest Area.

Finally, two water resources in the Study Area also provide scenic assets. Wright Reservoir, the small water reservoir in the Hurricane Forest Wildlife Refuge Park visible from Wright Reservoir Road provides a landscape mix of forest and water which is very pleasing. Also the wetland located on the KRIF property immediately south of I-89 offers a pleasant mix of water, marsh and open area which is visible along Route 5 and from I-89.

MAP 8: Route 5 South Study Scenic Assessment



From Lebanon Airport



NOT TO SCALE



Prepared by the Upper Valley Lake Sunapee
Regional Planning Commission

M. **UTILITIES:** The following is information on existing utility systems serving the Study Area, including sewer, water, and fire protection.

1. **WATER:** An eight inch Town water line serves homes and businesses along the northern section of Route 5 south to Kline Drive and down Kline Drive. The Town of Hartford Public Works Department has indicated there is adequate water supply to serve the projected development within this area lying below an elevation of 610 feet. Concern has been expressed about declining water pressure in this old line and the inadequate flows it provides for sprinkler systems to serve new buildings.
2. **SEWER:** The closest Town sewer collection line is an eight inch line located just north of the Study Area near the intersection of the VA Cutoff Road and Route 5. The Town of Hartford Public Works Department has indicated there is adequate capacity in the sewer treatment plant to accommodate the anticipated growth within the Study Area if needed.
3. **FIRE PROTECTION:** Fire protection is provided to the section of the Study Area located north of Kline Drive by three fire hydrants fed by the eight inch water line described in section 1. above. Additionally, two older fire hydrants located on the west side of Route 5 opposite Kline Drive are supplied by Simonds Reservoir to the west. These two older fire hydrants were required to be installed as part of the development of the propane gas facility prior to the existence of the Town water line.

IV. DEVELOPMENT SUITABILITY ANALYSIS: This suitability analysis is presented in two sections: A.) suitability for industrial-commercial development and B.) suitability for residential development.

A. SUITABILITY FOR INDUSTRIAL-COMMERCIAL DEVELOPMENT: First the Study Area was evaluated for its suitability for industrial-commercial development. For this analysis, existing developed areas, public lands, wetlands and areas with prime agricultural soils were deleted as areas not suitable for development. Existing developed areas, as identified on the Land Use/Land Cover Map, were not considered as redevelopment opportunities.

Public lands includes property owned by the Town for both recreation and solid waste management purposes. At the north end of the Study Area located south of Wright Reservoir Road is the Hurricane Forest Wildlife Refuge Park (Lot # 13-0023-000). This forested hillside provides a network of trails for year-round use. The Town owns the former Maxfield property (Lot # 14-0109-000) which is restricted by deed for recreation or agricultural use. The deed also restricts buildings from covering more than ten percent (10%) of the surface area of the property. This property is located in about the middle of the Study Area between Route 5 and the Rest Area off I-91. The Town operates the Solid Waste and Recycling Center which includes four properties located between Route 5 and I-91. These public lands were deleted from consideration as not suitable for commercial, industrial or residential development. However, as suggested at the January 11, 2001 public meeting, the Maxfield property and the former landfill site should be considered for development of recreational uses.

Wetlands and prime agricultural soils were deleted as areas suitable for development since these natural resource areas are restricted from development under the Act 250 process.

After deleting the areas described above, those portions of the remaining areas with slopes under 8% were considered desirable for commercial or industrial development. The slope of the land is an especially important factor in determining where commercial, industrial or higher density residential development is suitable. Commercial or industrial development seldom occurs on slopes over 8% due to the high cost of construction and potential environmental impacts of regrading the land to accommodate the relatively large buildings and associated on-site parking needs. Residential development can occur on slopes in excess of 8% with the density of development decreasing as the steepness of the slope increases.

The blank or white areas on Map 9 depict the areas suitable for commercial or industrial development based on this development suitability analysis. As can be seen by a quick perusal of Map 9, very little of the Study Area is suitable for commercial or industrial

Map 9

Route 5 South Study

Development Suitability

With Slopes < 8%



Data Sources:

Wetland locations based on US Fish & Wildlife Service National Wetlands Inventory data provided by VCGI. Refer to the VANR-DEC, Water Quality Division, Wetlands Section for official wetlands determinations.

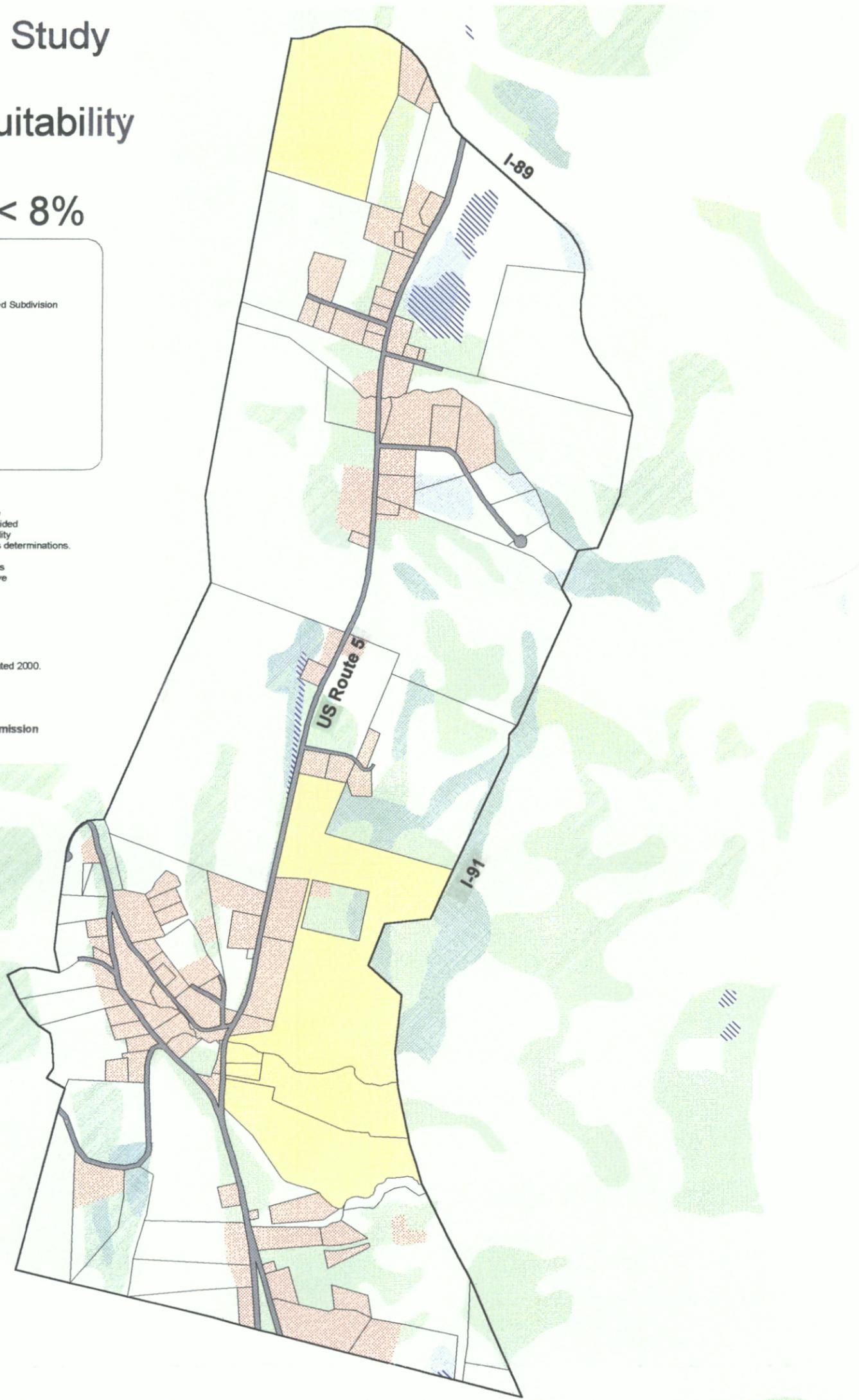
Soil types mapped by USDA Natural Resources Conservation Service, digitized as a cooperative effort of UVLSRPC and USDA-NRCS. Prime agricultural soils, slope categories and hydric soils as identified by NRCS

Existing land use mapped by UVLSRPC from 1:5000 orthophotos and field survey.

Parcel boundaries digitized by Microdata; updated 2000.

Map Prepared By:
Upper Valley Lake Sunapee Regional Planning Commission

January 2001; Revised February 2001



development and most of that is located north of Kline Drive on the east side of Route 5. Table 5 outlines the properties suitable for commercial/industrial development in the I-C Zone. Within the entire 449 acres in the I-C Zoning District, only 58.6 acres are considered suitable for industrial/commercial development based on this development suitability analysis. This represents only 13% of the land area within the I-C Zoning District. Of the 58.6 acres within the I-C Zoning District considered suitable for commercial/industrial development, only about 11.2 acres are located south of Kline Drive.

Table 5: Areas Suitable for Industrial/Commercial Development in the I-C Zone

Tax Map and Lot #	Owner	Area Suitable for I-C Dev.
14-0039-000	KRIF	31 ac
14-0061-000	Robichaud	8.5 ac
14-0060-000	Valley Bible Church	1.4 ac
14-0057-000	Kline	2.4 ac
14-0058-000	Kline	1.3 ac
14-0067-000	Kline	0.2 ac
14-0068-000	Kline	1.8 ac
14-0069-000	Kline	0.8 ac
14-0078-000	Valley Land Corporation	6.6 ac
14-0082-000	TST Enterprise	3.1 ac
14-0095-000	Windsor Co.	1.5 ac.
TOTAL		58.6 acres

B. SUITABILITY FOR RESIDENTIAL DEVELOPMENT: The residential development potential of the Study Area was determined based on a soil-based minimum lot size approach. A soil-based minimum lot size approach uses the actual capabilities of the soil-slope complex of an area proposed to be developed to determine the minimum lot size which will protect groundwater resources. In other words, a soil-based minimum lot size approach permits a density of development which is consistent with the natural capability of the land to accommodate the development without adversely affecting groundwater resources. Additionally, by managing the density of development in this fashion, the need for future municipal wastewater treatment and water supply systems is minimized.

Like the previous development suitability analysis, existing developed areas, public lands, wetlands and areas with prime agricultural soils were deleted as areas not suitable for development.

Within the remaining areas, the soil-based minimum lot size approach was used to ascertain the development capability of the area assuming on-site domestic water supply and wastewater disposal would be utilized. This assumption was made based on two factors. First, as outlined in APPENDIX G, the cost to extend water service above the existing water service elevation of 610 feet in the Route 5 corridor is estimated to be about \$3,250,000 which is a very expensive capital cost for the area to be served. Second, this assumption is based on a recommendation from the Hartford Planning Commission in 1995¹ to not extend water service above the existing service elevation of 610 feet to serve the residential zones on the westerly side of Route 5 because denser residential development is not desired.

A soil-based minimum lot size system developed in New Hampshire was used by modifying it to fit Vermont soils, since Vermont has not yet developed such a system. The Vermont Natural Resource Conservation Service identified comparable Vermont soils to those outlined in the "Model Subdivision Regulations for Soil-Based Lot Size-Report of the Ad Hoc Committee for Soil-Based Lot Size" (June, 1991). A list of the soils types encountered within the Study Area and the corresponding soil-based minimum lot size associated with each soil type is included in this report in APPENDIX A. The results of that suitability analysis shows that about 142 additional residential lots, averaging about two (2) acres in size, could be created in the Study Area.

¹ Dufresne-Henry Projects Status Report as of September 20, 1995.

C. **CONCLUSIONS OF THE SUITABILITY ANALYSIS:** The key conclusions of the suitability analysis are:

- 1) The I-C Zoning District on the east side of Route 5 south of the Kline subdivision (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000, and 14-0069-000) is not suitable for development for industrial-commercial type land uses. The suitability analysis suggests that either agricultural/forest uses or agricultural mixed with limited residential development are more appropriate for this area.
- 2) The R-3 Zone on the west side of Route 5 south from the Wright Farm (Lot #s 14-0045-000 and 14-0066-000) permits a density of residential development which is not appropriate for the area. Most of the R-3 zoned area is situated above the water service elevation of 610 feet as noted above. The cost to provide water service above this elevation is estimated to be \$3,250,000². Developing this area at the urban densities permitted in the R-3 zone (one dwelling unit per 9,000 square feet or 12,000 square feet per lot with Town water and sewer service) would significantly impact the scenic and agricultural resources which create the rural character on this stretch of the corridor. The soil types and slopes would suggest a two acre minimum lot size may be more consistent with the carrying capacity of the land.

² Reference APPENDIX G: Estimated Cost to Extend Water Above the Existing Water Service elevation of 610 Feet.

V. INPUT FROM PUBLIC MEETING ON JANUARY 11, 2001

A public meeting was conducted on January 11, 2001. All property owners and mobile home park renters located within the Study Area were invited to the meeting. The purpose of the meeting was to present and discuss the inventory of existing conditions, the development suitability analysis and future uses for the corridor.

The key points summarizing the input received at this public meeting are provided to follow. A detailed list of the all the comments received at the January 11, 2001 meeting are provided in APPENDIX D. These comments are organized by three sections of the corridor: middle, northern and southern. Map 10 identifies the location of the major landholdings within the Study Area which are referenced in this section and the ones to follow.

NORTHERN SECTION (That portion of the corridor lying north of the Wright Farm (Lot #s 14-0045-000 & 14-0066-000):

The group recognized that this part of the corridor on the east side of Route 5 has already experienced some industrial-commercial type development and is likely to see additional growth of a similar nature. Overall, the sentiment seemed to favor attracting quality industrial-commercial developments that would provide good paying jobs, be a positive economic asset to the community and be visually attractive. Constructing the utility infrastructure to serve this area would provide the opportunity for those quality developments. The group expressed the need to take the long view to create quality development. In particular, the residential neighbors in this area cited the desire for improved appearance of the buildings and sites for future industrial-commercial developments. Concern was expressed about declining water pressure and inadequate flows for sprinkler systems to serve new buildings.

With regards to the west side of Route 5 in this part of the corridor, support was expressed for future residential development with densities and lot sizes comparable to those existing there today. Preference was expressed for small developments and family subdivisions. Higher densities were not supported since the group recognized that cost of services, including education, for residential development outstrips the revenues generated by such development.

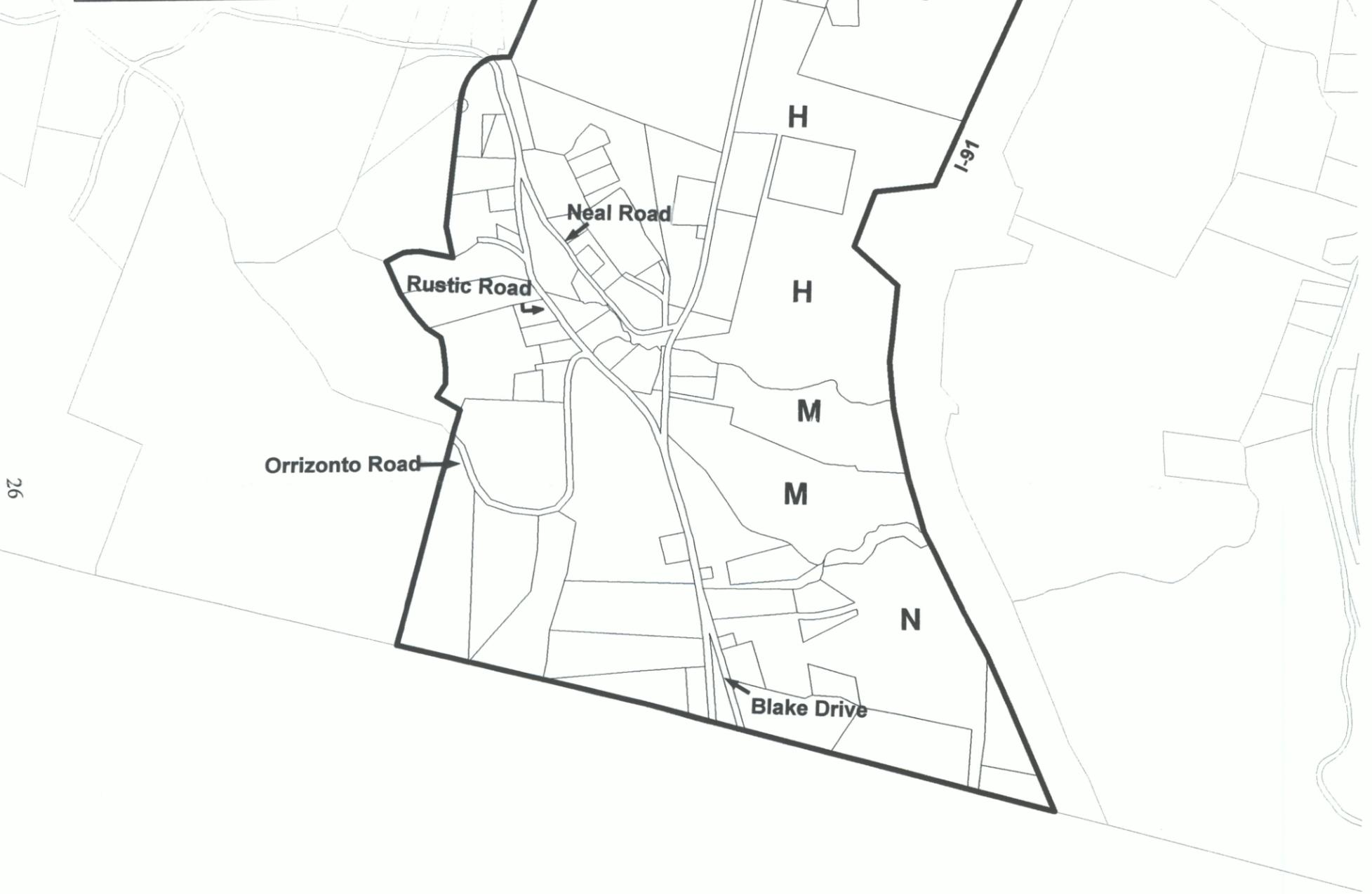
MIDDLE SECTION (Between the Wright Farm (Lot #s 14-0045-000 & 14-0066-000) on the north, and the Valley Land Corporation (Lot # 14-0077-000) and Town of Hartford (Lot # 14-0109-000) (former Maxfield) properties on the south):

The strongest sentiment expressed at the meeting was to retain the rural character of this section of the corridor. Preserving the farms with the open fields and the wooded hillsides was the preference of the group. These are the assets that create the scenic views. The Wright Farm was the focal point of this discussion. When asked "Would you support agricultural uses or low density, residential uses within the lands zoned industrial-commercial lying south of the Kline subdivision?", twenty-four (24) voted for agricultural uses and one (1) voted for residential use.

Map 10

Route 5 Study Area Major Landholdings

Map Key	Property Owner Name	Parcel Number
A	KRIF	(Lot# 14-0039-000)
B	Robichaud	(Lot# 12-0061-000)
C	Canaan Foundation	(Lot# 14-0060-000)
D	Kline	(Lot# 14-0057-000) (Lot# 14-0058-000) (Lot# 14-0067-000) (Lot# 14-0068-000) (Lot# 14-0069-000)
E	Wright Farm	(Lot# 14-0045-000) (Lot# 14-0066-000)
F	Valley Land Corp	(Lot #14-0077-000) (Lot# 14-0078-000)
G	TST Enterprises	(Lot# 14-0082-000)
H	Town (Farmer Maxfield)	(Lot# 14-0109-000)
I	Hurrican Forest Wildlife Refuge Park	(Lot# 14-0023-000)
J	D. Brown	(Lot# 14-0027-002)
K	W. Miller	(Lot# 14-0046-000)
L	W. Matson	(Lot# 14-0047-000)
M	Town (Recycling Center)	(Lot# 14-0103-000) (Lot# 14-0106-000)
N	Twin State Sand and Gravel	(Lot# 16-0009-000)



SOUTHERN SECTION (South of the Valley Land Corporation (14-0077-000) and Town of Hartford (14-0109-000) (former Maxfield) properties):

When asked for suggestions about future uses for the land zoned RC-2 located on the east side of Route 5 south of the recycling center, ideas included use for recreation and/or school sites. The former landfill was suggested as one site to consider for recreation playing fields.

VI. ALTERNATIVE FUTURE LAND USE SCENARIOS

Two future land use scenarios were prepared for consideration and evaluation. It should be understood that these are not necessarily scenarios that are being advocated, but that are real possibilities given:

- 1) the development suitability analysis discussed above;
- 2) a brainstorming session on assets and limitations of the Study Area and potential future land uses with input from representatives of the town of Hartford Planning and Recreation Departments, the Green Mountain Economic Development Corporation and the Regional Planning Commission (please refer to APPENDIX E for detailed notes on this meeting);
- 3) public input received at the January 11, 2001 meeting;
- 4) meetings with owners of large parcels;
- 5) knowledge of potential development that has been suggested by interested developers in the recent past; and
- 6) what uses could be developed under existing zoning.

Each of these two future land use scenarios is summarized to follow. For a detailed breakdown of the future land uses by parcel, please refer to the Future Land Use Scenarios by Parcel in APPENDIX B.

A. **FUTURE LAND USE SCENARIO #1:** The following are key features of this land use scenario which are depicted on Map 11.

- 1) Within the Industrial-Commercial Zoning District on the east side of Route 5 between I-89 and the Kline subdivision, a mix of uses to include:
 - * an industrial park (20 acres) and an office park (11 acres) on the KRIF property (Lot # 14-0039-000);
 - * two condominium/townhouse unit PUD developments of 15 units each on the Robichaud property (Lot # 14-0061-000) and the Canaan Foundation (Valley Bible Church) property (Lot # 14-0060-000);
 - * light industrial/warehouse uses (6.5 acres) on the Kline properties (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000, and 14-0069-000).
- 2) Agricultural conservation easements on the Wright Farm (Lot #s 14-0045-000 & 14-0066-000), the Valley Land Corporation properties (14-0077-000 & 14-0078-000), the TST Enterprises property (Lot # 14-0082-000), and the Town land acquired from the Maxfield Family (Lot # 14-0109-000) preserving the agricultural resources and uses in this area.

This scenario assumes the Wright farm properties and the land acquired by the Town from the Maxfield Family will be conserved in their entirety. Deed restrictions on the Wright Farm specify agricultural uses only. Also the warranty deed to the Town for the Maxfield property states the second priority permitted use shall be for recreational and agricultural purposes. Since the Board of Selectmen have decided that the first priority use for a golf course is not necessary or feasible at this time, the deed provides that these second priority uses can be pursued. The deed also restricts buildings from covering more than ten percent (10%) of the surface area of the property.

Limited residential development was assumed for the Valley Land Corporation properties (Lot #s 14-0077-000 & 14-0078-000) and the TST Enterprises property (Lot # 14-0082-000). The number of lots was based on including this area in a new Agricultural Conservation District with a minimum lot size of 20 acres.

- 3) Sixty (60) single family residential units located along the west side of Route 5 in two areas: 1) between I-89 and the Wright Farm property (Lot # 14-0045-000) and 2) in the area around Rustic and Orrizonto Roads. The number of residential units was determined by preserving the prime agricultural lands and permitting limited residential development on the remainder of the land based on a soil-based minimum lot size system.

Map 11

Route 5 South Study Future Land Use Scenario #1

Scenario 1 Land Uses

-  Existing Developed
-  Residential - Condominium/Townhouse
-  Residential - Single Family
-  Office
-  Commercial - Services/Wholesale
-  Industrial Park
-  Agriculture
-  Forest/Natural Areas
-  Road

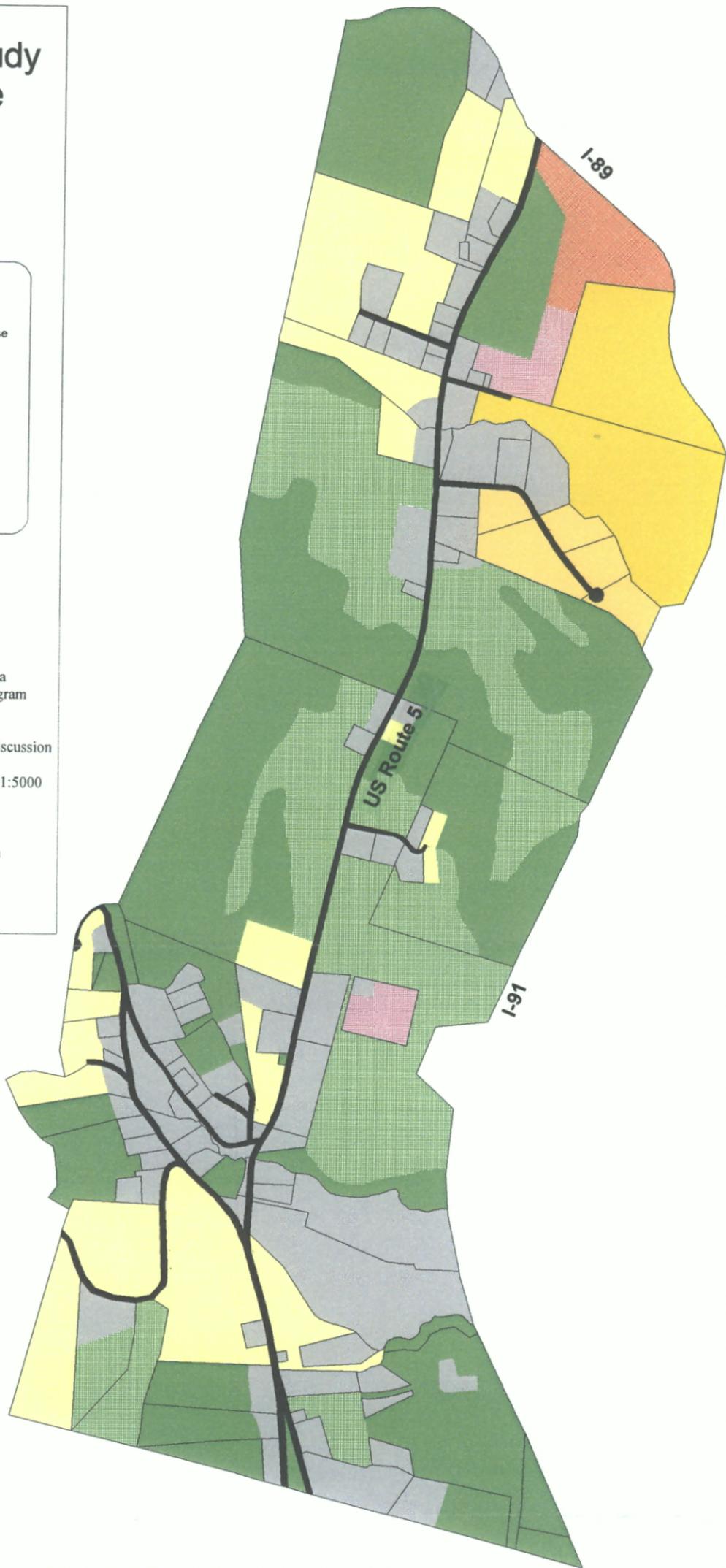
Data Sources:

Parcel boundaries shown as digitized by MicroData through Vermont GIS Digital Parcel Mapping Program and updated February 2000.

Land use scenarios developed by UVLSRPC for discussion purposes. Existing developed areas and forest and agricultural areas mapped by UVLSRPC based on 1:5000 orthophotos and 2000 field survey.

Map Prepared By: Upper Valley Lake Sunapee
Regional Planning Commission

March 2001



B. FUTURE LAND USE SCENARIO #2: The following are the major features of this land use scenario which are shown on Map 12.

- 1) Within the Industrial-Commercial Zoning District on the east side of Route 5 between I-89 and the Kline subdivision, a mix of uses to include:
 - * a retail shopping center of 164,000 square feet and a restaurant of 5,000 square feet (31 acres) on the KRIF property (Lot # 14-0039-000);
 - * an office park (7 acres) on the Robichaud property (Lot # 14-0061-000)
 - * a church building of 40,000 square feet with 700 seats on the Canaan Foundation (Valley Bible Church) property (Lot # 14-0060-000).
 - * a warehouse (2.4 acres) and an office/light industrial park (5.1) on the Kline properties (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000, and 14-0069-000);
- 2) A recreational park developed with playing fields on the land acquired by the Town from the Maxfield Family (Lot # 14-0109-000). As noted in Scenario #1, the warranty deed to the Town for the Maxfield property states the second priority permitted use shall be for recreational and agricultural purposes. Since the Board of Selectmen have decided that the first priority use for a golf course is not necessary or feasible at this time, the deed provides that these second priority uses can be pursued. The deed also provides that no more than 10% of the surface area of the land shall be covered with buildings for the permitted uses.
- 3) Residential development to include 84 condominium/townhouse units and 58 single family residential units on the west side of Route 5 and on the east side of Route 5 south of the Kline subdivision. The number of residential units was determined by preserving the prime agricultural lands and permitting limited residential development on the remainder of the land based on a soil-based minimum lot size system described earlier. The analysis suggests a permitted density of one dwelling per two acres.

Map 12

Route 5 South Study Future Land Use Scenario #2

Scenario 2 Land Uses

-  Existing Developed
-  Residential - Single Family
-  Office
-  Institutional
-  Commercial - Services/Wholesale
-  Commercial Retail
-  Recreation
-  Agriculture
-  Agriculture/Residential Mix
-  Forest/Natural Areas
-  Road

Data Sources:

Parcel boundaries shown as digitized by MicroData through Vermont GIS Digital Parcel Mapping Program and updated February 2000.

Land use scenarios developed by UVLSRPC for discussion purposes. Existing developed areas and forest and agricultural areas mapped by UVLSRPC based on 1:5000 orthophotos and 2000 field survey.

Map Prepared By: Upper Valley Lake Sunapee
Regional Planning Commission

March 2001



VII. WATER & WASTEWATER SERVICES FOR EXISTING AND FUTURE DEVELOPMENT

As noted earlier, the closest connection to the Town sewer system is an eight inch line located just north of the Study Area near the intersection of the VA Cutoff Road and Route 5. Currently, an eight inch water line extends south along the Route 5 corridor to Kline Drive.

The first issue to address in the utility facilities planning process is to identify the public and on-site utility service areas. Feasibility is a major factor in this determination. The Dufresne-Henry Report on the Route 5 South/I-91 Rest Areas Project estimated the cost to extend public water and wastewater utility services to the entire corridor would be about \$8,300,000 in 1995. This utility facility plan was based on serving a flow demand of 600,000 gallons per day (g.p.d.). The uses projected south of the Kline subdivision for both the future land use scenarios are open space or relatively low intensity uses which generate relatively low demand for water use. Of the two land use alternatives under consideration, the highest possible water demand to accommodate both existing and future development the entire length of the Route 5 corridor is estimated to be about 150,000 g.p.d. The reason for the difference in the projected demand for water use between the Dufresne-Henry Report and the future and use alternatives is the different assumptions about the amount of developable land in both the Residential Three (R-3) and Industrial-Commercial (I-C) districts.

An updated cost estimate for extending water and wastewater utility services to the entire Route 5 corridor is about \$9,000,000 (please refer to the detailed cost estimate and accompanying map of the suggested layout in APPENDIX H). This cost estimate is based on using all the assumptions from the Dufresne-Henry Report, except it assumes the 150,000 gallons per day highest water demand as projected for the future land use scenarios. Even with the smaller line sizes needed to serve about one-fourth of the projected water demand used in the Dufresne-Henry Report, the total estimated cost increased about \$700,000 due to inflation over the past six years.

The conclusion of this evaluation is that extending public utilities south of the Kline subdivision would be counter productive to the preservation of the agricultural/open space and scenic resources, and not needed to meet the utility demands for the low density residential uses projected for this area. Extending utilities south of the Kline subdivision would be cost prohibitive for the amount of development served. Therefore, the area south of the Kline subdivision was assumed to be served with on-site water and wastewater services for both of the proposed alternative future land use scenarios.

Two options for providing water and wastewater services to the area along Route 5 north of the Wright Farm are presented in this report: 1) on-site water and wastewater services, and 2) public water and wastewater services.

A. ON-SITE WATER AND WASTEWATER SERVICES:

The first option considered was on-site water and sewer services. On-site water service can satisfy the needs for domestic water use, but can be very expensive to provide the water pressures necessary to operate sprinkler systems for the industrial, commercial or residential buildings possible in this zone district. Depending on the size of building and type of use, on-site water storage of a sizeable capacity and a booster pump is needed to operate sprinkler systems. This on-site water storage and booster pump system is very expensive and acts as a deterrent for many potential developers.

On-site wastewater disposal limits the type of industrial-commercial type uses which will develop in an area. Typically, the types of industrial-commercial land uses which develop with on-site wastewater disposal include warehousing, contractor's yards, and utilities. The leech fields for on-site wastewater disposal systems occupy areas which could be used for other purposes including additional space for building and parking.

B. PUBLIC WATER AND WASTEWATER SERVICES:

The second option assumed public water and wastewater utility services would serve the area along Route 5 north of the Wright Farm. The first consideration in this option is to estimate the cost for extending public water and wastewater utility services for this northern part of the Study Area. The conceptual plans and cost estimates for extending these utility services are presented in the section to follow. Beyond the cost issue, another important consideration in deciding whether or not to extend public water and sewer service is the affect the availability of these utility services can have on the quality of development attracted to an area. While on-site water and wastewater services will limit the type and intensity of industrial and commercial uses which can develop with those services, providing public water and wastewater services opens the doors to a multitude of options. Uses that are both capital and employee intensive such as light industrial/ research parks are possible with public utilities whereas warehousing and contractor's yards are typical uses for properties with on-site utility services. And as noted earlier, public utilities permit maximum use of the site for buildings and parking and eliminates the need to use valuable land for on-site wastewater disposal.

The conceptual plans and cost estimates of providing public water and wastewater services for this northern part of the Study Area are presented below.

1. WATER SERVICE:

The water service to the Kline subdivision needs to be improved to ensure adequate pressure is available for fire flows. The existing 8" water line currently does not provide the pressure necessary for operating sprinkler systems. This has been a significant deterrent to any commercial/industrial development in the northern part of the Study Area.

The first option to consider is to conduct a hydraulic modeling study of the existing 8" water line to identify the flows to be gained by cleaning and relining this old water line. If the results of this analysis indicate the necessary flows can not be obtained with cleaning and relining the existing line, then a new water line should be extended from the VA Hospital Road to Kline Drive to provide the necessary service. After conferring with the Hartford Public Works Department, the preferred conceptual layout to provide water service is depicted on Map 13. This line would run along Route 5 to Kline Drive and then east on Kline Drive and terminate on the property owned by the Canaan Foundation (Valley Bible Church) (14-60).

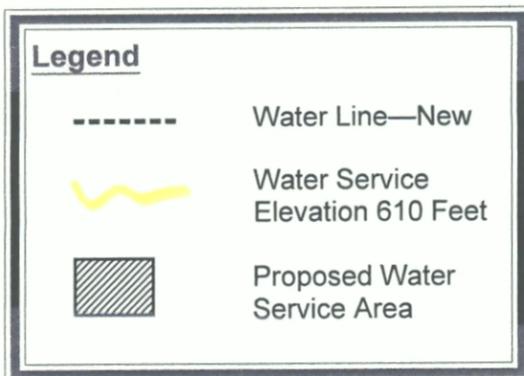
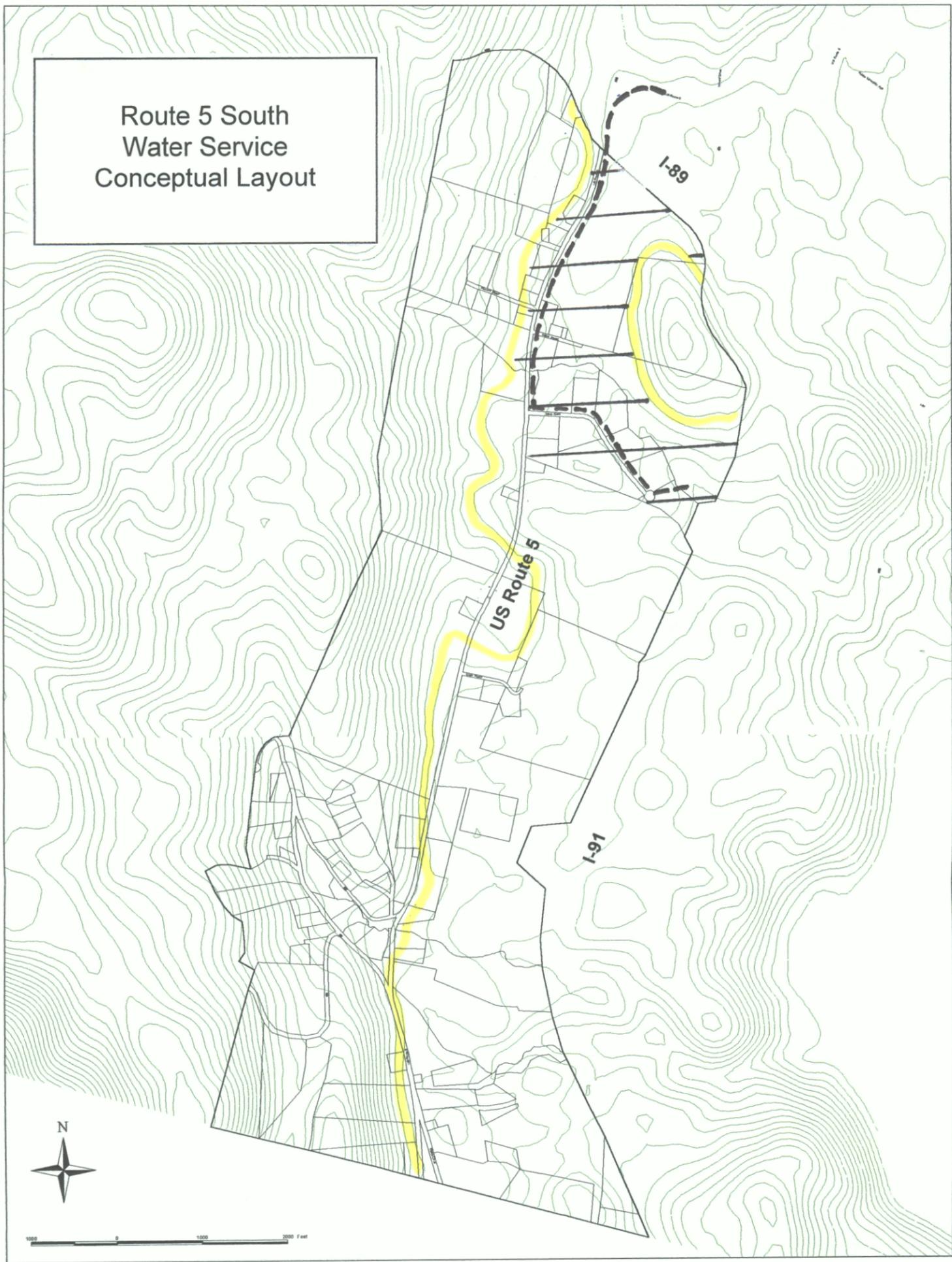
The projected water use for the area lying north of the Kline subdivision is about 100,000 gallons per day. Based on this estimated daily water demand, a cost estimate was developed for the conceptual layout shown on Map 13. The estimated cost is \$1,112,280 for a new water line which is outlined in Table 6. Based on serving 75.5 acres (48.5 acres of land zoned I-C and 27 acres of land zoned R-3), the cost to extend water service is \$14,732/ac. The 48.5 acres of developable land zoned I-C is outlined in Table 5. The 27 acres of developable land zoned R-3 includes parts of properties owned by D. Brown (14-0027-002), W. Miller (14-0046-000) and W. Matson (14-0047-000).

Table 6: Water Service Cost Estimate

<u>Service Area</u>	<u>Quantity</u>	<u>Unit</u>	<u>Description</u>	<u>Unit Price</u>	<u>Estimated Cost</u>
A 1	3,500 ³	LF	12" Water	\$124 ⁴	\$434,000
B 2	3,400	LF	12" Water line	124	<u>421,600</u>
				Sub-Total	855,600
				Contingencies (10%)	85,560
				Engineering-Design & Constr. (15%)	128,340
				Legal & Admin (5%)	<u>42,780</u>
				TOTAL	\$1,112,280

- 1 Water Use Estimate - 40,000-45,000 g.p.d.
- 2 Water Use Estimate - 35,000-50,000 g.p.d.
Total 75,000-95,000 g.p.d.
- 3 Tie into water at the old VA Cutoff Road on Route 5.
- 4 Average cost estimates based on recent bids received by the Hartford Public Works Department.

Map 13



2. WASTEWATER SERVICE:

A conceptual plan to provide wastewater service to the area lying north of the Wright Farm (14-0045-000 and 14-0066-000) is shown on Map 14. The route selection and line sizing were based on the estimated daily water demand and input from the Hartford Public Works Department. The proposed sewer lines would follow the same route as the water line south along Route 5 and east along Kline Drive to the Canaan Foundation (Valley Bible Church) (14-0060-000) property.

This part of the Study Area includes two sub-watersheds. An eight inch gravity sewer would serve the area flowing northward from Melisi Road. The area south of Melisi Road falls into another sub-watershed. This requires installing a gravity line running south along Route 5 and then east down Kline Drive to the Canaan Foundation (Lot # 14-0060-000) property, a pump station and a sewer force main running parallel to the gravity line up Kline Drive and Route 5 to the gravity sewer line running northward from Melisi Road.

The cost estimate for providing wastewater service to the area north of the Wright Farm (14-0045-000 and 14-0066-000) is \$1,769,300 as presented in Table 7. Based on serving 75.5 acres (48.5 acres of land zoned I-C and 27 acres of land zoned R-3), the cost to extend wastewater service as proposed is \$23,434/ac. As noted above in the section on water service, the 48.5 acres of developable land zoned I-C is outlined in Table 5 and the 27 acres of developable land zoned R-3 includes parts of properties owned by D. Brown (14-0027-002), W. Miller (14-0046-000) and W. Matson (14-0047-000).

Beyond the cost issue, another important consideration in deciding whether or not to extend sewer service is the affect it can have on the quality of development it attracts. The availability of sewer service provides the opportunity for many more uses to be feasible to develop including ones that are both capital and employee intensive which are typically excluded with on-site wastewater treatment.

Table 7: Wastewater Service Cost Estimate

<u>Service Area</u>	<u>Quantity</u>	<u>Unit</u>	<u>Description</u>	<u>Unit Price</u>	<u>Estimated Cost</u>
A 1	4,100 ³	LF	8" Gravity Sewer	\$124 ⁴	\$508,400
B 2	3,400	LF	8" Gravity Sewer	124	421,600
	3,400	LF	4" Force Main	90	306,000
	1	ea	Pump Station	125,000	125,000
				Sub-Total	1,361,000
				Contingencies (10%)	1,361,100
				Engineering-Design & Constr. (15%)	204,150
				Legal & Admin (5%)	<u>68,050</u>
				TOTAL	\$1,769,300

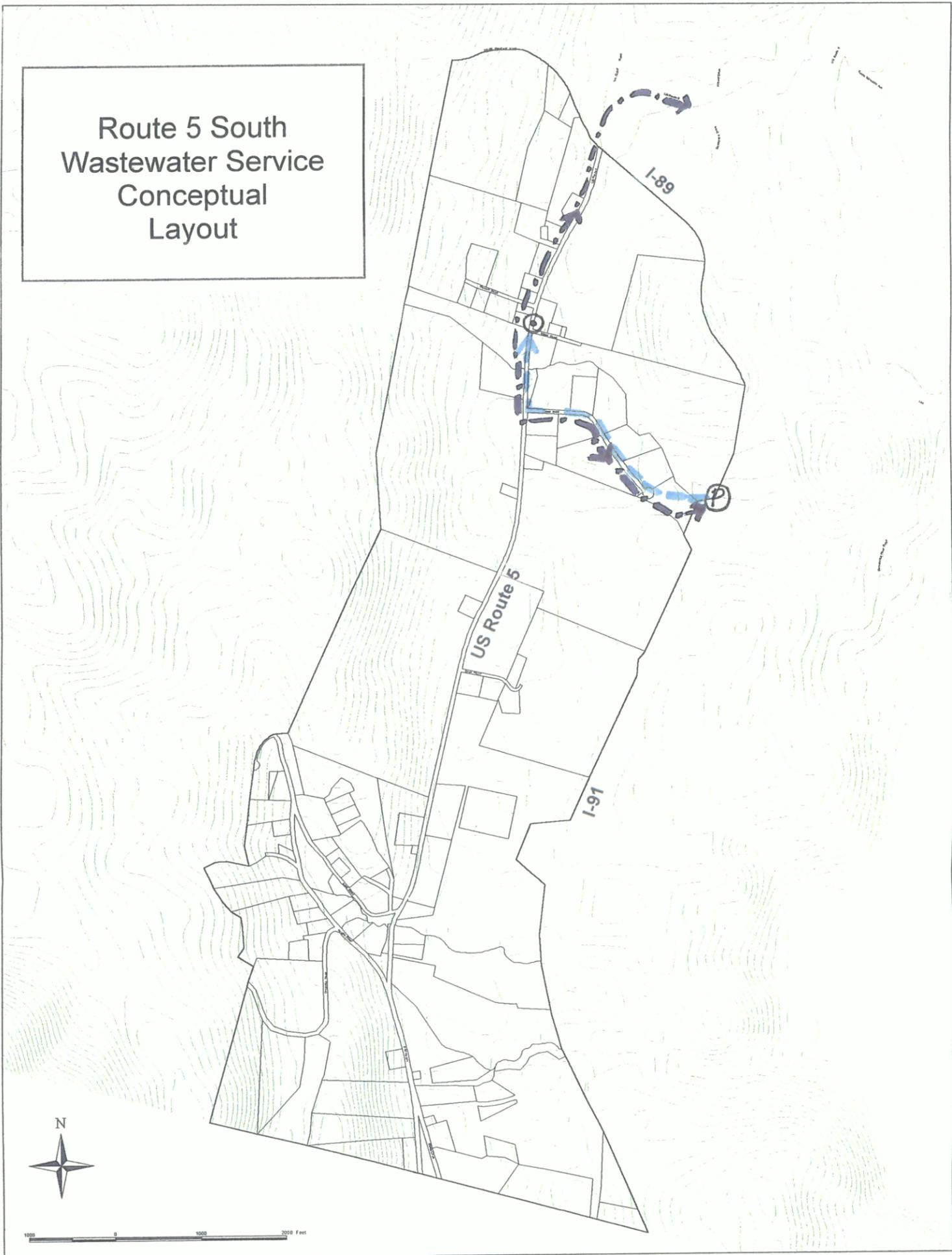
1 Water Use Estimate - 40,000-45,000 g.p.d.

2 Water Use Estimate - 35,000-50,000 g.p.d.
Total 75,000-95,000 g.p.d.

3 Tie into wastewater at the VA Hospital driveway on Route 5.

4 Average cost estimates based on recent bids received by the Hartford Public Works Department.

Map 14



Legend	
	Gravity Sewer—New
	Force Main—New
	Pump Station—New
	Gravity Sewer/Force Main Connection

VIII. TRANSPORTATION SERVICE FOR FUTURE DEVELOPMENT

A. INTRODUCTION

A traffic impact analysis was completed to evaluate the traffic impacts the proposed development scenarios would have on the Study Area's transportation system. This study is intended for planning purposes and should not be used as a substitute for impact studies pertaining to significant developments as they occur within the Study Area. Furthermore, considering the horizon year for this study is 2010, interim-planning analyses would be appropriate to gauge the traffic impacts as development is proceeding.

To evaluate the traffic impacts associated with the proposed development options, the following tasks were completed:

1. Readily available traffic data for the Study Area was gathered from the Vermont Agency of Transportation and *Lamoreaux and Dickinson Consulting Engineers*.
2. The Upper Valley Lake Sunapee Regional Planning Commission performed turning movement counts at the intersection of Route 5 and Kline Drive to obtain AM and PM peak hour traffic volumes and distribution.
3. The Design Hour Volume (DHV) was assumed to occur on a weekday PM peak hour. The DHV is 30th highest hour of traffic in a given year.
4. Traffic was projected to 2010 using the 1999 Vermont Agency of Transportation Continuous Traffic Counter Grouping Study & Regression Analysis. A factor of 1.11 was used to estimate background traffic growth in 2010. This is approximately 1 percent growth per year.
5. Traffic from two major developments with proposed access to Route 5 (Twin State Sand & Gravel (TSSG) and the Upper Valley Landfill) was included in the 2010 no-build and build scenarios. Trip generation estimates were taken directly from the revised Greater Upper Valley Solid Waste District (GUVSWD) Traffic Impact Study, *Lamoreaux and Dickinson Consulting Engineers, Inc.*, 1999; and the *Resource Systems Group, Inc.*, DRAFT Traffic Impact Study for Twin State Sand & Gravel (TSSG), 2000.
6. Two land use scenarios were evaluated for their impacts on the Study Area's transportation system. Trip generation rates for these land uses were obtained from the Institute of Transportation Engineers (ITE) Trip Generation publication, sixth edition. Traffic was assigned according to current PM peak hour traffic distribution percentages.
7. Congestion analysis was performed on four intersections within the Study Area: the proposed KRIF Drive/Route 5, Melisi Drive/Route 5, TSSG Site Driveway/Route 5 and the existing Kline Road/Route 5.
8. A safety analysis was performed. Conclusions and recommendations were developed.

The methods employed in this study are based on the suggested procedures and practices of the Highway Capacity Manual and the U.S. Department of Transportation: Site Impact Traffic Evaluation Handbook.

B. TRAFFIC

1. ASSUMED INFRASTRUCTURE IMPROVEMENTS

To evaluate the estimated impact of the proposed development alternatives we are assuming that Melisi Drive is enhanced to 2 12-foot lanes (1 eastbound, 1 westbound) with improved sight distances. Melisi Drive will be connected to the southerly end of the KRIF property. Also accessing the KRIF property will be a new access road (KRIF Drive) to the same specifications. The location of the proposed KRIF Drive has not been determined.

2. TRAFFIC & PLANNED DEVELOPMENTS

VTrans has an automatic traffic recorder count on Route 5 between the Hartland town line and the I-89 overpass for the week of June 9, 2000 (Location I.D. Y105). That location has an annual average daily traffic (AADT) of 4,300 vehicle per day in 2000. This segment of road had previously been counted in 1994 and had an AADT of 4,200 vehicle per day. Between 1994 and 2000, AADT increased by 100 vehicles—a 2.4 percent increase in total traffic. For comparison, the AADT for Route 4 in the Quechee area is approximately 9,100 vehicles per day.

The Upper Valley Lake Sunapee Regional Planning Commission performed two turning movement counts for the Route 5 and Kline Drive intersection; one count was from 6:45 – 8:45 am and the second count was from 3:45 – 5:45 pm, permitting a determination of AM and PM peak hours of traffic. The AM peak hour is from 7 – 8 and the PM peak is from 4 – 5 in the afternoon. These counts also provided the directional distribution of traffic.

The traffic analysis period seeks to replicate the design hour volume (DHV) of traffic, which is the 30th highest hour of traffic for the year. This period reflects the peak traffic demand a road should be designed to accommodate. The 1st highest hour of traffic is the highest hourly volume of traffic expected. The 30th highest hour of traffic represents less than 1 percent of the hours of the year. By adjusting peak hour traffic volumes to a DHV, we adjust for seasonal traffic variations as well.

There is more traffic in the PM peak hour than in the AM peak hour. It is therefore reasonable to assume that the PM peak hour is the period in which the DHV will occur for all intersections. We are also assuming that the DHV has a similar traffic distribution as the count data. See Figure 1 for estimated (2001) PM DHV traffic within the Study Area.

A growth factor was used to project future traffic along US Route 5. This factor was obtained in the VTrans 1999 Automatic Counter and Regression Analysis Report and is the growth factor for Class B urban roads (1.11 to project from 2000 to 2010). Traffic was first projected to the current year (2001), and then projected to 2010. Route 5 is expected grow at about 1% per year.

There are two planned developments that will have a significant impact on Route 5 traffic. These include the Greater Upper Valley Solid Waste District Landfill in Hartland and the Twin State Sand and Gravel operation in Hartford. Both are requesting to share an additional access road to Route 5

approximately 240 feet north of the intersection of U.S. Route 5 and Blake Drive. In order to account for the additional traffic from these developments, their traffic impact reports were used. The trip generation estimates outlined by these reports were included in the 2010 no-build and build scenarios. See Figure 2 for the Design Hour traffic volumes in 2010.

Figure 1: 2001 PM Design Hour Traffic Volumes

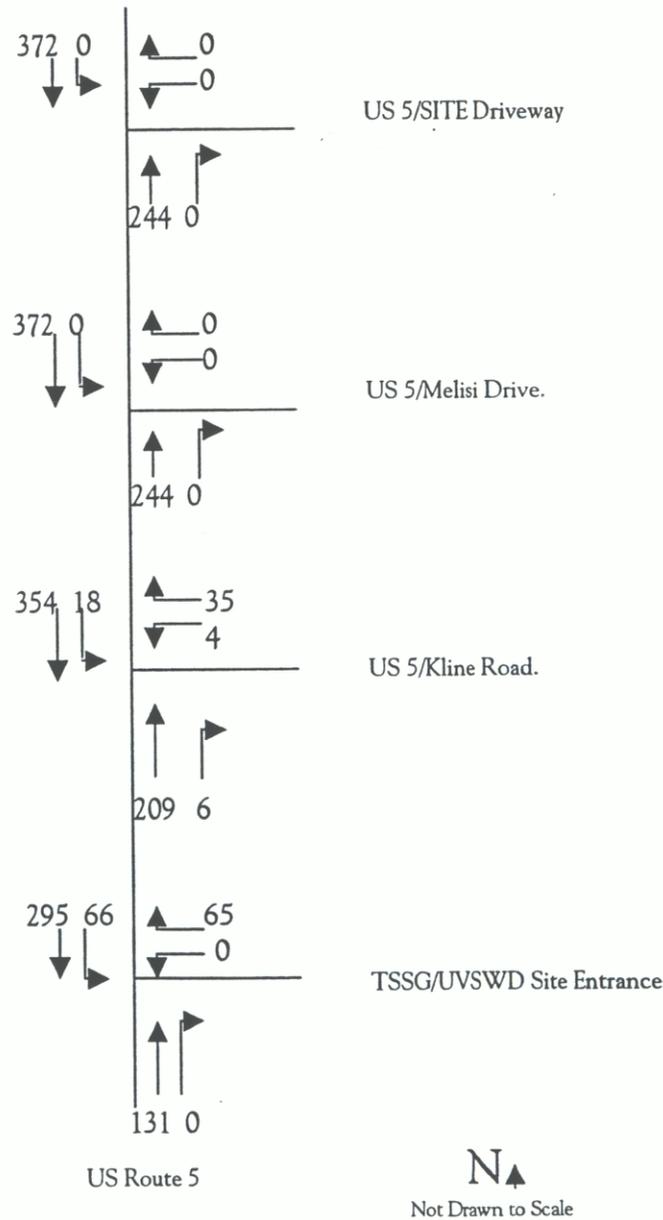
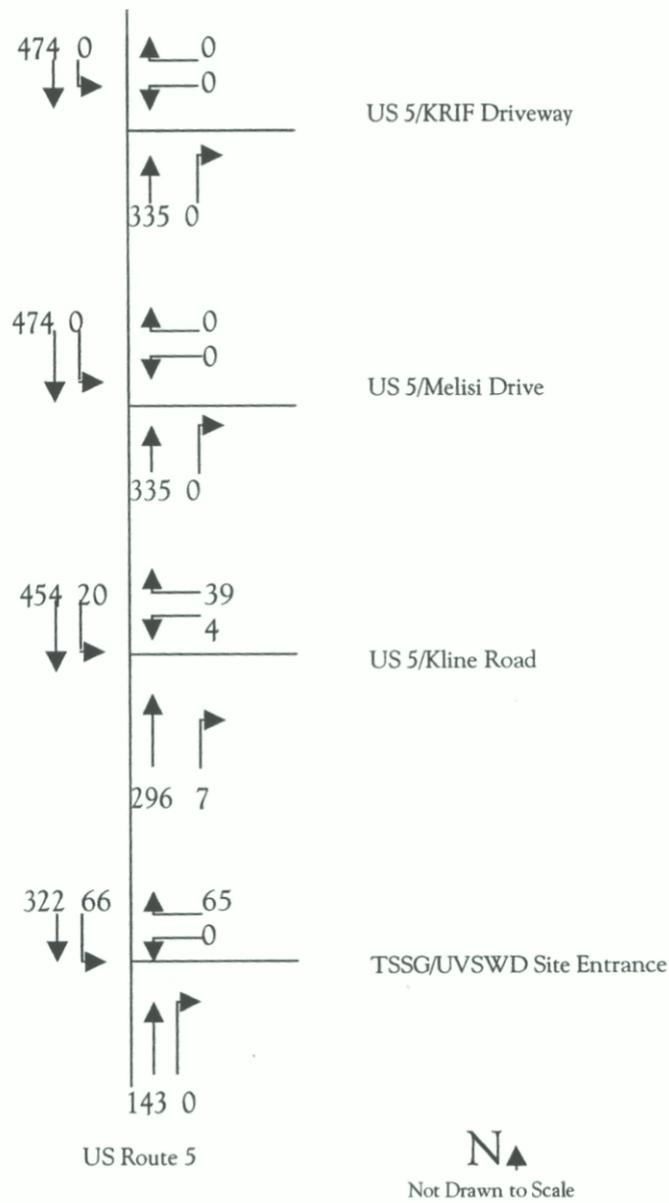


Figure 2: 2010 PM Design Hour (No-Build) Traffic Volumes



C. TRAFFIC FROM DEVELOPMENT ALTERNATIVES

1. TRIP GENERATION

The Institute of Transportation Engineers (ITE) publishes a trip generation handbook that details the likely amount of traffic to expect from various types of development. Local trip generation rates would be better suited for determining the number of trips generated by each land use, however, are not available for the land uses evaluated. It is assumed that the trip generation rates published by the ITE will reasonably estimate the number of vehicle trips generated by the proposed developments (See APPENDIX J for a listing of land uses and their associated trip generation rates). In order to determine the appropriate impacts during the PM peak hour, time periods for each land use were analyzed by examining the weighted average trip rates for different periods of the day and their relationship with the peak hour of the adjacent street traffic. Suggested practice is to "analyze the time period in which the combination of site-generated traffic and adjacent street traffic is at its maximum".³ It was determined that most land uses peaked approximately between 4-6 pm, which reasonably coincides with the PM peak hour (4-5pm) of Route 5. The only exception is the church in Scenario 2 where the peak hour is on a Sunday. Considering the size of this land use in relation to the traffic along U.S. Route 5, its trips were excluded from the Scenario 2 analysis. These trip generation rates do not reflect changes in employee modes of travel over the ten-year period.

2. TRAFFIC ASSIGNMENT

The Study Area was divided into seven (7) quadrants. The delineation of these quadrants was a function of the type and intensity of land use, topography and existing access roads. Three of these quadrants have driveways or entrances associated with them (Kline Road, Melisi Drive and KRIF Drive); the remaining four do not.

Traffic generated from quadrants with entrances was assigned using the traffic distribution percentages derived from the PM peak hour Kline Road/Route 5 turning movement count, the ITE Trip Generation directional percentages for each land use and local knowledge of the area (see APPENDIX K for distribution percentages). We assume the PM peak hour directional distributions tell us where traffic is coming from and where it is going for entrances servicing primarily commercial and industrial land uses.

Traffic generated from quadrants where there is no entrance was assumed to enter and exit at a point on Route 5 within the quadrant so to impact all appropriate intersections. In each scenario these quadrants are predominately residential land uses, and therefore, are assumed to have different directional distribution percentages than the commercial and industrial uses dominating Kline Road, Melisi Drive and KRIF Drive quadrants. Entering and exiting traffic from these quadrants was assigned to the

³ Institute of Transportation Engineers, Trip Generation Handbook: An ITE Proposed Recommended Practice, 1998.

transportation system using normal commuting patterns (63% southbound and 37% northbound) derived from the VTrans PM peak hour tube count (Y105) on Route 5 between the interstate underpass and the Hartland town line.

This traffic assignment method was deemed reasonable due to the simplicity of the road network and the size of the Study Area. There are only two ways traffic may enter the Study Area: Route 5 southbound or northbound. It is highly unlikely this will change. Nonetheless, one must recognize that by 2010 modes of travel and vehicle travel patterns may change due to increased congestion and other factors.

3. PASS-BY TRIPS

Not all additional trips add traffic to the traffic stream. For instance, one may make a trip to the grocery store and while on route, stop by the dry cleaners and then the bank. According to the Institute of Transportation Engineers, “pass-by trips are made as intermediate stops *on the way* from an origin to a primary trip destination without a route diversion.”⁴ Some of the land uses proposed would attract visitors who are traveling along Route 5 who are not making a primary trip to any given site within the Study Area.

Pass-by data from the ITE Trip Generation Handbook was used to determine the percentage pass-by trips for applicable land uses. Pass-by analysis was only necessary for two land uses in Scenario 2—the retail shopping center and a high turn over sit-down restaurant. This analysis may be found in APPENDIX L.

4. SCENARIO #1

See Figure 3 for the additional traffic assigned to the road network from Scenario 1. This traffic was added to the 2010 PM DHV to obtain the 2010 Scenario 1 traffic volumes (see Figure 4).

The following are key features of this land use scenario which are depicted on Map 11.

- 1) Within the Industrial-Commercial Zoning District on the east side of Route 5 between I-89 and the Kline subdivision, a mix of uses to include:
 - * an industrial park (20 acres) and an office park (11 acres) on the KRIF property (Lot # 14-0039-000);
 - * two condominium/townhouse unit PUD developments of 15 units each on the Robichaud property (Lot # 14-0061-000) and the Canaan Foundation (Valley Bible Church) property (Lot # 14-0060-000);

⁴ ibid

Figure 3: Scenario 1 Traffic Assignment

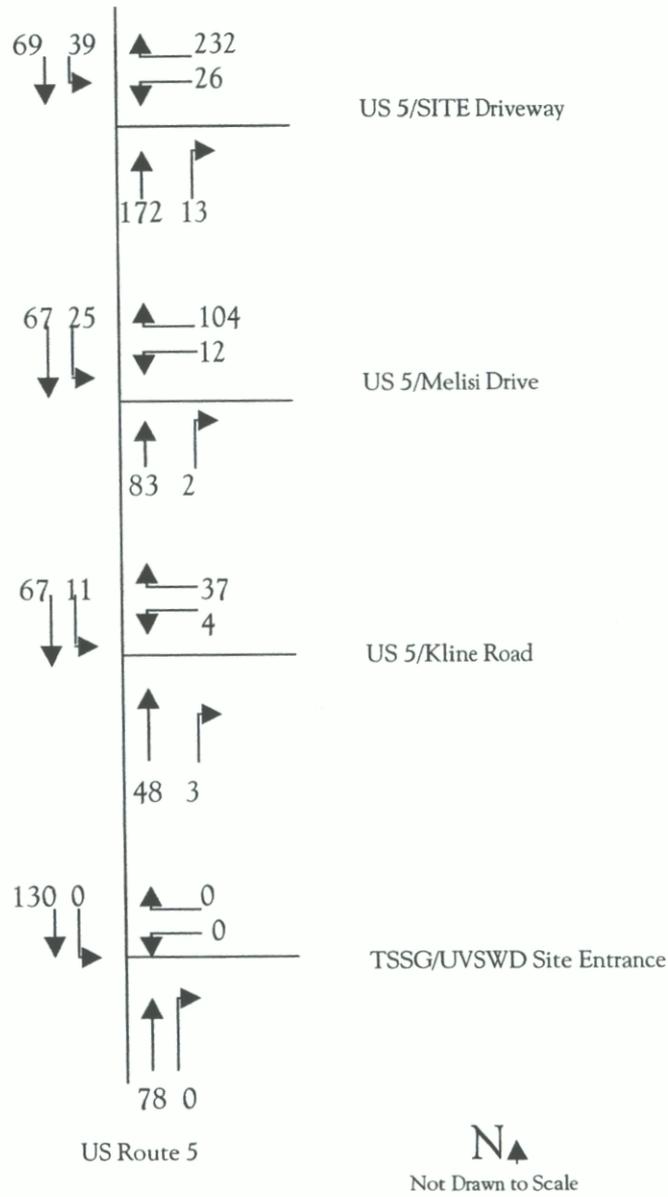
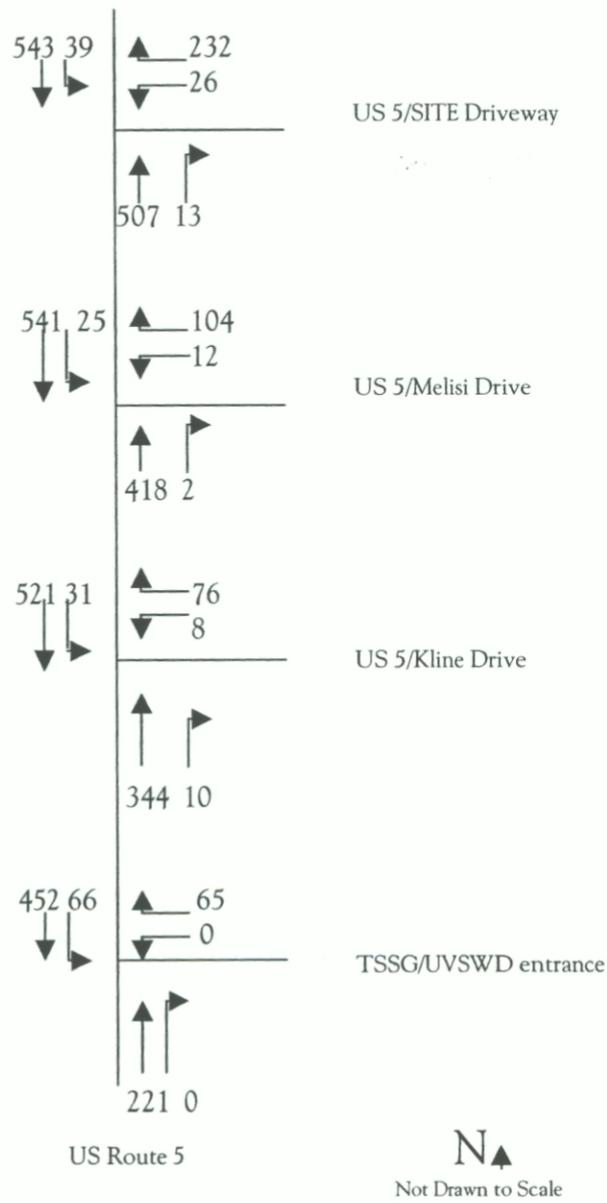


Figure 4: 2010 PM DHV Scenario 1 Build Traffic Distribution



* light industrial/warehouse uses (6.5 acres) on the Kline properties (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000, and 14-0069-000).

- 2) Agricultural conservation easements on the Wright Farm (Lot #s 14-0045-000 & 14-0066-000), the Valley Land Corporation properties (14-0077-000 & 14-0078-000), the TST Enterprises property (Lot # 14-0082-000), and the Town land acquired from the Maxfield Family (Lot # 14-0109-000) preserving the agricultural resources and uses in this area.

Limited residential development was assumed for the Valley Land Corporation properties (Lot #s 14-0077-000 & 14-0078-000) and the TST Enterprises property (Lot # 14-0082-000).

- 3) Sixty (60) single family residential units located along the west side of Route 5 in two areas: 1) between I-89 and the Wright Farm property (Lot # 14-0045-000) and 2) in the area around Rustic and Orrizonto Roads.

5. SCENARIO # 2

See Figure 5 for the additional traffic assigned to the road network from Scenario 2 after pass-by analysis. This traffic was added to the 2010 PM DHV to obtain the 2010 Scenario 2 traffic volumes (see Figure 6). The following are the major features of this land use scenario which are shown on Map 12.

- 1) Within the Industrial-Commercial Zoning District on the east side of Route 5 between I-89 and the Kline subdivision, a mix of uses to include:
- * a retail shopping center of 164,000 square feet and a restaurant of 5,000 square feet (31 acres) on the KRIF property (Lot # 14-0039-000);
 - * an office park (7 acres) on the Robichaud property (Lot # 14-0061-000)
 - * a church building of 40,000 square feet with 700 seats (Lot # 14-0060-000).
 - * a warehouse (2.4 acres) and an office/light industrial park (5.1) on the Kline properties (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000, and 14-0069-000);
- 2) A recreational park developed with playing fields on the land acquired by the Town from the Maxfield Family (Lot # 14-0109-000).

Figure 5: Scenario 2 Traffic Distribution (after pass-by analysis)

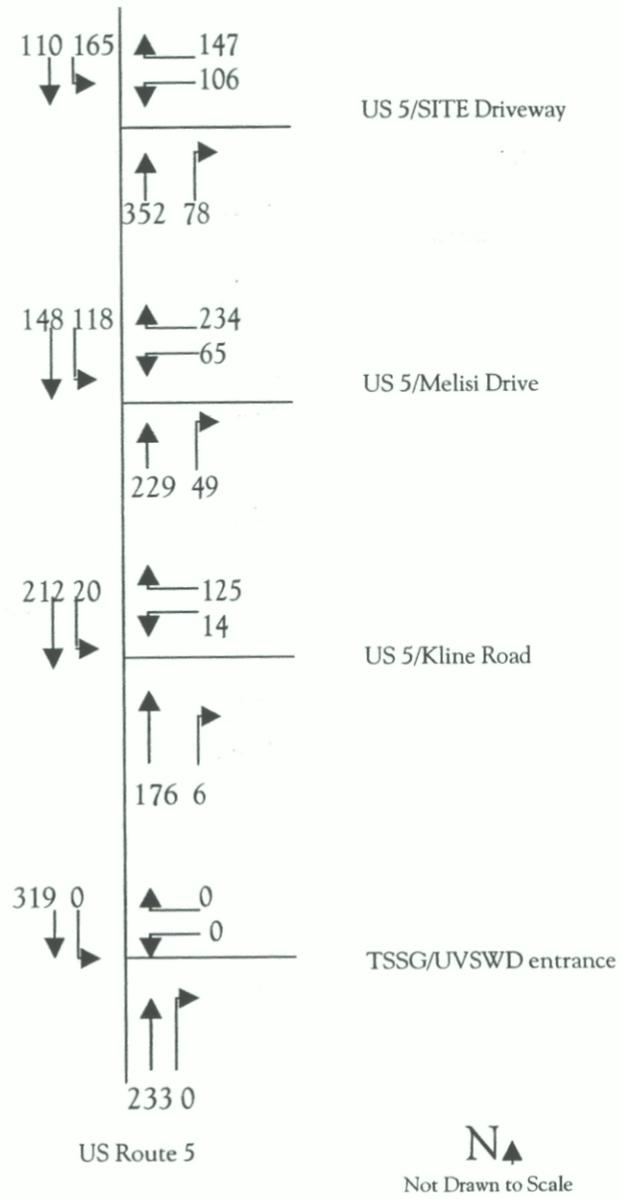
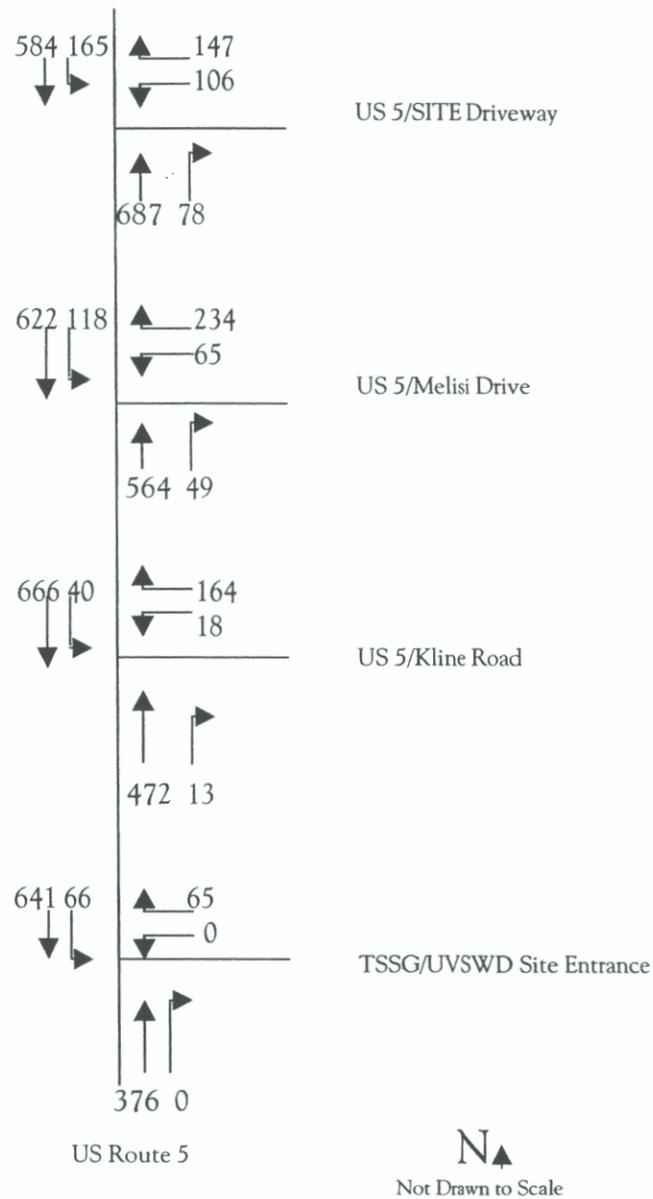


Figure 6: 2010 PM DHV Scenario 2 Traffic Volumes



- 3) Residential development to include 84 condominium/townhouse units and 58 single family residential units on the west side of Route 5 and on the east side of Route 5 south of the Kline subdivision.

D. CONGESTION ANALYSIS

1. LEVEL OF SERVICE

Level of Service (LOS) measures the average vehicle delay at an intersection in a qualitative manner. The average vehicle delay is a measure of seconds per vehicle. The numeric delay figure is then simplified into six categories established in the Highway Capacity Manual. These six categories range from “A” to “F” - “A” representing those intersections with the least delay and “F” indicating those with extreme delay and heavy congestion. The generalized criteria for LOS are represented in the table below.

Table 8: LOS Criteria for Unsignalized Intersections

LOS	Length of Vehicle Delay (in seconds)	Prevailing Conditions
A	≤ 10	Little to no congestion
B	>10 and ≤ 15	Slight congestion
C	>15 and ≤ 25	Average congestion
D	>25 and ≤ 35	Above average congestion
E	>35 and ≤ 50	High levels of congestion
F	> 50	Extreme congestion

The analysis period is the weekday PM design hour volume for 2001 and 2010 build and no-build scenarios.

Table 9: US Route 5 Congestion Analysis

Intersection	Approach	2001 PM Design Hour LOS	2010 PM Design Hour LOS		
		No-Build	No-Build	Scenario 1	Scenario 2
Route 5 & Kline Drive	WB	A-10.0 sec	B-10.7 sec	B-11.8 sec	C-16.9 sec
	NB	A-0.0 sec	A-0.0 sec	A-0.0 sec	A-0.0 sec
	SB	A-0.4 sec	A-0.3 sec	A-0.5 sec	A-0.5 sec
	Overall	A-0.8 sec	A-0.8 sec	A-1.3 sec	A-2.5 sec
Route 5 & Melisi Drive	WB	N/A	N/A	B-13.3 sec	F-150.7 sec
	NB	N/A	N/A	A-0.0 sec	A-0.0 sec
	SB	N/A	N/A	A-0.4 sec	A-1.5 sec
	Overall	N/A	N/A	A-1.6 sec	D-27.9 sec
Route 5 & KRIF Drive	WB	N/A	N/A	C-21.0 sec	F-1154.6 sec
	NB	N/A	N/A	A-0.0 sec	A-0.0 sec
	SB	N/A	N/A	A-0.6 sec	A-2.3 sec
	Overall	N/A	N/A	A-4.2 sec	F-166.3 sec
Route 5 & TSSG Site Driveway	WB	B-10.6 sec	B-10.7 sec	B-11.4 sec	B-13.3
	NB	A-0.0 sec	A-0.0 sec	A-0.0 sec	A-0.0 sec
	SB	A-0.3 sec	A-0.4 sec	A-0.4 sec	A-0.7 sec
	Overall	A-1.2 sec	A-1.2 sec	A-0.9 sec	A-0.7 sec

KEY:

WB = Westbound
SB = Southbound

NB = Northbound
LOS = Level of Service (A,B,C,D,E,F)

2. LEVEL OF SERVICE RESULTS

Table 9 on the previous page shows the LOS for the four intersections along Route 5 projected out to 2010 with no-build and build scenarios. Currently, the Route 5 and Kline Road intersection operates at a high LOS and is not significantly degraded by traffic in 2010 no-build or build scenarios. The Kline Road approach does lower to a LOS of C in Scenario 2, however, this is still considered an acceptable LOS. All other intersections operate at an acceptable LOS in 2010 no-build and Scenario 1 analyses.

Lower traffic volumes are projected in the southern portion of the Study Area, while higher traffic volumes are projected in the northern portion towards the interstate interchange and the regional center, White River Junction (WRJ). Typical commuting patterns for travelers along Route 5 during the PM peak hour of traffic indicate the majority of travelers are moving southbound away from the commercial center. However, most commuters leaving the Study Area are traveling northbound towards WRJ and the interchange. Simply put, the WRJ area attracts more vehicle trips than the more rural areas towards the south. This results in the majority of travelers leaving the Study Area's commercial and industrial establishments to travel northbound towards WRJ and the Interstate Highways System.

To increase the intensity and number of commercial and industrial land uses in the Route 5 south area, as provided in Scenario 2, will significantly burden the intersections towards the north, including Melisi Road and KRIF Drive. This is caused by the proposed retail shopping center, which generates much more traffic. The high delays for these intersections result from large traffic volumes on westbound approaches trying to access Route 5. Here overall LOS drop significantly, with a marginal LOS for Melisi Road (LOS C) and unacceptable LOS for KRIF Drive (LOS F).

In sum, normal growth will have a negligible impact on the LOS of these intersections according to this analysis, whereas intensive development in the northeast quadrant will cause significant delays on portions of the current road network.

E. SAFETY ANALYSIS

Safety is a major concern along Route 5. In assessing the safety issues, we made site visits, reviewed the crash history from VTrans for the 1994-1998 period and solicited input from the public during the January 11 and March 15, 2001 public meetings. Local officials and their staff are responsible for identifying hazards and making their roads safe. Although there are no high accident locations within the Study Area, there are several spots that deserve attention.

1. Crash History:

The crash history along Route 5 reveals that since 1994 there have been 11 reported crashes. Ten of these crashes are reported to be caused by driver error and the remaining crash unknown. None of these crashes could be associated with any unsafe locations or road conditions.

2. Public Input:

Hartford residents who frequently travel the Route 5 corridor expressed concern about the sight distances at several intersections and the high speed of traffic. The Neal Road intersection with Route 5 was referred to as a “death trap” due to insufficient sight distances. Melisi Road was sited as having poor sight distances as well.

The speed of vehicle travel along Route 5 was a concern among citizens, particularly for pedestrians and cyclists using the small shoulders. The speed of traffic also poses problems for vehicles exiting driveways and intersections where sight distances are marginal. A speed analysis was not completed.

F. SUMMARY OF ANALYSIS

The increased intensity and size of the commercial and industrial land uses in Scenario 2 significantly burden intersections in the northern portion of Route 5 including Melisi Road and KRIF Road (see Table 9 above). Our analysis indicates that less traffic-intensive land uses in Scenario 1 would have much less of an impact on the transportation system.

Due to the topography and location of Interstate 91, it would be difficult to increase road miles and make additional connections to the larger transportation network. Therefore, in order to mitigate increases in traffic, options are limited to capacity enhancements, signalization of intersections, transit and Transportation Demand Management.

It is important to recognize that traffic will continue to grow even with no new development in this corridor. This is wrought, in part, by increasing travel distances for commuters and growth in population. This growth is generally beyond the control of the local community, whereas a community can control the amount of increased traffic they will accommodate from development. The question is: will the traffic increase wrought by the community’s choices in development be addressed by better management of transit and roads, expanding capacity, reducing traffic demand or accepting increased congestion? Future land use decisions should be made with this question in mind.

IX. INPUT FROM PUBLIC MEETING ON MARCH 15, 2001

A public meeting was conducted on March 15, 2001. All property owners and renters located within the Study Area were invited to the meeting. The purpose of the meeting was to present and discuss the conclusions of the development suitability analysis, the two alternative future land use scenarios, utility services for future development and draft recommendations on land use, zoning, utilities and transportation.

Outlined below is a summary of the key points of public input received at this public meeting. A detailed list of all the comments received at the March 15, 2001 meeting are provided in APPENDIX I.

- * Prefer Alternative Future Land Use Scenario #1 which would preserve the agricultural, scenic and wildlife resources and maintain the rural character of the area.
- * Prefer light industrial/research/office park and residential uses and not retail uses for the Industrial-Commercial Zone north of the Wright Farm (Lot #s 14-0045-000 and 14-0066-000).
- * Concerned with commercial sprawl along Route 5 South. Should focus development efforts on downtown White River Junction which has existing utility infrastructure.
- * Question the cost effectiveness of extending water and sewer utilities to serve the area north of the Wright Farm (Lot #s 14-0045-000 and 14-0066-000).
- * Property owners, not the Town, should finance the cost of extending water and sewer utilities to serve the area north of the Wright Farm (Lot #s 14-0045-000 and 14-0066-000).
- * Concerned with the amount, speed and safety hazards associated with increased traffic on Route 5 South.

X. RECOMMENDATIONS

Recommendations are presented in four topical areas sequentially as follows: **A. LAND USE, B. UTILITIES, C. TRANSPORTATION and D. ZONING.** Please refer to Map 10 for the location of the major land holdings within the Study Area which are referenced in the section to follow. Map 15 depicts the recommended zoning districts.

A. **LAND USE:**

1. **Northern Section** (north of the Wright Farm (Lot # 14-0045-000 and 14-0066-000)): On the east side of Route 5 in the I-C Zone, accommodate the development of a mix of industrial-commercial uses. Light industrial, research and office parks, residential PUDs and a church are preferred uses.

Based on the existing uses, development patterns and the soils-based lot size analysis, the recommended land use for the west side of Route 5 is residential use with a density of between one unit per acre and one unit per two acres.

2. **Middle Section** (Between the Wright Farm (Lot # 14-0045-000 and 14-0066-000) on the north and the Valley Land Corporation (Lot # 14-0077-000) and Town (Lot # 14-0109-000) (Former Maxfield) lands on the south): Agricultural and forest uses are the recommended land uses for this section of the corridor. This area is blessed with a considerable area of prime agricultural soils and farming is the right land use to support where these resources are located. These agricultural resources with their open fields and forest edges create the scenic vistas along this designated scenic byway that add so much to the rural character.

The most permanent protection for these agricultural resources is offered by an agricultural conservation easement. Consideration should be given to protecting all of the large parcels in this area through an agricultural conservation easement. This part of the Route 5 corridor should be one of the target areas in Hartford for off-site mitigation for developing lands elsewhere with prime agricultural soils. For example, most of the remaining developable land in the Sykes Mountain Avenue Industrial-Commercial Zone has lands with prime agricultural soils. There are parts of the KRIF (Lot # 14-0039-000) and the Kline properties (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000 & 14-0069-000) within the Study Area which will need to address the issue of developing

lands with prime agricultural soils. Contributing towards the preservation of agricultural lands in this part of the Route 5 corridor is recommended as off-site mitigation for development of lands with prime agricultural soils elsewhere in the Study Area and other parts of Town such as the Sykes Mountain Avenue area.

3. Southern Section (South of Valley Land Corporation (Lot # 14-0077-000) and Town (Lot # 14-0109-000) (Former Maxfield) lands):

- * The recommended future uses for this area include low density residential use (one unit per two acres), recreational and institutional uses.
- * If the Town (Lot # 14-0109-000) (former Maxfield) property is conserved for agricultural use, then the Town should study alternative sites for the anticipated recreational uses (playing fields) to include the old landfill site and along the new access road on the land owned by Twin State Sand & Gravel.

4. Issues and Recommendations for Development of Properties in the I-C Zone north of the Wright Farm (Lot #s 14-0045-000 and 14-0066-000):

a. KRIF (Lot # 14-0039-000) property:

1) Use:

A Light Industrial or Office Park Use would be the preferred use for this property. This type of user could employ relatively high wage earners and have a positive impact on the local economy. These type of uses could fit in well with the neighboring residential area since they typically do not generate the noise and other nuisance impacts associated with many industrial or commercial uses. The traffic generated by a research or office park would be less than the traffic generated by a retail shopping center and would have lower impacts on the intersections with Route 5.

2) Utilities:

- a) Water: It is recommended the landowner extend private water service off the proposed public water

line in Route 5 and loop it through the property to tie back into Route 5 at Melisi Road. It is recommended this landowner coordinate with Mr. Robichaud, owner of Lot #14-0061-000, on plans for extending water service.

- b) Sewer: It is recommended the landowner extend private water service off the proposed public wastewater line in Route 5. It is recommended this landowner coordinate with Mr. Robichaud, owner of Lot # 14-0061-000, on plans for extending wastewater service.

3) Wetlands:

The largest wetland area in the Study Area is located on this property. It is recommended that the development of buildings and parking areas be set back a minimum of 100 feet from the wetland. This standard is based on the prevailing scientific research which indicates a natural vegetative buffer of at least this width is needed around a wetland to filter pollutants and maintain water quality. This natural buffer can be incorporated as part of a lot, but needs to remain in a natural, undeveloped condition.

4) Prime Agricultural Soils:

An area of prime agricultural soils is located on the southern end of this property off Melisi Road. The extension of utility and road improvements through this part of the property is critical to the development of the parcel. It would provide a necessary secondary road access for emergency vehicles and allow for looping of a water line to maintain adequate pressures. Under the Act 250 process, a landowner can offer to provide off-site mitigation to conserve prime agricultural lands elsewhere, equal or greater in area than that being developed, as compensation for the loss of prime agricultural lands on property being developed. For the reasons outlined above, it is recommended that the landowner provide off-site mitigation for development of this area of prime agricultural soils in the Act 250 review process.

5) Streams:

A stream feeds into the wetland along Route 5. It is recommended that the development of buildings and parking areas be set back a minimum of 100 feet from this stream. This standard is based on the prevailing scientific research which indicates a natural vegetative buffer of at least this width is needed to filter pollutants and maintain water quality. This natural buffer can be incorporated as part of a lot, but needs to remain in a natural, undeveloped condition.

6) Stormwater Management:

It is recommended that a stormwater management plan be prepared to identify the controls necessary to ensure that storm flows will not adversely impact downstream receiving waters for any development proposal. Each development proposal must demonstrate that it will not adversely affect downstream receiving waters.

7) Aesthetics:

It is recommended that a visual impact study accompany any development proposal on this highly visible site. The potential size and scale of the project and its proximity to the residential neighborhood to the west and to the I-89 and I-91 interchange area support this position. The Vermont Agency of Transportation is studying the interstate highway interchanges in the state and are particularly concerned with the visual impact of development around the interchanges. This is a very sensitive site in terms of this issue because of its high visibility from both I-89 and I-91.

b. Robichaud (Lot # 14-0061-000) property:

1) Use:

A Research or Office Park Use or a residential PUD would be the preferred types of land uses for this property. A Research or Office Park Use could employ relatively high wage earners and have a positive impact on the local

economy. These type of uses could fit in well with the neighboring residential area since they typically do not generate the noise and other nuisance impacts associated with many industrial or commercial uses.

2) Utilities:

a) Water: The developable site on this property is located at the top of the hill and well above the water service elevation of 610 feet. With the combination of steep terrain and probable ledge, the cost to install utilities would be relatively high. If water service is to be extended to the property, this owner needs to coordinate efforts with the owner of the KFIF (Lot # 14-0039-000) property on planning the extension.

b) Sewer: With the combination of steep terrain and probable ledge, the cost to install utilities would be relatively high. If wastewater service is to be extended to the property, this owner needs to coordinate efforts with the owner of the KFIF (Lot # 14-0039-000) property on planning the extension.

3) Wetlands:

Wetlands are not an issue on this site.

4) Prime Agricultural Soils:

Prime agricultural soils are not an issue on this site.

5) Streams:

Streams are not an issue on this site.

6) Stormwater Management:

Again the developable site on this property is located at the top of a steep hill. It is recommended that any stormwater be retained or detained on-site and released at a rate equal

the top of a steep hill. It is recommended that any stormwater be retained or detained on-site and released at a rate equal or less than historic rates to minimize downstream impacts. It is recommended that a stormwater management plan be prepared to identify all of the controls necessary to ensure that storm flows will not adversely impact downstream receiving waters for any development proposal. Each development proposal must demonstrate that it will not adversely affect downstream receiving waters.

7) Aesthetics:

It is recommended that development of this site maintain most of the existing tree cover around the ridgeline to screen/buffer the development. Thinning and cutting for "window views" is recommended over clear cutting.

c. Canaan Foundation (Valley Bible Church) (Lot # 14-0060-000) property:

1) Use:

A new church of 40,000 square feet and a sanctuary seating of up to 700 is planned for the building site at the eastern end of the property. This type of institutional use is compatible with both residential and industrial-commercial uses and is the recommended use for the site. An alternative land use which also could be appropriate for this property is a residential PUD with a layout which could effectively buffer the residential development from the impacts of neighboring industrial-commercial uses and the noise from I-91.

2) Utilities:

If served with public water and wastewater services, the church property would be served with lines running down through the Kline (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000 and 14-0069-000) properties.

3) Wetlands:

Wetlands are not an issue on this site.

4) Prime Agricultural Soils:

Prime agricultural soils are not an issue on this site.

5) Streams:

It is recommended that the development of buildings and parking areas be set back a minimum of 100 feet from the stream running along the southern boundary. This standard is based on the prevailing scientific research which indicates a natural vegetative buffer of at least this width is needed to filter pollutants and maintain water quality. This natural buffer can be incorporated as part of a lot, but needs to remain in a natural, undeveloped condition.

6) Stormwater Management:

It is recommended that a stormwater management plan be prepared to identify the controls necessary to ensure that storm flows will not adversely impact downstream receiving waters for any development proposal. Each development proposal must demonstrate that it will not adversely affect downstream receiving waters.

7) Aesthetics:

It is recommended the site be screened from the noise generated from I-91 by retaining a wide buffer of existing tree cover. The 100 foot setback from the stream along the southern boundary will provide a buffer from development of the industrial-commercial uses in the Kline subdivision.

d. Kline (Lot #s 14-0057-000, 14-0058-000, 14-0067-000, 14-0068-000 and 14-0069-000) properties:

1) Use:

The recommended uses are Light

Industrial/research/Office Park uses. Because all of the undeveloped parcels in the Kline subdivision are under the same ownership, the opportunity exists to consolidate some or all of the parcels into one or two building sites. If this were done, the road extension could be shortened gaining about one (1) acre of developable industrial-commercial land.

2) Utilities:

It is recommended that public water and wastewater services be extended to and through this subdivision to the Canaan Foundation (Valley Bible Church) (Lot # 14-0060-000) property.

3) Wetlands:

There are hydric soils on much of this area. It is recommended that an on-site investigation be made to identify the boundaries of wetlands restricted from development under the Act 250 process. It is recommended that the development of buildings and parking areas be set back a minimum of 100 feet from the wetlands. This standard is based on the prevailing scientific research which indicates a natural vegetative buffer of at least this width is needed around a wetland to filter pollutants and maintain water quality. This natural buffer can be incorporated as part of a lot, but needs to remain in a natural, undeveloped condition.

4) Prime Agricultural Soils:

The Kline subdivision was approved in the mid-1970s. As such according to the District Environmental Coordinator, the lots in this subdivision may be either grandfathered from having to address the issue of prime agricultural soils altogether or may be subject to off-site mitigation.

5) Streams:

It is recommended that the development of buildings and parking areas be set back a minimum of 100 feet from

the stream running along the southern boundary. This standard is based on the prevailing scientific research which indicates a natural vegetative buffer of at least this width is needed to filter pollutants and maintain water quality. This natural buffer can be incorporated as part of a lot, but needs to remain in a natural, undeveloped condition.

6) Stormwater management:

It is recommended that a stormwater management plan be prepared to identify the controls necessary to ensure that storm flows will not adversely impact downstream receiving waters for any development proposal. Each development proposal must demonstrate that it will not adversely affect downstream receiving waters.

7) Aesthetics:

It is recommended the site at the eastern end be screened from the noise generated from I-91 by retaining a wide buffer of existing tree cover. The 100 foot setback from the stream along the northern boundary will provide a buffer from development on the church property to the north.

B. UTILITIES:

1. Northern Section (north of the Wright Farm (Lot #s 14-0045-000 & 14-0066-000)):

- a. Water Service:** Either improve the existing water line or replace it to obtain the water pressures needed to support the urban uses projected for the area.

To determine whether the existing water line can provide the required pressures, it is recommended that a hydraulic modeling study be used to identify the flows which can be gained by cleaning and lining the old water line. If the results of this analysis indicate the necessary flows can not be obtained with cleaning and relining the existing line, then it is recommended that a new water line, as shown conceptually on Map 13, be extended from the VA Hospital Road down Kline Drive to provide adequate water service.

- b. Wastewater Service:** It is recommended that public wastewater service be extended to the Canaan Foundation (Valley Bible Church) (Lot # 14-0060-000) property at the end of Kline Drive as shown on Map 14.

2. Middle and Southern Sections (South from and including the Wright Farm (Lot #s 14-0045-000 & 14-0066-000)):

It is recommended that public utilities not be extended farther than the Wright Farm and that on-site water and wastewater services be used throughout this area.

3. General Recommendations on Utilities:

- a.** A professional engineer should be retained by the Town to do a preliminary design and cost estimate for the conceptual plans recommended in this report.
- b.** Utility lines should be sized to serve only the planned service area north of the Wright Farm (Lot #s 14-0045-000 and 14-0066-000) and not oversized to extend beyond that boundary.

- c. The Town and the property owners should meet to discuss further utility planning efforts and alternative methods of paying for the recommended improvements.
- d. The Town and the affected landowners should consider cooperatively forming a public private partnership to allocate costs for extending service.
- e. The Town should incorporate the cost of its portion of extending utility services to this area into the Town's Capital Improvement Program.

C. TRANSPORTATION:

- 1. Avoiding high-density commercial development, particularly retail, in the Route 5 South Study Area. Light-Industrial and office research development would likely produce higher paying jobs and better employment opportunities for the region's workforce.

Retail development generates the most vehicle trips of any proposed use in the Study Area. Therefore retail development would have the largest impact on the transportation network. The congestion analysis is testimony to this fact. Levels of Service in Scenario 2, where large-scale retail development dominates the KRIF property, are much lower than in Scenario 1 where a light-industrial office park is the chief land use. Furthermore, it may not be in the best interest of Hartford economically to invest in retail. Retail jobs generally pay much less than other sectors of the economy and typically a large proportion of the money spent at a large retail establishment does not stay in the community.

- 2. Access to Route 5 be restricted by minimizing new access points and removing unnecessary existing curb cuts when opportunities arise. This will protect the capacity of Route 5.
- 3. When Route 5 is scheduled for re-paving by VTrans, the Town should work with the Paving Management Department and UVLSRPC to have the shoulders widened or the road re-stripped to accommodate safe bicycle and pedestrian traffic. This will also enhance the Level of Service (LOS) along Route 5 by allowing thru-moving vehicles room to pass left turning

traffic.

4. The Town, the Regional Planning Commission and VTrans should cooperatively conduct a comprehensive travel demand study in order to evaluate the traffic impacts of the Route 5 South and Sykes Mountain Avenue development possibilities. The focus of this study would be to assess the impacts of any proposed zoning changes and new developments on Hartford's larger transportation network. The Sykes Mountain Avenue/Route 5 intersection and the interstate ramps are of particular concern.
5. All access points should be clearly delineated with curbing or by other appropriate means and to be aligned perpendicular when possible.
6. Scenic Byway funds, Transportation Enhancements and Bicycle and Pedestrian Grants should be explored to help enhance bicycle and pedestrian mobility in this corridor.
7. Flared approaches should be provided on Kline Drive, Melisi Drive and KRIF Drive with adequate storage space for right turning vehicles. This will greatly enhance the performance of these intersections, particularly the westbound approaches.
8. Traffic Impact Studies (TIS) should be required for each significant proposed development. Refer to the Vermont Agency of Transportation standards to determine what warrants a TIS.

Future traffic may warrant a southbound left-turn lane on Route 5 near the KRIF entrances. This is especially important if shoulder widths on Route 5 are not increased. The addition of turn lanes should be evaluated as development occurs.

9. The proposed KRIF Road should be connected to Melisi Road via the KRIF property. This will enhance traffic circulation in this area by allowing vehicles to travel in-between several lots without imposing friction on Route 5 traffic and to provide for secondary emergency vehicle access.
10. Sight distances and access points at Melisi Road should be improved to accommodate comparable volumes of traffic as the

current Kline Drive.

11. Sight distances should be improved at the Neal Road intersection with Route 5.
12. Clear approaches and sight distances should be maintained for all access points to Route 5. All plant material over 3 feet tall within the sight distance should be trimmed or removed. Signage should be outside of this sight area as well.
13. The Town of Hartford is considering the extension of sidewalks from the Sykes Avenue intersection underneath the Interstate to the VA Hospital. It is recommended to extend sidewalks down to the KRIF property at some point in the future.
14. Road, sidewalk and bicycle improvements should be incorporated in the Town's Capital Improvements Program.
15. The Regional Planning Commission and/or VTrans should conduct a speed study along Route 5 to ascertain the speed of traffic and its impact on vehicle and pedestrian safety. There is concern over high traffic speeds among residents.

D. ZONING:

Please refer to Map 15 which shows existing and proposed zoning for the Study Area.

1. Northern Section (north of the Wright Farm (Lot #s 14-0045-000 and 14-0066-000)):

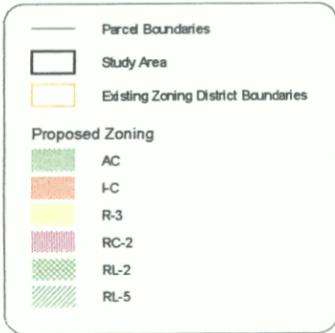
- a) The existing residential zoning districts north of the Wright Farm on the west side of Route 5 (Lot # 14-0045-000) should be retained.
- b) The existing Industrial-Commercial Zoning District north of the Wright Farm on the west side of Route 5 (Lot # 14-0066-000) should either:
 - 1) be retained;
 - 2) be rezoned to a new Light Industrial Zoning District . The existing Industrial-Commercial Zoning District permits such a broad range of uses and some very intensive industrial type uses. A Light Industrial Zoning District could be crafted which would permit the types of uses which would be a positive addition to the neighborhood.
 - 3) be overlain with a new overlay district for the Industrial-Commercial Zone which would address the same type of issues, such as use restrictions, covered by the suggested new Light Industrial Zoning District.

2. Middle Section (Between the Wright Farm (Lot #s 14-0045-000 and 14-0066-000) on the north and the Valley Land Corporation (Lot # 14-0077-000) and Town (Lot # 14-0109-000) (Former Maxfield) lands on the south):

It is recommended the I-C and R-3 zones in this section be rezoned to a newly created Agricultural Conservation zoning district with a minimum lot size of about 20 acres. Please refer to Map 15 which shows existing and proposed zoning for the Study Area.

Map 15

Route 5 South Study Proposed Zoning Districts



Data Sources:

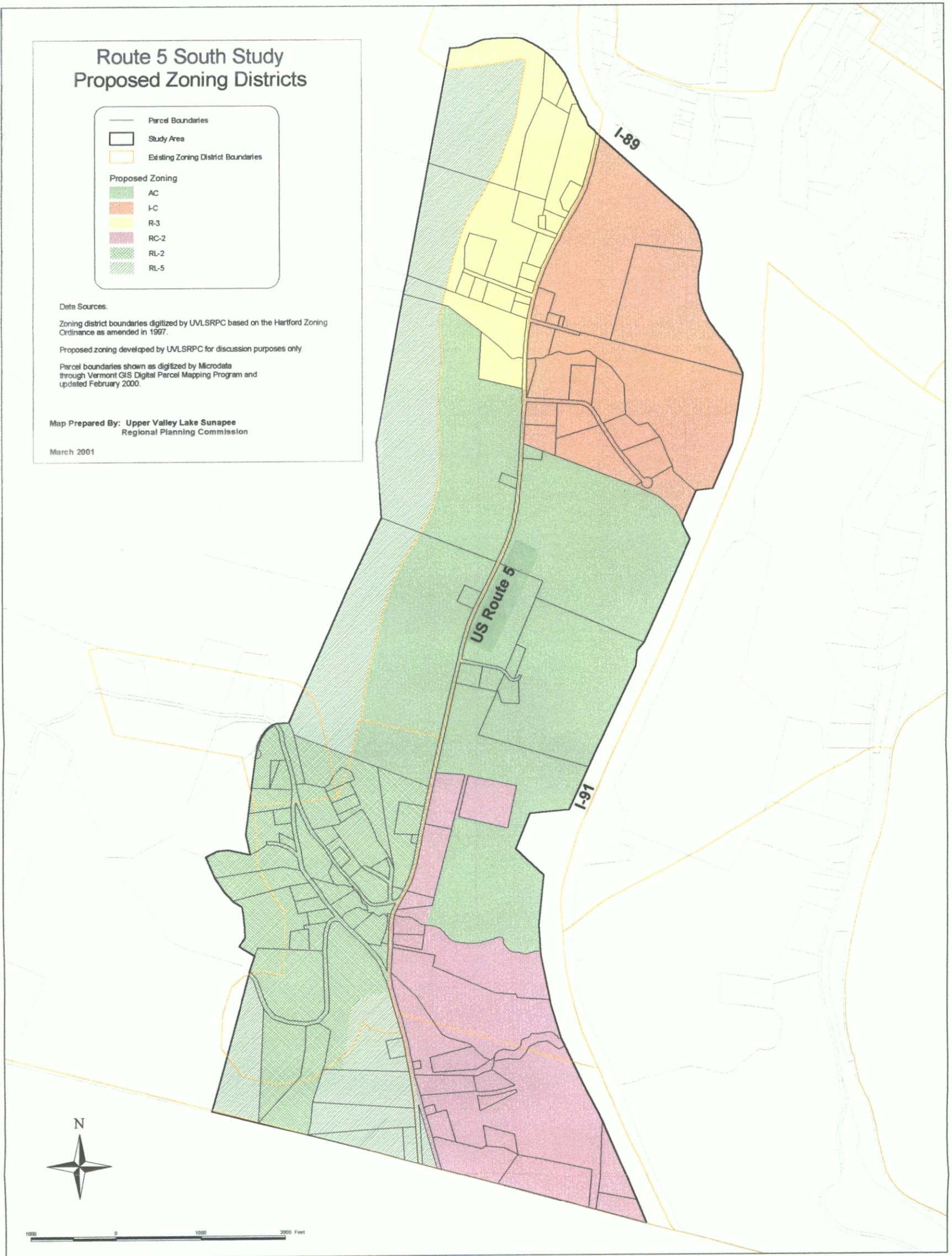
Zoning district boundaries digitized by UVLSRPC based on the Hartford Zoning Ordinance as amended in 1997.

Proposed zoning developed by UVLSRPC for discussion purposes only

Parcel boundaries shown as digitized by Microdata through Vermont GIS Digital Parcel Mapping Program and updated February 2000.

Map Prepared By: Upper Valley Lake Sunapee
Regional Planning Commission

March 2001



The Agricultural Resource Map, Map 16 to follow identifies there is significant overlap in this section of the corridor between agricultural use and the lands with prime agricultural soils. Preservation of the farms in this stretch of the corridor would also be achieving the goals of preserving scenic views along a designated scenic byway and preserving the rural character supported by the public.

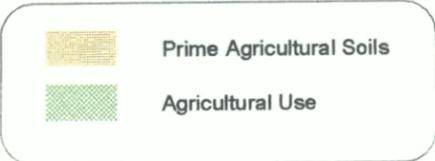
The Agricultural Conservation zone recommendation is meant to complement efforts to preserve the resources through agricultural easements.

3. Southern Section (South of Valley Land Corporation (Lot # 14-0077-000) and Town (Lot # 14-0109-000) (Former Maxfield) lands):

- a. As reflected on Map 15, it is recommended the RC-2 zone be extended north to include all of four lots which comprise the Town Recycling Center property (Lot #s 14-0103-000, 14-0104-000, 14-0105-000, & 14-0106-000) and the other properties fronting Route 5 (14-107, 14-108, & 14-94) north to the Windsor County Sheriff's property (Lot # 14-0095-000). This would be consistent with current and anticipated uses for these properties.
- b. For the residential area around Neal, Rustic and Orrizonto Roads:
 - 1) Rezone most of this area to a new Rural Lands Two (RL-2) zone which would permit a two (2) acre minimum lot size. Applying the soils-based lot size system to this area suggests two (2) acre minimum lot sizes on average are appropriate for the area. Feedback has been provided by the Hartford Public Works Department that there are failed septic systems in the area. Most of the area and road frontage is currently zoned RL-1 which permits a minimum lot size of one (1) acre. Most of the area has already been subdivided with several one acre size lots.
 - 2) It is recommended the RL-5 zone be retained for those small portions on the southern end, as shown on Map 15, where the very steep terrain warrants the larger minimum lot size.

Map 16

Route 5 South Study Agricultural Resource

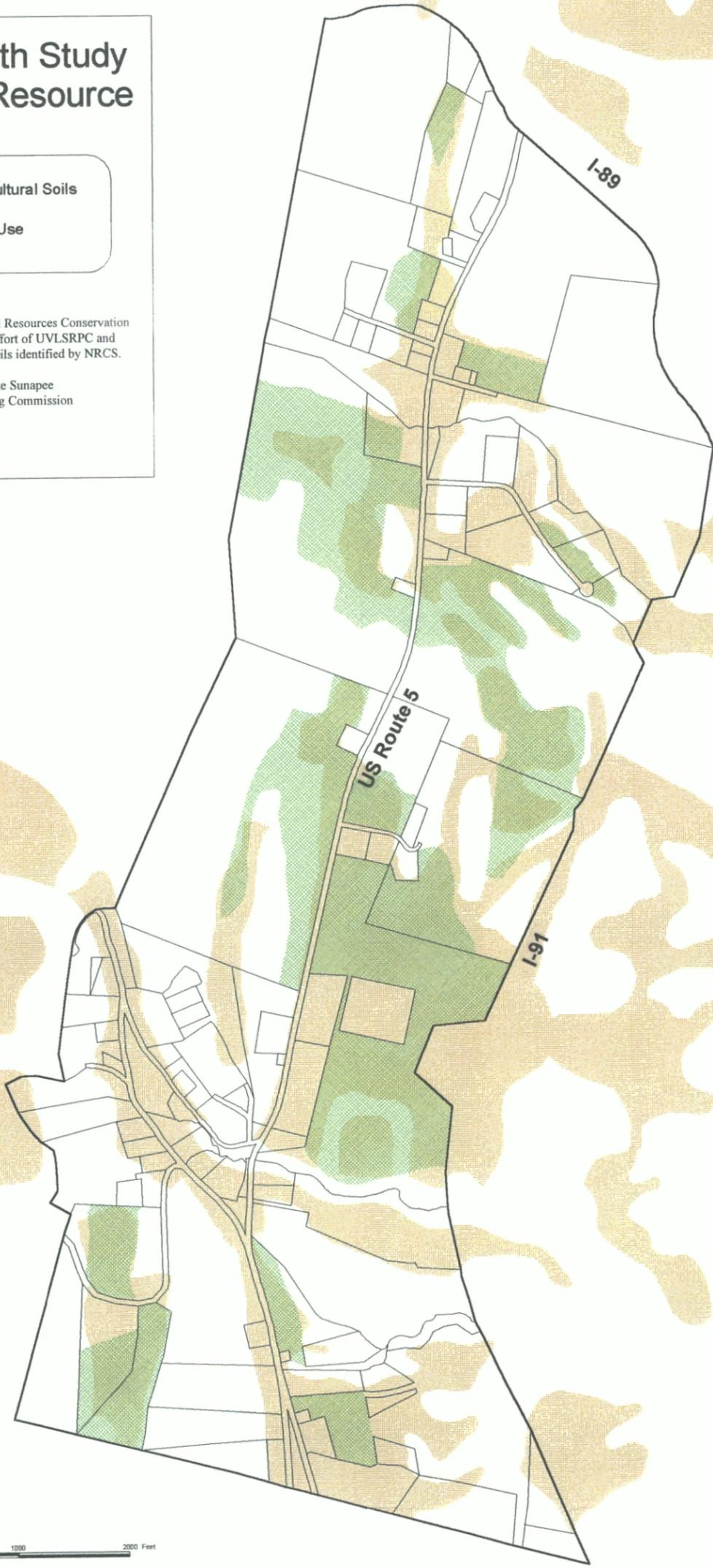


Data Sources:

Soil types mapped by USDA Natural Resources Conservation Service; digitized as a cooperative effort of UVLSRPC and USDA-NRCS. Prime agricultural soils identified by NRCS.

Map Prepared By: Upper Valley Lake Sunapee
Regional Planning Commission

February 2001



- 3) It is recommended that the zone line be extended to align with property boundaries, to the extent feasible as shown on the proposed zoning Map 15.

4. General Zoning Recommendations:

- a. Residential PUDs should be used for residential developments in this area to:
 - * preserve agricultural resources including lands being used for farming and lands with prime agricultural soils;
 - * maintain 100 ft. wide natural buffer of vegetation from wetlands and streams; and
 - * ensure the provision of visual and noise buffers from adjoining uses and highways (I-91 and Route 5)
- b. The Hartford Zoning Ordinance should be clarified that it permits residential PUD developments in the Industrial-Commercial Zone.

XI. APPENDIXES

APPENDIX A: Soil-Based Minimum Lot Size

Vermont Soil Type Symbol ①	Vermont Soil Type Name ①	New Hampshire Soil Type Symbol ② ③	New Hampshire Soil Type Name ② ③	Soil Based Minimum Lot Size (sq.ft...) ③
1C	Hitchcock	130	Hitchcock	56,000
1D	Hitchcock	130	Hitchcock	68,000
1E	Hitchcock	130	Hitchcock	86,000
2A	Belgrade	532	Belgrade	44,500
3	Pits, Quarries	299 ④	Udorthents, smoothed	50,000
4A	Raynham	533	Raynham	68,000
5B	Windsor	26	Windsor	35,500
5E	Windsor	26	Windsor	68,000
9A	Ninigret	513	Ninigret	44,500
9B	Ninigret	513	Ninigret	44,500
14B	Hinckley	12	Hinckley	35,500
14C	Hinckley	12	Hinckley	42,000
14D	Hinckley	12	Hinckley	51,500
15C	Dummerston	366 ④	Dutchess	56,000
15D	Dummerston	366 ④	Dutchess	68,000
16D	Dummerston	366 ④	Dutchess	68,000
19C	Vershire-Dummerston complex	370 ④	Tunbridge-Bershire complex	76,000
19D	Vershire-Dummerston complex	370 ④	Tunbridge-Bershire complex	86,000
19E	Vershire-Dummerston complex	370 ④	Tunbridge-Bershire complex	100,000
20C	Glover-Vershire complex	360 ④	Cardigan-Kearsarge complex	56,000
20D	Glover-Vershire complex	360 ④	Cardigan-Kearsarge complex	68,000

20E	Glover-Vershire complex	360 ④	Cardigan-Kearsarge complex	86,000
25B	Buckland	334 ④	Pittstown	68,000
25C	Buckland	334 ④	Pittstown	76,000
25D	Buckland	334 ④	Pittstown	86,000
26C	Buckland	336 ④	Pittstown-very stony	76,000
26E	Buckland	336 ④	Pittstown-very stony	100,000
28	Udorthents and Udipsammets	299 ④	Udorthents, smoothed	0
29A	Grange	433	Grange	68,000
30B	Caboti	646 ④	Pillsbury	68,000
30C	Caboti	646 ④	Pillsbury	76,000
32B	Urban Land-Windsor-Agawam	598 ④	Windsor-Urban Land complex	40,000
33	Rumney	105	Rumney	68,000
45B	Hinesburg	38	Eldridge	68,000
47	Markey muck	97 ④	Greenwood & Ossipee soils ponded	0
49C	Vershire -Buckland complex	334 ④	Pittstown	66,000

① Source: Interim Soil Survey Report for Windsor County Vermont, USDA Natural Resource Conservation Service, August - 1993.

② Determination of comparable soil types in Vermont and New Hampshire done by Tom Villers, USDA, Natural Resource Conservation Service.

③ Source: Model Subdivision Regulations for Soil-Based Lot Size - Report of the Ad Hoc Committee for Soil-Based Lot Size, Volume II, June - 1991.

④ Based on ratings for similar soils as determined by Tom Villers, USDA, Natural Resource Conservation Service.

APPENDIX B: Future Land Use Scenarios by Parcel

Future Land Use Scenario 1: Future Land Use Type by Parcel

Parcel #	Land Use Type	Land or Building Area or # D.U.
14-7-1	SFR	1
14-38	SFR	3
14-24-2	SFR	13
14-46	SFR	5
14-47	SFR	2
14-91	SFR	2
13-69	SFR	1
13-73	SFR	1
13-75	SFR	1
13-84	SFR	1
15-2	SFR	5
15-1	SFR	6
16-1	SFR	10
16-8	SFR	3
14-95	Office	50,000
14-77	SFR	4
14-78	SFR	1
14-82	SFR	2
14-60	MFR/Condo Town House	15
14-39	Industrial Park	20ac
	Office Park	11ac
14-61	MFR/Condo Town House	15
14-57	Warehouse	2.4ac
14-67	Contractor's Shop	0.2ac
14-58	Warehouse	1.3ac
14-68	Construction Yard	1.8ac
14-69	Contractor's Shop	0.8ac

FUTURE LAND USE SCENARIO 2: Future Land Use Type by Parcel

Parcel #	Land Use Type	Land or Building Area or # D.U.
14-7-1	SFR	1
14-38	SFR	3
14-27-2	SFR	13
14-46	SFR	5
14-47	SFR	2
14-91	SFR	2
13-69	SFR	1
13-73	SFR	1
13-75	SFR	1
13-84	SFR	1
15-2	SFR	5
15-1	SFR	6
16-1	SFR	10
16-8	SFR	3
14-95	Office	50,000
14-77	MFR-Condo/townhouse	28 D.U.
14-78	SFR	4 D.U.
14-82	MFR-Condo/townhouse	9 D.U.
14-109	Rec Park Use	64ac
14-39	Retail Shopping Center	164,000 sq. ft. Bldg
	Restaurant Sit-Down	5,000 sq. ft.. Bldg
14-61	Office Park	7ac
14-60	Church	40,000
14-57	Warehouse	2.4ac
14-67		
14-68		
	Office Park	5.1ac
14-69		
14-58		
14-45	MFR-Condo/townhouse	28 D.U.
14-66	MFR-Condo/townhouse	19 D.U.

APPENDIX C: Water Use Estimates for Land Use Scenarios

WATER USE ESTIMATES FOR FUTURE LAND USE SCENARIO #1

Wastewater Service Area	Land Use Type	Units	Water Use Rate	Estimated Water Use (gallons)
WSA A				
	<u>Existing Development:</u>			
	SFR 1	17 DU 2	300 g.p.d./DU 3	5,100
	Church	1	1000 g.p.d.	1,000
	Commercial Service	1.25ac	750 g.p.d./ac	<u>1,000</u>
			Sub-Total	7,100
	<u>Future Development:</u>			
	SFR	17 DU	300 g.p.d./DU 4	5,100
	Condo/Twnhse	15 DU	300 g.p.d./DU 5	4,500
	Indust Park	20 ac	750 g.p.d./ac	15,000
	Office Park	11 ac	750 g.p.d./ac	<u>8,250</u>
			Sub-Total	32,850
			WSA A TOTAL	39,950
WSA B				
	<u>Existing Development:</u>			
	SFR	7 DU	300 g.p.d./DU	2,100
	Light Industrial	19.8 ac	750 g.p.d./ac	<u>14,850</u>
			Sub-Total	16,950
	<u>Future Development:</u>			
	SFR	9DU	300 g.p.d./DU	2,700
	Condo/Twnhse	15DU	300 g.p.d./DU	4,500
	Light Industrial	6.5 ac	750 g.p.d./ac	<u>4,875</u>
			Sub-Total	12,075
			WSA B TOTAL	29,025
WSA C				
	<u>Existing Development:</u>			

	SFR	40 DU	300 g.p.d./DU	12,000
	Commercial Industrial	13.4 ac	750 g.p.d./ac	<u>10,050</u>
			Sub-Total	22,050
	<u>Future Development:</u>			
	SFR - 21	21 DU	300 g.p.d./DU	6,300
	Office - 50,000 sq. ft.	2.5 ac	750 g.p.d./ac	<u>1,875</u>
			Sub-Total	8,175
			WSA C TOTAL	30,225
WSA D				
	<u>Existing Development:</u>			
	SFR	20 DU	300 g.p.d./DU	6,000
	Mobile Homes	36 DU	300 g.p.d./DU	10,800
	Landfill Office	1	1,000	<u>1,000</u>
			Sub-Total	17,800
	<u>Future Development:</u>			
	SFR	13 DU	300 g.p.d./DU	3,900
			Sub-Total	3,900
			WSA D TOTAL	21,700

TOTAL SERVICE AREA

Existing Development	63,900
Future Development	<u>57,000</u>
	120,900

-
- 1 SFR = Single Family Residential
 - 2 DU = Dwelling Units
 - 3 G.p.d. = gallons per day
 - 4 Dufresne - Henry, Inc. Report: Route 5 South/I-91 Rest Areas Project: Water use at 750 g.p.d./ac for I-C based on a weighted average of three model areas (VA commercial zone, Olcott Park and Sykes Avenue).
 - 5 Dufresne - Henry, Inc. Report: Route 5 South/I-9 Rest Areas Project.

Water Use Estimates for Future Land Use Scenario #2

Wastewater Service Area	Land Use Type	Units	Water Use Rate	Estimated Water Use (gallons)
WSA A:				
	<u>Existing Development:</u>			
	SFR 1	17 DU 2	300 g.p.d./DU	5,100
	Church	1	1000 g.p.d. 3	1,000
	Commercial Service	1.25 ac	750 g.p.d./ac	<u>1,000</u>
			Sub-Total	7,100
	<u>Future Development:</u>			
	SFR	17 DU	300 g.p.d./DU 4	5,100
	Retail Shopping Center and Restaurant	31ac	750 g.p.d./ac 5	23,250
	Office Park	7ac	750 g.p.d./ac	<u>5,250</u>
			Sub-Total	33,600
			WSA A TOTAL	40,700
WSA B				
	<u>Existing Development:</u>			
	SFR	7 DU	300 g.p.d./DU	2,100
	Light Industrial	19.8 ac	750 g.p.d./ac	<u>14,850</u>
			Sub-Total	16,950
	<u>Future Development:</u>			
	SFR	7 DU	300 g.p.d./DU	2,100
	Condo/Twnhse	56 DU	300 g.p.d./DU	16,800
	Church	1	1,000 g.p.d.	1,000
	Warehouse	2.4 ac	750 g.p.d./ac	1,800
	Office Park	5.1 ac	750 g.p.d./ac	<u>3,825</u>
			Sub-Total	25,525
			WSA B TOTAL	42,475

WSA C				
	<u>Existing Development:</u>			
	SFR	40 DU	300 g.p.d./DU	12,000
	Commercial/Industrial	13.4 ac	750 g.p.d./ac	10,050
			Sub-Total	22,050
	<u>Future Development:</u>			
	Rec Park Use	64 ac	1,000 g.p.d.	1,000
	SFR	21 DU	300 g.p.d./DU	6,300
	Condo/Twnhse	28 DU	300 g.p.d./DU	8,400
	Office	2.5ac	750 g.p.d./ac	<u>1,875</u>
			Sub-Total	17,575
			WSA C TOTAL	39,625
WSA D				
	<u>Existing Development:</u>			
	SFR	20	300 g.p.d./DU	6,000
	Mobile Homes	36	300 g.p.d./DU	10,800
	Landfill Office	1	1,000	<u>1,000</u>
			Sub-Total	17,800
	<u>Future Development:</u>			
	SFR	13	300 g.p.d./DU	3,900
			Sub-Total	3,900
			WSA D TOTAL	21,700

TOTAL SERVICE AREA

Existing Development	63,900
Future Development	<u>80,600</u>
	144,500

-
- 1 SFR = Single Family Residential
 - 2 DU = Dwelling Units
 - 3 g.p.d. = Gallons per day
 - 4 Dufresne - Henry, Inc. Report: Route 5 South/I-91 Rest Areas Project.
 - 5 Dufresne - Henry, Inc. Report: Route 5 South/I-91 Rest Areas Project: Water use at 750 g.p.d./ac for I-C Uses based on a weighted average of three model areas (VA commercial zone, Olcott Park and Sykes Avenue).

APPENDIX D: Detailed Public Comments from the January 11, 2001 Meeting

The detailed public comments received at the January 11, 2001 public meeting included:

- * Enjoy driving down road.
- * Like to see it remain the way it is.
- * Important to save this piece of Vermont.
- * Need to address issue of taxes to save area.
- * Conserving land is great, but is concerned about traffic from new landfill and access from Twin State Gravel.
- * Route 5 is not safe for cyclists. Road should be widened. Would like to see shoulder widened for cyclists.
- * Concerned with the lack of quality of commercial development in the area.
- * Recommends putting more teeth into zoning.
- * Need to ensure protection of residential properties from commercial development.
- * Clean up mess along Route 5.
- * Pond on Route 5 near I-89 should never have been built.
- * Alan's Vending building is much better than the proposed auto body shop.
- * Likes wetland along Route 5 near I-89.
- * Traffic problem already exists on Route 5 during peak commuting times.
- * Not happy about new road to landfill and the traffic that it will generate.
- * Recommends rezoning area to agricultural, leave area as it is.
- * Opposed to developers who develop large tracts of land. Small developments and family subdivisions are okay.
- * Does anyone enjoy driving to West Lebanon? It is really bad on holidays and Fridays. Do you want Route 5 to become like 12A?
- * There is no alternative to Route 5. Where do we go if traffic increases?
- * When I-91 was closed, Route 5 was extremely busy. We don't want to see traffic like West

Lebanon.

- * No longer walks along Route 5. It is not safe anymore.
- * Neal Road/Route 5 intersection is very dangerous. It is a death trap. There is poor sight distance and many accidents have occurred there.
- * Have major landowners/farmers been consulted? Do they have an interest in keeping land in agriculture?
- * Will sewer be extended to the area?
- * Water pressure has been decreasing every year.
- * Concerned about truck traffic from landfill and gravel pit. With new access onto Route 5 from South Main Street, Route 5 needs to be improved and the speed limit reduced.
- * 50-mph speed limit is too high.
- * State denied funding for water/sewer extensions. Is this meeting related to that?
- * Hartford is 10th most populous community in Vermont and has highest mileage of roads. Would like to see this area of Town protected.
- * Route 5 dangerous to bicycle.
- * Growth is inevitable. We need to shape it to maintain our lifestyle. Town has limited land appropriate for development. Route 5 South was designated as a growth area just as Route 5 North. Sewer was extended to Route 5 North and development occurred. Where are we going to see growth in Hartford since Route 5 South is not appropriate for development? It should be concentrated. New commercial/industrial parks can be done nicely. The town needs to extend water and sewer to some areas for development and preserve other areas.
- * Avoid strip development, but we need growth to keep taxes down. If no growth here on Route 5, where will it go?
- * Look at area sensibly.
- * Can't always be service economy.
- * The area will not always have low unemployment.
- * Billings Office Park would be great compared to what development we have now on Route 5 south.
- * Creative things can be done. We have to think beyond the box.
- * It took 10-15 years to clean up lighting at Olcott Park.

- * We should not extend water and sewer down Route 5.
- * Keep some agriculture land preserved. In the future, it will come in handy.
- * We can maintain greenbelt, while still having quality development and balanced growth.
- * If we don't have reasonable changes to past development practices (Sykes Mountain Avenue) we will see more destruction of the landscape.
- * Hazen Farm preserved amongst commercial development. Good example of compatibility. It can be done.
- * On the large parcel by I-89, what are you going to build?
- * Town has violated state law many times. My family has been here for many generations. The Town opened Orrizonto Road for development. It is now hard to get to class 4 road for recreation. Why wasn't there any notification of residents? Town is paving the way for development without the approval of the townspeople.
- * Would you support agriculture zoning for industrial-commercial lands south of Kline? (Yes 24) How about urban development? (0). Would you support residential use south of Kline, low densities/steep slopes? (1).
- * What do you think about future uses for RC-2 lands? Should tourist uses be encouraged? Could be used for recreation / schools in years to come.
- * Maxfield property is wet. Is a golf course still being planned?
- * What about control of traffic on Route 5?
- * Is pleased to see such a great turnout. You need to keep involved in the public decisions regarding the future of the area..
- * Olcott and Billings were developed as planned developments with many restrictions. The Planned Development process can work well.
- * Don't wait until buildings go up. Take steps now. True. Few people attended the hearing on landfill / Twin State road.
- * If you do not develop on Route 5 south in Hartford, it may result in more development in Hartland and more traffic in Hartford.
- * Growth is inevitable. Just make sure that development is done the right way.
- * We have to preserve some areas, but take a common sense approach.
- * We need to address issues before you take on more growth.

- * We can't isolate ourselves from development. We need growth to keep taxes down. Don't become a bedroom community.
- * We need balance. Commercial development pays its way. Agricultural land pays its way, but residential land tends not to pay their way due to the high cost of services including education. We need to take the long view to create quality development.
- * This looked like the area for commercial development, but downtown commercial development may be more cost effective.
- * We need to look at the big picture. The selectboard should take the lead on attracting development downtown. This area is just a small part of the issue.
- * Since the tax benefits of Vermont are actually better than New Hampshire, we are likely to see more development pressure on our side of the river. We are not prepared for it. We need better planning. Let's open our eyes to what is ahead of us.
- * We should select certain types of industry and go after them.
- * We need to come up with money to keep agricultural land in agricultural use.
- * We need more planning.
- * Will our comments make a difference?
- * I want to remind you that with Act 60, lots of commercial development will likely increase our taxes. We may become a gold town if we are not careful.

APPENDIX E: Route 5 South Brainstorming Session - October 13, 2000

Present at the meeting: Jim Saudade, GMEDC; Lori Hirshfield & Matt Osborn Hartford Planning and Development; Tad Nunez, Hartford Recreation Department; and Peter Dzewaltowski & Ken McWilliams, UVLSRPC;

ASSETS OF THE Study Area:

- Close proximity to major transportation routes including I-89 and I-91
- Route 5 is able to accommodate high levels of traffic
- Close to WRJ and still in a rural setting
- Sixty-seven to seventy-three acres open (recreation property) for development
- Within 18,000 feet of major communications portal (the “switch”)
- Proximate to emergency services i.e. police and fire, which would likely lower insurance premiums
- The Study Area is one of a few left which is suitable for development in the Upper Valley
- Farmland and other scenic attributes within the Study Area
- Land formations, particularly topography, create natural separations between land areas
- Rest area on I-91 provides view of Study Area and may offer a means for advertising
- Rt. 5 is a Scenic Byway
- Much of the Study Area’s land is flat leading itself to easy bicycle and pedestrian travel
- Industry mix in the Upper Valley provides many opportunities for new industry and business
- Airports, hotels, state offices and the court house
- Central location
- Close to the landfill
- Proximity to railroads
- Relatively easy to extend water infrastructure
- Perception of the Upper Valley

LIMITATIONS & LIABILITIES OF THE Study Area:

- Slope, wetlands and soils
- Cost to extend water and sewer
- Permit issues for sewer extension i.e. Stowe decision
- Private landowners interests vs. Public interests
- Difficult to change zoning
- Insufficient quantity of housing in the area
- High pressure on land for development (Kline Dr.)
- Ledger property far away from Rt. 5
- Access issues
- Traffic volumes too low along Rt. 5 for successful retail development
- Signage limitations—no exposure from interstate limits commercial development
- The need to pump sewer back to WRJ cost more
- Small parcels limit the size of developments
- Cost of on-site septic systems is high due to soil suitability
- Existing labor force skills are ill suited to demand
- Unemployment is virtually nonexistent
- Environmental assets limit development

LAND USES APPROPRIATE FOR THE AREA WITHOUT WATER & SEWER:

- Warehousing/Distribution centers
- Motor vehicle repair
- Commercial services
- Most any use which does not require a high number of employees
- Utility services
- Small offices i.e. law firms and real estate
- Manufacturing which is non-water and employee intensive
- Recreation and open space
- Communication services
- Residential—large single family lots
- Small multi-family housing developments
- Auto dealership
- Junkyard

LAND USES APPROPRIATE FOR THE AREA WITH WATER & SEWER:

- Everything mentioned above
- Office parks for high tech and knowledge base industries
- Light industry
- Specialty foods
- Eating and drinking establishments
- High density housing
- Retail
- Mini-malls
- Biotech industries
- Assisted living facilities
- Schools, and other municipal and state buildings
- Banking, insurance and financial establishments
- Supermarket

OTHER THOUGHTS:

- Must keep in mind other business and industries outside of the Study Area and the possibility of their relocation or closing i.e. VA Hospital
- What is the cost of grading an 8 percent slope to a suitable site for industry or business? When is it cost effective and how will this impact the area's plan for development? In order to better gauge cost effectiveness, assessed values of each parcel will be gathered
- Assets and limitations are in conflict. For instance, the Study Area is close to a major communications portal, however, many industries which seek like infrastructure require larger lots than are available

APPENDIX F: Ancillary Septic System Ratings Classes ⁵

The seven interpretive separations, or classes, are defined below.

Class 1 Conventional/Soil Replacement. This class is composed of coarse textured, sandy and gravelly glacial outwash map units. Normally, conventional septic systems can be installed on these sites (see sec. 1-708, Env. Prot. Rules, 1996). Backfilling with finer textured material in the area of the absorption field is often required to slow the percolation rate enough to allow for thorough filtering of effluent (see sec. 1-714,F., Env. Prot. Rules, 1996). This process is commonly referred to as “soil replacement.”

Class 2 Conventional. This class is composed of well drained glacial till or lacustrine map units with a loamy, friable substratum. Normally, conventional septic systems can be installed on these sites (see sec. 1-708, Env. Prot. Rules, 1996).

Class 3 Mound. This class is composed of soils that are limited by depth to seasonal high water table, depth to bedrock, or permeability of the substratum. These sites typically require mound systems (see sec. 1-714, E., Env. Prot. Rules, 1996). An at-grade system may be used on sites with a maximum slope of 12% if other site requirements are met (see sec. 1-714, G., Env. Prot. Rules, 1996).

Class 4 Test, Mound, Curtain Drain. This class is composed of map units that usually require on-site monitoring in order to establish their suitability for septic system absorption fields. A significant percentage of these map units are typically found unsuitable for septic tank absorption fields due to the depth of the high water table. Once a site is determined to be acceptable, mound systems are normally specified (see sec. 1-714, E., Env. Prot. Rules, 1996). Under certain conditions, curtain drains may be used to lower the water table to a depth suitable to meet State requirements (see sec 1-714, C., Env. Prot. Rules, 1996).

Class 5 Marginally Suitable. This class is composed of map units that are generally unsuitable for septic tank absorption fields because of depth to bedrock or slope. In general, areas of these map units may be suitable for a mound system where the depth to bedrock ranges from 2 to 6 feet and the slope is less than 20 percent. They may e suitable for a conventional system where the depth to bedrock is greater than 6 feet and the slope is less than 20 percent.

Class 6 Not Suited. This class is composed of map units that are generally too rocky, too shallow, too wet, too steep, subject to flooding or otherwise unsuitable for use as septic tank absorption fields.

Class 7 Not Rated. Some map units have not been rated. These map units have little or no identifiable soil material. These areas include gravel and sand pits, urban land, quarries, and other areas where the native soil material has been excavated, regraded, filled, or covered over by urban structures. Onsite investigations are needed to determine the suitability of these map units for septic systems.

⁵ Ancillary Soil Interpretation Ratings for On-Site Sewage Disposal in Vermont, USDA - Natural Resource Conservation Service; January, 1997.

APPENDIX G: Estimated Cost to Extend Water Service Above the Existing Water Service Elevation of 610 Feet

2MG	1	Gallons	Elevated Water Storage Tank	\$1	2	\$2,000,000
1	1	Ea.	500gpm Water Booster Pump Station	\$500,000		\$500,000
						<hr/>
						\$2,500,000
			Contingencies (10%)			250,000
			Engineering - Design & Construction (15%)			375,000
			Legal & Administration (5%)			<u>125,000</u>
						<u>\$3,250,000</u>

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- 1 Dufresne - Henry, Inc. Report: Route 5 South/I-91 Rest Areas Project.
 - 2 Hartford Public Works Department; February, 2001.

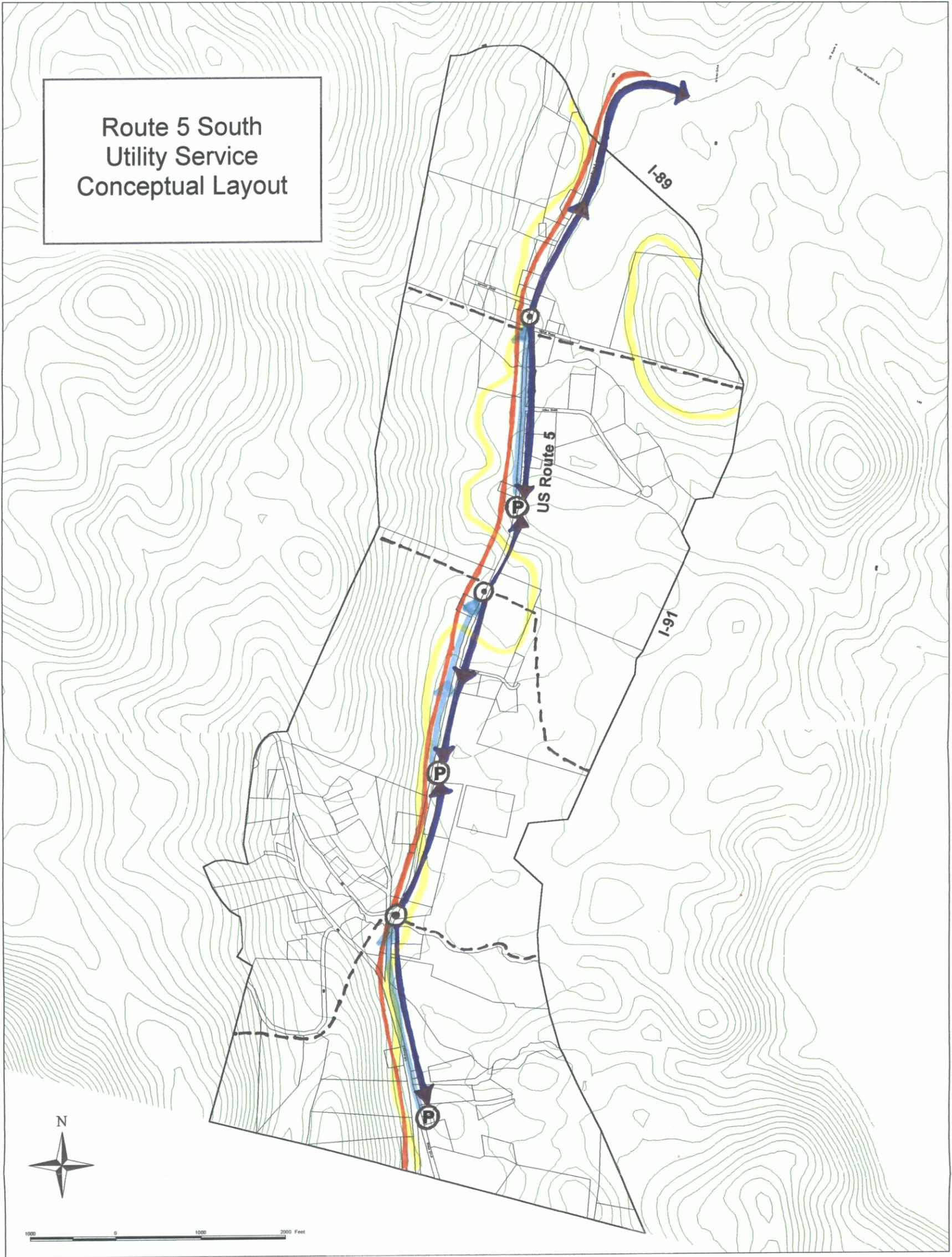
APPENDIX H: Cost Estimate to Extend Utility Services to the entire Route 5 South Corridor

Wastewater Service Area	Quantity	Unit	Description	Unit Price	Estimated Cost
WSA A					
	4,100	L.F.	12" Gravity Sewer	\$156/L.F.	639,600
	3,500	L.F.	12" Water	\$124/L.F.	434,000
WSA B					
	3,300	L.F.	8" Gravity Sewer	\$124/L.F.	409,200
	1	each	Pump Station	\$125,000	125,000
	2,100	L.F.	6" Force Main	\$100/L.F.	210,000
	3,300	L.F.	12" Water	\$124/L.F.	409,200
WSA C					
	3,800	L.F.	8" Gravity Sewer	\$124/L.F.	471,200
	2,200	L.F.	6" Force Main	\$100/L.F.	220,000
	1	each	Pump Station	\$125,000	125,000
	3,800	L.F.	12" Water	\$124/L.F.	471,200
	1	each	2HG Water Storage Tank	\$1/gal.	2,000,000
	1	each	500 gpm Water Booster Pump Station	500,000	500,000
WSA D					
	2,500	L.F.	8" Gravity Sewer	\$124/L.F.	310,000
	2,500	L.F.	4" Force Main	90/L.F.	225,000
	1	each	Pump Station	100,000	100,000
	2,500	L.F.	12" Water	\$124/L.F.	<u>310,000</u>
				Sub-Total	6,959,400
				Contingencies (10%)	695,940
				Engineering-Design & Construction (15%)	1,043,910
				Legal & Admin (5%)	<u>347,970</u>
				TOTAL ESTIMATED COST	\$9,047,220

Based on design for a Water Use Estimate of 150,000 gallons per day

Map 17

Route 5 South
Utility Service
Conceptual Layout



Legend	
	Water Line—New
	Wastewater Service Area
	Water Service Elevation 610 Feet
	Gravity Sewer—New
	Force Main—New
	Pump Station—New
	Gravity Sewer/Force Main Connection

APPENDIX I: Detailed Public Comments from the March 15, 2001 Meeting

The detailed public comments received at the March 15, 2001 public meeting included:

- * Concerned about the amount of traffic.
- * Concerned about the speed of traffic.
- * Concerned about the safety hazards of increased traffic.
- * Concerned about the impact of traffic from Twin State Sand and Gravel and the Upper Valley Solid Waste Facility.
- * Likes the 1st scenario incorporating residential on both sides of Route 5 S.
- * Does not see how you can allow development with wetlands, steep slopes and the impact development will have on groundwater and surface waters.
- * Has experience with the Vermont Agency of Transportation and sees problems with Route 5 being narrow with many curves. It is not a safe road. This will restrict development due to the inability to widen the road, regardless of which scenario takes place.
- * Does not have an opinion of either scenario. Believes that Act 250 will restrict commercial and multi-family residential development.
- * Retail development is not likely. Believes that we need to attract development downtown rather than expand commercial development elsewhere.
- * Concerned about development and the impact on farming operations.
- * Downtown has the infrastructure. Concerned about sprawl. Believes that Scenario 1 will better protect the rural character of the area.
- * Has lived in town for almost 50 years. Would hate to see Route 5 S. area changed. Likes scenario 1. Don't develop south of Kline Drive.
- * Route 5 S. is a scenic byway and a popular cycling route. It should be protected.
- * Is it cost effective to extend water and sewer south on Route 5 S.? Property owners should finance the cost of extending water and sewer, not the Town.
- * Has lived in town for 60 years. Traffic has increased a great deal already. Protect the scenic character of the area.
- * Protect the wildlife, from Kline Drive to the Hartland Town line, there are many deer, some moose, fox and turkeys to name a few.
- * The area is very special. It should be protected.
- * Additional development along Route 5 S. will impact the tax burden for the Town.
- * The continuation of development south on Route 5 will likely be strip commercial, will not likely be like the growth of New Hampshire, and it will hurt downtown.
- * Feels that it is clear that the public opposes development in the Route 5 S. area. Why come back with development alternatives?
- * Concerned about the increase in traffic that development will cause.

Parcel #	Land Use Type	Trip Gen Code #	Trip Generation Rate Standard	Land or Building Area or # D.U.	PM PK HR Trips	Pass-by	Directional Distribution				Scenario 1 Trips to Network		TOTAL QUAD TRIPS		
							Adjusted Trips	% entering	% exiting	Adj. # entering	Adj# exiting	Adj. # entering		Adj# exiting	
14-7-1	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
14-38	SFR	210	1/D.U.	3	3	0	3	0.64	0.36	2	1	11	6	17	
14-27-2	SFR	210	1/D.U.	13	13	0	13	0.64	0.36	8	5				
14-46	SFR	210	1/D.U.	5	5	0	5	0.64	0.36	3	2	4	3	7	
14-47	SFR	210	1/D.U.	2	2	0	2	0.64	0.36	1	1				
14-91	SFR	210	1/D.U.	2	2	0	2	0.64	0.36	1	1				
13-69	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
13-73	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
13-75	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
13-84	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
15-2	SFR	210	1/D.U.	5	5	0	5	0.64	0.36	3	2				
15-1	SFR	210	1/D.U.	6	6	0	6	0.64	0.36	4	2	36	75	111	
16-1	SFR	210	1/D.U.	10	10	0	10	0.64	0.36	6	4				
16-8	SFR	210	1/D.U.	3	3	0	3	0.64	0.36	2	1				
14-95	Office	710	1.49 /1000 # building	50,000	74	0	74	0.17	0.83	13	61				
14-77	SFR	210	1/D.U.	4	4	0	4	0.64	0.36	3	1				
14-78	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
14-82	SFR	210	1/D.U.	2	2	0	2	0.64	0.36	1	1				
14-60	MFR/Condo Town House	230	.54 trips/D.U.	15	8	0	8	0.65	0.35	5	3	10	6	16	
14-61	MFR/Condo Town House	230	.54/D.U.	15	8	0	8	0.65	0.35	5	3				
14-39	Industrial Park	130	8.6 trips/ac	20ac	132	0	132	0.21	0.79	28	104	74	368	442	
	Office Park	750	28.2 trips/ac	11ac	310	0	310	0.15	0.85	47	264				
14-57	Warehouse	150	8.77/ac	2.4ac	21	0	21	0.22	0.78	5	16				
14-67	Contractor's Shop	110	8.77/ac	0.2ac	1	0	1	0.3	0.7	0	1				
14-58	Warehouse	150	8.77/ac	1.3ac	11	0	11	0.22	0.78	2	9	14	41	55	
14-68	Construction Yard	110	8.77/ac	1.8ac	15	0	15	0.3	0.7	5	11				
14-69	Contractor's Shop	110	8.77/ac	0.8ac	7	0	7	0.3	0.7	2	5				
TOTAL						648					136	457	136	457	593

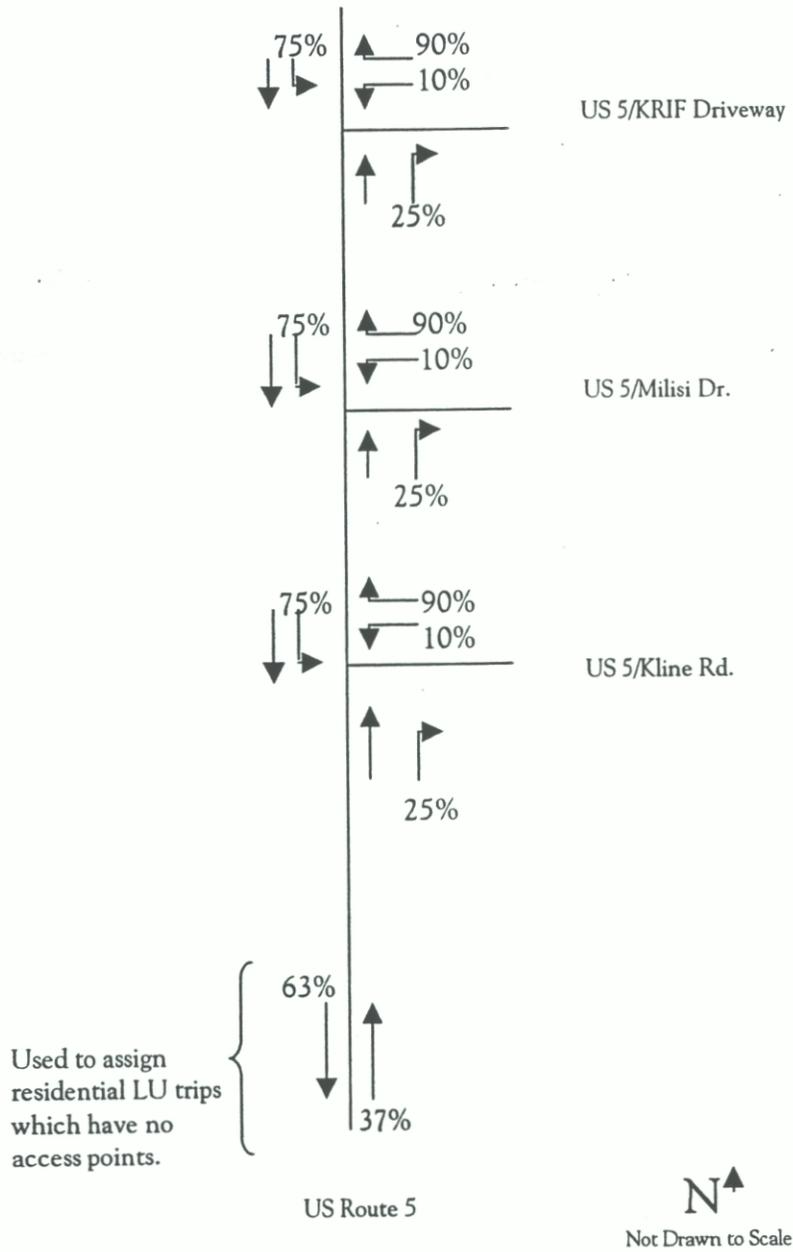
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Appendix J

Future Land Use Scenario 2
Appendix J

Parcel #	Land Use Type	Trip Gen. Code #	Trip Generation Rate Standard	Land or Building Area or # D.U.	PM PK HR Trips	Adjusted Through Pass-by %	Directional				Scenario 2 Trips to		TOTAL QUAD TRIPS		
							% entering	% exiting	# entering	# exiting	Adj. # entering	Adj# exiting			
14-7-1	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
14-38	SFR	210	1/D.U.	3	3	0	3	0.64	0.36	2	1	11	6	17	
14-27-2	SFR	210	1/D.U.	13	13	0	13	0.64	0.36	8	5				
14-46	SFR	210	1/D.U.	5	5	0	5	0.64	0.36	3	2	4	3	7	
14-47	SFR	210	1/D.U.	2	2	0	2	0.64	0.36	1	1				
14-91	SFR	210	1/D.U.	2	2	0	2	0.64	0.36	1	1				
13-69	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
13-73	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
13-75	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
13-84	SFR	210	1/D.U.	1	1	0	1	0.64	0.36	1	0				
15-2	SFR	210	1/D.U.	5	5	0	5	0.64	0.36	3	2				
15-1	SFR	210	1/D.U.	6	6	0	6	0.64	0.36	4	2	60	105	165	
16-1	SFR	210	1/D.U.	10	10	0	10	0.64	0.36	6	4				
16-8	SFR	210	1/D.U.	3	3	0	3	0.64	0.36	2	1				
14-95	Office	710	1.49 /1000 # building	50,000	74	0	74	0.17	0.83	13	61				
14-77	MFR-Condo/townhouse	230	.54/D.U.	28 D.U.	15	0	15	0.65	0.35	10	5				
14-78	SFR	210	1/D.U.	4 D.U.	4	0	4	0.64	0.36	3	1				
14-82	MFR-Condo/townhouse	230	.54/D.U.	9 D.U.	5	0	5	0.65	0.35	3	2				
14-109	Rec Park Use	412	.59/ac	64 ac	37	0.32	12	0.35	0.65	13	24				
14-39	Retail Shopping Center	820	3.74/1,000 sqft. Bldg	164,000 sqft. Bldg	613	0.6	368	0.48	0.52	294	319				
	Restaurant Sit-Down	832	19.38/1,000 sqft Bldg	5,000 sqft. Bldg	96	0.6	58	0.55	0.45	53	43	347	362	709	
14-61	Office Park	750	28.28/ac	7ac	197	0	197	0.15	0.85	30	167	63	190	253	
14-60	Church	560	.41/1,000 sqft. Building	40,000	56	0	56	0.59	0.41	33	23				
14-57	Warehouse	150	8.77/ac	2.4ac	21	0	21	0.22	0.78	5	16				
14-67							0			0	0				
14-68	Office Park	750	28.28/ac	5.1ac	144	0	144	0.15	0.85	22	122	26	139	165	
14-69							0			0	0				
14-58							0			0	0				
14-45	MFR-Condo/townhouse	230	.54/D.U.	28 D.U.	28	0	15	0.65	0.35	18	10	25	13	38	
14-66	MFR-Condo/townhouse	230	.54/D.U.	19 D.U.	10	0	10	0.65	0.35	7	4				
TOTAL					1,354		147								

APPENDIX K: Traffic Distribution



Melisi pass-by analysis

	KRIF	melisi
enter	347	243
exit	362	253

	#trips	pass-by v	non-pass-by
Route 5 & Kline Dr (2010 PM DHV)			
NB			
SB			
WB			
TH	0.48	104	62
LT	0.52	109	65
RT	709		44
%pass-by	0.6		

Non-pass-by pattern: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH	***	***	***
LT	***		0.75
RT	0.25	***	0.90

Non-pass-by volume adjustment: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH			
LT		31	4
RT	10		39

Pass-by pattern: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH	***	***	***
LT	***		0.63
RT	0.37	***	0.37

Pass-by volume adjustment: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH		-23	-39
LT			39
RT	23		24

Final Volumes: Route 5 & Kline Dr (2010 PM DHV)

	NB	SB	WB
TH	-23	-39	0
LT	0	71	46
RT	33	0	63

	KRIF	melisi
enter	347	243
exit	362	253
		104
		109

KRIF pass-by analysis

Route 5 & Kline Dr (2010 PM DHV)			#trips	pass-by	vo	non-pass-by
NB	SB	WB	Enter	0.48	243	146
			Exit	0.52	253	152
TH			Total	709		97
LT			%pass-by	0.6		101
RT						

Non-pass-by pattern: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH	***	***	***
LT	***		0.75
RT		0.25	0.90

Non-pass-by volume adjustment: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH			
LT			73
RT		24	91

Pass-by pattern: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH	***	***	***
LT	***		0.63
RT		0.37	0.37

Pass-by volume adjustment: Route 5 & Kline Dr (2001 PM DHV)

	NB	SB	WB
TH		-54	-92
LT			92
RT		54	56

Final Volumes: Route 5 & Kline Dr (2010 PM DHV)

	NB	SB	WB
TH		-54	-92
LT		0	165
RT		78	0