Transportation Project Report

Project Scoping Report

August 2019

Hanshaw Road from N. Triphammer to Pleasant Grove Road
Project Identification Number (PIN): N/A
Bridge Identification Number (BIN): N/A
Village of Cayuga Heights,
Tompkins County, New York

NEW YORK STATE OF OPPORTUNITY. Department of Transportation

U.S. Department of Transportation
Federal Highway Administration

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PROJECT SCOPE

1.1. Introduction

This report was prepared in accordance with the NYSDOT Project Development Manual, 17 NYCRR (New York Codes, Rules and Regulations) Part 15, and 23 CFR (Code of Federal Regulations) 771. Transportation needs have been identified (section 1.2), objectives established (1.2.3) to address the needs, and cost-effective alternatives developed (1.3).

1.2. Purpose and Need

1.2.1. Where is the Project Located?

The project location, as shown in Figure 1-1, is located in the Village of Cayuga Heights within Tompkins County, New York. It includes Hanshaw Road from N. Triphammer Road to Pleasant Grove Road including the following three intersections in the Village's Commercial District:

- Hanshaw Road and N. Triphammer Road
- Hanshaw Road, Triphammer Road and E. Upland Road
- Hanshaw Road and Pleasant Grove Road

(1) No routes are numbered within the project area. However, Hanshaw Road is County Route 109 outside the Village limit (0.1 miles to the east) and Pleasant Grove Road is County Route 122 outside the Village limit (0.6 miles to the southeast).

(2) The project area includes the intersections of five roadways:
   a. Hanshaw Road
   b. N. Triphammer Road
   c. Triphammer Road
   d. E. Upland Road
   e. Pleasant Grove Road

(3) Village of Cayuga Heights

(4) Tompkins County

Figure 1-1: Project Location Map

1.2.2. Why is the Project Needed?

The Village of Cayuga Heights is located in Tompkins County, NY within the Town of Ithaca, bordered to the south by the City of Ithaca and to the north by the Village of Lansing. Most roads in the Village serve local residents and are designed as such with narrow cross sections and alignments that follow the contours of the land. However, there are higher vehicle traffic volumes on the roads that also serve commuters and through traffic to and from major generators such as Cornell University and downtown Ithaca to the south, Ithaca Tompkins Regional Airport to the northeast, and the Village of Lansing and shopping centers to the north. Much of the activity within the Village occurs around the Commercial District shopping centers and the Village of Cayuga Heights municipal offices, which is also where most of the arterial roadways through the Village intersect each other. This project evaluates these higher volume roadways and their intersections.

This project studies potential improvements through this section of the Village including the intersections of Hanshaw Road with N. Triphammer Road, Triphammer Road, E. Upland Road and Pleasant Grove Road. Traffic congestion has been noted during peak travel hours through this corridor and as a result of these intersections with Hanshaw Road. There is some driver confusion and safety concerns also noted due to the geometric layout where roadways intersect at acute angles with multiple approaches and the presence of nearby driveways. In addition, the higher vehicle volumes, presence of multiple driveway accesses and traffic operations afford potential conflict between vehicles, pedestrians and bicyclists traveling through the area. This project is needed to explore options to improve traffic operations and to develop better facilities for all modes of transportation including automobile, pedestrian, bicycle, and transit.

1.2.3. What are the Objectives/Purposes of the Project?

(1) Improve overall vehicular safety and operational conditions at the major intersections in the Commercial District of the Village of Cayuga Heights.
(2) Improve overall safety and mobility for pedestrians and bicyclists by implementing accommodations to better serve their intended corridors of usage.
(3) Address geometric deficiencies to improve traffic flow and facilitate traffic operations.
(4) Correct safety deficiencies using cost effective accident reduction measures such that accident reduction benefits equal or exceed project costs attributable to safety work.
(5) Improve existing facilities and services using cost effective measures to eliminate the degradation of mainline level of service and improve level of service or reduce the hours of delay at LOS E for the design year.

1.3. Project Context

1.3.1. Transportation Plans and Land Use

The project area is located in the Cayuga Heights Commercial District, with many shops and business such as the Village Green Shopping Plaza on the north side of Hanshaw Road and the Corners Community Shopping Center on the south side of Hanshaw Road between E. Upland Road and Pleasant Grove Road. There is also institutional land use in the area including the Village Office and Police Department on Hanshaw Road, as well as the Fire Department along Pleasant Grove Road. Much of the area around the

Commercial District and throughout the rest of Cayuga Heights is residential, consisting mostly of single-family homes and apartment complexes.

The Village of Cayuga Heights Comprehensive Plan (2014) states that the transportation priorities are to keep the existing infrastructure in good condition and balance the transportation and safety needs of the Village population with those neighboring communities. Improving transit service, creating a more pedestrian and bicycle friendly environment, and preserving the character and quality of life in the Village are also transportation goals.

1.3.2. Roadway Conditions

In the project area, all roadways are urban minor arterials with the exception of Hanshaw Road to the west of N. Triphammer Road, which is a major collector road. All of the project roadways have one travel lane in each direction and a posted Village speed limit of 30 miles per hour. In addition, there are turn lanes on the approaches of N. Triphammer Road, Triphammer Road, and Pleasant Grove Road.

As shown in Figure 1-2, Hanshaw Road, N. Triphammer Road, Triphammer Road, and E. Upland Road intersect at two stop-controlled intersections. They are approximately 100 feet apart and often operate as one five-leg intersection. Also, there is a business driveway just to the east of Triphammer and E. Upland Roads, which interacts with the intersections. The other project intersection about 500 feet to the west where Pleasant Grove Road intersects Hanshaw Road, along with a gas station on the north side that has two driveways. All project roadways intersect at acute angles.

Between the E. Upland Road and Pleasant Grove Road, there is a driveway to the Corners Community Shopping Center to the south of Hanshaw Road. On the north side there are two driveways to the Village Green shopping plaza and Village Offices. There are also two midblock pedestrian crosswalks within the project area.

1.3.3. Existing Traffic Operations

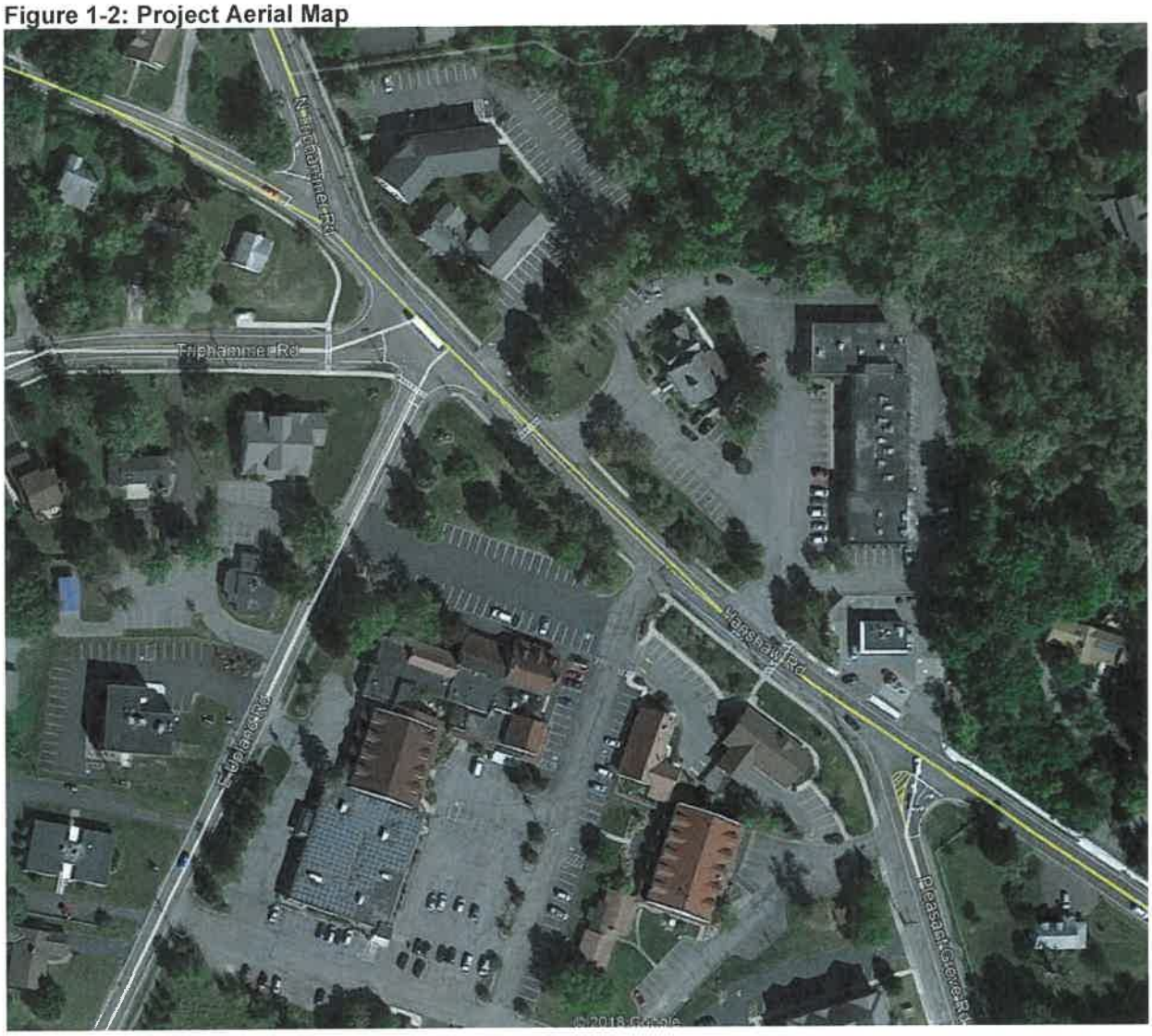
Traffic Control Devices

All the project intersections are unsignalized. Hanshaw Road is free flow traveling westbound then northwest at N. Triphammer Road. Hanshaw Road traveling southeast stops at N. Triphammer Road then is free flow eastbound through the project area.

The intersection of Hanshaw Road and N. Triphammer Road is a three-leg intersection where southbound N. Triphammer Road is controlled by a stop sign and has left and right turn lanes. Hanshaw Road has one travel lane in each direction and is stop-controlled traveling southwest. Vehicles traveling northwest on Hanshaw Road are uncontrolled and the right turn onto N. Triphammer Road often operates as a free flow movement due to the wide angle of the intersection.

At the intersection of Hanshaw Road with Triphammer Road and E. Upland Road, Hanshaw Road is uncontrolled in both directions. Triphammer Road and E. Upland Road intersect Hanshaw Road close together and angled toward each other. Both are controlled by stop signs. The Triphammer Road approach opens into two short turning lanes separating left-turning and right-turning movements. There is a driveway on the north side of Hanshaw Road just to the east of E. Upland Road, which operates in conjunction with the intersection.

Figure 1-2: Project Aerial Map



The intersection of Pleasant Grove Road and Hanshaw Road is a four-leg intersection, including the gas station driveway as the north leg. Hanshaw Road is uncontrolled and has one travel lane in both directions. Pleasant Grove Road is stop-controlled with left and right turn lanes. In addition, there is a shopping center driveway on Pleasant Grove Road that interacts with operations at the intersection.

Traffic Volumes

Existing turning movement counts were collected for weekdays during the PM peak period (4:00 – 6:00 PM) on April 9th, 2019 and during the AM peak period (7:00 – 9:00 AM) on April 10th, 2019. The peak hours were determined to be 8:00 to 9:00 AM and 4:45 to 5:45 PM. Diagrams showing the existing peak hour turning movement volumes are included in Appendix A.

Traffic volume forecasts for the project area were developed by examining historical Average Annual Daily Traffic (AADT) volumes from the NYSDOT Highway Data Services Bureau[1]. Based on analysis of past counts in the area, an annual growth rate of 0.50% was used to forecast turning movement volumes for the Design Year of 2040. The future peak hour turning movements can be seen in the diagram in Appendix A.

Level of Service and Capacity Analysis

Level of Service (LOS) analysis is a means of determining the ability of an intersection to accommodate traffic volumes. The analysis is based on intersection street geometry, traffic controls and traffic maneuvers. The analysis produces an indication of the Level of Service at which an intersection is functioning or is expected to function for future conditions.

The Level of Service calculation procedures are provided in the Highway Capacity Manual 6th edition (HCM) published by the Transportation Research Board, 2016. Version 10 of the computer software Synchro, developed by Trafficware, is utilized to determine the LOS for signalized intersections. The unsignalized intersections were input to Synchro to analyze existing operations and to evaluate future mitigation measures. Synchro is a software program utilized in the traffic engineering discipline. It is recommended by NYSDOT and considered an industry-approved method to assess existing traffic operations, determine the optimum traffic operations for individual intersections and analyze intersections along a corridor. The software also has the capability to create simulation models through SimTraffic, which can be used to observe operations and gives output including delays and queuing.

Level of Service is defined by letter characters that range from A to F, with A representing the best traffic operating conditions that have little or no delay and F characterizing conditions that have significant delay. LOS A through D are usually considered acceptable. LOS E is also considered acceptable at unsignalized intersections. For signalized intersections LOS E is considered representative of conditions where improvements may be needed, except in certain urban settings or for short durations. LOS F operating conditions are typically unacceptable, and improvements are needed in the form of traffic control, geometric changes or a combination of both.

Levels of service for signalized and unsignalized intersections are identified by the average control delay experienced by vehicles in seconds/vehicle. LOS for signalized intersections is determined for each traffic movement and the total intersection. The range of seconds of control delay defining level of service is different for signalized and unsignalized intersections, so the LOS results should not be compared to one another. Table 1-1 shows the range of delay defining LOS for signalized intersections. Table 1-2 shows the range of delay defining LOS for unsignalized intersections.

TABLE 1-1: Level of Service Ranges for Signalized Intersections

LOS	CONTROL DELAY PER VEHICLE (seconds)
A	Less than or equal to 10.0
B	Greater than 10.0 to no more than 20.0
C	Greater than 20.0 to no more than 35.0
D	Greater than 35.0 to no more than 55.0
E	Greater than 55.0 to no more than 80.0

[1] NYSDOT Engineering Division, Office of Technical Services, Traffic Monitoring Section. https://www.dot.ny.gov/divisions/engineering/technical-services/highway-data-services. *Historic Traffic Data csv file.*

F	Greater than 80.0

TABLE 1-2: Level of Service Ranges for Unsignalized Intersections

LOS	CONTROL DELAY PER VEHICLE (seconds)
A	Less than or equal to 10.0
B	Greater than 10.0 to no more than 15.0
C	Greater than 15.0 to no more than 25.0
D	Greater than 25.0 to no more than 35.0
E	Greater than 35.0 to no more than 50.0
F	Greater than 50.0

Traffic operations in the project area were analyzed to evaluate the existing (2019) and design year (2040) operating conditions. The design year is based on the NYSDOT Project Development Manual Appendix 5, with an Estimated Time of Completion (ETC) of 2020 plus 20 years (ETC+20). Turning movement volumes, roadway geometrics, and traffic control conditions were used to create Synchro models for the AM and PM peak hours and analyze the operations. Due to the unconventional geometric and control features of the intersections and limitations of Highway Capacity Manual 6th Edition (HCM6) methodologies used in Synchro, Synchro's SimTraffic simulations were used to analyze operations. For validation, the simulations were compared with videos recorded in the field. The operations, queues, and delays observed in the simulations are similar to existing conditions viewed in the videos. In addition, the traffic volume counts align with the patterns expected based on characteristics of the area and older AADT counts obtained from the NYSDOT website.

Summary tables showing the delay, Level of Service (LOS), and queue lengths for each stop-controlled lane are included in Appendix B. The analysis showed that all movements at the intersection of Hanshaw Road and N. Triphammer Road currently operate at a LOS B or better and are projected to operate at LOS D or better in 2040 during both peak hours.

Triphammer Road at Hanshaw Road operates at LOS E in the existing PM peak hour and is projected to operate at LOS F in 2040 for both the AM and PM periods, with the left turning movement is projected to operate at LOS E and F in the AM and PM 2040 peak hour, respectively. E. Upland Road currently operates at LOS D or better but is projected to operate at LOS E during both peak hours in 2040.

During the AM peak hour, Pleasant Grove Road at Hanshaw Road operates at LOS C and is projected to operate at LOS D in the design year. However, in the PM peak hour, the stop-controlled approach operates at LOS F in both existing and design year analysis. Long queues also occur on Pleasant Grove Road in the PM peak hour, which extend past the fire station driveway that is located about 250 feet south of the intersection.

Overall, N Triphammer Road at Hanshaw Road operates both in the existing AM and PM periods acceptably and is projected to continue to operate acceptably into the future design year of 2040 as well. And, based on maintaining Triphammer and E. Upland and Pleasant Grove Road in their present geometric orientations, the existing morning peak operation has also been shown to operated acceptably. However, without modifications to the existing orientation of Triphammer with Hanshaw Road, the existing evening peak periods show less than acceptable operations with poor LOS and long queues at the left turn approach. Projecting into 2040, these conditions will continue to deteriorate. Pleasant Grove Road at Hanshaw Road shows acceptable morning peak hour operation but currently operates poorly in the evening peak hours

with long delays and extensive queues currently. Projecting into 2040, this condition will only deteriorate further requiring modifications to the traffic control features.

1.3.4. Multimodal Considerations

There are existing sidewalks along Hanshaw Road within the project area, as well as one side of N. Triphammer Road, Triphammer Road, and Pleasant Grove Road. There is a crosswalk on Triphammer Road that connects the sidewalks to the transit stops on each side of the roadway. There is also a crosswalk at the stop sign on E. Upland Road. Connecting the shopping centers, Village offices, and Police department on both sides of Hanshaw Road, are two midblock unsignalized crosswalks between E. Upland Road and Pleasant Grove Road.

Bicyclists are currently accommodated on the roadway shoulders, which vary in width between 2 and 8 feet, or share the travel lane with vehicles. Bicyclists often travel between the Village's commercial district and the surrounding residential areas, as well as to Cornell University approximately 1.5 miles to the south on Pleasant Grove Road.

1.3.5. Safety Analysis

Requested Motor Vehicle accident reports were not available. Village officials were interviewed concerning any known history of accidents, recounting a small amount of anecdotal or recollected incidents. Observed conflict points between vehicles, bicyclists and pedestrians belies the need for linear separation and safe ingress/egress and conveyance along the Village roadways. Hanshaw Road is the through roadway and is uncontrolled except traveling southeast at N. Triphammer Road. In addition, the higher volume of right turning movements from Hanshaw Road northwest onto N. Triphammer Road and southeast onto Pleasant Grove Road under free flow conditions can make it difficult for vehicles on the intersecting streets and driveways to find a gap to safely enter the traffic stream. The geometry of roadways in the study area with closely spaced intersections and acute angles also shows driver confusion and leaving them unsure when they have the right-of-way to proceed.

1.4. Alternatives

1.4.1. Alternatives Considered and Eliminated from Further Study

A number of alternatives were considered to address the existing operation and safety concerns noted for the project area including the following: (A) Null Alternative; (B) Signalized Control; (C) Alternative 1: Geometric Improvements; (D) Alternative 2: Geometric and Traffic Control Changes; (E) Alternative 3: Roundabout Control; and (F) Alternative 4: Combined Geometric Improvements and Roundabout Control. The null alternative consists of retaining the existing roadway alignments and traffic control features as they exist today within the Study Area. This alternative would not produce improved traffic flow or vehicular operations, nor would this improve safety and mobility for pedestrians and bicyclists. Geometric deficiencies would not be addressed leaving safety concerns as they are today. The null alternative will not satisfy the project objectives and therefore is not considered further.

The Signalization Control alternative was considered including the installation of traffic signals at the intersection of Hanshaw Road and N. Triphammer Road, as well as at Hanshaw Road and Pleasant Grove Road. Traffic signal warrants based on the Manual on Uniform Traffic Control Devices (MUTCD) would be met for these two intersections, however only during limited time periods of the day around the peak traffic

hours. Installation of traffic signals would cause unnecessary delay to vehicles within the project area, especially during off-peak periods when vehicular volumes do not warrant signalized control. Improvements can be made to operational conditions with other more cost-effective alternatives. Therefore, the signalization alternative will not satisfy the project objectives and therefore is not considered further.

1.4.2. Reasonable Build Alternatives

Alternative 1: Alternative 1 involves geometric modifications to the study intersections to improve roadway alignments and operations. Under this alternative, traffic control at these intersections would remain stop controlled, and Hanshaw Road would continue to be the main "through" roadway. The intersection of Hanshaw Road and N. Triphammer Road would be converted to three-way stop control with a yield control right turn slip lane from northwest Hanshaw Road onto N. Triphammer Road. To improve operations and sight lines, geometric changes would be made to N. Triphammer Road, Triphammer Road, E. Upland Road, and Pleasant Grove Road to produce near right angles where the roadways intersect with Hanshaw Road. In addition, re-alignment of Triphammer Road and E. Upland Road separating the intersections would allow the intersections to operate as independent intersections with Hanshaw Road. The driveway from the Corners Community Shopping Center to Pleasant Grove Road would become a right turn only in and out of the Center to eliminate left turning conflicts with traffic on Pleasant Grove Road.

Enhanced accommodation for non-motorized travelers would be provided. Standard width bicycle lanes would be constructed along Hanshaw Road, N. Triphammer Road, and Pleasant Grove Road to support bicycle travel. The midblock pedestrian crosswalks on Hanshaw Road would remain, and the sidewalk along the south side of Hanshaw Road would be connected with crosswalks at the stop signs on Triphammer Road and E. Upland Road. If sidewalks are added in new locations in the future, crosswalks could also be added at other stop-controlled locations. The concept plans for this alternative and the construction cost estimate can be found in the Appendix C.

Alternative 2: Alternative 2 involves geometric and traffic control changes to the study intersections to improve roadway operations. This alternative would reduce traffic flow restrictions for the higher volume roadways of Hanshaw Road, N. Triphammer Road and Pleasant Grove Road and treat them as "through" roadways. Hanshaw Road to the west would be realigned to intersect N. Triphammer Road at a right angle with stop control at the three-way intersection and realignment of Hanshaw Road to the east at the intersection with Pleasant Grove road with a two-way stop-controlled intersection. As in Alternative 1, Triphammer Road and E. Upland Road would be realigned to separate intersections with Hanshaw Road. Also, similarly to Alternative 1, bicycle lanes would be added and the midblock pedestrian crosswalks would remain, and striped crosswalks would be added at stop-controlled intersections. The concept plans for this alternative and the construction cost estimate can be found in the Appendix C.

Alternative 3: Alternative 3 examined construction of roundabouts to improve traffic operations. A three-legged roundabout would be constructed at Hanshaw Road and N. Triphammer Road, and a four-legged roundabout would be constructed at Hanshaw Road, Pleasant Grove Road, and the Community Corners Shopping Center driveway. Roundabouts would improve the flow of traffic through the intersections and the necessary deflections would slow vehicles entering the Commercial District. As in the other alternatives, Triphammer Road and E. Upland Road would be realigned to separate intersections with Hanshaw Road. Also, bicycle lanes would be constructed, the midblock pedestrian crosswalks would remain, and crosswalks could also be added across legs of the roundabout approaches. The concept plans for this alternative and the construction cost estimate can be found in the Appendix C.

Alternative 4: Alternative 4 is a combination of Alternatives 1 and 3. A three-leg stop-controlled intersection would be constructed at Hanshaw Road and N. Triphammer Road, with a yield-controlled right turn slip lane from Hanshaw Road northwest onto N. Triphammer Road. A roundabout would be constructed at the intersection of Hanshaw Road, Pleasant Grove Road, and the Community Corners Shopping Center driveway. As in the other alternatives, Triphammer Road and E. Upland Road would be realigned to separate intersections with Hanshaw Road. Also, bicycle lanes would be added, the midblock pedestrian crosswalks would remain, and crosswalks could also be added across legs of the roundabout approaches. The concept plans for this alternative and the construction cost estimate can be found in the Appendix C.

1.4.3. Alternative Traffic Operations

For comparison to the Null Alternative, reasonable alternatives were examined. Operations with design year (2040) traffic volumes for both the AM and PM peak hours were analyzed for each alternative. Summary tables showing the delay, Level of Service (LOS), and queue lengths for each alternative are included in Appendix D.

Synchro SimTraffic traffic modeling software was used to examine the operations of Alternatives 1 and 2 with design year (2040) traffic volumes. Refer to section 1.3.3 for a discussion of Level of Service (LOS) and Synchro software. For the roundabouts in Alternatives 3 and 4, SIDRA software was used to analyze expected operating conditions. SIDRA implements the methods of the HCM 6th Edition roundabout capacity model for roundabout analysis to evaluate the delays and queues. Refer to section 1.3.3 for a discussion of Level of Service (LOS), the delay ranges for unsignalized intersections in Table 1-2 apply to roundabouts as well.

Alternative 1: Analysis results for Alternative 1 show that all stop-controlled movements are expected to operate at LOS C or better, except Triphammer Road northeast at Hanshaw Road which would operate at a LOS of D in the PM peak hour. Queueing was observed in the traffic simulation models on northbound Pleasant Grove Road with a 95th percentile queue length in the PM peak hour of around 120 feet. This showed an improvement from the Null Alternative, shortening the expected queue near but not past the fire station.

Alternative 2: Alternative 2 involves treating roadways with higher vehicular traffic volumes such as N. Triphammer Road and Pleasant Grove Road at Hanshaw Road, as free-flowing roadways without stop control. This is expected to result in a decrease of delays and queues on these approaches to Hanshaw Road. The analysis shows that all stop-controlled movements would be expected to operate at LOS C or better. The proposed stop control on Hanshaw Road, eastbound at N. Triphammer Road and westbound at Pleasant Grove Road, would lead to some increased delay and queueing, however, good levels of service would still be achieved.

Alternative 3: Alternative 3 includes constructing roundabouts at the intersections of Hanshaw Road at N. Triphammer Road and Hanshaw Road at Pleasant Grove Road. The SIDRA analysis showed all approaches to the roundabouts would be expected to operate at LOS B or better. No major queuing was shown in the analysis results. Traffic operations on Triphammer Road and E. Upland Road at Hanshaw Road would be expected to be the same as in Alternative 1, operating at LOS of C or better except for the evening LOS on Triphammer which is projected to drop to LOS D.

Alternative 4: Traffic analysis of Alternative 4 is a combination of Alternative 1 stop-controlled operations for the intersections of Hanshaw Road with N. Triphammer Road, Triphammer Road, and E. Upland Road.

Roundabout operations at Hanshaw Road and Pleasant Grove Road would be the same as Alternative 3 analysis. The results show that all movements are expected to operate at LOS C or better, except Triphammer Road northeast at Hanshaw Road which has a LOS D in the PM peak hour with about 25 seconds of delay. No significant queuing was observed in the traffic analysis.

1.5. How will the Alternatives Affect the Environment?

Should Federal funding be obtained, an environmental review process would evaluate and determine the National Environmental Protection Act (NEPA) classification of the project. Future analyses will assess the potential environmental impacts (i.e., wetlands, cultural resources, Section 4(f), endangered/threatened species, and noise), social impacts (i.e., property, mobility, environmental justice, general social groups, etc.), and economic and operational impacts (i.e., business access, parking, operations, and utilities) in relation to the alternative pursued. Similarly, a State Environmental Quality Review (SEQR) assessment would be undertaken to ensure the environmental impacts are mitigated by the project actions.

1.6. Comparison of Reasonable Alternatives

All reasonable alternatives were considered and detailed in Table 1-3 which shows how each alternative would address the project objectives. Refer to Section 1.4 for a description of each alternative and a discussion of traffic operations analyses. The Null Alternative would not meet any of the objectives and is therefore, not considered further in this analysis.

TABLE 1-3: Decision Matrix

Category	Alternatives Evaluated			
	Alternative 1	**Alternative 2**	**Alternative 3**	**Alternative 4**
Description	Geometric Improvements	Geometric and Traffic Control Changes	Roundabouts at Hanshaw Rd / N. Triphammer Rd and Hanshaw Rd / Pleasant Grove Rd	Geometric Improvements and Roundabout at Hanshaw Rd / Pleasant Grove Rd
Vehicular Traffic Operations	Produces less delay and queueing overall; major vehicle movements required to stop	Major vehicle movements are free flowing, produces less queueing on N. Triphammer Rd and Pleasant Grove Rd	Decreased delay at roundabouts; improved flow through project area	Decreased delay at roundabout; improved operations overall
Bicyclists	Dedicated bike lanes	Dedicated bike lanes	Dedicated bike lanes; Shared lane through roundabouts	Dedicated bike lanes; Shared lane through roundabout
Pedestrians	Maintain pedestrian crossings	Maintain pedestrian crossings; Recommend high	Maintain pedestrian crossings;	Maintain pedestrian crossings;

		visibility crossing measures due to free-flow movements on Hanshaw Rd.	Roundabouts introduce traffic calming	Roundabouts introduce traffic calming
Continuity	Hanshaw Rd remains as main "through" roadway	Through roadways defined by higher volume traffic	Roundabouts create gateway into commercial district	Roundabout creates gateway from east
Safety	Defined separated intersections decrease driver confusion; Right angle intersections improve sight distance	Defined separated intersections decrease driver confusion; Right angle intersections improve sight distance; Less conflict with queued vehicles	Defined separated intersections decrease driver confusion; Roundabouts decrease conflict points, can slow vehicles	Defined separate intersections decrease driver confusion; Roundabout decreases conflict points, can slow vehicles
Estimated Construction Costs	$0.675M	$1.10M	$3.44M	$2.16M

1.7. Which Alternative is Preferred?

This Scoping Study examined the existing operations of this area to identify the needs and objectives that should be addressed. The Decision Matrix summarized the findings and provided a venue for comparing feasible alternatives and their estimated construction costs to assist the Village with informed decision making consistent with industry regulations and processes. Further evaluation of the feasible and reasonable alternatives should be the basis for selecting a preferred alternative that will achieve the goals set forth in accordance with the environmental review processes required by NEPA and SEQR and in consultation with the users of these facilities.

For additional information or to provide comments, please contact:

Brent Cross, Village Engineer
Village of Cayuga Heights
836 Hanshaw Road
Cayuga Heights, New York

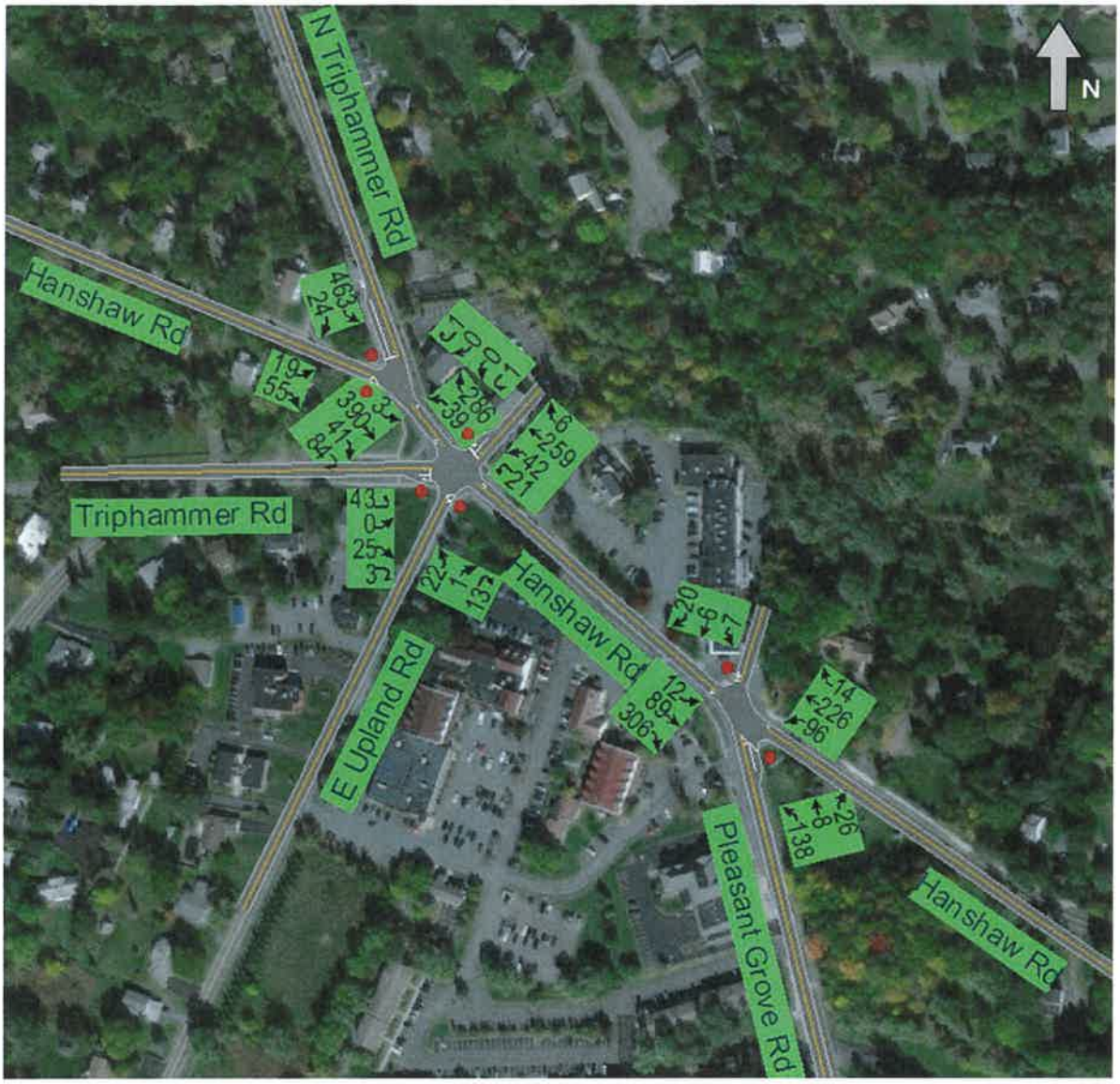
email: bcross@cayuga-heights.ny.us
telephone: (607) 257-5536

Appendix A

TURNING MOVEMENT DIAGRAMS

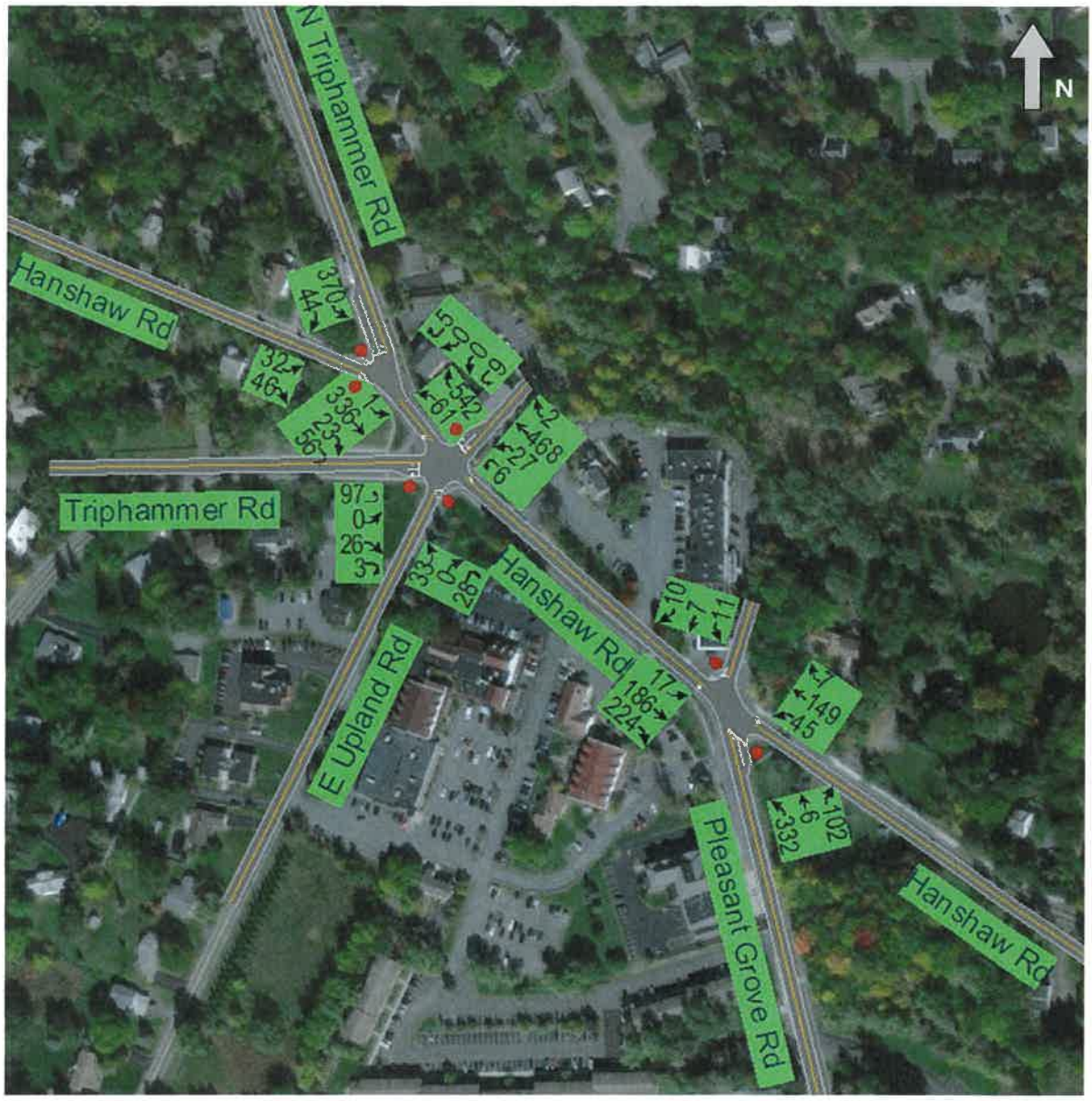
Turning Movement Diagrams

2019 Existing – AM Peak Hour



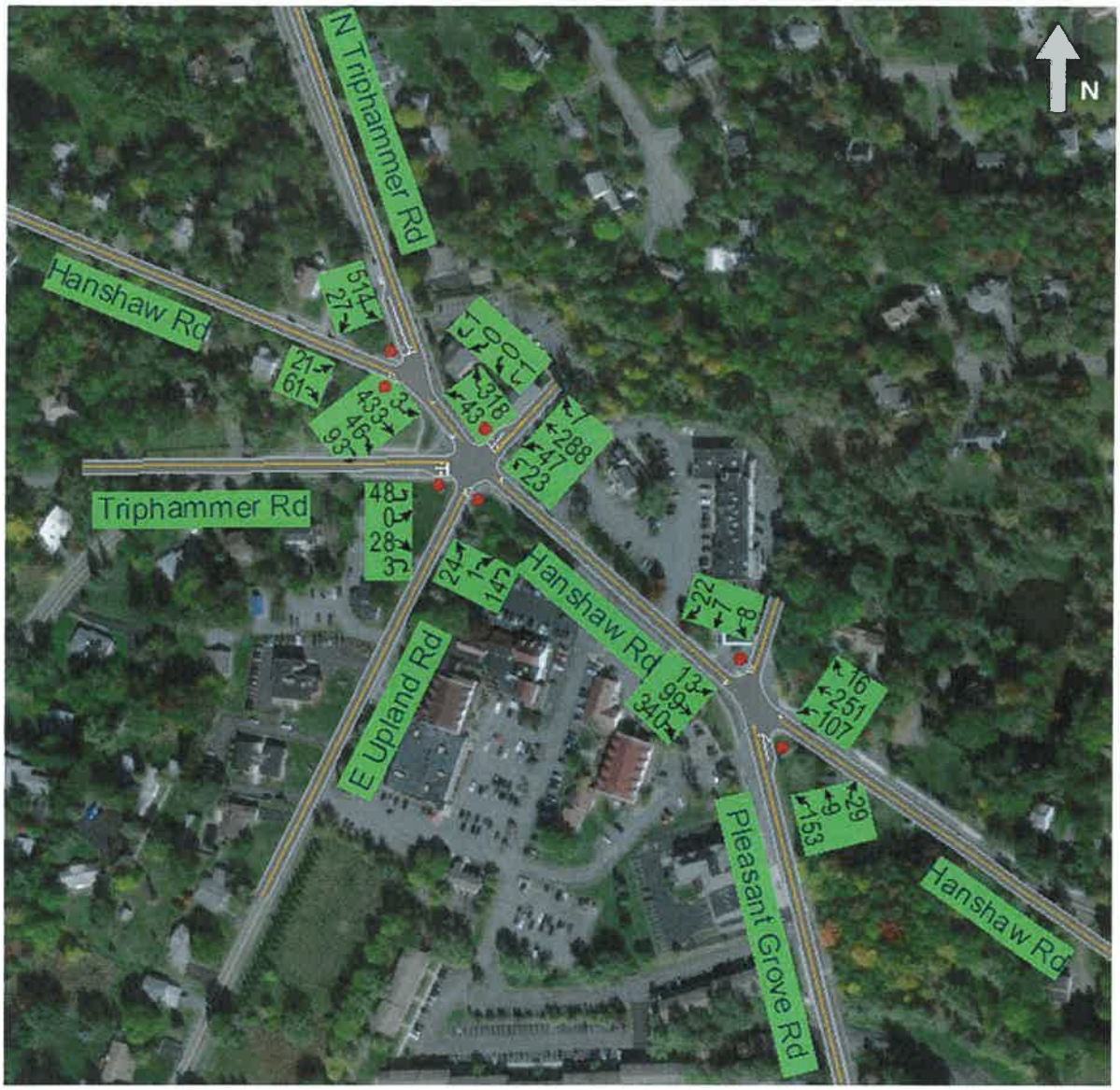
Turning Movement Diagrams

2019 Existing – PM Peak Hour



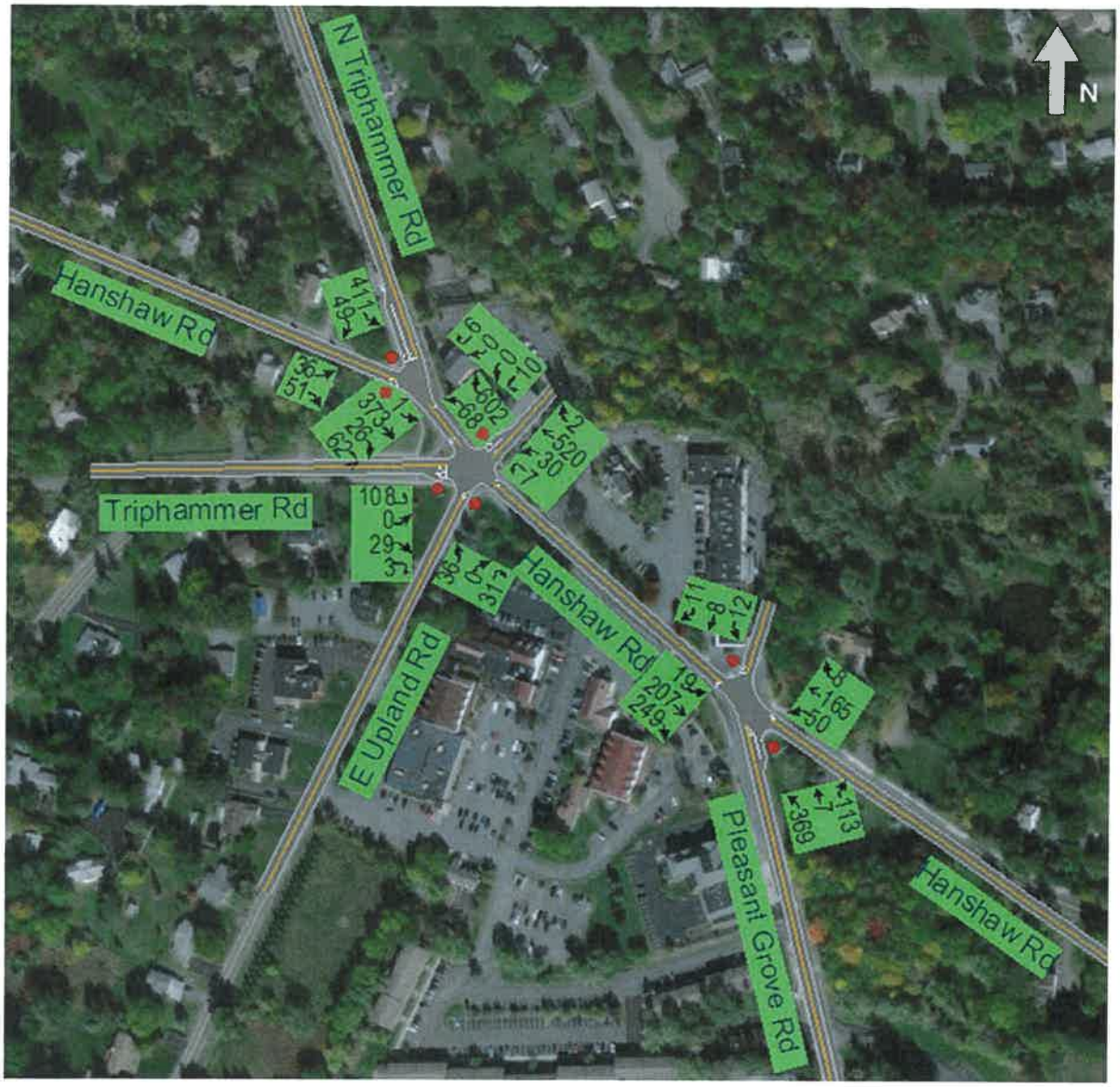
Turning Movement Diagrams

2040 Null – AM Peak Hour



Turning Movement Diagrams

2040 Null – PM Peak Hour



Appendix B

CAPACITY ANALYSIS SUMMARY TABLES:

EXISTING AND NULL

Table 1
Intersection Levels of Service and Delays

Intersection	Approach/Lane			Weekday AM Peak Hour				Weekday PM Peak Hour			
				2019 Existing		2040 Null		2019 Existing		2040 Null	
				LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)
Hanshaw Rd at N. Triphammer Rd	Hanshaw Rd	Eastbound	LT	A	6.9	A	7.3	D	27.1	C	24.3
			Approach	A	6.9	A	7.2	D	27.4	C	24.3
	N Triphammer Rd	Southeastbound	L	B	10.3	B	10.9	B	12.1	C	15.2
Unsignalized			R	A	2.6	A	2.6	A	3.4	A	3.7
			Approach	A	10.0	B	10.5	B	11.2	B	13.9
Hanshaw Rd at Triphammer Rd & E. Upland Rd	Triphammer Rd	Northeastbound	L	D	34.0	E	47.7	F	51.5	F	93.5
			TR	A	5.9	A	5.8	A	4.3	A	5.9
			Approach	C	21.7	D	31.2	E	39.5	F	74.3
	E Upland Rd	Northbound	LTR	C	19.3	E	36.8	D	28.5	E	48.7
Unsignalized			Approach	C	20.4	E	36.8	D	28.5	E	48.7
	Driveway	Southbound	L	A	7.7	A	0.0	C	17.8	C	21.4
			R	A	0.0	A	3.4	B	11.2	B	12.4
			Approach	A	8.1	A	6.1	B	14.8	C	17.8
Hanshaw Rd at Pleasant Grove Rd	Pleasant Grove Rd	Northbound	LT	C	24.8	D	31.0	F	70.9	F	161.3
			R	A	2.0	A	2.2	A	2.7	A	3.0
			Approach	C	21.7	D	26.6	F	56.4	F	129.9
Unsignalized	Driveway	Southbound	LTR	B	11.3	B	11.2	B	13.7	C	17.5
			Approach	B	11.7	B	10.9	B	14.3	C	17.5

LTR: Shared left/through/right lane; LT: Shared left/through lane; TR: Shared through/right lane

Delay and queue lengths from SimTraffic results, average of 5 simulation runs. LOS from HCM 6th Edition, Exhibit 20-2.

Table 2
Queue Lengths

Intersection	Approach/Lane			Weekday AM Peak Hour				Weekday PM Peak Hour			
				2019 Existing		2040 Null		2019 Existing		2040 Null	
				Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)
Hanshaw Rd at N. Triphammer Rd	Hanshaw Rd	Eastbound	LT	20	42	19	38	32	94	33	82
			Approach	-	-	-	-		-	-	-
	N Triphammer Rd	Southeastbound	L	93	157	101	175	88	160	102	208
Unsignalized			R	19	58	25	74	31	74	38	94
			Approach	-	-	-	-	-	-	-	-
Hanshaw Rd at Triphammer Rd & E. Upland Rd	Triphammer Rd	Northeastbound	L	41	97	51	118	74	153	120	245
			TR	24	56	25	57	27	61	27	61
			Approach	-	-	-	-	-	-	-	-
	E Upland Rd	Northbound	LTR	16	38	24	64	28	70	42	104
Unsignalized			Approach	-	-	-	-	-	-	-	-
	Driveway	Southbound	L	1	0	0	1	6	25	8	29
			R	7	5	4	13	7	32	8	34
			Approach	-	-	-	-	-	-	-	-
Hanshaw Rd at Pleasant Grove Rd	Pleasant Grove Rd	Northbound	LT	50	127	66	154	242	557	485	856
			R	26	65	28	67	49	72	51	74
			Approach	-	-	-	-	-	-	-	-
Unsignalized	Driveway	Southbound	LTR	25	56	25	53	19	45	22	51
			Approach	-	-	-	-	-	-	-	-

LTR: Shared left/through/right lane; LT: Shared left/through lane; TR: Shared through/right lane

Delay and queue lengths from SimTraffic results, average of 5 simulation runs. LOS from HCM 6th Edition, Exhibit 20-2.

Appendix C

ALTERNATIVE CONCEPT PLANS

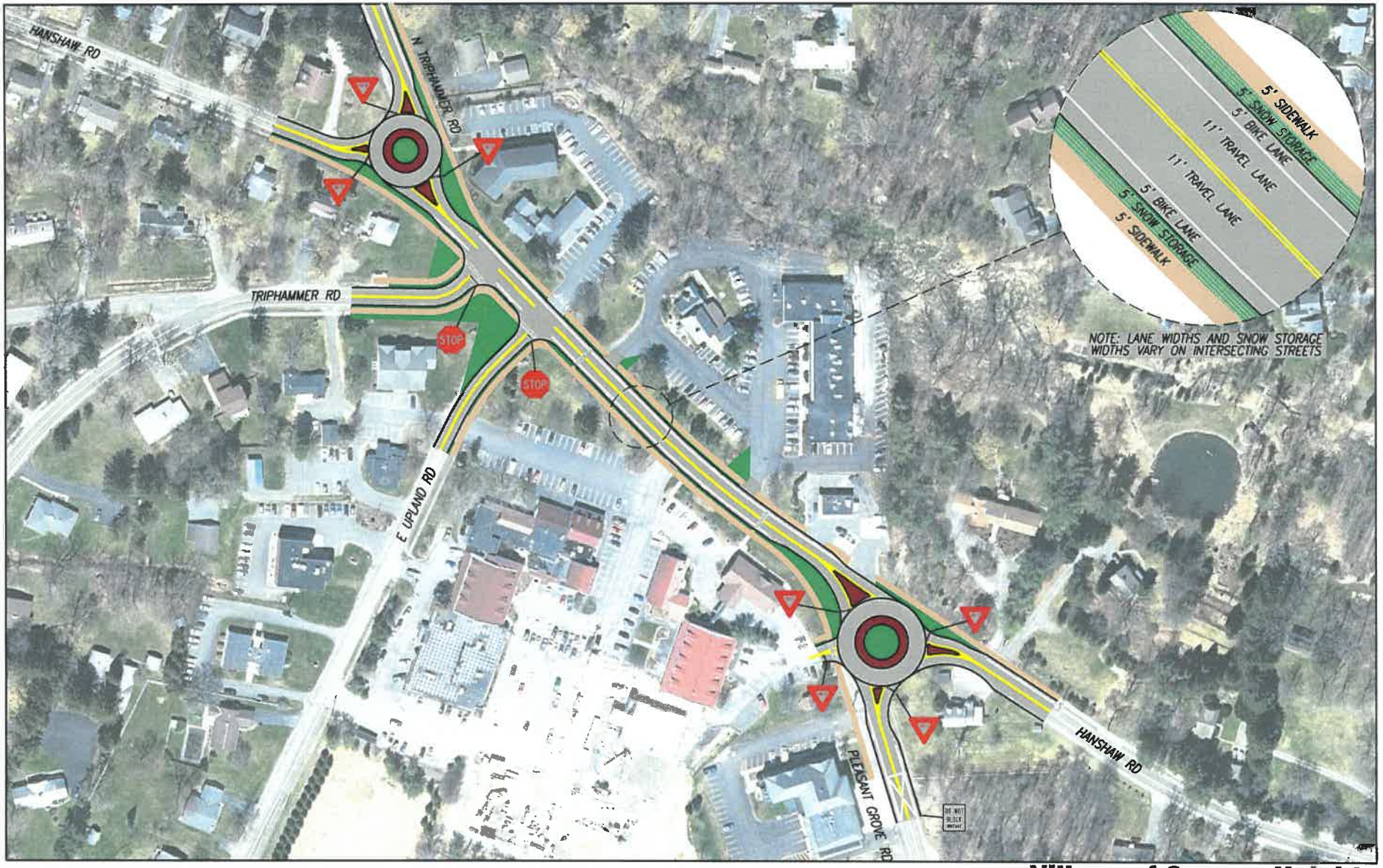
BERGMANN
ARCHITECTS ENGINEERS PLANNERS

N

Village of Cayuga Heights
Intersection Improvements - ALT 1

BERGMANN
ARCHITECTS ENGINEERS PLANNERS

Village of Cayuga Heights
Intersection Improvements - ALT 2



BERGMANN
ARCHITECTS ENGINEERS PLANNERS

N

Village of Cayuga Heights
Intersection Improvements - ALT 3

BERGMANN
ARCHITECTS ENGINEERS PLANNERS

Village of Cayuga Heights
Intersection Improvements - ALT 4

Cayuga Hts Intersection Estimates - Alt #1

Project	**Intersection Improvements**				
Project #	**PN 14117.00**	By	KMT	Date	8/24/2019
Client	**Village of Cayuga Hts.**	By	JCD	Date	8/29/2019

ESTIMATE OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	PRICE	QTY	COST
203.02	UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	$50.00	1535	$76,750.00
209.XXXX	EROSION CONTROL ITEMS				$0.00
304.12	SUBBASE COURSE, TYPE 2	CY	$50.00	1068	$53,400.00
402.018903	TRUE & LEVELING F9, SUPERPAVE HMA, 80 SERIES COMPACTION	TON	$150.00	130	$19,500.00
402.128303	12.5 F3 TOP COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	886	$110,750.00
402.198903	19 F9 BINDER COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
402.378903	37.5 F9 BASE COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
407.0102	TACK COAT, DILUTED	GAL	$10.00	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$23.30	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$10.00	5600	$56,000.00
520.05000010	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	LF	$10.00	3800	$38,000.00
605.1001	UNDERDRAIN FILTER TYPE 2	CY	$100.00	130	$13,000.00
605.1501	PERFORATED CORRUGATED POLYETHYLENE UNDERDRAIN TUBING, 6"DIAMETER	LF	$10.00	3800	$38,000.00
608.0101	CONCRETE SIDEWALKS AND DRIVEWAYS	CY	$550.00	123	$67,650.00
608.21	EMBEDDED DETECTABLE WARNING UNITS	SY	$400.00	16	$6,400.00
609.0203	GRANITE CURB - TYPE C	LF	$60.00	0	$0.00
610.XX & 611.XX	LANDSCAPING				$0.00
619.01	BASIC WORK ZONE TRAFFIC CONTROL	LS	$25,000.00	1	$25,000.00
625.01	SURVEY OPERATIONS	LS	$20,000.00	1	$20,000.00
645.XXX	SIGNAGE	SF	$40.00	100	$4,000.00
645.81	SIGN POSTS	EA LOC	$150.00	8	$1,200.00
663.XXXX	WATER OPERATIONS	EA LOC	$1,200.00	0	$0.00
664.XXXX	SEWER OPERATIONS	EA LOC	$5,000.00	0	$0.00
670.XXXX	STREET LIGHTING	EA LOC	$3,500.00	0	$0.00
			$0.00	0	$0.00
685.XX & 688.XX	STRIPING	EA LOC			$10,000.00
697.03	FIELD CHANGE PAYMENT	D-C	$50,000.00	1	$50,000.00
698.04	ASPHALT PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
698.05	FUEL PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
699.040001	MOBILIZATION	LS	$589,850.00	1	$23,594.00
			$0.00	0	$0.00

SUBTOTAL PROJECT CONSTRUCTION COSTS	***$613,444.00***
10% CONTINGENCY	**$61,345.00**
TOTAL W/ CONTINGENCY	**$674,789.00**
OVERALL ROUNDED TOTAL	**$675,000.00**

Assumptions:

1. Construct 5' shoulder/bike lanes along Hanshaw Rd, N. Triphammer, Pleasant Grove.
2. New Sidewalks along Hanshaw, N. Triphammer, Pleasant Grove both sides while meeting existing at Limit of work on E Upland and Triphammer Rds.
3. Mill and one course overall all pavements. T& L throughout.
4. Assumed LOW: N. Triphammer - 500'; Hanshaw Rd (west) - 200'; Triphammer Rd - 200'; E. Upland Rd - 200'; Pleasant Grove Rd - 300'; Hanshaw Rd (east)- 300'
5. No curbs - shoulder section with 5' snow storage.

Cayuga Hts Intersection Estimates - Alt #1

Project	**Intersection Improvements**				
Project #	**PN 14117.00**	By	KMT	Date	8/24/2019
Client	**Village of Cayuga Hts.**	By	JCD	Date	8/29/2019

ESTIMATE OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	PRICE	QTY	COST
203.02	UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	$50.00	1535	$76,750.00
209.XXXX	EROSION CONTROL ITEMS				$0.00
304.12	SUBBASE COURSE, TYPE 2	CY	$50.00	1068	$53,400.00
402.018903	TRUE & LEVELING F9, SUPERPAVE HMA, 80 SERIES COMPACTION	TON	$150.00	130	$19,500.00
402.128303	12.5 F3 TOP COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	886	$110,750.00
402.198903	19 F9 BINDER COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
402.378903	37.5 F9 BASE COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
407.0102	TACK COAT, DILUTED	GAL	$10.00	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$23.30	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$10.00	5600	$56,000.00
520.05000010	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	LF	$10.00	3800	$38,000.00
605.1001	UNDERDRAIN FILTER TYPE 2	CY	$100.00	130	$13,000.00
605.1501	PERFORATED CORRUGATED POLYETHYLENE UNDERDRAIN TUBING, 4" DIAMETER	LF	$10.00	3800	$38,000.00
608.0101	CONCRETE SIDEWALKS AND DRIVEWAYS	CY	$550.00	123	$67,650.00
608.21	EMBEDDED DETECTABLE WARNING UNITS	SY	$400.00	16	$6,400.00
609.0203	GRANITE CURB - TYPE C	LF	$60.00	0	$0.00
610.XX & 611.XX	LANDSCAPING				$0.00
619.01	BASIC WORK ZONE TRAFFIC CONTROL	LS	$25,000.00	1	$25,000.00
625.01	SURVEY OPERATIONS	LS	$20,000.00	1	$20,000.00
645.XXX	SIGNAGE	SF	$40.00	100	$4,000.00
645.81	SIGN POSTS	EA LOC	$150.00	8	$1,200.00
663.XXXX	WATER OPERATIONS	EA LOC	$1,200.00	0	$0.00
664.XXXX	SEWER OPERATIONS	EA LOC	$5,000.00	0	$0.00
670.XXXX	STREET LIGHTING	EA LOC	$3,500.00	0	$0.00
			$0.00	0	$0.00
685.XX & 686.XX	STRIPING	EA LOC			$10,000.00
697.03	FIELD CHANGE PAYMENT	D-C	$50,000.00	1	$50,000.00
698.04	ASPHALT PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
698.05	FUEL PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
699.040001	MOBILIZATION	LS	$589,850.00	1	$23,594.00
			$0.00	0	$0.00

SUBTOTAL PROJECT CONSTRUCTION COSTS	***$613,444.00***
10% CONTINGENCY	**$61,345.00**
TOTAL W/ CONTINGENCY	**$674,789.00**
OVERALL ROUNDED TOTAL	**$675,000.00**

Assumptions:

1. Construct 5' shoulder/bike lanes along Hanshaw Rd, N. Triphammer, Pleasant Grove.
2. New Sidewalks along Hanshaw, N. Triphammer, Pleasant Grove both sides while meeting existing at Limit of work on E Upland and Triphammer Rds.
3. Mill and one course overall all pavements. T& L throughout.
4. Assumed LOW: N. Triphammer - 500'; Hanshaw Rd (west) - 200'; Triphammer Rd - 200'; E. Upland Rd - 200'; Pleasant Grove Rd - 300'; Hanshaw Rd (east)- 300'
5. No curbs - shoulder section with 5' snow storage.

Cayuga Hts Intersection Estimates - Alt #2

Project	**Intersection Improvements/Reconstruction**				
Project #	**PN 14117.00**	By	KMT	Date	8/24/2019
Client	**Village of Cayuga Hts.**	By	JCD	Date	8/29/2019

ESTIMATE OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	PRICE	QTY	COST
203.02	UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	$50.00	2726	$136,300.00
209.XXXX	EROSION CONTROL ITEMS				$0.00
304.12	SUBBASE COURSE, TYPE 2	CY	$50.00	1623	$81,150.00
402.018903	TRUE & LEVELING F9, SUPERPAVE HMA, 80 SERIES COMPACTION	TON	$150.00	65	$9,750.00
402.128303	12.5 F3 TOP COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	2695	$336,875.00
402.198903	19 F9 BINDER COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
402.378903	37.5 F9 BASE COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
407.0102	TACK COAT, DILUTED	GAL	$10.00	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$23.30	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$10.00	3200	$32,000.00
520.05000010	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	LF	$10.00	2000	$20,000.00
605.1001	UNDERDRAIN FILTER TYPE 2	CY	$100.00	95	$9,460.00
605.1501	PERFORATED CORRUGATED POLYETHYLENE UNDERDRAIN TUBING, 4" DIAMETER	LF	$10.00	3000	$30,000.00
608.0101	CONCRETE SIDEWALKS AND DRIVEWAYS	CY	$550.00	123	$67,650.00
608.21	EMBEDDED DETECTABLE WARNING UNITS	SY	$400.00	16	$6,400.00
609.0203	GRANITE CURB - TYPE C	LF	$60.00	0	$0.00
610.XX & 611.XX	LANDSCAPING				$35,000.00
619.01	BASIC WORK ZONE TRAFFIC CONTROL	LS	$40,000.00	1	$40,000.00
625.01	SURVEY OPERATIONS	LS	$30,000.00	1	$30,000.00
645.XXX	SIGNAGE	SF	$40.00	100	$4,000.00
645.81	SIGN POSTS	EA LOC	$150.00	10	$1,500.00
663.XXXX	WATER OPERATIONS	EA LOC	$1,200.00	0	$0.00
664.XXXX	SEWER OPERATIONS	EA LOC	$5,000.00	0	$0.00
670.XXXX	STREET LIGHTING	EA LOC	$3,500.00	0	$0.00
			$0.00	0	$0.00
685.XX & 688.XX	STRIPING	EA LOC			$20,000.00
697.03	FIELD CHANGE PAYMENT	D-C	$1.00	100000	$100,000.00
698.04	ASPHALT PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
698.05	FUEL PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
699.040001	MOBILIZATION	LS	$960,285.00	1	$38,411.40
			$0.00	0	$0.00

SUBTOTAL PROJECT CONSTRUCTION COSTS	***$998,696.40***
10% CONTINGENCY	**$99,870.00**
TOTAL W/ CONTINGENCY	**$1,098,566.40**
OVERALL ROUNDED TOTAL	**$1,099,000.00**

Assumptions:
1. Construct 5' shoulder/bike lanes along Hanshaw Rd, N. Triphammer, Pleasant Grove.
2. Reconstruct intersections of N. Triphammer/Hanshaw (East) and Hanshaw (West)/Pleasant Grove. LOW: N. Triphammer - 200'; Hanshaw (east) - 200', Hanshaw - 200'. Full-Depth asphalt (9") - 12" Subbase, 12' lanes, 5' shoulder/bikelanes, 5' snow storage.
3. New Sidewalks along Hanshaw, N. Triphammer, Pleasant Grove both sides while meeting existing at Limit of work on E Upland and Triphammer Rds.
4. Mill and one course and T&L overall all existing pavements outside reconstructed areas.
5. Assumed LOW: N. Triphammer - 200'; Hanshaw Rd (west) - 200'; Triphammer Rd - 200'; E. Upland Rd - 200'; Pleasant Grove Rd - 300'; Hanshaw Rd (east)- 300'
6. No curbs - shoulder section with 5' snow storage.

Cayuga Hts Intersection Estimates - Alt #3 Two Gateway Roundabouts

Project
Project # PN 14117.00
Client Village of Cayuga Hts.

By KMT Date 8/24/2019
By JCD Date 8/29/2019

ESTIMATE OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	PRICE	QTY	COST
203.02	UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	$50.00	956	$47,800.00
209.XXXX	EROSION CONTROL ITEMS				$5,000.00
304.12	SUBBASE COURSE, TYPE 2	CY	$50.00	661	$33,050.00
402.018903	TRUE & LEVELING F9, SUPERPAVE HMA, 80 SERIES COMPACTION	TON	$150.00	54	$8,100.00
402.128303	12.5 F3 TOP COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	503	$62,875.00
402.198903	19 F9 BINDER COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
402.378903	37.5 F9 BASE COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
407.0102	TACK COAT, DILUTED	GAL	$10.00	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$23.30	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$10.00	2534	$25,340.00
520.05000010	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	LF	$10.00	1700	$17,000.00
605.1001	UNDERDRAIN FILTER TYPE 2	CY	$100.00	58	$5,800.00
605.1501	PERFORATED CORRUGATED POLYETHYLENE UNDERDRAIN TUBING, [illegible] DIAMETER	LF	$10.00	1700	$17,000.00
608.0101	CONCRETE SIDEWALKS AND DRIVEWAYS	CY	$550.00	74	$40,700.00
608.21	EMBEDDED DETECTABLE WARNING UNITS	SY	$400.00	16	$6,400.00
609.0203	GRANITE CURB - TYPE C	LF	$60.00	0	$0.00
610.XX & 611.XX	LANDSCAPING				$35,000.00
619.01	BASIC WORK ZONE TRAFFIC CONTROL	LS	$100,000.00	1	$100,000.00
625.01	SURVEY OPERATIONS	LS	$50,000.00	1	$50,000.00
645.XXX	SIGNAGE	SF	$40.00	600	$24,000.00
645.81	SIGN POSTS	EA LOC	$150.00	20	$3,000.00
663.XXXX	WATER OPERATIONS	EA LOC	$1,200.00	0	$0.00
664.XXXX	SEWER OPERATIONS	EA LOC	$5,000.00	0	$0.00
670.XXXX	STREET LIGHTING	EA LOC	$3,500.00	0	$0.00
	Roundabouts - 90' inscribed		$1,150,000.00	2	$2,300,000.00
685.XX & 688.XX	STRIPING	EA LOC			$50,000.00
697.03	FIELD CHANGE PAYMENT	D-C	$1.00	175000	$175,000.00
698.04	ASPHALT PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
698.05	FUEL PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
699.040001	MOBILIZATION	LS	$3,006,265.00	1	$120,250.60
			$0.00	0	$0.00

Note: Itemize quantities outside Roundabout areas

SUBTOTAL PROJECT CONSTRUCTION COSTS	***$3,126,515.60***
10% CONTINGENCY	**$312,652.00**
TOTAL W/ CONTINGENCY	**$3,439,167.60**
OVERALL ROUNDED TOTAL	**$3,440,000.00**

Assumptions:
1. Construct 5' shoulder/bike lanes along Hanshaw Rd, N. Triphammer, Pleasant Grove outside Rc
2. Construct asphalt roundabouts at N. Triphammer/Hanshaw (East) and Hanshaw (West)/Pleasant Grove. LOW: N. Triphammer - 200'; Hanshaw (east) - 200', Hanshaw(west) - 200' Pleasant Grove. Includes 5' sidewalks, splitter islands, landscape, closed drainage. Source of Est (NYSDOT Reg 5 3/2007 to 2019 est).
3. New Sidewalks along Hanshaw Rd to match sidewalks from roundabouts, meeting existing at Limit of work on E Upland and Triphammer Rds.
4. Mill and one course and T&L overall all existing pavements outside roundabout areas (450' Hanshaw, 200' E Upland, 200' Triphammer).
5. Curbbed roundabouts transition to no curbs outside roundabouts.
6. No Right of Way costs included.

Project	**Cayuga Hts Intersection Estimates - Alt #4 - Intersection Improve & 1-Roundabout**				
Project #	**PN 14117.00**	By	KMT	Date	8/24/2019
Client	**Village of Cayuga Hts.**	By	JCD	Date	8/29/2019

ESTIMATE OF QUANTITIES

ITEM NO.	DESCRIPTION	UNIT	PRICE	QTY	COST
203.02	UNCLASSIFIED EXCAVATION AND DISPOSAL	CY	$50.00	1463	$73,150.00
209.XXXX	EROSION CONTROL ITEMS				$5,000.00
304.12	SUBBASE COURSE, TYPE 2	CY	$50.00	882	$44,100.00
402.018903	TRUE & LEVELING F9, SUPERPAVE HMA, 80 SERIES COMPACTION	TON	$150.00	84	$12,600.00
402.128303	12.5 F3 TOP COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	654	$81,750.00
402.198903	19 F9 BINDER COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
402.378903	37.5 F9 BASE COURSE HMA, 80 SERIES COMPACTION	TON	$125.00	0	$0.00
407.0102	TACK COAT, DILUTED	GAL	$10.00	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$23.30	0	$0.00
490.XX	MISCELLANEOUS COLD MILLING OF BITUMINOUS CONCRETE	SY	$10.00	4267	$42,670.00
520.05000010	SAW CUTTING PORTLAND CEMENT CONCRETE AND COMPOSITE PAVEMENTS	LF	$10.00	2600	$26,000.00
605.1001	UNDERDRAIN FILTER TYPE 2	CY	$100.00	88	$8,800.00
605.1501	PERFORATED CORRUGATED POLYETHYLENE UNDERDRAIN TUBING, 4" DIAMETER	LF	$10.00	2600	$26,000.00
608.0101	CONCRETE SIDEWALKS AND DRIVEWAYS	CY	$550.00	148	$81,400.00
608.21	EMBEDDED DETECTABLE WARNING UNITS	SY	$400.00	16	$6,400.00
609.0203	GRANITE CURB - TYPE C	LF	$60.00	0	$0.00
610.XX & 611.XX	LANDSCAPING				$35,000.00
619.01	BASIC WORK ZONE TRAFFIC CONTROL	LS	$60,000.00	1	$60,000.00
625.01	SURVEY OPERATIONS	LS	$40,000.00	1	$40,000.00
645.XXX	SIGNAGE	SF	$40.00	175	$7,000.00
645.81	SIGN POSTS	EA LOC	$150.00	10	$1,500.00
663.XXXX	WATER OPERATIONS	EA LOC	$1,200.00	0	$0.00
664.XXXX	SEWER OPERATIONS	EA LOC	$5,000.00	0	$0.00
670.XXXX	STREET LIGHTING	EA LOC	$3,500.00	0	$0.00
	Roundabouts - 90' inscribed		$1,150,000.00	1	$1,150,000.00
685.XX & 688.XX	STRIPING	EA LOC			$40,000.00
697.03	FIELD CHANGE PAYMENT	D-C	$1.00	150000	$150,000.00
698.04	ASPHALT PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
698.05	FUEL PRICE ADJUSTMENT	D-C	$1.00	100	$100.00
699.040001	MOBILIZATION	LS	$1,891,570.00	1	$75,662.80
			$0.00	0	$0.00

Note: Itemize quantities outside Roundabout area

SUBTOTAL PROJECT CONSTRUCTION COSTS	***$1,967,232.80***
10% CONTINGENCY	**$196,724.00**
TOTAL W/ CONTINGENCY	**$2,163,956.80**
OVERALL ROUNDED TOTAL	**$2,164,000.00**

Assumptions:
1. Construct 5' shoulder/bike lanes along Hanshaw Rd, N. Triphammer, Pleasant Grove outside Roundabout.
2. Construct asphalt roundabout at Hanshaw (West)/Pleasant Grove. Hanshaw(west) - 200' Pleasant Grove. Includes 5' sidewalks, splitter islands, landscape, closed drainage. Source of Est (NYSDOT Reg 5 3/2007 to 2019 est).
3. New Sidewalks along Hanshaw Rd to match sidewalks from roundabout, meeting existing at Limit of work on E Upland and Triphammer Rds.
4. Mill and one course and T&L overall all existing pavements outside roundabout areas (600' Hanshaw, 200' E Upland, 200' Triphammer) and 300' on N. Triphammer, 200' on Hanshaw & 100' on Hanshaw(W) and Pleasant Grove.
5. Curbbed roundabouts transition to no curbs outside roundabouts.
6. No Right of Way costs included.

Appendix D

CAPACITY ANALYSIS SUMMARY TABLES:

EXISTING AND NULL

Village of Cayuga Heights Traffic Study
Build Alternatives

Bergmann
8/1/2019

Table 1
Intersection Levels of Service and Delays

Intersection	Approach/Lane			Weekday AM Peak Hour								Weekday PM Peak Hour							
				2040 Alternative 1		2040 Alternative 2		2040 Alternative 3		2040 Alternative 4		2040 Alternative 1		2040 Alternative 2		2040 Alternative 3		2040 Alternative 4	
				LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)	LOS	Control Delay (sec/veh)
Hanshaw Rd at N. Triphammer Rd	Hanshaw Rd	Eastbound	LTR	A	6.9	A	8.0	-	-	A	6.9	A	6.4	A	9.6	-	-	A	6.4
			Approach	A	6.9	A	8.0	A	7.4	A	6.9	A	6.3	A	9.6	A	5.3	A	6.3
	Hanshaw Rd	Northwestbound	L	-	-	A	3.6	-	-	-	-	-	-	A	2.4	-	-	-	-
			TR	A	2.5	-	-	-	-	A	2.5	A	1.7	-	-	-	-	A	1.7
			Approach	A	2.5	A	1.0	A	5.9	A	2.5	A	1.7	A	0.8	A	8.6	A	1.7
	N Triphammer Rd	Southeastbound	L	A	9.3	-	-	-	-	A	9.3	A	8.1	-	-	-	-	A	8.1
			R	A	2.5	A	0.3	-	-	A	2.5	A	2.2	A	0.0	-	-	A	2.2
			Approach	A	8.9	A	0.9	A	8.7	A	8.9	A	7.5	A	0.8	A	6.6	A	7.5
Hanshaw Rd at Triphammer RD	Triphammer Rd	Northeastbound	LR	C	18.9	B	14.4	C	18.9	C	18.9	D	26.2	C	19.5	D	26.2	D	26.2
			Approach	C	18.9	B	14.4	C	18.9	C	18.9	D	26.2	C	19.5	D	26.2	D	26.2
	Hanshaw Rd	Westbound	L	A	5.2	A	5.3	A	5.2	A	5.2	A	3.2	A	3.2	A	3.2	A	3.2
Hanshaw Rd at E. Upland Rd	E Upland Rd	Northbound	LTR	B	13.8	B	12.7	B	13.8	B	13.8	C	17.0	B	14.9	C	17.0	C	17.0
			Approach	B	14.2	B	13.0	B	14.2	B	14.2	C	17.0	B	14.9	C	17.0	C	17.0
	Driveway	Southbound	LT	B	11.4	A	4.3	B	11.4	B	11.4	C	16.4	B	11.4	C	16.4	C	16.4
			R	A	3.9	A	8.6	A	3.9	A	3.9	A	9.8	B	11.1	A	9.8	A	9.8
			Approach	A	7.6	A	6.5	A	7.6	A	7.6	B	14.5	B	11.3	B	14.5	B	14.5
	Hanshaw Rd	Eastbound	L	A	3.7	A	1.6	A	3.7	A	3.7	A	2.7	A	3.7	A	2.7	A	2.7
	Hanshaw Rd	Westbound	L	A	6.6	A	5.2	A	6.6	A	6.6	A	5.5	A	4.3	A	5.5	A	5.5
Hanshaw Rd at Pleasant Grove Rd	Pleasant Grove Rd	Northbound	L	-	-	A	7.5	-	-	-	-	-	-	A	3.5	-	-	-	-
			LR	B	11.9	-	-	-	-	-	-	B	12.3	-	-	-	-	-	-
			Approach	B	11.9	-	-	A	5.1	A	5.1	B	12.3	-	-	B	10.1	B	10.1
	Hanshaw Rd	Eastbound	L	-	-	A	3.3	-	-	-	-	-	-	A	6.7	-	-	-	-
			Approach	-	-	-	-	A	7.8	A	7.8	-	-	-	-	A	7.1	A	7.1
	Hanshaw Rd	Westbound	L	B	12.8	-	-	-	-	-	-	A	3.0	-	-	-	-	-	-
			LTR	-	-	B	12.3	-	-	-	-	-	-	B	14.4	-	-	-	-
			Approach	-	-	B	12.3	A	7.6	A	7.6	-	-	B	14.4	A	8.2	A	8.2

LTR: Shared left/through/right lane; LT: Shared left/through lane; TR: Shared through/right lane

Delay and queue lengths for stop-control from SimTraffic results, average of 5 simulation runs. LOS from HCM 6th Edition, Exhibit 20-2.
For approaches with no stop control, delays for left turn movements only are used, per HCM.

Village of Cayuga Heights Traffic Study
Build Alternatives

Bergmann
8/1/2019

Table 2
Queue Lengths

Intersection	Approach/Lane			Weekday AM Peak Hour								Weekday PM Peak Hour							
				2040 Alternative 1		2040 Alternative 2		2040 Alternative 3		2040 Alternative 4		2040 Alternative 1		2040 Alternative 2		2040 Alternative 3		2040 Alternative 4	
				Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)	Average (ft)	95th Percentile (ft)
Hanshaw Rd at N. Triphammer Rd	Hanshaw Rd	Eastbound	LTR	38	61	33	56	-	-	38	61	32	52	34	62	-	-	32	52
			Approach	-	-	-	-	7	16	-	-	-	-	-	-	5	12	-	-
	Hanshaw Rd	Northwestbound	L	-	-	17	45	-	-	-	-	-	-	18	48	-	-	-	-
			TR	28	59	-	-	-	-	28	59	30	56	-	-	-	-	30	56
			Approach	-	-	-	-	24	61	-	-	-	-	-	-	53	131	-	-
	N Triphammer Rd	Southeastbound	L	75	134	-	-	-	-	75	134	58	102	-	-	-	-	58	102
			R	20	59	-	-	-	-	20	59	22	51	-	-	-	-	22	51
			Approach	-	-	-	-	42	105	-	-	-	-	-	-	26	66	-	-
Hanshaw Rd at Triphammer RD	Triphammer Rd	Northeastbound	LR	53	108	45	89	53	108	53	108	70	132	64	121	70	132	70	132
			Approach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hanshaw Rd	Westbound	L	25	55	21	51	25	55	25	55	12	39	11	34	12	39	12	39
Hanshaw Rd at E. Upland Rd	E Upland Rd	Northbound	LTR	26	57	26	57	26	57	26	57	37	71	38	69	37	71	37	71
			Approach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Driveway	Southbound	LT	1	7	1	6	1	7	1	7	9	29	6	23	9	29	9	29
			R	1	9	2	15	1	9	1	9	6	28	7	30	6	28	6	28
			Approach	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	Hanshaw Rd	Eastbound	L	5	23	3	18	5	23	5	23	3	16	3	18	3	16	3	16
	Hanshaw Rd	Westbound	L	33	93	30	81	33	93	33	93	17	54	17	61	17	54	17	54
Hanshaw Rd at Pleasant Grove Rd	Pleasant Grove Rd	Northbound	L	-	-	2	16	-	-	-	-	-	-	2	12	-	-	-	-
			LR	67	104	-	-	-	-	-	-	96	115	-	-	-	-	-	-
			Approach	-	-	-	-	11	27	11	27	-	-	-	-	39	97	39	97
	Hanshaw Rd	Eastbound	L	-	-	22	63	-	-	-	-	-	-	66	138	-	-	-	-
			Approach	-	-	-	-	31	76	31	76	-	-	-	-	32	79	32	79
	Hanshaw Rd	Westbound	L	81	188	-	-	-	-	-	-	31	73	-	-	-	-	-	-
			LTR	-	-	93	176	-	-	-	-	-	-	72	135	-	-	-	-
			Approach	-	-	-	-	24	61	24	61	-	-	-	-	17	43	17	43

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Delay and queue lengths for stop-control from SimTraffic results, average of 5 simulation runs. LOS from HCM 6th Edition, Exhibit 20-2.
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