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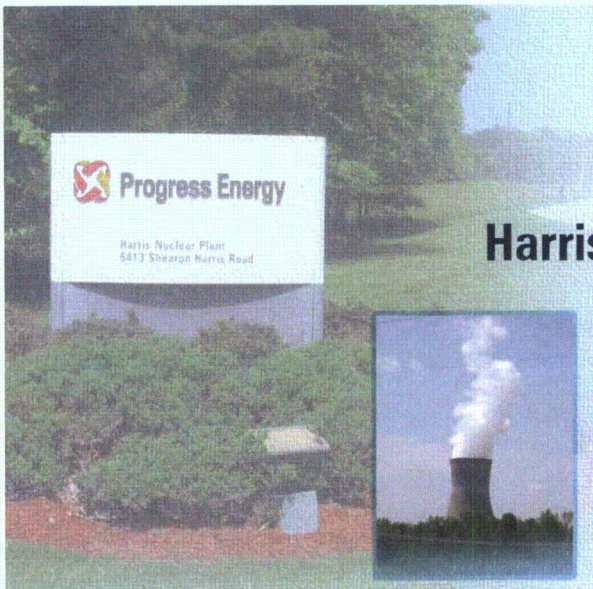

Harris Advanced Reactor Traffic Impact Analysis and Conceptual Design for Impacted Roads

Prepared for: Progress Energy

FINAL

Prepared by: Kimley-Horn and Associates, Inc.

July 2008
TI120044.08

Traffic Impact Analysis and Conceptual Design for Impacted Roads

for

Harris Advanced Reactor

New Hill, North Carolina

Prepared for:

Progress Energy Service Company, LLC

Raleigh, North Carolina

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June 2008

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1.0 Executive Summary

The Shearon Harris Nuclear Plant is located on the west side of Shearon Harris Road south of US 1 near New Hill, North Carolina. There is currently one reactor and 754 employees at the existing facility, which has one driveway onto Shearon Harris Road. The proposed expansion will add two reactors and an estimated 773 employees, for a total of 1,527 employees. The additional reactors will require raising the elevation of the Shearon Harris Reservoir by 20 feet.

The report summarizes the Traffic Impact Analysis (TIA) and conceptual roadway plans for alterations to NCDOT-maintained roadways in the vicinity of the plant that will be impacted by the increase in the reservoir elevation. Also included are conceptual interchange designs for a proposed new interchange on US 1.

Construction activity on Harris Advanced Reactor (HAR) Unit 2 is expected to be between 2013 and 2018, and construction activity on HAR Unit 3 is expected to be between 2014 and 2019, so both reactors are planned to be in operation in 2019. During the construction phase, Progress Energy proposes two access points for construction traffic:

- A new interchange on US 1 – either at the existing Shearon Harris Road overpass, or at a new location to the southwest
- Re-open the existing access road on Shearon Harris Road north of the main driveway, which was used during construction of the existing facility

During construction, the existing reactor will remain on-line, and those employees will continue to use the existing main driveway on Shearon Harris Road. After the construction is complete and all three reactors are on-line, Progress Energy proposes to provide access to the facility via a new interchange on US 1 and a new service road parallel to US 1. The existing main driveway on Shearon Harris Road will likely be closed when the new reactors are on-line.

This report presents trip generation, distribution, traffic analyses, and recommendations for transportation improvements required to meet anticipated traffic demands. The traffic conditions studied include the existing (2008) traffic, the projected (2015) construction traffic with and without a new interchange on US 1, and projected (2019) build-out traffic conditions. The weekday AM and PM peak hours were studied.

The North Carolina Department of Transportation (NCDOT) District Office and Town of Holly Springs were consulted to obtain background information and to ascertain the elements to be covered in the Traffic Impact Analysis (TIA).

Based on the traffic capacity analyses presented herein, the projected (2015) construction traffic condition is a heavier traffic volume load on the roadway network than the projected (2019) build-out traffic condition.

To evaluate the need for a new interchange on US 1, this study includes analysis of the projected (2015) construction traffic condition without a new interchange to determine if the existing roadway network can accommodate the additional traffic that will be generated by the construction activity.

The following roadway improvements would be required <u>if a new interchange on US 1 is not constructed</u> to accommodate the construction traffic and build-out traffic:

New Hill Holleman Road at US 1 Southbound Ramps

- Widen the overpass from two lanes to four lanes to provide a second southbound through lane on New Hill Holleman Road and left-turn lanes in both directions on New Hill Holleman Road
- Construct westbound dual left-turn lanes on the US 1 Southbound off-ramp with 200 feet of storage
- Install a traffic signal

New Hill Holleman Road at US 1 Northbound Ramps

- Widen overpass to provide an exclusive southbound left-turn lane on New Hill Holleman Road with 125 feet of storage
- Construct an exclusive northbound right-turn lane on New Hill Holleman Road that extends to Friendship Road
- Construct an exclusive eastbound right-turn lane on the US 1 northbound off-ramp with 125 feet of storage

New Hill Holleman Road at Shearon Harris Road

- Construct an exclusive northbound left-turn lane on New Hill Holleman Road with 200 feet of storage
- Construct an exclusive southbound right-turn lane on New Hill Holleman Road with 250 feet of storage

Old US 1 at Shearon Harris Road

- Construct an exclusive eastbound right-turn lane on Old US 1 with 200 feet of storage
- Construct an exclusive westbound left-turn lane on Old US 1 with 100 feet of storage

Shearon Harris Road at Construction Driveway

- Construct an exclusive northbound left-turn lane on Shearon Harris Road with 125 feet of storage
- Construct an exclusive eastbound right-turn lane on the Construction Driveway with 150 feet of storage

Shearon Harris Road at Proposed Service Road

- Construct an exclusive northbound left-turn lane on Shearon Harris Road with 125 feet of storage
- Construct an exclusive southbound right-turn lane on Shearon Harris Road with 150 feet of storage
- Provide separate left and right-turn lanes on the Service Road

The main conclusion of the TIA is that the existing interchange on US 1 at New Hill Holleman Road does not have enough traffic capacity for the projected (2015) construction traffic and projected (2019) build-out traffic conditions. In addition to other turn lane improvements, the existing two-lane New Hill Holleman Road overpass would have to be widened to four lanes or replaced with a new structure to accommodate the projected traffic volumes.

The site will be under construction for several years, and a new interchange on US 1 southwest of New Hill Holleman Road would allow this significant level of traffic volume to access the site without interfering with the existing traffic at the New Hill Holleman Road interchange. If the proposed interchange is built, many of the employees at the existing site will also divert to the new interchange at build-out, thereby reducing traffic volume at the existing interchange. Therefore, a new interchange on US 1 would relieve traffic volumes on the existing New Hill Holleman Road interchange and extend the service life of the existing interchange.

The following roadway improvements are recommended to accommodate the projected (2015) construction traffic condition <u>with the proposed interchange on US 1 in place</u>:

New Hill Holleman Road at Shearon Harris Road

- Construct an exclusive northbound left-turn lane on Shearon Harris Road with 200 feet of storage

Old US 1 at Shearon Harris Road

- Construct an exclusive westbound left-turn lane on Old US 1 with 100 feet of storage

Shearon Harris Road at Construction Driveway

- Construct an exclusive northbound left-turn lane on Shearon Harris Road with 125 feet of storage
- Construct an exclusive eastbound right-turn lane on the Construction Driveway with 150 feet of storage

Shearon Harris Road at Proposed Service Road

- Construct an exclusive northbound left-turn lane on Shearon Harris Road with 125 feet of storage
- Construct an exclusive southbound right-turn lane on Shearon Harris Road with 150 feet of storage
- Provide separate left and right-turn lanes on the Service Road

All of the study intersections are expected to operate at an overall acceptable level-of-service in the AM and PM peak hours for the projected (2015) construction traffic and the projected (2019) build-out traffic conditions with the recommended improvements in place. The improvements listed above for the

projected (2015) construction traffic condition are expected to be adequate for the projected (2019) build-out traffic condition.

For the proposed interchange on US 1, five options were evaluated based on several criteria including location, interchange spacing, traffic operation and construction cost:

- **Option 1** – Convert existing Shearon Harris Road overpass to a diamond interchange
- **Option 2** – Convert existing Shearon Harris Road overpass to a modified partial cloverleaf interchange
- **Option 3** – New trumpet interchange approximately 4,000 feet southwest of the Shearon Harris Road overpass
- **Option 4** – New trumpet interchange approximately 1,000 feet northeast of the railroad overpass
- **Option 5** – New diamond interchange approximately 1,000 feet northeast of the railroad overpass

Out of the five preliminary interchange concepts that were developed, Option 1 and Option 3 are recommended for closer study.

Conceptual roadway plans were prepared to evaluate the impacts to public infrastructure resulting from the proposed construction of Shearon Harris Nuclear Power Plant Units 2 and 3. Public infrastructure improvements were needed either to accommodate the 20 foot increase in the normal pool elevation of Harris Lake or as a result of increased traffic volume on the adjacent roadways due to increased construction and employment traffic. Conceptual plans were developed at the following locations resulting from the increased lake elevations:

- New Hill Holleman Road (SR 1127) in two locations near White Oak and Little White Oak Creeks
- Holly Springs / New Hill Road (SR 1152) near White Oak Creek
- Rex Road (SR 1127) near Cary Branch
- North Carolina Highway 42
- Cass Holt Road (SR 1116) near Buckhorn Creek
- Sweet Springs Road (SR 1117) near Buckhorn Creek
- Shearon Harris Road (SR 1134) at three locations near tributaries of Little White Oak Creek

Conceptual roadway widening plans were also developed to depict the roadway improvements identified in the TIA.

2.0 Introduction

The Shearon Harris Nuclear Plant is located on the west side of Shearon Harris Road south of US 1 near New Hill, North Carolina. There is currently one reactor and 754 employees at the existing facility, which has one driveway onto Shearon Harris Road. The proposed expansion will add two reactors and an estimated 773 employees, for a total of 1,527 employees. The additional reactors will require raising the elevation of the Shearon Harris Reservoir by 20 feet.

The report summarizes the Traffic Impact Analysis (TIA) and conceptual roadway plans for alterations to NCDOT-maintained roadways in the vicinity of the plant that will be impacted by the increase in the reservoir elevation. Also included are conceptual interchange designs for a proposed new interchange on US 1.

Construction activity on Harris Advanced Reactor (HAR) Unit 2 is expected to be between 2013 and 2018, and construction activity on HAR Unit 3 is expected to be between 2014 and 2019, so both reactors are planned to be in operation in 2019. During the construction phase, Progress Energy proposes two access points for construction traffic:

- A new interchange on US 1 – either at the existing Shearon Harris Road overpass, or at a new location to the southwest
- Re-open the existing access road on Shearon Harris Road north of the main driveway, which was used during construction of the existing facility

During construction, the existing reactor will remain on-line, and those employees will continue to use the existing main driveway on Shearon Harris Road. After the construction is complete and all three reactors are on-line, Progress Energy proposes to provide access to the facility via a new interchange on US 1 and a new service road parallel to US 1. The existing main driveway on Shearon Harris Road will likely be closed when the new reactors are on-line.

This report presents trip generation, distribution, traffic analyses, and recommendations for transportation improvements required to meet anticipated traffic demands. The traffic conditions studied include the existing (2008) traffic, the projected (2015) construction traffic with and without a new interchange on US 1, and projected (2019) build-out traffic conditions. The weekday AM and PM peak hours were studied.

The NCDOT District Office and Town of Holly Springs were consulted to obtain background information and to ascertain the elements to be covered in the TIA.

For the proposed interchange on US 1, five options were evaluated based on several criteria including location, interchange spacing, traffic operation and construction cost:

- **Option 1** – Convert existing Shearon Harris Road overpass to a diamond interchange
- **Option 2** – Convert existing Shearon Harris Road overpass to a modified partial cloverleaf interchange .
- **Option 3** – New trumpet interchange approximately 4,000 feet southwest of the Shearon Harris Road overpass
- **Option 4** – New trumpet interchange approximately 1,000 feet northeast of the railroad overpass
- **Option 5** – New diamond interchange approximately 1,000 feet northeast of the railroad overpass

Out of the five preliminary interchange concepts that were developed, Option 1 and Option 3 are recommended for closer study.

Conceptual roadway plans were prepared to evaluate the impacts to public infrastructure resulting from the proposed construction of Shearon Harris Nuclear Power Plant Units 2 and 3. Public infrastructure improvements were needed either to accommodate the 20 foot increase in the normal pool elevation of Harris Lake or as a result of increased traffic volume on the adjacent roadways due to increased construction and employment traffic. Conceptual plans were developed at several locations resulting from the increased lake elevations. Conceptual roadway widening plans were also developed to depict the roadway improvements identified in the TIA.

3.0 Inventory

3.1 Study Area

The study area for this TIA consists of the following intersections:

- Old US 1 at New Hill Holleman Road / New Hill Olive Chapel Road
- New Hill Holleman Road at US 1 Southbound Ramps
- New Hill Holleman Road at US 1 Northbound Ramps
- New Hill Holleman Road at Shearon Harris Road
- New Hill Holleman Road / Rex Road at Avent Ferry / Bartley Holleman Road
- Old US 1 at Shearon Harris Road
- Shearon Harris Road at Main Driveway
- Shearon Harris Road at Construction Driveway
- Shearon Harris Road at Proposed US 1 Southbound Ramps
- Shearon Harris Road at Proposed US 1 Northbound Ramps
- Shearon Harris Road at Proposed Service Road

This study area was determined based upon discussions with NCDOT staff, and Figure 1 shows the site location.

3.2 Existing Conditions

Progress Energy currently controls approximately 10,000 acres around the existing facility and plans to construct two additional reactors on the site. The land uses surrounding the Progress Energy property are primarily low-density residential and agricultural. Major roadways in the study area include US 1, Old US 1, New Hill Holleman Road, Shearon Harris Road, Avent Ferry Road, and Rex Road. The existing roadway laneage is shown in Figure 2.

Northbound Ramps

US 1 is a four-lane freeway with an estimated 2008 average daily traffic (ADT) volume of approximately 20,000 vehicles per day. US 1 has a posted speed limit of 65 mph in the vicinity of the site.

Old US 1 is a two-lane roadway with an estimated 2008 ADT volume of approximately 3,800 vehicles per day. Old US 1 has a posted speed limit of 55 mph in the vicinity of the site.

New Hill Holleman Road is a two-lane roadway with an estimated 2008 ADT volume of approximately 6,500 vehicles per day. New Hill Holleman Road has a posted speed limit of 45 mph in the vicinity of the site.

Shearon Harris Road is a two-lane roadway with an estimated 2008 ADT volume of approximately 1,500 vehicles per day. Shearon Harris Road has a statutory speed limit of 55 mph in the vicinity of the site.

Avent Ferry Road is a two-lane roadway with an estimated 2008 ADT volume of approximately 2,100 vehicles per day. Avent Ferry Road has a posted speed limit of 55 mph in the vicinity of the site.

Rex Road is a two-lane roadway with an estimated 2008 ADT volume of approximately 2,700 vehicles per day. Rex Road has a posted speed limit of 55 mph in the vicinity of the site.

According to the Wake County Thoroughfare Plan, Old US 1, New Hill Holleman Road, Avent Ferry Road and Rex Road are classified as major thoroughfares.

Kimley-Horn and Associates, Inc.	HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS	SITE LOCATION	FIGURE 1

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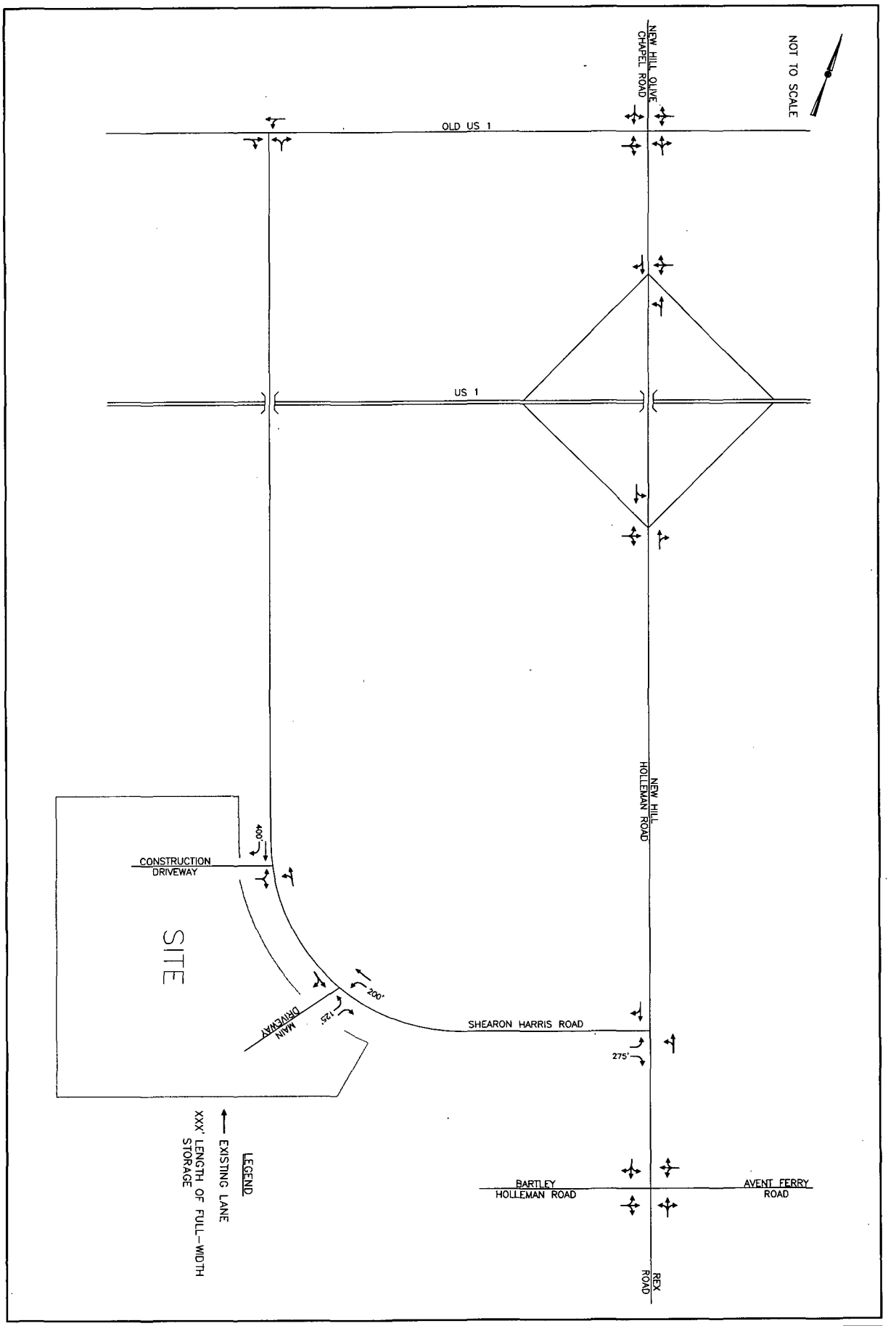

Kimley-Horn and Associates, Inc.

HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

EXISTING ROADWAY
LANEAGE

FIGURE
2

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4.0 Traffic Generation

The traffic generation potential of the proposed expansion was estimated based on the existing traffic volume entering and exiting the facility for the existing number of employees extrapolated to the projected number of employees.

The projected peak level of construction traffic is based on information provided by Progress Energy and Shaw Nuclear Services, and the following assumptions:

- 3,150 construction workers per day are expected on-site at the peak time in 2015. The current construction schedule calls for 10-hour shifts each weekday. If necessary, the contractor can change to two or three shifts to accelerate the construction. To be conservative, we analyzed the one shift schedule, and assumed that 70% of the workers arrive during the AM peak hour and leave during the PM peak hour.
- We assumed a vehicle occupancy rate of 1.8 workers per vehicle.
- Most of the raw materials are expected to be delivered to the site via the existing spur railroad. Approximately 75 delivery trucks per day are anticipated, and we assumed 10 trucks will enter and exit the site in each peak hour to be conservative.
- We assumed 150 vehicles per hour (including the 10 trucks) in the off-peak direction in both peaks.
- The existing reactor will remain in operation during construction, and those employees will continue to use the existing main driveway on Shearon Harris Road.

Table 4.1 shows the estimated traffic generation potential of the existing facility, the construction phase and the expanded facility for a typical weekday.

Table 4.1
Traffic Generation (vehicles)

Scenario	ADT		AM Peak Hour		PM Peak Hour	
	In	Out	In	Out	In	Out
Existing – 754 employees	500	500	200	19	19	174
Construction – 3,150 employees	2,500	2,500	1,240	150	150	1,240
Expanded – 1,527 employees	1,000	1,000	405	40	40	355

5.0 Site Traffic Distribution

The proposed generated trips were distributed to the surrounding roadway network based on the existing turning movement counts and population densities in the area as follows:

- 30% to / from the northeast on US 1
- 25% to / from the southwest on Old US 1
- 14% to / from the east on Rex Road
- 11% to / from the east on Avent Ferry Road
- 10% to / from the southwest on US 1
- 7% to / from the northeast on Old US 1
- 3% to / from the north on New Hill Holleman Road

The existing site traffic distribution and assignment was confirmed with NCDOT staff, and is shown on Figure 3. This overall distribution was applied to the projected (2015) construction and projected (2019) build-out traffic conditions. Figure 4 shows the distribution and assignment of the projected (2015) construction traffic without the proposed interchange on US 1. Figure 5 shows the distribution and assignment of the projected (2015) construction traffic with the proposed interchange on US 1. Figure 6 shows the distribution and assignment of the projected (2019) build-out traffic with the proposed interchange.

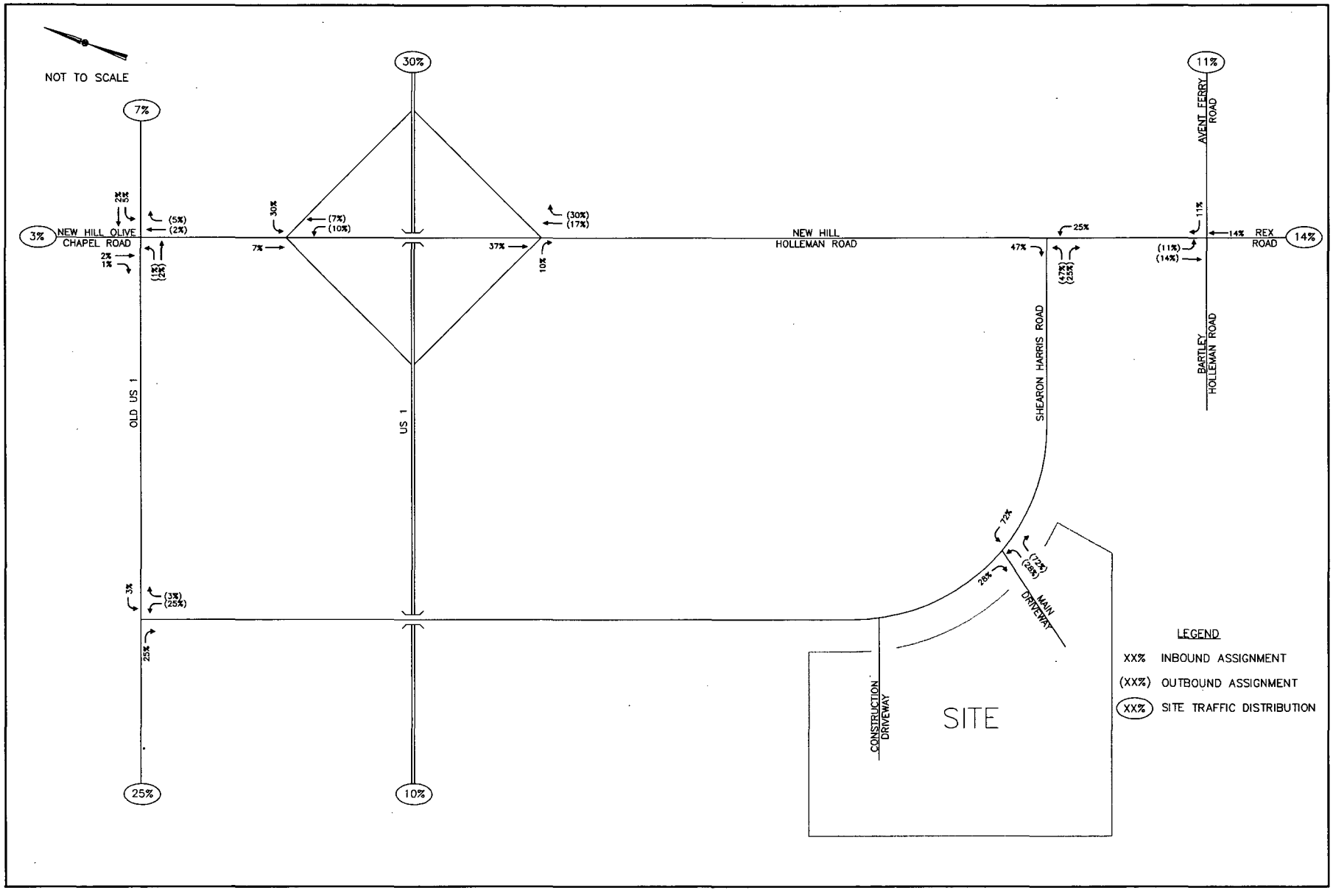

FIGURE 3

EXISTING SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS

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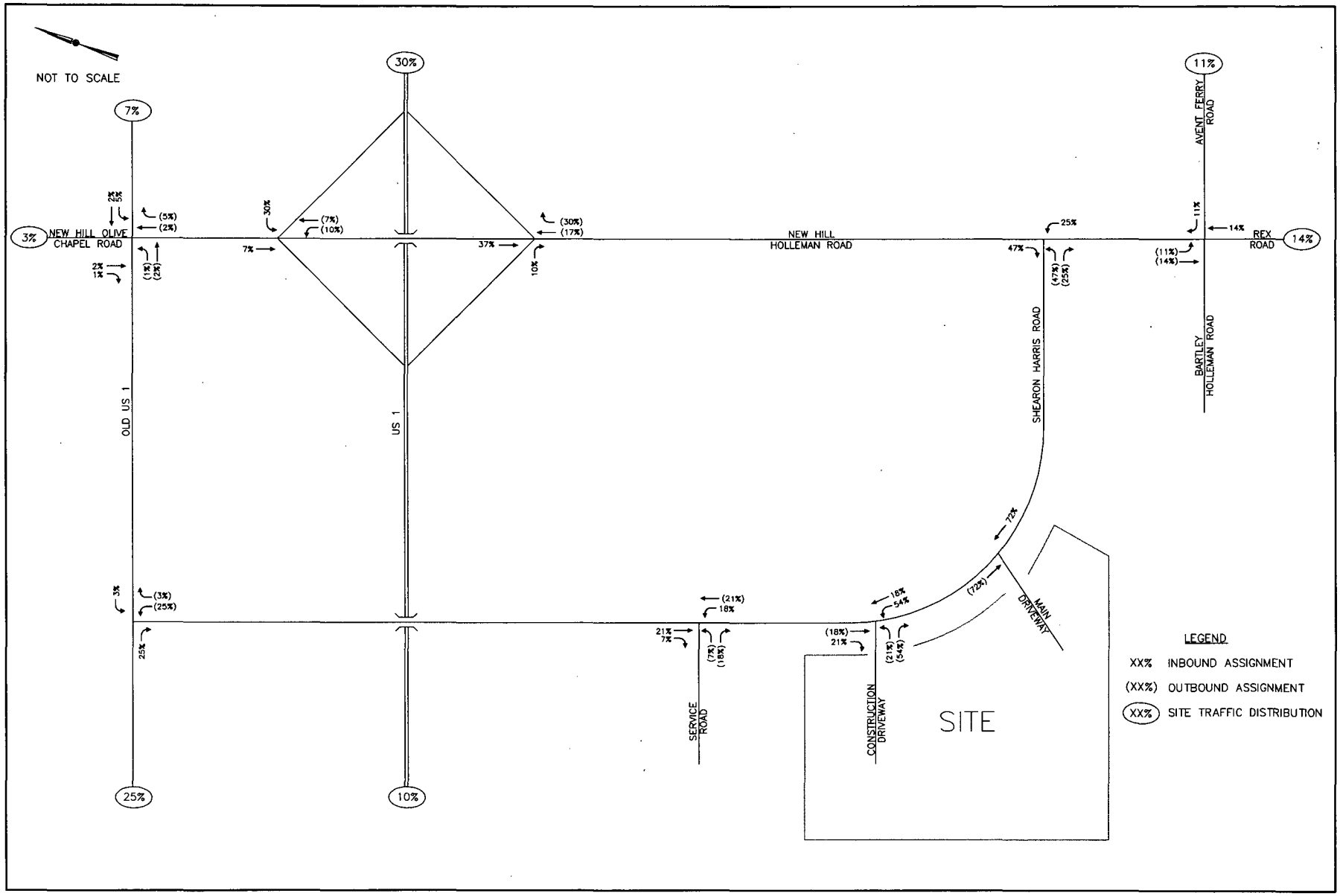

FIGURE 4

CONSTRUCTION SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

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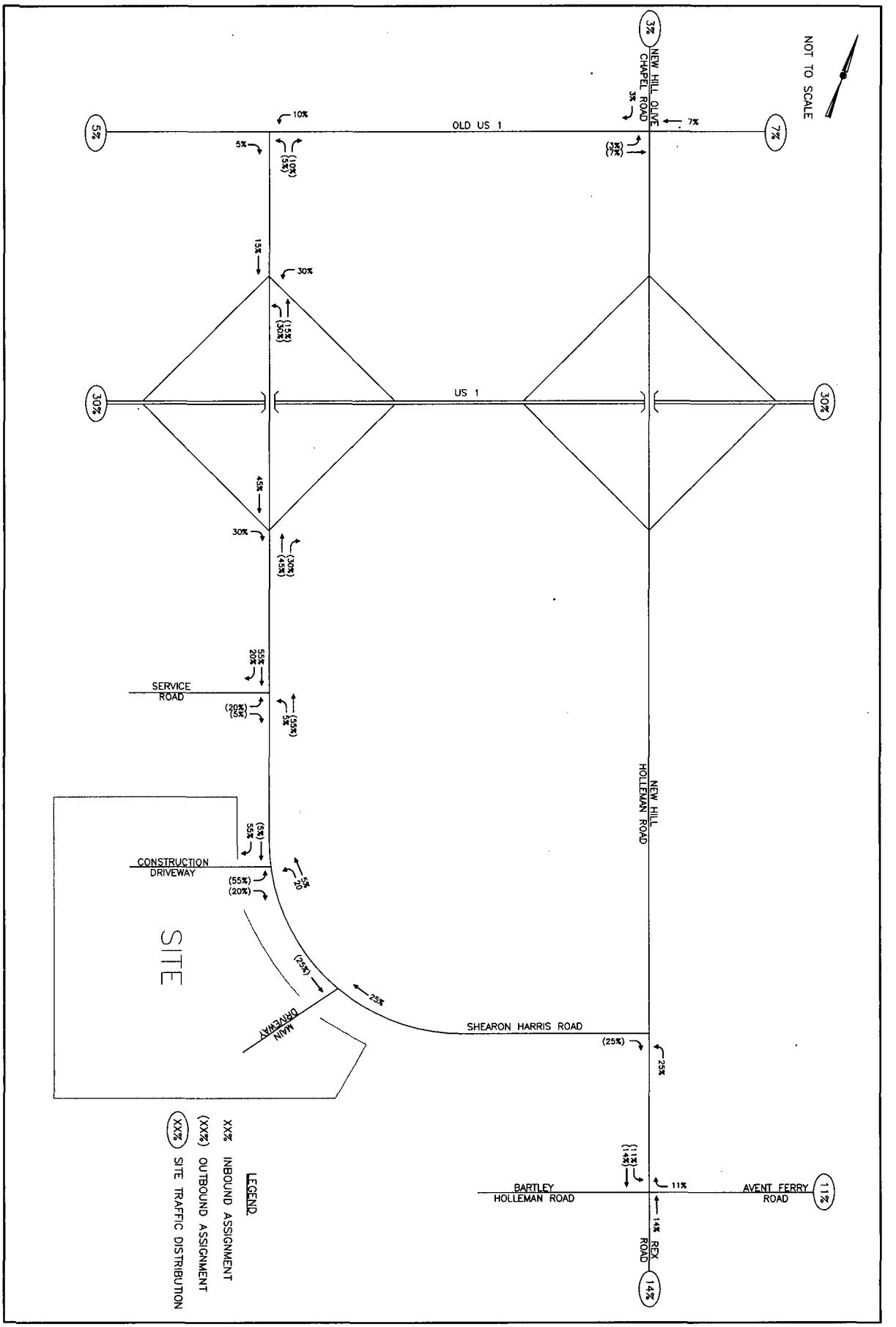

Kimley-Horn and Associates, Inc.

HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

CONSTRUCTION TRAFFIC
DISTRIBUTION AND ASSIGNMENT
WITH PROPOSED INTERCHANGE

FIGURE
5

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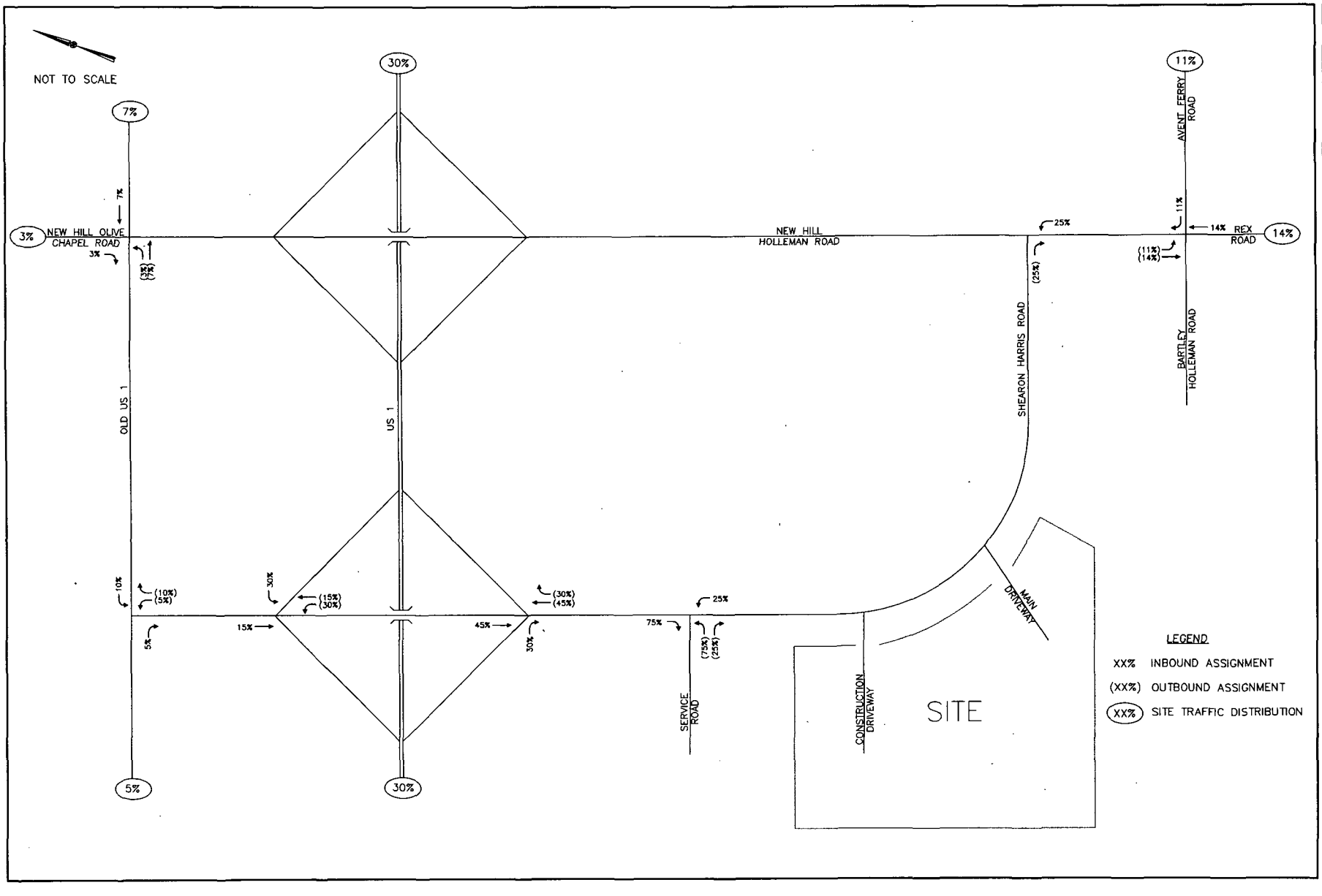

FIGURE 6

BUILD-OUT SITE TRAFFIC DISTRIBUTION AND ASSIGNMENT

HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS

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6.0 Projected Traffic Volumes

6.1 Existing Traffic

AM peak hour (5:00 to 8:00 AM) and PM peak hour (4:00 to 7:00 PM) turning movement counts were performed at the following intersections on Wednesday, May 14 and Thursday, May 15, 2008:

- Old US 1 at New Hill Holleman Road
- New Hill Holleman Road at US 1 Southbound Ramps
- New Hill Holleman Road at US 1 Northbound Ramps
- New Hill Holleman Road at Shearon Harris Road
- New Hill Holleman Road / Rex Road at Avent Ferry Road / Bartley Holleman Road
- Old US 1 at Shearon Harris Road
- Shearon Harris Road at Main Driveway

The existing (2008) AM and PM peak hour traffic volumes at this intersection are shown in Figure 7, and the traffic count data are included in the Appendix.

Note that the peak hours for the existing employee traffic occur between 5:45 and 6:45 AM and 4:15 and 5:15 PM, which generally do not coincide with the peak hours for the study intersections. To be conservative, the peak hour trip generation for the plant was applied to the peak hour volumes at the study intersections. The existing (2008) employee AM and PM peak hour traffic volumes are shown in Figure 8.

6.2 Historic Growth Traffic

Based on historical ADT data published by NCDOT and discussion with NCDOT, the existing (2008) AM and PM peak hour traffic volumes were grown by an annual rate of 3.0% for seven years to estimate the projected (2015) background traffic volumes, and for eleven years to estimate the projected (2019) background traffic volumes. The background traffic growth rate was not applied to the existing employee traffic volumes.

6.3 Approved Development Traffic

Approved development traffic is generated by approved, but not yet constructed, projects in the vicinity of the proposed project. Based on discussion with NCDOT and Town of Holly Springs staff, there are two approved developments in the vicinity of the site that will have a significant impact on the study intersections:

- The Twelve Oaks development is located northwest of the intersection of Holly Springs-New Hill Road and Old Holly Springs-Apex Road in Holly Springs. The development is expected to include 1,065 single-family homes, 191 townhomes and an 18-hole golf course, and is expected to be built-out in 2010. The traffic generation potential for this development was applied to the study intersections based on the TIA performed by Kimley-Horn and Associates, Inc. in October 2005.

- The Novartis campus is located on Green Oaks Parkway in Holly Springs. Campus A is expected to consist of approximately 600,000 SF of manufacturing space, and is expected to be built-out in 2020. The traffic generation potential for this development was applied to the study intersections based on the TIA performed by Kimley-Horn and Associates, Inc. in September 2006.

Based on discussion with the Town, we understand that there are two potential developments in the area that will have a significant impact on the study intersections:

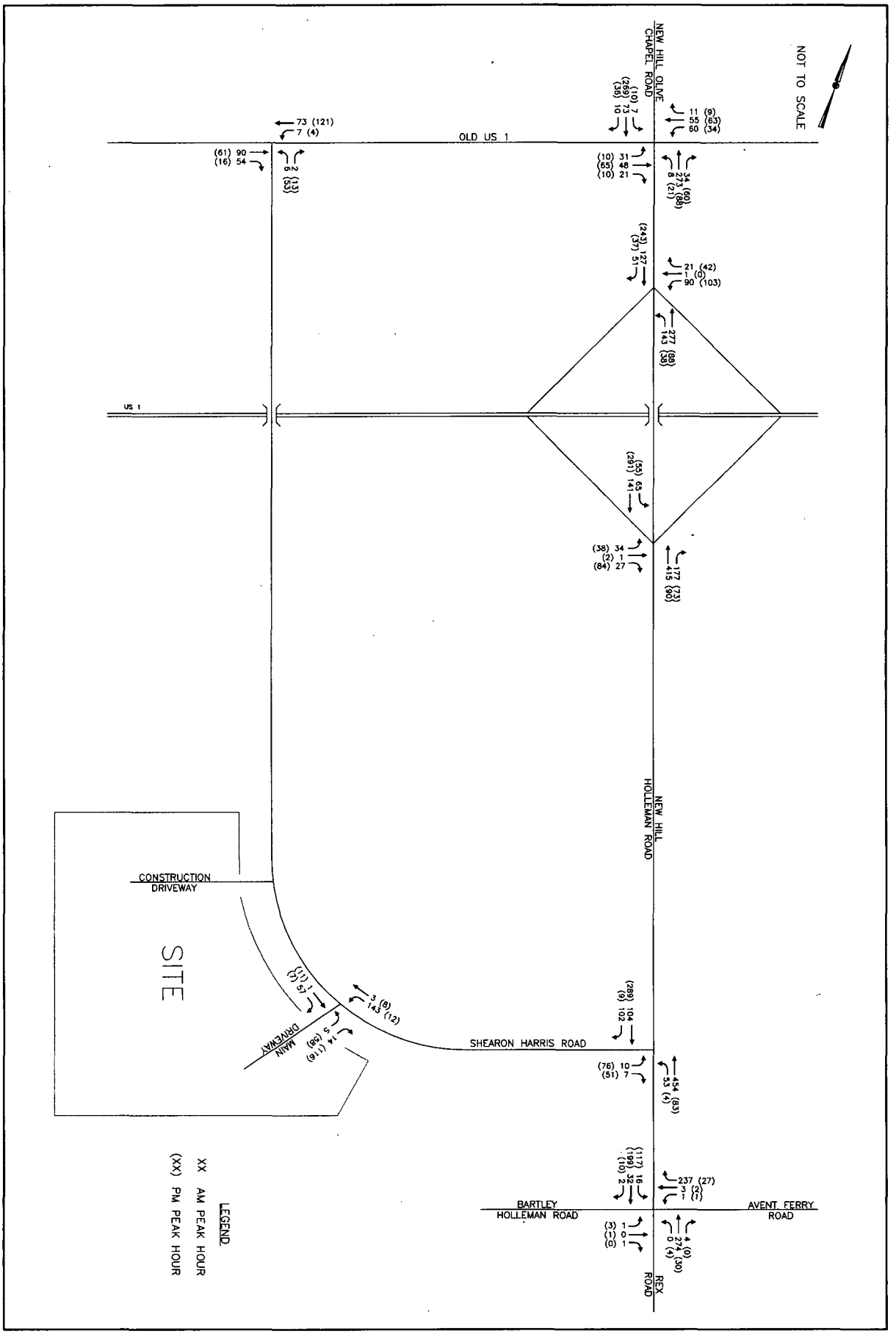
- The proposed Western Wake Water Reclamation Facility is located in the southeast quadrant of the intersection of Old US 1 at Shearon Harris Road. The facility is expected to have 25 employees, with one proposed driveway on Shearon Harris Road. The facility is expected to be in operation in 2012. A TIA has not been required for this site, so the trip generation potential of the site was estimated based on the number of employees, then distributed to the study intersections.

- There is a potential future industrial park site on Friendship Road north of the Friendship Road / New Hill Road split. The site consists of approximately 130 acres, and a TIA has not been performed for this site. The trip generation potential of the site was estimated based on the ITE trip generation rates, then distributed to the study intersections.

6.4 Projected (2015) and (2019) Traffic

To estimate the projected (2015) and (2019) background peak hour traffic volumes, the approved development traffic volumes and historic growth traffic volumes were added to the existing traffic volumes. To obtain the projected (2015) construction and (2019) build-out traffic volumes, the site traffic volumes were added to the background traffic volumes. Figures 9 and 10 show the projected (2015) background AM and PM peak hour traffic volumes at the study intersections.

Figures 11 and 12 show the projected (2015) construction AM and PM peak hour traffic volumes at the study intersections. Figures 13 and 14 show the projected (2015) construction AM and PM peak hour traffic volumes at the study intersections with the proposed interchange on US 1 in place. Figures 15 and 16 show the projected (2019) background AM and PM peak hour traffic volumes at the study intersections. Figures 17 and 18 show the projected (2019) build-out AM and PM peak hour traffic volumes at the study intersections.



Kimley-Horn and Associates, Inc.

HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

EXISTING (2008) AM AND PM
PEAK HOUR TRAFFIC VOLUMES

FIGURE
7

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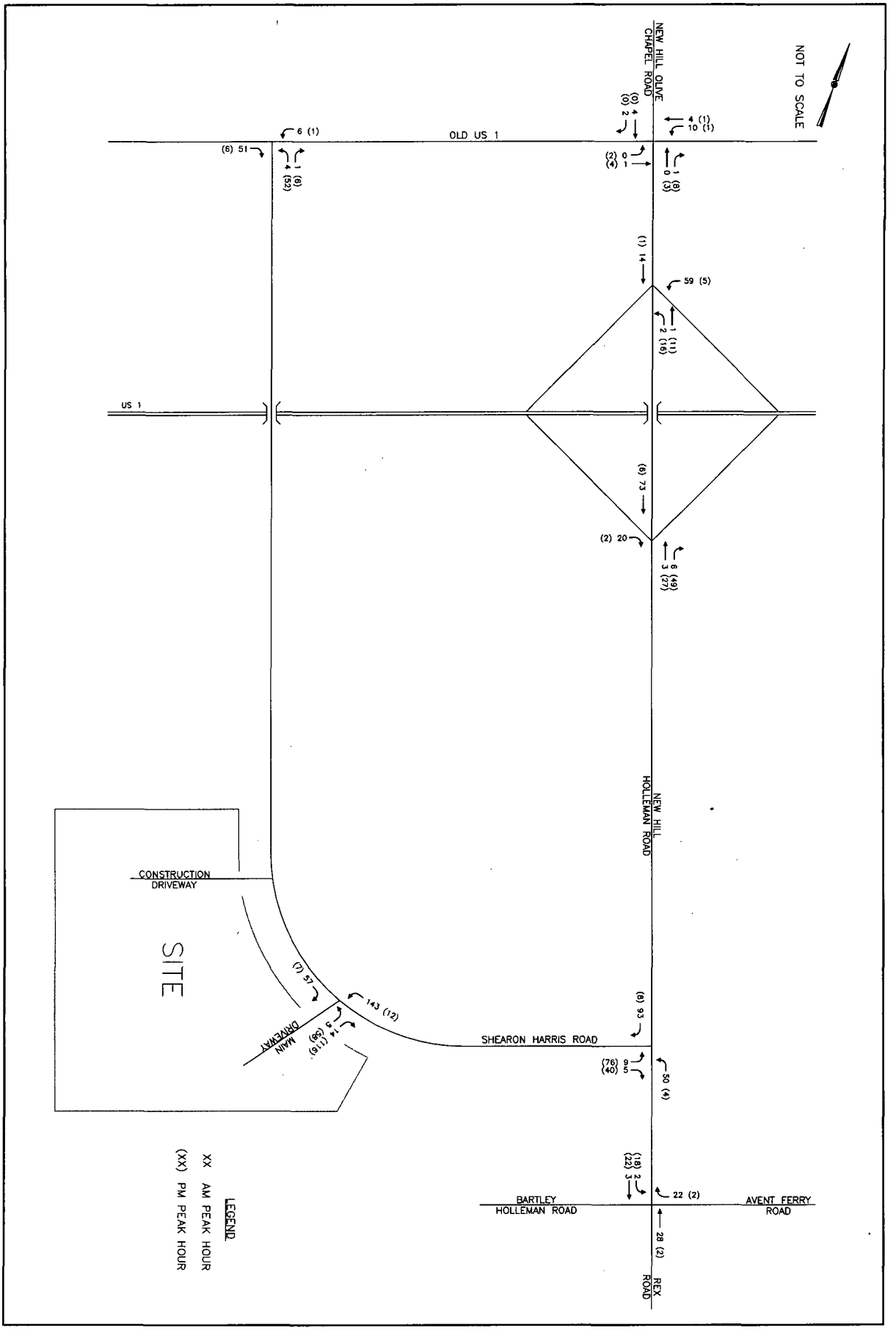

Kimley-Horn and Associates, Inc.

HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

EXISTING (2008) EMPLOYEE AM AND PM
PEAK HOUR TRAFFIC VOLUMES

FIGURE
8

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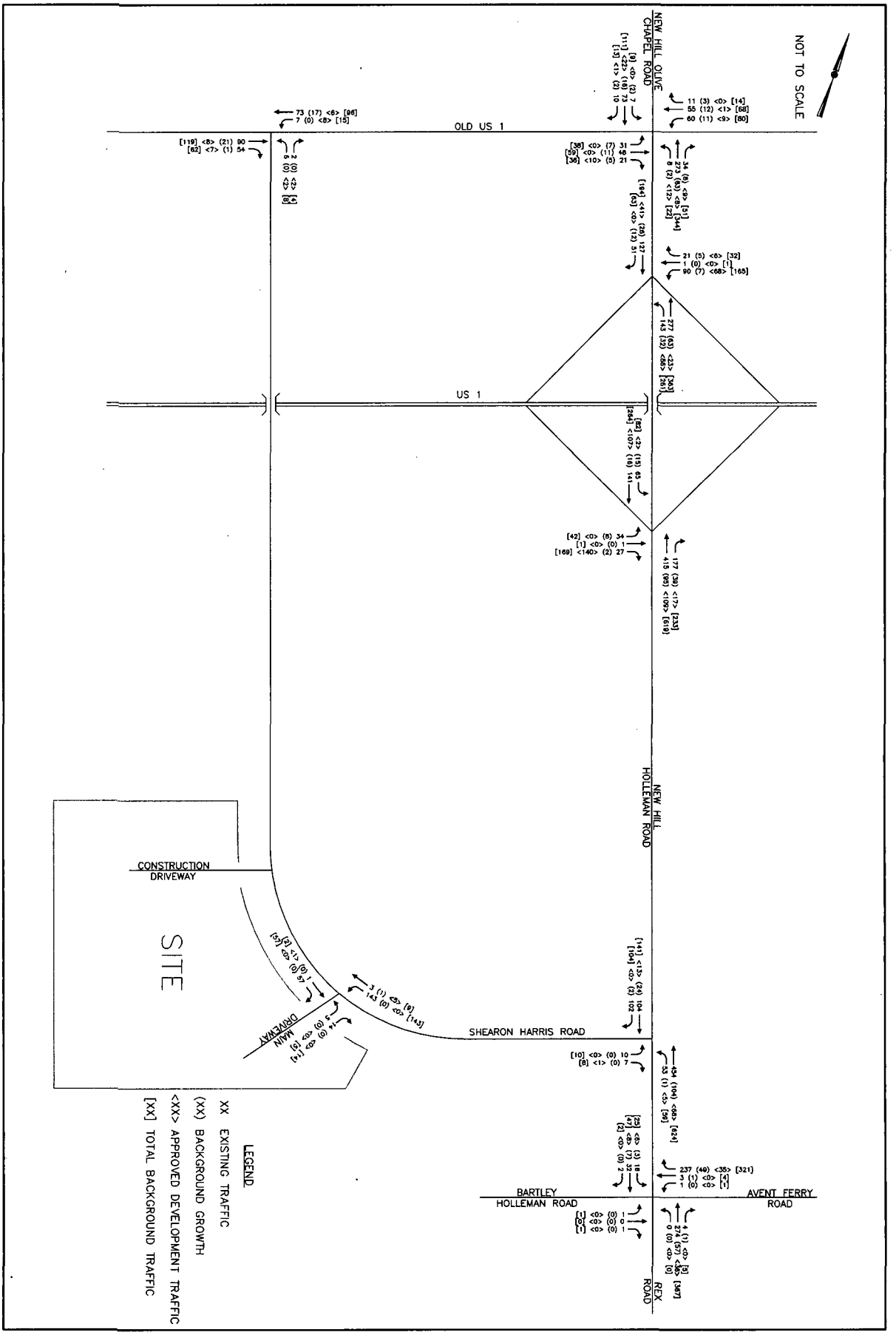

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HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

PROJECTED (2015) BACKGROUND AM
PEAK HOUR TRAFFIC VOLUMES

FIGURE
9

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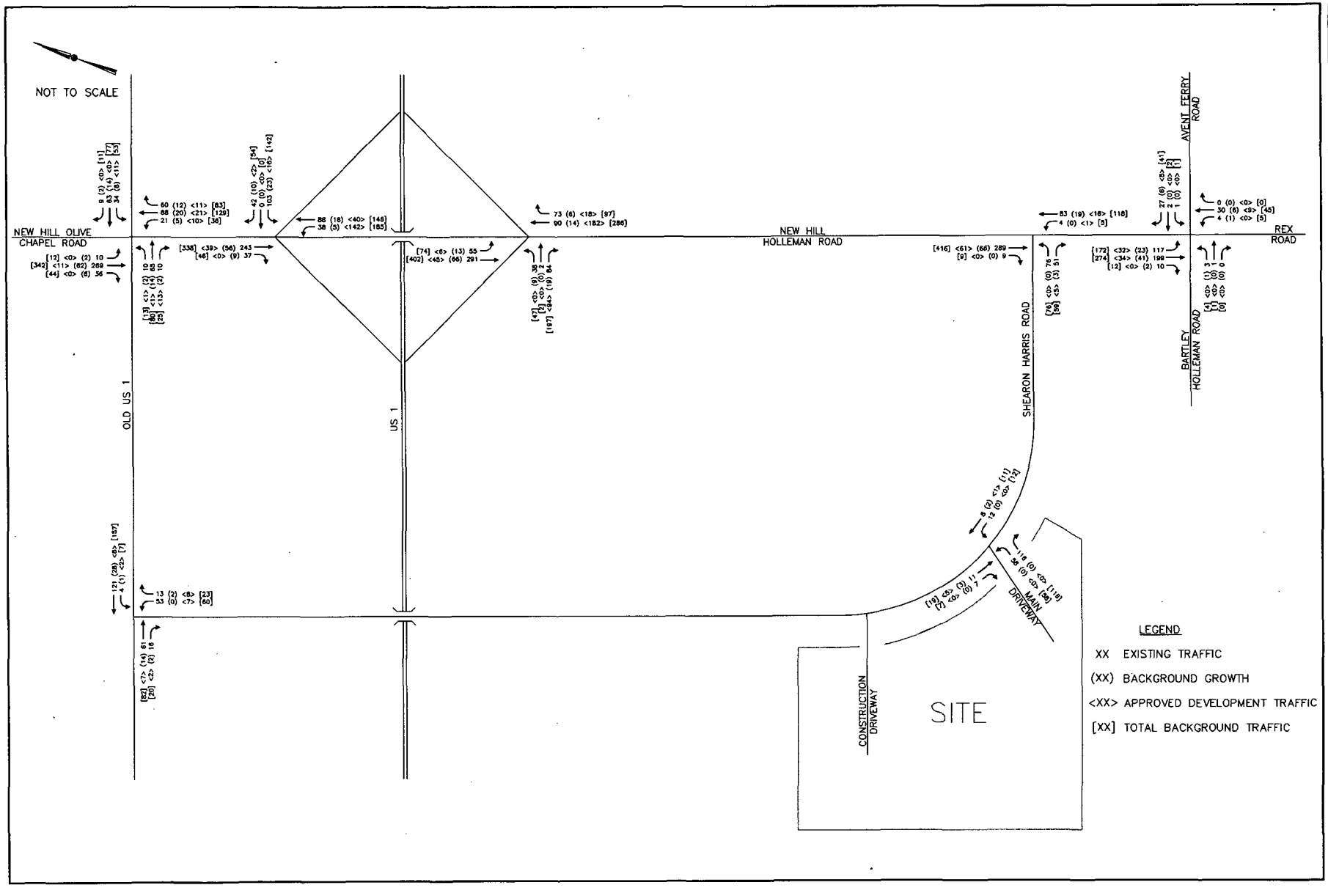

FIGURE 10

PROJECTED (2015) BACKGROUND PM PEAK HOUR TRAFFIC VOLUMES

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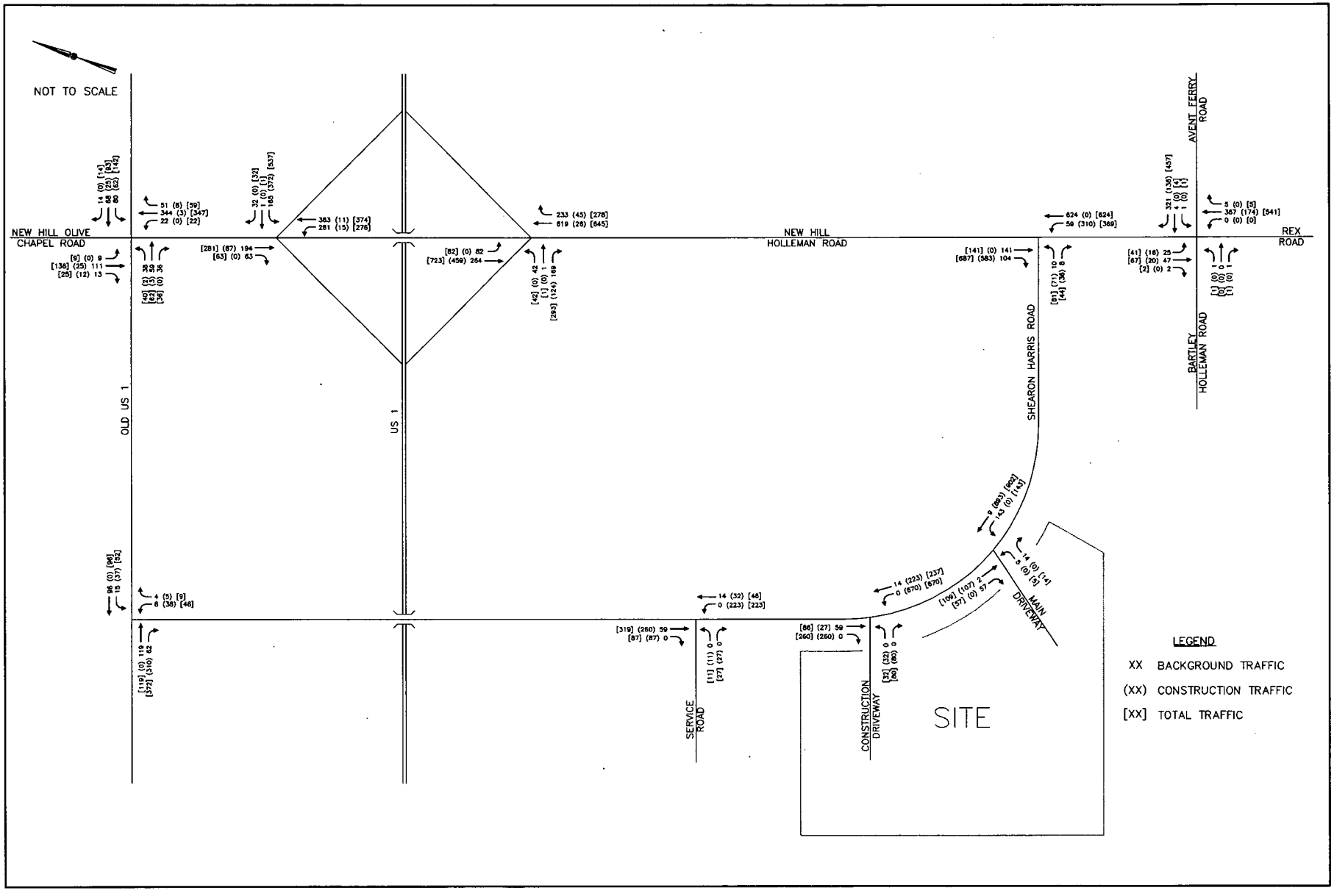

FIGURE 11

PROJECTED (2015) CONSTRUCTION AM PEAK HOUR TRAFFIC VOLUMES

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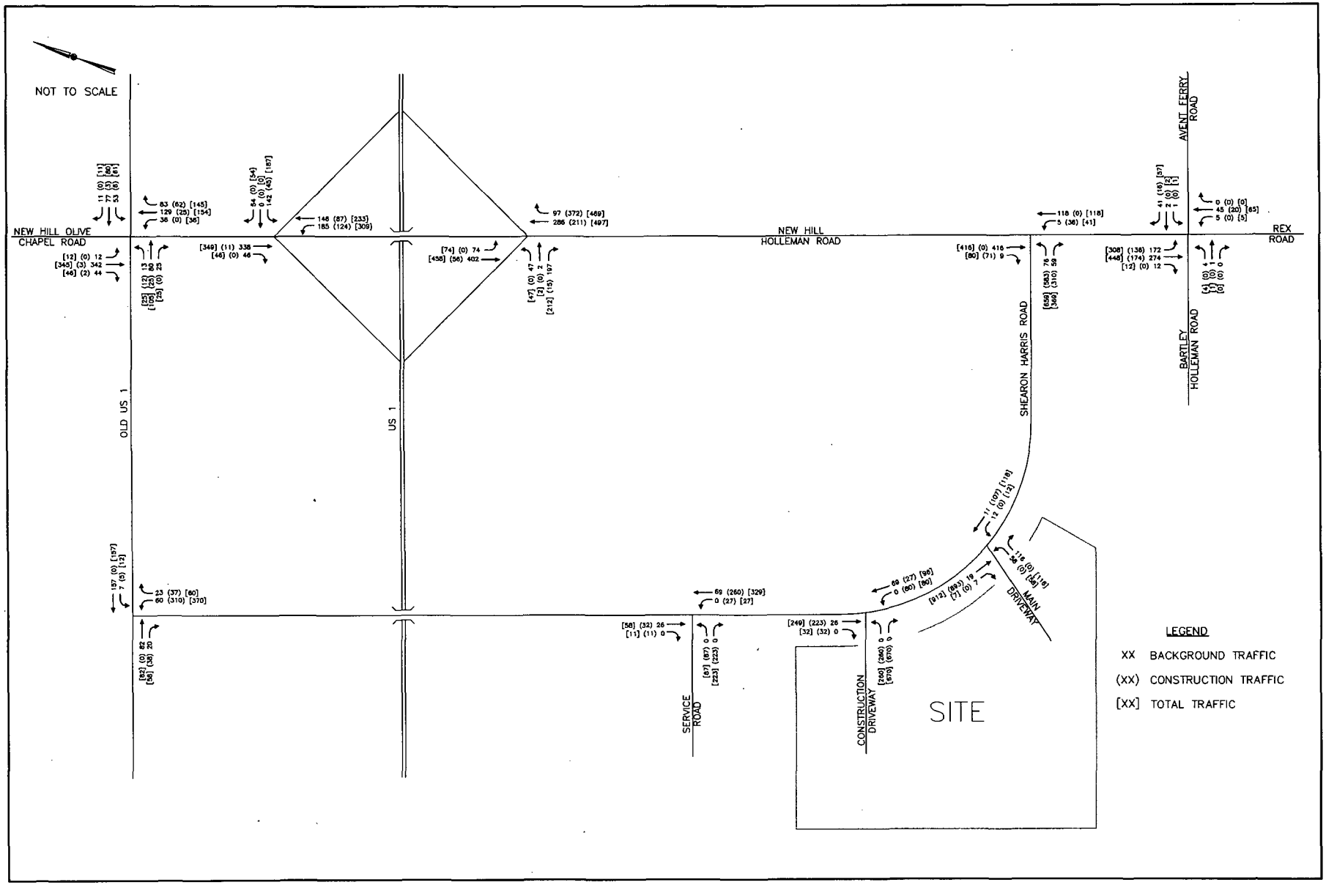

FIGURE 12

PROJECTED (2015) CONSTRUCTION PM PEAK HOUR TRAFFIC VOLUMES

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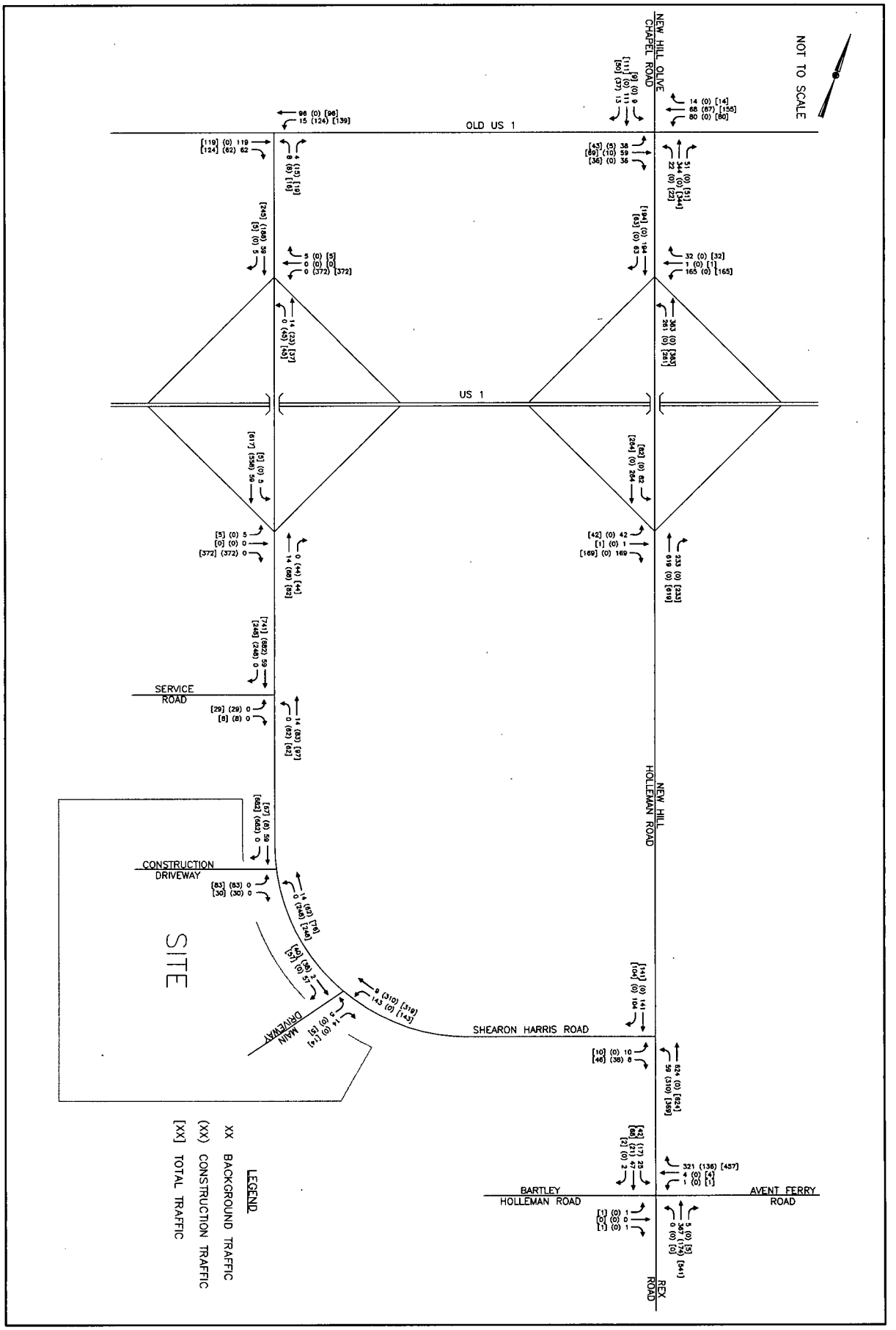

Kimley-Horn and Associates, Inc.

HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

PROJECTED (2015) CONSTRUCTION AM
PEAK HOUR TRAFFIC VOLUMES
WITH PROPOSED INTERCHANGE

FIGURE
13

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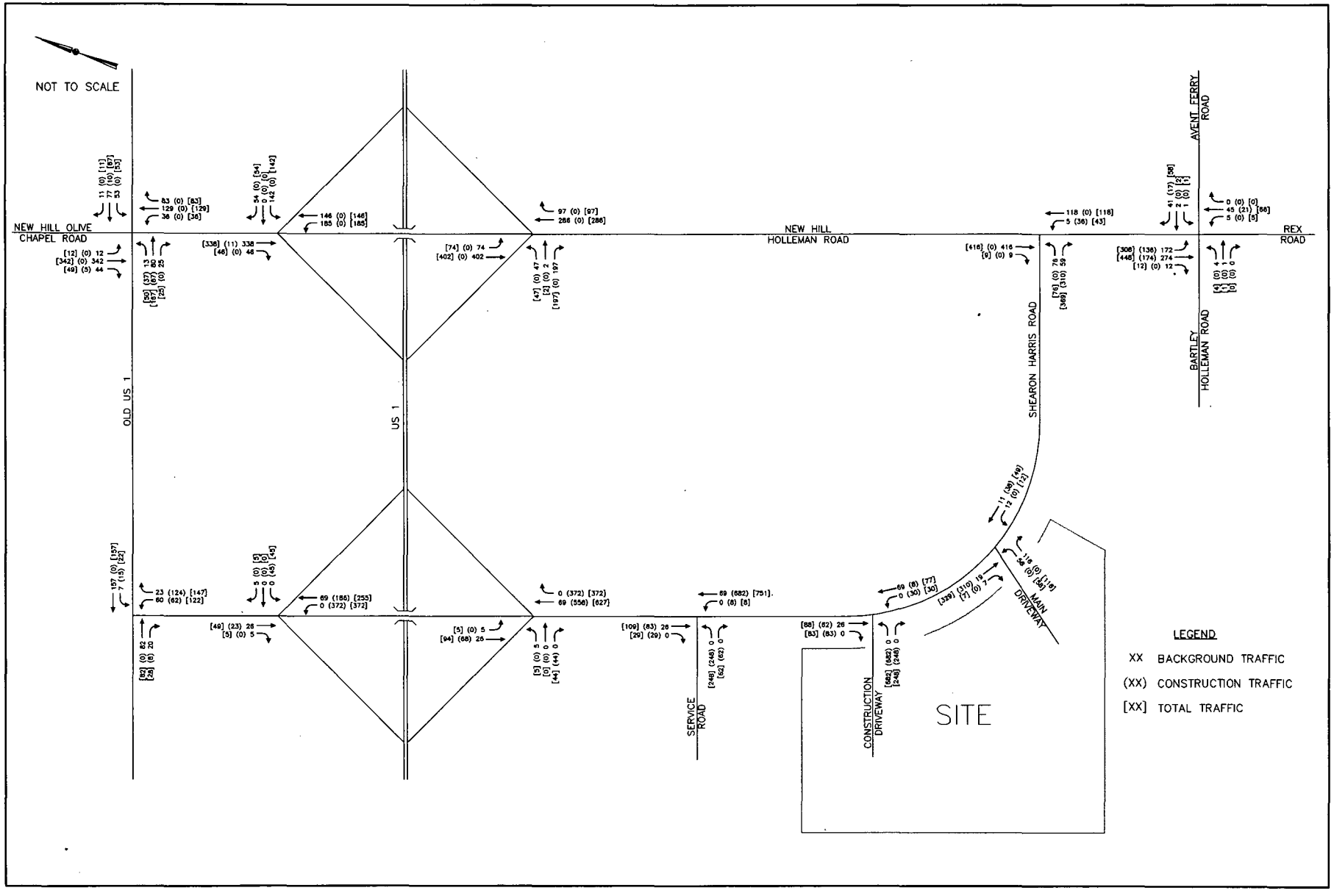

FIGURE 14

PROJECTED (2015) CONSTRUCTION PM PEAK HOUR TRAFFIC VOLUMES WITH PROPOSED INTERCHANGE

HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS

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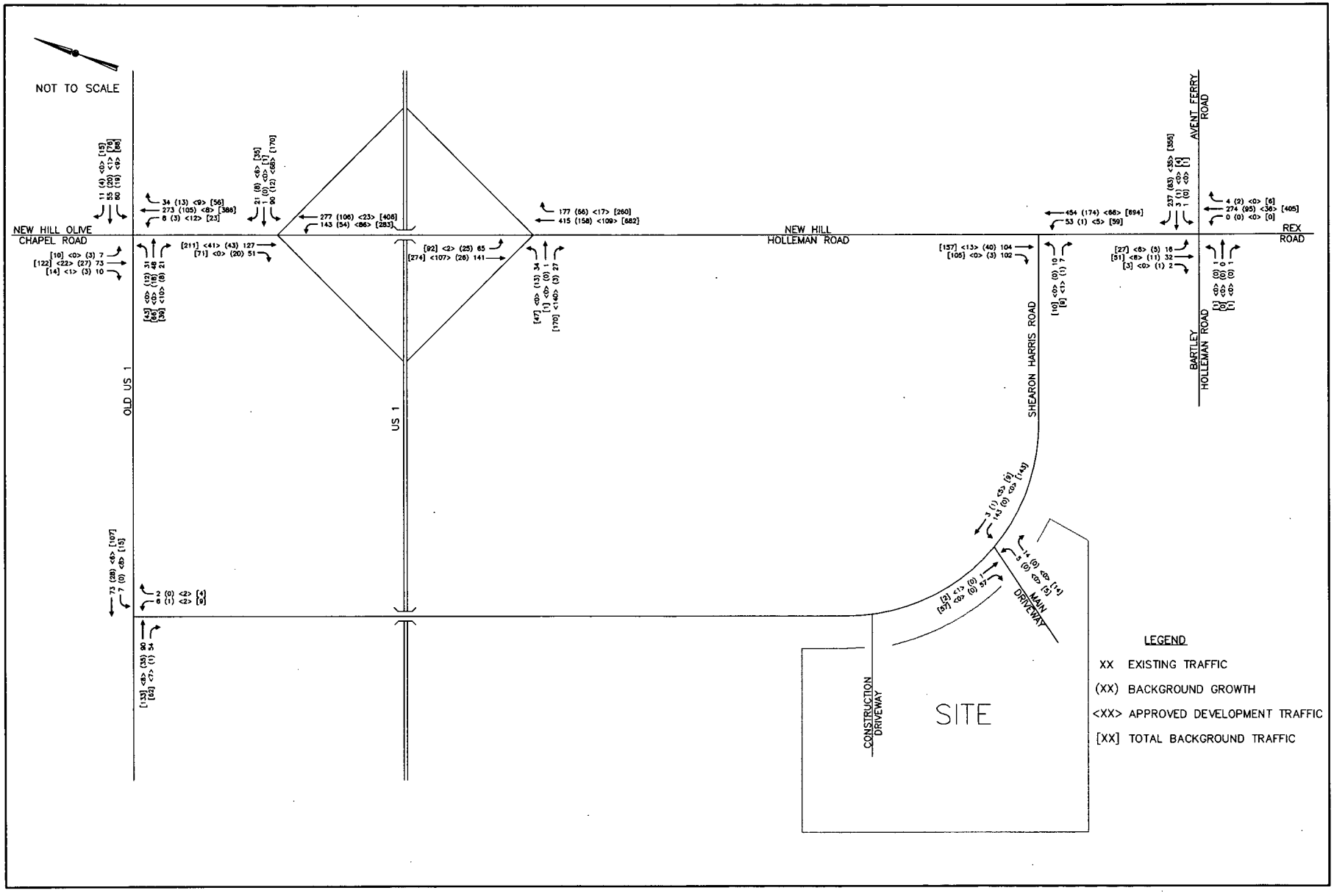

FIGURE 15

PROJECTED (2019) BACKGROUND AM PEAK HOUR TRAFFIC VOLUMES

HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS

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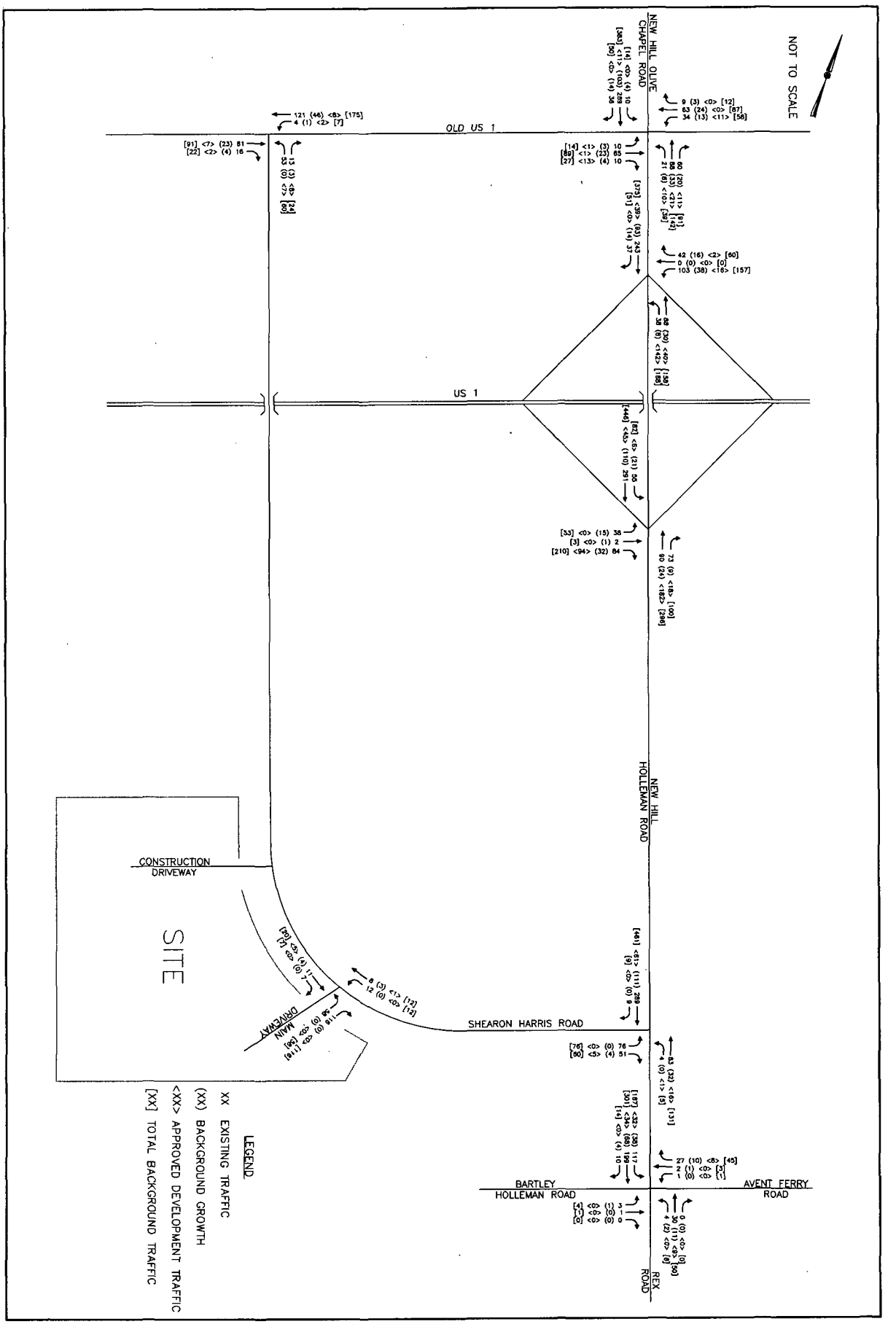

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HARRIS ADVANCED REACTOR
TRAFFIC IMPACT ANALYSIS

PROJECTED (2019) BACKGROUND PM
PEAK HOUR TRAFFIC VOLUMES

FIGURE
16

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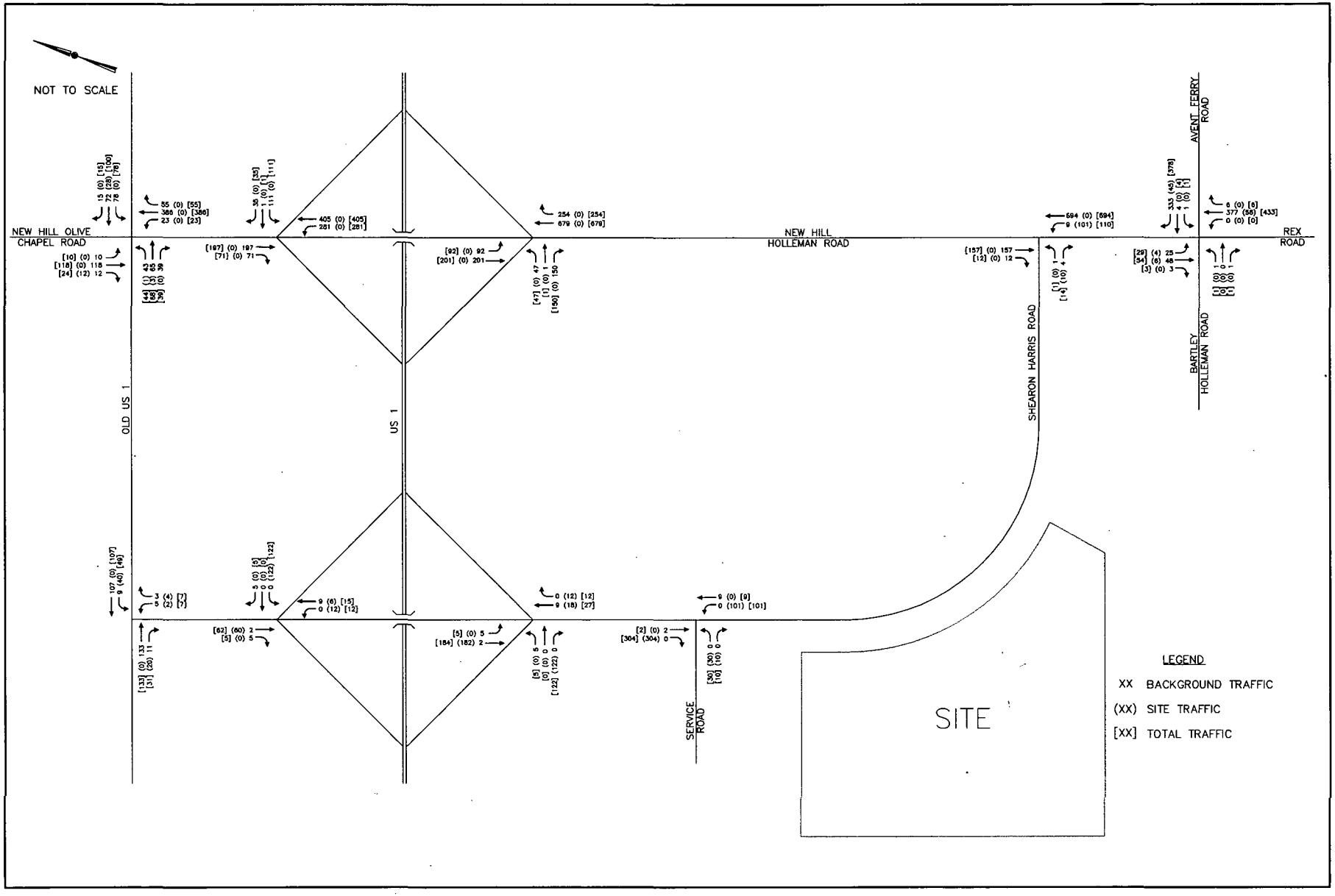

FIGURE 17

PROJECTED (2019) BUILD-OUT AM PEAK HOUR TRAFFIC VOLUMES

HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS

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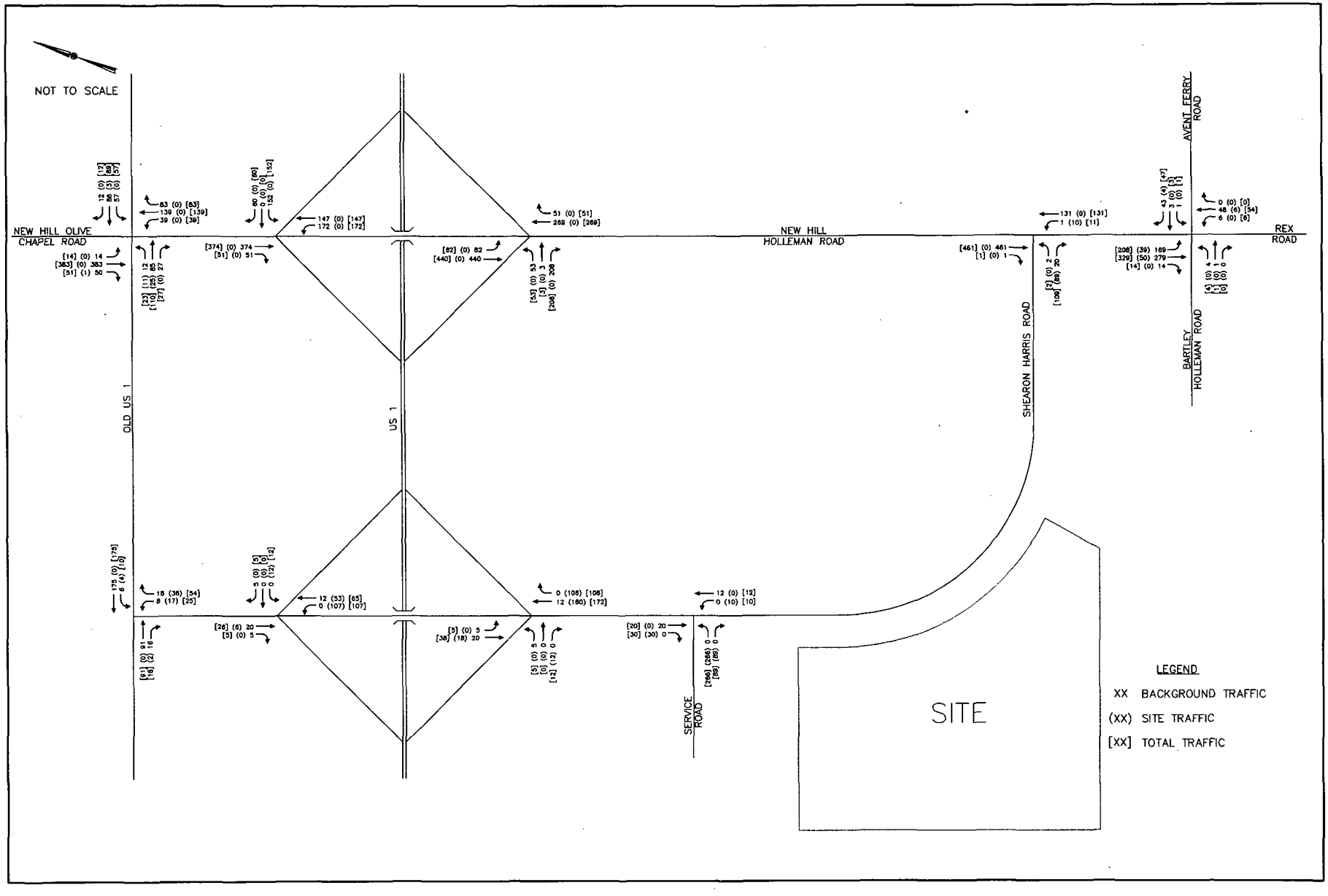

FIGURE 18

PROJECTED (2019) BUILD-OUT PM PEAK HOUR TRAFFIC VOLUMES

HARRIS ADVANCED REACTOR TRAFFIC IMPACT ANALYSIS

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7.0 Proposed Interchange on US 1

Progress Energy is pursuing a new interchange on US 1 in the vicinity of the site to accommodate the construction traffic and to serve the future service road into the facility at build-out of the site. Five interchange alternatives were evaluated based on several criteria including location, interchange spacing, traffic operation and construction cost. Five options were considered:

- **Option 1** – Convert existing Shearon Harris Road overpass to a diamond interchange
- **Option 2** – Convert existing Shearon Harris Road overpass to a modified partial cloverleaf interchange
- **Option 3** – New trumpet interchange approximately 4,000 feet southwest of the Shearon Harris Road overpass
- **Option 4** – New trumpet interchange approximately 1,000 feet northeast of the railroad overpass
- **Option 5** – New diamond interchange approximately 1,000 feet northeast of the railroad overpass

Following is a discussion of the benefits and drawbacks for each option.

7.1 Option 1 – Conceptual Layout

Option 1 includes constructing a full diamond interchange on US 1 at the existing Shearon Harris Road overpass with a two-lane service road parallel to US 1 from Shearon Harris Road to just east of the existing railroad line. The service road would be approximately 7,200 feet along US 1 with an additional 3,000 feet parallel to the railroad spur.

The two primary advantages to this option are that no changes are required to the existing two-lane Shearon Harris Road bridge over US 1, and all of the necessary right-of-way appears to be owned by Progress Energy. If the interchange is located here, it would improve the access to the plant, the proposed Western Wake Water Reclamation Facility, and also provide the traveling public with an alternative route between US 1 and Old US 1.

There are two main drawbacks to this option. First, the heavy movement from southbound US 1 to southbound Shearon Harris Road would be a left turn at the ramp terminal. Second, the spacing between the Shearon Harris Road overpass and the New Hill Holleman Road overpass is approximately 0.97 mile. Generally, the desired minimum interchange spacing is one mile in urban areas and two miles in rural areas. When the interchange spacing is less than one mile, the need for auxiliary lanes needs to be evaluated.

The footprint of this interchange is relatively small with only 600 feet between the ramp terminals along Shearon Harris Road. If NCDOT requires left-turn lanes on Shearon Harris Road at both on ramps, that would likely require widening of the bridge deck.

7.2 Option 2 – Conceptual Layout

Option 2 includes a modified partial cloverleaf alignment at the existing Shearon Harris Road overpass with ramps and loops in the east and west quadrants of the interchange, and the same service road as Option 1.

This option increases the spacing between the ramp terminals on Shearon Harris Road to approximately 1,100 feet, and the heavy movement from southbound US 1 to southbound on Shearon Harris Road would become a loop movement and a right turn onto Shearon Harris Road instead of a left turn as it is in Option 1. The other advantage to this alignment is that the proposed service road can align directly with the US 1 northbound ramps. Again, all necessary right-of-way appears to be owned by Progress Energy, and the interchange would also serve the traveling public with direct access to Shearon Harris Road.

This option is more expensive than Option 1 because the existing bridge end slopes will require removal and a vertical end wall will be required to allow room for the loop ramps under the bridge. As with Option 1, the spacing between the Shearon Harris Road overpass and the New Hill Holleman Road overpass is approximately 0.97 mile, so the need for auxiliary lanes would need to be evaluated.

7.3 Option 3 – Conceptual Layout

Option 3 is a three-legged trumpet interchange located on Progress Energy property approximately 4,000 feet west of the existing overpass of Shearon Harris Road. With this option, the length of the service road parallel to US 1 decreases from 7,200 feet to approximately 3,200 feet along US 1 with the additional 3,000 feet parallel to railroad.

The biggest advantage to this alternative over Options 1 and 2 is the increased interchange spacing along US 1 from 0.97 mile to approximately 1.72 miles from New Hill Holleman Road. As with Options 1 and 2, all of the necessary right-of-way for the footprint of this interchange appears to be owned by Progress Energy.

There are three primary disadvantages to this interchange alignment compared to Options 1 and 2. This option requires a new bridge structure over US 1, the interchange would only serve plant traffic, and it would be difficult to modify the interchange in the future to provide access to the north toward Old US 1. This option would not provide direct access to a public road.

7.4 Option 4 – Conceptual Layout

Option 4 is also a three-legged trumpet interchange located mostly on privately owned property approximately 1,000 feet east of the existing railroad overpass. At this location, the spacing from the New Hill Holleman Road interchange increases to 2.36 miles, but the length of the service road increases slightly compared to Option 3.

However, in addition to the drawbacks listed above for Option 3, this alternative would require right-of-way acquisition at an unknown cost. There is also a cemetery on the north side of US 1 at the end of Shady Grove Road that would be a major obstacle to permitting the interchange at this location.

7.5 Option 5 – Conceptual Layout

Option 5 consists of a full diamond interchange located mostly on privately owned property approximately 1,000 feet east of the existing railroad overpass (same location as Option 4). Two benefits to this configuration are that it could be converted relatively easily to accommodate a connection to the north toward Old US 1, and it provides the shortest service road length.

One additional drawback to this configuration is the heavy volume of traffic from US 1 southbound toward the site would have to stop at the ramp terminal. Again, the presence of the cemetery at the end of Shady Grove Road would be a major obstacle to permitting the interchange at this location.

The conceptual plans for each option are shown in Figures 19, 20, 21, 22 and 23.

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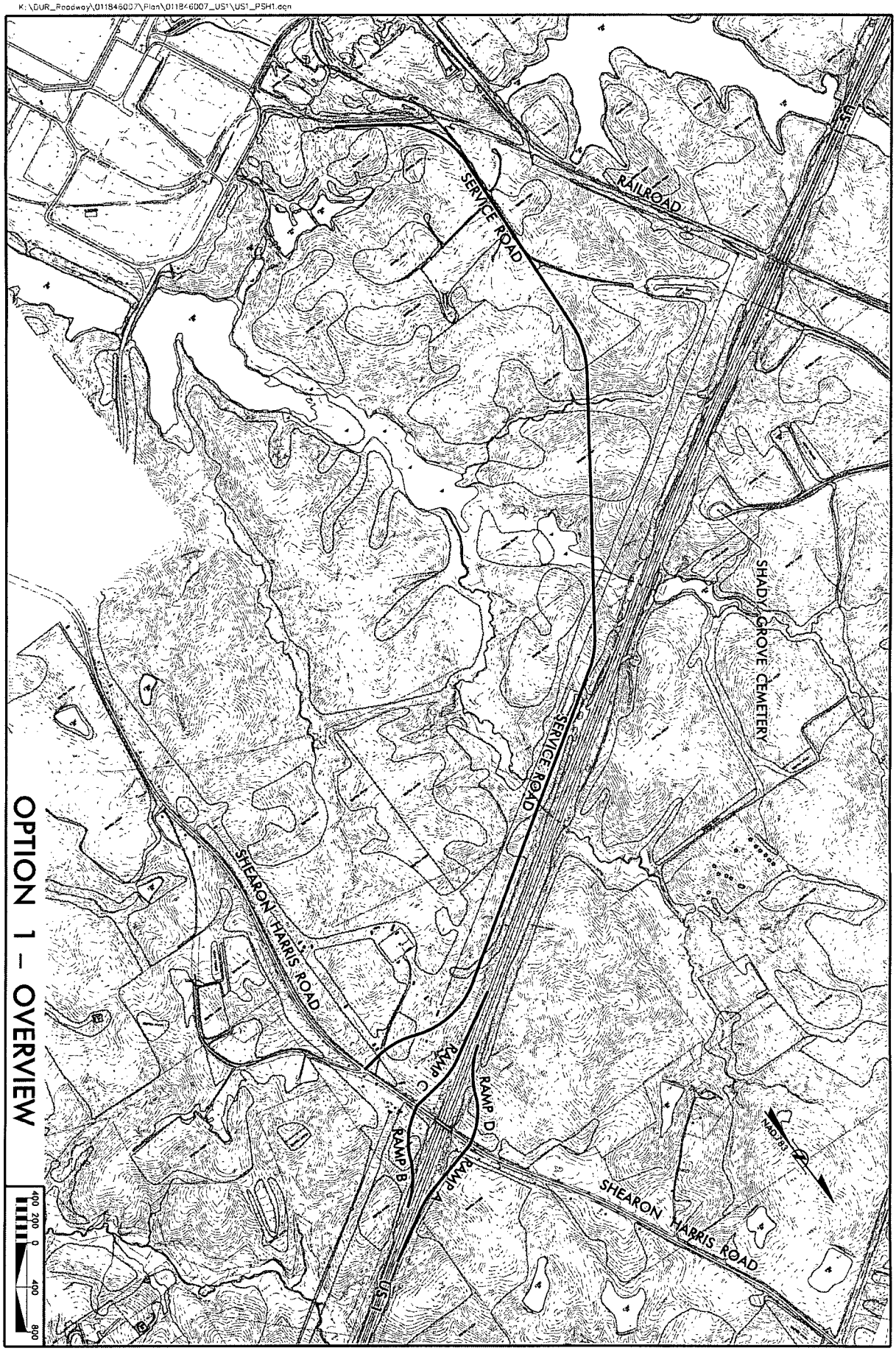

OPTION 1 – OVERVIEW

Kimley-Horn and Associates, Inc.	HARRIS ADVANCED REACTOR CONCEPTUAL DESIGN FOR IMPACTED ROADS	OPTION 1 - OVERVIEW	FIGURE 19

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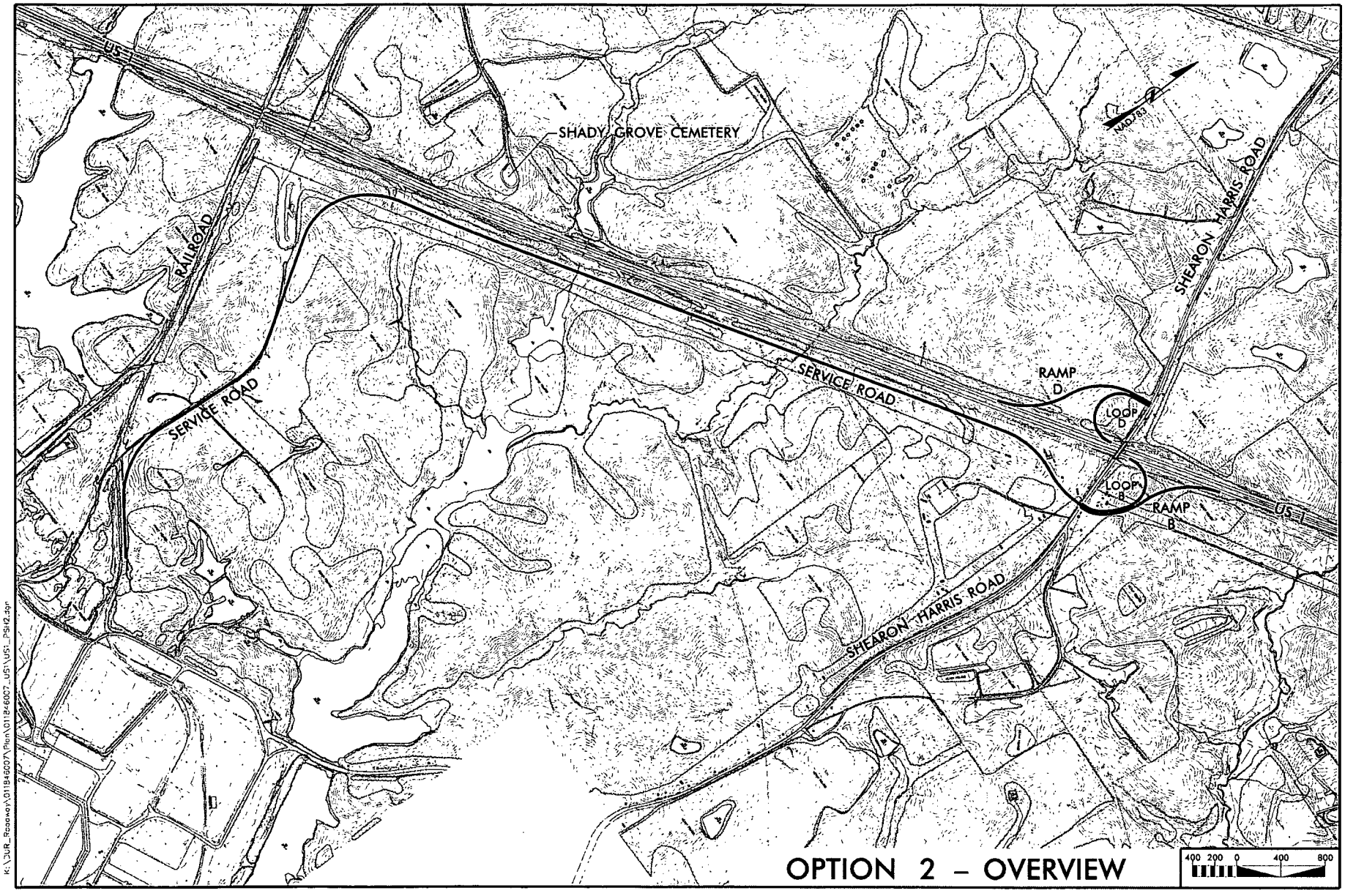

OPTION 2 – OVERVIEW

FIGURE 20

OPTION 2 - OVERVIEW

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

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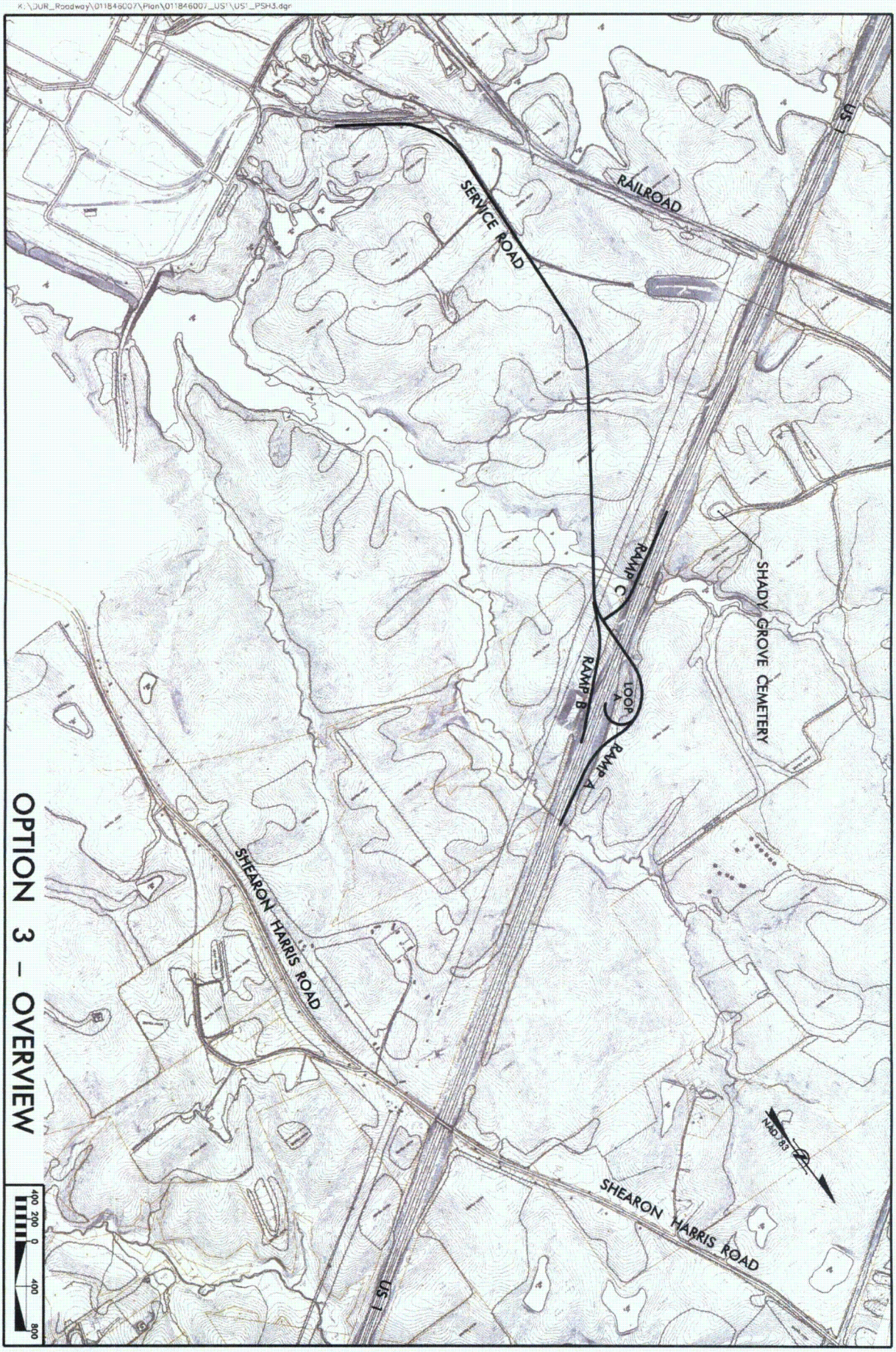

OPTION 3 - OVERVIEW

Kimley-Horn and Associates, Inc.	HARRIS ADVANCED REACTOR CONCEPTUAL DESIGN FOR IMPACTED ROADS	OPTION 3 - OVERVIEW	FIGURE 21

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OPTION 4 - OVERVIEW

Kimley-Horn and Associates, Inc.	HARRIS ADVANCED REACTOR CONCEPTUAL DESIGN FOR IMPACTED ROADS	OPTION 4 - OVERVIEW	FIGURE 22

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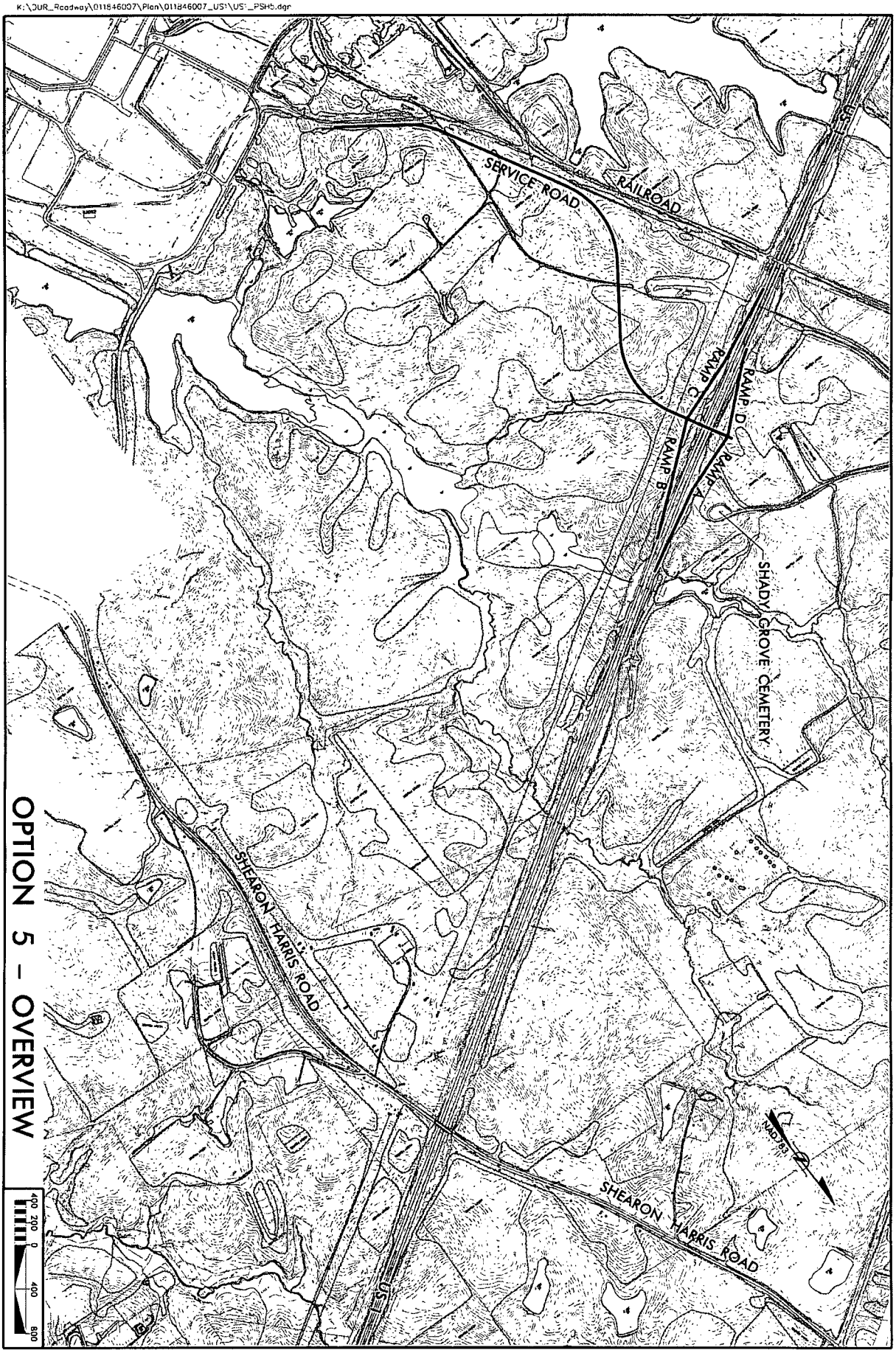

OPTION 5 – OVERVIEW

Kimley-Horn and Associates, Inc.	HARRIS ADVANCED REACTOR CONCEPTUAL DESIGN FOR IMPACTED ROADS	OPTION 5 - OVERVIEW	FIGURE 23

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Table 7.1 summarizes the Engineer's Opinion of Probable Construction Cost for each option. Note that the cost opinion for Options 1 and 2 includes auxiliary lanes in both directions on US 1 between Shearon Harris Road and New Hill Holleman Road, and the cost opinion for Options 4 and 5 do not include the cost of right-of-way acquisition, which is unknown.

Table 7.1
Conceptual Interchange Layouts
Engineer's Opinion of Probable Construction Cost

Option 1	$7,400,000
Option 1 with widening of the overpass to three lanes	$8,800,000
Option 2	$8,000,000
Option 3	$7,650,000
Option 4	$7,000,000 *
Option 5	$6,850,000 *

*** - does not include the cost of right-of-way acquisition**

Note that the cost opinion for Options 1 and 2 assumes that the existing Shearon Harris Road overpass is structurally sufficient to accommodate conversion to an interchange, and that there is adequate vertical clearance over US 1.

Table 7.2 summarizes the roadway design criteria for the conceptual interchange designs. The cost opinion spreadsheet calculations are included in the Appendix.

Table 7.2
Conceptual Interchange Design
Summary of Design Criteria

Route	US 1	Ramp	Ramp
Line	Auxiliary Lanes	-	-
Classification	Freeway	-	-
Terrain Type	Rolling	Rolling	Rolling
Design Speed (mph)	70	50	40
Posted Speed (mph)	65	45	35
Proposed ROW Width (ft)	Uniform	Variable	Variable
Control of Access	Full	Full	Full
Rumble Strips (Y / N)	Y	N	N
Typical Section Type	4 Lane Divided	Shoulder	Shoulder
Lane Width (ft)	12	14	14
Sidewalks (Y / N)	N	N	N
Bicycle Lanes (Y / N)	N	N	N
Median Width (ft)	-	N/A	N/A
Median Protection (GR / Barrier)	N/A	-	N
Shoulder Width (Total)			
Median (ft)	-	N/A	N/A
Outside w/o GR (ft)	12	10 (IN) / 12 (OUT)	10 (IN) / 12 (OUT)
Outside w/ GR (ft)	17	15 (IN) / 17 (OUT)	15 (IN) / 17 (OUT)
Paved Shoulder			
Outside Total / FDPS (ft)	10 / 4 (FDPS)	4	4
Median Total / FDPS (ft)	-	N/A	N/A
Grade			
Maximum	EXIST	5%	5%
Minimum	EXIST	0.3%	0.3%
K Value			
Sag	181	96	79
Crest	247	84	61
Horizontal Alignment			
Maximum Superelevation	8%	8%	8%
Minimum Radius (ft)	EXIST	758	444
Spiral (Y / N)	-	Y	Y
Cross Slopes			
Pavement	EXIST	2%	2%
Paved Shoulder	2% / 4%	2%	2%
Turf Shoulder	4%	8%	8%
Median Ditch	-	N/A	N/A
Ditch Typical (A, B, C)	A	A	A
Clear Zone 4:1 Slopes (ft)	46*	26**	26**

Table 7.2 (continued)
Conceptual Interchange Design
Summary of Design Criteria

Route	Loop	Service Road	Service Road
Line	-	NCDOT	Private
Classification	-	Arterial	Local
Terrain Type	Rolling	Rolling	Rolling
Design Speed (mph)	30	50	50
Posted Speed (mph)	25	45	45
Proposed ROW Width (ft)	-		
Control of Access	Full	N	Y
Rumble Strips (Y / N)	N	N	N
Typical Section Type	Shoulder / C&G	Shoulder	Shoulder
Lane Width (ft)	16	12	12
Sidewalks (Y / N)	N	N	N
Bicycle Lanes (Y / N)	N	N	N
Median Width (ft)	N/A	N/A	N/A
Median Protection (GR / Barrier)	N/A	N	N/A
Shoulder Width (Total)			
Median (ft)	N/A	N/A	N/A
Outside w/o GR (ft)	10	8	8
Outside w/ GR (ft)	15	13	11
Paved Shoulder			
Outside Total / FDPS (ft)	4	NONE	NONE
Median Total / FDPS (ft)	N/A	N/A	N/A
Grade			
Maximum	7%	5%	8%
Minimum	0.3%	0.3%	0.3%
K Value			
Sag	37	96	96
Crest	19	84	84
Horizontal Alignment			
Maximum Superelevation	8%	8%	8%
Minimum Radius (ft)	150	758	758
Spiral (Y / N)	Y	N	N
Cross Slopes			
Pavement	2%	2%	2%
Paved Shoulder	2%	N/A	N/A
Turf Shoulder	8%	8%	8%
Median Ditch	N/A	N/A	N/A
Ditch Typical (A, B, C)	A	B	C
Clear Zone 4:1 Slopes (ft)	18	28*	28*

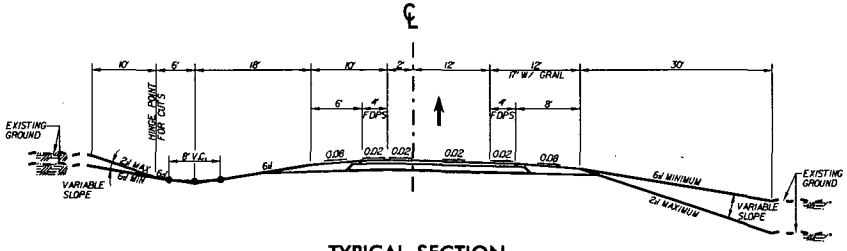
7.6 Recommended Interchange Layouts

Out of the five interchange options that were developed, Option 1 and Option 3 are recommended for closer study. It appears that Option 1 would have the lowest overall construction cost out of the three options that do not require right-of-way acquisition. This option is attractive because it utilizes the existing Shearon Harris Road overpass. Although Option 3 would likely be slightly more expensive to construct than Option 1 (primarily due to a new overpass over US 1), this concept provides the most direct access into and out of the site.

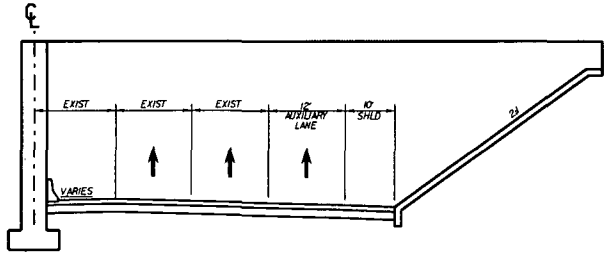
Figures 24 through 39 provide details for the conceptual interchange designs for Options 1 and 3, and enclosed for reference are 1" = 100' scale full-size plots of the detailed conceptual plans for Options 1 and 3.

For the purposes of the TIA, it was assumed that Option 1 would be constructed to accommodate the construction traffic and the build-out traffic. If Option 3 is constructed, the operation of the study intersections would generally improve compared to Option 1 because all of the plant traffic would access the site via US 1, and there would be less site traffic on the surrounding roadway network.

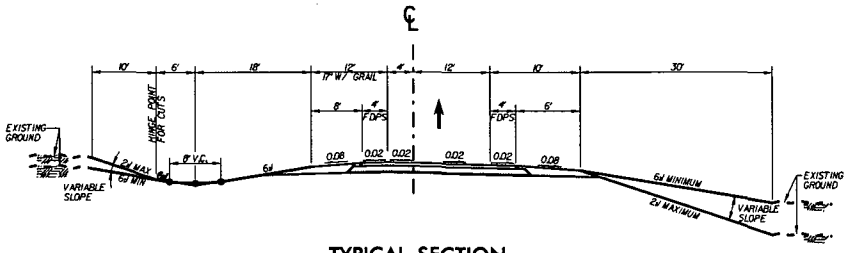
Note that NCDOT and the Federal Highway Administration (FHWA) will likely require an Interchange Justification Report (IJR) to permit the construction of the proposed interchange on US 1. At the appropriate time, the traffic capacity analysis and other information contained in the TIA can be used to initiate the IJR process with NCDOT and FHWA.



TYPICAL SECTION
RAMPS

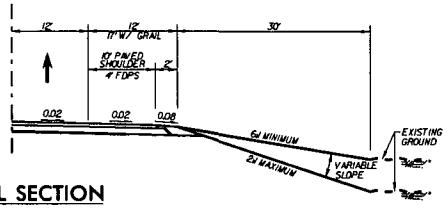


BRIDGE TYPICAL SECTION
AUXILLARY LANES



TYPICAL SECTION
LOOPS

EXISTING EDGE OF TRAVEL LANE (US 1)



TYPICAL SECTION
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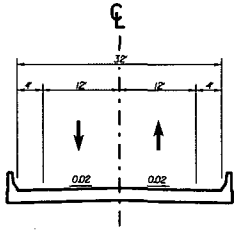
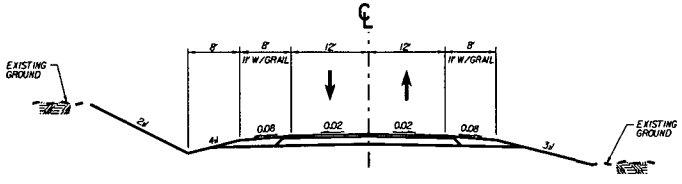


BRIDGE TYPICAL SECTION
SHEARON HARRIS SERVICE ROAD



TYPICAL SECTION
SERVICE ROAD

FIGURE 24

OPTION 1 THRU 5 - TYPICAL SECTIONS

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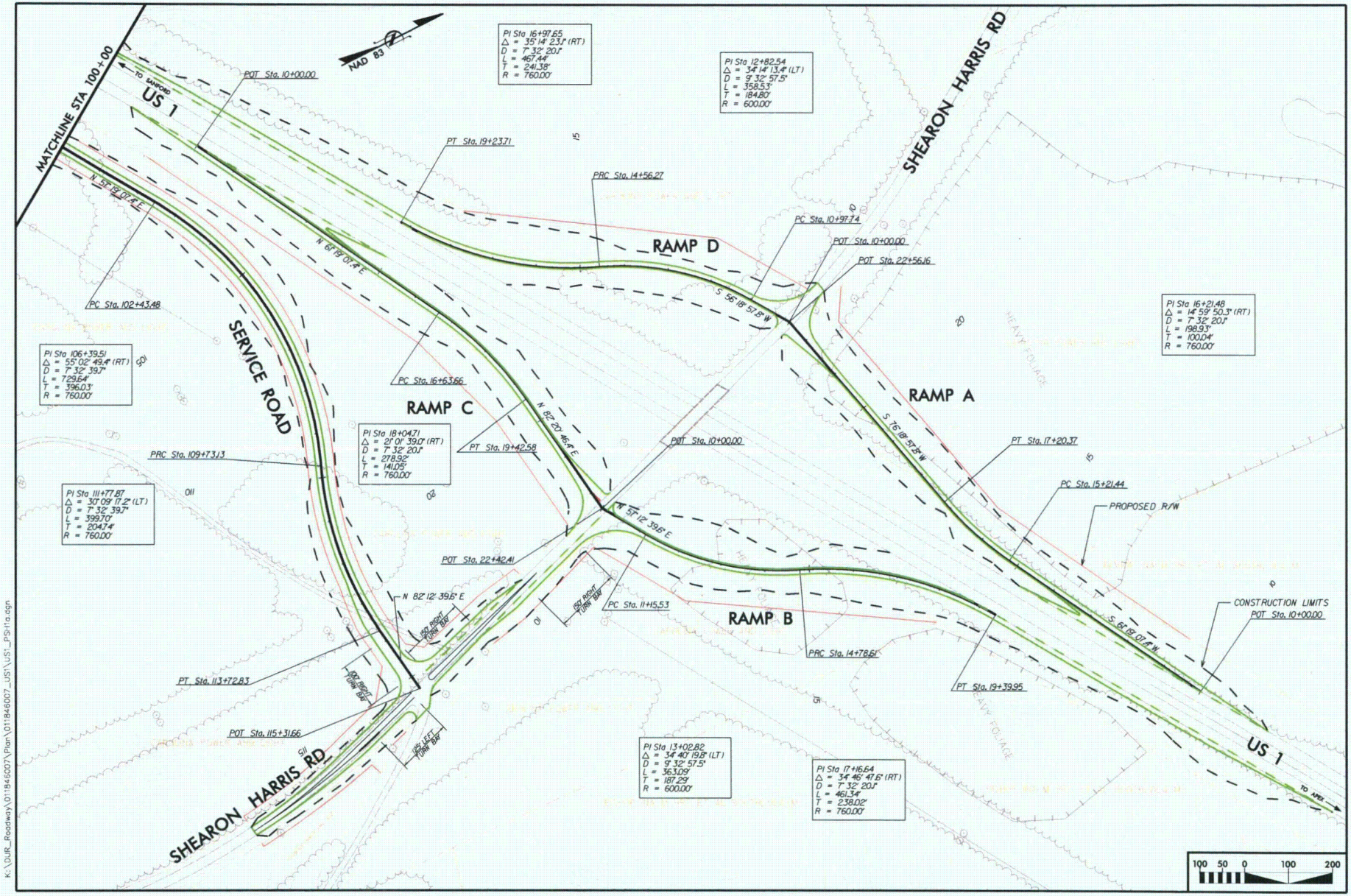

FIGURE 25

OPTION I - INTERCHANGE LAYOUT

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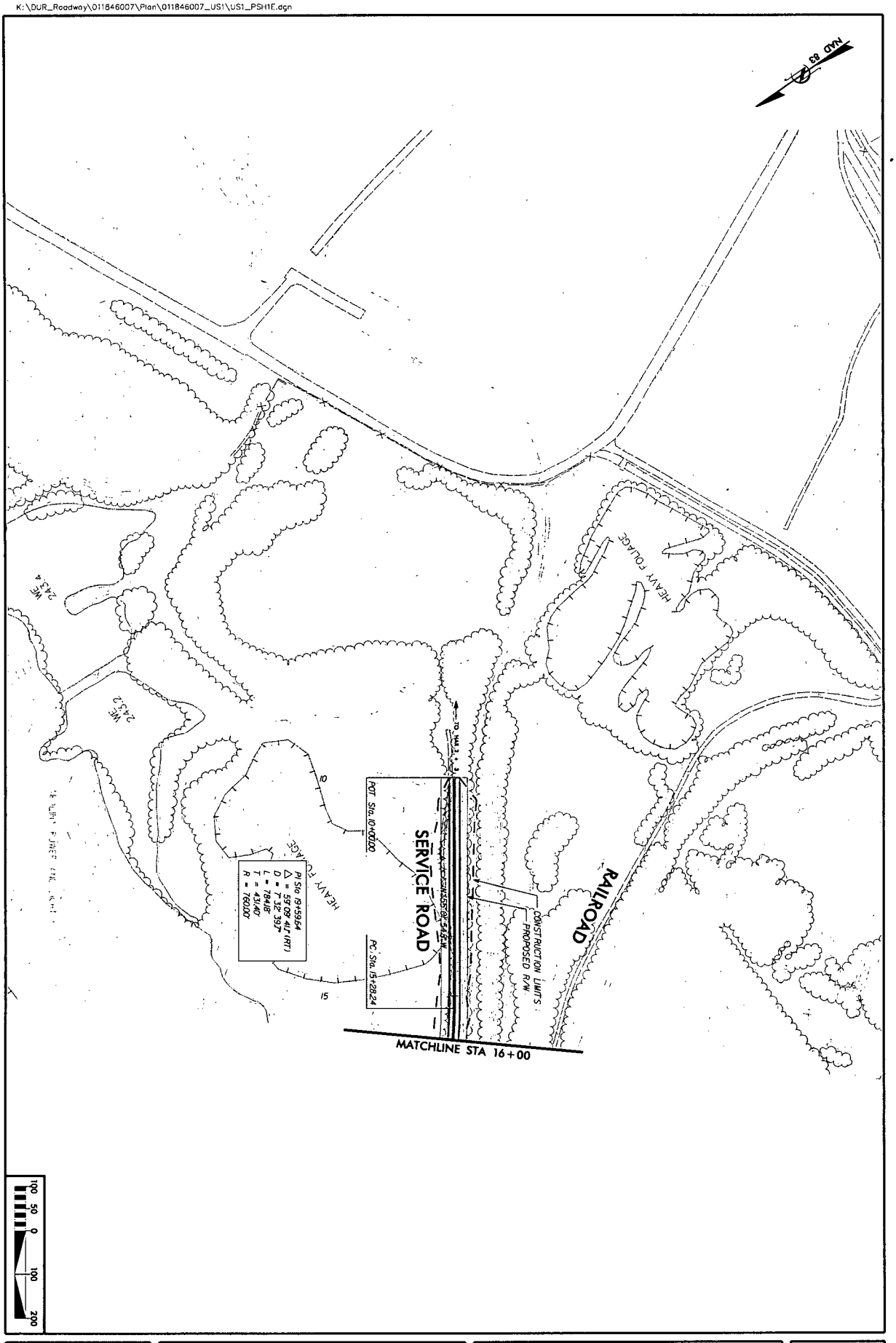

Kimley-Horn and Associates, Inc.	HARRIS ADVANCED REACTOR CONCEPTUAL DESIGN FOR IMPACTED ROADS	OPTION 1 - SERVICE ROAD	FIGURE 26

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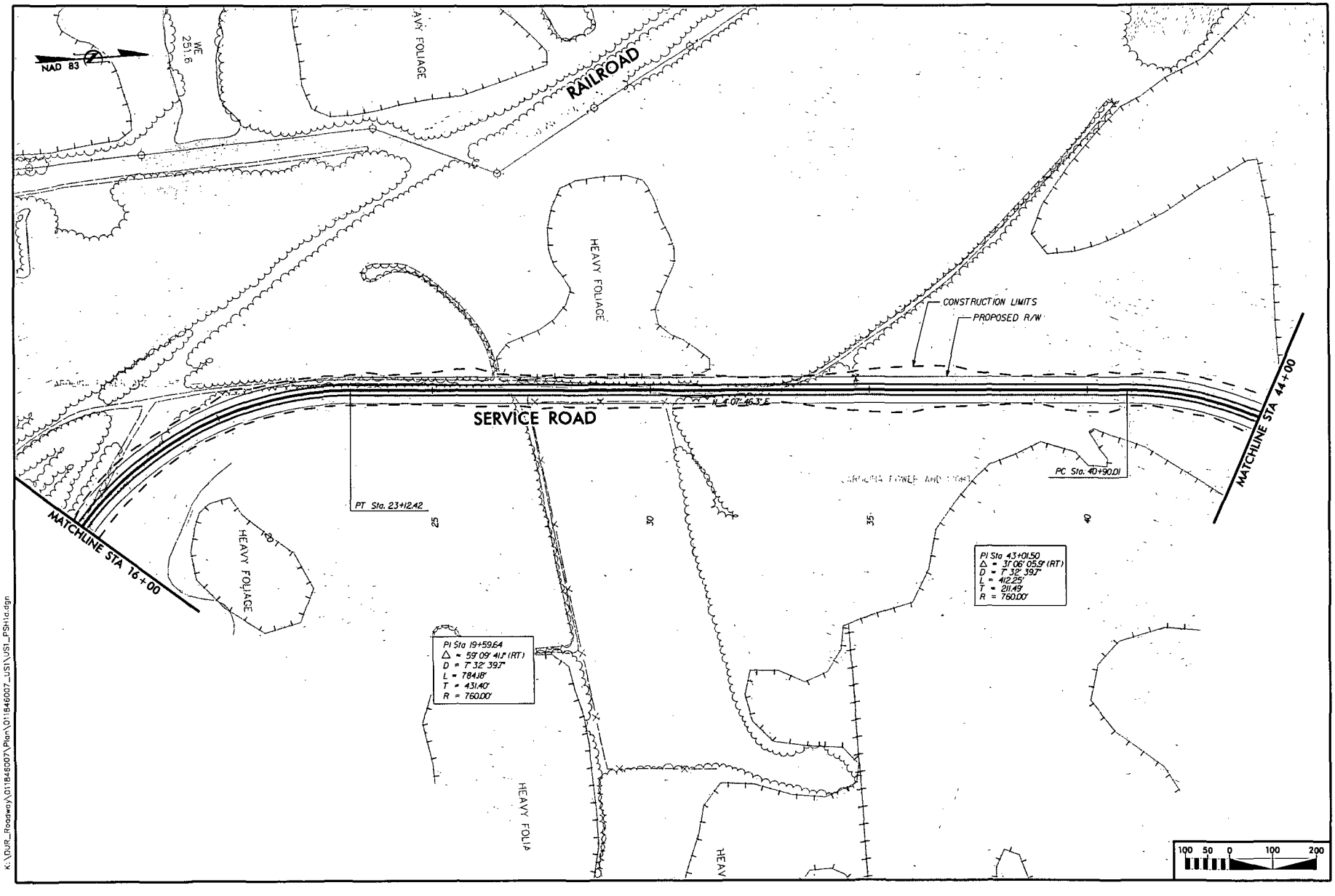

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FIGURE 27

OPTION I - SERVICE ROAD

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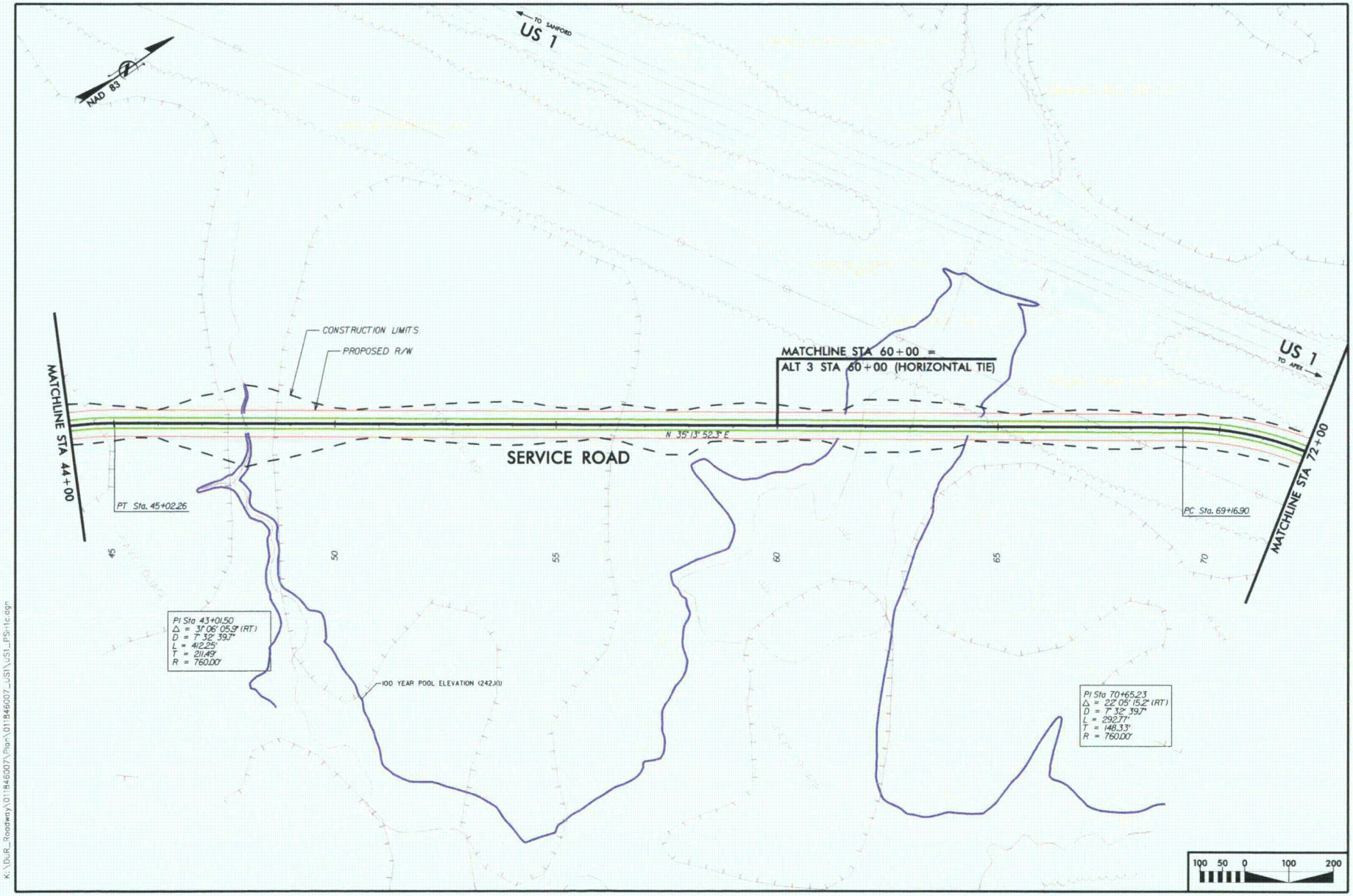

FIGURE 28

OPTION 1 - SERVICE ROAD

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FIGURE 29

OPTION 1 - SERVICE ROAD

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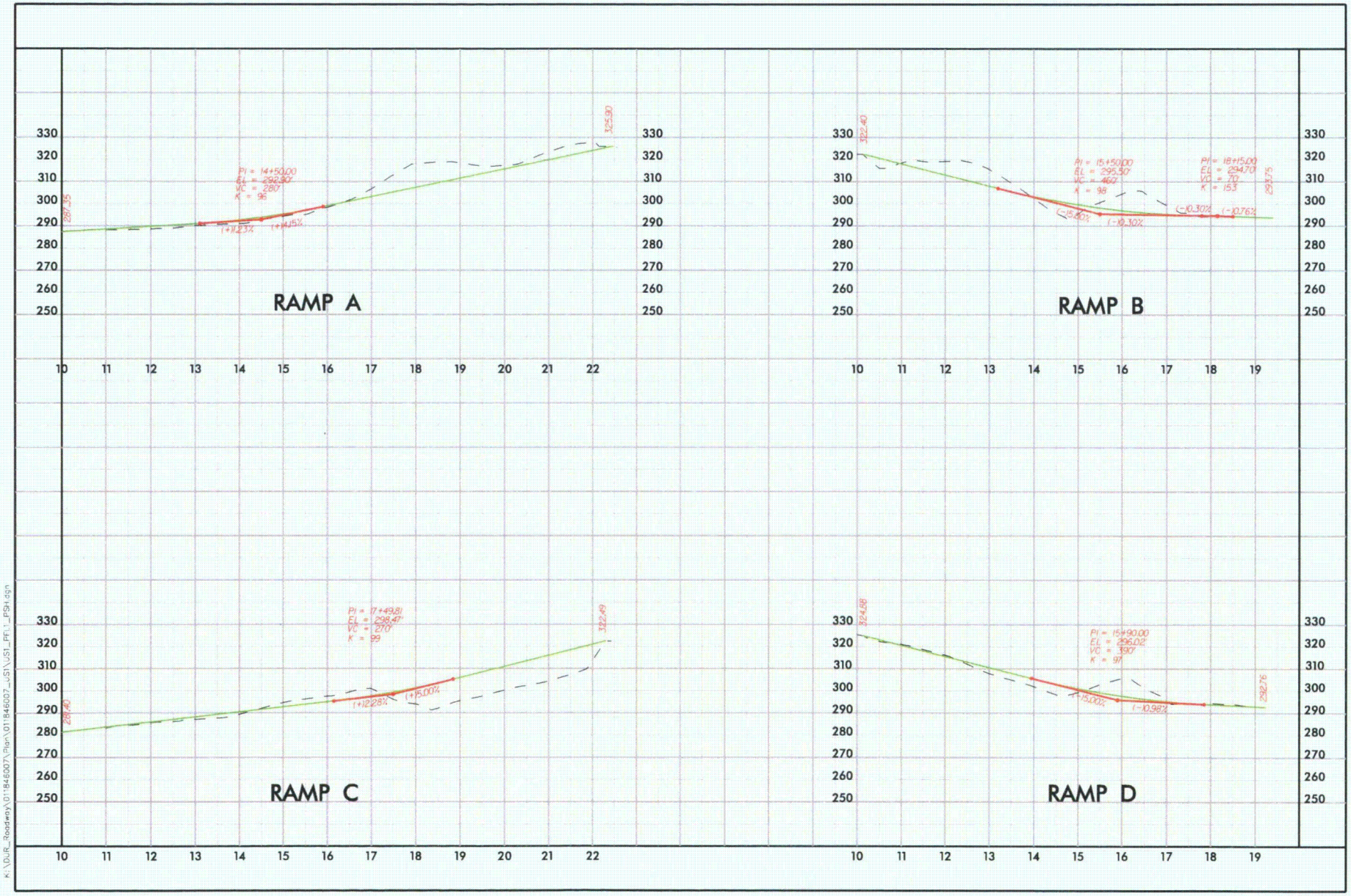

FIGURE 30

OPTION I - RAMP PROFILES

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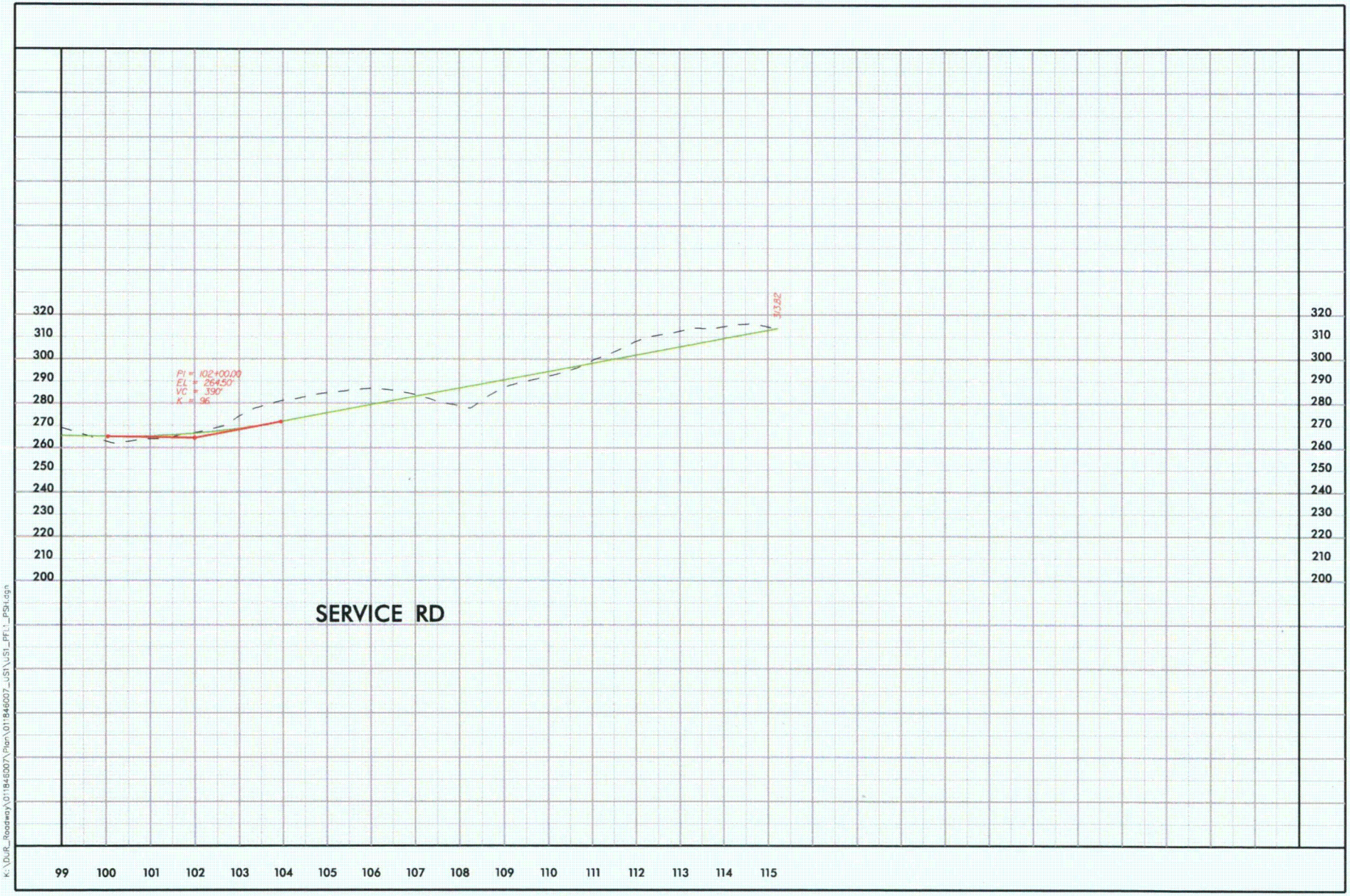

FIGURE 31

OPTION 1- SERVICE ROAD PROFILE

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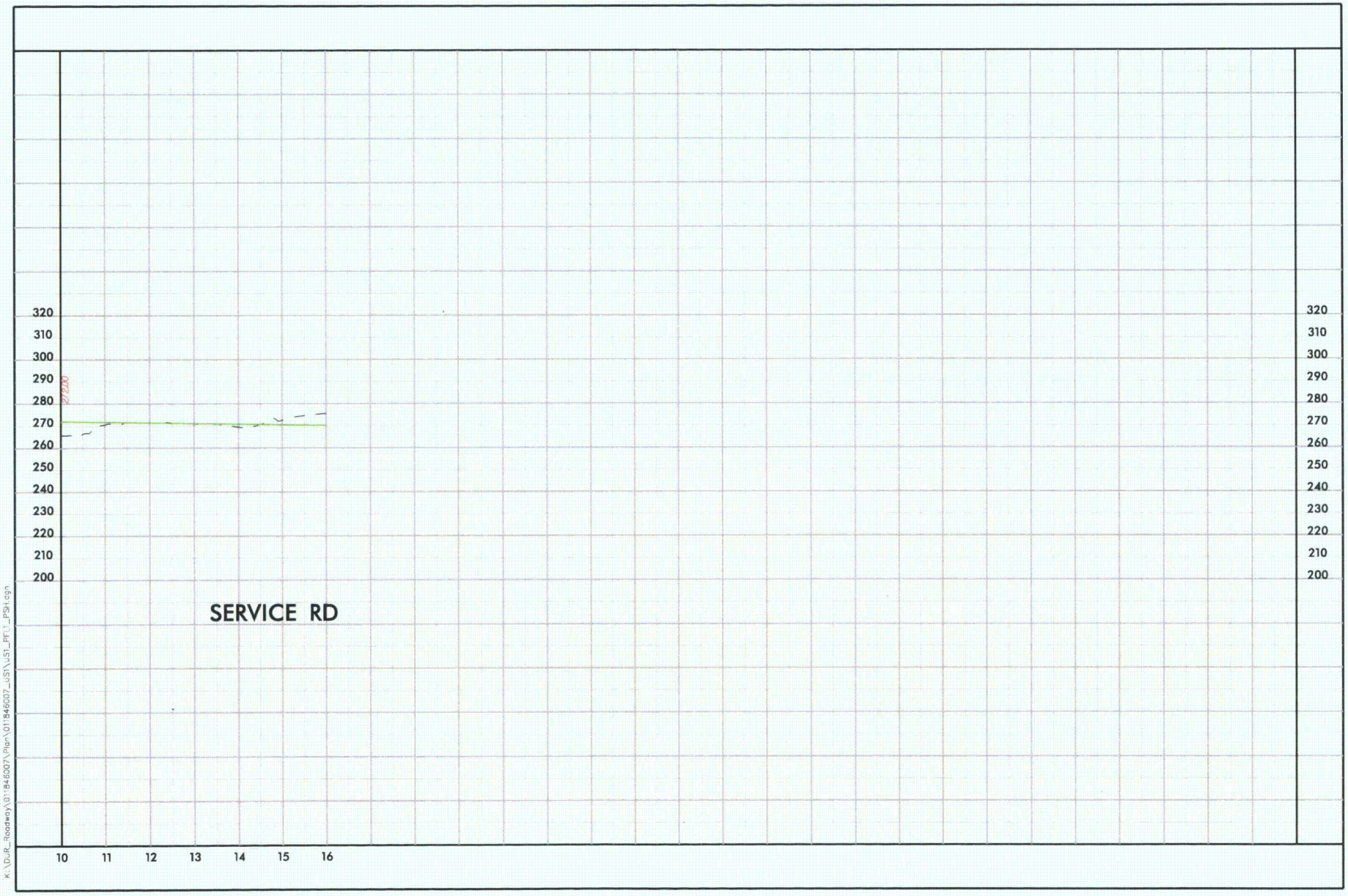

FIGURE 32

OPTION 1 - SERVICE ROAD PROFILE

HARRIS ADVANCED REACTOR
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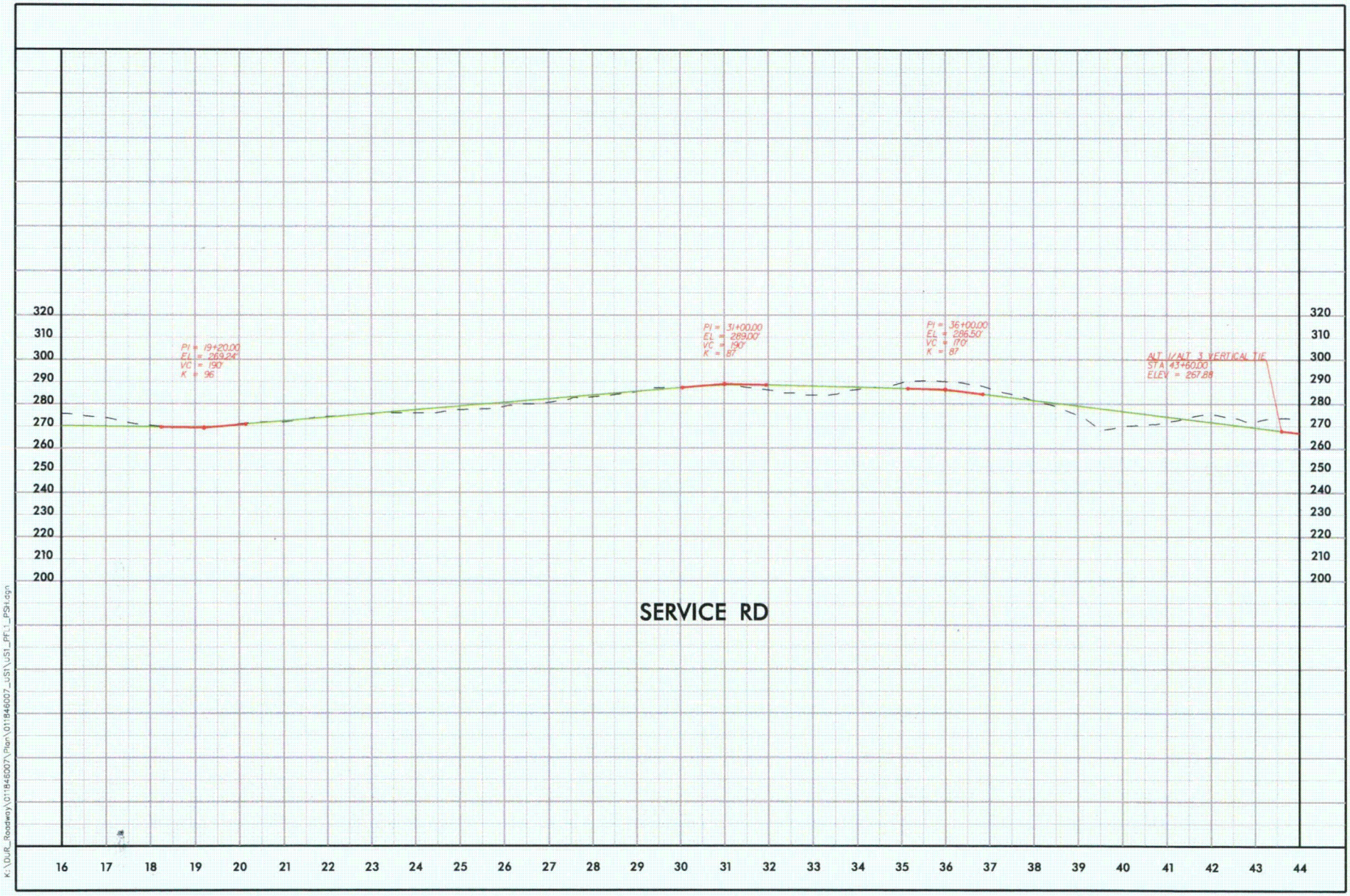

FIGURE 33

OPTION I - SERVICE ROAD PROFILE

HARRIS ADVANCED REACTOR
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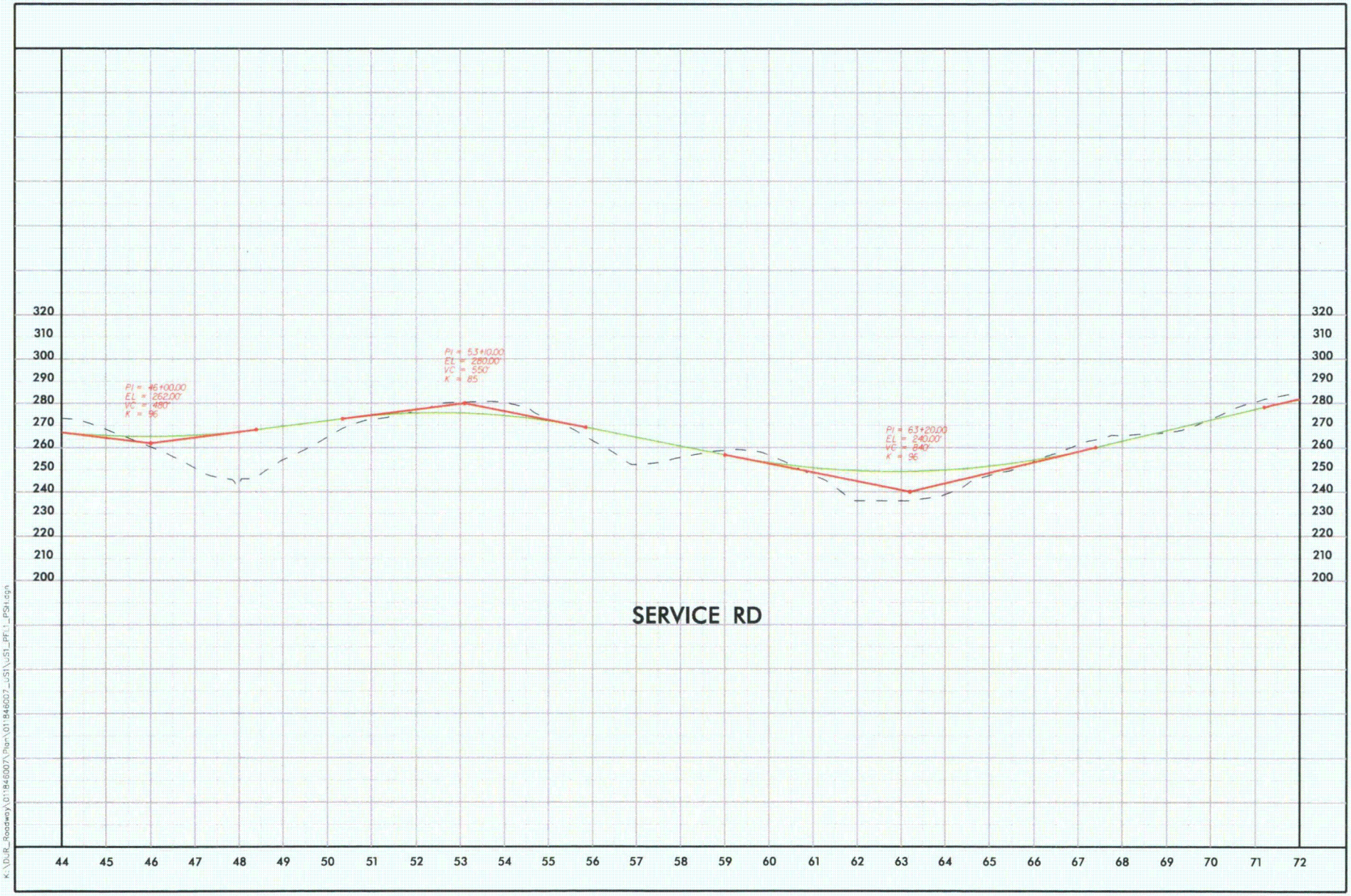

FIGURE 34

OPTION 1 - SERVICE ROAD PROFILE

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

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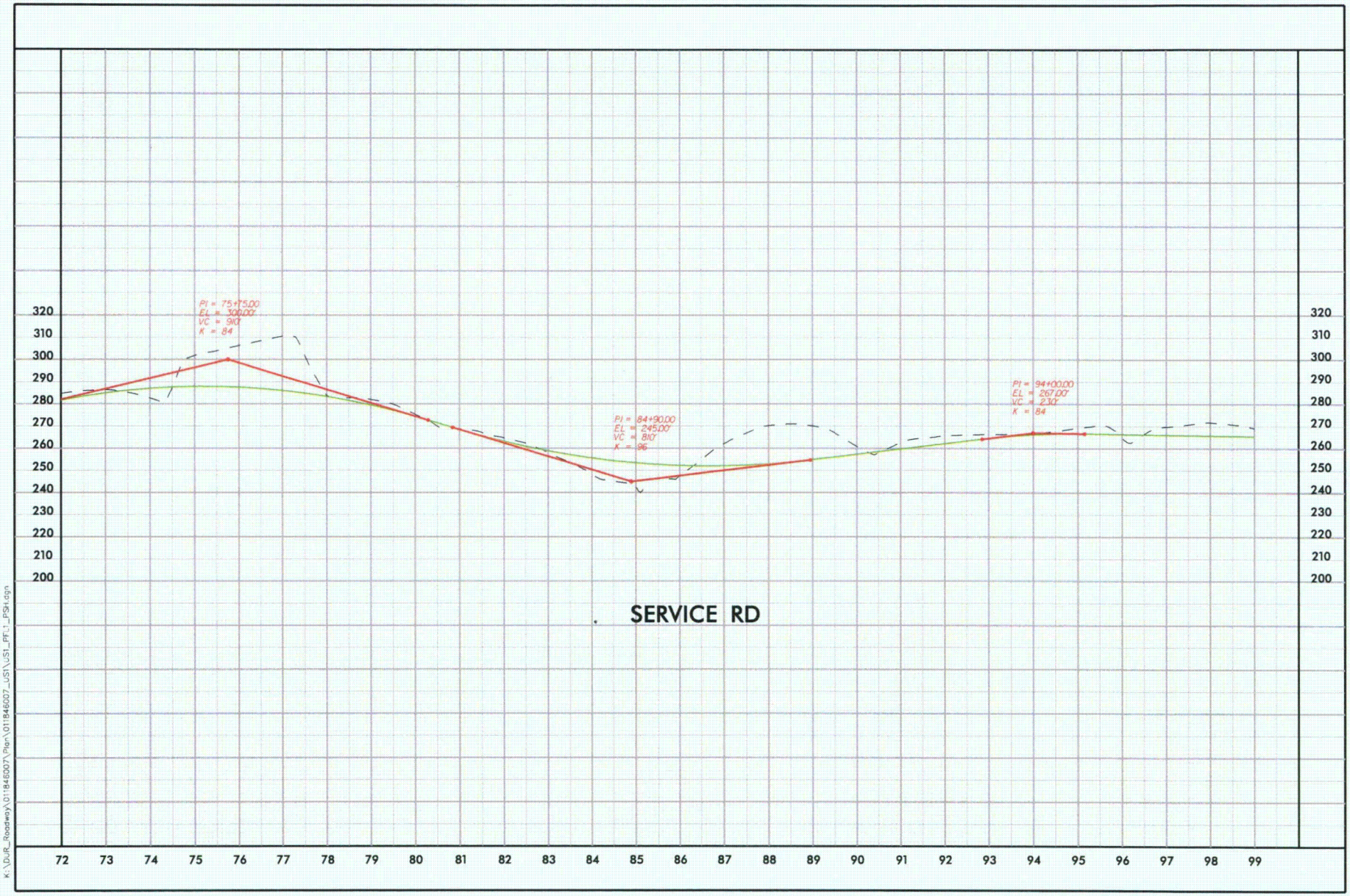

FIGURE 35

OPTION I - SERVICE ROAD RAMP PROFILE

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

Kimley-Horn and Associates, Inc.

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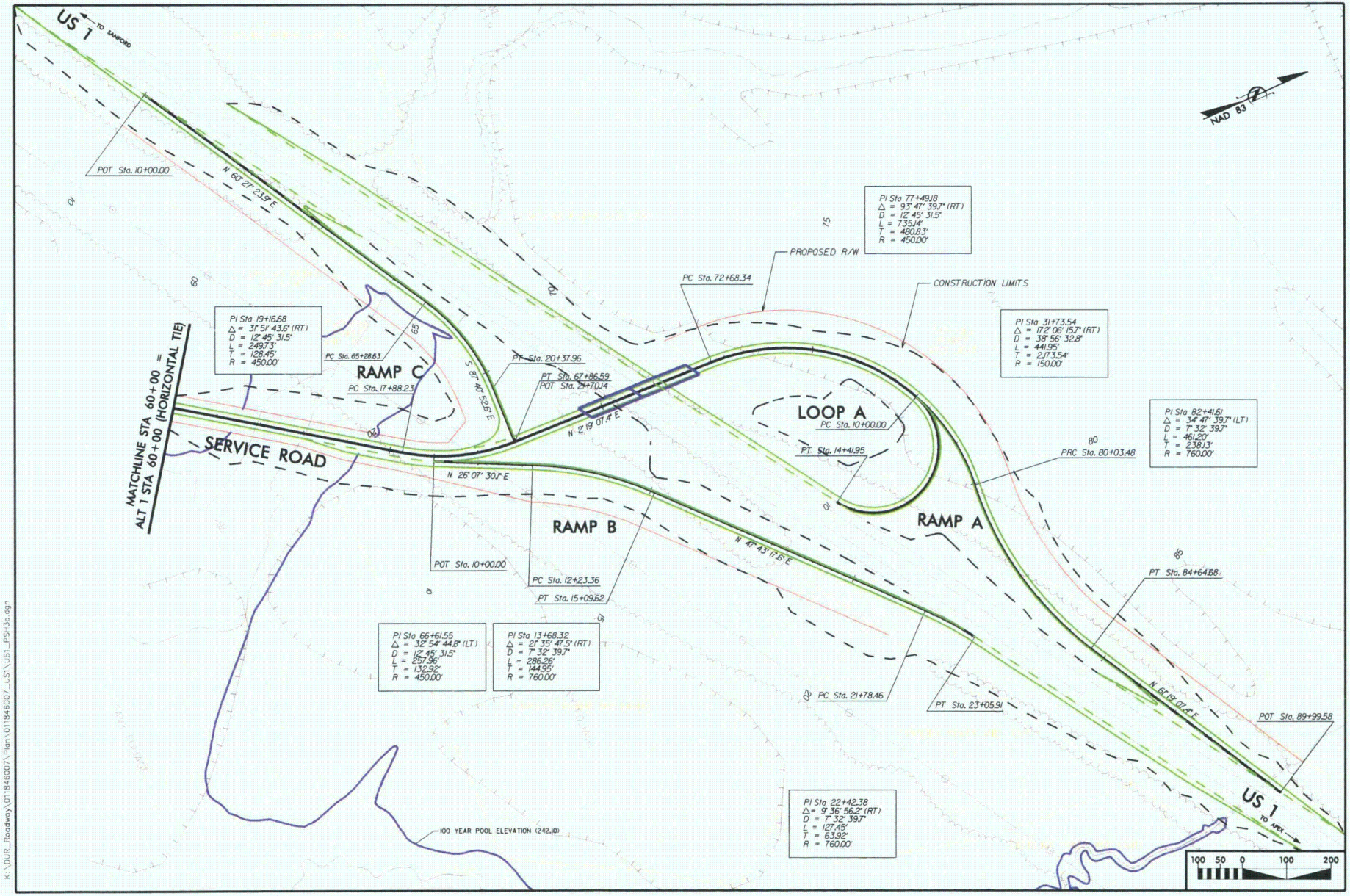

FIGURE 36

OPTION 3 - INTERCHANGE LAYOUT

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

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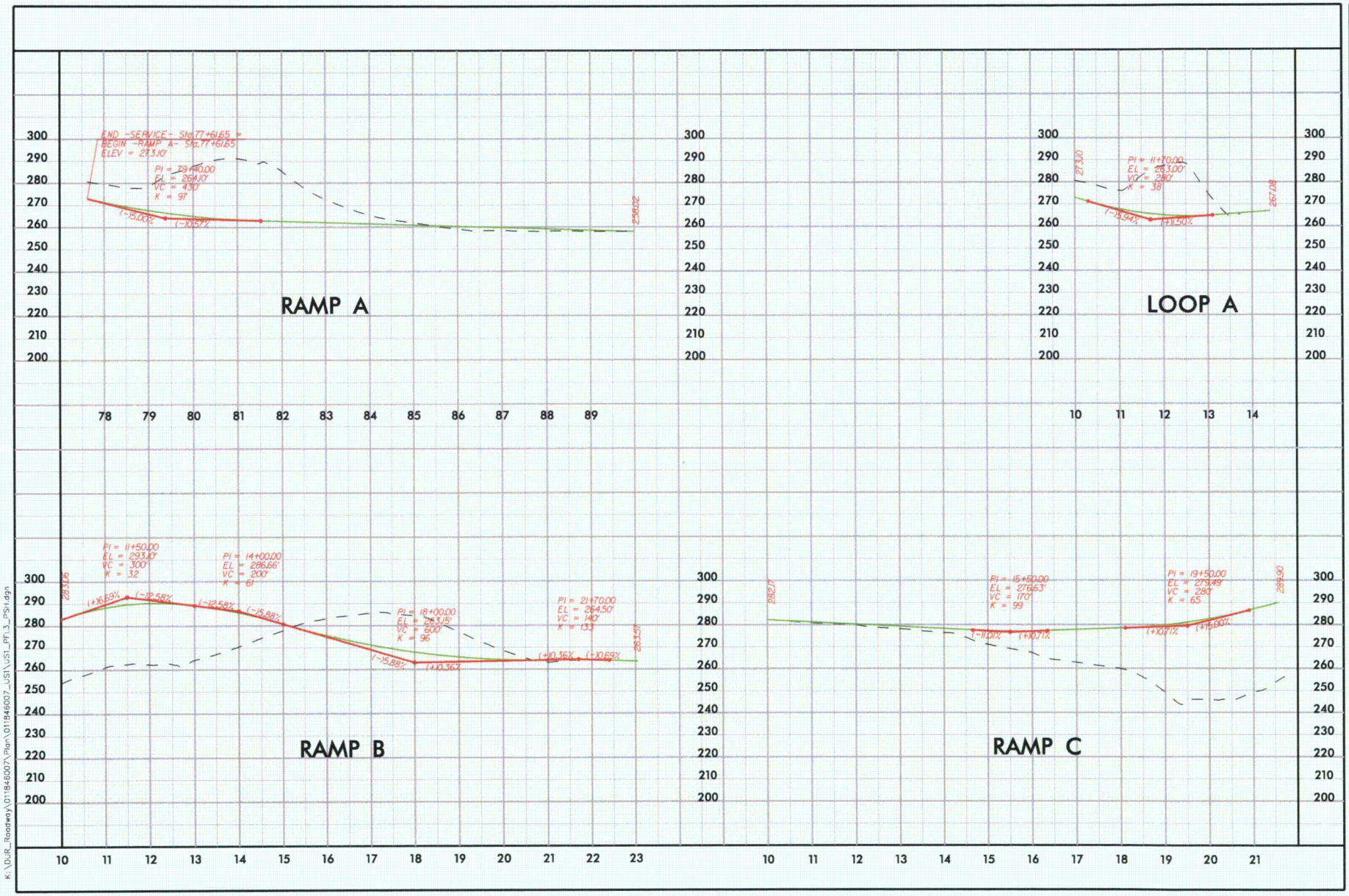

FIGURE 37

OPTION 3 - RAMP PROFILES

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

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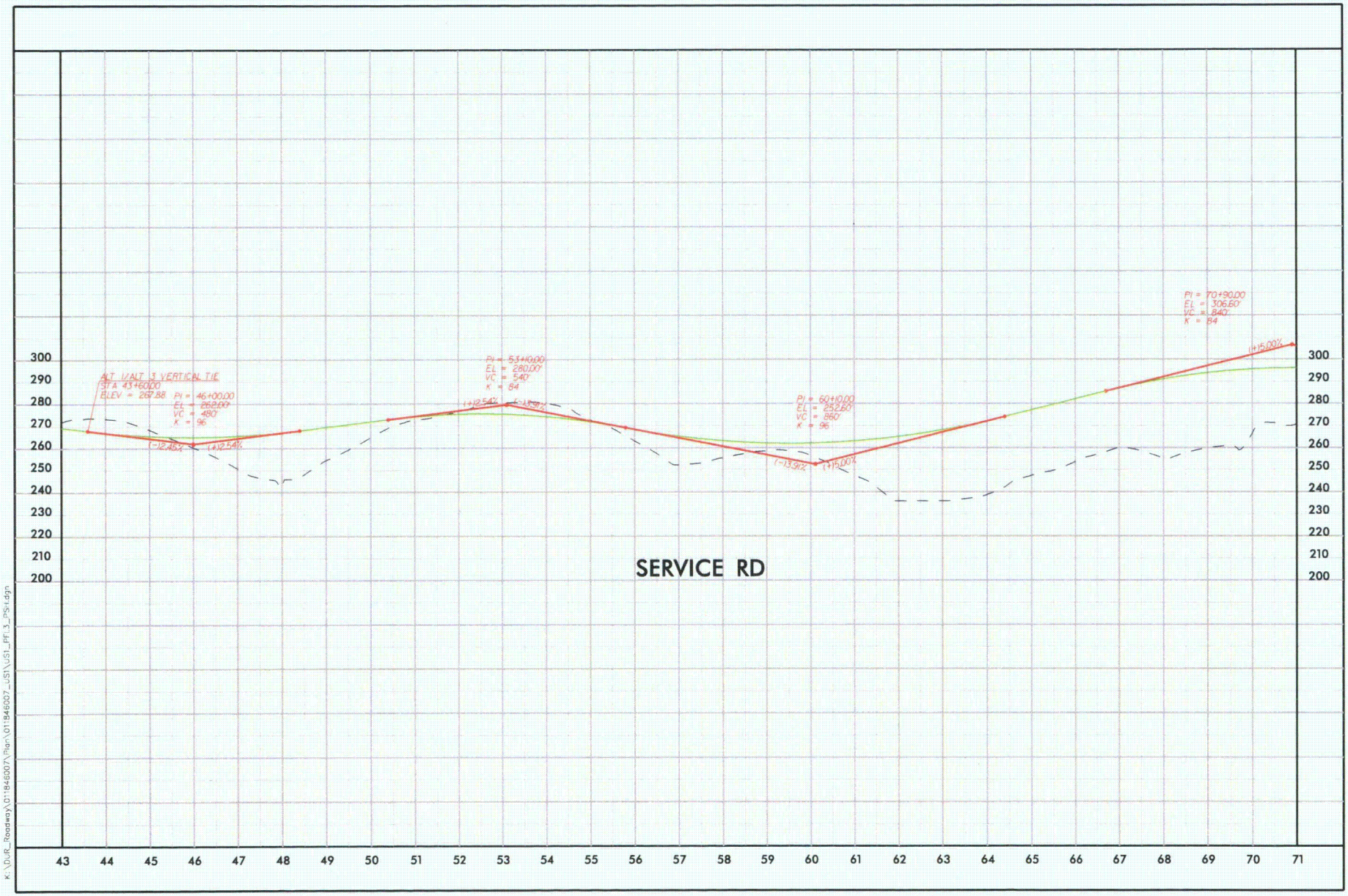

FIGURE 38

OPTION 3 - SERVICE ROAD PROFILE

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

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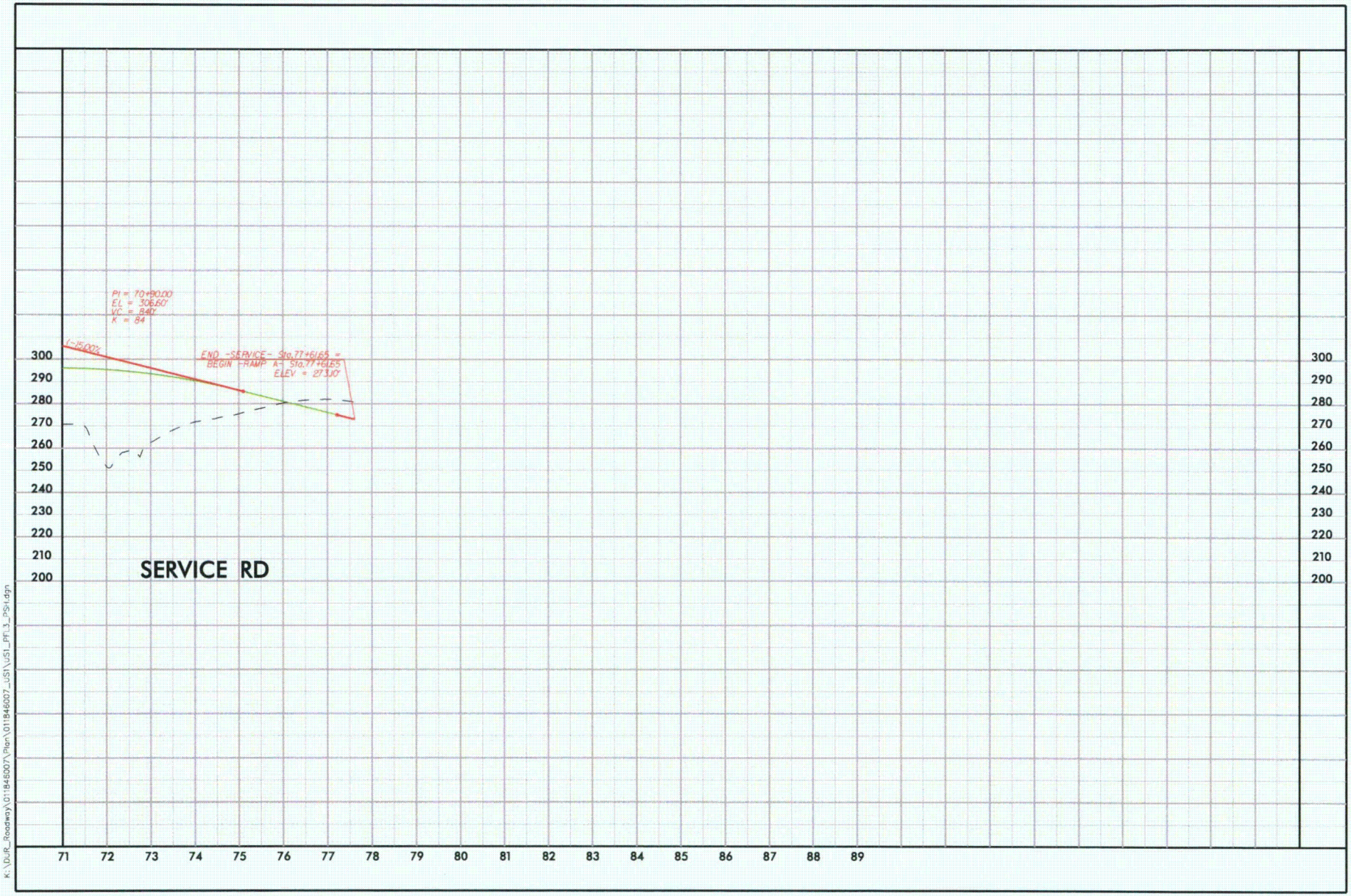

FIGURE 39

OPTION 3 - SERVICE ROAD PROFILE

HARRIS ADVANCED REACTOR
CONCEPTUAL DESIGN FOR IMPACTED ROADS

Kimley-Horn and Associates, Inc.

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8.0 Capacity Analysis

Capacity analyses (see Appendix) were performed for the AM and PM peak hours for the existing (2008) traffic, projected (2015) construction traffic with and without a new interchange on US 1, and projected (2019) build-out traffic conditions using Synchro Version 7 software to determine the operating characteristics of the surrounding road network and the impacts of the proposed project.

Capacity is defined as the maximum number of vehicles that can pass over a particular road segment or through a particular intersection within a set time duration. Capacity is combined with Level-of-Service (LOS) to describe the operating characteristics of a road segment or intersection. LOS is a qualitative measure that describes operational conditions and motorist perceptions within a traffic stream. The *Highway Capacity Manual* defines six levels of service, LOS A through LOS F, with A representing the shortest average delays and F representing the longest average delays. LOS D is the typically accepted standard for signalized intersections in urbanized areas. For signalized intersections, LOS is defined for the overall intersection operation.

For unsignalized intersections, only the movements that must yield right-of-way experience control delay. Therefore, LOS criteria for the overall intersection is not reported by Synchro Version 7 or computable using methodology published in the *Highway Capacity Manual.* Accordingly, minor street approach delays are reported herein for unsignalized conditions. For descriptive purposes, results between LOS A and LOS C for the side street approach are assumed to represent short delays. Results between LOS D and LOS E for the side street approach are assumed to represent moderate delays, and LOS F for the side street approach is assumed to represent long delays. It is typical for stop sign controlled side streets and driveways intersecting major streets to experience long delays during peak hours, while the majority of the traffic moving through the intersection on the major street experiences little or no delay. Table 8.0-A lists the LOS control delay thresholds published in the *Highway Capacity Manual* for signalized and unsignalized intersections, as well as the unsignalized operational descriptions assumed herein.

Table 8.0-A
Level-of-Service Control Delay Thresholds

Level-of-Service	Signalized Intersections – Control Delay Per Vehicle [sec/veh]	Unsignalized Intersections – Average Control Delay [sec/veh] & Qualitative Operational Description	
A	≤ 10	≤ 10	Short Delays
B	> 10 – 20	> 10 – 15	
C	> 20 – 35	> 15 – 25	
D	> 35 – 55	> 25 – 35	Moderate Delays
E	> 55 – 80	> 35 – 50	
F	> 80	> 50	Long Delays

Capacity analyses were performed for the existing (2008) traffic, projected (2015) traffic with and without a new interchange on US 1, and projected (2019) build-out traffic conditions. Analyses were performed for the following intersections:

- Old US 1 at New Hill Holleman Road
- New Hill Holleman Road at US 1 Southbound Ramps
- New Hill Holleman Road at US 1 Northbound Ramps
- New Hill Holleman Road at Shearon Harris Road
- New Hill Holleman Road / Rex Road at Avent Ferry / Bartley Holleman Road
- Old US 1 at Shearon Harris Road
- Shearon Harris Road at Main Driveway
- Shearon Harris Road at Construction Driveway
- Shearon Harris Road at Proposed US 1 Southbound Ramps
- Shearon Harris Road at Proposed US 1 Northbound Ramps
- Shearon Harris Road at Proposed Service Road

Table 8.0-B summarizes the operation for the study intersections for the AM and PM peak hour traffic conditions listed above. All capacity analyses are included in the Appendix and are briefly summarized in the following sub-sections.

Table 8.0-B
Level-of-Service Summary

Condition	AM Peak Hour LOS	PM Peak Hour LOS
Old US 1 at New Hill Holleman Road (Unsignalized)		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Long delays for minor street left turns	Moderate delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Long delays for minor street left turns	Long delays for minor street left turns
Projected (2019) Build-Out Traffic	Long delays for minor street left turns	Long delays for minor street left turns
New Hill Holleman Road at US 1 Southbound Ramps		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic – *Signalized*	C (26.8)	C (23.3)
Projected (2015) Construction Traffic with Proposed Interchange	Long delays for minor street left turns	Long delays for minor street left turns
Projected (2019) Build-Out Traffic	Long delays for minor street left turns	Long delays for minor street left turns

Table 8.0-B Level-of-Service Summary		
Condition	**AM Peak Hour LOS**	**PM Peak Hour LOS**
New Hill Holleman Road at US 1 Northbound Ramps (Unsignalized)		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Moderate delays for minor street left turns	Short delays for minor street left turns
Projected (2019) Build-Out Traffic	Moderate delays for minor street left turns	Moderate delays for minor street left turns
New Hill Holleman Road at Shearon Harris Road (Unsignalized)		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Long delays for minor street left turns	Long delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Long delays for minor street left turns	Short delays for minor street left turns
Projected (2019) Build-Out Traffic	Short delays for minor street left turns	Short delays for minor street left turns
New Hill Holleman Road / Rex Road at Avent Ferry Road / Bartley Holleman Road (Unsignalized)		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Long delays for minor street left turns	Long delays for minor street left turns
Projected (2019) Build-Out Traffic	Long delays for minor street left turns	Short delays for minor street left turns
Old US 1 at Shearon Harris Road (Unsignalized)		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2019) Build-Out Traffic	Short delays for minor street left turns	Short delays for minor street left turns

Table 8.0-B Level-of-Service Summary		
Condition	**AM Peak Hour LOS**	**PM Peak Hour LOS**
Shearon Harris Road at Main Driveway (Unsignalized)		
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Moderate delays for minor street left turns	Moderate delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Short delays for minor street left turns	Short delays for minor street left turns
Shearon Harris Road at Construction Driveway (Unsignalized)		
Projected (2015) Construction Traffic	Long delays for minor street left turns	Moderate delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Short delays for minor street left turns	Long delays for minor street left turns
Shearon Harris Road at Proposed US 1 Southbound Ramps (Unsignalized)		
Projected (2015) Construction Traffic with Proposed Interchange	Moderate delays for minor street left turns	Moderate delays for minor street left turns
Projected (2019) Build-Out Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Shearon Harris Road at Proposed US 1 Northbound Ramps (Unsignalized)		
Projected (2015) Construction Traffic with Proposed Interchange	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2019) Build-Out Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Shearon Harris Road at Proposed Service Road (Unsignalized)		
Projected (2015) Construction Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Short delays for minor street left turns	Long delays for minor street left turns
Projected (2019) Build-Out Traffic	Short delays for minor street left turns	Short delays for minor street left turns

8.1 Old US 1 at New Hill Holleman Road

Analyses indicate that the unsignalized intersection of Old US 1 at New Hill Holleman Road currently operates with short delays for minor street left turns in the AM and PM peak hours. For the projected (2015) construction traffic condition, the intersection is projected to operate with long delays for minor street left turns in the AM peak hour and with moderate delays for minor street left turns during the PM peak hour. For the projected (2015) construction traffic condition with the proposed interchange, the intersection is projected to operate with long delays for the minor street left turns in the AM and PM peak hours. At build-out of the expansion in 2019, the intersection is expected to continue to operate with long delays for minor street left turns in the AM and PM peak hours.

New Hill Holleman Road looking north at Old US 1

Long delays are typical for minor street left turns at intersections with major thoroughfares. This intersection is not expected to meet Manual on Uniform Traffic Control Devices (MUTCD) traffic signal warrants, and no roadway improvements are recommended at this intersection.

Table 8.1 summarizes the level-of-service (LOS) for the unsignalized intersection of Old US 1 at New Hill Holleman Road for the existing (2008) traffic, projected (2015) construction traffic, and projected (2019) build-out traffic conditions.

Table 8.1
Level-of-Service
Old US 1 at New Hill Holleman Road (Unsignalized)

Condition	AM Peak Hour LOS	PM Peak Hour LOS
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Long delays for minor street left turns	Moderate delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Long delays for minor street left turns	Long delays for minor street left turns
Projected (2019) Build-Out Traffic	Long delays for minor street left turns	Long delays for minor street left turns

8.2 New Hill Holleman Road at US 1 Southbound Ramps

Analyses indicate that the unsignalized intersection of New Hill Holleman Road at US 1 Southbound Ramps currently operates with short delays for minor street left turns in the AM and PM peak hours. For the projected (2015) construction traffic condition, the intersection would be expected to meet MUTCD traffic signal warrants, and the following roadway improvements would be needed:

- Widen the overpass from two lanes to four lanes to provide a second southbound through lane on New Hill Holleman Road and left-turn lanes in both directions on New Hill Holleman Road
- Construct westbound dual left-turn lanes on the US 1 Southbound off-ramp with 200 feet of storage
- Install a traffic signal

With the roadway improvements listed above, this intersection would be expected to operate at level-of-service (LOS) C in the AM and PM peak hours for the projected (2015) construction traffic condition.

For the projected (2015) construction traffic condition with the proposed interchange, the intersection in its current configuration is projected to operate with long delays for minor street left turns in the AM and PM peak hours. At build-out of the expansion in 2019, the intersection is expected to continue to operate with long delays for minor street left turns in the AM and PM peak hours.

Long delays are typical for minor street left turns at intersections with major thoroughfares. With the new interchange on US 1 in place, this intersection is not expected to meet MUTCD traffic signal warrants, and no roadway improvements are recommended at this intersection.

Table 8.2 summarizes the level-of-service (LOS) for the unsignalized intersection of New Hill Holleman Road at US 1 Southbound Ramps for the existing (2008) traffic, projected (2015) construction traffic, and projected (2019) build-out traffic conditions.

Table 8.2
Level-of-Service
New Hill Holleman Road at US 1 Southbound Ramps

Condition	AM Peak Hour LOS (Delay)	PM Peak Hour LOS (Delay)
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic – *Signalized*	C (26.8)	C (23.3)
Projected (2015) Construction Traffic with Proposed Interchange	Long delays for minor street left turns	Long delays for minor street left turns
Projected (2019) Build-Out Traffic	Long delays for minor street left turns	Long delays for minor street left turns

8.3 New Hill Holleman Road at US 1 Northbound Ramps

Analyses indicate that the unsignalized intersection of New Hill Holleman Road at US 1 Northbound Ramps currently operates with short delays for minor street left turns in the AM and PM peak hours. For the projected (2015) construction traffic condition, the following roadway improvements would be needed:

- Widen overpass to provide an exclusive southbound left-turn lane on New Hill Holleman Road with 125 feet of storage
- Construct an exclusive northbound right-turn lane on New Hill Holleman Road that extends to Friendship Road
- Construct an exclusive eastbound right-turn lane on the US 1 northbound off-ramp with 125 feet of storage

New Hill Holleman Road looking north at US 1 Northbound Ramps

With the roadway improvements listed above, the intersection would be projected to operate with short delays for minor street left turns in the AM and PM peak hours for the projected (2015) construction traffic condition.

For the projected (2015) construction traffic condition with the proposed interchange, the intersection in its current configuration is projected to operate with moderate delays for the minor street left turns in the AM peak hour and with short delays for the minor street left turns during the PM peak hour. At build-out of the expansion in 2019, the intersection is expected to operate with moderate delays for minor street left turns in the AM and PM peak hours. No roadway improvements are recommended at this intersection with the proposed interchange in place.

Table 8.3 summarizes the level-of-service (LOS) for the unsignalized intersection of New Hill Holleman Road at US 1 Northbound Ramps for the existing (2008) traffic, projected (2015) construction traffic, and projected (2019) build-out traffic conditions.

Table 8.3
Level-of-Service
New Hill Holleman Road at US 1 Northbound Ramps (Unsignalized)

Condition	AM Peak Hour LOS	PM Peak Hour LOS
Existing (2008) Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic	Short delays for minor street left turns	Short delays for minor street left turns
Projected (2015) Construction Traffic with Proposed Interchange	Moderate delays for minor street left turns	Short delays for minor street left turns
Projected (2019) Build-Out Traffic	Moderate delays for minor street left turns	Moderate delays for minor street left turns