Chapter 4.0

Environmental Consequences and Mitigation

4.0 Environmental Consequences and Mitigation

This chapter presents the specific transportation and environmental impacts or effects of each of the alternatives under consideration. As described in Chapter 2, the EIS scoping process resulted in the identification of 18 action alternatives. In February 2003, in response to public input, an additional alternative (Alternative D.2) was identified and included for consideration in the EIS. The potential impacts of the 19 action alternatives are summarized by impact area in each subsection of this chapter. The information and data presented in this chapter provides the analytical basis for the comparison of alternatives presented in Chapter 5.

4.1 Transportation and Mobility

4.1.1 Introduction

This section presents potential impacts related to traffic and circulation and describes future travel conditions under the No-Action Alternative. To determine the traffic impacts of each of the action alternatives and the No-Action Alternative, seven quantitative performance measures were developed. These performance measures are discussed below and relate closely to the transportation objectives agreed upon by the Partners' Roundtable. Data related to these measures is a product of the Penns Neck Area EIS Travel Demand Forecasting Model. The model and the process used to develop it are described in Section 4.1.2 below. In addition, data presented in this section was used in association with a variety of other performance measures related to potential impacts to the natural and built environment. A comparison of the alternatives to all of the project goals and objectives is presented in Chapter 5 of the EIS.

Consistent with FHWA guidance, the EIS planning horizon year is 2028. This represents the estimated year of project completion (2008) plus 20 years. The base year for this EIS is 2001 and data from that year represents existing conditions. The EIS traffic study analyzed traffic conditions for the base year, 2001, and horizon year, 2028, in the AM peak hour within the core study area, which is generally bounded by Plainsboro Road/Mapleton Road to the north, Alexander Road to the south, Clarksville Road to the east and Nassau Street (State Route 27) to the west. The AM peak hour was selected as representative of future peak period traffic conditions in the Penns Neck area. **All data compared in this section is for the AM peak hour.** Table 4-2 presents AM peak hour traffic data for each alternative for the quantitative performance measures discussed in this chapter. PM peak hour data for each alternative is provided in Appendix D.

4.1.2 Penns Neck Area EIS Travel Demand Forecasting Model

The data presented in this chapter are the product of the Penns Neck Area EIS Travel Demand Forecasting model (EIS travel forecasting model). This model was created specifically for the EIS to estimate future travel demand in the Penns Neck area under

various scenarios. This section provides an overview of the model components, the model development process and model assumptions. A complete description of the EIS travel forecasting model and modeling process is presented in the Penns Neck Area EIS Traffic and Circulation Study available for reference at the EIS document repositories described in Chapter 7.

The complex nature of the study area and the availability of municipal traffic models in the majority of the Primary Study Area (PSA) led to a unique multi-step approach to modeling. As described in Chapter 1, the study area for the Penns Neck Area EIS has been structured into overlapping regions. The Primary Study Area is composed of the municipalities of Plainsboro Township, Princeton Borough, Princeton Township and West Windsor Township. This area approximates a five-mile radius from the intersection of Route 1 and Washington Road in West Windsor Township. The Secondary Study Area (SSA) is composed of twenty municipalities in Mercer, Middlesex and Somerset Counties. It provides a regional context regarding demographics and travel patterns. The PSA and the SSA are comprised of municipalities and counties that fall under the jurisdiction of two Metropolitan Planning Organizations (MPO) – The Delaware Valley Regional Planning Commission (DVRPC) and the North Jersey Transportation Planning Authority (NJTPA).

The first step involved the creation of a 22-county integrated regional model. This integrated regional model was developed by merging the North Jersey Regional Transportation Model (NJRTM), developed and operated by NJTPA, and the DVRPC travel demand model. This integrated regional model is capable of interfacing across MPO jurisdictional lines. The second step in the modeling process was to create a Local Area Model (LAM) for the Penns Neck Area EIS to simulate travel patterns in the PSA at the micro-scale level that could interface with the integrated regional model. The LAM was created by merging existing local traffic models developed and used over the past two decades by West Windsor Township, Princeton Borough and Princeton Township and a local traffic model created for Plainsboro Township.

The regional model provides the context within which travel in the PSA is conducted. It provides data relating to the directional orientation, mode choice, and route usage of long distance travel. The LAM uses the contextual travel data provided by the regional model to incorporate travel patterns and influences occurring outside the LAM boundary. The LAM uses a very detailed parcel/tract-based zonal system and detailed land use data to estimate trip generation. The chief output of the LAM is a set of detailed traffic assignments to the streets and highways in the PSA calibrated for a base year 2001 condition. The LAM's fine scale zonal system produces detailed traffic performance data for specific PSA roadway segments, intersections and interchanges.

The regional and local models were calibrated to ensure that the models replicated existing travel patterns with a reasonable level of accuracy. Regional model calibration efforts focused primarily on the replication of traffic by time of day along

major approach corridors in the Penns Neck area. These included: Route 1, Route 206, Route 27, Route 133, major county routes (including CR571), the NJ Turnpike and I-95/295 approaches to Route 1. In addition, traffic volumes across the integrated regional model borders and peak period traffic flows from major employment sites were verified. Simulated traffic volumes on key routes in the Penns Neck area were verified against an extensive database of observed traffic counts. Finally, travel patterns were confirmed against data collected as part of the East-West Origin and Destination Survey study conducted by Urbitran Associates in October 2001.

Critical modeling inputs and assumptions include the following:

Regional Demographic Data

Demographic data from Census 2000 and MPO-derived trend population and employment forecasts were used to provide travel demand and performance data from travel originating outside the SSA and PSA. In addition, adjusted population and employment forecasts were developed for the SSA municipalities. Population and employment forecasts for the SSA are explained in more detail in Section 3.4.

Local Area Land Use Data and Forecasts

A detailed and comprehensive local land use inventory study was conducted as part of the LAM development process. This study provides a very accurate estimate of existing land uses in the PSA municipalities at various levels of detail, including 555 traffic analysis zone (TAZ) districts within municipalities, in municipal aggregations, and in totals for the PSA. For each TAZ, land use is classified into 20 different land use categories. The study also estimates growth potential in the PSA municipalities and forecasts 2028 population and employment in each TAZ. Population and employment forecasts for the PSA are explained in more detail in Section 3.4.

It should be noted that the LAM uses a modified employment forecast for those alternatives that do not include an east-side connector road (i.e., No-Action, C-series, G-series and D.2). The modified employment forecast assumes constrained development of the Sarnoff property located in West Windsor Township. This is consistent with the recently approved General Development Plan (GDP) for the Sarnoff property, which limits development on the Sarnoff site to Phase I, if an east-side connector road or its "functional equivalent" is not constructed. Phase I includes approximately 600,000 square feet of new and expanded facilities.

Detailed roadway network assumptions

The LAM includes a very fine-grained roadway network, which includes detailed data regarding the existing number of travel and auxiliary lanes, and the location and attributes of most traffic control devices, including traffic signals, stop signs and yield signs. Detailed future roadway network assumptions are also incorporated in order to simulate future travel conditions and traffic patterns accurately. Future roadway network assumptions include currently planned improvements in the PSA. These include only those projects programmed for funding in a regional, county or

municipal capital improvement program or plan. Additional detail regarding future roadway network assumptions is provided in Appendix D.

Trip Generation Rates

Trip generation rates and procedures from the Institute of Transportation Engineers (ITE) Trip Generation, 6th Edition and Trip Generation Manual published in 2001, were used to generate trips from each zone in the LAM based on the detailed land use and demographic data described above.

4.1.3 Summary of Conditions Under the No-Action Alternative

As described in Chapter 2, the No-Action Alternative is a "do-nothing" alternative that assumes only routine maintenance and currently planned improvements will be made to study area roadways. Against that infrastructure backdrop, trip generation forecasts for 2028 have been overlaid. Under the No-Action Alternative, 2028 AM peak hour traffic conditions in the Penns Neck area would be substantially worse than the 2001 base year or "existing" conditions.

To understand better the effect of demographic and economic growth on the No-Action transportation system, it is useful to examine the projected changes in traffic flows on Route 1 and east-west roads in the core study area. By 2028, traffic on Route 1 is expected to grow significantly, with the largest growth destined for West Windsor and Plainsboro and points north. As Table 4-1 shows, AM peak hour traffic on Route 1 between Harrison Street and Washington Road is expected to grow 25% in the northbound direction and 33% in the southbound direction. The directional flow of traffic on several segments of east-west roads is also noteworthy. Table 4-1 shows that disproportionate growth in AM peak hour traffic will occur on Alexander Road east of Route 1 in the eastbound direction (+103%), Alexander Road west of Route 1 in the westbound direction (+54%), Washington Road west of Route 1 in the eastbound direction (+157%), and Harrison Street in the eastbound direction (+88%). These changes in directional flow underscore the enlarged role that residential areas located outside of the PSA will play as future labor markets grow for jobs located in and near the core study area.

Table 4-1
Growth in Traffic by Direction
Base Year Conditions vs. No-Action Alternative

	Base Year AM Peak Hour		2028 AM Peak Hour		% Change	
	NB	SB	NB	SB	NB	SB
Route 1						
B/w Washington Road and Harrison Street	4,671	2,993	5,855	3,980	25%	33%
North of College Road (Plainsboro Twp.)	1,994	2,480	2,823	3,071	42%	24%
South of Meadow Road (W. Windsor Twp.)	4,534	2,569	6,700	3,169	48%	23%
East-West Roadways	**EB**	**WB**	**EB**	**WB**	**EB**	**WB**
Alexander Road						
East of Route 1 (b/w Vaughn Dr & Roszel Rd)	454	1,883	920	1,711	103%	-9%
West of Route 1 (b/w D&R Canal & Rt 1)	872	965	1,343	1,003	54%	4%
Washington Road						
East of Route 1 (b/w NEC rail line & Rt 1)	470	1,107	743	1,938	58%	75%
West of Route 1 (b/w D&R Canal & Rt 1)	575	619	1,477	730	157%	18%
Harrison Street						
West of Route 1 (b/w D&R Canal & Rt 1)	309	589	580	602	88%	2%

System-wide traffic congestion as measured by Vehicle Hours Traveled (VHT), VHT under congested conditions and Vehicle Miles Traveled (VMT) under congested conditions would increase significantly compared to the base year. VHT on study area roadways would increase from approximately 7,390 in the base year to 18,060 in 2028, an increase of approximately 145%. VHT under congested conditions would increase from approximately 3,070 to 16,840, an increase of 450%, and VMT under congested conditions would increase from a low base of approximately 1,930 to 31,220, an increase of 1500%.

Travel conditions in the PSA would deteriorate substantially according to a number of measures. AM peak hour travel time northbound on the 2.4 mile segment of Route 1 through the study area would increase from an existing average travel time of 5 minutes to greater than 15 minutes. AM peak hour travel time southbound would increase from an existing 4 minutes to approximately 7 minutes. Average east-west travel times between the intersection of CR571 and Clarksville Road in West Windsor Township and Nassau Street in Princeton Borough, an average distance of approximately 3.6 miles, would increase from an existing 10 to 13 minutes to between 18 and 21 minutes by 2028. This represents an 80% increase. Average

intersection delays crossing Route 1 at Washington Road and Harrison Street would increase from an existing 3 to 4 minutes to more than 16 minutes in 2028.

Under the No-Action Alternative, the distribution of two-way traffic on Alexander Road, Washington Road and Harrison Street west of Faculty Road will shift from Alexander Road and Harrison Street to Washington Road. At the same time, the distribution of two-way traffic between the NEC rail line and Route 1 would shift from Alexander Road to Washington Road. Traffic volumes on virtually all core area roadways would increase significantly.

The proportion of heavy trucks using Alexander Road as a percentage of total daily traffic would increase from 3% under existing conditions to 5.4% under the No-Action Alternative. The proportion of heavy trucks using Washington Road would increase from 2.1% under existing conditions to 3.9%, and the proportion of heavy trucks using

Harrison Street would increase from 4.2% under existing conditions to 6.6% of total daily traffic under the No-Action Alternative.

For the purposes of the EIS traffic impact analyses, the action alternatives were compared against the No-Action Alternative.

4.1.4 Travel Delay and Growth in Congestion

Travel delay and growth in congestion were considered using three system level performance measures. These included: Vehicle Hours Traveled (VHT), VHT under congested conditions and Vehicle Miles Traveled (VMT) under congested conditions. Each of these measures examined travel conditions in the core study area. VHT measures total hours traveled by all vehicles on all roadway segments over a specified period of time – in this case, the AM peak hour. VHT under congested conditions is the amount of vehicle hours spent on roadways that are over capacity. VMT under congested conditions measures total miles traveled by all vehicles traveling under congested road conditions (i.e., where traffic volumes exceed the capacity of the roadway). Figure 4-1 illustrates various measures for growth in congestion.

4.1.4.1 No-Action Alternative

Under the No-Action Alternative, VHT on study area roadways would increase from approximately 7,390 in the base year to 18,060 in 2028, an increase of approximately 145%. VHT under congested conditions would increase from approximately 3,070 to 16,840, an increase of 450%, and VMT under congested conditions would increase from approximately 1,930 to 31,220, an increase of 1500%.

4.1.4.2 Action Alternatives

A-series Action Alternatives (A, A.1, A.2, A.3, A.4)
Compared to the No-Action Alternative, the A-series alternatives would reduce Vehicle Hours Traveled (VHT) by 32% to 40%, VHT under congested conditions 36% to 44% and Vehicle Miles Traveled (VMT) under congested conditions 11% to 22%.

B-series Action Alternatives (B, B.1, B.2)
Compared to the No-Action Alternative, the B-series alternatives would reduce VHT 35% to 41%, VHT under congested conditions 40% to 45% and VMT under congested conditions 19% to 25%.

C-series Action Alternatives (C, C.1)
Compared to the No-Action Alternative, the C-series alternatives would reduce VHT 21% to 29%, VHT under congested conditions 23% to 31% and VMT under congested conditions 18% to 21%.

D-series Action Alternatives (D, D.1, D.2)
Compared to the No-Action Alternative, Alternatives D and D.1 would reduce VHT by 36% to 38%, VHT under congested conditions by 39% to 42% and VMT under congested conditions by 11% to 13%. Alternative D.2 would reduce VHT by 27%, VHT under congested conditions 29% and VMT under congested conditions 10%.

E Action Alternative
Compared to the No-Action Alternative, Alternative E would reduce VHT by 35%, VHT under congested conditions 39% and VMT under congested conditions 14%.

F-series Action Alternatives (F, F.1)
Compared to the No-Action Alternative, the F-series alternatives would reduce VHT 45%, VHT under congested conditions 50% and VMT under congested conditions 30% to 34%.

G-series Action Alternatives (G, G.1, G.2)
Compared to the No-Action Alternative, the G-series alternatives would reduce VHT 4% to 16% and VHT under congested conditions 4% to 16%, Alternatives G and G.1 would reduce VMT under congested conditions 6%, and Alternative G.2 would increase VMT under congested conditions 11%.

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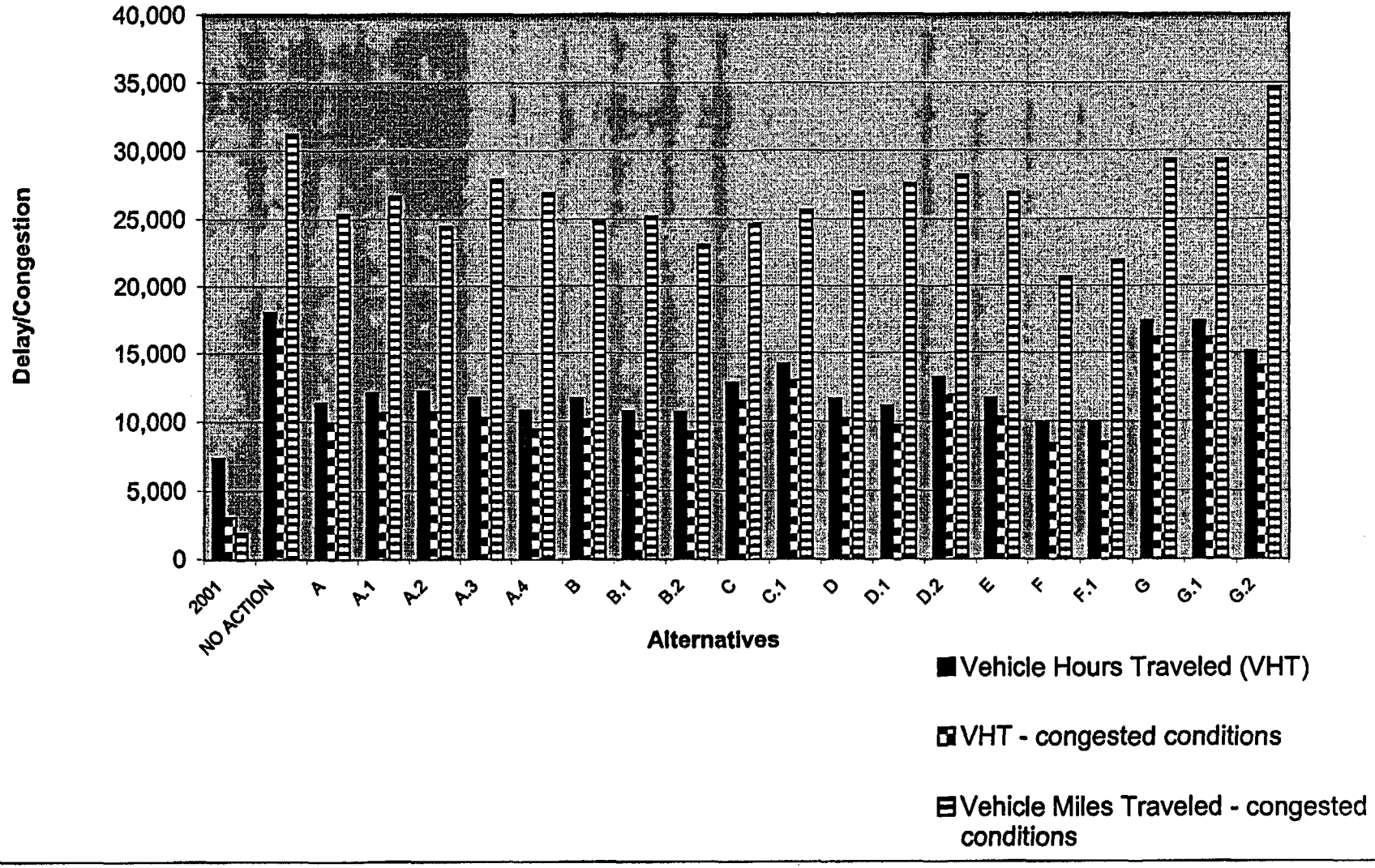
TABLE 4-2: AM Peak Hour Traffic Data - Various Performance Measures

last revised 5-15-03

	Existing 2001	No Action	Route 1 in-a-cut					Route 1 at-grade					Route 1 in-a-cut						Route 1 at-grade		
			A	A.1	A.2	A.3	A.4	B	B.1	B.2	C*	C.1*	D	D.1	D.2*	E	F	F.1	G*	G.1*	G.2*
1. Travel delay and rate of growth in congestion (Various measures)																					
Reduces Vehicle hours traveled	7,391	18,056	11,364	12,102	12,241	11,778	10,850	11,688	10,756	10,685	12,842	14,238	11,632	11,112	13,196	11,683	9,905	9,968	17,373	17,373	15,156
Reduces Vehicle hours traveled under congested conditions	3,065	16,843	9,951	10,647	10,734	10,294	9,449	10,170	9,347	9,279	11,564	13,003	10,254	9,724	11,917	10,288	8,395	8,484	16,171	16,171	14,073
Reduces Vehicle Miles Traveled under congested conditions	1,929	31,220	25,384	26,680	24,472	27,924	26,942	24,834	25,231	23,089	24,659	25,657	27,015	27,630	26,229	26,951	20,662	21,910	29,369	29,369	34,635
2. Travel time on Route 1 (Travel time in minutes - AM peak hour)																					
Northbound	5	15.13	12.53	12.30	12.62	12.25	12.04	12.12	12.35	11.29	11.18	11.97	12.95	12.71	12.14	12.90	11.65	11.60	14.54	14.54	15.64
Southbound	4	6.86	4.60	4.28	4.18	4.73	4.85	5.36	4.96	4.37	3.92	3.99	5.08	4.88	4.52	4.48	4.98	4.95	5.80	5.80	7.64
3. Travel time on E-W streets (Average 2-way travel time in minutes - AM peak hour)																					
Travel from Clarksville Road/CR 571 intersection in W. Windsor to Nassau Street in the vicinity of:																					
Alexander Rd	13	21.34	18.64	19.15	18.62	18.57	18.05	20.89	19.08	19.22	20.36	22.66	18.13	19.00	18.57	19.10	18.69	17.57	20.67	20.67	26.54
Washington Rd	10	18.32	13.64	14.05	13.74	14.61	14.14	16.47	16.35	16.84	18.95	19.79	13.65	13.88	13.92	15.04	13.26	14.62	17.41	17.41	23.18
Harrison St	12	19.79	13.86	13.69	14.08	14.78	14.25	16.84	16.01	16.84	18.91	20.64	13.64	13.81	14.40	14.24	14.54	15.72	18.77	18.77	23.21
4. Intersection delays crossing Route 1(Total average E-W approach delay in minutes - AM peak hour)																					
Alexander Rd crossing Route 1	<1 (0.5)	<1 (0.4)	<1 (0.4)	<1 (0.4)	<1 (0.4)	<1 (0.4)	<1 (0.3)	<1 (0.4)	<1 (0.3)	<1 (0.5)	<1 (0.7)	<1 (0.4)	<1 (0.4)	<1 (0.3)	<1 (0.3)	<1 (0.4)	<1 (0.4)	<1 (0.4)	<1 (0.5)	<1 (0.5)	1.2
Washington Rd crossing Route 1	3	16+	0	<1 (0.4)	<1 (0.3)	<1 (0.4)	<1 (0.4)	N/A	N/A	N/A	N/A	N/A	<1 (0.3)	<1 (0.3)	<1 (0.4)	<1 (0.4)	0	<1 (0.5)	6.7	8.5	N/A
Harrison St crossing Route 1	4.8	16+	<1 (0.4)	<1 (0.3)	<1 (0.4)	<1 (0.7)	<1 (0.6)	<1 (0.2)	<1 (0.2)	<1 (0.2)	<1(0.6)	<1 (0.8)	<1 (0.5)	<1 (0.5)	<1 (0.5)	N/A	N/A	N/A	4.6	6.4	N/A
6. Change in traffic volume on key routes (Two-way traffic volume - AM peak hour)																					
a) Core area b/w D&R Canal and NEC rail line																					
Alexander Rd b/w Canal & Route 1	1,681	2,346	2,118	2,221	2,157	2,077	1,943	2,161	2,127	2,037	2,286	2,554	2,033	2,068	2,086	2,132	2,039	1,902	2,223	2,223	2,607
% Change		40%	-10%	-5%	-8%	-11%	-17%	-8%	-9%	-13%	-3%	9%	-13%	-12%	-11%	-9%	-13%	-19%	-5%	-5%	11%
Alexander Rd crossing D&R Canal	1,825	2,480	2,265	2,370	2,301	2,222	2,090	2,314	2,273	2,146	2,398	2,702	2,181	2,221	2,090	2,259	2,171	2,031	2,363	2,363	2,733
% Change		36%	-9%	-4%	-7%	-10%	-16%	-7%	-8%	-13%	-3%	9%	-12%	-10%	-16%	-9%	-12%	-18%	-5%	-5%	10%
Washington Rd b/w Canal and Route 1	1,388	2,426	1,726	1,702	1,570	1,680	1,761	1,292	1,258	331	984	1,832	1,698	1,750	1,898	1,768	1,508	1,750	2,291	2,291	1,327
% Change		75%	-29%	-30%	-35%	-31%	-27%	-47%	-48%	-86%	-59%	-24%	-30%	-28%	-22%	-27%	-38%	-28%	-6%	-6%	-45%
Washington Rd crossing D&R Canal	1,380	2,207	1,585	1,545	1,400	1,511	1,601	1,808	1,884	1,962	2,180	1,656	1,525	1,576	1,670	1,593	1,325	1,525	2,067	2,067	1,257
% Change		60%	-28%	-30%	-37%	-32%	-27%	-18%	-15%	-11%	-1%	-25%	-31%	-29%	-24%	-28%	-40%	-31%	-6%	-6%	-43%
Harrison St b/w Canal and Route 1 (Lower Harrison St)	923	1,182	36	36	36	36	36	36	36	36	1,316	1,301	36	36	36	36	36	36	1,566	1,566	1,671
% Change		28%	-97%	-97%	-97%	-97%	-97%	-97%	-97%	-97%	11%	10%	-97%	-97%	-97%	-97%	-97%	-97%	32%	32%	41%
Harrison St crossing D&R Canal	923	1,182	2,167	2,056	2,398	2,443	2,436	1,797	1,778	1,884	1,316	1,301	2,414	2,207	2,160	2,082	2,546	2,471	1,566	1,566	1,671
% Change		28%	83%	74%	103%	107%	106%	52%	50%	59%	11%	10%	104%	87%	83%	76%	115%	109%	32%	32%	41%
Mapleton Rd in Plainsboro	393	901	857	863	825	855	856	860	848	861	906	945	828	810	740	866	870	886	850	850	821
% Change		129%	-5%	-4%	-8%	-5%	-5%	-5%	-6%	-4%	1%	5%	-8%	-10%	-18%	-4%	-3%	-2%	-6%	-6%	-9%
Washington Rd in Penns Neck	1,607	2,670	1,346	1,239	1,203	1,214	939	730	902	672	1,940	1,990	665	645	2,436	547	1,206	965	2,714	2,714	1,961
% Change		66%	-50%	-54%	-55%	-55%	-65%	-73%	-66%	-75%	-27%	-25%	-75%	-76%	9%	-80%	-55%	-64%	2%	2%	-27%
Fisher Place b/w Route 1 and Fairview Ave	44	0	393	0	61	0	7	0	0	0	0	0	149	138	88	0	84	571	0	0	0
% Change		–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Canal Pointe Blvd south of Alexander Rd	833	1,549	1,294	1,437	1,368	1,189	1,405	1,287	1,358	2,030	1,612	1,413	1,525	1,576	1,387	1,522	1,454	1,450	1,503	1,503	1,468
% Change		86%	-16%	-7%	-12%	-23%	-9%	-17%	-12%	31%	4%	-9%	-2%	2%	-10%	-2%	-6%	-6%	-3%	-3%	-5%
b) West of D&R Canal																					
Alexander Rd b/w Faculty Rd & University Pl	1,736	2,229	2,054	2,143	2,110	2,074	2,015	2,152	2,121	2,065	2,253	2,272	2,062	2,104	2,113	2,015	2,041	2,003	2,142	2,142	2,259
% Change		28%	-8%	-4%	-5%	-7%	-10%	-3%	-5%	-7%	1%	2%	-7%	-6%	-5%	-10%	-8%	-10%	-4%	-4%	1%
Alexander Rd b/w University Pl and Mercer St	1,300	1,713	1,584	1,718	1,622	1,626	1,589	1,686	1,631	1,662	1,616	1,771	1,630	1,681	1,680	1,626	1,466	1,422	1,526	1,526	1,703
% Change		32%	-8%	0%	-5%	-5%	-7%	-2%	-7%	-3%	-6%	3%	-5%	-2%	-2%	-5%	-14%	-17%	-11%	-11%	-1%
Washington Rd b/w Nassau St & Faculty Rd	1,222	2,058	1,669	1,711	1,566	1,698	1,725	1,797	1,883	1,932	1,952	1,651	1,701	1,727	1,715	1,785	1,516	1,574	1,981	1,981	1,506
% Change		68%	-19%	-17%	-24%	-17%	-16%	-13%	-9%	-6%	-5%	-20%	-17%	-16%	-17%	-13%	-26%	-24%	-4%	-4%	-27%
Harrison St. b/w Nassau St & Faculty Rd (Upper Harrison St.)	899	1,231	1,594	1,513	1,515	1,581	1,621	1,425	1,416	1,533	1,234	1,205	1,563	1,432	1,504	1,468	1,691	1,689	1,398	1,398	1,400
% Change		37%	29%	23%	23%	28%	32%	16%	15%	25%	0%	-2%	27%	16%	22%	19%	37%	37%	14%	14%	14%
Nassau St b/w Mercer St & Washington Rd	1,496	1,806	1,817	1,733	1,757	1,798	1,838	1,734	1,734	1,735	1,621	1,771	1,763	1,673	1,722	1,921	1,765	1,823	1,791	1,791	1,812
% Change		21%	1%	-4%	-3%	0%	2%	-4%	-4%	-4%	-10%	-2%	2%	-7%	-5%	6%	-2%	1%	-1%	-1%	0%
Nassau St b/w Washington Rd & Harrison St	1,194	2,344	1,937	2,013	2,002	1,923	1,937	2,003	1,991	2,120	2,172	1,981	1,913	1,883	1,827	1,955	1,922	1,797	2,470	2,470	2,009
% Change		96%	-17%	-14%	-15%	-18%	-17%	-15%	-15%	-10%	-7%	-15%	-18%	-20%	-22%	-17%	-18%	-23%	5%	5%	-14%
Faculty Rd b/w Alexander Rd & Washington Rd	726	1,053	1,066	1,117	1,062	1,033	1,000	1,011	1,003	928	924	1,137	998	970	878	1,165	976	888	987	987	1,188
% Change		45%	1%	6%	1%	-2%	-5%	-4%	-5%	-12%	-12%	8%	-5%	-8%	-17%	11%	-7%	-16%	-6%	-6%	13%
Faculty Rd b/w Washington Rd & Harrison St	351	848	594	563	535	471	515	697	682	629	805	807	461	468	500	545	493	497	773	773	605
% Change		142%	-30%	-34%	-37%	-44%	-39%	-18%	-20%	-26%	-5%	-5%	-46%	-45%	-41%	-36%	-42%	-41%	-9%	-9%	-29%
c) Vicinity of NEC rail line																					
Alexander Road b/w Roszel Rd & Vaughn Dr	2,301	2,631	3,100	3,181	3,086	3,029	2,954	2,614	2,973	2,912	3,261	3,378	3,096	3,145	3,054	3,081	2,886	2,892	2,640	2,640	3,077
% Change		14%	18%	21%	17%	15%	12%	-1%	13%	11%	24%	28%	18%	20%	16%	17%	10%	10%	0%	0%	17%
Alexander Rd east of NEC rail line	608	1,564	1,194	1,176	1,286	1,133	1,108	1,362	1,329	1,085	1,246	1,373	1,126	1,151	1,153	1,175	1,198	1,078	1,396	1,396	1,520
% Change		157%	-24%	-25%	-18%	-28%	-29%	-13%	-15%	-31%	-20%	-12%	-28%	-26%	-26%	-25%	-23%	-31%	-11%	-11%	-3%
Wallace Rd	559	723	486	611	476	610	462	871	481	564	420	415	453	461	516	572	605	643	749	749	999
% Change		29%	-33%	-15%	-34%	-16%	-36%	20%	-33%	-22%	-42%	-43%	-37%	-36%	-29%	-21%	-16%	-11%	4%	4%	38%
North Post Rd	1,275	1314	1106	1230	1041	1210	1088	1268	1001	1056	1058	1131	1143	1239	1139	1085	1139	1261	1369	1369	1284
% Change		3%	-16%	-6%	-21%	-8%	-17%	-4%	-24%	-20%	-19%	-14%	-13%	-6%	-13%	-17%	-13%	-4%	4%	4%	-2%
Bear Brook Road	619	1428	1677	1696	1668	1614	1647	1266	1642	1607	1512	1461	1516	1566	1421	1663	1586	1602	1681	1681	1411
% Change		131%	17%	19%	17%	13%	15%	-11%	15%	13%	6%	2%	6%	10%	0%	16%	11%	12%	18%	18%	-1%
CR 571 b/w Alexander Rd and Wallace Rd	1,213	2588	2578	2566	2488	2651	2485	2521	2527	2455	2028	1933	2610	2690	2310	2577	2535	2480	2145	2145	2405
% Change		113%	0%	-1%	-4%	2%	-4%	-3%	-2%	-5%	-22%	-25%	1%	4%	-11%	0%	-2%	-4%	-17%	-17%	-7%
Clarksville Road b/w No.Post Rd and CR 571	1,517	2066	2074	2070	1970	2061	2083	2286	2175	1947	2084	2090	1923	1962	2030	1980	2083	1970	2165	2165	2466
% Change		36%	0%	0%	-5%	0%	1%	11%	5%	-6%	1%	1%	-7%	-5%	-2%	-4%	1%	-5%	5%	5%	19%

* Assumes constrained development of Sarnoff property

Figure 4-1 Growth in Congestion - Various Measures



4.1.5 North-South Travel Time on Route 1

The EIS travel forecasting model was used to simulate average north-south travel time on the 2.4 mile segment of Route 1 between Carnegie Center Boulevard in West Windsor Township and Scudders Mill Road in Plainsboro Township. AM peak hour travel times for each alternative were compared to travel times under the No-Action Alternative. Figure 4-2 depicts change in north-south travel time on Route 1 for each alternative.

4.1.5.1 No-Action Alternative

Under the No-Action Alternative, northbound travel time on Route 1 would increase from a base year 2001 average travel time of 5 minutes to more than 15 minutes. Average southbound travel time on Route 1 would increase from an existing 4 minutes to approximately 7 minutes.

4.1.5.2 Action Alternatives

A-series Action Alternatives (A, A.1, A.2, A.3, A.4)
The A-series alternative would provide uninterrupted traffic flow on Route 1 through the Penns Neck area. Consequently, compared to the No-Action Alternative, the A-series alternatives would reduce northbound travel time along Route 1 by 17% to 20%, resulting in a travel time of approximately 12 to 13 minutes. Southbound travel time would be reduced by 29% to 39%, resulting in a travel time of approximately 4 to 5 minutes.

B-series Action Alternatives (B, B.1, B.2)
The B-series alternative would provide uninterrupted traffic flow on Route 1 through the Penns Neck area. Consequently, compared to the No-Action Alternative, the B-series alternatives would reduce northbound travel time along Route 1 by 18% to 25%, resulting in a travel time of 11 to 12 minutes. Southbound travel time would be reduced 22% to 36%, resulting in a travel time of 4 to 5 minutes.

C-series Action Alternatives (C, C.1)
The C-series alternative would provide uninterrupted traffic flow on Route 1 through the Penns Neck area. Consequently, compared to the No-Action Alternative, the C-series alternatives would reduce northbound travel time on Route 1 21% to 26%, resulting in a travel time of approximately 11 to 12 minutes. Southbound travel time would be reduced by 42% to 43%, resulting in a travel time of approximately 4 minutes.

D-series Action Alternatives (D, D.1, D.2)
The D-series alternative would provide uninterrupted traffic flow on Route 1 through the Penns Neck area. Consequently, compared to the No-Action Alternative, Alternatives D and D.1 would reduce northbound travel time 14% to 16%, resulting

in a travel time of 12 to 13 minutes. Southbound travel time would be reduced by 26% to 29%, resulting in a travel time of approximately 5 minutes. Alternative D.2 would reduce northbound travel time 20% and southbound travel time 34%.

E Action Alternative
Alternative E would provide uninterrupted traffic flow on Route 1 through the Penns Neck area. Consequently, compared to the No-Action Alternative, Alternative E would reduce northbound travel time by 15%, resulting in a travel time of approximately 13 minutes. Southbound travel time would be reduced by 35%, resulting in a travel time of approximately 4 minutes.

F-series Action Alternatives (F, F.1)
The F-series alternative would provide uninterrupted traffic flow on Route 1 through the Penns Neck area. Consequently, compared to the No-Action Alternative, the F-series alternatives would reduce northbound travel time on Route 1 by 23%, resulting in a travel time of approximately 12 minutes. Southbound travel time would be reduced by 27% to 28%, resulting in a travel time of approximately 5 minutes.

G-series Action Alternatives (G, G.1, G.2)
Alternatives G and G.1 would maintain the Washington Road and Harrison Street traffic signals with minor intersection improvements. Consequently, compared to the No-Action Alternative, Alternatives G and G.1 would reduce northbound travel time 4%, resulting in a travel time of approximately 14 minutes, and would reduce southbound travel time 15%, resulting in a travel time of approximately 6 minutes. Alternative G.2 would remove the Penns Neck area traffic signals and restrict east-west access to right turn only at Route 1. Consequently, northbound travel time would increase 3%, resulting in a travel time of approximately 15 minutes, and southbound travel time would be reduced 11%, resulting in a travel time of approximately 7 minutes.

4.1.6 Travel Time on East-West Routes

The EIS travel forecasting model was used to simulate average travel time on east-west streets in the Penns Neck area. Travel time was measured between designated origins and destinations in West Windsor Township and Princeton Borough. Specifically, average travel times were calculated based on simulated travel between the intersection of CR571 and Clarksville Road in West Windsor Township and Nassau Street in the vicinity of: a) Alexander Road, b) Washington Road, and c) Harrison Street in Princeton Borough. This is an average distance of 3.6 miles. All east-west travel time calculations are average two-way travel times. The travel times compared in this section are for the AM peak hour. Figure 4-3 depicts change in north-south travel time on Route 1 for each alternative in the AM peak hour.

Figure 4-2 North-South (Rte. 1) Travel Time

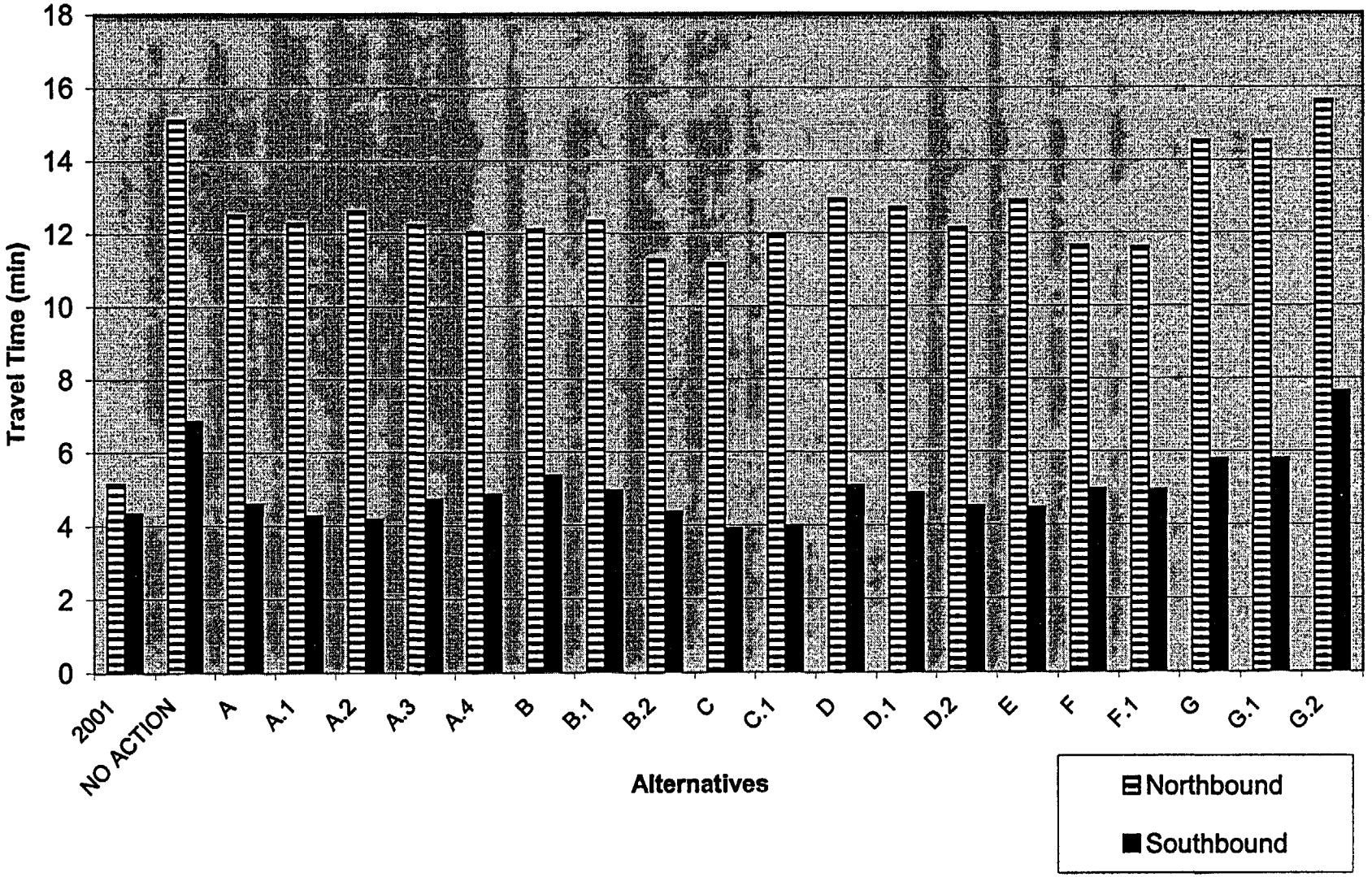
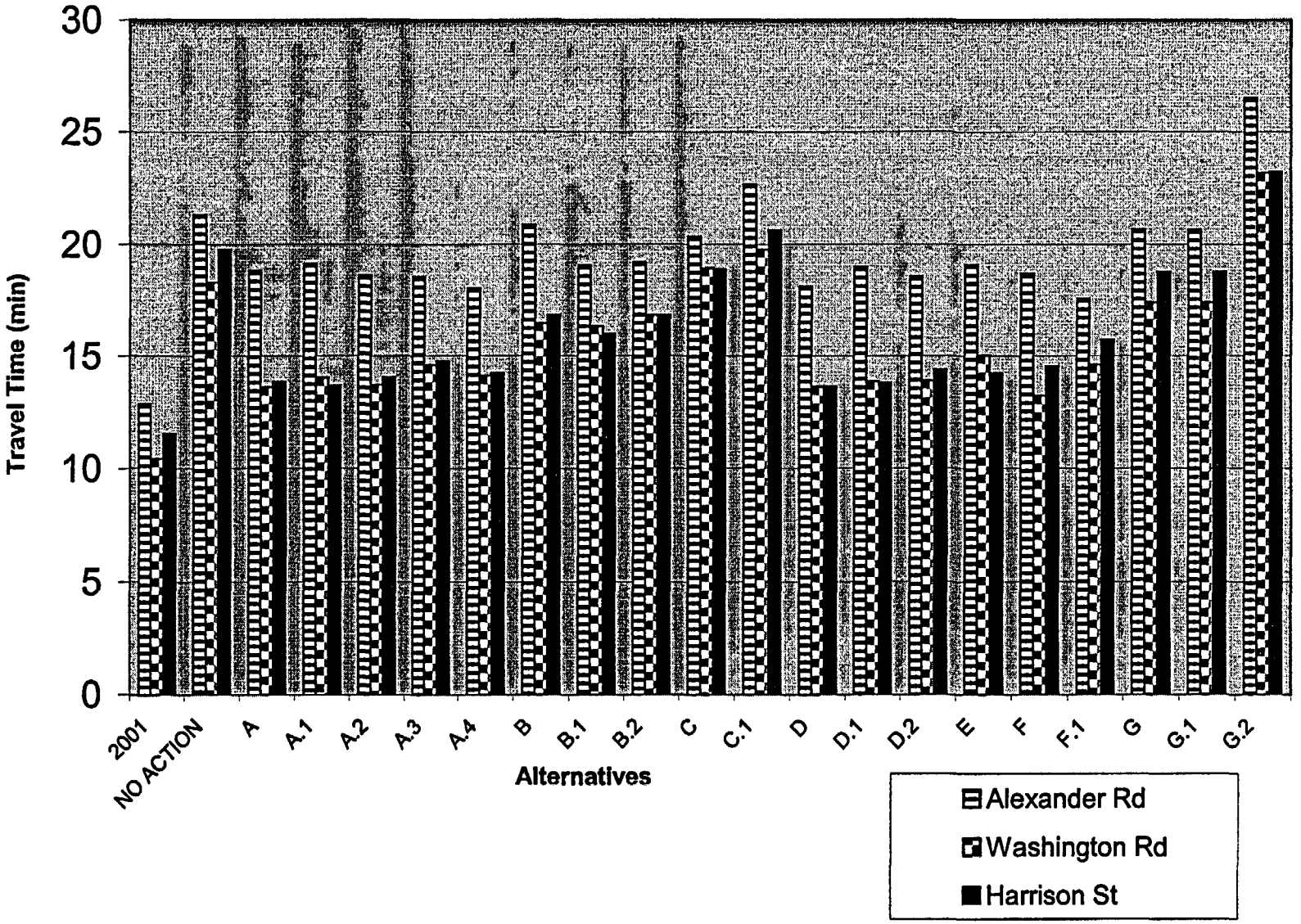


Figure 4-3 East-West Travel time



4.1.6.1 No-Action Alternative

Under the No-Action Alternative average east-west travel times would increase from existing conditions. East-west travel time between West Windsor and Nassau Street in the vicinity of Alexander Road would increase from the current 13 minutes to more than 21 minutes in 2028. Travel time between West Windsor and Nassau Street in the vicinity of Washington Road would increase from the current 10 minutes to more than 18 minutes, and travel to and from Nassau Street in the vicinity of Harrison Street, and West Windsor would increase from the current 12 minutes to just under 20 minutes.

4.1.6.2 Action Alternatives

A-series Action Alternatives (A, A.1, A.2, A.3, A.4)
Compared to the No-Action Alternative, the A-series alternatives, which include Route 1 in-a-cut with grade-separated through movement of traffic across Route 1 at both Washington Road and Harrison Street, would reduce east-west travel time 10%-31%, resulting in average two-way travel times of 14 to 19 minutes. Travel times to and from Nassau Street at Washington Road and Harrison Street are reduced the most, while travel times to and from Nassau Street in the vicinity of Alexander Road are reduced the least.

B-series Action Alternatives (B, B.1, B.2)
Compared to the No-Action Alternative, the B-series alternatives, which do not include Route 1 in-a-cut, would reduce east-west travel time 2% to 19%, resulting in an average two-way travel time of 16 to 21 minutes. Travel times to and from Nassau Street at Washington Road and Harrison Street are reduced the most, while travel times to and from Nassau Street in the vicinity of Alexander Road are reduced the least.

C-series Action Alternatives (C, C.1)
Compared to the No-Action Alternative, Alternative C, which does not include Route 1 in-a-cut or an east-side connector road but does include a west-side connector road between Alexander Road and Washington Road, would increase east-west travel time between West Windsor and Nassau Street in the vicinity of Washington Road by 3%. Travel time to Nassau Street in the vicinity of Alexander Road would decrease 5% and travel time to Nassau Street in the vicinity of Harrison Street would decrease 4%. Alternative C.1, which does not include Route 1 in-a-cut, an east-side connector road or a west-side connector road between Alexander Road and Washington Road, would increase east-west travel time 4% to 8% to all three destinations. Average two-way travel time under the C alternatives would range from 19 minutes to more than 22 minutes.

D-series Action Alternatives (D, D.1, D.2)
Compared to the No-Action Alternative, Alternatives D and D.1, which include Route 1 in-a-cut with grade-separated through movement of traffic across Route 1 at both Washington Road and Harrison Street and an ESC road, would reduce east-west travel time 11% to 31%, resulting in an average two-way travel time of 13 to 19 minutes. Travel times to and from Nassau Street at Washington Road and Harrison Street are reduced the most, while travel times to and from Nassau Street in the vicinity of Alexander Road are reduced the least.
Alternative D.2 which includes Route 1 in-a-cut with grade-separated through movement of traffic across Route 1 at both Washington Road and Harrison Street with no ESC road, would reduce east-west travel time 13% to 27%, resulting in an average two-way travel time of 14 to 19 minutes. Travel times to and from Nassau Street at Washington Road and Harrison Street are reduced the most, while travel times to and from Nassau Street in the vicinity of Alexander Road are reduced the least.

E Action Alternative
Compared to the No-Action Alternative, Alternative E, which includes Route 1 in-a-cut with grade-separated through movement of traffic across Route 1 at Washington Road and in the vicinity of Harrison Street, would reduce east-west travel time 10% to 28%, resulting in an average two-way travel time of 14 to 19 minutes. Travel times to and from Nassau Street at Washington Road and Harrison Street are reduced the most, while travel times to and from Nassau Street in the vicinity of Alexander Road are reduced the least.

F-series Action Alternatives (F, F.1)
Compared to the No-Action Alternative, the F-series alternatives, which include Route 1 in-a-cut with grade-separated through movement of traffic across Route 1 at both Washington Road and Harrison Street but prohibits through movement of east-west traffic across Route 1 at Harrison Street, would reduce east-west travel time 12% to 28%, resulting in an average two-way travel time of 13 to 19 minutes. Travel times to and from Nassau Street at Washington Road and Harrison Street are reduced the most, while travel times to and from Nassau Street in the vicinity of Alexander Road are reduced the least.

G-series Action Alternatives (G, G.1, G.2)
Compared to the No-Action Alternative, Alternatives G and G.1, which retain the Penns Neck area traffic signals, would reduce east-west travel time 3% to 5%. Alternative G.2, which eliminates the Penns Neck area traffic signals but does not permit east-west traffic to cross Route 1 at Washington Road or Harrison Street, would increase east-west travel time 17% to 24%. Average two-way travel time under the G alternatives would range from 17 minutes to 26 minutes.

4.1.7 Intersection Delays Crossing Route 1

Average intersection delays for east-west travelers crossing Route 1 were estimated. The data presented for this measure resulted from a secondary intersection delay analysis conducted using traffic volume data from the EIS travel forecasting model. Intersection delays reported in this section are for the AM peak hour.

4.1.7.1 No-Action Alternative

Under the No-Action Alternative, traffic crossing Route 1 at Washington Road and Harrison Street would experience average delays that exceed 16 minutes. Delays crossing Route 1 at Alexander Road would be largely unaffected.

4.1.7.2 Action Alternatives

A-series Action Alternatives (A, A.1, A.2, A.3, A.4)
Compared to the No-Action Alternative, the A-series alternatives, which permit access across Route 1 at Washington Road and Harrison Street, would reduce east-west intersection delays crossing Route 1 at Washington Road and Harrison Street to less than one minute. Delays at Alexander Road would be largely unaffected and remain less than one minute.

B-series Action Alternatives (B, B.1, B.2)
Compared to the No-Action Alternative, the B-series alternatives would reduce east-west intersection delays crossing Route 1 at Harrison Street to less than one minute. Delays at Alexander Road would be largely unaffected and remain less than one minute. There is no through access across Route 1 at Washington Road under the B-series alternatives.

C-series Action Alternatives (C, C.1)
Compared to the No-Action Alternative, the C-series alternatives would reduce east-west intersection delays crossing Route 1 at Harrison Street to less than one minute. Delays at Alexander Road would be largely unaffected and remain less than one minute. There is no through access across Route 1 at Washington Road under the C-series alternatives.

D-series Action Alternatives (D, D.1, D.2)
Compared to the No-Action Alternative, the D-series alternatives would reduce east-west intersection delays crossing Route 1 at Washington Road and Harrison Street to less than one minute. Delays at Alexander Road would be largely unaffected and would remain less than one minute.

E Action Alternative
Compared to the No-Action Alternative, Alternative E would reduce east-west intersection delays crossing Route 1 at Washington Road to less than one minute. Delays at Alexander Road would be largely unaffected and would remain less than

one minute. There is no through access across Route 1 at Harrison Street under Alternative E. Delays at the new interchange located just north of Fisher Place would be less than one minute.

F-series Action Alternatives (F, F.1)
Compared to the No-Action Alternative, the F-series alternatives would reduce east-west intersection delays crossing Route 1 at Washington Road to less than one minute. Delays at Alexander Road would be largely unaffected and remain less than one minute. There is no through access across Route 1 at Harrison Street under the F-series alternatives.

G Action Alternatives (G, G.1, G.2)
Compared to the No-Action Alternative, Alternatives G and G.1 would reduce east-west intersection delays when crossing Route 1 at Washington Road and Harrison Street from 16+ minutes to 6.7 minutes and 8.5 minutes, respectively. Delays crossing Route 1 at Alexander Road would be largely unaffected and would remain less than one minute. Alternative G.2 would increase delays at Alexander Road to 1.2 minutes. Under Alternative G.2, through traffic across Route 1 at Harrison Street and Washington Road would be eliminated.

4.1.8 Balance of Traffic on East-West Routes

The balance of traffic on east-west routes in the Penns Neck area was measured in terms of total two-way, east-west traffic volume and the percent distribution of total two-way, east-west traffic volume on the three principal east-west roads in the study area. Balance of traffic was considered at two locations: 1) west of Faculty Road; and 2) between the NEC rail line and Route 1.

Data for these measures was generated using the EIS travel forecasting model. When considering these measures, it is very important to consider both the volume of traffic using a particular route and the percentage distribution of traffic. The percent distribution alone may be misleading relative to the impact of changing traffic patterns. It should also be noted that some percentages do not add to 100% due to rounding.

4.1.8.1 No-Action Alternative

The distribution of AM peak hour traffic on Alexander Road, Washington Road and Harrison Street west of Faculty Road will change over time from the base year with or without improvements in the Penns Neck area. Although traffic would grow on all east-west routes under the No-Action Alternative, the distribution of two-way traffic west of Faculty Road (Location 1) would shift from Alexander Road and Harrison Street to Washington Road. The distribution of two-way traffic between the NEC rail line and Route 1 (Location 2) would shift from Alexander Road to Washington Road.

	Base Year		No-Action	
	Volume	%	Volume	%
Location 1				
-Alexander Rd	1,736	45%	2,229	40%
-Washington Rd	1,222	32%	2,058	37%
-Harrison St	899	23%	1,231	22%
Location 2				
-Alexander Rd	2,301	59%	2,631	49%
-Washington Rd	1,607	41%	2,670	51%
-ESC Rd	-	-		-

4.1.8.2 Action Alternatives

A-series Action Alternatives (A, A.1, A.2, A.3, A.4)

The A-series alternatives would provide Route 1 in-a-cut with through access across Route 1 at Washington Road, a new grade-separated interchange in the vicinity of Harrison Street and a direct west-side connector (WSC) road to existing Harrison Street at the D&R canal. This would enhance the attractiveness of the Harrison Street corridor as an east-west travel route. Consequently, compared to the No-Action Alternative, the A-series alternatives would shift the distribution of two-way traffic west of Faculty Road (Location 1) from Alexander Road and Washington Road to Harrison Street, creating a more equal distribution of traffic into and out of Princeton. The greatest proportion of traffic would remain on Alexander Road.

The A-series alternatives would include an east-side (ESC) connector road. The ESC road provides an alternative to Washington Road for accessing and crossing Route 1. Consequently, the most pronounced change in two-way traffic east of Route 1 between the NEC rail line and Route 1 (Location 2) would be the shift in traffic from Washington Road to the ESC road.

	No-Action		A		A.1		A.2		A.3		A.4	
	Vol	%	Vol	%	Vol	%	Vol	%	Vol	%	Vol	%
Location 1												
Alexander Rd	2,229	40%	2,054	39%	2,143	40%	2,110	39%	2,074	39%	2,015	38%
Washington Rd	2,058	37%	1,669	31%	1,711	32%	1,566	31%	1,698	32%	1,725	32%
Harrison St	1,231	22%	1,594	30%	1,513	28%	1,515	29%	1,581	30%	1,621	30%
Location 2												
Alexander Rd	2,631	49%	3,100	39%	3,181	40%	3,086	40%	3,029	39%	2,954	40%
Washington Rd	2,670	51%	1,346	17%	1,239	16%	1,203	16%	1,214	16%	939	13%
ESC Rd	-	-	3,457	44%	3,435	44%	3,398	44%	3,560	46%	3,481	47%

B-series Action Alternatives (B, B.1, B.2)

The B-series alternatives would provide improvements to Route 1 at-grade, a new grade-separated interchange in the vicinity of Harrison Street, a WSC road between Route 1 and Washington Road and an indirect connection to existing Harrison Street at the D&R Canal. This would somewhat enhance the attractiveness of the Harrison Street corridor as an east-west travel route. Consequently, compared to the No-Action Alternative, the B-series alternatives would shift the distribution of two-way traffic west of Faculty Road (Location 1) from Alexander Road and Washington Road to Harrison Street. The greatest proportion of traffic would remain on Alexander Road.

The B-series alternatives include an ESC road and prohibit through access across Route 1 at Washington Road. The ESC road provides an alternative to Washington Road for accessing and crossing Route 1. Consequently, the most pronounced change in two-way traffic east of Route 1 between the NEC rail line and Route 1 (Location 2) would be the shift in traffic from Washington Road to the ESC road.

	No-Action		B		B.1		B.2	
	Vol	%	Vol	%	Vol	%	Vol	%
Location 1								
-Alexander Rd	2,229	40%	2,152	40%	2,121	39%	2,065	37%
-Washington Rd	2,058	37%	1,797	33%	1,863	35%	1,932	35%
-Harrison St	1,231	22%	1,425	27%	1,416	26%	1,533	28%
Location 2								
-Alexander Rd	2,631	49%	2,614	38%	2,973	41%	2,912	40%
-Washington Rd	2,670	51%	730	11%	902	13%	672	9%
-ESC Rd	-	-	3,528	51%	3,302	46%	3,733	51%

C-series Action Alternatives (C, C.1)

The C-series alternatives provide improvements to Route 1 at-grade, a grade-separated interchange in the vicinity of Harrison Street with limited improvements to existing Harrison Street at this location, and a two-way frontage road west of Route 1. The C-series alternatives prohibit through access across Route 1 at Washington Road. Given the nature of these improvements, compared to the No-Action Alternative, the C-series alternatives would result in a only minor shift in the distribution of two-way traffic west of Faculty Road (Location 1) from Washington Road to Alexander Road.

The C-series alternatives would not include an ESC road and they would provide only right-turn access to and from Route 1 northbound at Washington Road. Consequently, the distribution of two-way traffic between the NEC rail line and Route 1 (Location 2) would shift from Washington Road to Alexander Road.

	No-Action		C		C.1	
	Vol	%	Vol	%	Vol	%
Location 1						
-Alexander Rd	2,229	40%	2,253	41%	2,272	44%
-Washington Rd	2,058	37%	1,952	36%	1,651	32%
-Harrison St	1,231	22%	1,234	23%	1,205	23%
Location 2						
-Alexander Rd	2,631	49%	3,261	63%	3,378	63%
-Washington Rd	2,670	51%	1,940	37%	1,990	37%
-ESC Rd	-	-	-	-	-	-

D-series Action Alternatives (D, D.1, D.2)

The D-series alternatives would provide Route 1 in-a-cut with through access across Route 1 at Washington Road, a new grade-separated interchange in the vicinity of Harrison Street, one-way frontage roads on both sides of Route 1, and a WSC road to existing Harrison Street at or near the D&R Canal. This would enhance the attractiveness of the Harrison Street corridor as an east-west travel route. Consequently, compared to the No-Action Alternative, Alternatives D and D.1 would shift the distribution of two-way traffic west of Faculty Road (Location 1) from Alexander Road and Washington Road to Harrison Street. The greatest proportion of traffic would remain on Alexander Road.

Alternatives D and D.1 would include an ESC road. The ESC road provides an alternative to Washington Road for accessing and crossing Route 1. Consequently, the most pronounced change in two-way traffic east of Route 1, between the NEC rail line and Route 1 (Location 2), would be the shift in traffic from Washington Road to the ESC road.

Because Alternative D.2 would not include and ESC road, the distribution of two-way traffic between the NEC rail line and Route 1 (Location 2) would shift from Washington Road to Alexander Road, but traffic volumes on Washington Road would only be slightly reduced when compared to traffic volumes under the No-Action Alternative.

	No-Action		D		D.1		D.2	
	Vol	%	Vol	%	Vol	%	Vol	%
Location 1								
-Alexander Rd	2,229	40%	2,062	39%	2,104	40%	2,113	40%
-Washington Rd	2,058	37%	1,701	32%	1,727	33%	1,715	32%
-Harrison St	1,231	22%	1,563	29%	1,432	27%	1,504	28%
Location 2								
-Alexander Rd	2,631	49%	3,096	43%	3,145	44%	3,054	56%
-Washington Rd	2,670	51%	665	9%	645	9%	2,436	44%
-ESC Rd	-	-	3,384	47%	3,329	47%	-	-

E Action Alternative

Alternatives E would provide Route 1 in-a-cut with through access across Route 1 at Washington Road, a new grade-separated interchange in the vicinity of Fisher Place, one-way frontage roads on both sides of Route 1, and a WSC road to existing Harrison Street near the D&R Canal. This would enhance the attractiveness of the Harrison Street corridor as an east-west travel route. Consequently, compared to the No-Action Alternative, Alternative E would shift the distribution of two-way traffic west of Faculty Road (Location 1) from Alexander Road and Washington Road to Harrison Street.

Alternatives E would also include an ESC road. The ESC road provides an alternative to Washington Road for accessing and crossing Route 1. In addition, the less circuitous nature of the ESC road alignment increases its effectiveness as an alternative to Washington Road. Alternative E results in the most significant reduction in traffic along Washington Road in Penns Neck. The distribution of two-way traffic between the NEC rail line and Route 1 (Location 2) would shift from Washington Road to the ESC road.

	No-Action		E	
	Vol	%	Vol	%
Location 1				
-Alexander Rd	2,229	40%	2,015	38%
-Washington Rd	2,058	37%	1,785	34%
-Harrison St	1,231	22%	1,468	28%
Location 2				
-Alexander Rd	2,631	49%	3,081	44%
-Washington Rd	2,670	51%	547	8%
-ESC Rd		-	3,407	48%

F-series Action Alternatives (F, F.1)

The F-series alternatives would provide Route 1 in-a-cut with through access across Route 1 at Washington Road, a new grade-separated interchange in the vicinity of Harrison Street, and a WSC road to existing Harrison Street at or near the D&R Canal. Alternative F.1 also provides one-way frontage roads on both sides of Route 1. Under the F-series alternatives, through access across Route 1 on the new Harrison Street interchange would be prohibited. This enhances the attractiveness of the Harrison Street corridor as a travel route to and from Route 1. Consequently, compared to the No-Action Alternative, the F-series alternatives would shift the distribution of two-way traffic west of Faculty Road (Location 1) from Alexander Road and Washington Road to Harrison Street.

The F-series alternatives would include an ESC road. The ESC road provides an alternative to Washington Road for accessing Route 1. Consequently, the most pronounced change in two-way traffic between the NEC rail line and Route 1 (Location 2) would be the shift in traffic from Washington Road to the ESC road.

	No-Action		F		F.1	
	Vol	%	Vol	%	Vol	%
Location 1						
-Alexander Road	2,229	40%	2,041	39%	2,003	38%
-Washington Road	2,058	37%	1,516	29%	1,574	30%
-Harrison Street	1,231	22%	1,691	32%	1,689	32%
Location 2						
-Alexander Road	2,631	49%	2,886	37%	2,892	37%
-Washington Road	2,670	51%	1,206	15%	965	13%
-ESC Road	-	-	3,769	48%	3,876	50%

G-series Action Alternatives (G, G.1, G.2)

Alternatives G and G.1 would maintain Route 1 at-grade, retain the traffic signals and provide turning lane improvements at the Washington Road and Harrison Street intersections and remove the traffic signal at Fisher Place. Alternative G.2 would maintain Route 1 at-grade, eliminate the Penns Neck area traffic signals and prohibit through access across Route 1 at all three intersections.

The comparatively limited scale of these improvements would result in only minor changes in the distribution of traffic east and west of Route 1 when compared to the No-Action Alternative. Alternatives G and G.1 would result in a minor shift in the distribution of two-way traffic west of Faculty Road (Location 1) from Alexander Road and Washington Road to Harrison Street. Alternative G.2 would shift the distribution of two-way traffic at Location 1 from Washington Road to Harrison Street and Alexander Road. The G-series alternatives would shift the distribution of two-way traffic between the NEC rail line and Route 1 (Location 2) from Washington Road to Alexander Road.

	No-Action		G		G.1		G.2	
	Vol	%	Vol	%	Vol	%	Vol	%
Location 1								
-Alexander Rd	2,229	40%	2,142	39%	2,142	39%	2,259	44%
-Washington Rd	2,058	37%	1,981	36%	1,981	36%	1,506	29%
-Harrison St	1,231	22%	1,398	25%	1,398	25%	1,400	27%
Location 2								
-Alexander Rd	2,631	49%	3,007	59%	3,007	59%	3,077	61%
-Washington Rd	2,670	51%	2,129	41%	2,129	41%	1,961	39%
-ESC Rd	-	-	-	-	-	-	-	-

4.1.9 Change in Traffic Volume on Key Routes

Change in local traffic patterns was assessed based on the degree to which traffic increased or decreased in comparison to the No-Action Alternative. For comparison purposes, key roadway segments were selected and grouped into three generalized geographic areas: a) the core area between the D&R Canal and the NEC rail line; b)

west of the D&R Canal; and c) the vicinity of the NEC rail line. Table 4.1 presents the data related to change in traffic on these routes.

When considering the data, it is important to consider both the volume of traffic using a particular route and the percentage change in traffic. The percent change in traffic may be misleading relative to the impact of changing traffic patterns. For the purposes of this summary, traffic changes in the core study area in excess of 10% change are summarized below.

4.1.9.1 No-Action Alternative

Given projected growth in population and employment, the predominance of low-density, single-use land use patterns throughout the study area and anticipated continued reliance on automobile use to meet daily mobility needs, traffic throughout the PSA is expected to increase significantly by 2028. As shown in Table 4-3, compared to base-year traffic conditions, AM peak hour traffic volumes on virtually all core area roadways would increase significantly under the No-Action Alternative.

Table 4-3
Change in Traffic on Key Routes
Base Year vs. No-Action Alternative

	Base Year AM Peak Hour Volume	No-Action AM Peak Hour Volume	Percent Change
Core area b/w D&R Canal and NEC rail line			
Alexander Rd b/w Canal & Route 1	1,680	2,345	40%
Alexander Rd crossing D&R Canal	1,825	2,480	36%
Washington Rd b/w Canal and Route 1	1,390	2,425	75%
Washington Rd crossing D&R Canal	1,380	2,205	60%
Harrison St b/w Canal and Route 1 (Lower Harrison St)	925	1,180	28%
Harrison St crossing D&R Canal	925	1,180	28%
Mapleton Rd in Plainsboro	395	900	129%
Washington Rd in Penns Neck	1,605	2,670	66%
Fisher Place b/w Route 1 and Fairview Ave	45	0	--
Canal Pointe Blvd south of Alexander Rd	835	1,550	86%
West of D&R Canal			
Alexander Rd b/w Faculty Rd & University Pl	1,735	2,230	28%
Washington Rd b/w Nassau St & Faculty Rd	1,220	2,060	68%
Harrison St. b/w Nassau St & Faculty Rd (Upper Harrison St.)	900	1,230	37%
Nassau St b/w Mercer St & Washington Rd	1,495	1,805	21%
Nassau St b/w Washington Rd & Harrison St	1,195	2,345	96%
Faculty Rd b/w Alexander Rd & Washington Rd	725	1,055	45%
Faculty Rd b/w Washington Rd & Harrison St	350	850	142%
Vicinity of NEC rail line			
Alexander Road b/w Roszel Rd & Vaughn Dr	2,300	2,630	14%
Alexander Rd east of NEC rail line	610	1,565	157%
Wallace Rd	560	725	29%
North Post Rd	1,275	1314	3%
Bear Brook Road	620	1430	131%
CR 571 b/w Alexander Rd and Wallace Rd	1,215	2590	113%
Clarksville Road b/w No. Post Rd and CR 571	1,515	2065	36%

4.1.9.2 Action Alternatives

A-series Action Alternatives (A, A.1, A.2, A.3, A.4)

Compared to the No-Action Alternative, the A-series alternatives would reduce traffic on Washington Road through the Penns Neck neighborhood 50% to 65%. This is primarily due to the incorporation of an ESC road in these alternatives. As previously described, the components of the A-series alternatives would enhance the attractiveness of the Harrison Street corridor for east-west travel. Consequently, the A-series alternatives would increase traffic on Upper Harrison Street (west of Faculty Road) 23% to 32%. In addition, traffic on Washington Road west of Route 1 would be reduced 16% to 35%; traffic on Alexander Road between Route 1 and the D&R Canal would be reduced up to 17%; traffic on Alexander Road between Faculty Road and University Place would be reduced up to 10%; traffic on Faculty Road between Washington Road and Harrison Street would be reduced 30% to 44%; and traffic on Canal Pointe Boulevard would be reduced up to 23%. Because the A-series alternatives include a WSC road that bypasses Lower Harrison Street between Route 1 and the D&R Canal, these alternatives would reduce traffic on Lower Harrison Street 97%.

Compared to the No-Action Alternative, the A-series alternatives would reduce traffic on Alexander Road east of the NEC rail line 18% to 29%; reduce traffic on Wallace Road 15% to 36%; increase traffic on Bear Brook Road 13% to 19%; and increase traffic on Alexander Road between Roszel Road and Vaughn Drive 12% to 21%. These changes are primarily due to the incorporation of a Vaughn Drive connector (VDC) road as a component of these alternatives.

B-series Action Alternatives (B, B.1, B.2)

Compared to the No-Action Alternative, the B-series alternatives would reduce traffic on Washington Road through the Penns Neck neighborhood 66% to 75%. This is primarily due to the incorporation of an ESC road as a component of these alternatives, and because these alternatives would prohibit through access across Route 1 at Washington Road. Because the components of the B-series alternatives would enhance the attractiveness of the Harrison Street corridor for east-west travel, these alternatives would increase traffic on Upper Harrison Street by 16% to 25%; reduce traffic on Washington Road between Route 1 and the D&R Canal 47% to 86%; reduce traffic on Washington Road west of Faculty Road up to 13%; reduce traffic on Alexander Road between Route 1 and the D&R Canal up to 13%; reduce traffic on Nassau Street between Washington Road and Harrison Street 10% to 15%; and reduce traffic on Faculty Road between Washington Road and Harrison Street 18% to 26%. In addition, Alternatives B and B.1 would also reduce traffic on Canal Pointe Boulevard 12% to 17%. However, because Alternative B.2 includes a WSC road between Washington Road and Alexander Road, with a direct connection to Canal Pointe Boulevard, this alternative would increase traffic on Canal Point Boulevard 31%.

Alternatives B.1 and B.2 include a VDC road. As such, compared to the No-Action Alternative, these alternatives would reduce traffic on Alexander Road east of the NEC rail line by 15% to 31%; reduce traffic on Wallace Road 22% to 33%; reduce traffic on North Post Road 20% to 24%; increase traffic on Bear Brook Road 13% to 15%; and increase traffic on Alexander Road between Roszel Road and Vaughn Drive by 11% to 13%.

Alternative B, which does not include a VDC road would reduce traffic on Alexander Road east of the NEC rail line 13%; reduce traffic on Bear Brook Road 11%; increase traffic on Wallace Road 20% and increase traffic on Clarksville Road between North Post Road and CR571 11%.

C-series Action Alternatives (C, C.1)

The C-series alternatives would prohibit through access across Route 1 at Washington Road and include a VDC road, but they would not include an ESC road linking CR571 to Harrison Street. Consequently, the C-series alternatives discourage the use of Washington Road for east-west travel and do little to enhance travel along the Harrison Street corridor. Compared to the No-Action Alternative, the C-series alternatives would reduce traffic on CR571 in Princeton Junction between Alexander Road and Wallace Road 22% to 25%; reduce traffic on Washington Road through the Penns Neck neighborhood 25% to 27%; reduce traffic on Washington Road between Route 1 and the D&R Canal 24% to 59%; reduce traffic on Washington Road west of Faculty Road up to 20%; reduce traffic on Nassau Street between Washington Road and Harrison Street up to 15%; and increase traffic on Lower Harrison Street 10% to 11%.

Because Alternative C also includes a WSC road between Alexander Road and Washington Road, it would reduce traffic on Faculty Road between Alexander Road and Washington Road 12%. In addition, because the C-series alternatives include a VDC road, they would reduce traffic on Alexander Road east of the NEC rail line 12% to 20%; reduce traffic on Wallace Road 42% to 43%; reduce traffic on North Post Road 14% to 19%; and increase traffic on Alexander Road between Roszel Road and Vaughn Drive 24% to 28%.

D-series Action Alternatives (D, D.1, D.2)

Compared to the No-Action Alternative, Alternatives D and D.1 would reduce traffic on Washington Road through the Penns Neck neighborhood 75% to 76%. This is primarily due to the incorporation of an ESC road in these alternatives. Alternative D.2, which does not include and ESC road, would reduce traffic on Washington Road through the Penns Neck neighborhood by only 9%, or approximately 235 vehicles, in the AM peak hour.

Because the components of the D-series alternatives would enhance the attractiveness of the Harrison Street corridor for east-west travel, these alternatives would increase traffic on Upper Harrison Street 16% to 27%; reduce traffic on Washington Road between Route 1 and the D&R Canal 22% to 30%; reduce traffic on Washington

Road west of Faculty Road 16% to 17%; reduce traffic on Alexander Road between Route 1 and the D&R Canal 11% to 13%; reduce traffic on Nassau Street between Washington Road and Harrison Street 18% to 22%; and reduce traffic on Faculty Road between Washington Road and Harrison Street 41% to 46%.

Alternatives D and D.2 would include a WSC road that bypasses Lower Harrison Street between Route 1 and the D&R Canal. Consequently Alternative D would reduce traffic on Lower Harrison Street 97%. The WSC road included in Alternative D. 1 would only bypass Lower Harrison Street east of Logan Drive. Consequently, Alternative D.1 would only reduce traffic on the short segment of Lower Harrison Street between Route 1 and Logan Drive.

The D-series alternatives would also incorporate a VDC road. Consequently, compared to the No-Action Alternative, these alternatives would reduce traffic on Alexander Road east of the NEC rail line 26% to 28%; reduce traffic on Wallace Road 29% to 37%; reduce traffic on North Post Road up to 13%; increase traffic on Bear Brook Road up to 10%; and increase traffic on Alexander Road between Roszel Road and Vaughn Drive 16% to 20%.

E Action Alternative

Compared to the No-Action Alternative, Alternative E would reduce traffic on Washington Road through the Penns Neck neighborhood 80%. This is primarily due to the incorporation of the ESC3 alignment as part of the alternative. This alignment for the ESC road is less circuitous than the other ESC road alignments and provides a more time efficient east-west travel route. Because the components of Alternative E would enhance the attractiveness of the Harrison Street corridor as an east-west travel route, it would increase traffic on Upper Harrison Street 19%; reduce traffic on Washington Road between Route 1 and the D&R Canal 27%; reduce traffic on Washington Road west of Faculty Road 13%; reduce traffic on Alexander Road between Faculty Road and University Place 10%; reduce traffic on Nassau Street between Washington Road and Harrison Street 17%; and reduce traffic on Faculty Road between Washington Road and Harrison Street 36%. Alternative E would also include a WSC road that bypasses Lower Harrison Street between Route 1 and the D&R Canal. Consequently Alternative E would reduce traffic on Lower Harrison Street 97%.

In addition, compared to the No-Action Alternative, Alternative E would reduce traffic on Alexander Road east of the NEC rail line 25%; reduce traffic on Wallace Road 21%; reduce traffic on North Post Road 13%; increase traffic on Bear Brook Road 16%; and increase traffic on Alexander Road between Roszel Road and Vaughn Drive 17%. These changes would be primarily due to the incorporation of the VDC road.

F-series Action Alternatives (F, F.1)

Compared to the No-Action Alternative, the F-series alternatives would reduce traffic on Washington Road through the Penns Neck neighborhood 55% to 64%. This

reduction is primarily due to the incorporation of an ESC road as a component of the alternatives. Although the F-series alternatives prohibit through access across Route 1 at the proposed Harrison Street interchange, the design of the interchange would significantly enhance east-west access to and from Route 1 northbound and southbound. Consequently, the F-series alternatives would increase traffic on Upper Harrison Street approximately 37%; reduce traffic on Washington Road west of Route 1 24% to 38%; reduce traffic on Alexander Road west of Route 1 up to 19%; reduce traffic on Nassau Street between Washington Road and Harrison Street 18% to 23%; reduce traffic on Faculty Road between Alexander Road and Washington Road up to 16%; and reduce traffic on Faculty Road between Washington Road and Harrison Street 41% to 42%.

In addition, because the F-series alternatives would include a VDC road, these alternatives would reduce traffic on Alexander Road east of the NEC rail line by 23% to 31%; reduce traffic on Wallace Road 11% to 16%; reduce traffic on North Post Road up to 13%; increase traffic on Bear Brook Road 11% to 12% and increase traffic on Alexander Road between Roszel Road and Vaughn Drive approximately 10%.

G-series Action Alternatives (G, G.1, G.2)

Alternatives G and G.1 would maintain Route 1 at-grade, retain the traffic signals and provide turning lane improvements at the Washington Road and Harrison Street intersections. In addition, G and G.1 would remove the traffic signal at Fisher Place and include a VDC road. These alternatives would enhance access to and from Route 1 at Harrison Street. As a result, compared to the No-Action Alternative, traffic on Lower Harrison Street would increase approximately 32% and traffic on Upper Harrison Street west of Faculty Road would increase 14%. Because Alternatives G and G.1 would include a VDC road, traffic on Alexander Road east of the NEC rail line would decrease 11%; traffic on CR571 between Alexander Road and Wallace Road would decrease 17%; and traffic on Bear Brook Road would increase 18%.

Alternative G.2 would maintain Route 1 at-grade, eliminate the Penns Neck area traffic signals and prohibit through access across Route 1 at all three intersections. East-west travel across Route 1 would be accommodated via the existing interchanges at Alexander Road and Scudders Mill Road. This would diminish the attractiveness of Washington Road as an east-west travel corridor, increase the use of Alexander Road, and increase the use of Harrison Street because of its proximity to the Scudders Mill Road interchange and U-turn.

As a result, traffic on Washington Road east and west of Route 1 would decrease 27% to 45%; traffic on Alexander Road east and west of Route 1 would increase 10% to 17%; traffic on Lower Harrison Street would increase 41%; traffic on Upper Harrison Street would increase 14%; traffic on Nassau Street between Washington Road and Harrison Street would decrease 14%; traffic on Faculty Road between Alexander Road and Washington Road would increase 13%; and traffic on Faculty Road between Washington Road and Harrison Street would decrease 29%. In the area east

of the NEC rail line, traffic on Wallace Road would increase 38% and traffic on Clarksville Road between North Post Road and CR571 would increase 19%.

4.1.10 Truck Traffic on East-West Routes

Truck traffic on east-west routes was examined using the regional component of the EIS travel forecasting model (Table 4-4). For the purpose of this analysis, truck use was considered in terms of what proportion of total daily traffic on each route heavy trucks would represent. Model outputs related to truck traffic are primarily influenced by changes in regional land use patterns relative to uses known to generate significant truck traffic (e.g., warehouses, large scale retail, etc.), and significant changes in roadway infrastructure that add/improve links/connections within the existing roadway network. Given the regional nature of these influences, it should be noted that the predictive capability of travel demand models relative to localized changes in truck traffic patterns is limited. In addition, given the comparatively localized nature of the improvements contemplated under the action alternatives, the action alternatives would not be expected to significantly change truck traffic patterns on east-west routes.

Table 4-4
Trucks as a Percent of Total Daily Traffic

	Existing	No-Action, C and G-Series Alternatives	All other Alternatives
Alexander Rd	3.0%	5.4%	3.5%
Washington Rd	2.1%	3.9%	3.7%
Harrison St	4.2%	6.6%	5.8%

4.1.10.1 No-Action Alternative

Compared to existing conditions, under the No-Action Alternative the proportion of heavy trucks using Alexander Road as a percentage of total daily traffic would increase from the existing 3% to 5.4% in 2028. The proportion of heavy trucks using Washington Road would increase from the existing 2.1% to 3.9% and the proportion of heavy trucks using Harrison Street would increase from the existing 4.2% to 6.6% of total daily traffic.

4.1.10.2 Action Alternatives

The A, B, D, E and F-series Alternatives
Compared to No-Action Alternative, A, B, D, E and F-series Alternatives would decrease the proportion of heavy trucks using Alexander Road as a percentage of total daily traffic from 5.4% to 3.5%. The proportion of heavy trucks using Washington

Road would decrease from 3.9% to 3.7% and the proportion of heavy trucks using Harrison Street would decrease from 6.6% to 5.8% of total daily traffic.

The C and G-series Alternatives

The C-series alternative would result in truck usage patterns comparable to the No-Action Alternative. The proportion of heavy trucks using Alexander Road as a percentage of total daily traffic would be 5.4%. The proportion of heavy trucks using Washington Road would be 3.9% and the proportion of heavy trucks using Harrison Street would be 6.6% of total daily traffic.

4.2 Air Quality

The Clean Air Act Amendments (CAAA) of 1990 require each state to submit to the United States Environmental Protection Agency (USEPA) a State Implementation Plan (SIP) for attaining and maintaining air quality standards for pollutants for which the state is designated non-attainment. The SIP must contain the specific measures for controlling and reducing emissions to bring the state into compliance. The SIP must also include the criteria and procedures for determining the conformity of transportation plans, programs, and projects.

Transportation Conformity Statement

Transportation Conformity is a process required of Metropolitan Planning Organizations (MPOs) pursuant to the CAAA, to ensure that Federal funding and approval are given to those transportation activities that are consistent with air quality goals. USEPA promulgated the Transportation Conformity Rules (TCR) under the CAAA effective on December 27, 1993. The transportation conformity regulation, "Conformity to State or Federal Implementation Plans of Transportation Plans, Programs, and Projects Funded, Developed or Approved under Title 23 U.S.C. or the Federal Transit Act" (40 CFR Parts 51 and 93), is used for conformity determinations.

The study area is located in an ozone non-attainment area and hence a conformity determination is required. Nonattainment areas are those areas which have been designated by the United States Environmental Protection Agency (EPA) as not meeting the standard or are in "nonattainment." The conformity requirements are as follows:

1. The project must come from a conforming transportation plan (TIP), and
2. In CO non-attainment areas, the project must not cause or contribute to any new localized CO violations or increase the frequency or severity of any existing CO violations in CO nonattainment areas.

The Penns Neck Area EIS is currently listed in the Delaware Valley Regional Planning Commission's Fiscal Year 2003-2005 Transportation Improvement Program (TIP). The TIP was adopted by the DVRPC on June 27, 2002, and became effective

as of October 1, 2002. The Penns Neck Area EIS (DB# 031) is programmed for $0.10 million for Final Scope Development in FY 2003 only. The page from the TIP is provided in Appendix A. The project will be included in the STIP at the appropriate time.

Impact Analysis

A project is considered to have an impact on air quality if one of the following occurs:

1. The project causes a new violation of the Carbon Monoxide (CO) NAAQS or makes an existing violation worse (negative impact).

2. The project eliminates a violation of the NAAQS (positive impact).

The study of motor vehicles and their impact on ambient air quality is conducted in regard to primary and secondary pollutants. Primary pollutants are those emitted directly into the atmosphere by the vehicle exhaust. The primary pollutants from motor vehicles are carbon monoxide (CO), hydrocarbons (HC), oxides of nitrogen (NOx), oxides of sulfur (SOx), and particulate, which occur mainly in the form of lead and carbon soot. These pollutants are of regional concern and are analyzed for a project with all other programmed transportation projects in a region by the MPO as part of conformity analysis. The analysis presented in this report investigates only carbon monoxide, as motor vehicles are the main source of CO emissions nationwide. As a result of its relative inertness, the diffusion and transport of CO emissions in the atmosphere can be predicted in a mathematical model.

The assessment of a project's impact on air quality in the microscale area is made for two alternative conditions (Action and No-Action) for two time periods (the estimated time of completion (ETC) and ETC plus 20). For this project, the ETC year is 2008 and ETC plus 20 years is represented by the year 2028, or the project design year. Microscale refers to the region near the roadway, generally within 300 meters, where concentrations of pollutants from the vehicles are the highest and contribute noticeably to background pollutant levels.

Intersection Ranking

The analysis of air quality was performed for representative Action Alternatives and the No-Action Alternative. Action Alternatives with a similar design and configuration were grouped together for analysis. This resulted in seven series, A, B, C, D, E, F, and G, plus the Vaughn Drive Connector (VDC) Alternatives (1, 2, and 3) and the No-Action Alternative. From these groups, one Action Alternative, which was deemed to have the most potential for detrimental effect, was selected to represent each series. Using this "worst case" approach, the analyses yielded a conservative impact assessment for the series. The impacts of other alternatives in each series are understood to be incrementally less than the representative alternative.

For each representative Action Alternative, and the No-Action Alternative, the top three intersections were ranked by highest traffic volume and worst level of service (LOS), as prescribed by the USEPA's "Guideline for Modeling Carbon Monoxide from Roadway Intersections." The traffic volume and LOS data was obtained from the traffic modeling work performed for the Penns Neck Area EIS and discussed in Section 4.1 of this EIS.

Intersection Modeling
Models approved by the US Environmental Protection Agency (USEPA), MOBILE5b and CAL3QHC (Version 2.0) model, were utilized to develop appropriate emission factors and determine hourly concentrations of CO. Input parameters were obtained from NJDEP's publication *Air Quality Analysis for Intersections*, November 2001.

Roadway impacts were modeled using worst-case meteorological conditions as prescribed by the USEPA. These conditions include a stability class of "D" (neutral) for urban areas, a wind speed of 1 meter per second, and a mixing height of 1000 meters. A surface roughness length of 108 cm (combination of vegetated and paved areas) was used for this analysis. The model calculated the CO concentrations at each receptor for a given wind direction. The estimates of CO concentrations were made for the peak one-hour and peak eight-hour time periods. The peak eight-hour CO concentrations in this study were obtained by applying the USEPA's persistence factor of 0.7 to the calculated peak one-hour CO concentrations. Greater discussion of the air quality analysis may be found in the *Air Quality Technical Environmental Study, Penns Neck Area EIS.*

4.2.1 No-Action Alternative, Air Quality

The No-Action Alternative would involve no changes to the existing road network. Additional traffic from area growth is expected to increase congestion and delays on existing roadways through Design Year 2028. The modeled CO concentrations under the No-Action Alternative indicate that localized concentrations of CO will increase (Table 4-5). However, no violation of the AAQS for CO would occur under a No-Action Alternative.

4.2.2 Action Alternatives, Air Quality

CO analysis of the representative Action Alternatives indicates no violation of the AAQS for CO would occur (Table 4-5). Alternatives A.1, D, E and F would have Route 1 in-a-cut. Model results show that, of these alternatives, Alternatives E and F would have the smallest total CO 1-hour and 8-hour concentrations, while A.1 and D would have the highest total CO concentrations. Alternatives B, C.1 and G.1 would have Route 1 at-grade. Among these alternatives, Alternative B would have the smallest total CO 1-hour and 8-hour concentrations while G.1 would have some of the highest total CO concentrations.

4.2.3 Mitigation Measures, Air Quality

Neither the Action Alternatives nor the No-Action Alternative would cause an exceedance of the CO AAQS. No mitigation measures are warranted.

Table 4-5
Modeled CO Concentration Results

Alternative	Intersection and Peak Period	Receptors	1-hr (modeled)	1-hr Total(2)	8-hr Total(2)
No-Action	1. Rt 1 / CR 571 (AM) (Penns neck)	1. Princeton Baptist Church (Rt 1 - ROW)	4.3	7.3	5.1
		2. Princeton Baptist Church School Play ground (facing WB Washington road)	2.3	5.3	3.7
		3. EB Washington Road (ROW) (at the vicinity of 1st residence from intersection)	3.1	6.1	4.3
		4. SB Rt 1(ROW) (NW Quadrant)	5.6	8.6	6
	2. Rt 1 / Harrison Street (AM)	1. Eden Institute (Rt 1 - ROW)	4.1	7.1	5
		2. Eden Institute Play ground (Rt 1 - ROW)	4.3	7.3	5.1
		3. WB Sarnoff (ROW) (NE Quadrant)	6.9	9.9	6.9
	3. Rt 1 / Sarnoff Driveway (AM)	1. Eden Institute (Rt 1 - ROW)	5.7	8.7	6.1
		2. WB Sarnoff Driveway (ROW) (NE corner close to intersection)	6.8	9.8	6.9
		3. SB Rt 1 (ROW) (SW Quadrant)	7.3	10.3	7.2
	4. Rt 1 / Sarnoff Driveway (PM)	1. Eden Institute (Rt 1 - ROW)	5.6	8.6	6
		2. WB Sarnoff Driveway (ROW) (NE corner close to intersection)	6.0	9.0	6.3
		3. SB Rt 1 (ROW) (SW Quadrant)	6.8	9.8	6.9
A.1	1. Alexander Road / Vaughn Drive (AM)	1. WB Alexander Rd (ROW) (NE Quadrant)	7.2	10.2	7.1
	2. Alexander Road / Roszel road (AM)	1. WB Alexander Rd (ROW) (NE Quadrant)	5.8	8.8	6.2
	3. Alexander Road / Canal Pointe Blvd (PM)	1. EB Alexander Rd (ROW) (SW Quadrant)	4.3	7.3	5.1
	4. Alexander Road / North Post - Wallace Rd (PM)	1. NB North Post Road (ROW) (SE Quadrant)	4.5	7.5	5.3
		2. NB North Post Road (ROW) (NE Quadrant)	4.6	7.6	5.3
B	1. Alexander Road / Canal Pointe Blvd (PM)	1. EB Alexander Rd (ROW) (SW corner close to intersection)	3.7	6.7	4.7
	2. Alexander Road /	1. Rt 1 NB off Ramp (ROW) (SE corner close to intersection)	5.3	8.3	5.8
	3. Alexander Road / Roszel road (AM)	1. NB Roszel Rd (ROW) (SE Quadrant)	4.8	7.8	5.5
	4. Alexander Road / Vaughn Drive (AM)	1. WB Alexander Rd (ROW) (NE corner close to intersection)	5.5	8.5	6
	5. Alexander Road / North Post - Wallace Rd (PM)	1. NB North Post Road (ROW) (SE Quadrant)	3.7	6.7	4.7
		2. NB North Post Road (ROW) (NE Quadrant)	3.4	6.4	4.5
C.1	1. Alexander Road / Canal Pointe Blvd (PM)	1. EB Alexander Rd (ROW) (SW Quadrant)	4.9	7.9	5.5
	2. Alexander Road / Vaughn Drive (AM)	1. WB Alexander Rd (ROW) (NW quadrant)	5.9	8.9	6.2
	3. Alexander Road / Rt 1 NB off ramp (PM)	1. Rt 1 NB off Ramp (ROW) (SE quadrant)	5.9	8.9	6.2
	4. Alexander Road / Roszel road (AM)	1. WB Alexander Rd (ROW) (NE corner close to intersection)	5.5	8.5	6

Table 4-5
Modeled CO Concentration Results

Alternative	Intersection and Peak Period	Receptors	1- hr (modeled)	1- hr Total(2)	8- hr Total(2)
D	1. Alexander Road / Canal Pointe Blvd (PM)	1. EB Alexander Rd (ROW) (SW corner close to intersection)	5.0	8.0	5.6
	2. Alexander Road / Vaughn Drive (AM)	1. SB Vaughn Drive (ROW) (NW quadrant)	6.2	9.2	6.4
	3. Alexander Road / Roszel road (AM)	1. WB Alexander Rd (ROW) (NE corner close to intersection)	6.1	9.1	6.4
	4. Alexander Road / North Post - Wallace Rd (PM)	1. NB North Post Road (ROW) (SE Quadrant)	4.2	7.2	5
		2. NB North Post Road (ROW) (NE Quadrant)	3.9	6.9	4.8
E	1. Alexander Road / Vaughn Drive (AM)	1. EB Alexander Rd (ROW) (SW quadrant)	5.9	8.9	6.2
	2. Alexander Road / Canal Pointe Blvd (PM)	1. EB Alexander Rd (ROW) (SW corner close to intersection)	4.8	7.8	5.5
	3. Alexander Road / Roszel road (AM)	1. WB Alexander Rd (ROW) (NE corner close to intersection)	5.7	8.7	6.1
	4. Alexander Road / North Post - Wallace Rd (PM)	1. NB North Post Road (ROW) (SE Quadrant)	4.4	7.4	5.2
		2. NB North Post Road (ROW) (NE Quadrant)	4.2	7.2	5
F	1. Alexander Road / Vaughn Drive (AM)	1. EB Alexander Rd (ROW) (SW quadrant)	6.1	9.1	6.4
	2. Alexander Road / Canal Pointe Blvd (PM)	1. EB Alexander Rd (ROW) (SE quadrant)	5.4	8.4	5.9
	3. Alexander Road / Roszel Road (AM)	1. WB Alexander Rd (ROW) (NE Quadrant)	6.1	9.1	6.4
	4. Alexander Road / North Post - Wallace Rd (PM)	1. NB North Post Road (ROW) (SE Quadrant)	3.4	6.4	4.5
		2. NB North Post Road (ROW) (NE Quadrant)	3.4	6.4	4.5
G.1	1. Rt 1 / Harrison Street (AM)	1. Eden Institute (Rt 1 - ROW)	5.0	8.0	5.6
		2. Eden Institute Play ground (Rt 1 - ROW)	5.6	8.6	6
		3. EB Harrison Street (ROW) (SW Quadrant)	8.9	11.9	8.3
	2. Rt 1 / Washington Road (PM)	1. Princeton Baptist Church (Rt 1 - ROW)	4.1	7.1	5
		2. Princeton Baptist Church School Play ground (facing WB Washington road)	3.3	6.3	4.4
		3. SB Rt 1 (ROW) (SW Quadrant)	9.1	12.1	8.5
	3. Alexander Road / Canal Pointe Blvd (PM)	1. WB Alexander Rd (ROW) (NE quadrant)	4.1	7.1	5
	4. Alexander Road / Vaughn Drive (AM)	1. EB Alexander Rd (ROW) (SW quadrant)	6.0	9.0	6.3

EB – Eastbound
NB – Northbound
ROW – Right-of-way
SB – Southbound
WB – Westbound
(2) With Background CO

4.3 Noise

The analysis of potential noise impact of Action and No-Action Alternatives used the Federal Highway Administration (FHWA) Traffic Noise Prediction Model (FHWA-RD-77-108) and the Traffic Noise Model (TNM) Version 2.0. As indicated in Section 3.3.1 of this EIS, a noise impact occurs if one or both of the following occur:

1. Predicted Leq noise levels approach or exceed the Noise Abatement Criteria given in Table 3-14. Noise levels that approach the criteria are defined as occurring at 1 dBA less than these criteria.

2. A substantial increase in predicted noise levels over existing noise levels occur even though the impact criteria level is not reached. This increase is considered to be 10 dBA or greater, which is roughly a doubling or more of the perceived noise levels.

Table 4-6 summarizes the anticipated noise impacts as a result of the Action and No-Action alternatives. The following subsections discuss these findings.

Table 4-6
Modeled Traffic Noise Impacts

Alternative	Impacts	Alternative	Impacts
No-Action	28 Residences 1 Church 1 School 1Preschool	C.1	26 Residences 1 Church 1 School 1 Preschool
A	16 Residences 1 Preschool	D	17 Residences 1 School 1 Preschool
A.1	16 Residences 1 Preschool	D.1	21 Residences 1 School 1 Preschool
A.2	14 Residences 1 Preschool	D.2 (interpolated)	25 Residences 1 Church 1 School 1Preschool
A.3	14 Residences 1 Preschool	E	26 Residences 1 School 1 Preschool
A.4	16 Residences 1 Preschool	F	9 Residences 1 Preschool
B	22 Residences 1 Church 1 Preschool	F.1	13 Residences 1Preschool
B.1	22 Residences 1 Church 1 Preschool	G	28 Residences 1 Church 1 School 1Preschool
B.2	22 Residences 1 Church 1 Preschool	G.1	28 Residences 1 Church 1 School 1Preschool
C	26 Residences 1 Church 1 School 1 Preschool	G.2	28 Residences 1 Church 1 School 1Preschool

4.3.1 No-Action Alternative, Noise

Predicted traffic noise levels as a result of the No-Action Alternative would increase 4 dBA or less over the existing noise levels. Within the project study area, 28 residences, 1 church, 1 school, 1 preschool and a portion of Princeton University property would be subjected to noise levels that approach or exceed the NAC Category B level of 67 dBA Leq. The school, church and preschool would all be directly impacted by Route 1 traffic noise as in the existing condition. A small portion of Princeton University's property would be impacted both by Route 1 and Washington Road. A noise contour map for the No-Action Alternative is provided as Figure 4-4.

4.3.2 Action Alternatives, Noise

Noise contour maps for the Action Alternatives are provided as Figures 4-5 through 4-17.

Alternative A Series
Predicted noise levels would approach or exceed the NAC at up to 16 residences, a pre-school and a portion of Princeton University property under Alternatives A, A.1 and A.4. Alternatives A.2 and A.3 would have 14 residential impacts. All of the residential impacts are in the area of Fisher Place, Washington Road, and Varsity and Mather Avenues. The impact on Princeton University property is limited to the areas adjacent to Route 1, Washington Road, and the West-side Connector.

Alternative B Series
For all of the B alternatives, impacts would include 22 residences, a preschool, the Princeton Baptist Church (Category E) and a portion of Princeton University property. All locations would experience noise levels that approach or exceed the NAC. All of the residential impacts are in the area of Fisher Place, Washington Road, and Varsity and Mather Avenues. The "B" alternatives with either option of the west-side connector would increase noise levels substantially on portions of the University property.

Alternative C and C.1
Both "C" alternatives would impact 26 residences, the Princeton Baptist Church, Eden Institute, a preschool, and portions of Princeton University property. Noise levels would approach or exceed the NAC at these locations. Six of the residential impacts are on Harrison Street with the remainder in the area of Fisher Place, Washington Road, and Varsity and Mather Avenues.

Alternative D Series
D and D.1 would impact a preschool, Eden Institute, and 14 residences in the area of Fisher Place, Washington Road and Varsity and Mather Avenues would experience noise levels that approach or exceed the NAC. Portions of the Princeton University property that border Washington Road, Route 1, and the west-side connector would experience noise levels that approach or exceed the NAC. Alternatives D and D.1 would impact 3 and 7 residences on Harrison Street, respectively. The difference in impact levels is due to the alignments of the west-side connector.

D.2 would impact 3 residences on Harrison Street and 22 residences in the area of Fisher Place, Washington Road and Varsity and Mather Avenues would experience noise levels that approach or exceed the NAC. In addition, the Princeton Baptist Church, Eden Institute, a preschool, and portions of Princeton University property bordering Washington Road, Route 1 and Harrison Street would experience noise levels that approach or exceed the NAC.

Alternative E
Alternative E would impact 26 residences, including 5 in the area of Harrison Street, 7 on Fisher Place and 14 on Washington Road, and Varsity and Mather Avenues. The Eden Institute and a preschool would experience noise levels that approach or exceed the NAC as well as portions of Princeton University property that are adjacent to Washington Road, Route 1 and the west-side connector.

Alternative F and F.1
The "F" alternatives would have the lowest number of residential noise impacts of all the alternatives. All 9 residences for F and 13 residences for F.1 are in the area of Washington Road and Varsity and Mather Avenues. A preschool would also experience noise levels that approach or exceed the NAC under either alternatives as well as portions of Princeton University property that borders Washington Road, Route 1 and the west-side connector.

Alternative G Series
The G Alternatives would involve the least amount of change to roadway and travel patterns within the study area. As such, these alternatives would result in virtually no change in the noise environment from the No-Action Alternative. Six (6) residences on Harrison Street and 22 residences in the area of Fisher Place, Washington Road and Varsity and Mather Avenues would experience noise levels that approach or exceed the NAC. In addition, the Princeton Baptist Church, Eden Institute, a preschool, and portions of Princeton University property bordering Washington Road, Route 1 and Harrison Street would experience noise levels that approach or exceed the NAC.

4.3.3 Noise Abatement Potential

When predicted noise levels approach or exceed the NAC, or when there is a substantial increase in predicted noise levels over existing noise levels, an evaluation of noise mitigation measures is made. The FHWA recognizes five methods of noise mitigation for the reduction of traffic noise levels. The following potential abatement strategies were examined:

- Traffic management strategies
- Roadway alignment alterations
- Property acquisition to create a buffer zone between source and receptor
- Noise insulation of public use buildings
- Installation of noise barriers within the right of way

Traffic Management
Traffic management strategies for noise abatement purposes include alternate traffic routing and prohibiting certain classes of vehicles from using the proposed roadway. This project is designed to facilitate the passage of any class of vehicle on a multi-lane thoroughfare, including private or commercial vehicles. Consequently, prohibiting classes of vehicles is not a viable option for noise mitigation.

Roadway Alignment Alterations
In most circumstances, the sensitive receptors exposed to the highest noise levels are those located proximate to the roadway. Alterations to the roadway geometry can serve to reduce noise levels by moving the source further from the sensitive receptors. In this EIS, numerous alignment alterations were investigated. Selection of a preferred alternative would be made cognizant of the noise impact consequences.

Property Acquisition
Property along a roadway corridor can be acquired to form a buffer zone between noise sensitive receptors and a roadway. This strategy is usually only considered where unimproved property is available between the roadway and noise sensitive receptors. In the study area, few undeveloped or scarcely developed areas exist along the various Action alignments where effective buffer zones could be acquired. Additionally, this treatment would not alleviate the noise impacts to the existing receptors immediately adjacent to existing or proposed roadways since land is either not available to separate those receptors from the roadway or the land that does exist is insufficient in size to effectively reduce noise levels.

Sound Proofing
Noise insulation of public use facilities and buildings can be considered for facilities affected by noise impacts. The Princeton Baptist Church would have interior noise levels that approach or exceed the NAC (Category E) with the "B", "C" and "G" alternatives. Based on the recent noise monitoring, the Church already has a significant building attenuation (22 dBA) and the structure is air-conditioned, which allows the windows to remain closed during warm weather. If one of the above alternatives is selected for construction, further investigation of the potential to provide noise insulation could be investigated during design of the selected alternative.

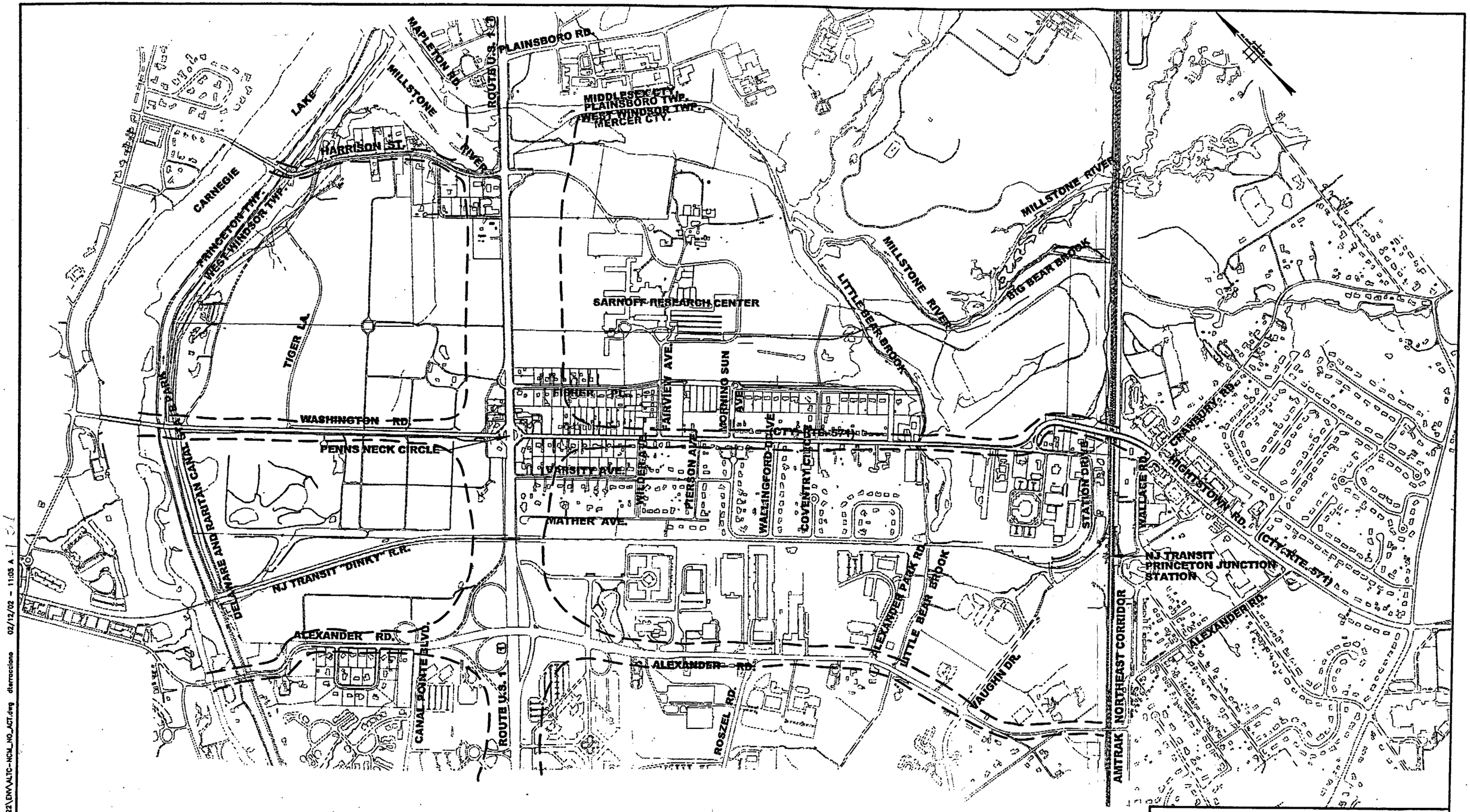
Noise Barriers
Noise barriers, when properly designed and installed, are an effective means for reducing traffic noise at noise sensitive receptors located along a roadway. Several factors must be considered before noise barriers can be determined appropriate for a project. These include engineering feasibility, the noise reduction level that can be attained, the direct benefit of a barrier which is the number of noise impacts eliminated, any supplemental benefits of a barrier, barrier cost and the cost per residence or the economics of a barrier.

For the most part noise barriers are not feasible within the study area due to the land service nature of the roadways. However, the construction of noise barriers was found to be feasible at two locations for a few of the alternatives. The locations of the barriers are shown in Figures 4-12 through 4-14.

Eden Institute
A noise barrier 18 feet in height and 700 feet long adjacent to the southbound side of Route 1 would eliminate the noise impact to the school under the "D" and "E" alternatives. A barrier is estimated to cost $290,000 and would reduce noise levels by as much as 10 dBA and would eliminate the impact at the school.

Fisher Place
A barrier 16 feet high and 1200 feet long would eliminate predicted noise impacts at 7 residences on Fisher Place under Alternative E. A barrier could be located adjacent to the east-side connector near the western end of Fisher Place. Two residences would receive a supplemental benefit with a barrier. With an estimated cost of $370,000, the cost per residence would be $44,000.

In the course of the final design of projects that have had noise mitigation recommended, the NJDOT typically conducts a Final Noise Study. The Final Noise Study reassesses the noise impact findings, and addresses remaining traffic noise mitigation issues. These issues would include the selection and detailed design of noise barriers, updates on land use in the project area, and examination of any design changes to the project that might affect noise.



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

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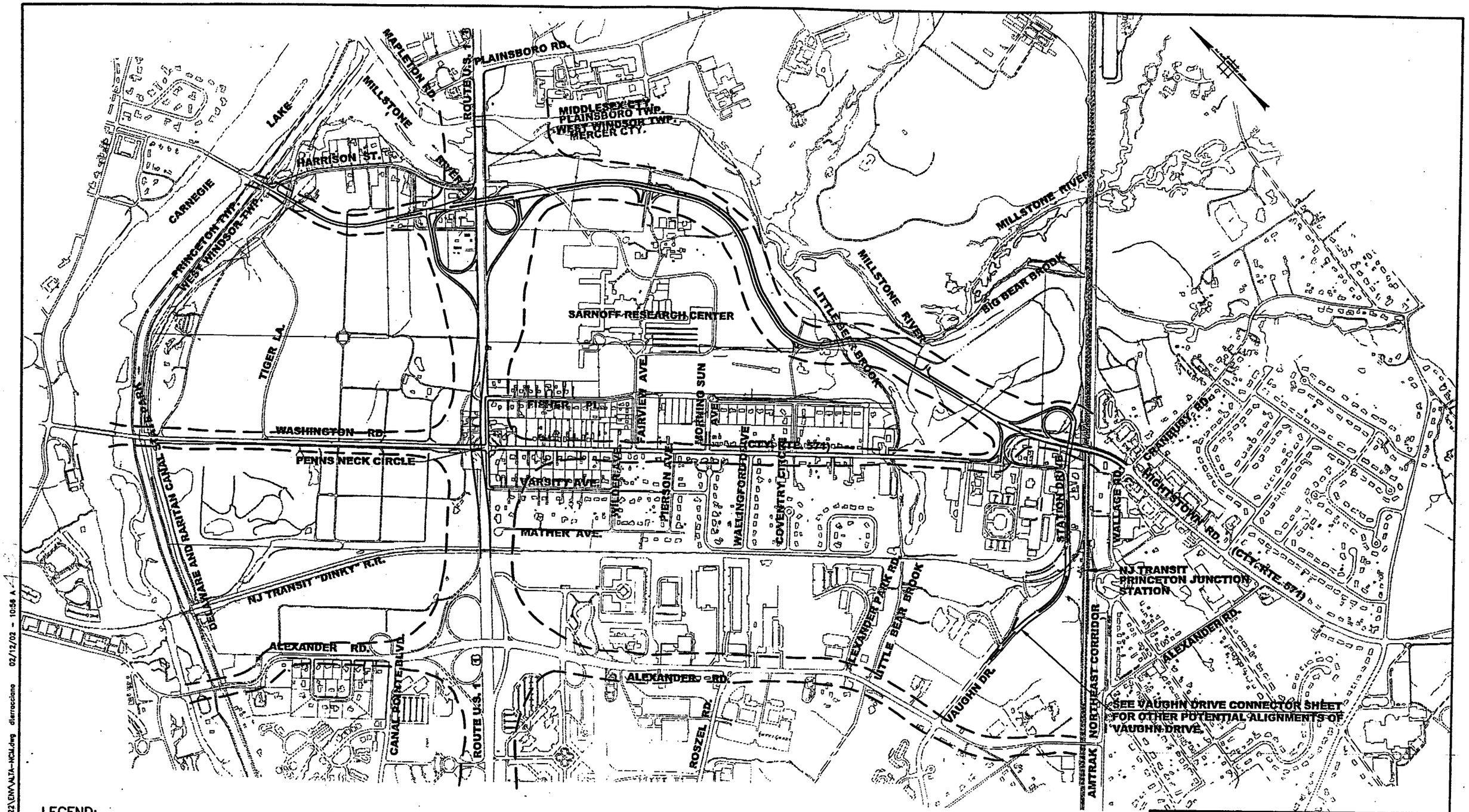
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
NO ACTION

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-4



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- EXISTING CONDITIONS
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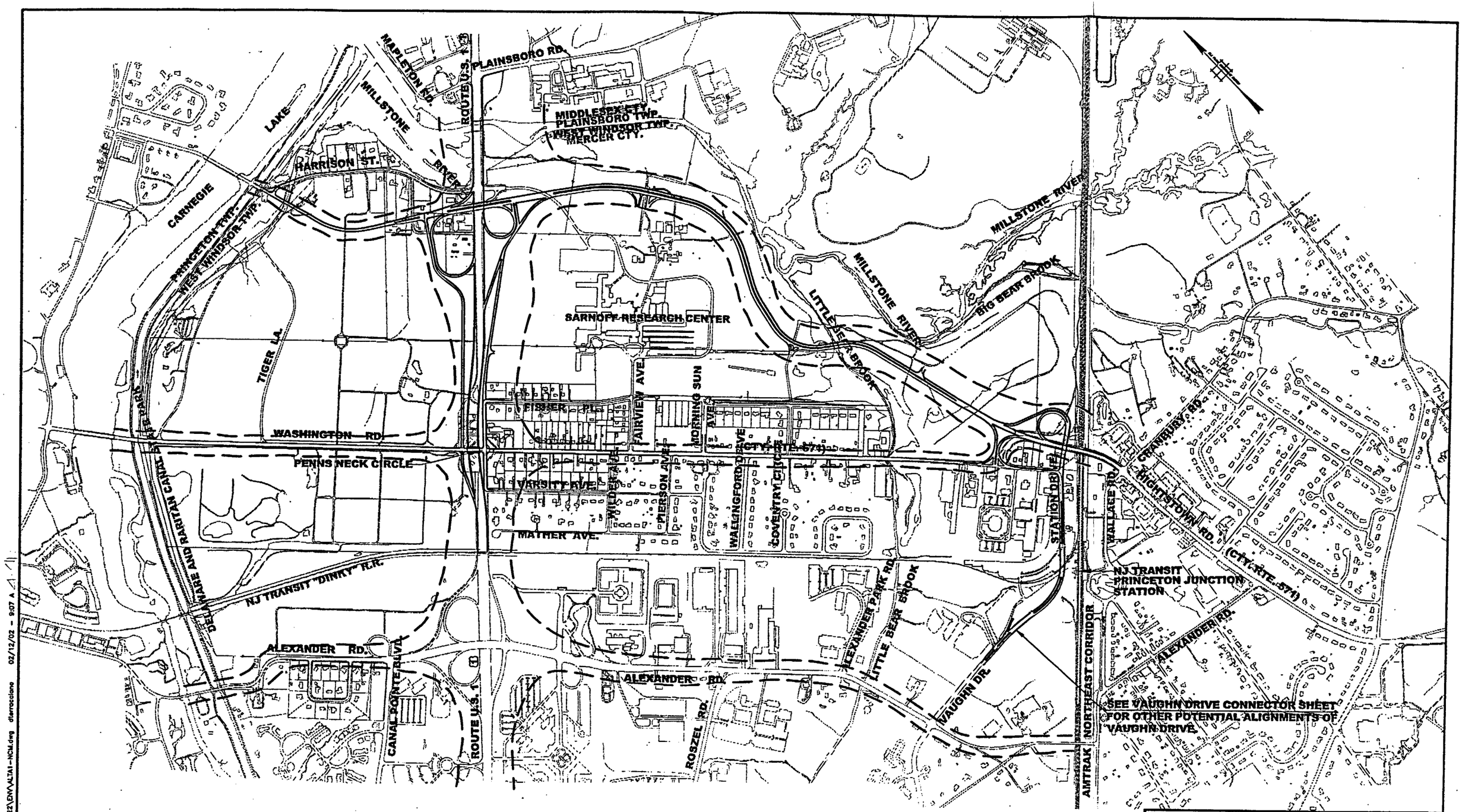
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE A

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-5



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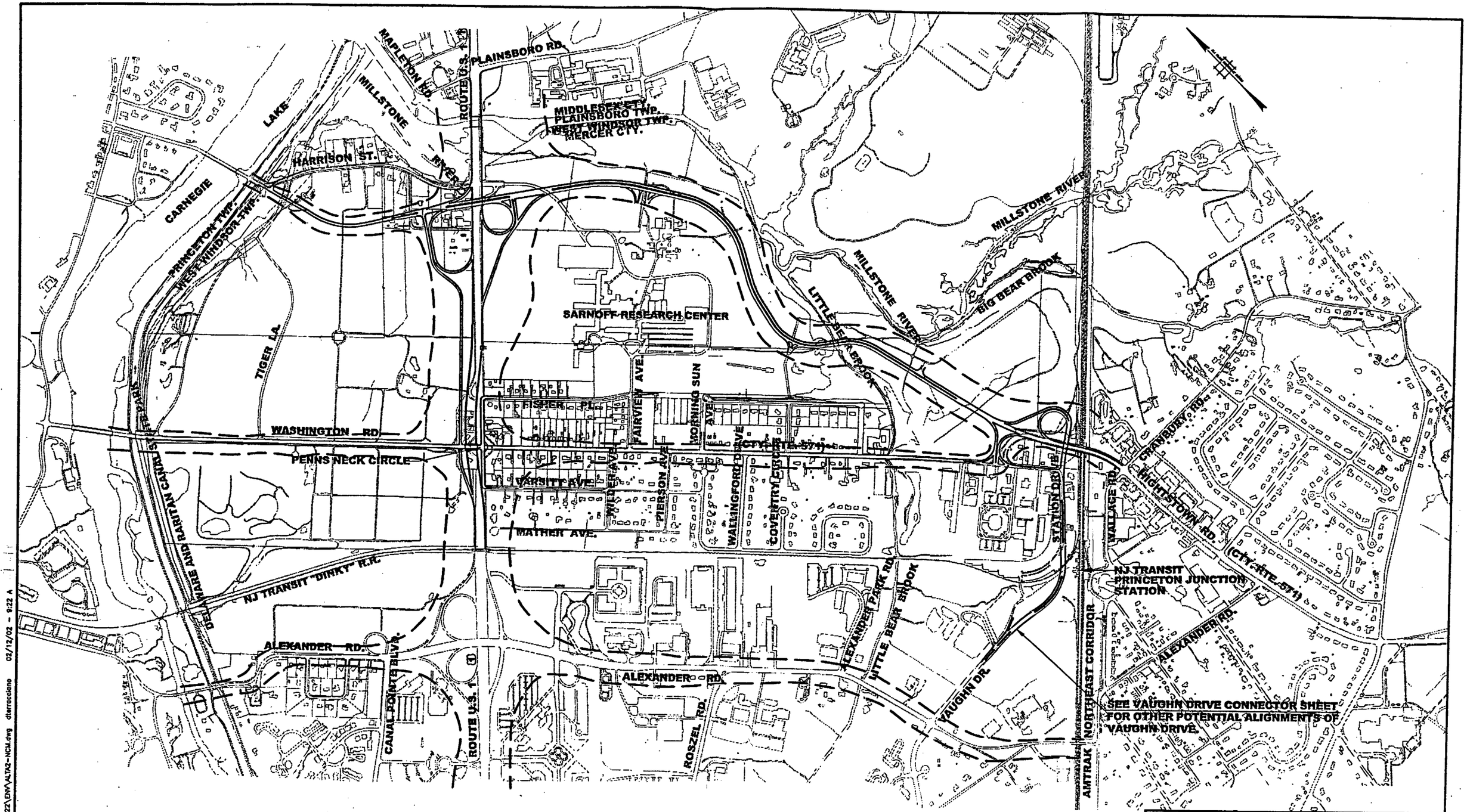
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE A.1

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-6



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- EXISTING CONDITIONS
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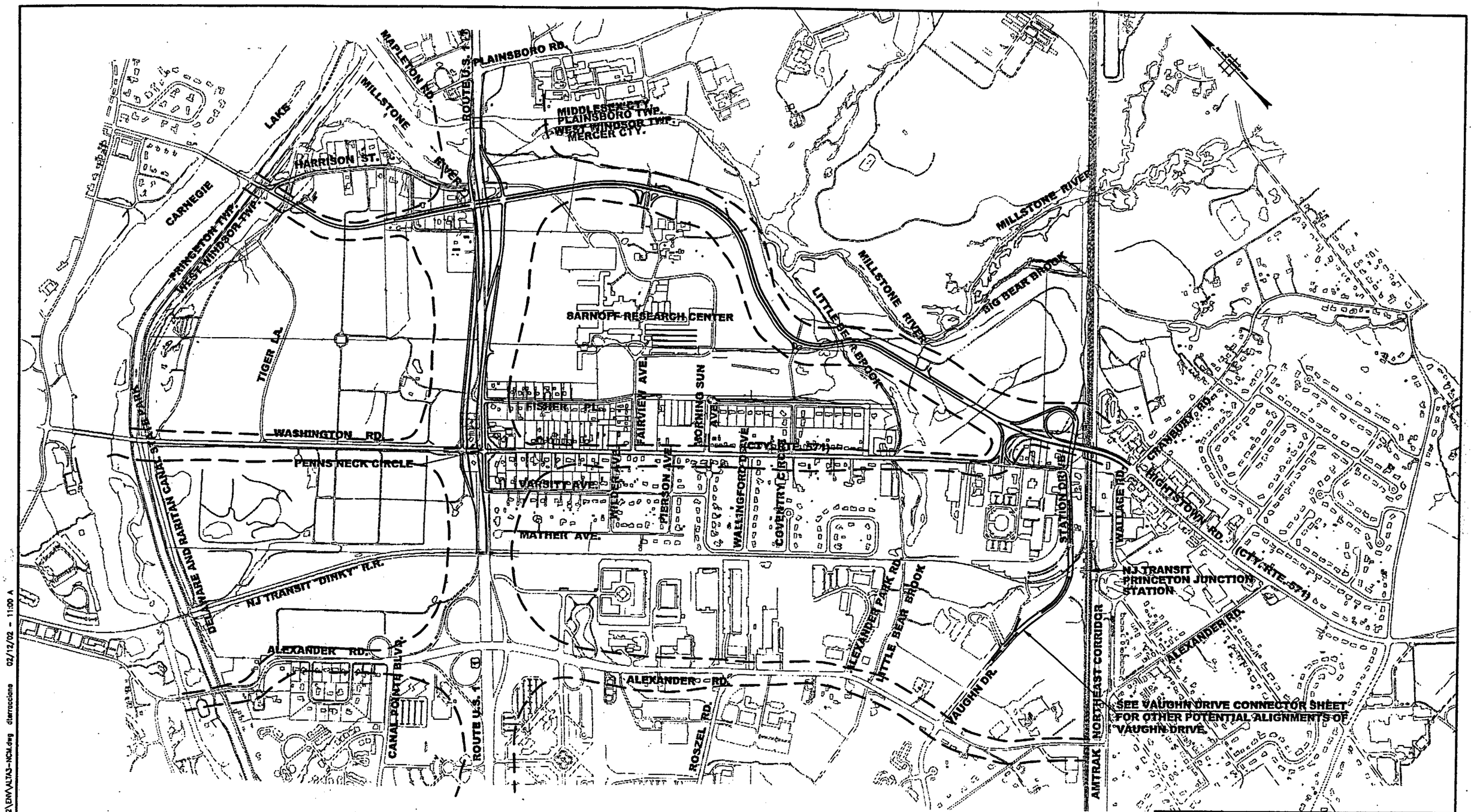
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE A.2

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-7



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- EXISTING CONDITIONS
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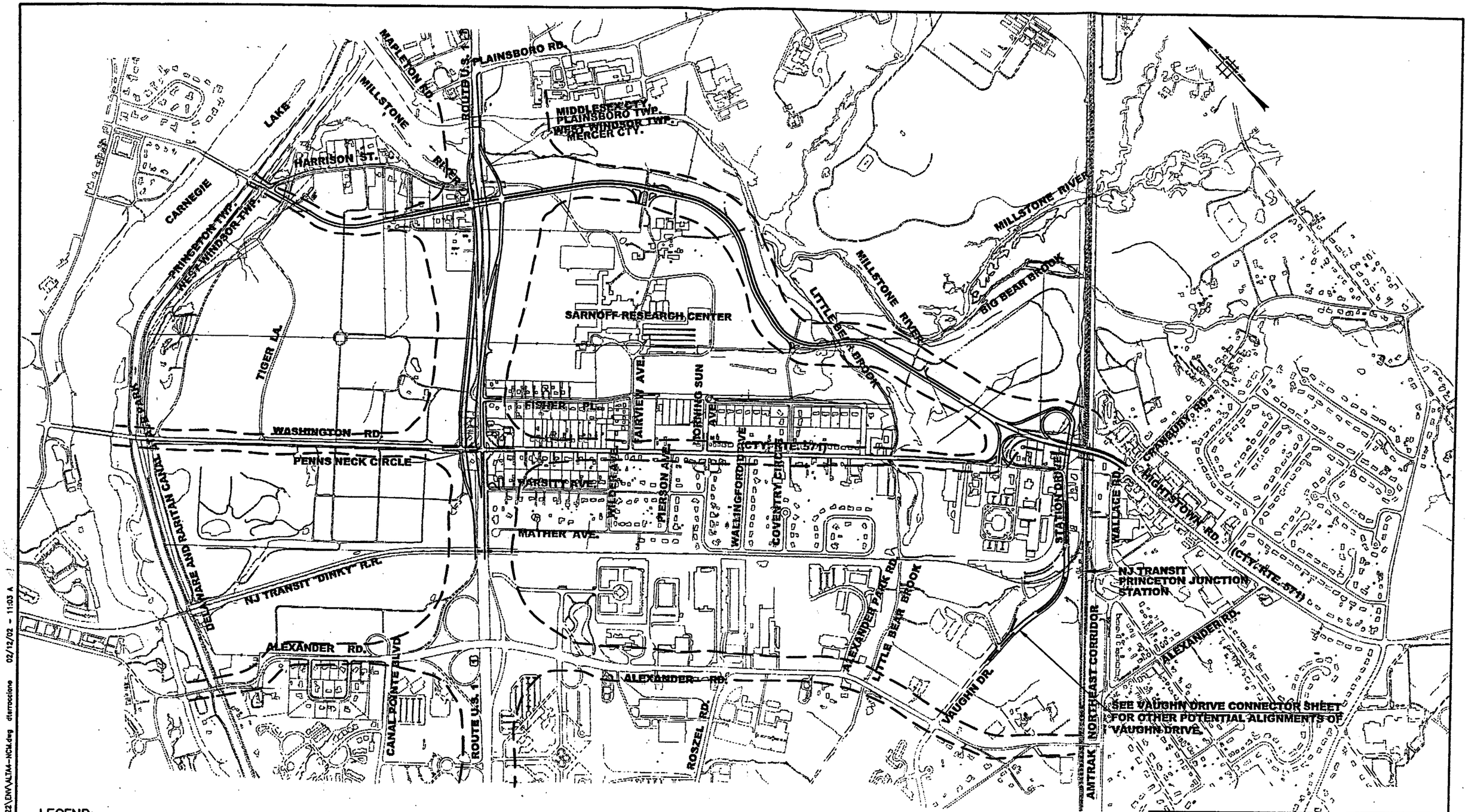
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE A.3

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-8



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- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
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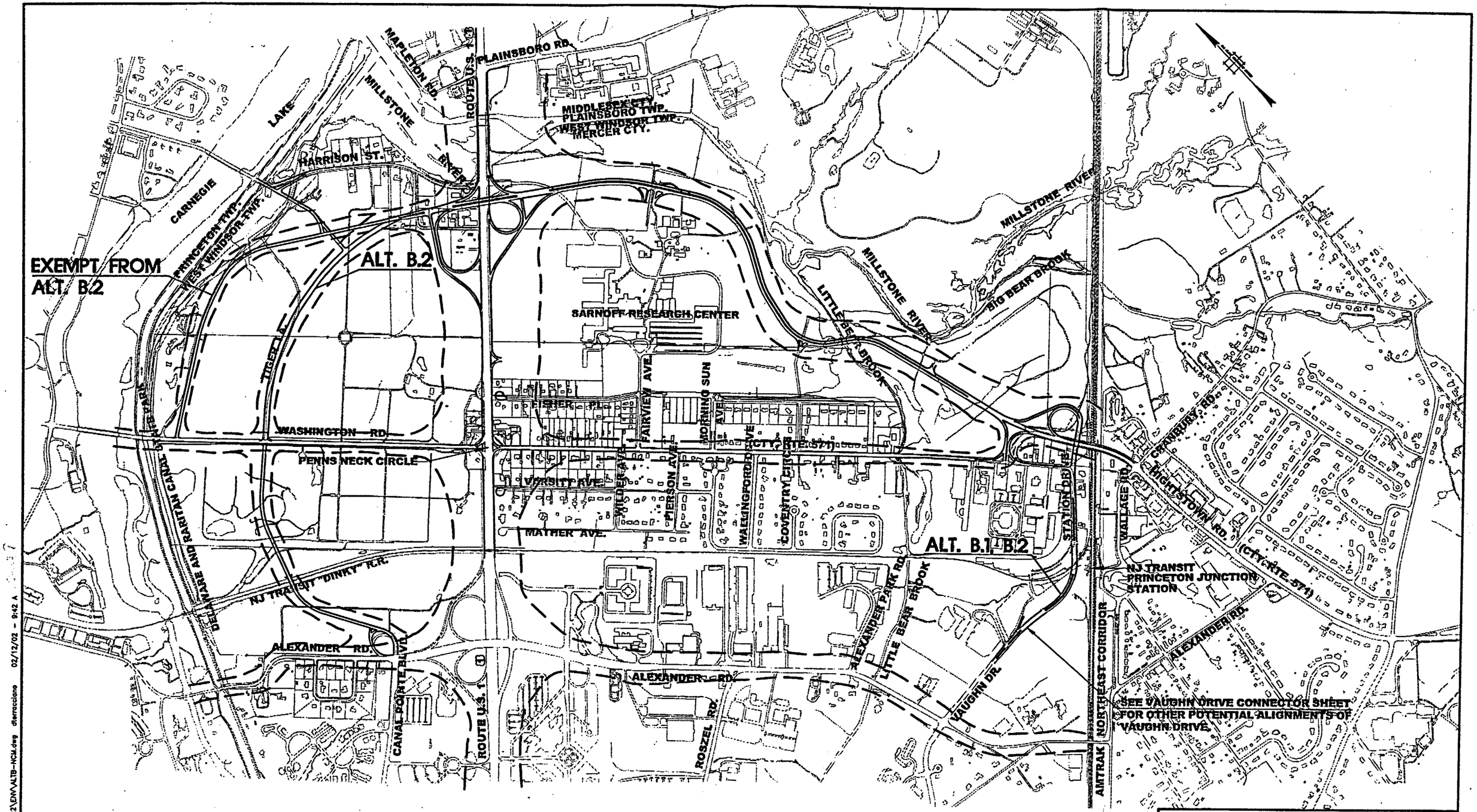
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE A.4

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-9



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

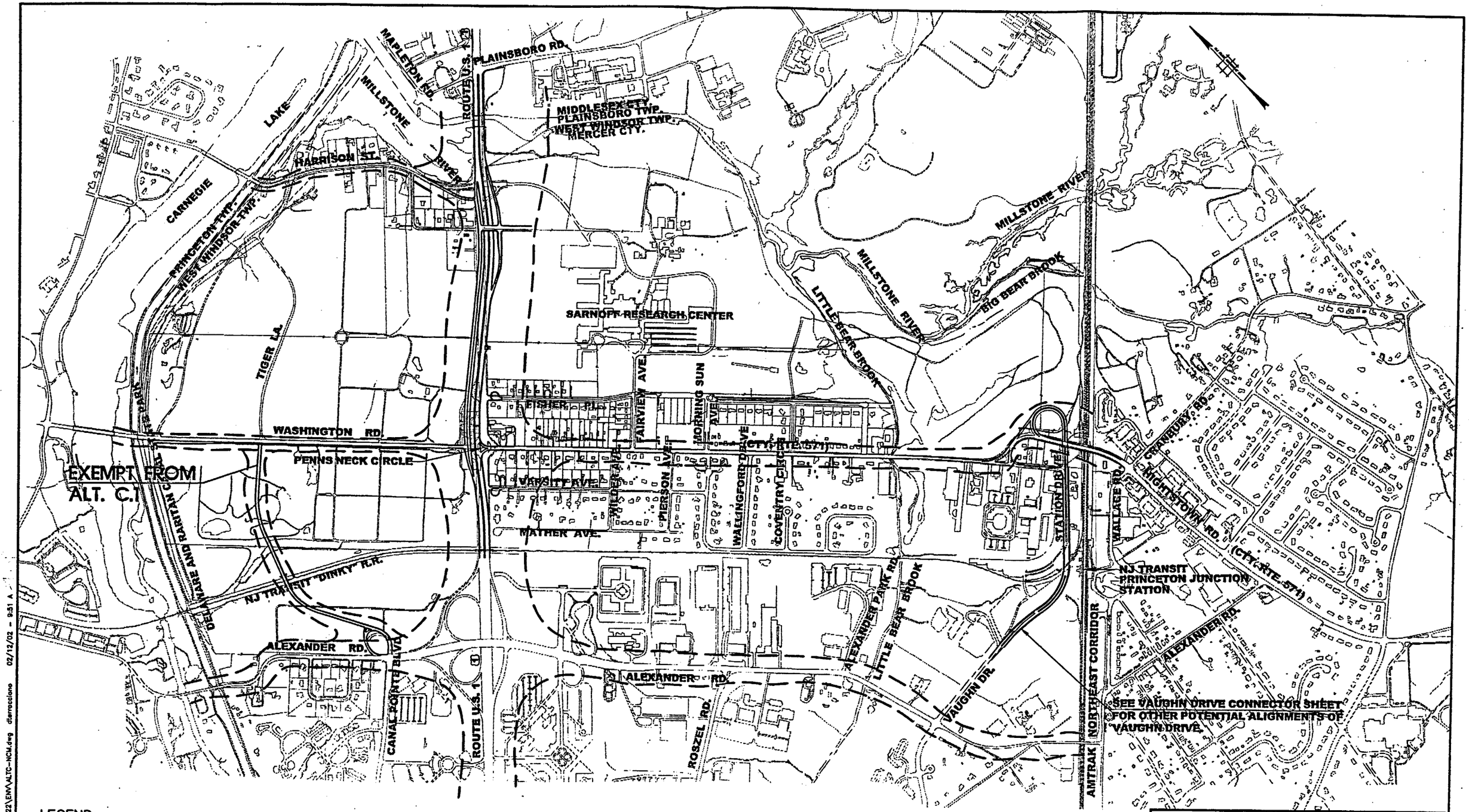
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE B, B.1, B.2

DATE: NOV. 2002
SCALE: 1"=1000'

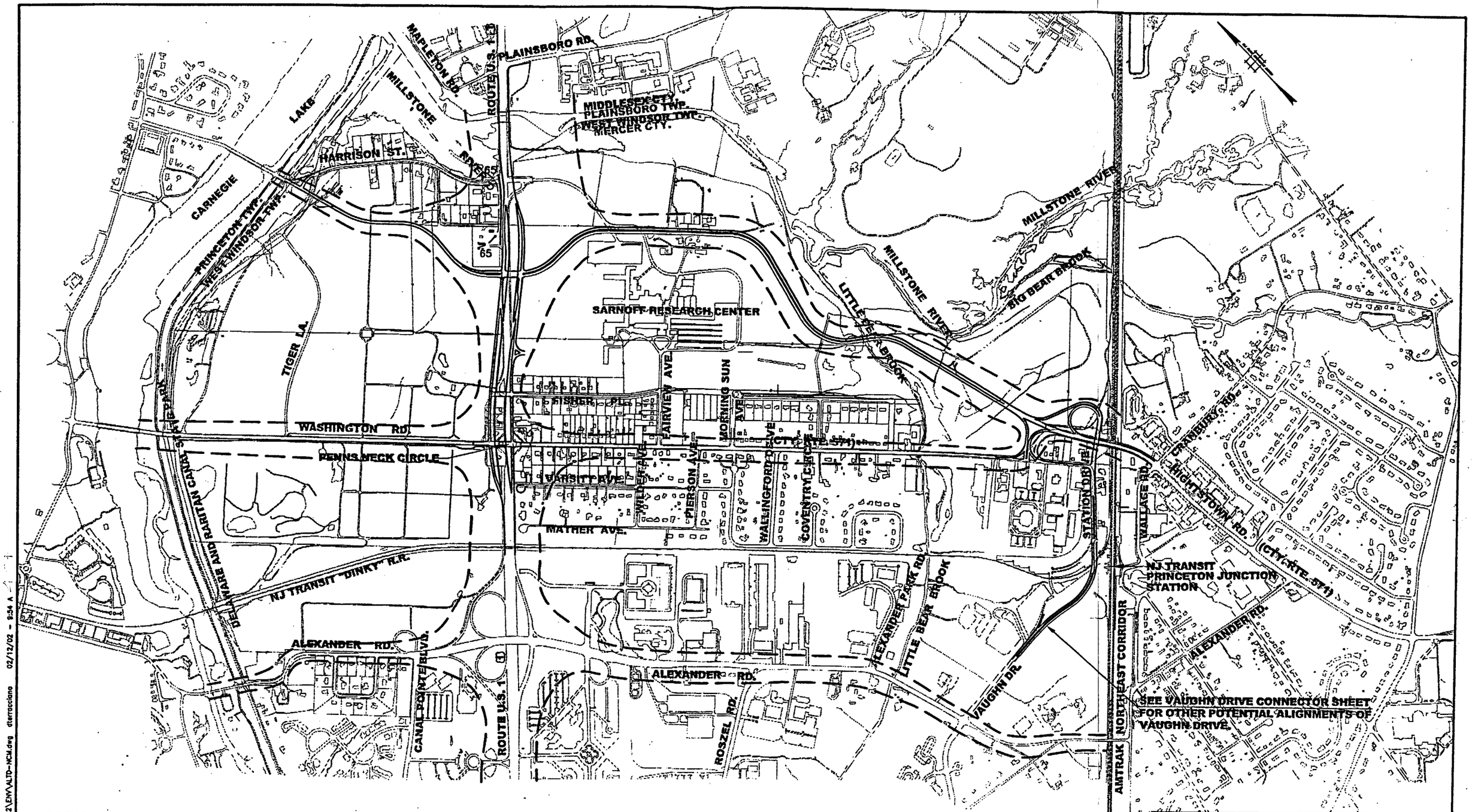
FIGURE 4-10



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

NEW JERSEY DEPARTMENT OF TRANSPORTATION	
PENNS NECK AREA ENVIRONMENTAL IMPACT STATEMENT NOISE CONTOUR MAP ACTION ALTERNATIVE C, C.1	
DATE: NOV. 2002 SCALE: 1"=1000'	FIGURE 4-11



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

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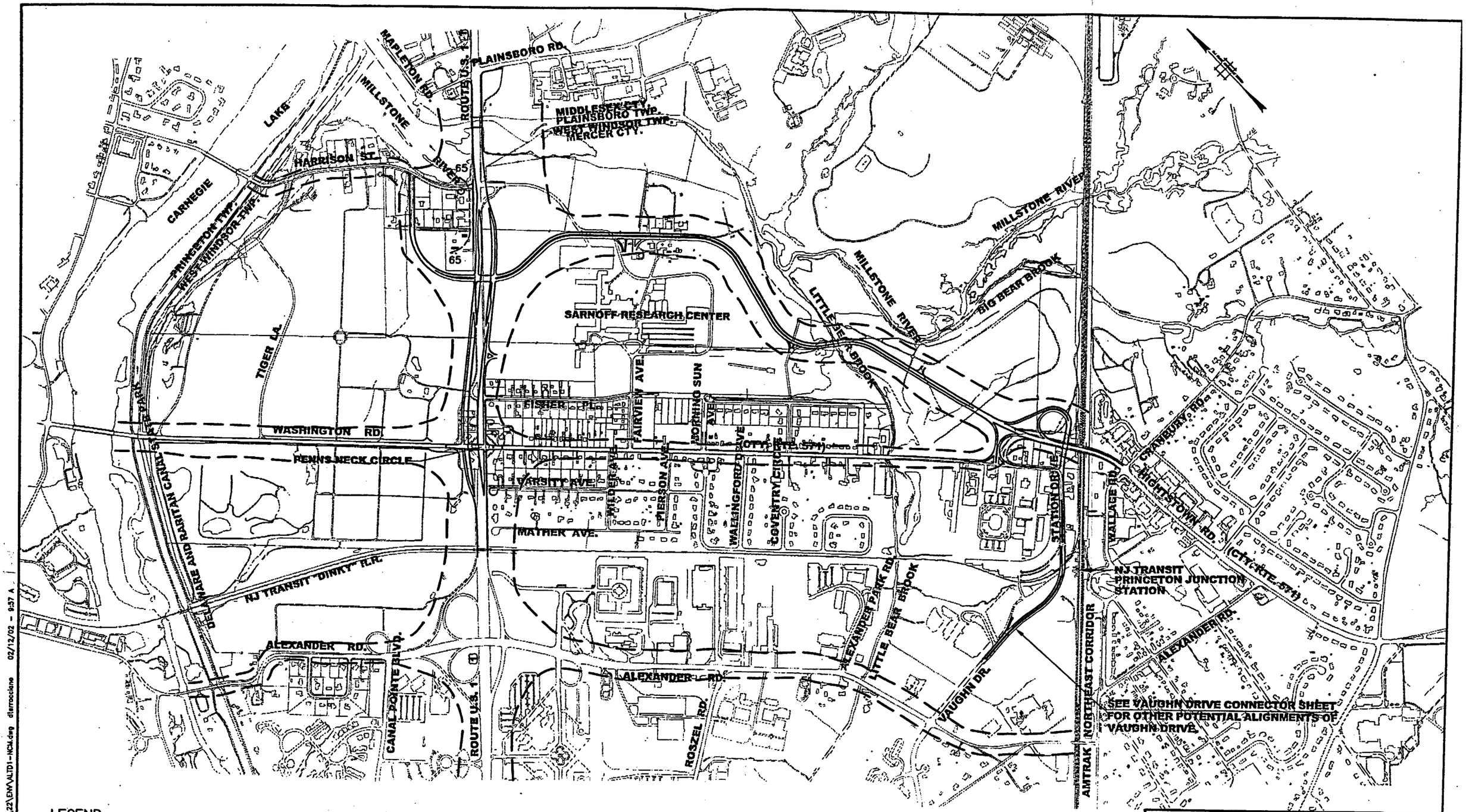
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE D

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-12



LEGEND:

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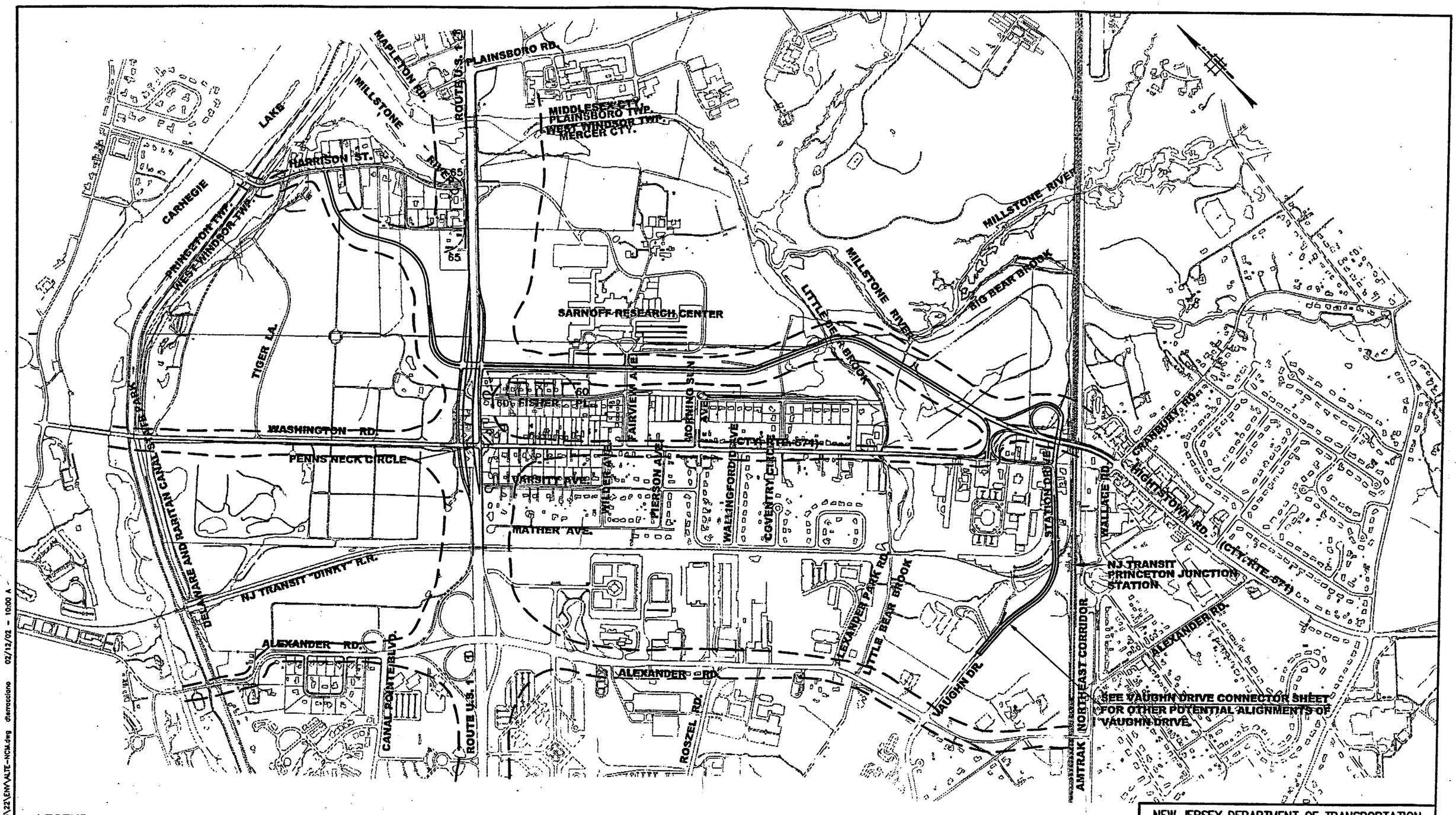
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

NEW JERSEY DEPARTMENT OF TRANSPORTATION	
PENNS NECK AREA ENVIRONMENTAL IMPACT STATEMENT NOISE CONTOUR MAP ACTION ALTERNATIVE D.1	
DATE: NOV. 2002 SCALE: 1"=1000'	FIGURE 4-13



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- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
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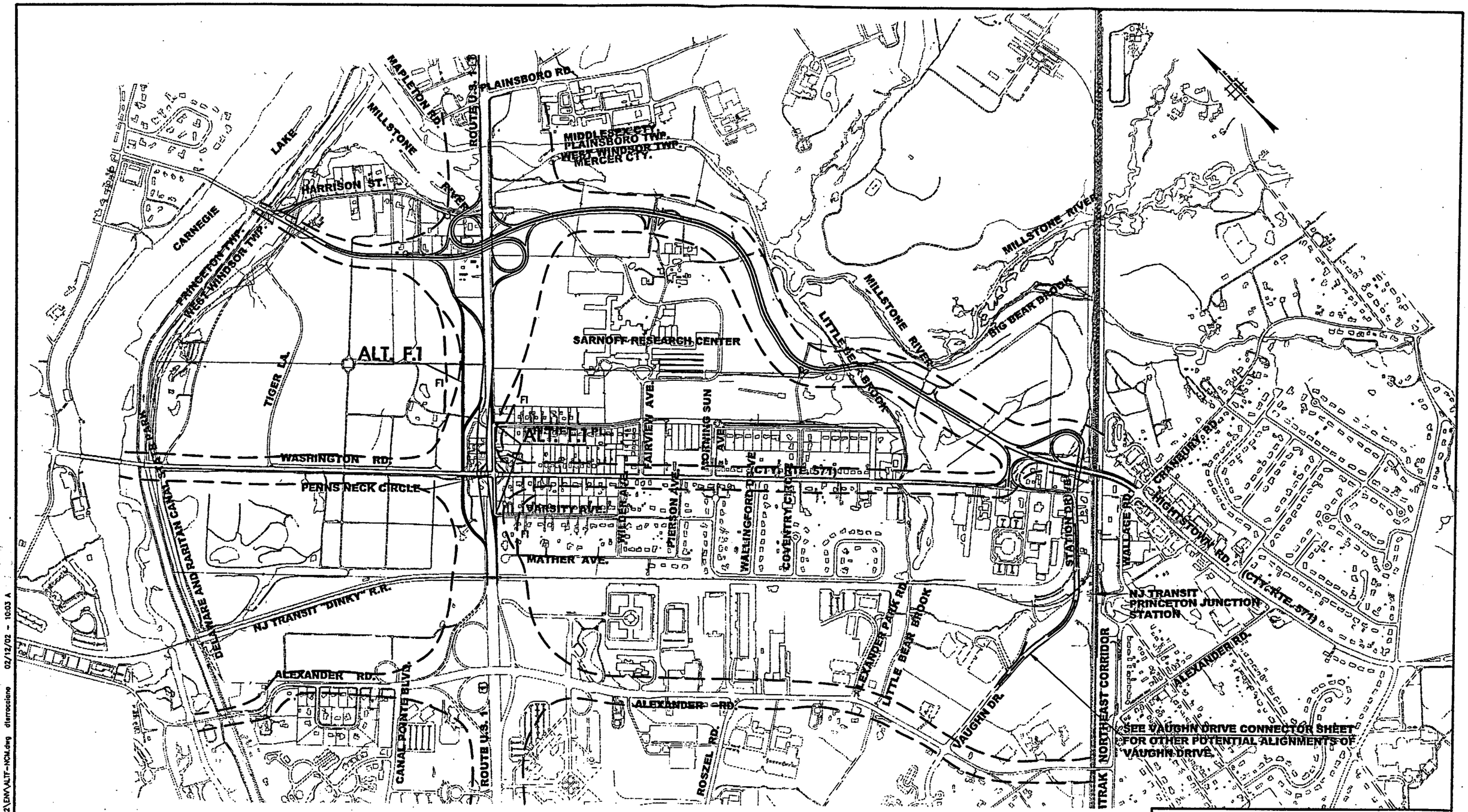
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE E

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-14



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
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- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

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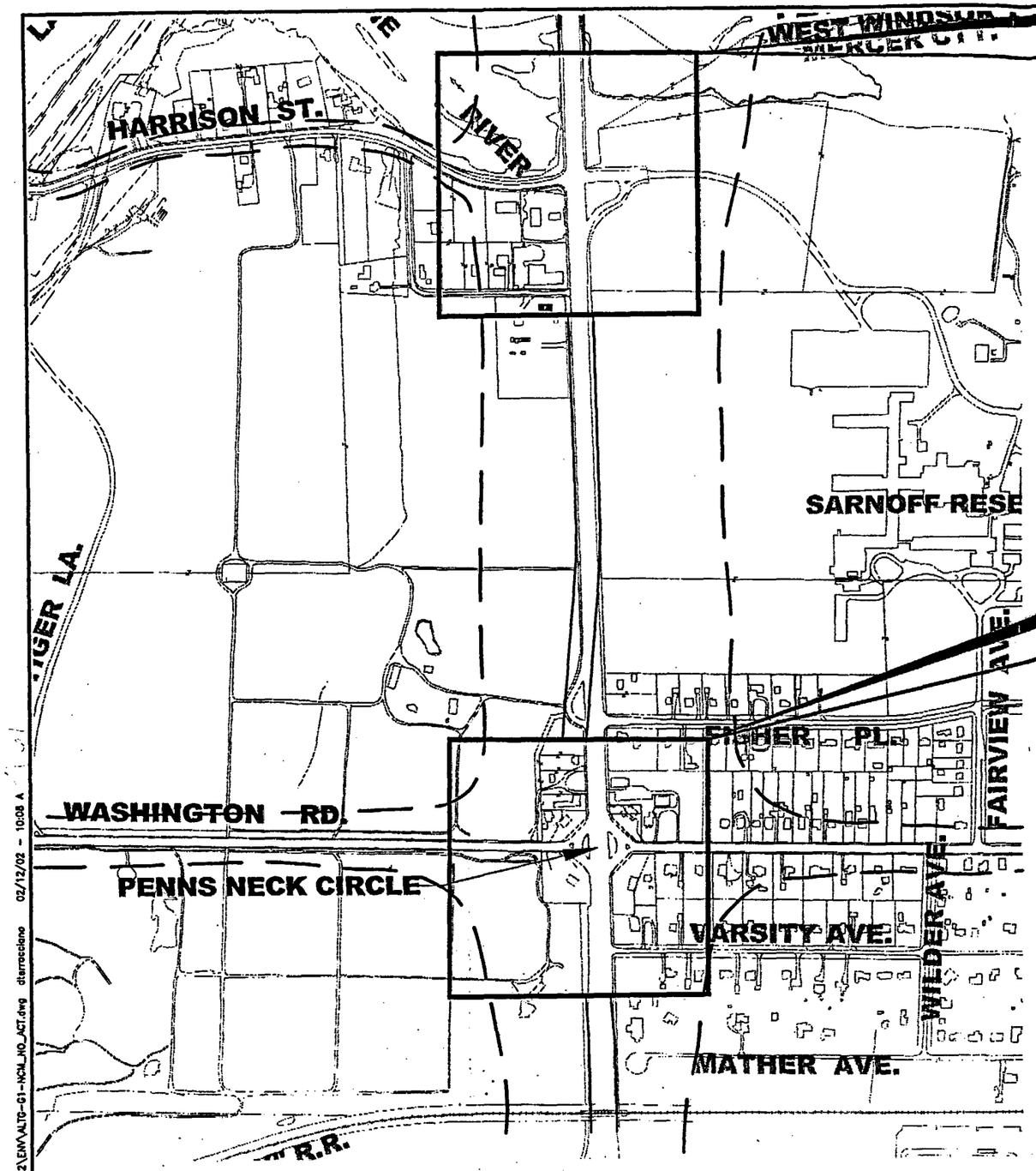
NEW JERSEY DEPARTMENT OF TRANSPORTATION

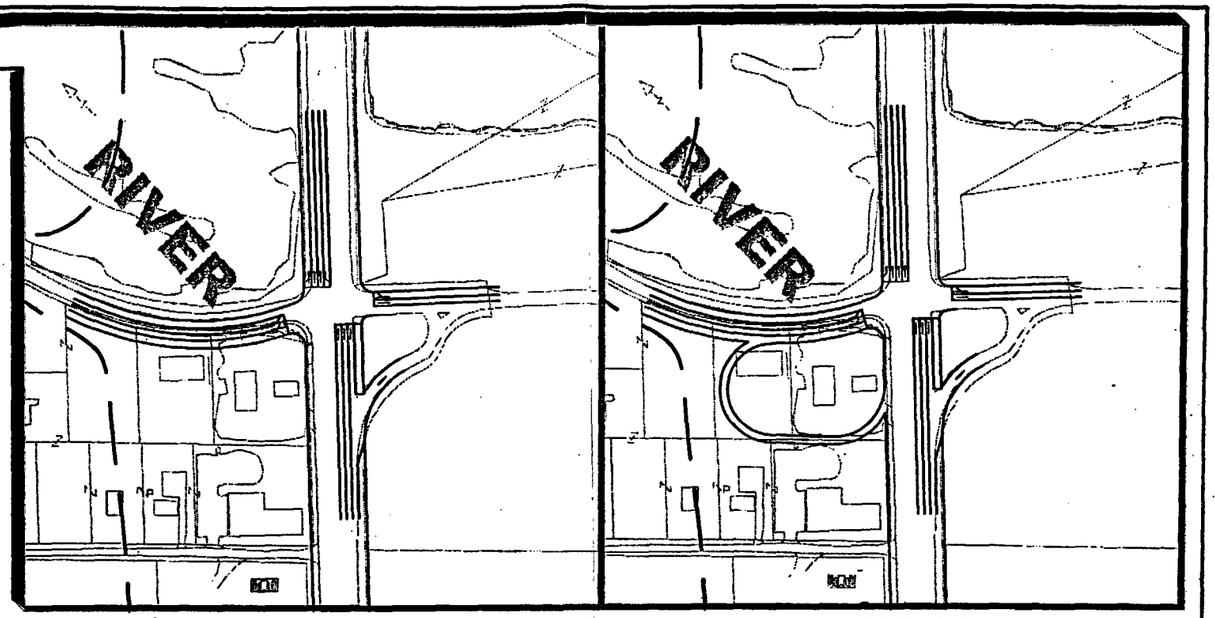
PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE F, F.1

DATE: NOV. 2002
SCALE: 1"=1000'

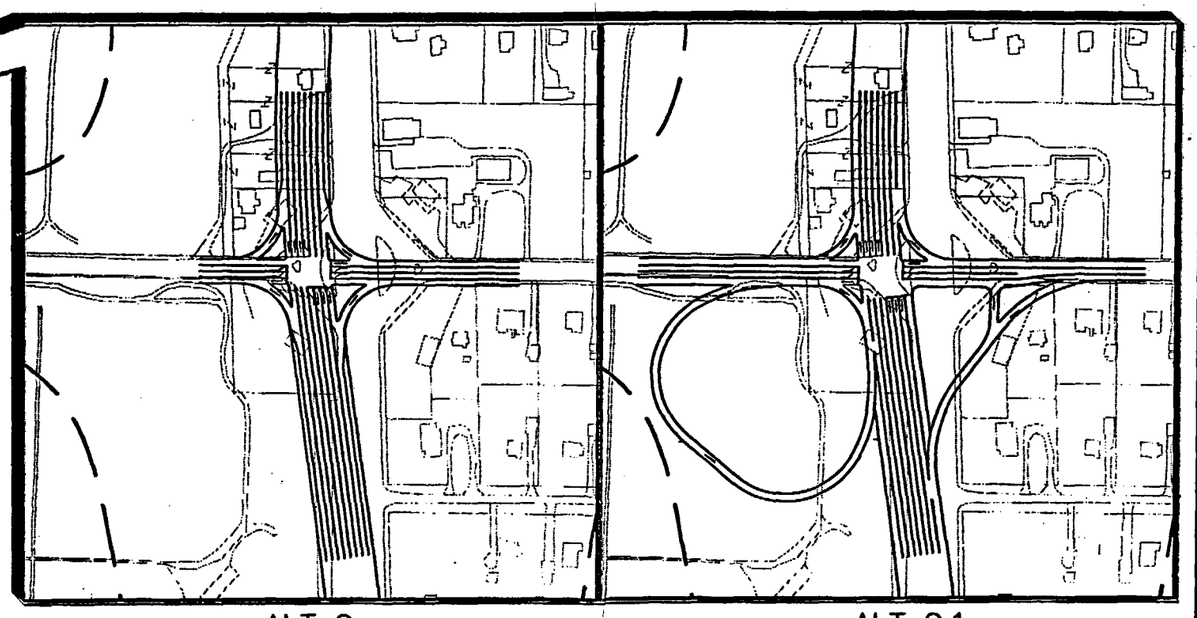
FIGURE 4-15





ALT G

ALT G.1



ALT G

ALT G.1

LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

NOTE:

NOISE CONTOURS FOR ALTERNATIVES G, G.1, G.2 AND THE NO ACTION ALTERNATIVE ARE VIRTUALLY IDENTICAL.

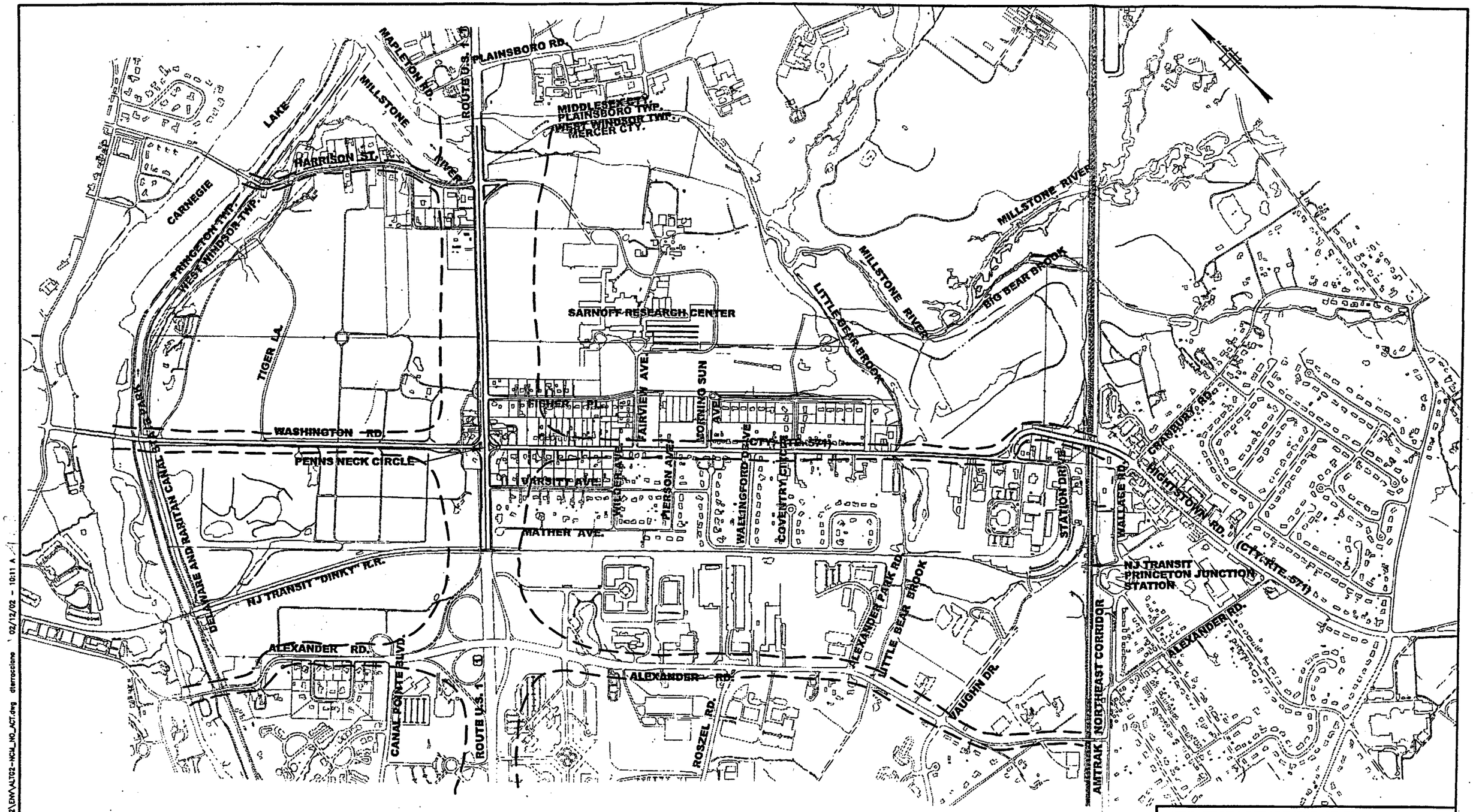
NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE G, G.1

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-16



LEGEND:

- PROPOSED IMPROVEMENTS
- EXISTING CONDITIONS
- MODELED 66 DECIBEL CONTOUR
- PROPOSED SOUND BARRIER
- MODELED CONTOUR, WITH SOUND BARRIER (DECIBEL LEVEL AS MARKED)

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NEW JERSEY DEPARTMENT OF TRANSPORTATION

PENNS NECK AREA
ENVIRONMENTAL IMPACT STATEMENT

NOISE CONTOUR MAP
ACTION ALTERNATIVE G.2

DATE: NOV. 2002
SCALE: 1"=1000'

FIGURE 4-17