

An aerial photograph of a road corridor, likely in the Lehigh Valley area. A thick yellow line runs diagonally from the top-left to the bottom-right, highlighting the study area. The background shows a mix of residential, commercial, and industrial buildings, parking lots, and green spaces. A road with a '22' marker is visible in the upper right.

SCHOENERSVILLE ROAD CORRIDOR SIGNAL STUDY

**City of Bethlehem,
Hanover Township (Lehigh County),
and Hanover Township (Northampton
County)**

Lehigh County & Northampton County

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**Lehigh Valley Transportation Study
PennDOT District 5**

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The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the views or policies of either the U.S. Department of Transportation, Federal Highway Administration (FHWA), Federal Transit Administration (FTA) or the Commonwealth of Pennsylvania at the time of publication. This report does not constitute a standard, specification, or regulation.

INTRODUCTION

The Lehigh Valley Planning Commission (LVPC) conducted a study of a portion of the Schoenersville Road corridor in the City of Bethlehem, Lehigh County and Hanover Township, Northampton County to gauge the potential for improving traffic signals to more efficiently move people and goods. Building additional road capacity in today's economic climate with transportation funds more limited now than at any point in the recent past is much more difficult. Instead of building additional capacity, traffic flow improvements are more likely to be obtained through improved management and operation of the existing infrastructure. Improvements to traffic signals can yield a low cost/high benefit impact. Updating or modernizing signal components or entire signal heads can reduce congestion, improve safety, improve mobility by reducing the overall number of vehicle stops thus decreasing delay, and reduce fuel consumption and the associated negative impact to air quality.

Nationwide, there are about 330,000 traffic signals and, according to FHWA, 75% of those signals could be improved by updating equipment or adjusting the timing. Statewide, there are 13,600 traffic signals; 718 traffic signals are located in Lehigh and Northampton counties.

PennDOT does not own or maintain any traffic signals in the Commonwealth. All traffic signals are owned, maintained, and operated by the 2,566 municipalities located within Pennsylvania's 67 counties. Municipalities often treat traffic signals, with regards to revising signal timing plans, as the responsibility of PennDOT. PennDOT's authority is limited to the review and approval of signal permitting and timing plans.

The purpose of this planning report is to present the data collected within the corridor and the analysis performed in the interest of determining if further engineering-type analysis is warranted to retime the traffic signals. If further analysis is warranted, additional data collection efforts will be undertaken.

IDENTIFICATION OF CANDIDATE CORRIDORS

The Lehigh Valley Transportation Study (LVTS), the Metropolitan Planning Organization (MPO) for Lehigh and Northampton counties, utilized multiple sources of data to identify candidate corridors for study. Corridors were first identified through a review of the Lehigh Valley Congestion Management Process — 2008 report. This document identifies corridors of at least one mile in length anticipated to be congested in the year 2030. Four corridors were identified in this report as a candidate for study. The second identification of candidate corridors utilized a geographic information system for transportation (GIS-T). A geographic information system is an information system specializing in the input, management, analysis and reporting of geographical (spatially related) information. GIS-T refers to the principles and applications of applying geographic information technologies to transportation problems. The GIS-T was reviewed for signalized corridors, length of corridor, number of traffic signals within the corridor, traffic signal density per linear mile, roadway functional classification of the facility, traffic volumes within the corridor, and type of signals present (fully-actuated, semi-actuated, pre-timed, volume-density). Corridor field views were conducted as necessary. Six corridors were identified through this process. All ten corridors are listed in Table 1.

**TABLE 1
Candidate Corridors**

Corridor Name	Municipality (ies)	Corridor Limits		Length Miles	# of Total Signals	Functional Class.
		From	To			
Lehigh Street	Emmaus/Salisbury/Allentown	Cedar Crest Blvd.	8th St.	5.38	22	Prin./Minor Art.
Northampton St.	Easton	15th St.	7th St.	0.72	6	Minor Art.
25th St. - Route 248	L. Nazareth Twp./Palmer Twp.	Hollo Rd.	Park Ave.	2.5	9	Prin. Art.
25th St.	L. Nazareth Twp./Palmer Twp.	Hollo Rd.	Freemansburg Ave.	4.11	18	Prin./Minor Art.
Lower Macungie Rd.	L./U. Macungie Twps.	Hamilton Blvd.	Brookside Rd.	2.16	8	Minor Art.
Route 512	Hanover Twp. (N. Co.)	Jaindl Blvd.	Rt. 22 EB ramps	1.71	8	Minor Art.
Hanover Ave.	Allentown	E. Hamilton St.	N. Whanetta St.	1.87	7	Prin. Art.
Schoenersville Rd.	Bethlehem (L. Co.), Hanover Twp. (N. Co.)	Airport Rd.	Eaton Ave.	2.67	14	Minor Art.
Route 309	S. & N. Whitehall Twps.	Shankweiler Rd.	Walbert Ave.	2.89	6	Prin. Art.
Route 191	Beth. Twp./L. Nazareth Twp.	Newburg Rd.	Rt. 22 EB ramps	1.88	5	Minor Art.

DESCRIPTION OF SELECTED CORRIDOR

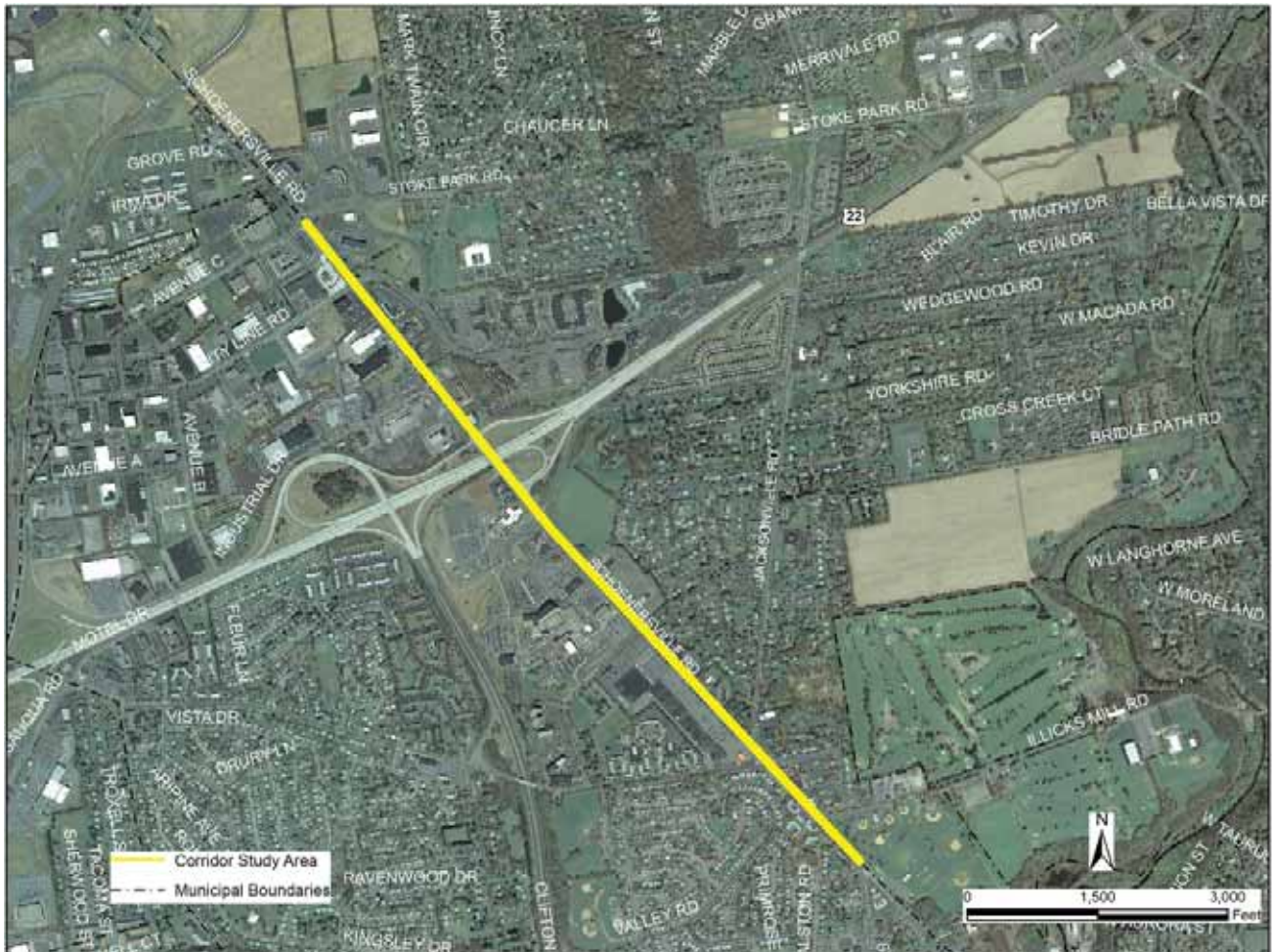
The entire Schoenersville Road corridor (SR 1009) spans the City of Bethlehem, Hanover Township (Lehigh County), and Hanover Township (Northampton County) from Airport Road to Mauch Chunk Road for a distance of 2.80 miles. A portion of the Schoenersville Road corridor from Avenue C/Stoke Park Road to 8th Avenue was chosen for study, a distance of 1.84 miles as shown on Map 1. This corridor was chosen due to its traffic signals operating on dated signal timing plans and due to the importance of this corridor for access to US Route 22, medical facilities, varied retail establishments, and proximity to large residential developments. This corridor was considered a high priority for study after the Lehigh Street corridor in Allentown and Northampton Street corridor in Easton were completed.

The surrounding area contains a mixture of various zoning classifications/land uses ranging from light industrial, office/business, commercial, institutional, mixed use, urban residential, retail commercial, and suburban residential. Most of these zoning classifications/land uses have frontage and access on Schoenersville Road. A few of the zoning classifications do not have frontage but are located within close proximity to the corridor.

The majority of the corridor is a bituminous-type paving. Only the section between the US Route 22 westbound ramp and Macada Road is concrete. It is classified as a minor arterial. This higher-level classification has the primary function of moving traffic with a lesser function of providing access to properties. The entire length of the corridor from 8th Avenue to Avenue C/Stoke Park Road is 1.84 miles and contains 11 traffic signals for a signal density of nearly six traffic signals per mile.

Annual Average Daily Traffic (AADT) varies throughout the corridor. Traffic volumes were obtained utilizing PennDOT's Internet Traffic Monitoring System (ITMS). The northern portion

MAP 1
Schoenersville Road Corridor Study Area



of the corridor (north of Industrial Drive) has the lowest traffic volumes at 9,900 AADT. The central portion of the corridor, in the vicinity of the US Route 22 interchange, has traffic volumes as high as 31,200 AADT. The section of the corridor between the US Route 22 eastbound ramps and Catasauqua Road/Birchwood Drive also sees high volumes of traffic up of to 19,000 AADT. The southernmost portion of the corridor between Catasauqua Road/Birchwood Drive and 8th Avenue has traffic volumes of 24,400 AADT. In addition, six of the 11 intersections have signal timing plans dating back to 2004. These high volumes, coupled with the high density of traffic signals along the corridor, and outdated signal timing plans indicate the need for signal system upgrades. Table 2 defines signal timing plan issue dates/revision dates by intersection. Table 3 depicts signal control type by intersection.

The 11 traffic signals are located at the following intersections along Schoenersville Road: 8th Avenue, Illicks Mill Road, Catasauqua Road/Birchwood Drive, Jacksonville Road, Westgate Drive, West Macada Road, US Route 22 Eastbound ramps, US Route 22 Westbound ramps, Industrial Drive, City Line Road/Valley Center Parkway, and Avenue C/Stoke Park Road.

The corridor is an important one for the City of Bethlehem for a number of reasons. The north-south corridor (SR 1009) provides access to varied retail/commercial/industrial/residential and other important economic-generating land uses. Four industrial parks employing over 10,000

TABLE 2
Signal Timing Plan Issue Dates/Revision Dates by Intersection

Intersection	Date of Timing Plan Last Issue Revision
Avenue C/Stoke Park Rd.	9/9/2009
City Line Rd./Valley Center Parkway	1/18/2008
Industrial Drive	9/9/2009
Rt. 22 Westbound Ramps	4/9/2004
Rt. 22 Eastbound Ramps	1/7/2005
W. Macada Rd./Private Dr.	4/9/2004
Westgate Dr.	4/9/2004
Jacksonville Rd.	4/9/2004
Catasauqua Rd./Birchwood Dr.	4/9/2004
Illicks Mill Rd.	11/23/2004
8th Ave.	5/3/2006

TABLE 3
Signal Control Type by Intersection

#	Intersection	Control Type
1	Schoenersville Road/Avenue C/Stoke Park Road	Semi-Actuated
2	Schoenersville Road/City Line Road/Valley Center Parkway	Semi-Actuated
3	Schoenersville Road/Industrial Drive	Fully-Actuated
4	Schoenersville Road/US Route 22 Westbound Ramps	Semi-Actuated
5	Schoenersville Road/US Route 22 Eastbound Ramps	Semi-Actuated
6	Schoenersville Road/W Macada Road/Private Drive	Fully-Actuated
7	Schoenersville Road/Westgate Drive	Semi-Actuated
8	Schoenersville Road/Jacksonville Road	Fully-Actuated
9	Schoenersville Road/Catasauqua Road/Birchwood Drive	Fully-Actuated
10	Schoenersville Road/Illicks Mill Road	Fully-Actuated
11	Schoenersville Road/8th Avenue	Fully-Actuated

persons are located either adjacent to or within close proximity to Schoenersville Road. It also provides a direct access point onto US Route 22, the Lehigh Valley's main thoroughfare. This corridor is also important to emergency service vehicles for access to Lehigh Valley Hospital Center's Muhlenberg campus.

TRAFFIC SIGNAL TERMINOLOGY AND EXISTING SIGNAL CONTROL TYPES

Modern traffic signals allocate time in a variety of ways from the most simple two-phase pre-timed mode to the most complex adaptive traffic signal control. This section briefly describes the basic terminology of traffic signals and the various types of signal operations. The following terms are commonly used to describe traffic signal operations:

CYCLE - any complete sequence of signal indications.

CYCLE LENGTH - the total time for a signal to complete one cycle.

PHASE - the part of a cycle allocated to any combination of traffic movements receiving the right-of-way simultaneously during one or more intervals.

CHANGE INTERVAL - the “yellow” plus “all red” intervals that occur between phases to provide for clearance of the intersection before conflicting movements are released.

GREEN TIME - the time within a given phase during which the “green” indication is shown.

LOST TIME - time during which the intersection is not effectively used by any movement. These times occur during the change interval (when the intersection is clearing) and at the beginning of each phase as the first few cars in a standing queue experience start-up delays.

EFFECTIVE GREEN TIME - the time during a given phase that is effectively available to the permitted movement, generally taken to be the green time plus the change interval minus the lost time for the designated phase.

GREEN RATIO - the ratio of effective green time to the cycle length.

EFFECTIVE RED - the time during which a given movement or set of movements is effectively not permitted to move.

Traffic signals may operate in five basic modes depending on the type of control equipment used. The five modes are described below.

PRE-TIMED - Pre-timed control is ideally suited to closely spaced intersections where traffic volumes and patterns are consistent on a daily or day-of-week basis. Such conditions are often found in downtown areas. They are also better suited to intersections where three or fewer phases are needed. Pre-timed control has several advantages. For example, it can be used to provide efficient coordination with adjacent pre-timed signals, since both the start and end of green are predictable. Also, it does not require detectors, thus making its operation immune to problems associated with detector failure. Finally, it requires a minimum amount of training to set up and maintain. On the other hand, pre-timed control cannot compensate for unplanned fluctuations in traffic flows, and it tends to be inefficient at isolated intersections where traffic arrivals are random.

SEMI-ACTUATED - Semi-actuated control uses detection only for the minor movements at an intersection. The phases associated with the major-road through movements are operated as “non-actuated.” That is, these phases are not provided detection information. In this type of operation, the controller is programmed to dwell in the non-actuated phase and, thereby, sustain a green indication for the highest flow movements (normally the major-road through movement). Minor movement phases are serviced after a call for their service is received. Semi-actuated control is most suitable for application at intersections that are part of a coordinated arterial street system. Semi-actuated control may also be suitable for isolated intersections with a low-speed major road and lighter crossroad volume. Semi-actuated control has several advantages. Its primary advantage is that it can be used effectively in a coordinated signal system. Also, relative to pre-timed control, it reduces the delay incurred by the major-road through movements (i.e., the movements associated with the non-actuated phases) during periods of light traffic. Finally, it does not require detectors for the major-road through movement phases and hence, its operation is not compromised by the failure of these detectors. The major disadvantage of semi-actuated operation is that continuous demand on the phases associated with one or more minor movements can cause excessive delay

to the major-road through movements if the maximum green and passage time parameters are not appropriately set. Another drawback is that detectors must be used on the minor approaches, thus requiring installation and ongoing maintenance. Semi-actuated operation also requires more training than that needed for pre-timed control.

FULLY-ACTUATED - Fully-actuated control refers to intersections for which all phases are actuated and hence, it requires detection for all traffic movements. Fully-actuated control is ideally suited to isolated intersections where the traffic demands and patterns vary widely during the course of the day. Most modern controllers in coordinated signal systems can be programmed to operate in a fully-actuated mode during low-volume periods where the system is operating in a “free” (or non-coordinated) mode. Fully-actuated control can also improve performance at intersections with lower volumes that are located at the boundary of a coordinated system and do not impact progression of the system. Fully-actuated control has also been used at the intersection of two arterials to optimize green time allocation in a critical intersection control method. There are several advantages of fully-actuated control. First, it reduces delay relative to pre-timed control by being highly responsive to traffic demand and to changes in traffic pattern. In addition, detection information allows the cycle time to be efficiently allocated on a cycle-by-cycle basis. Finally, it allows phases to be skipped if there is no call for service, thereby allowing the controller to reallocate the unused time to a subsequent phase. The major disadvantage of fully-actuated control is that its cost (initial and maintenance) is higher than that of other control types due to the amount of detection required. It may also result in higher percentage of vehicles stopping because green time is not held for upstream platoons.

VOLUME-DENSITY – Volume-density signal control is more advanced than fully-actuated control. The signal records and retains actual traffic volumes. Vehicles queued up over a certain distance cause information to be sent to a traffic controller, and the controller adjusts the length of green time.

ADAPTIVE TRAFFIC SIGNAL CONTROL – Adaptive traffic signal control is a concept where vehicular traffic in a network is detected at an upstream and/or downstream point and an algorithm is used to predict when and where the traffic will be and to make signal adjustments at the downstream intersections based on those predictions. The signal controller utilizes these algorithms to compute optimal signal timings based on detected traffic volume and simultaneously implement the timings in real-time. This real-time optimization allows a signal network to react to volume variations, which results in reduced vehicle delay, shorter queues, and decreased travel times. Adaptive traffic control can have an impact where traffic conditions fluctuate randomly on a day-to-day basis, traffic conditions change rapidly due to new or changing developments in land use, incidents, crashes, or other events result in unexpected changes to traffic demand, and other disruptive events, such a preemption, require a response.

INTERSECTION AND LANE GEOMETRY AND EXISTING SIGNAL TIMING PLANS

The following is a description of each signalized intersection including aerial photographs. Signal permit plans can be found in Appendix B.

Schoenersville Road/Avenue C/Stoke Park Road Intersection

Schoenersville Road (SR 1009) is classified as a minor arterial and runs in a northwest to southeast manner along the border between Lehigh and Northampton County and the City of Bethlehem and Hanover Township. Figure 1 shows the location of the intersection. Its posted speed limit at this location is 40 mph. Avenue C is classified as a local road, runs in a west to east manner, and joins Schoenersville Road from the west. The western terminus of Stoke Park Road is classified as a local road, runs in a west to east manner, and joins Schoenersville Road from the east.

This intersection is a four-way, semi-actuated signalized intersection. The southbound approach of Schoenersville Road to Avenue C/Stoke Park Road is a four-lane road with a dedicated left turn only lane, a dedicated right turn only lane, and two through lanes. No on-street parking is allowed. The northbound approach of Schoenersville Road is a four-lane road with a dedicated left turn only lane, a dedicated right turn only lane, and two through lanes. No on-street parking is allowed. Signal preemption exists on all approaches. Curb cuts with truncated domes, pedestrian signal heads, and marked crosswalks exist on all intersection quadrants. Sidewalks are present only on the southwest quadrant. Traffic signals do not contain backplates.

FIGURE 1
Schoenersville Road/Avenue C/Stoke Park Road Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/City Line Road/Valley Center Parkway Intersection

Figure 2 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. City Line Road is classified as an urban collector, runs in a west to east manner, and joins Schoenersville Road from the west. Valley Center Parkway is classified as a local road, runs in a west to east manner, and joins Schoenersville Road from the east.

This intersection is a four-way, semi-actuated signalized intersection. The southbound approach of Schoenersville Road is three lanes with a dedicated left turn only lane, a through lane, and a shared through/right turn lane. No on-street parking is allowed. The northbound approach is four-lanes with a dedicated left turn only lane, a dedicated right turn only lane, and two through lanes. No on-street parking is allowed. Signal preemption exists for the northbound, southbound, and westbound approaches. Curb cuts exist only on the two northern quadrants. However, no sidewalks, truncated domes, or signal backplates exist. Pedestrian signal heads and marked crosswalks occupy all quadrants.

FIGURE 2
Schoenersville Road/City Line Road/Valley Center Parkway Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/Industrial Drive Intersection

Figure 3 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. Industrial Drive is classified as a local road, runs in a west to east manner, and joins Schoenersville Road from the west.

This intersection is a three-way, fully-actuated signalized intersection. The southbound approach of Schoenersville Road to Industrial Drive is three lanes with a dedicated left turn only lane, a through lane, and a shared through/right turn lane. No on-street parking is allowed. The northbound approach of Schoenersville Road to Industrial Drive is three lanes with a dedicated left turn only lane and two through lanes. No on-street parking is allowed. All quadrants of this intersection lack curb cuts, truncated domes, pedestrian signal heads, and sidewalks. Signal preemption exists for the southbound and northbound approaches. Signal backplates are present. Marked crosswalks are present on the northbound, southbound, and eastbound approaches.

FIGURE 3
Schoenersville Road/Industrial Drive Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/US Route 22 Westbound Intersection

Figure 4 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. The US Route 22 exit and entrance ramps are classified as freeways and expressways and run in an east to west manner.

This intersection is a four-way, semi-actuated signalized intersection. The southbound approach of Schoenersville Road is two lanes with a through lane and a shared through/right turn lane. No on-street parking is allowed. The northbound approach of Schoenersville Road is three lanes with a dedicated left turn only lane and two through lanes. No on-street parking is allowed. All quadrants of this intersection lack curb cuts, truncated domes, pedestrian signal heads, and sidewalks. However, marked crosswalks are present on all quadrants. Signal backplates exist on the westbound approach. Signal preemption is on all three approaches.

FIGURE 4
Schoenersville Road/US Route 22 West Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/US Route 22 Eastbound Intersection

Figure 5 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. The US Route 22 exit and entrance ramps are classified as freeways and expressways and run in a west to east manner.

This intersection is a three-way, semi-actuated signalized intersection. The southbound approach of Schoenersville Road is three lanes with a dedicated left turn only lane and two through lanes. No on-street parking is allowed. The northbound approach is two lanes with two through lanes and a right turn channelized lane. No on-street parking is allowed. Signal preemption and back-plates exist for all 3 approaches. Curb cuts, truncated domes, pedestrian signal heads, marked crosswalks, and sidewalks are absent from the intersection.

FIGURE 5
Schoenersville Road/US Route 22 East Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/West Macada Road/Private Drive Intersection

Figure 6 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. West Macada Road is classified as an urban collector, runs in a west to east manner, and joins Schoenersville Road from the east. A private drive to access Lehigh Valley Hospital's Muhlenberg campus runs in an east to west manner and joins Schoenersville Road from the west.

This intersection is a four-way, fully-actuated signalized intersection. The southbound approach of Schoenersville Road is four lanes with a dedicated left turn only lane, a dedicated right turn only lane, and two through lanes. No on-street parking is allowed. The northbound approach of Schoenersville Road is three lanes with a dedicated left turn only lane and one shared through right turn lane. No on-street parking is allowed. This intersection contains signal preemption, signal backplates, pedestrian signal heads and marked crosswalks for all approaches. However, sidewalks and truncated domes are absent. Curb cuts are present on the two western quadrants.

FIGURE 6
Schoenersville Road/West Macada Road/Private Drive Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/Westgate Drive Intersection

Figure 7 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. Westgate Drive is classified as an urban collector, runs in an east to west manner, and joins Schoenersville Road from the west.

This intersection is a three-way, semi-actuated signalized intersection. The southbound approach of Schoenersville Road is two lanes with a through lane and a shared through/right turn lane. No on-street parking is allowed. The northbound approach of Schoenersville Road is three lanes with a dedicated left turn only lane and two through lanes. No on-street parking is allowed. This intersection contains signal preemption, signal backplates, pedestrian signal heads, and marked crosswalks on all approaches. Curb cuts exist on the two northern quadrants while a sidewalk exists only on the northeast quadrant. Truncated domes are absent.

FIGURE 7
Schoenersville Road/Westgate Drive Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/Jacksonville Road Intersection

Figure 8 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. Jacksonville Road is classified as an urban collector and runs in a north-north-east to south-southwest manner.

This intersection is a three-way, fully-actuated signalized intersection. The southbound approach of Schoenersville Road is four lanes with a dedicated left turn only lane and three through lanes. No on-street parking is allowed. The northbound approach of Schoenersville Road is two lanes with a through lane and a shared through/right turn lane. No on-street parking is allowed. This intersection is absent of any signal backplates, pedestrian signal heads, marked crosswalks, or truncated domes. Traffic signal preemption is present only for the southbound Schoenersville Road and Jacksonville Road movements. One curb cut exists on the east intersection quadrant.

FIGURE 8
Schoenersville Road/Jacksonville Road Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/Catasauqua Road/Birchwood Drive Intersection

Figure 9 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. Catasauqua Road (SR 1020) is classified as an urban collector, runs in a west to east manner, and joins Schoenersville Road from the west. Birchwood Drive is classified as a local road, runs in a west to east manner, and joins Schoenersville Road from the east.

This intersection is a four-way, fully-actuated signalized intersection. The southbound approach of Schoenersville Road is three lanes with a dedicated right turn only lane, a through lane, and a shared through/left turn lane. No on-street parking is allowed. The northbound approach is three lanes with a dedicated left turn only lane, a through lane, and a shared through/right turn lane. No on-street parking is allowed. Traffic signal preemption exists for the northbound, eastbound, and westbound approaches. Curb cuts, truncated domes, signal backplates, pedestrian signal heads, and marked crosswalks are absent. However, sidewalks are present on the northeast and southwest quadrants.

FIGURE 9
Schoenersville Road/Catasauqua Road/Birchwood Drive Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/Illicks Mill Road Intersection

Figure 10 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. Illicks Mill Road is classified as an urban collector, runs in an east to west manner and joins Schoenersville Road from the east.

This intersection is a three-way, fully-actuated signalized intersection. The southbound approach of Schoenersville Road is three lanes with a dedicated left turn only lane and two through lanes. On-street parking is allowed on the west side of the street. The northbound approach of Schoenersville Road to Illicks Mill Road is two lanes with a through lane and a shared through/right turn lane. No on-street parking is allowed on the east side of the street. This intersection contains pedestrian signal heads and marked crosswalks. Sidewalks are present on the western and south-eastern quadrants of the intersection. Curb cuts, truncated domes, signal preemption, and signal backplates are absent.

FIGURE 10
Schoenersville Road/Illicks Mill Road Intersection



Source: Pictometry International Corp., 2009

Schoenersville Road/8th Avenue Intersection

Figure 11 shows the location of the intersection. Schoenersville Road's posted speed limit at this location is 40 mph. 8th Avenue between Schoenersville Road and Eaton Avenue is classified as a minor arterial, runs in a north to south manner, and joins Schoenersville Road from the south.

This intersection is a three-way, fully-actuated signalized intersection. The southbound approach of Schoenersville Road is two lanes with a dedicated right turn only lane and a through lane. On-street parking is allowed on the west side of the street. The northbound approach of Schoenersville Road is two lanes, both of which are through lanes. No on-street parking is allowed. Curb cuts are present within the pedestrian island, at the northern Wawa property line, and on the north and south sides of Jerome Street. Truncated domes are present within the pedestrian island and at the northern Wawa property line. Signal preemption is present for the northbound and southbound Schoenersville Road approaches. Pedestrian signal heads exist at Jerome Street Sidewalks are present within the pedestrian island, along the east and west sides of the Wawa property, and along the west side of Schoenersville Road and 8th Avenue Signal backplates and marked crosswalks are absent from the intersection.

FIGURE 11
Schoenersville Road/8th Avenue Intersection



Source: Pictometry International Corp., 2009

CRASH ANALYSIS

Crash data was compiled using PennDOT's Crash Data Analysis Retrieval Tool (CDART) system. The most recent crash data from years 2008 to 2012 was utilized. According to Section 3746(a) of Title 75, Pennsylvania's Consolidated Statute defines a reportable crash as a crash that involves injury to or death of any person and/or damage to any motor vehicle to the extent that it cannot be driven under its own power in its customary manner without further damage or hazard to the vehicle or other traffic elements or the roadway, and therefore requires towing. The crash analysis shows that there were a total of 168 reportable crashes along the corridor, including one fatality and five major crashes. Among the crashes, 50% were angle collisions and 33% were rear end collisions. The one fatality that occurred during this period was a bicycle-related crash that was a combination of an automobile speeding and the cyclist entering the highway improperly. US Route 22 eastbound and westbound ramps connecting to Schoenersville Road had a high frequency of crashes with 46 reported crashes and one major injury. Three of the signalized intersections out of the 11 that are accounted for in this study had 20 or more crashes. The following intersections are worth noting:

- ▶ Schoenersville Road/Avenue C/Stoke Park Road – This intersection contained 21 crashes. three of the crashes involved caused major injuries. Two of these major crashes were angle collisions. Five of these crashes were caused by improper or careless turns.
- ▶ Schoenersville Road/US Route 22 Eastbound Ramps – Twenty-two crashes occurred at this intersection with one major injury. Seven of these crashes were caused by improper or careless left turns from vehicles traveling south. The signal should be reviewed for possible upgrades.
- ▶ Schoenersville Road/US Route 22 Westbound Ramps – This intersection contained 24 crashes. Five of these crashes involved running red lights. Six of them were caused by improper or careless turns, three of these were cars traveling west in the PM peak hours and may have been affected by sun glare. The signals should be reviewed for possible visibility upgrades.
- ▶ Schoenersville Road/8th Avenue – Fourteen crashes occurred at this intersection. Six of these crashes involved running red lights. Among them, five were from vehicles traveling south. The signal should be reviewed for possible upgrades.

Detailed crash data will be provided to PennDOT for their consideration. However, it has been suppressed in this report considering its confidentiality pursuant to 75 PA C.S. 3754 and 23 U.S.C. 409 and may not be disclosed or used in litigation without written permission from PennDOT.

SPEED AND DELAY RUNS

LVPC conducted data collection in January 2013. Data collected involved contact with the City of Bethlehem to obtain recent traffic count data along Schoenersville Road. The City provided a current traffic count conducted in April 2012 for the intersections of Schoenersville Road with Jacksonville Road and Catasauqua Road/Birchwood Drive. This data provided the AM and PM peak hour of traffic (the four consecutive 15-minute intervals of highest traffic volumes) which is the targeted time of the speed and delay runs. The AM peak hour for the Schoenersville Road/Jacksonville Road intersection started at 7:30. The PM peak hour began at 4:30. The AM peak hour for the Schoenersville Road/Catasauqua Road/Birchwood Drive intersection started at 7:45. The PM peak hour began at 4:30.

Speed and delay are two principal measures of roadway system performance. A speed and delay study provides valuable data prior to implemented improvements that may be compared to data obtained after the implementation of improvements to show a net benefit through increased speeds and reduced delay. Speed and delay data collection involves conducting travel runs along the corridor in a test vehicle, documenting travel times between signals, stopped delay, and delay-causing events. The test vehicle driver travels at a speed dictated by the prevailing speed (not the posted speed limit) of vehicles along the corridor. This is accomplished by attempting to safely pass as many vehicles as pass the test vehicle. Speed and delay runs were conducted for the AM and PM peak periods on Thursday, January 17, 2013.

Table 4 depicts a summation of all nine directional travel runs conducted during both the AM and PM peak periods for Schoenersville Road. The speed limit throughout the entire corridor is 40 mph. The cumulative travel time and cumulative stopped delay depict the travel time and stopped delay for all nine speed and delay runs conducted for the corridor.

TABLE 4
Schoenersville Road Corridor Signal Study Summary

Corridor	Direction	Time AM/PM	Cumulative Travel Time (min) : (sec)	Cumulative Stopped Delay (min) : (sec)	Travel Speed (mph)	Posted Speed (mph)	% of Intersections Experiencing Stops	% Travel Speed of Posted Speed	Average Queue Lengths	# of Cycle Failures
Schoenersville Rd.	Northbound	AM	19 : 17	2 : 56	28.6	40	50.0%	71.6%	4.7	0
	Southbound	AM	26 : 28	7 : 30	20.9	40	100.0%	52.2%	2.7	0
	Northbound	PM	23 : 3	6 : 23	19.2	40	80.0%	48.0%	4.7	0
	Southbound	PM	21 : 28	5 : 21	20.6	40	80.0%	51.5%	4.1	0

The cumulative travel times and cumulative stopped delays vary moderately not only from the AM peak to the PM peak, but also by directional flow. The morning northbound flow had the shortest cumulative travel time at 19 minutes 17 seconds and the lowest cumulative stopped delay at 2 minutes 56 seconds. This resulted in the fastest travel speed of 28.6 mph and the fewest number of intersections experiencing stopped delay (50% of intersections experienced stopped delay). The travel speed as a percentage of the posted speed limit was the highest at 71.6%. However, it had tied for first with longest average queue lengths at 4.7 vehicles. Conversely, the longest cumulative travel time and cumulative stopped delay also occurred in the AM peak but for the southbound movement at 26 minutes 28 seconds and 7 minutes 30 seconds, respectively. Stopped delay was experienced at each intersection. Its travel speed was second highest at 20.9 mph and also had the second highest travel speed as a percentage of the posted speed limit at 52.2%. The relatively high travel speed could be attributed, in part, to having the shortest average queue lengths at 2.7 vehicles.

The PM peak period operational characteristics were more homogenous with much smaller differences between the northbound and southbound flows. The northbound flow had a cumulative travel time of 23 minutes 3 seconds with cumulative stopped delay measuring 6 minutes 23 seconds, the slowest travel speed at 19.2 mph representing 48% of the posted speed limit, 80% of intersections experiencing stopped delay, and tied for the highest average queue lengths at 4.7 vehicles. The southbound flow had a cumulative travel time of 21 minutes 28 seconds and a cumulative stopped delay of 5 minutes 21 seconds, a travel speed of 20.6 mph representing 51.5% of the posted speed limit, 80% of intersections experiencing stopped delay, and average queue lengths of 4.1 vehicles. At no time were signal cycle failures witnessed (a signal failure is defined as a traffic signal cycle where queued vehicles were not able to progress through the signal during a single cycle).

Detailed speed and delay run data by intersection for the entire corridor may be found in Appendix A. Information presented includes cumulative travel time, stopped delay, running speed, travel speed, queue lengths, and number of cycle failures.

RECOMMENDATIONS

The results of this study indicate that the Schoenersville Road corridor, Stoke Park Road to 8th Avenue, generally operates sufficiently to allow for the smooth but slow flow of vehicular traffic given the volumes utilizing the corridor. However, excessive delay and long travel times occur during the AM peak period primarily in the southbound direction. Considering that signals within this corridor are operating on timing plans that date back as far as 2004, signal retimings and optimization should be considered. Municipalities should utilize the Automated Red Light Enforcement (ARLE) program to apply for 100% State funds for the replacement, upgrading, and retiming of traffic signals, controllers, and other signal-related components. This program funds improvements through the use of funds obtained from red light running fines captured within the City of Philadelphia. This program specifically allows for retiming of existing traffic-control signals; upgrading, modernization, or improvements to traffic-control signals; the interconnection and coordination of traffic-control signals to improve mobility; the installation of a traffic-control signal system or the expansion of an existing system to improve mobility; revisions to traffic-control signal operational modes to improve safety or mobility including conversion to actuated, traffic responsive, or traffic adaptive modes of operation; improvements to traffic-control signals or other official traffic-control devices to reduce energy consumption; the installation of new or improved detection systems for traffic-control signals; and the upgrading, modernization, or safety improvements to traffic-control signals having railroad preemption.

NEXT STEPS

Contingent upon approval and programming of this project, additional data collection in the form of intersection traffic counts will be needed for the purpose of developing alternative signal timing plans. Once improvements are implemented and traffic flows have had time to adjust accordingly, an after-action review of the corridor will be conducted to determine the reduction in peak hour travel time and delay. The goal is to obtain at least a 10% reduction in travel time. A 10% reduction in travel time would result in average speeds of 24.5 miles per hour for the entire corridor compared to a 22.1 miles per hour average obtained from current travel conditions.

Considering that many traffic signals function on outdated timing plans, are owned and maintained by Pennsylvania's local municipalities, coupled with the historically robust population growth of the area which has continued to add traffic to the regional road network, a new smarter approach is being considered. This approach introduces the concept of "Priority Arterial Corridors" which are a selected set of regionally critical highways where the state would have a greater role in operation of traffic signals. This role could include PennDOT contracts to review and optimize these selected signals on a routine basis as part of their asset management systems approach to highway operations and maintenance. This new role might be funded through the state's capital program as a continuing program. Much of this proposal has been discussed in one form or another among members of the State Transportation Advisory Committee and the two funding commissions. Pennoni Associates, Inc. has been retained by PennDOT to develop a Traffic Signal Operations and Maintenance Plan that addresses this issue. The consultant has conducted a review of best practices from Georgia, New Jersey, North Carolina, Ohio, and Virginia and is currently obtaining input from municipal officials, vendors/contractors, design engineers, planning officials, PennDOT Central and District offices, and Federal Highway Administration representatives. A draft plan was submitted by the consultant to PennDOT for their review in June 2013. The plan is currently under PennDOT review awaiting release.

APPENDIX A

Table 5 depicts a summation of all five southbound travel runs conducted during the AM peak period for the Schoenersville Road corridor. The distance in miles depicted between intersections is cumulative for all travel runs conducted. For example, the distance between Illicks Mill Road and 8th Avenue is 0.14 miles. The distance for five runs equates to a total of 0.70 miles. The posted speed limit through the corridor is 40 mph. Average travel speed, which is a calculated vehicle speed that includes stopped delay times and acceleration/deceleration times, was 20.86 mph. This is 52.15% of the posted speed limit. The highest average travel speed for any section was 32.21 mph for the section between West Macada Road and Westgate Drive. The lowest average travel speed for any section was 14.91 mph for the section between Industrial Drive and the US Route 22 Westbound ramps. Delay may be caused by numerous factors such as bus loading/unloading, double parked vehicles, vehicles making turns, pedestrians, traffic signals, etc. The only southbound delay experienced in this corridor was a result of traffic volumes and signals. The intersection should be evaluated for possible signal timing improvements or optimization.

**TABLE 5
TRAVEL TIME & DELAY STUDY - FIELD SHEET SUMMARY**

Road: Schoenersville Road Direction: SouthBound RUN: SouthBound Summary of All Runs
 Project: Signal Corridor Study Date: 1/17/2013 Performed by: JG & MD
 Location: Bethlehem City/Hanover Day of Wk: Thursday Peak Period: AM
 Weather: Partly Sunny

Control Point	Posted Speed (mph)	Distance (mi.)	Cumulative Travel Time (seconds)	Stopped Delay		Running Speed (mph)	Travel Speed (mph)	Delay Factors
				(min)	(sec)			
Avenue C/Stoke Park Road								
City Line Road/Center Valley Parkway	40	0.90	170	1	0	29.45	19.06	TS
Industrial Drive	40	1.40	335	0	11	32.73	30.55	TS
US Route 22 Westbound Ramps	40	0.70	504	1	3	23.77	14.91	TS
US Route 22 Eastbound Ramps	40	0.75	618	0	23	29.67	23.68	TS
W Macada Road	40	0.30	682	0	22	25.71	16.88	TS
Westgate Drive	40	1.70	872	0	11	34.19	32.21	TS
Jacksonville Road	40	1.75	1234	2	39	31.03	17.40	TS
Catasauqua Road/Birchwood Drive	40	0.25	1288	0	12	21.43	16.67	TS
Illicks Mill Road	40	0.75	1428	0	37	26.21	19.29	TS
8th Avenue	40	0.70	1588	0	52	23.33	15.75	TS
		9.20	1588	7	30	29.10	20.86	

Delay Factor Codes:

BS = Bus Loading/Unloading
 DP = Double Parking
 EV = Emergency Vehicle
 GC = General Congestion
 LT = Left Turns
 OT = Other

PK = Parked Cars
 PD = Pedestrians
 RR = Railroad Crossing
 SS = Stop Sign
 TK = Truck
 TS = Traffic Signal

LO = Delivery Loading/Unloading
 CY = Cyclist
 RT = Right Turn
 GT = Garbage Trucks

Stopped Delay - Time spent motionless in a vehicle.

Running Speed - Calculated speed of the vehicle while in motion, including acceleration and deceleration times.

Travel Speed - Calculated speed of the vehicle including stopped delay times.

Queue Lengths - number or distance of vehicles in a queue

of Cycle Failures - (queues not completely discharging during each signal cycle)

Stopped Delay as a percentage of total run time for the corridor = 28.34%

Table 6 depicts a summation of all five northbound travel runs conducted during the AM peak period for the Schoenersville Road corridor. The distance in miles depicted between intersections is cumulative for all travel runs conducted. The posted speed limit through the corridor is 40 mph. Average travel speed, which is a calculated vehicle speed that includes stopped delay times and acceleration/deceleration times, was 28.63 mph. This is 71.58% of the posted speed limit. The highest average travel speed for any section was 42.57 mph for the section between Jacksonville Road and Westgate Drive. The lowest average travel speed for any section was 16.70 mph for the section between City Line Road/Valley Center Parkway and Avenue C/Stoke Park Road. Delay may be caused by numerous factors such as bus loading/unloading, vehicles making turns, pedestrians, traffic signals, etc. The only northbound delay experienced in this corridor was a result of traffic volumes and signals. The intersection should be evaluated for possible signal timing improvements or optimization.

**TABLE 6
TRAVEL TIME & DELAY STUDY - FIELD SHEET SUMMARY**

Road: Schoenersville Road Direction: NorthBound RUN: NorthBound Summary of All Runs
 Project: Signal Corridor Study Date: 1/17/2013 Performed by: JG & MD
 Location: Bethlehem City/Hanover (LC & NC) Day of Wk: Thursday Peak Period: AM
 Weather: Partly Sunny

Control Point	Posted Speed (mph)	Distance (mi.)	Cumulative Travel Time (seconds)	Stopped Delay		Running Speed (mph)	Travel Speed (mph)	Delay Factors
				(min)	(sec)			
8th Avenue								
Illicks Mill Road	40	0.14	114	0	17	25.98	22.11	TS
Catasauqua Road/Birchwood Drive	40	0.15	234	0	32	30.68	22.50	TS
Jacksonville Road	40	0.05	266	0	0	28.13	28.13	
Westgate Drive	40	0.35	414	0	0	42.57	42.57	
W Macada Road	40	0.34	594	0	11	36.21	34.00	TS
US Route 22 Eastbound Ramps	40	0.06	643	0	0	22.04	22.04	
US Route 22 Westbound Ramps	40	0.15	766	0	31	29.35	21.95	TS
Industrial Drive	40	0.14	838	0	0	35.00	35.00	
City Line Road/Center Valley Parkway	40	0.28	963	0	0	40.32	40.32	
Avenue C/Stoke Park Road	40	0.18	1157	1	25	29.72	16.70	TS
		1.84	1157	2	56	33.76	28.63	

Delay Factor Codes:

BS = Bus Loading/Unloading
 DP = Double Parking
 EV = Emergency Vehicle
 GC = General Congestion
 LT = Left Turns
 OT = Other

PK = Parked Cars
 PD = Pedestrians
 RR = Railroad Crossing
 SS = Stop Sign
 TK = Truck
 TS = Traffic Signal

LO = Delivery Loading/Unloading
 CY = Cyclist
 RT = Right Turn
 GT = Garbage Trucks

Stopped Delay - Time spent motionless in a vehicle.

Running Speed - Calculated speed of the vehicle while in motion, including acceleration and deceleration times.

Travel Speed - Calculated speed of the vehicle including stopped delay times.

Queue Lengths - number or distance of vehicles in a queue

of Cycle Failures - (queues not completely discharging during each signal cycle)

Stopped Delay as a percentage of total run time for the corridor = 15.21%

Table 7 depicts a summation of all four southbound travel runs conducted during the PM peak period for the Schoenersville Road corridor. The distance in miles depicted between intersections is cumulative for all travel runs conducted. The posted speed limit through the corridor is 40 mph. Average travel speed, which is a calculated vehicle speed that includes stopped delay times and acceleration/deceleration times, was 20.57 mph. This is 51.43% of the posted speed limit. The highest average travel speed for any section was 31.79 mph for the section between West Macada Road and Westgate Drive. The lowest average travel speed for any section was 11.52 mph for the section between the US Route 22 Eastbound ramp and West Macada Road. Delay may be caused by numerous factors such as bus loading/unloading, vehicles making turns, pedestrians, traffic signals, etc. The only southbound delay experienced in this corridor was a result of traffic volumes and signals. The intersection should be evaluated for possible signal timing improvements or optimization.

**TABLE 7
TRAVEL TIME & DELAY STUDY - FIELD SHEET SUMMARY**

Road: Schoenersville Road Direction: SouthBound RUN: SouthBound Summary of All Runs
 Project: Signal Corridor Study Date: 1/17/2013 Performed by: JG & MD
 Location: Bethlehem City/Hanover (LC & NC) Day of Wk: Thursday Peak Period: PM
 Weather: Cloudy

Control Point	Posted Speed (mph)	Distance (mi.)	Cumulative Travel Time (seconds)	Stopped Delay		Running Speed (mph)	Travel Speed (mph)	Delay Factors
				(min)	(sec)			
Avenue C/Stoke Park Road								
City Line Road/Center Valley Parkway	40	0.72	163	1	0	25.17	15.90	TS
Industrial Drive	40	1.12	309	0	25	33.32	27.62	TS
US Route 22 Westbound Ramps	40	0.56	446	0	46	22.15	14.72	TS
US Route 22 Eastbound Ramps	40	0.60	525	0	0	27.34	27.34	
W Macada Road	40	0.24	600	0	34	21.07	11.52	TS
Westgate Drive	40	1.36	754	0	0	31.79	31.79	TS
Jacksonville Road	40	1.40	1000	1	17	29.82	20.49	TS
Catasauqua Road/Birchwood Drive	40	0.20	1056	0	19	19.46	12.86	TS
Illicks Mill Road	40	0.60	1184	0	43	25.41	16.88	TS
8th Avenue	40	0.56	1288	0	17	23.17	19.38	TS
		7.36	1288	5	21	27.40	20.57	

Delay Factor Codes:

BS = Bus Loading/Unloading
 DP = Double Parking
 EV = Emergency Vehicle
 GC = General Congestion
 LT = Left Turns
 OT = Other

PK = Parked Cars
 PD = Pedestrians
 RR = Railroad Crossing
 SS = Stop Sign
 TK = Truck
 TS = Traffic Signal

LO = Delivery Loading/Unloading
 CY = Cyclist
 RT = Right Turn
 DV = Disabled Vehicle
 GT = Garbage Truck

Stopped Delay - Time spent motionless in a vehicle.

Running Speed - Calculated speed of the vehicle while in motion, including acceleration and deceleration times.

Travel Speed - Calculated speed of the vehicle including stopped delay times.

Queue Lengths - number or distance of vehicles in a queue

of Cycle Failures - (queues not completely discharging during each signal cycle)

Stopped Delay as a percentage of total run time for the corridor = 24.92%

Table 8 depicts a summation of all four northbound travel runs conducted during the PM peak period for the Schoenersville Road corridor. The distance in miles depicted between intersections is cumulative for all travel runs conducted. The posted speed limit through the corridor is 40 mph. Average travel speed, which is a calculated vehicle speed that includes stopped delay times and acceleration/deceleration times, was 19.16 mph. This is 47.90% of the posted speed limit. The highest average travel speed for any section was 41.65 mph for the section between Jacksonville Road and Westgate Drive. The lowest average travel speed for any section was 10.05 mph for the section between West Macada Road and the US Route 22 Eastbound ramp. Delay may be caused by numerous factors such as bus loading/unloading, vehicles making turns, pedestrians, traffic signals, etc. The only northbound delay experienced in this corridor was a result of traffic volumes and signals. The intersection should be evaluated for possible signal timing improvements or optimization.

**TABLE 8
TRAVEL TIME & DELAY STUDY - FIELD SHEET SUMMARY**

Road: Schoenersville Road Direction: NorthBound RUN: NorthBound Summary of All Runs
 Project: Signal Corridor Study Date: 1/17/2013 Performed by: JG & MD
 Location: Bethlehem City/Hanover (LC & NC) Day of Wk: Thursday Peak Period: PM
 Weather: Cloudy

Control Point	Posted Speed (mph)	Distance (mi.)	Cumulative Travel Time (seconds)	Stopped Delay		Running Speed (mph)	Travel Speed (mph)	Delay Factors
				(min)	(sec)			
8th Avenue								
Illicks Mill Road	40	0.56	157	0	52	19.20	12.84	TS
Catasauqua Road/Birchwood Drive	40	0.60	286	0	44	25.41	16.74	TS
Jacksonville Road	40	0.20	314	0	0	25.71	25.71	
Westgate Drive	40	1.40	435	0	0	41.65	41.65	
W Macada Road	40	1.36	722	2	2	29.67	17.06	TS
US Route 22 Eastbound Ramps	40	0.24	808	0	32	16.00	10.05	TS
US Route 22 Westbound Ramps	40	0.60	917	0	13	22.50	19.82	TS
Industrial Drive	40	0.56	1014	0	4	21.68	20.78	TS
City Line Road/Center Valley Parkway	40	1.12	1175	0	16	27.81	25.04	TS
Avenue C/Stoke Park Road	40	0.72	1383	1	40	24.00	12.46	TS
		7.36	1383	6	23	26.50	19.16	

Delay Factor Codes:

BS = Bus Loading/Unloading
 DP = Double Parking
 EV = Emergency Vehicle
 GC = General Congestion
 LT = Left Turns
 OT = Other

PK = Parked Cars
 PD = Pedestrians
 RR = Railroad Crossing
 SS = Stop Sign
 TK = Truck
 TS = Traffic Signal

LO = Delivery Loading/Unloading
 CY = Cyclist
 RT = Right Turn
 GT = Garbage Truck

Stopped Delay - Time spent motionless in a vehicle.

Running Speed - Calculated speed of the vehicle while in motion, including acceleration and deceleration times.

Travel Speed - Calculated speed of the vehicle including stopped delay times.

Queue Lengths - number or distance of vehicles in a queue

of Cycle Failures - (queues not completely discharging during each signal cycle)

Stopped Delay as a percentage of total run time for the corridor = 27.69%

APPENDIX B

Condition Diagram Only

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	BERKS & LEHIGH	0061	LCI	48 OF 43
CITY OF BETHLEHEM & HANOVER TOWNSHIP				
PERMIT NO.	48-206-002	SHEET	2	OF 3
DATE ISSUED	10-18-78	DATE REVISED	9-9-09	

GENERAL NOTES

INSTALLATION, OPERATION, AND MAINTENANCE OF THIS TRAFFIC SIGNAL TO BE IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.

NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.

ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.

ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND ARE TO BE INSTALLED AND MAINTAINED BY THE PERMITTEE UNLESS OTHERWISE INDICATED. EXCEPT THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS WHICH WILL BE MAINTAINED BY THE DEPARTMENT.

INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS WILL HAVE A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.

THE BOTTOM OF SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY ARE NOT TO BE LESS THAN 15 FEET NOR MORE THAN 19 FEET ABOVE THE ROADWAY. THE BOTTOM OF POST MOUNTED SIGNAL HEADS ARE NOT TO BE LESS THAN 8 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.

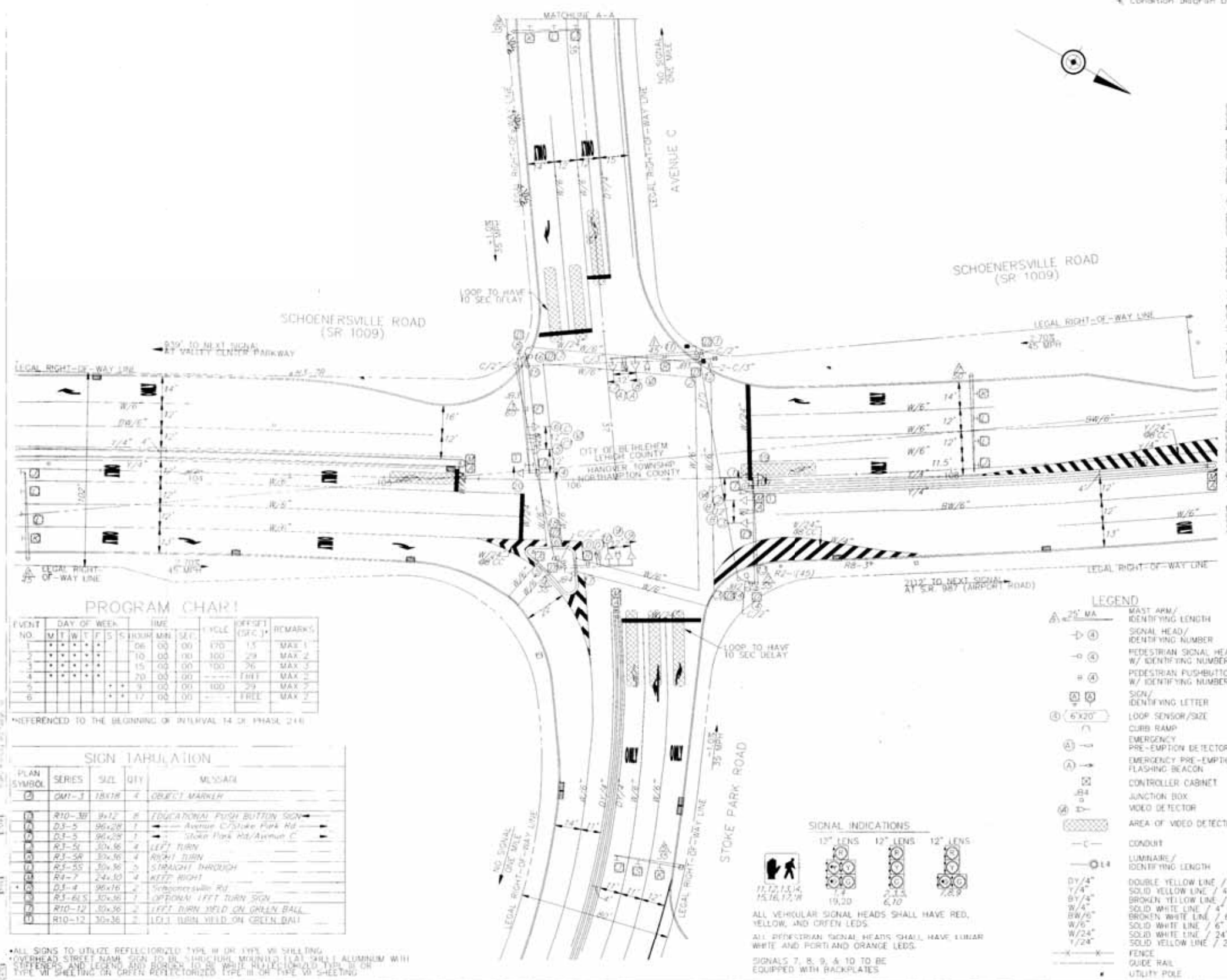
THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS MEASURED AT RIGHT ANGLES TO THE APPROACH IS TO BE 8 FEET.

IN ADDITION TO THIS SIGNAL PERMIT, THE PERMITTEE WILL ALSO OBTAIN A HIGHWAY OCCUPANCY PERMIT PRIOR TO ANY OPENINGS BEING MADE IN OR UNDER ANY PORTION OF A STATE HIGHWAY.

THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 121. PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES. PRIOR TO CONSTRUCTION OF ANY UTILITIES, THE PERMITTEE SHALL CONTACT ANY AGENCIES WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.

PAVEMENT MARKINGS WILL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING TC-8000 SERIES STANDARDS.

MAINTENANCE AND PROTECTION FOR THE INSTALLATION AND MAINTENANCE OF THE SIGNALS TO BE IN ACCORDANCE WITH PUBLIC WORKS, WORK ZONE TRAFFIC CONTROL GUIDELINES.



PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
1	•••••	06:00:00	170	15	MAX 1
2	•••••	10:00:00	100	29	MAX 2
3	•••••	15:00:00	100	26	MAX 3
4	•••••	20:00:00	100	29	MAX 2
5	•••••	24:00:00	100	29	MAX 2
6	•••••	17:00:00	100	29	MAX 2

*REFERENCED TO THE BEGINNING OF INTERVAL 14 OF PHASE 214

SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY	MESSAGE
○	OM1-3	18x18	4	OBJECT MARKER
○	R10-30	8x12	8	EDUCATIONAL PUSH BUTTON SIGN
○	D3-5	96x28	1	Avenue C/Stoke Park Rd
○	D3-5	96x28	1	Stoke Park Rd/Avenue C
○	R3-5L	30x36	4	LEFT TURN
○	R3-5R	30x36	4	RIGHT TURN
○	R3-5S	30x36	2	STRAIGHT THROUGH
○	R4-7	24x30	4	KEEP RIGHT
○	D3-4	96x18	2	Schoenersville Rd
○	R3-6LS	30x36	1	OPTIONAL LEFT TURN SIGN
○	R10-12	30x36	2	LEFT TURN YIELD ON GREEN BALL
○	R10-12	30x36	2	LEFT TURN YIELD ON GREEN BALL

*ALL SIGNS TO UTILIZE REFLECTORIZED TYPE III OR TYPE VI SHEETING. OVERHEAD STREET NAME SIGN TO BE ALUMINUM MOUNTED TO 1 1/2" ALUMINUM WITH SHEETING AND LOGO SIGN BOARD TO BE WHITE PLACED TO TYPE III OR TYPE VI SHEETING ON GREEN REFLECTORIZED TYPE III OR TYPE VI SHEETING.

LEGEND

- △ 25' MA - WEST ARM / IDENTIFYING LENGTH
- ▷ ④ - SIGNAL HEAD / IDENTIFYING NUMBER
- ④ - PEDESTRIAN SIGNAL HEAD W/ IDENTIFYING NUMBER
- ⊕ ④ - PEDESTRIAN PUSH-BUTTON W/ IDENTIFYING NUMBER
- ○ - SIGN / IDENTIFYING LETTER
- ⑤ 6'x20' - LOOP SENSOR/SIZE
- ⌒ - CURB RAMP
- ⊖ - EMERGENCY PRE-EMPTION DETECTOR
- ⊖ - EMERGENCY PRE-EMPTION FLASHING BEACON
- ⊖ - CONTROLLER CABINET
- ⊖ - JUNCTION BOX
- ⊖ - VIDEO DETECTOR
- ▨ - AREA OF VIDEO DETECTION
- - - - - CONDUIT
- L4 - LUMINAIRE / IDENTIFYING LENGTH
- DY/4" - DOUBLE YELLOW LINE / 4" WIDTH
- Y/4" - SOLID YELLOW LINE / 4" WIDTH
- B/Y/4" - BROWN YELLOW LINE / 4" WIDTH
- W/4" - SOLID WHITE LINE / 4" WIDTH
- BW/6" - BROWN WHITE LINE / 6" WIDTH
- W/6" - SOLID WHITE LINE / 6" WIDTH
- W/24" - SOLID WHITE LINE / 24" WIDTH
- 1/24" - SOLID YELLOW LINE / 24" WIDTH
- - - - - FENCE
- - - - - GUIDE RAIL
- - UTILITY POLE

SIGNAL INDICATIONS

12" LENS 12" LENS 12" LENS

11,12,13,14 1,4 2,15 7,8,9

15,16,17,18 19,20 6,70

ALL VEHICULAR SIGNAL HEADS SHALL HAVE RED, YELLOW, AND GREEN LEDS.

ALL PEDESTRIAN SIGNAL HEADS SHALL HAVE LUMINAIRE WHITE AND PORTLAND ORANGE LEDS.

SIGNALS 7, 8, 9, & 10 TO BE EQUIPPED WITH BACKPLATES

COUNTY: LEHIGH / NORTHAMPTON

MUNICIPALITY: CITY OF BETHLEHEM / HANOVER TOWNSHIP

INTERSECTION: S.R. 1009 (SCHOENERSVILLE ROAD) & STROKE PARK ROAD & AVENUE C

REVIEWED: *Pratt* 6/12/09
MUNICIPAL OFFICIAL DATE

REVIEWED: *Chitt* 6-11-09
DIST. TRAFFIC SIGNALS DIV. DATE

RECOMMENDED: *Chitt* 6/19/09
DISTRICT TRAFFIC ENGINEER DATE

SCALE: 25' 0" 25' 50'

DISTRICT	COUNTY	S.R.	SECTION
5-0	LEHIGH/NORTHAMPTON	987	001/002
		1009	002
		1009	002
HANOVER TOWNSHIP (NORTHAMPTON CO.) AND CITY OF BETHLEHEM			
PERMIT NO. 39-302-23	SHEET		2 OF 2
DATE ISSUED 2/27/79	DATE REVISED		1-18-08

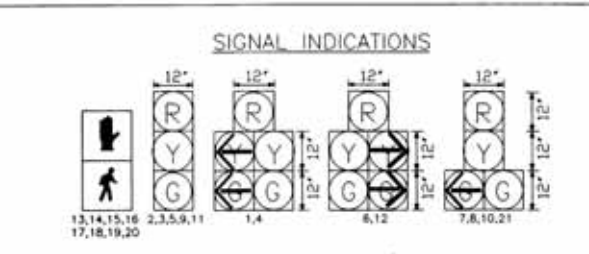
* CONDITION DIAGRAM ONLY

PHASING, TIMING and COLOR SEQUENCE CHART

SIGNALS	PHASE 1+5		PHASE 2+5		PHASE 1+6		PHASE 2+6		PHASE 4		PHASE 8		EMERGENCY FLASHING OPERATION
	1	2	3	4	5	6	7	8	9	10	11	12	
1	R/4	R/4	R/4	G/4	Y/4	R/4	R/4	R/4	G/4	Y/4	R/4	R/4	Y
2,3	R	R	R	G	Y	R	R	R	G	Y	R	R	Y
4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	G/4	Y/4	R/4	R/4	Y
5	R	R	R	R	R	R	R	R	G	Y	R	R	Y
6	R	R	R	R	R	R	R	R	G	Y	R	R	Y
7,8	R	R	R	R	R	R	R	R	G	Y	R	R	Y
9	R	R	R	R	R	R	R	R	G	Y	R	R	Y
10,21	R	R	R	R	R	R	R	R	R	R	R	R	Y
11	R	R	R	R	R	R	R	R	R	R	R	R	Y
12	R/4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	R/4	Y
13,15	H	H	H	H	H	H	H	H	H	H	H	H	OFF
17,19	H	H	H	H	H	H	H	H	H	H	H	H	OFF
14,20	H	H	H	H	H	H	H	H	H	H	H	H	OFF
16,18	H	H	H	H	H	H	H	H	H	H	H	H	OFF

EMERGENCY PREEMPTION PHASING MOVEMENT, PHASING AND SEQUENCE CHART

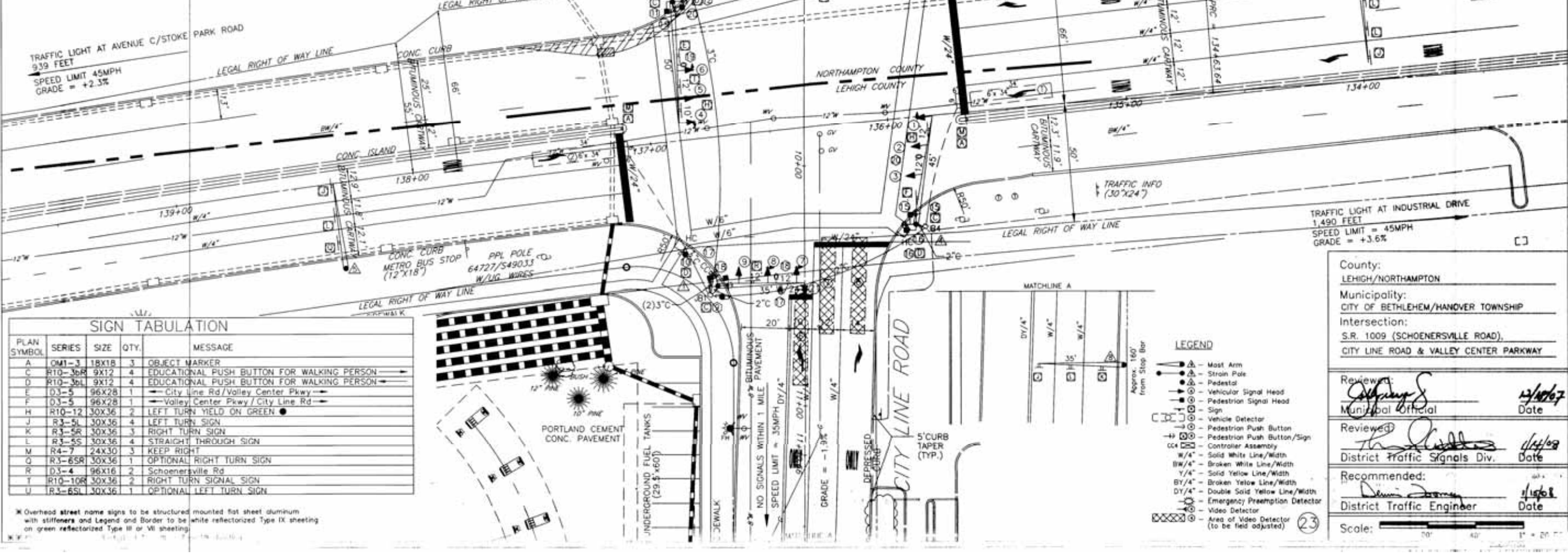
SIGNALS	PHASE 1		PHASE 2		PHASE 3		PHASE 4		PHASE 5		EMERGENCY FLASHING OPERATION
	1	2	3	4	5	6	7	8	9		
1	R	R	R	R	R	R	R	R	R	R	Y
2,3	R	R	R	R	R	R	R	R	R	R	Y
4	R	R	R	R	R	R	R	R	R	R	Y
5	R	R	R	R	R	R	R	R	R	R	Y
6	R	R	R	R	R	R	R	R	R	R	Y
7,8	R	R	R	R	R	R	R	R	R	R	Y
9	R	R	R	R	R	R	R	R	R	R	Y
10,21	R	R	R	R	R	R	R	R	R	R	Y
11	R	R	R	R	R	R	R	R	R	R	Y
12	R	R	R	R	R	R	R	R	R	R	Y
13,15,16,17,18,19,20	H	H	H	H	H	H	H	H	H	H	OFF
21	H	H	H	H	H	H	H	H	H	H	OFF



- NOTES:
- R/4 IF FOLLOWED BY PHASE 2+5
 - R/4 IF FOLLOWED BY PHASE 1+6
 - G/4 IF FOLLOWED BY PHASE 2+6
 - G IF FOLLOWED BY PHASE 2+6
 - PHASE 1+5 TO FOLLOW PHASE 4 OR PHASE 8 ONLY
 - UPON PEDESTRIAN ACTUATION ONLY
 - PHASE 2+5, 1+6 TO FOLLOW PHASE 4, PHASE 8, OR PHASE 1+5
 - Y/4 IF FOLLOWED BY PHASE 1+5, 1+6
 - R/4 IF FOLLOWED BY PHASE 1+5, 1+6

PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
1	* * * * *	06:00:00	120	0	MAX 1
2	* * * * *	10:00:00	100	0	MAX 2
3	* * * * *	15:00:00	100	0	MAX 3
4	* * * * *	20:00:00	---	---	FREE MAX 2
5	* * * * *	9:00:00	100	0	MAX 2
6	* * * * *	17:00:00	---	---	FREE MAX 2



SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY.	MESSAGE
A	OM1-3	18X18	3	OBJECT MARKER
C	R10-36R	9X12	4	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
D	R10-36L	9X12	4	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
E	D3-5	96X28	1	City Line Rd/Valley Center Pkwy
F	D3-5	96X28	1	Valley Center Pkwy/City Line Rd
H	R10-12	30X36	2	LEFT TURN YIELD ON GREEN
J	R3-5L	30X36	4	LEFT TURN SIGN
K	R3-5R	30X36	3	RIGHT TURN SIGN
L	R3-5S	30X36	4	STRAIGHT THROUGH SIGN
M	R4-7	24X30	3	KEEP RIGHT
Q	R3-6SR	30X36	1	OPTIONAL RIGHT TURN SIGN
R	D3-4	96X16	2	Schoenersville Rd
T	R10-10R	30X36	2	RIGHT TURN SIGNAL SIGN
U	R3-6SL	30X36	1	OPTIONAL LEFT TURN SIGN

County: LEHIGH/NORTHAMPTON
Municipality: CITY OF BETHLEHEM/HANOVER TOWNSHIP
Intersection: S.R. 1009 (SCHOENERSVILLE ROAD), CITY LINE ROAD & VALLEY CENTER PARKWAY

Reviewed: *[Signature]* 12/16/07
Municipal Official Date

Reviewed: *[Signature]* 1/14/08
District Traffic Signals Div. Date

Recommended: *[Signature]* 1/16/08
District Traffic Engineer Date

Scale: 1" = 20'

PHASING, TIMING and COLOR SEQUENCE CHART

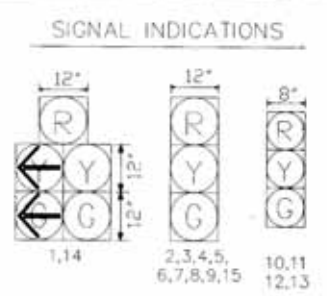
PHASE	1	2	3	4	5	6	7	8	9	10	11	12	13
INTERVALS	1	2	3	4	5	6	7	8	9	10	11	12	13
SIGNALS	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14
EMERGENCY CLEARING OPERATION													

EMERGENCY PREEMPTION PHASING PHASING, TIMING AND COLOR SEQUENCE CHART

PHASE	2+5	7+8	3+6	4+13
INTERVALS	1	2	3	4
SIGNALS	1,14	2,3,4,5,6,7,8,9,10,11,12,13	1,14	2,3,4,5,6,7,8,9,10,11,12,13

SMALL PRINT/NOTES

THE CONTRACTOR SHALL BE EQUIPPED WITH EMERGENCY PREEMPTION FOR ALL APPROACHES AND THROUGH APPROACHES OF ALL SIGNALS. THE PREEMPTION APPROACH OF SIGNALS 1,14 AND THROUGH APPROACH OF SIGNALS 2,3,4,5,6,7,8,9,10,11,12,13 SHALL BE EQUIPPED WITH EMERGENCY PREEMPTION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER OPERATION OF THE PREEMPTION SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER OPERATION OF THE PREEMPTION SYSTEM. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROPER OPERATION OF THE PREEMPTION SYSTEM.



SIGNALS 10,11,12, & 13 TO BE EQUIPPED WITH TUNNEL VISORS AND 0" STRAIGHT FIN LOUVERS.

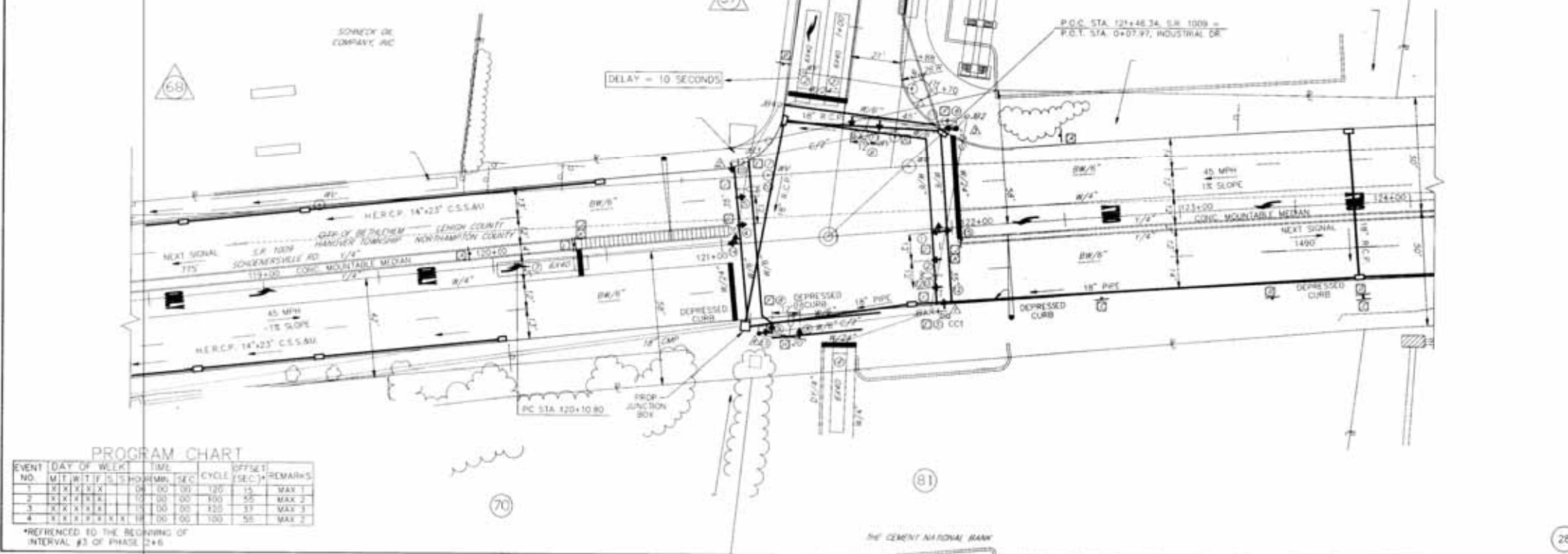
SIGNALS 1,2,3,4,5,6,7,8,9,14 & 15 TO BE EQUIPPED WITH BACKPLATES.

ALL SIGNALS TO BE EQUIPPED WITH LEDs.

SIGN TABULATION

PLAN SYMBOL	SERIES	SRZ	QTY	MESSAGE
W-11-2	30X30	1	1	LEFT LANE MUST TURN LEFT
W-11-2R	30X30	1	1	RIGHT LANE MUST TURN RIGHT
W-11-2M	30X30	1	1	ALL TRAFFIC MUST TURN RIGHT
W-11-2M	30X30	1	1	DO NOT ENTER
W-11-2	30X30	1	1	PUSH BUTTON FOR GREEN LIGHT
W-11-2	30X30	1	1	PUSH BUTTON FOR GREEN LIGHT
W-11-2	30X30	1	1	LEFT TURN YIELD ON GREEN
W-11-2	30X30	1	1	SCHOENERSVILLE RD
W-11-2	30X30	1	1	INDUSTRIAL DR
W-11-2	30X30	1	1	HAZARD WARNING
W-11-2	30X30	1	1	HAZARD WARNING
W-11-2	30X30	1	1	HAZARD WARNING
W-11-2	30X30	1	1	NO TURN

- LEGEND**
- ▲ - Mast Arm
 - △ - Strain Pole
 - - Pedestal
 - - Vehicular Signal Head
 - - Pedestrian Signal Head
 - - Sign
 - - Vehicle Detector
 - - Pedestrian Push Button
 - - Pedestrian Push Button/Sign
 - - Controller Assembly
 - W/4" - Solid White Line/Width
 - BW/4" - Broken White Line/Width
 - Y/4" - Solid Yellow Line/Width
 - BY/4" - Broken Yellow Line/Width
 - DY/4" - Double Solid Yellow Line/Width
 - JB1 - Junction Box
 - EM - EMERGENCY PREEMPTION DEVICE



PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE (SEC)	OFFSET (SEC)	REMARKS
1	X X X X X X X	04:00	120	15	MAX 1
2	X X X X X X X	04:00	100	05	MAX 2
3	X X X X X X X	04:00	120	33	MAX 3
4	X X X X X X X	04:00	100	55	MAX 4

*REFERENCED TO THE BEGINNING OF INTERVAL #3 OF PHASE 2+5

DISTRICT	COUNTY	ROUTE	SECTION	SHEET
3-D	BERKS & LEHIGH	8062	LC1	42 OF 43
CITY OF BETHLEHEM & HANOVER TOWNSHIP				
PERMIT NO.	39-002-028	SHEET	2 OF 3	
DATE ISSUED	6-15-92	DATE REVISED	9-9-08	

* Condition Diagram Only

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.

No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.

All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.

All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State Highways which will be maintained by the Department.

Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.

The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.

The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.

In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.

This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 121, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.

Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-8600 Series.

Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 213, Work Zone Traffic Control.

County: LEHIGH/NORTHAMPTON

Municipality: CITY OF BETHLEHEM/HANOVER TOWNSHIP

Intersection: S.R.1009(SCHOENERSVILLE ROAD), INDUSTRIAL DRIVE AND PRIVATE DRIVEWAY

Reviewed: *Frank Tom* 6/24/09 Date

Municipal Official

Reviewed: *Chris Long* 6/24/09 Date

District Traffic Signal Div.

Recommended: *[Signature]* 6/23/09 Date

District Traffic Engineer

Scale: 0 25 50

PHASING, TIMING and COLOR SEQUENCE CHART

PHASE	1+6	2+6	8	RAMP PREEMPTION	EMERGENCY FLASHING OPERATION
SIGNALS	1, 2, 3, 4	5, 6, 7, 8	9, 10, 11, 12, 13		
INTERVALS	1, 2, 3, 4	5, 6, 7, 8	9, 10, 11, 12, 13		
FIXED	3	5	2	4	2
MINIMUM PASSAGE	3	3	3	3	3
MAX 1	13	55	34	60	
MAX 2	15	49	18	60	
MAX 3	11	54	17	60	
PEDESTRIAN MEMORY	NL	MR	NL	NL	

① PHASE 1+6 TO FOLLOW PHASE 8 ONLY OR PREEMPTION ONLY
 ② PREEMPTION TO BE ACTIVATED BY A CONSTANT 20 SECONDS CALL ON THE PREEMPT DETECTOR
 ③ A CONSTANT CALL ON THE RAMP PREEMPTION DETECTOR FOR 180 SECONDS SHALL INHIBIT THE PREEMPT CALL
 ④ UPON PEDESTRIAN ACTUATION ONLY
 ⑤ G IF FOLLOWED BY PHASE 1+6

EMERGENCY PREEMPTION PHASING

PHASE	2	8	8
SIGNALS	14, 15, 16	17, 18	19, 20, 21
INTERVALS	14, 15, 16	17, 18	19, 20, 21
SELECTIVE CLEARANCE			

CONTROLLER TO BE EQUIPPED WITH EMERGENCY PREEMPTION FOR THE WESTBOUND APPROACH OF RAMP NA AND THE NORTHBOUND AND SOUTHBOUND APPROACHES OF SCHOENERSVILLE ROAD WITH A FLASHING FAIL SAFE DEVICE FOR EACH DIRECTION.

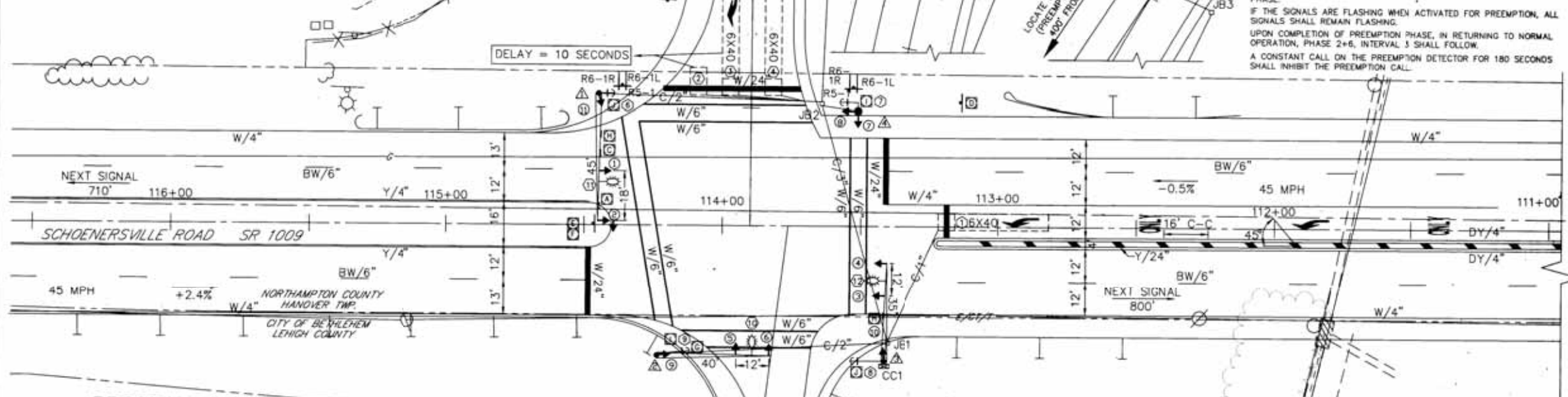
THE SIGNALS WHEN ACTIVATED BY AN EMERGENCY VEHICLE SHALL TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS. THE GREEN INDICATIONS FOR THE PREEMPTED PHASE SHALL REMAIN GREEN FOR THE DURATION OF SIGNAL PREEMPTION AND RED INDICATIONS DISPLAYED FOR ALL OTHER PHASES.

IF THE SIGNALS WHEN ACTIVATED BY AN EMERGENCY VEHICLE SHALL TIME OUT ALL YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INDICATION OF THE PREEMPTION PHASE GOVERNED BY THE ACTUATION OF THE APPROACHING EMERGENCY VEHICLE.

IF THE SIGNALS WHEN ACTIVATED BY AN EMERGENCY VEHICLE ARE FLASHING ALL SIGNALS SHALL REMAIN FLASHING.

UPON COMPLETION OF PREEMPTION PHASE 2 OR 8, IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 3 SHALL FOLLOW.

UPON COMPLETION OF PREEMPTION PHASE 8, IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 3 SHALL FOLLOW.



RAMP PREEMPTION NOTES:

WHEN PREEMPTION IS ACTIVATED, ANY GREEN INDICATION, EXCEPT GREEN INDICATIONS BY SIGNALS #5, #6, AND #10, SHALL BE FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS.

WHEN PREEMPTION IS ACTIVATED, ALL YELLOW AND RED INDICATIONS SHALL TIME OUT, FOLLOWED BY THE GREEN INTERVAL OF THE PREEMPTION PHASE.

IF THE SIGNALS ARE FLASHING WHEN ACTIVATED FOR PREEMPTION, ALL SIGNALS SHALL REMAIN FLASHING.

UPON COMPLETION OF PREEMPTION PHASE, IN RETURNING TO NORMAL OPERATION, PHASE 2+6, INTERVAL 3 SHALL FOLLOW.

A CONSTANT CALL ON THE PREEMPTION DETECTOR FOR 180 SECONDS SHALL INHIBIT THE PREEMPTION CALL.

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.

No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.

All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.

All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State highways which will be maintained by the Department.

Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.

The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.

The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.

In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.

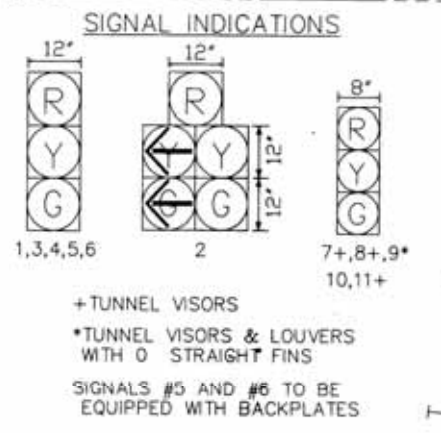
This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.

Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards, TC-7600 Series.

Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
1	X X X X X	06 00 00	120	72	MAX 1
2	X X X X X	10 00 00	100	28	MAX 2
3	X X X X X	15 00 00	100	33	MAX 3
4	X X X X X	20 00 00	---	---	FREE MAX 2
5		X X 09 00 00	100	28	MAX 2
6		X X 17 00 00	---	---	FREE MAX 2



SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY.	MESSAGE
A	R10-12	30X36	1	LEFT TURN YIELD ON GREEN
B	R3-7R	30X30	2	RIGHT LANE MUST TURN RIGHT
C	R3-1	30X30	1	NO RIGHT TURN
D	R3-7L	30X30	2	LEFT LANE MUST TURN LEFT
E	R4-7	24X30	1	KEEP RIGHT
F	W16-1	18X18	1	HAZARD MARKER
G	D3-4	96X16	1	Schoenersville Rd
H	D3-4	72X16	2	Rt 22 West
I	R10-3	9X12	2	PUSH BUTTON FOR GREEN LIGHT
J	R10-3	9X12	2	PUSH BUTTON FOR GREEN LIGHT

- ### LEGEND
- ▲ - Mast Arm
 - △ - Strain Pole
 - - Pedestal
 - - Vehicular Signal Head
 - - Pedestrian Signal Head
 - - Sign
 - - Vehicle Detector
 - - Pedestrian Push Button
 - - Pedestrian Push Button/Sign
 - - Controller Assembly
 - - W/4" - Solid White Line/Width
 - - BW/4" - Broken White Line/Width
 - - Y/4" - Solid Yellow Line/Width
 - - BY/4" - Broken Yellow Line/Width
 - - DY/4" - Double Solid Yellow Line/Width
 - - JB1 - Junction Box
 - - Emergency Preemption Detector

County: NORTHAMPTON
 Municipality: CITY OF BETHLEHEM
 Intersection: S.R. 1009 (SCHOENERSVILLE ROAD) AND S.R. 22 RAMP NA & NB

Reviewed: *[Signature]* 3/8/04
 District Traffic Signals Div. Date

Recommended: *[Signature]* 3/25/04
 District Traffic Engineer Date

Recommended: *[Signature]* 3/26/04
 District Traffic Engineer Date

Scale: 0 20 40 60

• CONDITION DIAGRAM ONLY

GENERAL NOTES

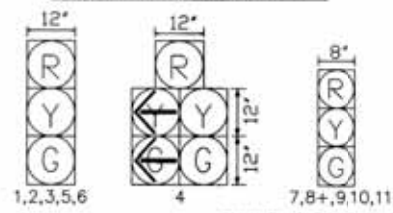
Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.
No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.
All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.
All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State highways which will be maintained by the Department.
Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.
The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.
The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.
In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.
This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.
Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-7600 Series.
Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

TIMING and COLOR SEQUENCE CHART

PHASE 2+6					PHASE 4+B					RAMP PREEMPTION				
INTVLS	INTVLS	INTVLS	INTVLS	EMERGENCY FLASHING OPERATION	INTVLS	INTVLS	INTVLS	INTVLS		INTVLS	INTVLS	INTVLS	INTVLS	
R	R	R	R	Y	R	R	R	R	Y	R	R	R	R	Y
G	G	G	G	Y	R	R	R	R	Y	R	R	R	R	Y
Y	Y	Y	Y	R	R	R	R	R	Y	R	R	R	R	Y
C	C	C	C	Y	R	R	R	R	Y	R	R	R	R	Y
R	R	R	R	Y	R	R	R	R	Y	R	R	R	R	Y
R	R	R	R	Y	R	R	R	R	Y	R	R	R	R	Y
R	R	R	R	Y	R	R	R	R	Y	R	R	R	R	Y
R	R	R	R	Y	R	R	R	R	Y	R	R	R	R	Y
5	5	2			4	2	4	2		4	2			
69				3										
46				3										
34				60										

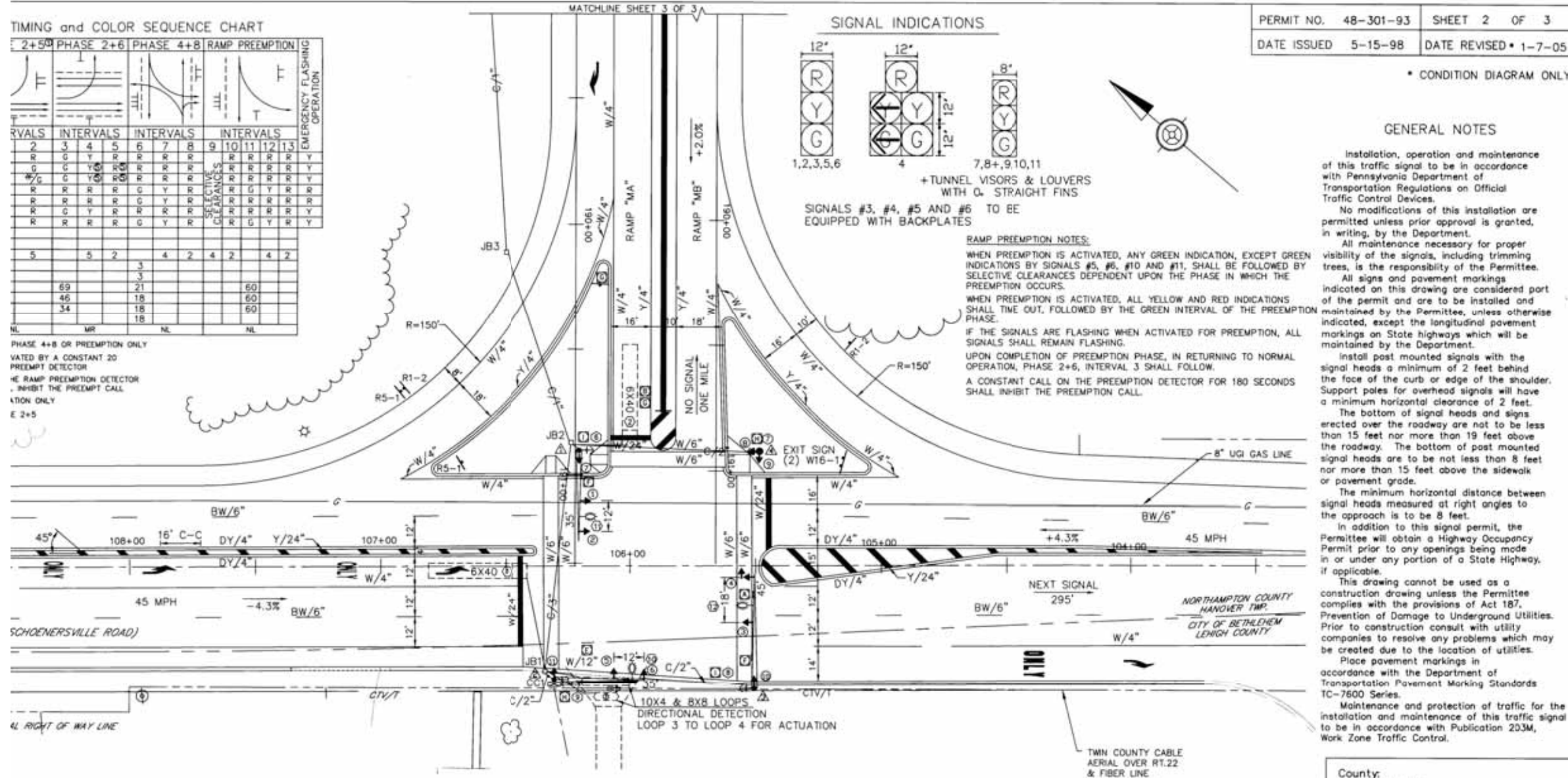
PHASE 4+B OR PREEMPTION ONLY
ACTIVATED BY A CONSTANT 20
PREEMPT DETECTOR
THE RAMP PREEMPTION DETECTOR
- INHIBIT THE PREEMPT CALL
FUNCTION ONLY
E 2+5

SIGNAL INDICATIONS



SIGNALS #3, #4, #5 AND #6
EQUIPPED WITH BACKPLATES

RAMP PREEMPTION NOTES:
WHEN PREEMPTION IS ACTIVATED, ANY GREEN INDICATION, EXCEPT GREEN INDICATIONS BY SIGNALS #5, #6, #10 AND #11, SHALL BE FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS.
WHEN PREEMPTION IS ACTIVATED, ALL YELLOW AND RED INDICATIONS SHALL TIME OUT, FOLLOWED BY THE GREEN INTERVAL OF THE PREEMPTION PHASE.
IF THE SIGNALS ARE FLASHING WHEN ACTIVATED FOR PREEMPTION, ALL SIGNALS SHALL REMAIN FLASHING.
UPON COMPLETION OF PREEMPTION PHASE, IN RETURNING TO NORMAL OPERATION, PHASE 2+6, INTERVAL 3 SHALL FOLLOW.
A CONSTANT CALL ON THE PREEMPTION DETECTOR FOR 180 SECONDS SHALL INHIBIT THE PREEMPTION CALL.



LEGEND

TIME	MIN	SEC	CYCLE (SEC)	OFFSET (SEC)	REMARKS
1:00	00	120	61		MAX 1
1:00	00	100	59		MAX 2
1:00	00	100	59		MAX 3
1:00	00	100	59		MAX 4
1:00	00	100	59		MAX 5
1:00	00	100	59		MAX 6
1:00	00	---	---		FREE
1:00	00	---	---		FREE
1:00	00	---	---		FREE

REGULATION

MESSAGE

LEFT TURN YIELD ON GREEN

KEEP RIGHT

RIGHT LANE MUST TURN RIGHT

LEFT LANE MUST TURN LEFT

Schoenersville Rd

RT 22 Lane

HAZARD MARKER

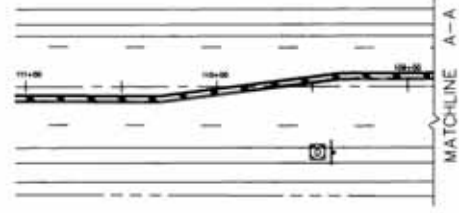
PUSH BUTTON FOR GREEN LIGHT

PUSH BUTTON FOR GREEN LIGHT

EMERGENCY PREEMPTION PHASING

PHASE 2				PHASE 4				PHASE 6			
SIGNALS	INTVLS	INTVLS	INTVLS	SIGNALS	INTVLS	INTVLS	INTVLS	SIGNALS	INTVLS	INTVLS	INTVLS
1-2	R	R	R	3-4	R	R	R	5-6	R	R	R
1-2	G	G	G	3-4	G	G	G	5-6	G	G	G
1-2	Y	Y	Y	3-4	Y	Y	Y	5-6	Y	Y	Y
1-2	C	C	C	3-4	C	C	C	5-6	C	C	C
1-2	R	R	R	3-4	R	R	R	5-6	R	R	R
1-2	Y	Y	Y	3-4	Y	Y	Y	5-6	Y	Y	Y
1-2	C	C	C	3-4	C	C	C	5-6	C	C	C
1-2	R	R	R	3-4	R	R	R	5-6	R	R	R

EMERGENCY PREEMPTION NOTES:
CONTROLLER TO BE EQUIPPED WITH EMERGENCY PREEMPTION FOR THE WESTBOUND APPROACHES OF RAMP MA AND RAMP MB AND THE NORTHBOUND AND SOUTHBOUND APPROACHES OF SCHOENERSVILLE ROAD WITH A FLASHING FAI SAFE DEVICE FOR EACH DIRECTION.
THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS. THE GREEN INDICATIONS FOR THE PREEMPTED PHASE SHALL REMAIN GREEN FOR THE DURATION OF SIGNAL PREEMPTION AND RED INDICATIONS DISPLAYED FOR ALL OTHER PHASES.
THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL TIME OUT ALL YELLOW AND RED INDICATIONS, FOLLOWED BY THE GREEN INTERVAL OF THE PREEMPTION PHASE GOVERNED BY THE ACTUATION OF THE APPROACHING EMERGENCY VEHICLE.
IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING ALL SIGNALS SHALL REMAIN FLASHING.
UPON COMPLETION OF PREEMPTION PHASE 3 OR 4, IN RETURNING TO NORMAL OPERATION, PHASE 2+6 INTERVAL 3 SHALL FOLLOW.
UPON COMPLETION OF PREEMPTION PHASE 4, IN RETURNING TO NORMAL OPERATION, PHASE 2+4 INTERVAL 3 SHALL FOLLOW.



▲	△	○	○	○	○	○	○
●	●	●	●	●	●	●	●
→	→	→	→	→	→	→	→
○	○	○	○	○	○	○	○
□	□	□	□	□	□	□	□

LEGEND

▲ - Mast Arm
△ - Strain Pole
○ - Pedestal
● - Vehicular Signal Head
○ - Pedestrian Signal Head
○ - Sign
○ - Vehicle Detector
○ - Pedestrian Push Button
○ - Pedestrian Push Button/Sign
○ - Controller Assembly
○ - Junction Box
○ - Emergency Preemption Detector

County: NORTHAMPTON
Municipality: CITY OF BETHLEHEM
Intersection: SCHOENERSVILLE ROAD (S.R. 1009) & S.R. 0022 RAMP MA & MB

Reviewed: 3/6/04
Municipal Official Date

Reviewed: 3/6/04
District Traffic Signals Div. Date

Recommended: 3/6/04
District Traffic Engineer Date

Scale: 0 20 40 80

■ CONDITION DIAGRAM ONLY

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.

No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.

All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.

All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State highways which will be maintained by the Department.

Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.

The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.

The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.

In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.

This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.

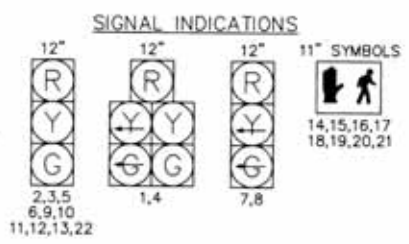
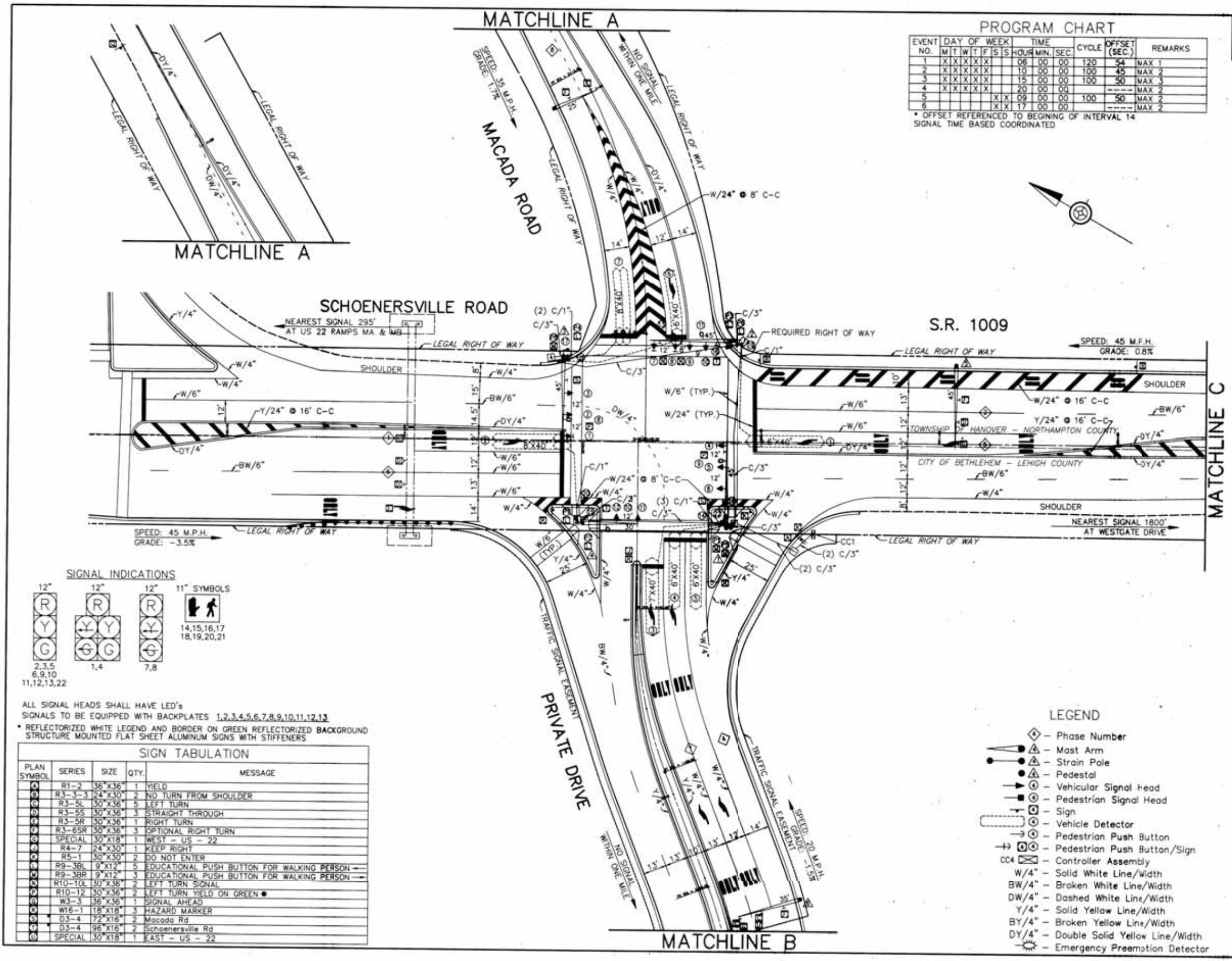
Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-7600 Series.

Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
	M T W T F S S	HOUR MIN. SEC.			
1	X X X X X	06 00 00	120	54	MAX 1
2	X X X X X	10 00 00	100	45	MAX 2
3	X X X X X	15 00 00	100	50	MAX 3
4	X X X X X	20 00 00	---	---	MAX 2
5	X X X X X	09 00 00	100	50	MAX 2
6	X X X X X	17 00 00	---	---	MAX 2

* OFFSET REFERENCED TO BEGINNING OF INTERVAL 14
 SIGNAL TIME BASED COORDINATED



ALL SIGNAL HEADS SHALL HAVE LED'S
 SIGNALS TO BE EQUIPPED WITH BACKPLATES 1,2,3,4,5,6,7,8,9,10,11,12,13
 REFLECTORIZED WHITE LEGEND AND BORDER ON GREEN REFLECTORIZED BACKGROUND
 STRUCTURE MOUNTED FLAT SHEET ALUMINUM SIGNS WITH STIFFENERS

SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY.	MESSAGE
○	R1-2	36" X 36"	1	YIELD
○	R3-3	24" X 30"	2	NO TURN FROM SHOULDER
○	R3-5L	30" X 36"	5	LEFT TURN
○	R3-5S	30" X 36"	3	STRAIGHT THROUGH
○	R3-5R	30" X 36"	1	RIGHT TURN
○	R3-6SR	30" X 36"	3	OPTIONAL RIGHT TURN
○	SPECIAL	30" X 18"	1	WEST - US - 22
○	R4-7	24" X 30"	1	KEEP RIGHT
○	R5-1	30" X 30"	2	DO NOT ENTER
○	R9-3BL	9" X 12"	5	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
○	R9-3BR	9" X 12"	3	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
○	R10-1L	30" X 36"	2	LEFT TURN SIGNAL
○	R10-1R	30" X 36"	2	LEFT TURN YIELD ON GREEN
○	W3-3	36" X 36"	1	SIGNAL AHEAD
○	W16-1	18" X 18"	3	HAZARD MARKER
○	D3-4	72" X 16"	2	Macada Rd
○	D3-4	96" X 16"	2	Schoenersville Rd
○	SPECIAL	30" X 18"	1	EAST - US - 22

LEGEND

- ◇ - Phase Number
- ▲ - Mast Arm
- △ - Strain Pole
- - Pedestal
- - Vehicular Signal Head
- - Pedestrian Signal Head
- - Sign
- - Vehicle Detector
- - Pedestrian Push Button
- - Pedestrian Push Button/Sign
- CC4 - Controller Assembly
- W/4" - Solid White Line/Width
- BW/4" - Broken White Line/Width
- DW/4" - Dashed White Line/Width
- Y/4" - Solid Yellow Line/Width
- BY/4" - Broken Yellow Line/Width
- DY/4" - Double Solid Yellow Line/Width
- ☼ - Emergency Preemption Detector

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PHASING, TIMING and COLOR SEQUENCE CHART

SIGNALS	PHASE 1+6			PHASE 2+6			PEDESTRIAN			PHASE 8			EMERGENCY FLASHING OPERATION
	1	2	3	4	5	6	7	8		9	10	11	
1	G	Y	R	G	Y	R	R	R		R	R	R	Y
2	G	Y	R	G	Y	R	R	R		R	R	R	Y
3,4	R	R	R	G	Y	R	R	R		R	R	R	Y
5,6	R	R	R	G	Y	R	R	R		R	R	R	Y
7	R	R	R	R	R	R	R	R		G	Y	R	R
8,9	H	H	H	H	H	H	M	FH		H	H	H	OFF
10,11,12,13	H	H	H	H	H	H	M	FH		H	H	H	OFF

FIXED	4.5	1.5	4.5	1.5	3.5	2
MIN. GREEN	3				3	
PASSAGE	3				3	
MAXIMUM I	6		31		15.5	
MAXIMUM II	6		24		12.5	
PEDESTRIAN*					7	18

MEMORY NON-LOCKING MAX. RECALL NON-LOCKING NON-LOCKING

*UPON PEDESTRIAN ACTUATION ONLY

OPERATION NOTES
 ① G/C-Y- IF FOLLOWED BY PHASE 2+6
 ② G IF FOLLOWED BY PHASE 2+6
 ③ PHASE 1+6 FOLLOWS PHASE 8 OR PEDESTRIAN PHASE ONLY
 ④ UPON PEDESTRIAN ACTUATION ONLY, OTHERWISE HAND SYMBOL AT ALL TIMES
 ⑤ UPON PEDESTRIAN ACTUATION ONLY

EMERGENCY PRE-EMPTION PHASING

SIGNALS	PHASE 2			PHASE 8			PHASE 6		
	12	13	14	18	19	20	15	16	17
1	R	R	R	R	R	R	G	Y	R
2	R	R	R	R	R	R	G	Y	R
3,4	G	Y	R	R	R	R	R	R	R
5,6	G	Y	R	R	R	R	R	R	R
7	R	R	R	R	R	R	R	R	R
8,9	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF
10,11,12,13	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF

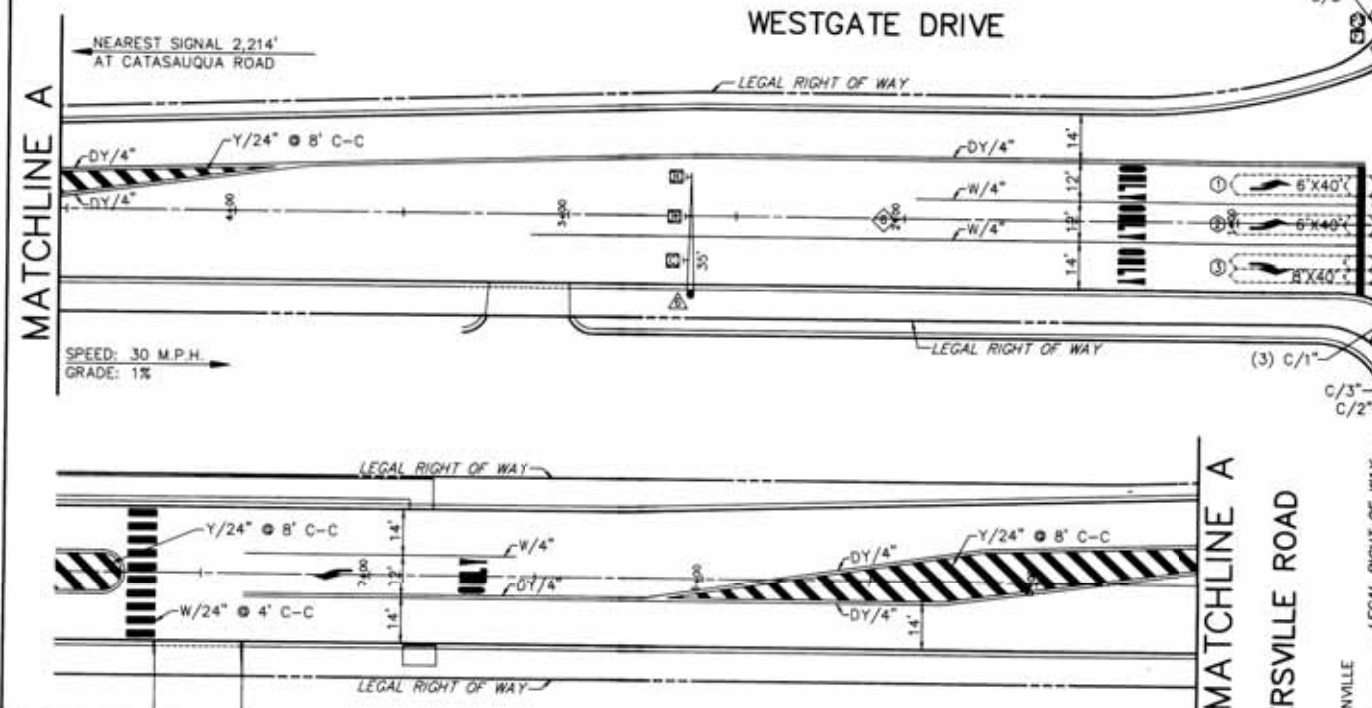
SELECTIVE CLEARANCES
 * 4.5, 1.5 * 3.5, 2 * 4.5, 1.5

* FOR DURATION OF PRE-EMPTION

PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
1	X X X X X X	06:30:00	85	2	MAX II, OFF PEAK
2	X X X X X X	07:00:00	95	2	MAX I, AM PEAK
3	X X X X X X	08:30:00	85	2	MAX II, OFF PEAK
4	X X X X X X	15:30:00	95	2	MAX I, PM PEAK
5	X X X X X X	18:00:00	85	2	MAX II, OFF PEAK
6	X X X X X X	22:00:00	85	---	FREE, MAX II

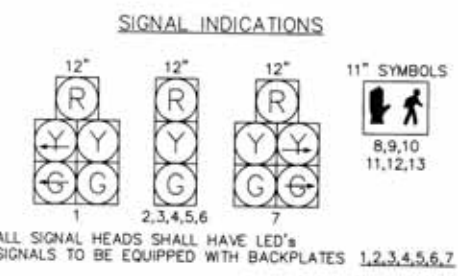
* OFFSET REFERENCED TO BEGINNING OF INTERVAL 5 PHASE 2+6
 MASTER CONTROLLER IS LOCATED AT SCHOENERSVILLE ROAD, JACKSONVILLE ROAD, CATASAUQUA ROAD AND BIRCHWOOD DRIVE



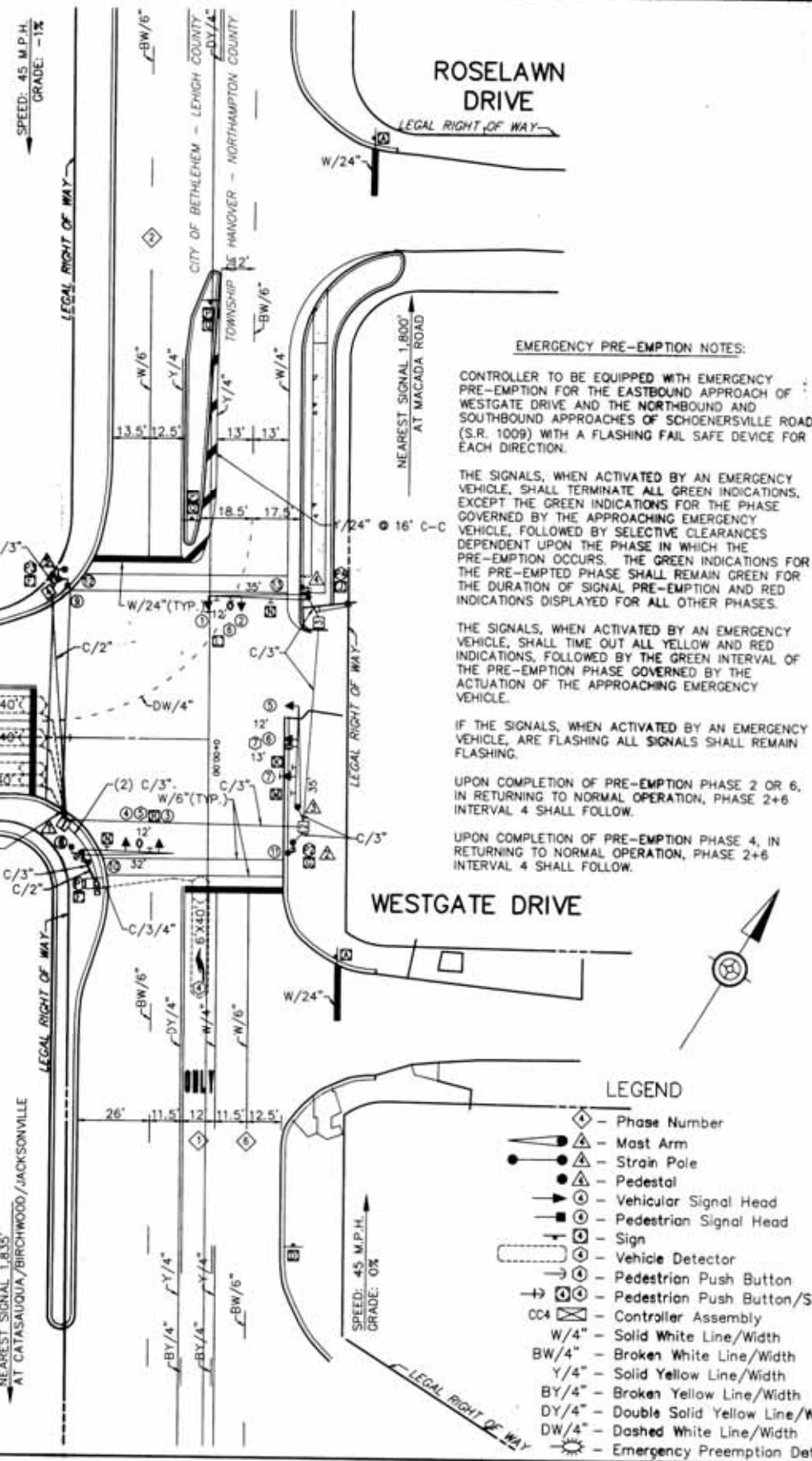
SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY.	MESSAGE
○	R1-1	30" X 30"	2	STOP
○	R3-SL	30" X 36"	2	LEFT TURN
○	R3-SR	30" X 36"	1	RIGHT TURN
○	R3-L	30" X 30"	1	LEFT LANE MUST TURN LEFT
○	R4-11-1	30" X 36"	1	LEFT LANE NO TRUCKS
○	R10-3B	9" X 12"	2	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
○	R10-3B	9" X 12"	1	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
○	R10-3BR	9" X 12"	1	EDUCATIONAL PUSH BUTTON FOR WALKING PERSON
○	R10-10R	30" X 36"	1	RIGHT TURN SIGNAL
○	R10-12	30" X 36"	1	LEFT TURN YIELD ON GREEN
○	D3-4	96" X 18"	1	Schoenersville Rd
○	D3-4	96" X 18"	2	Westgate Dr
○	R4-7	24" X 30"	2	KEEP RIGHT
○	W16-1	18" X 18"	2	HAZARD MARKER
○	R3-2	30" X 36"	1	NO LEFT TURN

REFLECTORIZED WHITE LEGEND AND BORDER ON GREEN REFLECTORIZED BACKGROUND STRUCTURE MOUNTED FLAT SHEET ALUMINUM SIGNS WITH STIFFENERS



S.R. 1009



LEGEND

- - Phase Number
- △ - Mast Arm
- - Strain Pole
- - Pedestal
- - Vehicular Signal Head
- - Pedestrian Signal Head
- - Sign
- - Vehicle Detector
- - Pedestrian Push Button
- - Pedestrian Push Button/Sign
- - Controller Assembly
- W/4" - Solid White Line/Width
- BW/4" - Broken White Line/Width
- Y/4" - Solid Yellow Line/Width
- BY/4" - Broken Yellow Line/Width
- DY/4" - Double Solid Yellow Line/Width
- DW/4" - Dashed White Line/Width
- - Emergency Preemption Detector

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.
 No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.
 All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.
 All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State highways which will be maintained by the Department.
 Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.
 The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.
 The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.
 In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.
 This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.
 Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-7600 Series.
 Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

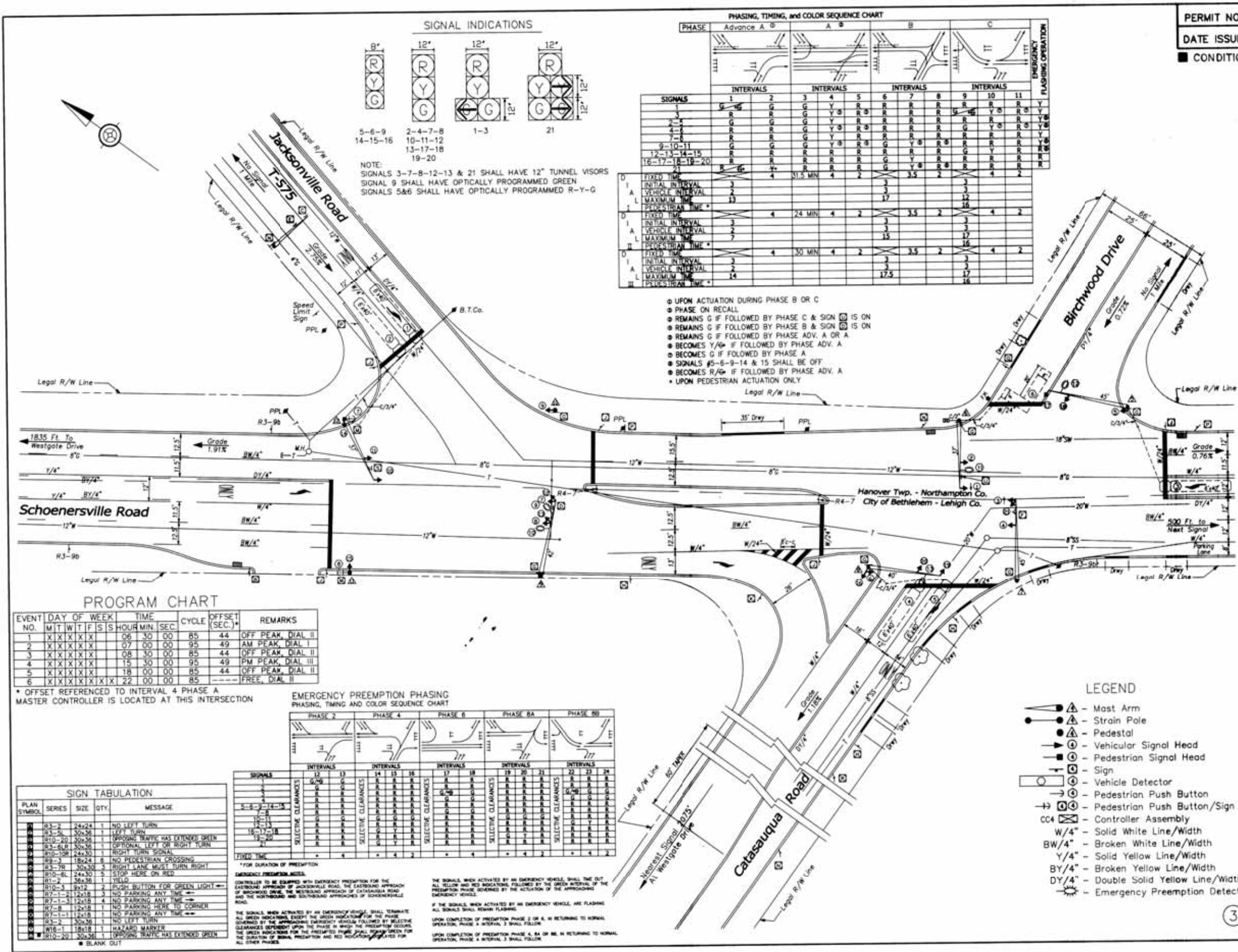
County: LEHIGH
 Municipality: CITY OF BETHLEHEM
 Intersection: SCHOENERSVILLE ROAD (S.R. 1009) & WESTGATE DRIVE

Reviewed: [Signature] Date: 3/16/04
 Municipal Official

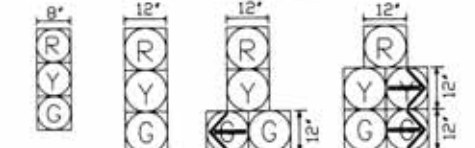
Reviewed: [Signature] Date: 3/16/04
 District Traffic Signals Div.

Recommended: [Signature] Date: 3/16/04
 District Traffic Engineer

Scale: 1" = 50'



SIGNAL INDICATIONS



NOTE: SIGNALS 3-7-8-12-13 & 21 SHALL HAVE 12" TUNNEL VISORS
 SIGNAL 9 SHALL HAVE OPTICALLY PROGRAMMED GREEN
 SIGNALS 5&6 SHALL HAVE OPTICALLY PROGRAMMED R-Y-G

PHASING, TIMING, and COLOR SEQUENCE CHART

PHASE	Advance A		A		B		C	
	1	2	3	4	5	6	7	8
SIGNALS	1-4	5-8	9-12	13-16	17-20	21	22-24	25
INITIAL INTERVAL	3	3	3	3	3	3	3	3
VEHICLE INTERVAL	2	2	2	2	2	2	2	2
MAXIMUM TIME	7	7	7	7	7	7	7	7
PEDESTRIAN TIME	4	4	4	4	4	4	4	4
FIXED TIME	4	4	4	4	4	4	4	4
VEHICLE INTERVAL	3	3	3	3	3	3	3	3
VEHICLE INTERVAL	2	2	2	2	2	2	2	2
MAXIMUM TIME	7	7	7	7	7	7	7	7
PEDESTRIAN TIME	4	4	4	4	4	4	4	4

- UPON ACTUATION DURING PHASE B OR C
- PHASE ON RECALL
- REMAINS G IF FOLLOWED BY PHASE C & SIGN 15 IS ON
- REMAINS G IF FOLLOWED BY PHASE B & SIGN 15 IS ON
- REMAINS G IF FOLLOWED BY PHASE ADV. A OR A
- BECOMES Y/R IF FOLLOWED BY PHASE ADV. A
- BECOMES G IF FOLLOWED BY PHASE A
- SIGNALS 5-6-9-14 & 15 SHALL BE OFF
- BECOMES R/Y IF FOLLOWED BY PHASE ADV. A
- UPON PEDESTRIAN ACTUATION ONLY

PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
1	X X X X X X	06:30:00	85	44	OFF PEAK, DIAL II
2	X X X X X X	07:00:00	95	49	AM PEAK, DIAL I
3	X X X X X X	08:30:00	85	44	OFF PEAK, DIAL II
4	X X X X X X	15:30:00	95	49	PM PEAK, DIAL III
5	X X X X X X	18:00:00	85	44	OFF PEAK, DIAL II
6	X X X X X X	22:00:00	85	44	FREE, DIAL II

* OFFSET REFERENCED TO INTERVAL 4 PHASE A
 MASTER CONTROLLER IS LOCATED AT THIS INTERSECTION

EMERGENCY PREEMPTION PHASING, TIMING AND COLOR SEQUENCE CHART

PHASE	PHASE 2		PHASE 4		PHASE 6		PHASE 8A		PHASE 8B	
	1	2	3	4	5	6	7	8	9	10
SIGNALS	13	14	15	16	17	18	19	20	21	22
INITIAL INTERVAL	3	3	3	3	3	3	3	3	3	3
VEHICLE INTERVAL	2	2	2	2	2	2	2	2	2	2
MAXIMUM TIME	7	7	7	7	7	7	7	7	7	7
PEDESTRIAN TIME	4	4	4	4	4	4	4	4	4	4

SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY	MESSAGE
10	RS-2	24x24	1	NO LEFT TURN
11	RS-2	30x36	1	LEFT TURN
12	RS-20	30x36	1	OPPOSITE TRAFFIC HAS EXTENDED GREEN
13	RS-20	30x36	1	OPTIONAL LEFT OR RIGHT TURN
14	RS-20	30x36	1	RIGHT LANE MUST TURN RIGHT
15	RS-108	24x30	1	RIGHT TURN SIGNAL
16	RS-3	18x24	6	NO PEDESTRIAN CROSSING
17	RS-7R	30x30	5	STOP HERE ON RED
18	RS-2	30x36	1	YIELD
19	RS-10	24x12	2	PUSH BUTTON FOR GREEN LIGHT
20	RS-14	12x18	2	NO PARKING ANY TIME
21	RS-15	12x18	4	NO PARKING ANY TIME
22	RS-8	12x18	1	NO PARKING HERE TO CORNER
23	RS-11	12x18	1	NO PARKING ANY TIME
24	RS-2	30x36	1	NO LEFT TURN
25	RS-1	18x12	1	HAWK MARKER
26	RS-20	30x36	1	OPPOSITE TRAFFIC HAS EXTENDED GREEN

EMERGENCY PREEMPTION NOTES:
 CONTROLLER TO BE EQUIPPED WITH EMERGENCY PREEMPTION FOR THE EASTBOUND APPROACH OF JACKSONVILLE ROAD, THE EASTBOUND APPROACH OF BIRCHWOOD DRIVE, THE WESTBOUND APPROACH OF CATASAUQUA ROAD AND THE NORTHBOUND AND SOUTHBOUND APPROACHES OF SCHOENERSVILLE ROAD.
 THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL FLASH ALL YELLOW AND RED INDICATORS, FOLLOWED BY THE GREEN INTERVAL OF THE PREEMPTION PHASE, GOVERNED BY THE ACTUATION OF THE APPROACHING EMERGENCY VEHICLE.
 UPON COMPLETION OF PREEMPTION PHASE 2 OR 4, 6 OR 8, 10 RETURNING TO NORMAL OPERATION, PHASE 1 INTERVAL 3 SHALL FOLLOW.
 UPON COMPLETION OF PREEMPTION PHASE 4, 8A OR 8B, 10 RETURNING TO NORMAL OPERATION, PHASE 1 INTERVAL 3 SHALL FOLLOW.

LEGEND

- ▲ - Mast Arm
- - Strain Pole
- - Pedestal
- ⊙ - Vehicular Signal Head
- ⊙ - Pedestrian Signal Head
- ⊙ - Sign
- ⊙ - Vehicle Detector
- ⊙ - Pedestrian Push Button
- ⊙ - Pedestrian Push Button/Sign
- CC4 ⊙ - Controller Assembly
- W/4" - Solid White Line/Width
- BW/4" - Broken White Line/Width
- Y/4" - Solid Yellow Line/Width
- BY/4" - Broken Yellow Line/Width
- DY/4" - Double Solid Yellow Line/Width
- ⊙ - Emergency Preemption Detector

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.
 No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.
 All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.
 All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State Highways which will be maintained by the Department.
 Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.
 The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the side of or pavement grade.
 The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.
 In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.
 This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.
 Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-7600 Series.
 Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

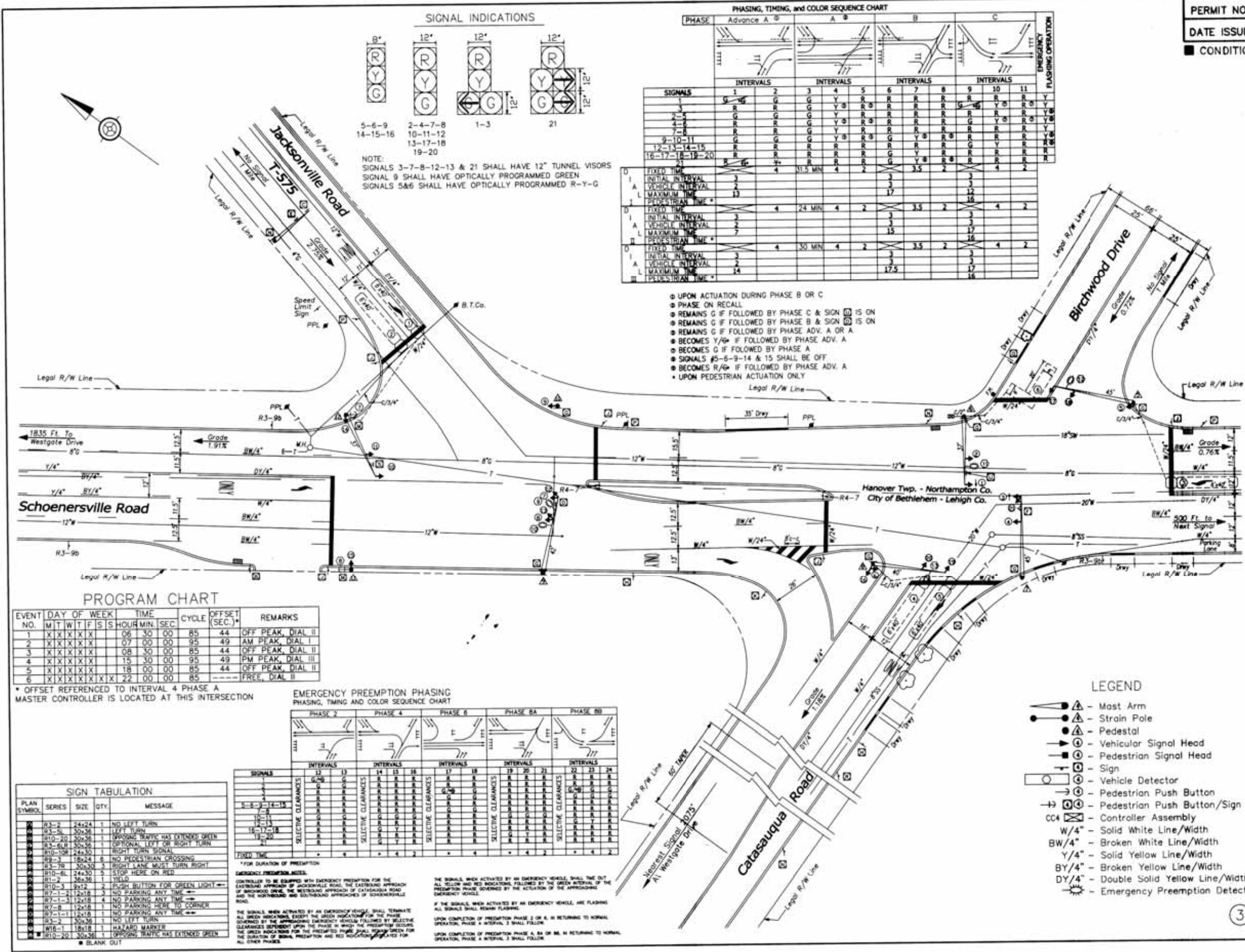
County: LEHIGH & NORTHAMPTON,
 Municipality: CITY OF BETHLEHEM & HANOVER TOWNSHIP
 Intersection: SCHOENERSVILLE ROAD (SR 1009), JACKSONVILLE ROAD, CATASAUQUA ROAD & BIRCHWOOD DRIVE

Reviewed: [Signature] 1/6/04
 Municipal Official Date

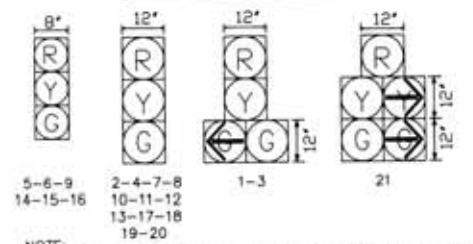
Reviewed: [Signature] 1/6/04
 District Traffic Signals Div. Date

Recommended: [Signature] 1/6/04
 District Traffic Engineer Date

Scale: 1" = 40'



SIGNAL INDICATIONS



NOTE:
 SIGNALS 3-7-8-12-13 & 21 SHALL HAVE 12" TUNNEL VISORS
 SIGNAL 9 SHALL HAVE OPTICALLY PROGRAMMED GREEN
 SIGNALS 5&6 SHALL HAVE OPTICALLY PROGRAMMED R-Y-G

PHASING, TIMING, and COLOR SEQUENCE CHART

PHASE	Advance A	A	B	C
SIGNALS	1-2-3	4-5-6	7-8-9	10-11-12
INTERVALS	1 2 3	4 5 6	7 8 9	10 11 12
INITIAL INTERVAL	3	3	3	3
VEHICLE INTERVAL	2	2	2	2
MAXIMUM TIME	7	7	7	7
PEDESTRIAN TIME	13	13	13	13
FIXED TIME	4	4	4	4
INITIAL INTERVAL	3	3	3	3
VEHICLE INTERVAL	2	2	2	2
MAXIMUM TIME	7	7	7	7
PEDESTRIAN TIME	13	13	13	13

- UPON ACTUATION DURING PHASE B OR C
- PHASE ON RECALL
- REMAINS G IF FOLLOWED BY PHASE C & SIGN 15 ON
- REMAINS G IF FOLLOWED BY PHASE B & SIGN 15 ON
- REMAINS G IF FOLLOWED BY PHASE ADV. A OR A
- BECOMES Y/G IF FOLLOWED BY PHASE ADV. A
- BECOMES G IF FOLLOWED BY PHASE A
- SIGNALS 5-8-9-14 & 15 SHALL BE OFF
- BECOMES R/G IF FOLLOWED BY PHASE ADV. A
- UPON PEDESTRIAN ACTUATION ONLY

PROGRAM CHART

EVENT NO.	DAY OF WEEK	TIME	CYCLE	OFFSET (SEC.)	REMARKS
1	X X X X X	06:30:00	85	44	OFF PEAK, DIAL II
2	X X X X X	07:00:00	95	49	AM PEAK, DIAL I
3	X X X X X	08:30:00	85	44	OFF PEAK, DIAL II
4	X X X X X	15:30:00	95	49	PM PEAK, DIAL III
5	X X X X X	18:00:00	85	44	OFF PEAK, DIAL II
6	X X X X X	22:00:00	85		FREE, DIAL II

* OFFSET REFERRED TO INTERVAL 4 PHASE A
 MASTER CONTROLLER IS LOCATED AT THIS INTERSECTION

EMERGENCY PREEMPTION PHASING PHASING, TIMING AND COLOR SEQUENCE CHART

PHASE	PHASE 2	PHASE 4	PHASE 6	PHASE 8A	PHASE 8B
SIGNALS	12-13	14-15	16-17	18-19	20-21
INTERVALS	1 2 3	4 5 6	7 8 9	10 11 12	13 14 15
INITIAL INTERVAL	3	3	3	3	3
VEHICLE INTERVAL	2	2	2	2	2
MAXIMUM TIME	7	7	7	7	7
PEDESTRIAN TIME	13	13	13	13	13
FIXED TIME	4	4	4	4	4
INITIAL INTERVAL	3	3	3	3	3
VEHICLE INTERVAL	2	2	2	2	2
MAXIMUM TIME	7	7	7	7	7
PEDESTRIAN TIME	13	13	13	13	13

SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY.	MESSAGE
W	W-4	24x24	1	NO LEFT TURN
W	W-5	30x36	1	LEFT TURN
W	W-6	30x36	1	PROCEEDING TRAFFIC HAS EXTENDED GREEN
W	W-7	30x36	1	OPTIONAL LEFT OR RIGHT TURN
W	W-8	24x30	1	RIGHT TURN SIGNAL
W	W-9	18x24	6	NO PEDESTRIAN CROSSING
W	W-10	30x36	1	RIGHT LANE MUST TURN RIGHT
W	W-11	24x30	2	STOP HERE ON RED
W	W-12	36x36	1	YIELD
W	W-13	9x12	2	PUSH BUTTON FOR GREEN LIGHT
W	W-14	12x18	2	NO PARKING ANY TIME
W	W-15	12x18	4	NO PARKING ANY TIME
W	W-16	12x18	1	NO PARKING HERE TO CORNER
W	W-17	12x18	1	NO PARKING ANY TIME
W	W-18	30x36	1	NO LEFT TURN
W	W-19	30x36	1	NO LEFT TURN
W	W-20	30x36	1	HAWKING MARKER
W	W-21	30x36	1	PROCEEDING TRAFFIC HAS EXTENDED GREEN

EMERGENCY PREEMPTION MODELS
 CONTROLLER TO BE EQUIPPED WITH EMERGENCY PREEMPTION FOR THE EASTBOUND APPROACH OF JACKSONVILLE ROAD, THE EASTBOUND APPROACH OF BIRCHWOOD DRIVE, THE WESTBOUND APPROACH OF CATASAUQUA ROAD AND THE NORTHBOUND AND SOUTHBOUND APPROACHES OF SCHOENERSVILLE ROAD.
 THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL TERMINATE ALL GREEN INDICATIONS EXCEPT THE GREEN INDICATION FOR THE PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS. THE GREEN INDICATIONS FOR THE PREEMPTED PHASE SHALL REMAIN GREEN FOR THE DURATION OF SIGNAL PREEMPTION AND RED INDICATIONS SHALL BE OFF FOR ALL OTHER PHASES.
 IF THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ARE FLASHING ALL SIGNALS SHALL REMAIN FLASHING.
 UPON COMPLETION OF PREEMPTION PHASE 2 OR 4, IN RETURNING TO NORMAL OPERATION, PHASE 4 INTERVAL 3 SHALL FOLLOW.
 UPON COMPLETION OF PREEMPTION PHASE 6, 8A OR 8B, IN RETURNING TO NORMAL OPERATION, PHASE 4 INTERVAL 3 SHALL FOLLOW.

LEGEND

- ▲ - Mast Arm
- - Strain Pole
- - Pedestal
- ⊙ - Vehicular Signal Head
- ⊙ - Pedestrian Signal Head
- ⊙ - Sign
- ⊙ - Vehicle Detector
- ⊙ - Pedestrian Push Button
- ⊙ - Pedestrian Push Button/Sign
- CC4 ⊙ - Controller Assembly
- W/4" - Solid White Line/Width
- BW/4" - Broken White Line/Width
- Y/4" - Solid Yellow Line/Width
- BY/4" - Broken Yellow Line/Width
- DY/4" - Double Solid Yellow Line/Width
- ⊙ - Emergency Preemption Detector

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.
 No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.
 All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.
 All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State highways which will be maintained by the Department.
 Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.
 The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.
 The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.
 In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.
 This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.
 Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-7600 Series.
 Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

County: LEHIGH & NORTHAMPTON
 Municipality: CITY OF BETHLEHEM & HANOVER TOWNSHIP
 Intersection: SCHOENERSVILLE ROAD (SR 1009), JACKSONVILLE ROAD, CATASAUQUA ROAD & BIRCHWOOD DRIVE

Reviewed: [Signature] 4/6/04
 Municipal Official Date

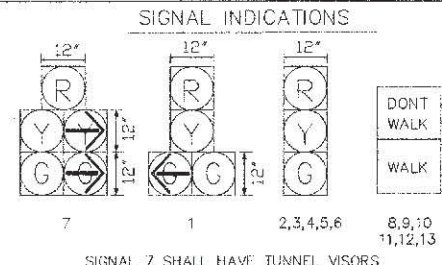
Reviewed: [Signature] 4/5/04
 District Traffic Signals Div. Date

Recommended: [Signature] 4/6/04
 District Traffic Engineer Date

Scale: 1" = 25'

SIGN TABULATION				
PLAN SYMBOL	SERIES	SIZE	QTY.	MESSAGE
a	R9-7(R)	9X12	2	PUSH BUTTON FOR WALK SIGNAL
b	R18-2(R)	24X30	1	RIGHT TURN SIGNAL
c	R9-7(L)	9X12	1	PUSH BUTTON FOR WALK SIGNAL
d	R9-7(L)	9X12	2	PUSH BUTTON FOR WALK SIGNAL
h	R7-1-1	12X18	7	NO PARKING ANYTIME
i	R7-1-2	12X18	5	NO PARKING ANYTIME
k	R7-1-3	12X18	4	NO PARKING ANYTIME
m	R5-1	30X30	2	DO NOT ENTER
o	R3-2(N)	24X24	2	NO LEFT TURN
p	R3-2-1(N)	24X18	2	NO LEFT TURN
q	R10-11	24X30	4	NO TURN ON RED

PROGRAM CHART											
EVENT NO.	DAY OF WEEK					TIME		CYCLE	OFFSET (SEC.)	REMARKS	
	M	T	W	T	F	S	HR				MIN
1	*	*	*	*	*	*	07	00	00	95	MAX 1
2	*	*	*	*	*	*	08	30	00	85	MAX 2
3	*	*	*	*	*	*	15	30	00	95	MAX 1
4	*	*	*	*	*	*	18	00	00	85	MAX 2



PERMIT NO. 39-302-017 SHEET 2 OF 2
 DATE ISSUED 3-3-75 DATE REVISED 11-23-04

GENERAL NOTES

Installation, operation and maintenance of this traffic signal to be in accordance with Pennsylvania Department of Transportation Regulations on Official Traffic Control Devices.

No modifications of this installation are permitted unless prior approval is granted, in writing, by the Department.

All maintenance necessary for proper visibility of the signals, including trimming trees, is the responsibility of the Permittee.

All signs and pavement markings indicated on this drawing are considered part of the permit and are to be installed and maintained by the Permittee, unless otherwise indicated, except the longitudinal pavement markings on State highways which will be maintained by the Department.

Install post mounted signals with the signal heads a minimum of 2 feet behind the face of the curb or edge of the shoulder. Support poles for overhead signals will have a minimum horizontal clearance of 2 feet.

The bottom of signal heads and signs erected over the roadway are not to be less than 15 feet nor more than 19 feet above the roadway. The bottom of post mounted signal heads are to be not less than 8 feet nor more than 15 feet above the sidewalk or pavement grade.

The minimum horizontal distance between signal heads measured at right angles to the approach is to be 8 feet.

In addition to this signal permit, the Permittee will obtain a Highway Occupancy Permit prior to any openings being made in or under any portion of a State Highway, if applicable.

This drawing cannot be used as a construction drawing unless the Permittee complies with the provisions of Act 187, Prevention of Damage to Underground Utilities. Prior to construction consult with utility companies to resolve any problems which may be created due to the location of utilities.

Place pavement markings in accordance with the Department of Transportation Pavement Marking Standards TC-8500 Series.

Maintenance and protection of traffic for the installation and maintenance of this traffic signal to be in accordance with Publication 203M, Work Zone Traffic Control.

EMERGENCY PREEMPTION PHASING
 MOVEMENT, PHASING AND SEQUENCE CHART

	PHASE 1	PHASE 2	PHASE 4
INTERVAL	12-14	15-17	18-20
SIGNALS	G G G G	R R R R	R R R R
1	G G G G	R R R R	R R R R
2	G G G G	R R R R	R R R R
3,4	R R R R	G G G G	R R R R
5,6	R R R R	G G G G	R R R R
7	R R R R	G G G G	R R R R
8,9,10	DW DW DW	DW DW DW	DW DW DW
11,12,13	DW DW DW	DW DW DW	DW DW DW
FIXED TIME	1 3 2	1 4 2	1 3 2

* FOR DURATION OF PREEMPTION
 @ SEE NOTES BELOW

IF THE PREEMPTION EQUIPMENT HAS ENCODING CAPABILITIES FOR VEHICLE IDENTIFICATION AND THERE IS THE NEED TO ALLOW PREEMPTION BY EMERGENCY VEHICLES FROM NEARBY MUNICIPALITIES WITH DIFFERENT EMI TAGS, IT IS RECOMMENDED TO HAVE THE "7-BIT" "00" FEATURE ON TO GIVE UNCODED EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PREEMPTION.

EMERGENCY PREEMPTION NOTES

THE CONTROLLER SHALL BE EQUIPPED WITH EMERGENCY PREEMPTION FOR THE WESTBOUND APPROACHES OF ILLUCKS MILL ROAD AND THE NORTHBOUND AND SOUTHBOUND APPROACHES OF SCHOENERSVILLE ROAD WITH AN INDICATOR LIGHT FOR EACH APPROACH. THE INDICATOR LIGHT SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT AND IT SHALL FLASH FOR THE APPROPRIATE APPROACH DURING THE GREEN INTERVAL IN THE PREEMPTION PHASE TO CONFIRM THAT THE EMERGENCY VEHICLE HAS CONTROL OF THE INTERSECTION.

THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL IMMEDIATELY TERMINATE ALL GREEN INDICATIONS, EXCEPT THE GREEN INDICATIONS FOR THE PHASE POSSESSED BY THE APPROACHING EMERGENCY VEHICLE, FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS. THE GREEN INDICATIONS FOR THE PREEMPTED APPROACH SHALL REMAIN GREEN FOR THE DURATION OF SIGNAL PREEMPTION WITH RED INDICATIONS DISPLAYED FOR ALL OTHER APPROACHES.

THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL TIME OUT ALL YELLOW AND RED INTERVALS, FOLLOWED BY THE GREEN INTERVAL OF THE PREEMPTION PHASE POSSESSED BY THE APPROACHING EMERGENCY VEHICLE.

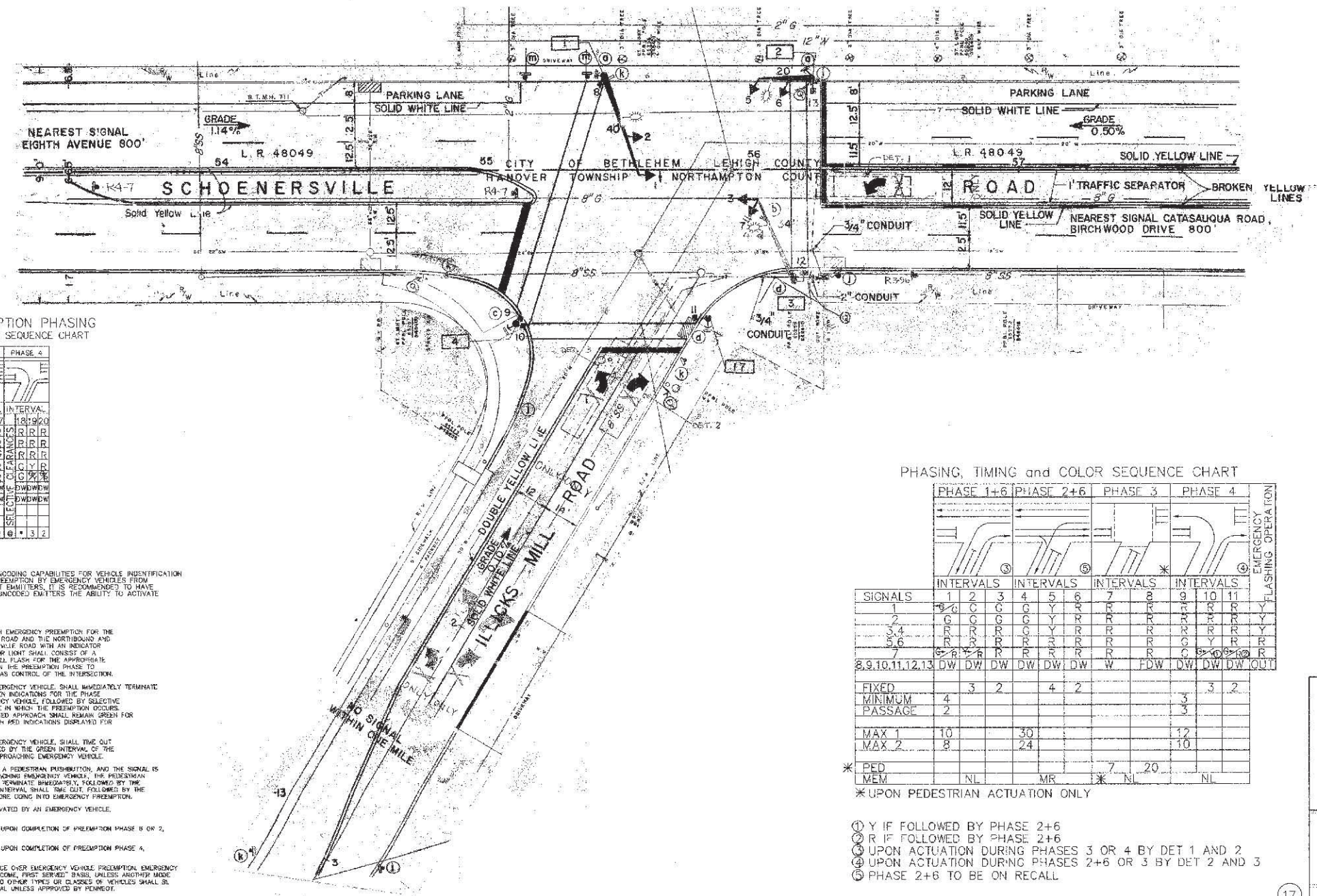
IF THE SIGNALS HAVE BEEN ACTIVATED BY A PEDESTRIAN PUSHBUTTON, AND THE SIGNAL IS SUBSEQUENTLY PREEMPTED BY AN APPROACHING EMERGENCY VEHICLE, THE PEDESTRIAN WALK (WALKING PERSON) INTERVAL SHALL TERMINATE IMMEDIATELY, FOLLOWED BY THE PEDESTRIAN CLEARANCE INTERVAL. THIS INTERVAL SHALL TIME OUT, FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES BEFORE GOING INTO EMERGENCY PREEMPTION.

IF THE SIGNALS ARE FLASHING WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ALL SIGNALS SHALL REMAIN FLASHING.

WHEN RETURNING TO NORMAL OPERATION, UPON COMPLETION OF PREEMPTION PHASE 1 OR 2, GO TO PHASE 2+6, INTERVAL 4.

WHEN RETURNING TO NORMAL OPERATION, UPON COMPLETION OF PREEMPTION PHASE 4, GO TO PHASE 2+6, INTERVAL 4.

IF AN PREEMPTION SHALL TAKE PRECEDENCE OVER EMERGENCY VEHICLE PREEMPTION. EMERGENCY VEHICLES SHALL BE SERVED ON A FIRST COME, FIRST SERVED BASIS, UNLESS ANOTHER MODE OF OPERATION IS APPROVED BY PERMITTEE. NO OTHER TYPES OR CLASSES OF VEHICLES SHALL BE PERMITTED TO PREEMPT THE TRAFFIC SIGNAL UNLESS APPROVED BY PERMITTEE.



PHASING, TIMING AND COLOR SEQUENCE CHART

SIGNALS	PHASE 1+6		PHASE 2+6		PHASE 3		PHASE 4		EMERGENCY FLASHING OPERATION
	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS	INTERVALS		
1	G	G	R	R	R	R	R	R	Y
2	G	G	R	R	R	R	R	R	Y
3,4	R	R	G	G	R	R	R	R	Y
5,6	R	R	G	G	R	R	R	R	Y
7	R	R	G	G	R	R	R	R	Y
8,9,10,11,12,13	DW	DW	DW	DW	DW	DW	W	FDW	DW
FIXED	4	3	2	4	2			3	2
MINIMUM PASSAGE	2							3	
MAX 1	10			30				12	
MAX 2	8			24				10	
* PED MEM	NL			MR				7	20

* UPON PEDESTRIAN ACTUATION ONLY

- ① Y IF FOLLOWED BY PHASE 2+6
- ② R IF FOLLOWED BY PHASE 2+6
- ③ UPON ACTUATION DURING PHASES 3 OR 4 BY DET 1 AND 2
- ④ UPON ACTUATION DURING PHASES 2+6 OR 3 BY DET 2 AND 3
- ⑤ PHASE 2+6 TO BE ON RECALL

LEGEND

- ▲ - Most Arm
- - Pedestal
- ⊙ - Vehicular Signal Head
- ⊙ - Pedestrian Signal Head
- ⊙ - Sign
- ⊙ - Vehicle Detector
- ⊙ - Pedestrian Push Button
- ⊙ - Pedestrian Push Button/Sign
- ⊙ - Controller Assembly
- W/4" - Solid White Line/Width
- BW/4" - Broken White Line/Width
- Y/4" - Solid Yellow Line/Width
- BY/4" - Broken Yellow Line/Width
- DY/4" - Double Solid Yellow Line/Width
- ⊙ - Emergency Preemption Detector

County: LEHIGH

Municipality: CITY OF BETHLEHEM AND HANOVER TOWNSHIP

Intersection: SCHOENERSVILLE RD AND ILLUCKS MILL ROAD

APPROVED: *George E. Perker* DATE: 7-27-75
 MUNICIPAL ENGINEER

APPROVED: *W. Be...* DATE: 3-7-73
 DISTRICT TRAFFIC ENGR.

Scale: 20 0 20 40

PHASING, TIMING AND COLOR SEQUENCE CHART

SIGNALS	PHASE 1+5			PHASE 2+6			PHASE 3+4			EMERGENCY FLASHING OPERATION	
	1	2	3	4	5	6	7	8	9		10
1,2	R	R	R	R	R	R	R	G	Y	R	Y
3	R	R	R	R	R	R	R	G	Y	R	Y
4,5	R	R	R	R	R	R	R	G	Y	R	Y
6,7	G	G	G	G	G	G	G	R	R	R	R
8,9	R	R	R	R	R	R	R	G	Y	R	Y
10,11	W	FDW	FDW	DW	DW	DW	DW	DW	DW	DW	OUT
FIXED TIME		6	4	2		4	2		4	2	
MINIMUM PASSAGE					3			3			
MAXIMUM I		21				11				39	95 SEC
MAXIMUM II		29				11				21	85 SEC
MAXIMUM III		41				11				19	95 SEC
RECALL		MR			NL			NL			

OPERATION NOTES

- ① R if followed by phase C
- ② Y if followed by phase C
- ③ R if followed by phase C
- ④ G if followed by phase A

EMERGENCY PREEMPTION PHASING MOVEMENT, PHASING AND SEQUENCE CHART

SIGNALS	PHASE 1			PHASE 5			PHASE 6		
	11	12	13	14	15	16	17	18	19
1,2	G	G	G	R	R	R	R	R	R
3	G	G	G	R	R	R	R	R	R
4,5	R	R	R	G	G	G	G	G	G
6,7	R	R	R	G	G	G	G	G	G
8,9	R	R	R	R	R	R	R	R	R
10,11	D	W	D	D	W	D	D	W	D
SELECTIVE CLEARANCES									
FIXED TIME	4	2	0	4	2	0	4	2	0

*FOR DURATION OF PREEMPTION
 @SEE NOTES BELOW

▲ CONDITION DIAGRAM ONLY

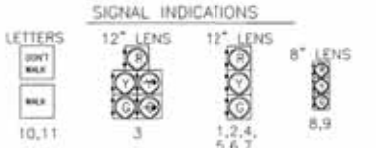
IF THE PREEMPTION EQUIPMENT HAS EXCEEDING CAPABILITIES FOR VEHICLE IDENTIFICATION AND THERE IS THE NEED TO ALLOW PREEMPTION BY EMERGENCY VEHICLES FROM NEARBY MUNICIPALITIES WITH DIFFERENT LIMITS, IT IS RECOMMENDED TO HAVE THE ZERO "00" FEATURE ON TO GIVE UNCOOD EMITTERS THE ABILITY TO ACTIVATE THE EMERGENCY PREEMPTION.

EMERGENCY PREEMPTION NOTES
 THE CONTROLLER SHALL BE EQUIPPED WITH EMERGENCY PREEMPTION FOR THE EASTBOUND AND WESTBOUND APPROACHES OF SCHOENERSVILLE RD AND THE NORTHBOUND APPROACH OF EIGHTH AVENUE WITH AN INDICATOR LIGHT FOR EACH APPROACH. THE INDICATOR LIGHT SHALL CONSIST OF A FLASHING WHITE FLOOD LIGHT AND IT SHALL FLASH FOR THE APPROPRIATE APPROACH DURING THE GREEN INTERVAL IN THE PREEMPTION PHASE TO CONFIRM THAT THE EMERGENCY VEHICLE HAS CONTROL OF THE INTERSECTION.
 THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL IMMEDIATELY TERMINATE ALL GREEN INDICATIONS EXCEPT THE GREEN INDICATIONS FOR THE PHASE COVERED BY THE APPROACHING EMERGENCY VEHICLE. FOLLOWED BY SELECTIVE CLEARANCES DEPENDENT UPON THE PHASE IN WHICH THE PREEMPTION OCCURS. THE GREEN INDICATIONS FOR THE PREEMPTED APPROACH SHALL REMAIN GREEN FOR THE DURATION OF SIGNAL PREEMPTION WITH RED INDICATIONS DISPLAYED FOR ALL OTHER APPROACHES.
 THE SIGNALS, WHEN ACTIVATED BY AN EMERGENCY VEHICLE, SHALL THE OUT ALL YELLOW AND RED INTERVALS, FOLLOWED BY THE GREEN INTERVAL OF THE PREEMPTION PHASE GOVERNED BY THE APPROACHING EMERGENCY VEHICLE.
 IF THE SIGNALS HAVE BEEN ACTIVATED BY A PEDESTRIAN PUSHBUTTON, AND THE SIGNAL IS SUBSEQUENTLY PREEMPTED BY AN APPROACHING EMERGENCY VEHICLE, THE PEDESTRIAN WALK (MAKING PERSON) INTERVAL SHALL TERMINATE IMMEDIATELY, FOLLOWED BY THE PEDESTRIAN CLEARANCE INTERVAL. THIS INTERVAL SHALL BE FOLLOWED BY THE APPROPRIATE SELECTIVE CLEARANCES BEFORE GOING INTO EMERGENCY PREEMPTION.
 IF THE SIGNALS ARE FLASHING WHEN ACTIVATED BY AN EMERGENCY VEHICLE, ALL SIGNALS SHALL REMAIN FLASHING.
 WHEN RETURNING TO NORMAL OPERATION UPON COMPLETION OF PREEMPTION PHASE I OF 5, GO TO PHASE 1+5, INTERVAL 1.
 WHEN RETURNING TO NORMAL OPERATION UPON COMPLETION OF PREEMPTION PHASE 6, GO TO PHASE 1+5, INTERVAL 1.
 TRAFFIC PREEMPTION SHALL TAKE PRECEDENCE OVER EMERGENCY VEHICLE PREEMPTION. EMERGENCY VEHICLES SHALL BE SERVED ON A "FIRST COME, FIRST SERVED" BASIS UNLESS ANOTHER MODE OF OPERATION IS APPROVED BY PENNDOT. NO OTHER TYPES OR CLASSES OF VEHICLES SHALL BE PERMITTED TO PREEMPT THE TRAFFIC SIGNAL UNLESS APPROVED BY PENNDOT.

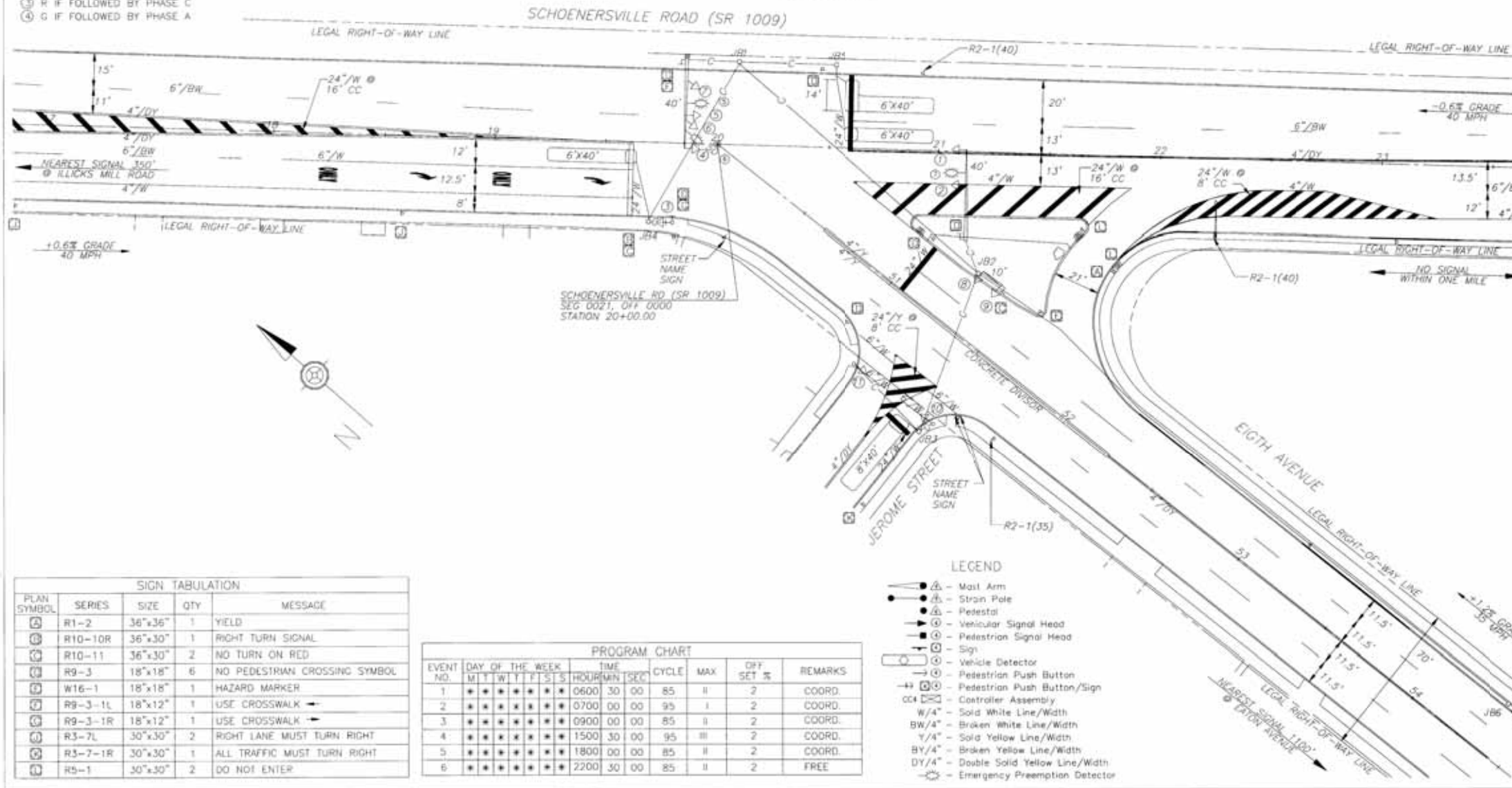
DISTRICT	COUNTY	ROUTE	SECTION	SHEET
5-0	LEHIGH & NORTHAMPTON	SR 159	30T	2 OF 6
CITY OF BETHLEHEM & HANOVER TOWNSHIP				
PERMIT NO 39-302-002		SHEET 2 OF 2		
DATE ISSUED: 8-22-61		DATE REVISED: 5-3-06 ▲		

GENERAL NOTES

INSTALLATION, OPERATION, AND MAINTENANCE OF THIS TRAFFIC SIGNAL TO BE IN ACCORDANCE WITH PENNSYLVANIA DEPARTMENT OF TRANSPORTATION REGULATIONS ON OFFICIAL TRAFFIC CONTROL DEVICES.
 NO MODIFICATIONS OF THIS INSTALLATION ARE PERMITTED UNLESS PRIOR APPROVAL IS GRANTED, IN WRITING, BY THE DEPARTMENT.
 ALL MAINTENANCE NECESSARY FOR PROPER VISIBILITY OF THE SIGNALS, INCLUDING TRIMMING TREES, IS THE RESPONSIBILITY OF THE PERMITTEE.
 ALL SIGNS AND PAVEMENT MARKINGS INDICATED ON THIS DRAWING ARE CONSIDERED PART OF THE PERMIT AND ARE TO BE INSTALLED AND MAINTAINED BY THE PERMITTEE, UNLESS OTHERWISE INDICATED. EXCEPT THE LONGITUDINAL PAVEMENT MARKINGS ON STATE HIGHWAYS WHICH WILL BE MAINTAINED BY THE DEPARTMENT.
 INSTALL POST MOUNTED SIGNALS WITH THE SIGNAL HEADS A MINIMUM OF 2 FEET BEHIND THE FACE OF THE CURB OR EDGE OF THE SHOULDER. SUPPORT POLES FOR OVERHEAD SIGNALS WILL HAVE A MINIMUM HORIZONTAL CLEARANCE OF 2 FEET.
 THE BOTTOM OF SIGNAL HEADS AND SIGNS ERECTED OVER THE ROADWAY ARE NOT TO BE LESS THAN 15 FEET NOR MORE THAN 19 FEET ABOVE THE ROADWAY. THE BOTTOM OF POST MOUNTED SIGNAL HEADS ARE NOT TO BE LESS THAN 8 FEET NOR MORE THAN 15 FEET ABOVE THE SIDEWALK OR PAVEMENT GRADE.
 THE MINIMUM HORIZONTAL DISTANCE BETWEEN SIGNAL HEADS MEASURED AT RIGHT ANGLES TO THE APPROACH IS TO BE 8 FEET.
 IN ADDITION TO THIS SIGNAL PERMIT, THE PERMITTEE WILL ALSO OBTAIN A HIGHWAY OCCUPANCY PERMIT PRIOR TO ANY OPENINGS BEING MADE IN OR UNDER ANY PORTION OF A STATE HIGHWAY.
 THIS DRAWING CANNOT BE USED AS A CONSTRUCTION DRAWING UNLESS THE PERMITTEE COMPLIES WITH THE PROVISIONS OF ACT 187, PREVENTION OF DAMAGE TO UNDERGROUND UTILITIES, EFFECTIVE DECEMBER 19, 1996 PRIOR TO CONSTRUCTION CONSULT WITH UTILITY COMPANIES TO RESOLVE ANY PROBLEMS WHICH MAY BE CREATED DUE TO THE LOCATION OF UTILITIES.
 PAVEMENT MARKINGS WILL BE PLACED IN ACCORDANCE WITH THE DEPARTMENT OF TRANSPORTATION PAVEMENT MARKING TC-7600 SERIES STANDARDS.
 MAINTENANCE AND PROTECTION FOR THE INSTALLATION AND MAINTENANCE OF THIS SIGNAL TO BE IN ACCORDANCE WITH PUB 203, WORK ZONE TRAFFIC CONTROL.



SIGNALS TO BE EQUIPPED WITH TUNNEL VISORS: 3
 NOTE: SIGNALS 4,5,6, & 7 SHALL BE OPTICALLY PROGRAMMED AND HAVE RIGID MOUNTING



SIGN TABULATION

PLAN SYMBOL	SERIES	SIZE	QTY	MESSAGE
(A)	R1-2	36"x36"	1	YIELD
(B)	R10-10R	36"x30"	1	RIGHT TURN SIGNAL
(C)	R10-11	36"x30"	2	NO TURN ON RED
(D)	R9-3	18"x18"	6	NO PEDESTRIAN CROSSING SYMBOL
(E)	W16-1	18"x18"	1	HAZARD MARKER
(F)	R9-3-1L	18"x12"	1	USE CROSSWALK
(G)	R9-3-1R	18"x12"	1	USE CROSSWALK
(H)	R3-7L	30"x30"	2	RIGHT LANE MUST TURN RIGHT
(I)	R3-7-1R	30"x30"	1	ALL TRAFFIC MUST TURN RIGHT
(J)	R5-1	30"x30"	2	DO NOT ENTER

PROGRAM CHART

EVENT NO.	DAY OF THE WEEK							TIME	CYCLE	MAX	OFF SET %	REMARKS
	M	T	W	T	F	S	S					
1	*	*	*	*	*	*	*	0600 30 00	85	11	2	COORD.
2	*	*	*	*	*	*	*	0700 00 00	95	1	2	COORD.
3	*	*	*	*	*	*	*	0900 00 00	85	11	2	COORD.
4	*	*	*	*	*	*	*	1500 30 00	95	11	2	COORD.
5	*	*	*	*	*	*	*	1800 00 00	85	11	2	COORD.
6	*	*	*	*	*	*	*	2200 30 00	85	11	2	FREE

