



# Armada Township

## PLANNING COMMISSION

23121 E. Main Street, P.O. Box 578

Armada, Michigan 48005

Telephone: (586) 784-5200 Facsimile: (586) 784-5211

### AGENDA

April 6, 2022

7:00 p.m.

In-person and Virtual

Please take notice that a regular meeting of the Armada Township Planning Commission will be held on Wednesday, April 6, 2022 at 7:00 p.m. in person and by electronic remote access in accordance with the Emergency Order under MCL 333.2253, implemented in response to COVID-19 social distancing requirements and Michigan Department of Health and Humans Services. Per state directives, public meeting access and participation is permitted though conference calling, real time streaming, and other technologies in compliance with Public Act 267 of 1976, the Open Meeting Act (OMA). The public may participate in the meeting through GoToMeeting access by way of computer, tablet or smartphone using the following link:  
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Members of the public may also participate in the Board meeting by calling in to the following number:

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ACCESS CODE: 289-326-485

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In the event a member of the public wishes to submit questions or provide input to Board members prior to the meeting, they should contact the Township Planning Commission members by emailing their input to [planning@armadatwp.org](mailto:planning@armadatwp.org). All input received from members of the public prior to the meeting will be read into the record during the meeting.

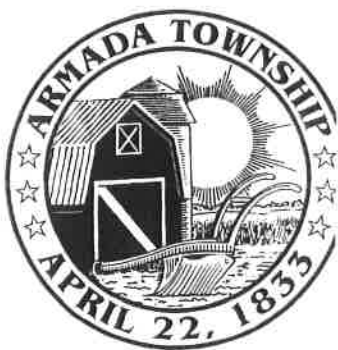
The agenda for the regular meeting of **Wednesday, April 6, 2022** is as follows:

### Regular Meeting

1. Call to order
2. Pledge of Allegiance
3. Roll Call
4. Approve/Amend Agenda
5. Approval of minutes: **Regular Meeting Minutes November 3, 2021**
6. Public Comments
7. Public Hearing
8. Reports and Correspondence
9. New Business: **A.) Annual Report**  
**B.) Meeting Dates for 2022 Open Resolution**  
**C.) Election of Officer's**
10. Unfinished Business
11. PC Projects: **A.) Ordinance Updates – second homes on property; seasonal worker clause, limit size of attachment on attached garages, accessory structures, shipping containers, administrative review- fence conflict**
12. Public Comments
13. Adjournment

Next Scheduled Regular Meeting: May 4, 2022





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## PLANNING COMMISSION

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Armada, Michigan 48005

Telephone: (586) 784-5200 Facsimile: (586) 784-5211

### MINUTES

November 3, 2021

In Person & Virtual Meeting

7:00 p.m.

#### Regular Meeting

1. Call to order
2. Pledge of Allegiance
3. Roll Call
4. Approve/Amend Agenda
5. Approval of minutes: **Regular Meeting October 6, 2021**
6. Public Comments
7. Public Hearing: **Zoning Ordinance Amendments: Medical Marijuana, Shipping Containers, Agri-business, Site Plan Administrative Review Authority**
8. Reports & Correspondence
9. New Business: **Zoning Ordinance Amendments:**
  - A.) **Shipping Containers**
  - B.) **Agri-Business**
  - C.) **Site Plan Administrative Review Authority**
  - D.) **Medical Marijuana**
10. Unfinished Business
11. PC Projects: **A.) Ordinance Updates- second homes on property; seasonal worker clause, limit size of attachment on garages, accessory structures**
12. Public Comments
13. Adjournment

Next Scheduled Regular Meeting: December 1, 2021

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**Call to order:** Vice-Chair Abercrombie called the meeting to order at 7:00 p.m.

**Pledge of Allegiance:** Vice-Chair Abercrombie led the group in the Pledge of Allegiance.

**Roll Call:** Present: Finlay, Jabara, Finn, Murray, Wieske and Abercrombie. Also, present: Planner Laura Haw and Recording Secretary Christine White. Absent: Kehrig

**Approve Agenda:** Motion made by Murray, no second, to remove Medical Marijuana from the agenda. Motion Failed. Motion made by Finlay, seconded by Wieske, to approve the agenda as presented. All Ayes: Motion Carried.

**Approval of Minutes:** Regular meeting minutes October 6, 2021. Motion made by Murray, seconded by Abercrombie, to approve the minutes as presented. All Ayes: Motion Carried.

**Public Comments:** Buddy Dalton from Flushing Township in Genesee County, spoke via go-to-meeting, gave comments in regard to the Medical Marijuana law passed in 2008, and thinks the commission should stop with the language and not move forward. He believes the language is illegal.

Steve Nikkel, doesn't understand why agenda item would be pulled with no information.

Monica Job asked why Murray wanted the Medical Marijuana ordinance removed, would like a link to the webinar that Chair Kehrig attended, DTE electrical grid does not have the capability for grow operations, the residents on Old Farm Trail need to be protected. Businesses in the commercial and industrial district have to have a log of all chemicals. The fire department needs to know that and it is a health and safety issue.

Jenny Lindemann from Flushing Township, spoke via go-to-meeting, with the American For Safe Access, Michigan Chapter gave comments in regard to medical marijuana ordinance, and thinks that it will end up in court, and wanted to know how many properties are available in the industrial district.

Scott Hagerstorm from Lansing, MI, spoke via go-to-meeting, with the Michigan Care Giver's opposes the ordinance because it bans or outlaws caregivers and hopes it does not move forward.

**Public Hearing: Zoning Ordinance Amendments: Medical Marijuana, Shipping Containers, Agri-business, Site Plan Administrative Review Authority:** Vice-Chair Abercrombie explained the process of the Public Hearing and went over the public notice verification. She also, thanked the public for coming and encouraged all to stay involved, that their voices and opinions matter.

**Motion made by Abercrombie, seconded by Wieske, to open the Public Hearing at 7:28 p.m. All Ayes: Motion Carried.** Planner Laura Haw went through the proposed Medical Marijuana Ordinance. New definitions will be added, a certificate requirement to the M-1 and M-2 districts, and section 2.43 clarifies that it will only be allowed in the M-1 and M-2 industrial districts.

Ron Noteboom, 72541 Old Farm Trail, Armada, MI, supports the ordinance and wanted to clarify misinformation. Spoke about a Supreme Court Decision that gives townships the right to limit the area to which it is allowed. Ray Township shares same attorney and have same ordinance. Armada is one of the last to adopt this language. Richmond has similar ordinance and it is working.

Jim Goetzinger, 78550 Coon Creek Rd., Armada, MI, is in support of the ordinance amendment, adjacent communities have similar ordinance, planning commission protects residents, does not believe growing operations is good for residents.

Monica Job, 19040 33 Mile Rd. Armada, MI, concerned that there was a quorum of the township board last month at the planning commission meeting. In the M-1 or commercial district there has to be a list of every chemical in the facility. The electrical grid in rural area is not set up to handle the electricity need to grow. In Richmond, house burned down due to growing in the basement.

David Jones, 71333 Coon Creek Rd., Armada, MI, grow house across the road in operation for several years, doesn't belong in a residential neighborhood. In support of an ordinance that would not allow it in a residential area.

Amy VanHoeck, 73265 True Rd., Armada, MI, concerned about inability to have an ordinance at all. All surrounding communities have one of some sorts. Would like an ordinance put together that is legally binding, nobody wants a lawsuit. township taxes are high enough.

Buddy Dalton, Flushing Township, MI, spoke via go-to-meeting, a lot of people riled up over bad caregivers, apologized for them. Good caregivers, you would never know about, they keep the grass cut, shop in same stores, pay taxes, you would not be bothered by the good caregivers. They have been growing since 2008, they depend on supply for life saving medicine. A few bad apples should not restrict all. That is what the Supreme Court said. Issue should be tabled for an ordinance that makes sense.

Marcie Noteboom, 72541 Old Farm Trail, Armada, MI, would like to point out that the people here speaking, live here, and are the ones dealing with the issue. Hopes the board will listen to the people who vote. Not against medical marijuana, against how out of control it has become. Something needs to be in place.

Darcy Falkowski, 72613 Old Farm Trail, Armada, MI, all the callers are from Flushing, the Flushing amendment is the one Maureen always references, we live here, it is our community. Asking for the commission to make Armada a better community.

Jenny Lindemann, 6110 Deland Rd., Flushing, MI, wants people to remember that they are talking about medical cannabis, it is for patients. Everyone is allowed to grow twelve plants. Going after medication won't solve the problem. She explained an ordinance under a home occupation, that would solve the problem. Recreational growers are more of a problem. Properties available in the industrial district are expensive.



Steve Nikkel, 77655 Armada Center Rd., Armada, MI, had an issue with neighbor, got involved, why he ran as trustee. Board needs to protect taxpayers. Grow houses will destroy community. Would like ordinance to be enforceable.

Scott Hagestrom, in 2018 recreational marijuana passed and allows twelve plants as a right, so it will be in the residential area. This is about patients. More tailored language to protect caregivers and property rights to protect voters should be looked into.

Rochelle Leone, 72700 Old Farm Trail, Armada, MI, here in support of putting an ordinance in place. If paying \$400,000 cash for a house no one is living in, can afford to go to industrial district. Something needs to be put into place.

**Motion made by Jabara, seconded by Finlay, to close the Public Hearing. All Ayes: Motion Carried.**

**Motion made by Finlay, seconded by Jabara, to open the Public Hearing on Shipping Container's. All Ayes: Motion Carried.**

**Roll Call: Present: Finlay, Jabara, Finn, Murray, Wieske and Abercrombie. Also, present: Planner Laura Haw and Recording Secretary Christine White. Absent: Kehrig.**

Planner Laura Haw went through the proposed ordinance amendments on Shipping Container's.

Steve Nikkel, 22675 Armada Center Rd., Armada, MI, beauty is in the eye of the beholder. Don't make an ordinance that you can't enforce.

**Motion made by Wieske, seconded by Finlay, to close the Public Hearing. All Ayes: Motion Carried.**

**Motion made by Murray, seconded by Abercrombie to open the Public Hearing on Agri-business. All Ayes: Motion Carried. Roll Call: Present: Finlay, Jabara, Finn, Murray, Wieske and Abercrombie. Also, present: Planner Laura Haw and Recording Secretary Christine White. Absent: Kehrig.**

Planner Laura Haw went through the proposed ordinance amendments on Agri-business noting that the township attorney recommended that 55% grown on site be changed to 50% grown on site to follow the GAMPP's state requirement.

Monica Job, 19040 33 Mile Rd., Armada, MI, who determines 50%? Planner Haw explained only changing the requirement from 55 to 50%. She wanted to know who would oversee the requirement. Hopes other issues will be addressed whether grown on farm or not.

**Motion made by Jabara, seconded by Finlay, to close the Public Hearing. All Ayes: Motion Carried.**

**Motion made by Murray, seconded by Abercrombie, to open the Public Hearing on Site Plan Administrative Review Authority. All Ayes: Motion Carried. Roll Call: Present: Finlay, Jabara, Finn, Murray, Wieske and Abercrombie. Also, present: Planner Laura Haw and Recording Secretary Christine White. Absent: Kehrig.** Planner Laura Haw went through the proposed ordinance amendments on Site Plan Administrative Review Authority.

Monica Job, 19040 33 Mile Rd., Armada, MI, in favor prior, not in favor now, any changes should go before the planning commission, then the township board, unless absolutely minor changes.

Steve Nikkel, 22675 Armada Center Rd., Armada, MI, questioned reason for landscape, site plans should always come back. **Motion made by Finn, seconded by Murray, to close the Public Hearing. All Ayes: Motion Carried.**

**Reports and Correspondence:** Vice-Chair Abercrombie read a report from Chair Kehrig on a seminar by ROWE, noted a draft Macomb Township Ordinance, a fire department prevention bulletin, and a prevention directive from the Fire Chief. **Motion made by Murray, seconded by Wieske, to receive and file as presented. All Ayes: Motion Carried.**

**New Business: Zoning Ordinance Amendments:**

**A.) Shipping Container's:** The commission discussed how beauty and appearance would be enforced. **Motion made by Finn, seconded by Murray to table shipping containers to re-work Section 1.1, 5 C. Finlay; Nay, Jabara; Nay, Finn; Aye, Murray; Aye, Abercrombie; Aye, Wieske; Nay: Three (3) Ayes; Three (3) Nays; Motion Failed. Motion made by Finlay, seconded by Wieske, to recommend to the Township Board. Five (5) Ayes; One (1) Nay: Finn: Motion Carried.**

**B.) Agri-Business:** The state would determine if 50% is produced on site. Complaints would be made to the state. **Motion made by Murray, seconded by Finn, to recommend to the township board. All Ayes: Motion Carried.**

**C.) Site Plan Administrative Review Authority:** planner clarified that this is reducing the criteria for review, not increasing it. **Motion made by Murray, seconded by Abercrombie, to recommend to the township board. Five (5) Ayes; One (1) Nay: Finlay: Motion Carried.**

**D.) Medical Marijuana:** Murray went over that she is not opposed to the ordinance in any way. Additional information had been in the packet that the township attorney did not include. Finn disagrees with the ordinance as written. She believes we need one, but not the one being proposed. Murray went over a house bill HB5301 that would only allow for twenty-four plants. Abercrombie would like to find out how much the electrical grid in township can handle, and concerned about public health and safety and property values. **Motion made by Finlay, seconded by Abercrombie, to recommend to the township board. Five (5) Ayes; One (1) Nay: Finn. Motion Carried.**

**Unfinished Business:** None.

**PC Projects: A.) Ordinance Updates: Second homes on property; seasonal worker clause, limit size of attachment on garages, accessory structures:** No new updates. Jabara would like accessory structures in the front yard itemized for next meeting.

**Public Comments:** Jim Goetzinger thanked commission. Attending planning commission meeting is okay per the supervisor and is interested in them and will continue as a resident.

Buddy Owen, Clio, MI owns Clio Cultivation believes ordinance is illegal, we are affecting their way of life, to harsh, and is set up for a lawsuit.

Jenny Lindemann thanked Finn, thinks she is the most educated, listen to her to avoid lawsuit.

**Adjournment: Motion made by Finn, seconded by Murray, to adjourn at 8:52 p.m. All Ayes: Motion Carried.**

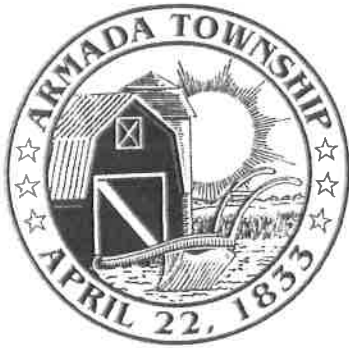
Respectfully submitted:

*Christine White*  
Christine White,  
Recording Secretary

Approved:

DJ Kehrig,  
Chairperson

Date \_\_\_\_\_



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## PLANNING COMMISSION

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## Memo

From: Christine White  
Planning & Zoning Secretary  
[planning@armadatwp.org](mailto:planning@armadatwp.org)

To: Planning Commissioners

Re: Reports and Correspondences  
March 2, 2022

- Blake Farm's Traffic Study Update
- Planner Administrative Review for Achatz fence
- Citizen Planner February News Letter
- Planning & Zoning News November 2021, December 2021, January 2022, February 2022





# ***Blake's Farms Traffic Study***

***January 21, 2022***

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## **EXECUTIVE SUMMARY**

This study is intended to review the current traffic operations on the roadway network surrounding the Blake's Farms development, including the driveways servicing the development. The project site is located west/northwest of the village of Armada in Armada Township, Michigan. The existing Blake's Farms development consists of the Lovey's Lavender Farm & Artisan Market, Blake's Tasting Room, and Blake's Orchard & Cider Mill. These developments center around agricultural, market, and culinary businesses. These businesses utilize five (5) existing drives located on Armada Center Road, Romeo Plank Road, and 34 Mile Road with parking available at the site, but primarily located south of Armada Center Road, requiring patrons to walk across Armada Center Road to access Blake's attractions.

This analysis reviewed the operations of the surrounding roadway network and site driveways during the peak business season (October) for Blake's Farms. This analysis included review of the existing pedestrian traffic signal which provides gaps in vehicular traffic on Armada Center Road to allow pedestrians to cross to/from the parking areas south of Armada Center Road.

Alternative access plans were examined during this analysis including:

- Option 1: Require all Blake's Farms patrons to enter from:
  - Drive #1 (off Romeo Plank Road),
  - Drive #3 (access to the north Blake's Farms parking lot), or
  - Drive #5 (off 34 Mile Road)and exit from one of the three (3) Blake's Farms drives on Armada Center Road (Drives #2, #3, and #4)
- Option 2: Open Drive #1 (off Romeo Plan Road) and Drive #5 (off 34 Mile Road) to entering traffic
- Option 3: Retain the existing drive layouts however install a boulevard section on Armada Center Road in the vicinity of Blake's Farms
- Option 4: Open Drive #1 (off Romeo Plank Road) to entering traffic, construct a center left-turn lane on Armada Center Road, and eliminate left-turns into and out of Drive #2 (western access to the south Blake's Farms parking lot)

Based on the traffic and safety analysis conducted for this report, it was observed that some traffic operational issues are present during the existing annual peak hour however, no correctable crash patterns were identified. Field review showed that Blake's Farms employees perform well in directing vehicular and pedestrian traffic to appropriate parking and pedestrian crossing locations, during high volume periods.

Review of the alternative access plans showed improvements under each plan however, Option #4, Open Drive #1 to entering traffic, construct a center left-turn lane on Armada Center Road, and eliminate left-turns into and out of Drive #2 provided the greatest improvement to traffic operations. Implementation of this

option should be considered after appropriate on-site improvements are made which may include:

- Construct a center left-turn lane on Armada Center Road
- Construct a raised median island at Drive #2 to restrict left turns into and out of Drive #2
- Construct on-site improvements to allow traffic to appropriately utilize Drive #1. Improvements may include:
  - Clear signing directing traffic to the appropriate driveway
  - Widening and leveling of access roads/driveways as needed to allow for two-way traffic
  - On-site signage/visual cues directing traffic to appropriate parking/access areas.

## **I. INTRODUCTION**

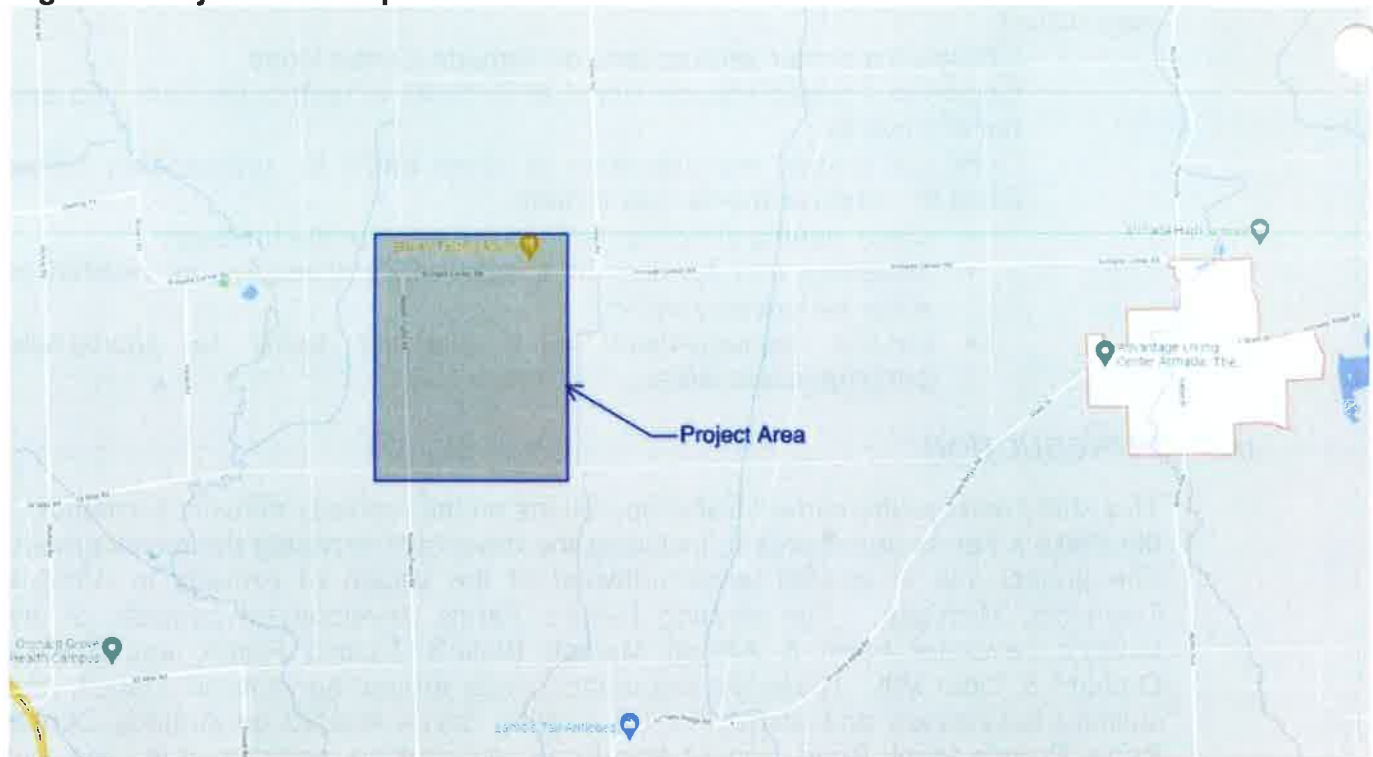
This study reviews the current traffic operations on the roadway network surrounding the Blake's Farms development, including the driveways servicing the development. The project site is located west/northwest of the village of Armada in Armada Township, Michigan. The existing Blake's Farms development consists of the Lovey's Lavender Farm & Artisan Market, Blake's Tasting Room, and Blake's Orchard & Cider Mill. These developments center around agricultural, market, and culinary businesses and utilize five (5) existing drives located on Armada Center Road, Romeo Plank Road, and 34 Mile Road with parking available at the site, but primarily located south of Armada Center Road, requiring patrons to cross Armada Center Road to access Blake's attractions.

This analysis reviews the operations of the surrounding roadway network and site driveways during the peak business season (October) for Blake's Farms. It includes review of the existing traffic signal located between the existing Drive #3 and Drive #4 on Armada Center Road (See Figure 2 for the existing roadway network).

The following methodology was used to conduct this study:

1. Conduct site visits to obtain roadway geometry and observe traffic operations.
2. Perform manual turning and pedestrian movement counts at study area intersections and summarize the existing weekend peak hour vehicular/pedestrian traffic volumes.
3. Evaluate the capacity of study area intersections under existing traffic conditions.
4. Identify operational and/or safety deficiencies of the existing roadway system and identify mitigation measures, if any.

**Figure 1: Project Area Map**



## **II. EXISTING CONDITIONS**

### **A. Study Area Roadways**

#### **1. Armada Center Road**

Armada Center Road is an east-west minor arterial within the study area. From its intersection with Romeo Plank Road east to east of Blake's Farms, Armada Center Road consists of two (2) 10-foot wide asphalt travel lanes in each direction with gravel shoulders and open drainage outside of the travel lanes. The pavement along Armada Center Road in the study area is in fair to good condition. The posted speed limit is 55 mph within the study limits. Land use along Armada Center Road in the study area is primarily a mix of agricultural and low-density residential.

#### **2. Romeo Plank Road**

Romeo Plank Road is a two-lane, two-way asphalt road with 11 ft travel lanes. The posted speed limit throughout the study area is 55 mph. Land use along Romeo Plank Road is primarily agricultural. Gravel shoulders with open drainage exist throughout the project limits on Romeo Plank Road.

### **3. 34 Mile Road**

34 Mile Road is a two-lane, two-way gravel road within the project limits. Land use along 34 Mile Road is primarily agricultural and low-density residential.

## **B. Study Area Intersections**

### **1. Armada Center Road & Romeo Plank Road**

Armada Center Road intersects Romeo Plank Road at an all-way stop controlled intersection. All intersection approaches consist of one lane serving all movements. Two (2) span-wire mounted red flashers spanning across the intersection alert traffic to the STOP controlled intersection.

### **2. Romeo Plank Road & 34 Mile Road**

Romeo Plank Road is connected to 34 Mile Road via an unsignalized intersection. All intersection approaches consist of a single lane accommodating all available movements. The east-west 34 Mile Road approaches consist of an asphalt approach however, beyond the approaches, 34 Mile Road is a gravel cross section.

### **3. Romeo Plank Road & Drive #1**

The Blake's Farms Drive #1 meets Romeo Plank Road at an unsignalized intersection. The Drive #1 approach consists of an approximately 20 foot wide approach with one entering lane and one exiting lane. The Drive #1 approach is a gravel cross section. The Romeo Plank Road approaches to this intersection consist of a single lane in each direction accommodating all available movements.

### **4. Armada Center Road & Drive #2**

This three-legged, unsignalized intersection is formed when Drive #2 connects with Armada Center Road. The Drive #2 approach consists of a single entrance lane and a single exit lane. The Drive #2 approach is a gravel approach and the single exiting lane accommodates all available movements. The Armada Center Road approaches to this intersection consist of a single, shared lane accommodating all available movements.

### **5. Armada Center Road & Drive #3**

Drive #3 intersects Armada Center Road at a three-legged, unsignalized intersection. Drive #3 consists of a single entering lane and a single exiting lane which accommodates all available movements. This drive is the only drive that services the northern parking area for the Blake's Farms property. The Armada Center Road approaches to this intersection consist of a single lane servicing all available movements and are free-flow.

## **6. Armada Center Road & Pedestrian Crossing**

The existing pedestrian crossing which allows visitors of Blake's Farms who park on the south side of Armada Center Road to travel to/from Blake's Farms, has the following features:

- "ladder" style pedestrian crossing pavement markings
- Full traffic signal with two signal faces serving each direction of travel on Armada Center Road and a "No Turns" case sign between the two signal faces.
- Pedestrian crossing warning signs (W11-2) on each Armada Center Road approach
- Pedestrian crossing signal heads for pedestrians crossing Armada Center Road
- Pushbuttons to allow pedestrians to activate the pedestrian traffic signal

## **7. Armada Center Road & Drive #4**

Drive #4 intersects Armada Center Road at a three-legged, unsignalized intersection. Drive #3 consists of a single entering lane and a single exiting lane which accommodates all available movements. The Armada Center Road approaches to this intersection consist of a single lane servicing all available movements and are free-flow.

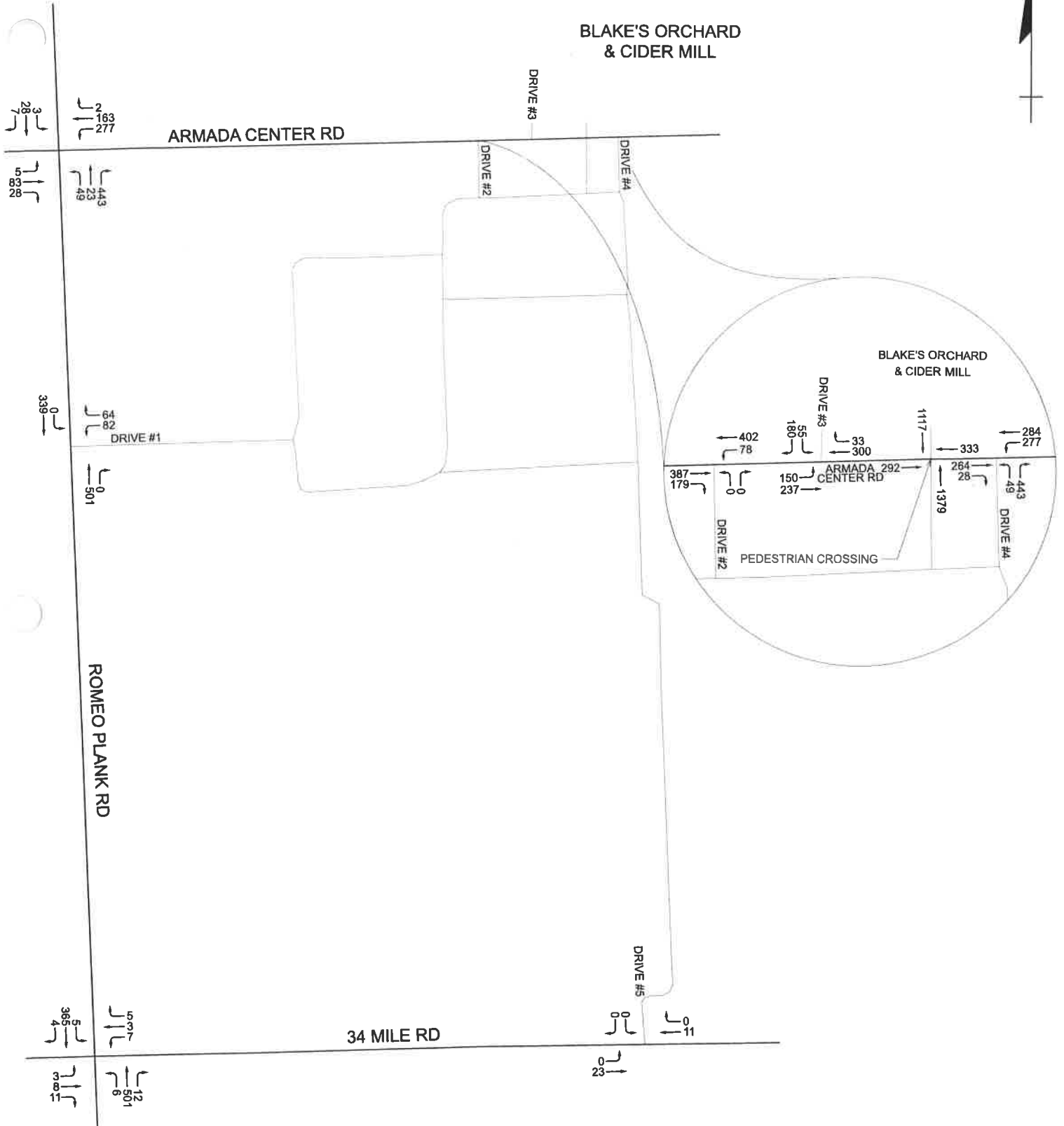
### **III. TRAFFIC VOLUMES**

#### **A. Existing Traffic Volumes**

Manual turning movement counts were performed by Spalding DeDecker at the seven (7) study area intersections on Saturday, October 2, 2021. Based upon consultation with Blake's Farms, the first and second weekend in October represent the busiest time period for their establishment annually. The counts were performed from 11 am to 5 pm to capture the busiest hour of the year for Blake's Farms. The counts were recorded in 15-minute intervals to enable the identification of the peak hour and traffic peaking characteristics, pedestrian activity, and heavy vehicle activity within that hour.

The peak hour occurred from 12:00 PM (noon) to 1:00 PM. Turning movement volumes for each of the study area intersections were reasonably balanced where appropriate. The existing weekend peak hour traffic volumes are shown in Figure 2.





SPALDING DeDECKER	NO SCALE	DESIGN UNIT:	TSC:	DATE: 11/30/2021
		JN:	FIGURE 2	DRAWING SHEET
			EXISTING (2021) TRAFFIC VOLUMES	SECT

FILE:

## **B. Trip Distribution and Assignment**

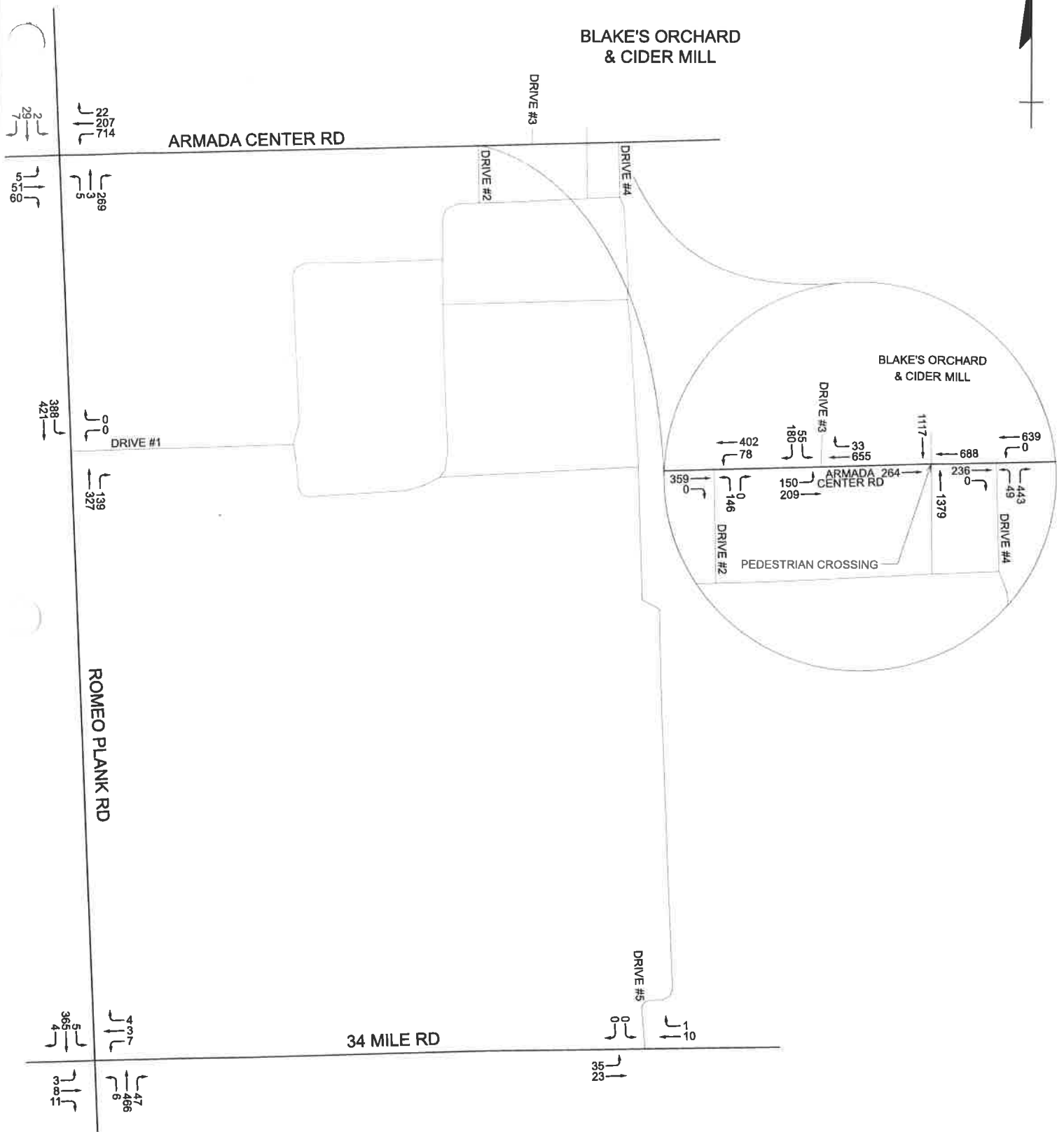
### **1. Option 1: Restricted Entering/Exiting**


This option would require all traffic travelling to Blake's Farms to access the existing parking areas via Drives #1, #3, and #5 only while all exiting traffic would be required to exit the existing Blake's Farms parking area via Drives #2, #3, and #4. Based upon the current roadway and driveway layouts/characteristics the following assumptions were made to redistribute traffic amongst the driveways:

- Entering Traffic
  - Traffic entering at Drive #3 will continue to enter at Drive #3
  - Traffic travelling from the south
    - 80% will enter at Drive #1
    - 20% will enter at Drive #5
  - Traffic travelling from the east or west
    - All will enter at Drive #1
- Exiting Traffic
  - All traffic currently exiting at Drive #1 will exit at Drive #2

The above assumptions were developed based upon the distance traffic would be required to travel to access the Blake's Farms driveways and the condition of the roadways that the traffic would be required to traverse to access those driveways. Key to these assumptions is that traffic will be required to traverse a 3,300 ft section of gravel road on 34 Mile Road to access Drive #5. This led to a greater percentage of traffic travelling from the south utilizing Drive #1 when compared to Drive #5.

The traffic volumes for this Option are shown in Figure 3.



FILE:	 <b>SPALDING DeDECKER</b>	<b>NO SCALE</b>	DESIGN UNIT:	TSC:	DATE: 11/30/2021
			JN:	FIGURE 3	DRAWING SHEET
				OPTION 1 (2021) TRAFFIC VOLUMES	SECT

## **2. Option 2: Open Drives #1 and #5 to Entering Traffic**

This option would open Drives #1 and #5 to entering traffic, thus reducing entering traffic burdens at the remaining three driveways. The proposed traffic redistribution was based upon the current roadway and driveway layouts/characteristics. The following assumptions were made to redistribute traffic amongst the driveways:

- Entering Traffic
  - Traffic travelling from the south
    - 80% will enter at Drive #1
    - 20% will enter at Drive #5
  - Traffic travelling from the west
    - 15% of remaining Drive #2 entering traffic will enter at Drive #1
    - 5% of remaining Drive #4 entering traffic will enter at Drive #1

The above assumptions were developed based upon the distance traffic would be required to travel to access the Blake's Farms driveways and the condition of the roadways that the traffic would be required to traverse to access those driveways.

The traffic volumes for this Option are shown in Figure 4.

### **3. Option 3: Construct a Boulevard Section on Armada Center Road in the Vicinity of Blake's Farms**

This option would retain the existing traffic distribution. No modifications to traffic volumes would result from this option. The traffic volumes for this Option are shown in Figure 2.

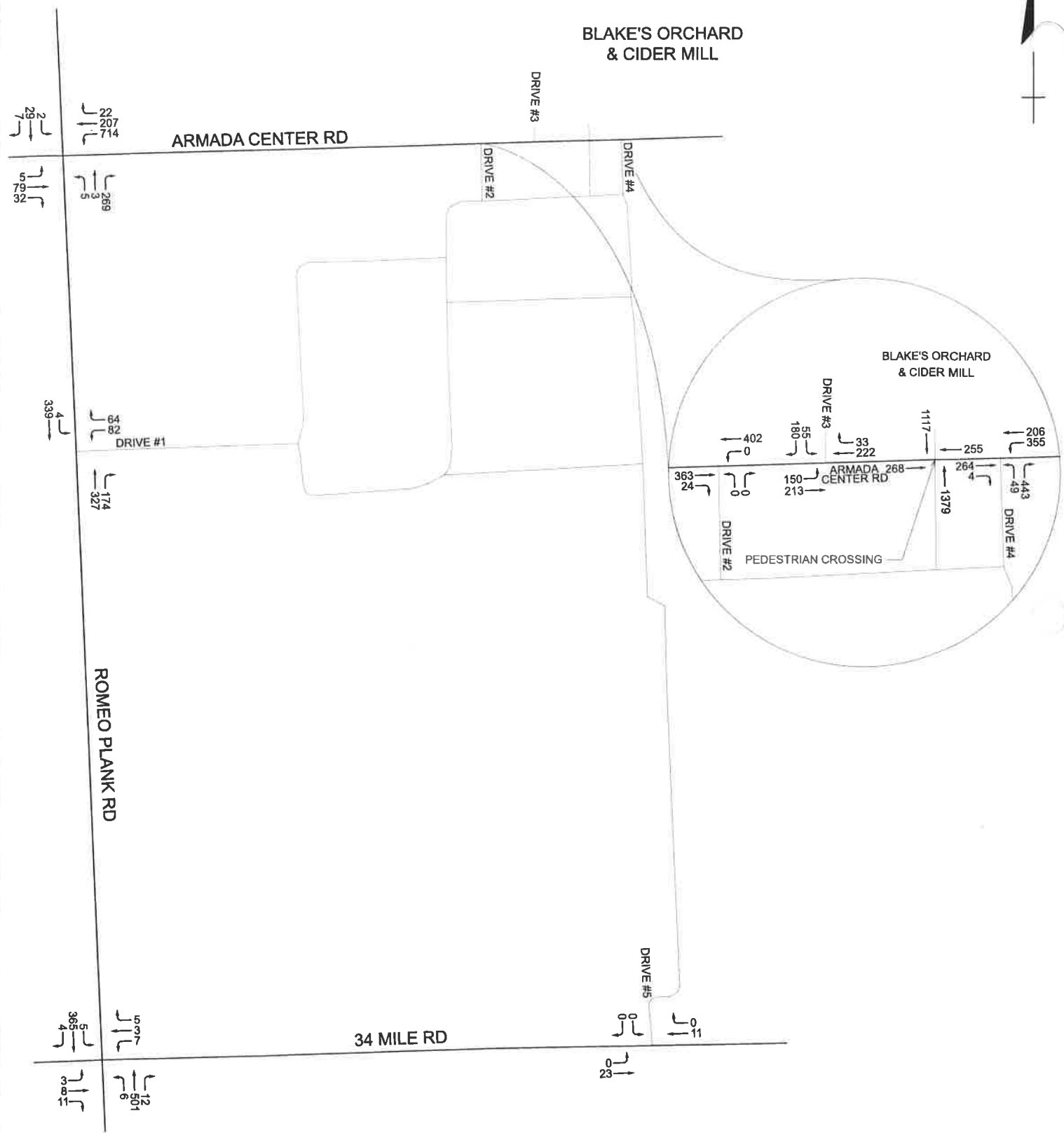
### **4. Option 4: Open Drive #1 to Entering Traffic, Center Left-Turn on Armada Center and No Left-Turns at Drive #2**

This option would open Drive #1 to entering traffic, construct a center left-turn lane on Armada Center Road, and eliminate left-turns into and out of Drive #2, thus reducing entering traffic burdens at Drive #2 and reducing traffic on Armada Center Road in front of Blake's Farms. The proposed traffic redistribution was based upon the current roadway and driveway layouts/characteristics. The following assumptions were made to redistribute traffic amongst the driveways:

- Entering Traffic
  - Traffic travelling from the south
    - 100% will enter at Drive #1
  - Traffic travelling from the west
    - 15% of remaining Drive #2 entering traffic will enter at Drive #1
    - 5% of remaining Drive #4 entering traffic will enter at Drive #1
  - Traffic travelling from the east
    - 100% of traffic travelling to the south parking lot will enter at Drive #4

The above assumptions were developed based upon the distance traffic would be required to travel to access the Blake's Farms driveways and the condition of the roadways that the traffic would be required to traverse to access those driveways.

The traffic volumes for this Option are shown in Figure 5.



**NO SCALE**

DESIGN UNIT:	TSC:	DATE: 11/	11
JN:	FIGURE 5	DRAWING SHEET	
	OPTION 4 (2021) TRAFFIC VOLUMES	SECT	

FILE:



#### **IV. TRAFFIC OPERATIONS ANALYSIS**

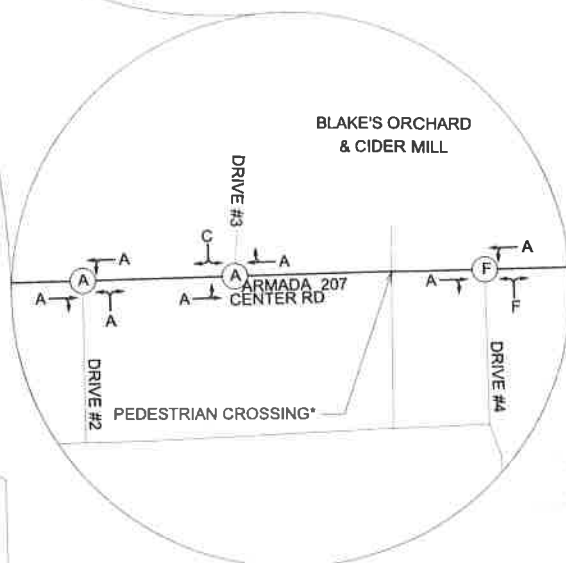
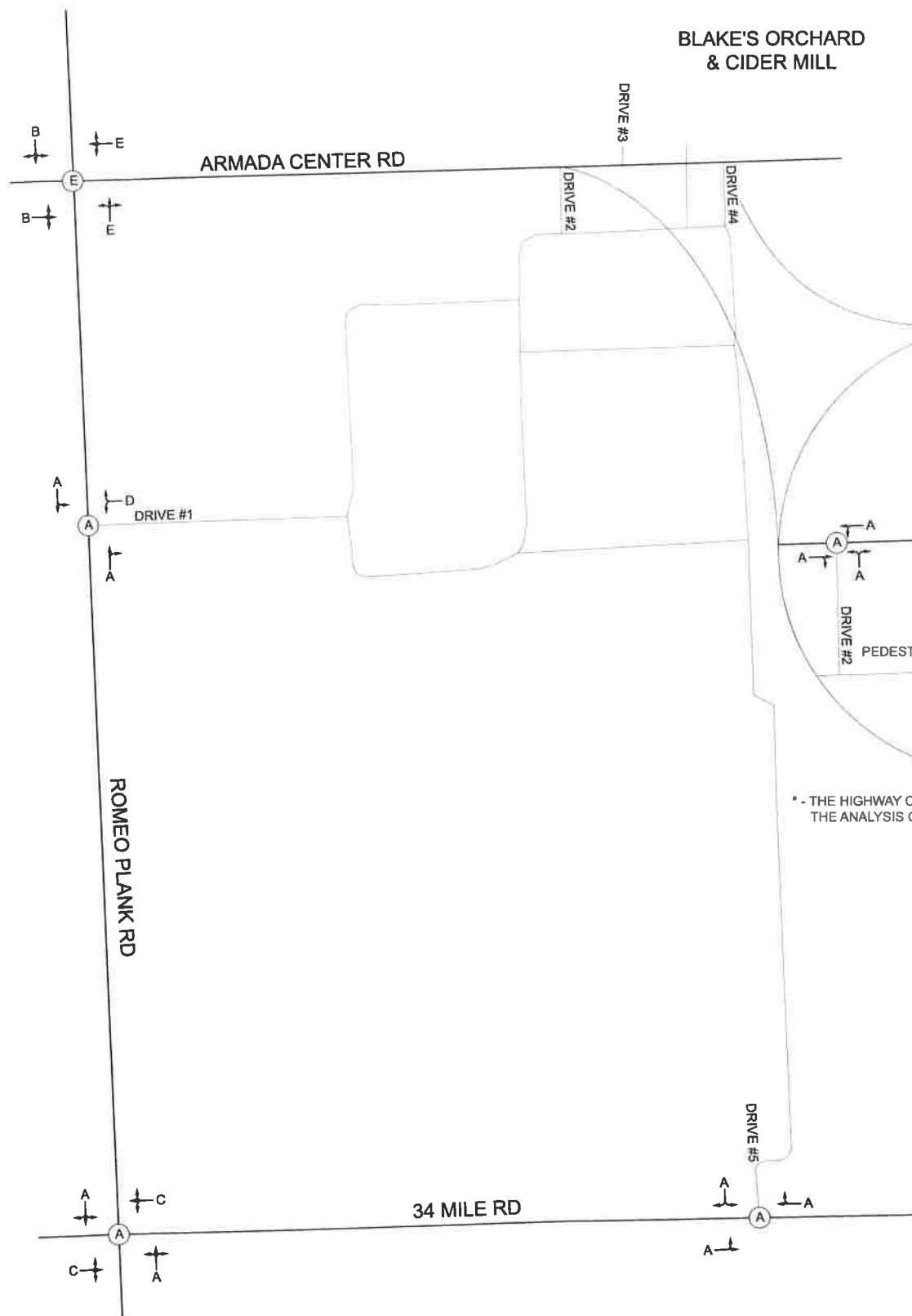
Based on the traffic counts, traffic peaking characteristics, and intersection geometry, a level of service analysis was conducted for the existing traffic conditions. This analysis is necessary to determine the ability of an intersection or roadway to accommodate traffic. Level of service (LOS) is a qualitative measure that describes motorist satisfaction with various factors influencing the degree of traffic congestion. These factors include travel time, speed, maneuverability, and delay.

The level of service analysis methodology for analyzing signalized and unsignalized intersections is documented in the Highway Capacity Manual (HCM) (Transportation Research Board, Washington D.C., 2020). Levels of service range from A to F. LOS A describes operations with little or no delay while LOS F describes highly congested conditions with substantial delays. LOS D or better is generally considered acceptable for peak hours of traffic under peak hour conditions.

Synchro 11 software was used to analyze the traffic operations. Synchro allows for the analysis and optimization of isolated signals and coordinated traffic signal systems. The Synchro model accounts for the affects upstream intersection operations have on individual intersections when developing levels of service. A base model of the traffic operations network was developed for the study area which includes the existing roadway characteristics.

##### **A. Existing (2021) Conditions**

The level of service results for existing conditions are shown in Figure 6. Results are shown for the overall intersection and each lane group. Corresponding values of control delay in seconds per vehicle (s/veh) are summarized in tables included in Appendix B.



\* - THE HIGHWAY CAPACITY MANUAL DOES NOT SUPPORT THE ANALYSIS OF PEDESTRIAN TRAFFIC SIGNALS

KEY:	
	LANE GROUP LEVEL OF SERVICE
	OVERALL INTERSECTION LEVEL OF SERVICE



NO SCALE

DESIGN UNIT:	TSC:	DATE: 11/1/21
JN:	FIGURE 6	DRAWING SHEET
	EXISTING (2021) LEVELS OF SERVICE	SECT

FILE:

As shown, all of the intersection approaches within the study area are currently operating at acceptable levels of service (LOS D or better) during the annual weekend peak hour with the exception of the Armada Center Road/Romeo Plank Road and Armada Center Road/Drive #4 intersections.

Analysis of the Armada Center Road/Romeo Plank Road intersection shows unacceptable delays with calculated lane group delays ranging from 11 to 46 seconds/vehicle and an overall intersection LOS E with 38 seconds of delay per vehicle on average. In general, the northbound and westbound movements account for the majority of the intersection delays. Volume to capacity (v/c) ratios are calculated below 1.00 on all of the approaches with the greatest v/c ratio of 0.92 on the westbound approach. This means that while extended delays are calculated, there is still sufficient capacity at the intersection to accommodate additional traffic volume however, as the intersection approaches come closer to capacity, minor variations in traffic flows may disrupt traffic operations through the intersection significantly. Based upon field observations and SimTraffic simulation of the intersection, minor queues (1-4 vehicles) occasionally occur, however, no significant queuing was present.

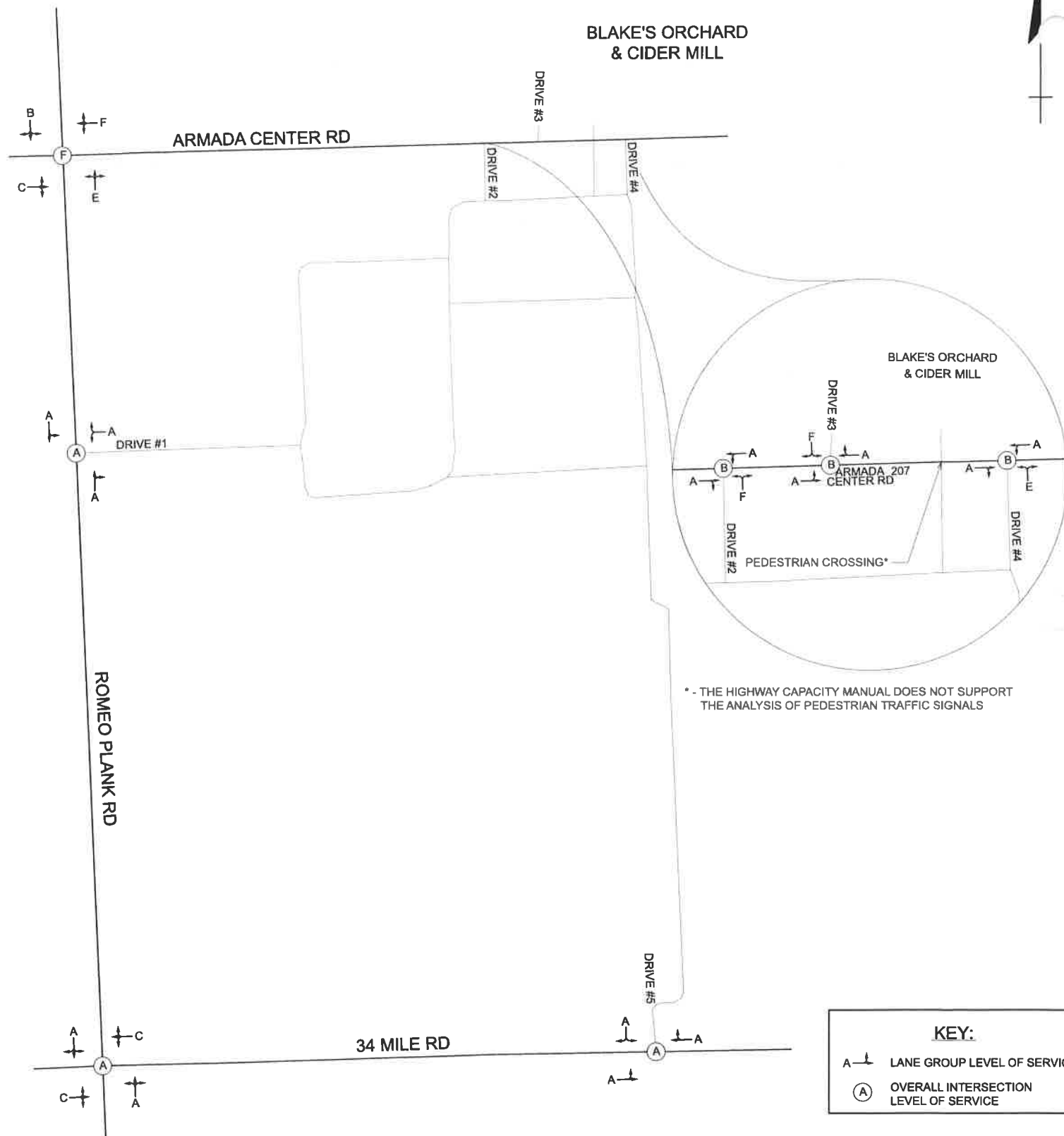
The intersection of Armada Center Road/Drive #4 was also shown to currently operate with excessive calculated delays. As shown in Figure 6, the northbound (Blake's Drive #4) approach is shown to operate at a poor level of service under annual weekend peak hour conditions. Volume to capacity (v/c) ratios are calculated above 1.00 on this approach as well. This means that this approach is currently operating above capacity and that some vehicles may be required to endure significant delays before clearing the intersection and queuing may exist during the annual weekend peak hour. Based upon field observations and SimTraffic simulation of the intersection, significant queues (10 vehicles average on the Drive #4 approach and 16 vehicles average on the westbound approach) occur.

Queuing on the westbound Armada Center Road approach is caused by the upstream pedestrian crossing traffic signal. Based upon field review and SimTraffic simulation, the large number of pedestrians (nearly 2,500 during the annual weekend peak hour) activate the traffic signal every cycle, causing through traffic on Armada Center Road to stop while pedestrians cross. These stops of vehicular traffic produce westbound Armada Center Road queues that extend beyond Drive #4 and cause left-turning traffic from Drive #4 to wait for these queues to diminish prior to completing their turn. Field observations show that a single exiting lane is present on Drive #4 which required all traffic to wait until left-turn movements can be accomplished after the westbound Armada Center Road queues diminish.

## **B. Option 1 (2021) Conditions**

The level of service results for Option 1 (2021) conditions are shown in Figure 7. Results are shown for the overall intersection and each lane group. Corresponding

N



values of control delay in seconds per vehicle (s/veh) are summarized in tables included in Appendix B.

As stated earlier in this report, this option would redistribute entering and exiting trips to/from the existing Blake's Farms development to various existing access points for the Blake's Farms development. In addition, the existing exiting approaches at Drive #2 and Drive #4 will be reconfigured to utilize the existing two-lane driveway width to accommodate an exclusive left-turn exiting lane and an exclusive right-turn exiting lane. With this trip redistribution and driveway lane reconfiguration, minor improvements to existing LOS are provided in select locations, however, the Armada Center Road/Romeo Plank Road and Armada Center Road/Drive #4 intersections will continue to provide unacceptable LOS and two (2) new intersections are also calculated to provide unacceptable LOS on at least one intersection approach: Armada Center Road/Drive #2 and Armada Center Road/Drive #3.

As with existing conditions, analysis of the Armada Center Road/Drive #4 intersection showed poor LOS on the northbound approach, however, with Option 1, this approach is projected to improve from LOS F (357 sec/veh) under existing conditions to LOS E (43 sec/veh) operating conditions. The overall intersection LOS is also projected to improve from LOS F (161 sec/veh) under existing conditions to LOS B (19 sec/veh) under Option 1 conditions. Westbound queues are projected to be 13 vehicles on average at this intersection. As stated under the existing conditions discussion, queuing on the westbound Armada Center Road approach is caused by the upstream pedestrian crossing traffic signal. The stops of vehicular traffic caused by the upstream pedestrian signal produce westbound Armada Center Road queues that extend beyond Drive #4 and cause left-turning traffic from Drive #4 to wait for these queues to diminish prior to completing their turn. While this option provides separate lanes for Drive #4 right and left-turns, queuing on the Drive #4 approach average approximately 7 vehicles on each lane.

Similarly, the northbound approach at the Armada Center Road/Romeo Plank Road intersection is projected to improve from LOS E (39 sec/veh) to LOS C (16 sec/veh) under Option 1 conditions. However, the westbound approach is projected to degrade from LOS E (46 sec/veh) to LOS F (327 sec/veh) and the overall intersection is projected to also degrade from LOS E (38 sec/veh) to LOS F (232 sec/veh). These altered operations are due to the redistribution of entering traffic from the northbound right-turn at this intersection to Drives #1 and #5 and the redistribution of entering traffic at Drives #2 and #4 to Drive #1, adding more than 400 westbound left-turns to this intersection. These additional westbound left-turns result in westbound Armada Center Road queues calculated to average 76 vehicles in length. Review of a traffic signal at this intersection to improve operations could be provided however, due to the seasonal nature of these traffic volumes, it is unlikely that a traffic signal will be warranted.

The combination of redistribution of exiting trips to the Blake's Farms driveways on Armada Center Road and requiring entering trips to travel west along Armada Center Road to Romeo Plank Road leads to poor operations at the Drive #2 and

Drive #3 intersections. The addition of 146 exiting left-turns at Drive #2 results in LOS F (142 sec/veh) operating conditions for the northbound (Driveway #2) approach. While the addition of 355 westbound through trips at the Drive #3 intersection results in LOS F (116 sec/veh) conditions for the southbound (Driveway #3) approach. Queuing on both the Drive #2 and Drive #3 approaches are calculated to be 7 vehicles on average with this option in place.

Volume to capacity (v/c) ratios are calculated above 1.00 on the following intersection approaches for this option:

- Westbound Armada Center Road/Romeo Plank Road (v/c = 1.67 compared to 0.92 under existing conditions)
- Northbound Drive #2 (v/c = 1.04 compared to 0 under existing conditions)
- Southbound Drive #3 (v/c = 1.06 compared to 0.58 under existing conditions)

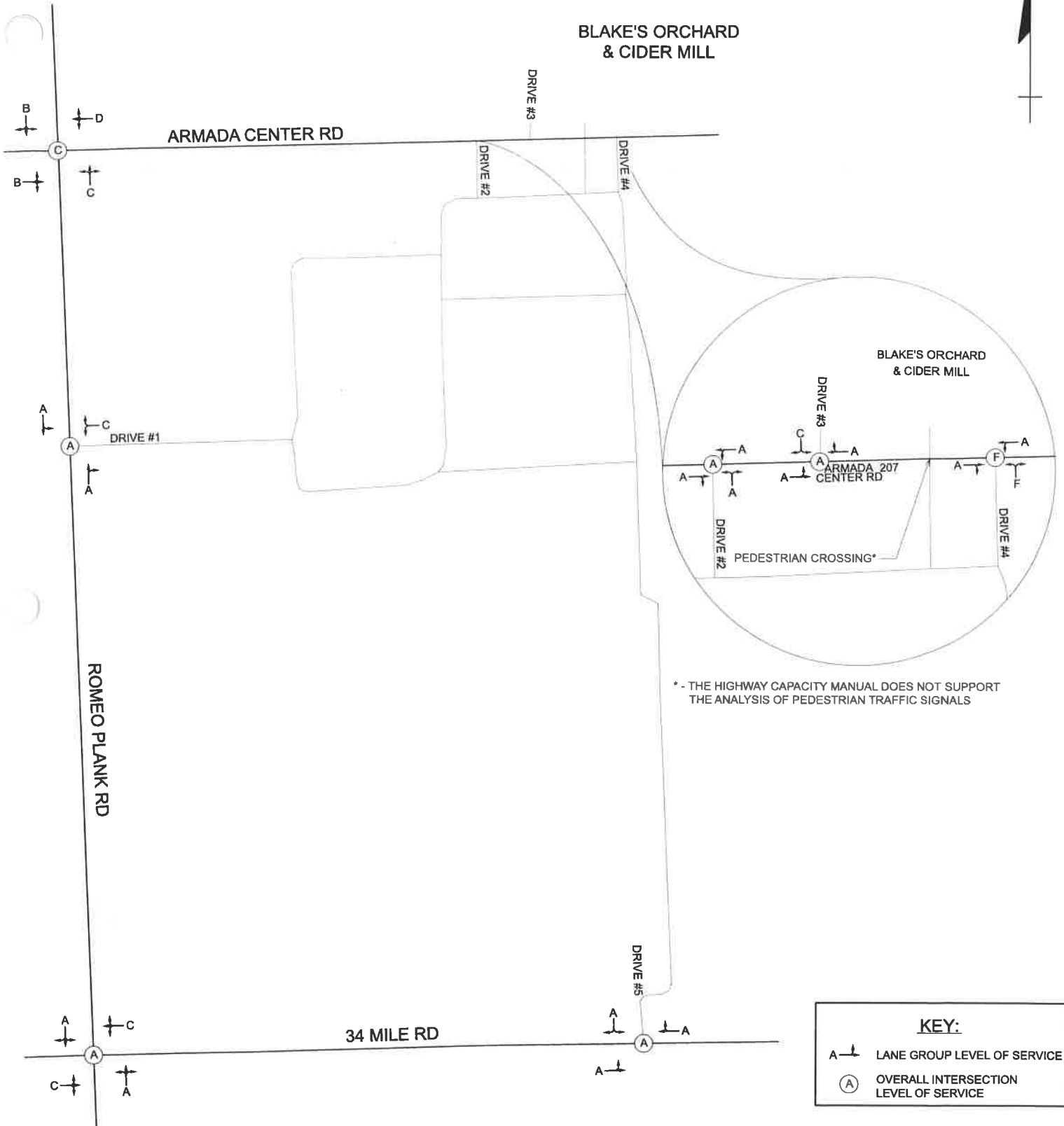
This means that these movements will operate above capacity and that traffic flow will become increasingly unstable resulting in excessive delays and queuing before clearing the intersection during the annual weekend peak hour. Please also note that the northbound Drive #4 approach is projected to operate at a v/c ratio of 0.96 (compared to 1.73 under existing conditions), just below capacity despite separation of the right and left-turn movements.

#### **C. Option 2 (2021) Conditions**

The level of service results for Option 2 (2021) conditions are shown in Figure 8. Results are shown for the overall intersection and each lane group. Corresponding values of control delay in seconds per vehicle (s/veh) are summarized in tables included in Appendix B.

As stated earlier in this report, this option would retain the existing drive layout and composition, however, Drives #1 and #5 would be opened to entering traffic. With this trip redistribution, several improvements to existing LOS are provided, leaving only the Armada Center Road/Drive #4 intersection that will continue to provide unacceptable LOS.





KEY:	
A	LANE GROUP LEVEL OF SERVICE
(A)	OVERALL INTERSECTION LEVEL OF SERVICE

SPALDING DeDECKER	NO SCALE	DESIGN UNIT:	TSC:	DATE: 11/30/2021
		JN:	FIGURE 8	DRAWING SHEET
			OPTION 2 (2021) LEVELS OF SERVICE	SECT

As with existing conditions, analysis of the Armada Center Road/Drive #4 intersection showed poor LOS on the northbound approach, however, with Option 2, the delay experienced by vehicles on this approach is projected to improve slightly from LOS F (357 sec/veh) under existing conditions to LOS F (341 sec/veh) operating conditions. The overall intersection delay is also projected to improve slightly from LOS F (161 sec/veh) under existing conditions to LOS F (156 sec/veh) under Option 2 conditions. Westbound queues are projected to be 10 vehicles on average at this intersection. As stated under the existing conditions discussion, queuing on the westbound Armada Center Road approach is caused by the upstream pedestrian crossing traffic signal. The stops of vehicular traffic caused by the upstream pedestrian signal produce westbound Armada Center Road queues that extend beyond Drive #4 and cause left-turning traffic from Drive #4 to wait for these queues to diminish prior to completing their turn. This queuing causes queues on the Drive #4 approach to average approximately 9 vehicles under Option 2 conditions.

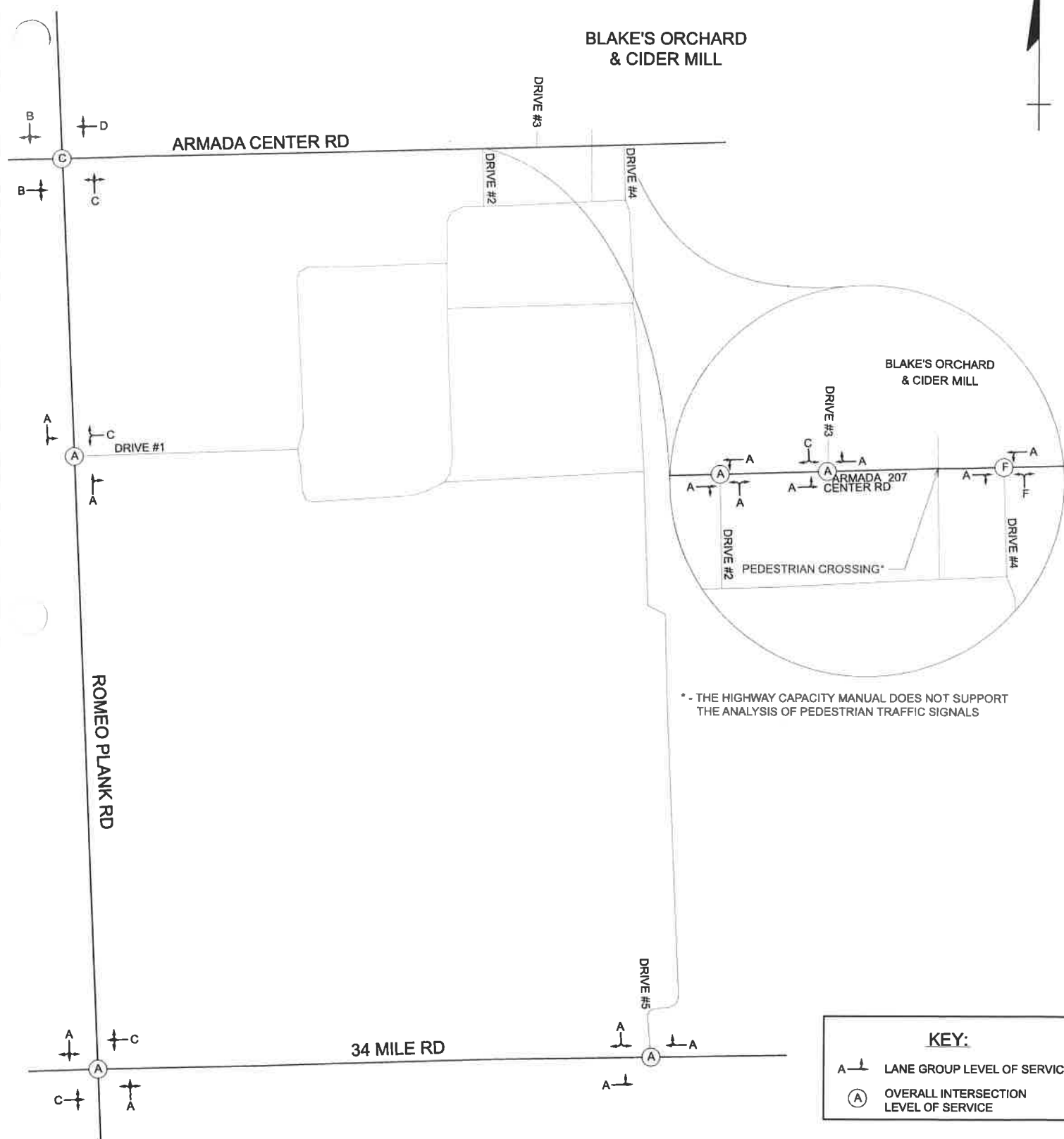
Only the northbound Drive #4 approach is calculated to operate at a v/c ratio greater than 1.0 under Option 2 conditions. This approach is projected to operate with a v/c ratio of 1.69 under this option compared to 1.73 under existing conditions. This means that these movements will operate above capacity and that traffic flow will become increasingly unstable resulting in excessive delays and queuing before clearing the intersection during the annual weekend peak hour.

#### **D. Option 3 (2021) Conditions**

The level of service results for Option 3 (2021) conditions are shown in Figure 9. Results are shown for the overall intersection and each lane group. Corresponding values of control delay in seconds per vehicle (s/veh) are summarized in tables included in Appendix B.

As stated earlier in this report, this option would retain the existing drive layout, composition, and access however, Armada Center Road would be reconstructed as a boulevard in the vicinity of Blake's Farms. With this roadway configuration, minor operational improvements are provided by allowing left-turn lanes for Armada Center Road left-turning traffic. However, the Armada Center Road/Romeo Plank Road and Armada Center Road/Drive #4 intersections will continue to provide unacceptable LOS with this option.

The largest benefits associated with this option will be: removal of left-turning traffic from the through traffic stream via median exclusive left-turn lanes, and the potential of pedestrian storage in the median. The exclusive left-turn lanes will allow left-turning traffic to queue in exclusive lanes while allowing through traffic to progress relatively unaffected which will result in better operations and better safety by reducing the potential for rear-end crashes. The median could also serve as pedestrian refuge for pedestrians that begin their movement across Armada Center Road, but can only complete the crossing of one bound of Armada Center Road prior to the signal changing.



\* - THE HIGHWAY CAPACITY MANUAL DOES NOT SUPPORT THE ANALYSIS OF PEDESTRIAN TRAFFIC SIGNALS

**KEY:**

A

LANE GROUP LEVEL OF SERVICE

A

OVERALL INTERSECTION LEVEL OF SERVICE

FILE:	SPALDING DeDECKER	NO SCALE	DESIGN UNIT:	TSC:	DATE: 11/30/2021
			JN:	FIGURE 9	DRAWING SHEET
				OPTION 3 (2021) LEVELS OF SERVICE	SECT

Because no improvements are proposed at the Armada Center Road/Romeo Plank Road intersection, the projected operations at this intersection will remain as they are existing. The northbound approach will continue to operate at LOS E (39 sec/veh) under Option 3 conditions. The westbound approach will also continue to operate at LOS E (46 sec/veh) and the overall intersection will continue to operate at LOS E (38 sec/veh).

As with existing conditions, analysis of the Armada Center Road/Drive #4 intersection showed poor LOS on the northbound approach, however, with Option 3, the delay on this approach is projected to improve from LOS F (357 sec/veh) under existing conditions to LOS F (210 sec/veh). The overall intersection delay is also projected to improve from LOS F (161 sec/veh) under existing conditions to LOS F (96 sec/veh) under Option 3 conditions. Westbound queues are projected to be 2 vehicles on average at this intersection. As stated under the existing conditions discussion, queuing on the westbound Armada Center Road approach is caused by the upstream pedestrian crossing traffic signal. The stops of vehicular traffic caused by the upstream pedestrian signal produce westbound Armada Center Road queues that extend beyond Drive #4 and cause left-turning traffic from Drive #4 to wait for these queues to diminish prior to completing their turn. While this option provides separate lanes for westbound Armada Center Road left-turns, queuing on the Drive #4 approach still average approximately 9 vehicles.

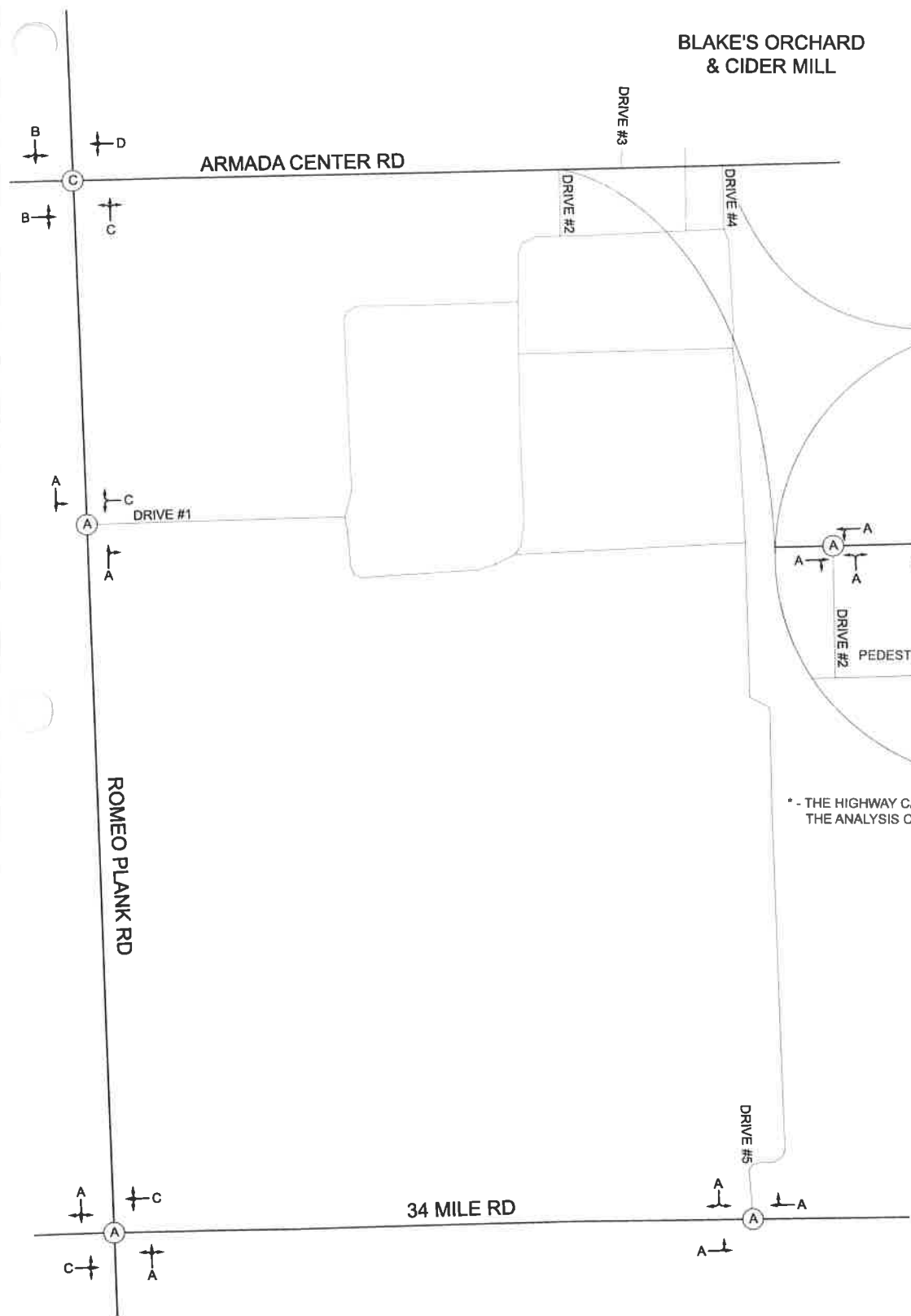
Volume to capacity (v/c) ratios are calculated above 1.00 on the northbound Drive #4 (v/c = 1.40 compared to 1.73 under existing conditions). This means that this movement will operate above capacity and that traffic flow will become increasingly unstable resulting in excessive delays and queuing before clearing the intersection during the annual weekend peak hour.

While minor variations in delay are projected at the remaining study area intersections, all intersection approaches and overall intersections will continue to operate at existing LOS with this option.

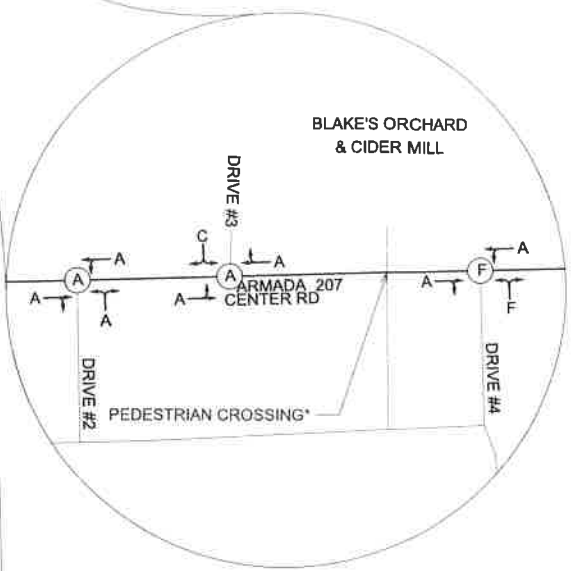
#### **E. Option 4 (2021) Conditions**

The level of service results for Option 4 (2021) conditions are shown in Figure 10. Results are shown for the overall intersection and each lane group. Corresponding values of control delay in seconds per vehicle (s/veh) are summarized in tables included in Appendix B.

As stated earlier in this report, this option would retain the existing drive layout and composition, however, Drive #1 would be opened to entering traffic, a center left-turn lane would be constructed on Armada Center Road servicing Drives #3 and #4, and left-turns into and out of Drive #2 would be eliminated via a raised median island on Armada Center Road. With these modifications, several improvements to existing LOS are provided, leaving only the Armada Center Road/Drive #4 intersection that will continue to provide unacceptable LOS.



\* - THE HIGHWAY CAPACITY MANUAL DOES NOT SUPPORT THE ANALYSIS OF PEDESTRIAN TRAFFIC SIGNALS




**KEY:**

A

LANE GROUP LEVEL OF SERVICE

A

OVERALL INTERSECTION LEVEL OF SERVICE

FILE:	 <b>SPALDING DeDECKER</b>	<b>NO SCALE</b>	DESIGN UNIT:	TSC:	DATE: 11/30/2021
			JN:	FIGURE 10	DRAWING SHEET
				OPTION 4 (2021) LEVELS OF SERVICE	SECT

As with existing conditions, analysis of the Armada Center Road/Drive #4 intersection showed poor LOS on the northbound approach, however, with Option 4, the delay experienced by vehicles on this approach is projected to improve slightly from LOS F (357 sec/veh) under existing conditions to LOS F (237 sec/veh) operating conditions. The overall intersection delay is also projected to improve slightly from LOS F (161 sec/veh) under existing conditions to LOS F (110 sec/veh) under Option 4 conditions. Westbound queues are projected to be 2 vehicles on average at this intersection. As stated under the existing conditions discussion, queuing on the westbound Armada Center Road approach is caused by the upstream pedestrian crossing traffic signal. The stops of vehicular traffic caused by the upstream pedestrian signal produce westbound Armada Center Road queues that extend beyond Drive #4 and cause left-turning traffic from Drive #4 to wait for these queues to diminish prior to completing their turn. This queuing causes queues on the Drive #4 approach to average approximately 9 vehicles under Option 4 conditions.

Only the northbound Drive #4 approach is calculated to operate at a v/c ratio greater than 1.0 under Option 4 conditions. This approach is projected to operate with a v/c ratio of 1.46 under this option compared to 1.73 under existing conditions. This means that these movements will operate above capacity and that traffic flow will become increasingly unstable resulting in excessive delays and queuing before clearing the intersection during the annual weekend peak hour.

## **V. CRASH ANALYSIS**

A crash analysis for Blake's Farms on Armada Center Road from Romeo Plank Road to east of the Blake's orchard parking lot entrances, Romeo Plank Road from 34 Mile to Armada Center Rd, and 34 Mile from Romeo Plank Road to the southern driveway entrance to Blake's Farms parking lot was performed to determine current concerns that may be impacted by traffic alterations. Crash reports were compiled for the years of 2016 through 2020.

### **A. Armada Center Road from Romeo Plank Road to 950 ft West of Cape Road**

There were 25 reported crashes over the last five years. Most crashes resulted in property damage only or possible injury crashes. One crash resulted in a suspected incapacitating injury ('A' injury) and no crashes resulted in a fatality ('K' injury). The most prominent crash types were Single Motor Vehicle crashes (11) and Rear-End crashes (8).

**Table 1: Study Area Crashes by Type and Severity**

Crash Type	No Injury	Possible Injury	Incapacitating Injury (A)	Total
Single Motor Vehicle	7	3	1	<b>11</b>
Head-on	0	1	0	<b>1</b>
Angle	1	0	0	<b>1</b>
Rear-End	4	4	0	<b>8</b>
Rear-End Left-Turn	0	1	0	<b>1</b>
Other	3	0	0	<b>3</b>
<b>Total</b>	<b>15</b>	<b>9</b>	<b>1</b>	<b>25</b>

Specifically, at Blake's Farms off of Armada Center Road there were 11 total crashes. Of these crashes, only one was a suspected incapacitating injury. A majority of these crashes were classified as Single Motor Vehicle crashes (6). The rest of the crashes were classified as Rear-End (2), Other (2), and Rear-End Left Turn (1). Pedestrians were not involved in any of the reported crashes.

**Table 2: Blake's Farm Drive Area Crashes by Type and Severity**

Crash Type	No Injury	Possible Injury	Incapacitating Injury (A)	Total
Single Motor Vehicle	2	3	1	<b>6</b>
Rear-End	1	1	0	<b>2</b>
Rear-End Left-Turn	0	1	0	<b>1</b>
Other	2	0	0	<b>2</b>
<b>Total</b>	<b>5</b>	<b>5</b>	<b>1</b>	<b>11</b>

Review of the A-Level injury crash report shows that the crash occurred east of Capac Road on Armada Center Road in September of 2016 as a single-vehicle crash. According to the crash report, the vehicle was travelling eastbound in the early morning hours (2 am) under dark and foggy conditions (clear and dry roadway) when it crossed the center line and entered the ditch along westbound Armada Center Road. The vehicle then struck a driveway embankment, flipping the vehicle onto its roof. Neither drugs nor alcohol were factors in the crash.

#### **B. Romeo Plank Road from 34 Mile Road to Armada Center Road**

There were 36 reported crashes over the last five years. A majority of the crashes resulted in no injury. One crash resulted in a suspected incapacitating injury and none of the crashes resulted in a fatality. Most crashes that occurred were classified as Single Motor Vehicle crashes (17) or Rear-End crashes (12).



**Table 3: Romeo Plank Road (34 Mile to Armada Center) Crashes by Type and Severity**

Crash Type	No Injury	Possible Injury	Incapacitating Injury (A)	Total
Single Motor Vehicle	15	2	0	<b>17</b>
Rear-End	8	4	0	<b>12</b>
Rear-End Left-Turn	0	1	0	<b>1</b>
Sideswipe – Same Direction	1	0	0	<b>1</b>
Other	4	1	1	<b>6</b>
<b>Total</b>	<b>28</b>	<b>8</b>	<b>1</b>	<b>37</b>

Review of the A-Level injury crash report shows that the crash occurred at the Romeo Plank Road/34 Mile Road intersection in November of 2016 as a right-angle crash. According to the crash report, an eastbound 34 Mile Road vehicle stopped at the stop sign then continued through the intersection striking a southbound Romeo Plank vehicle. The 34 Mile Road vehicle driver stated that they were unable to see the Romeo Plank Road vehicle due to foggy conditions. Neither drugs nor alcohol were factors in the crash.

**C. 34 Mile Road to 900 Feet West of Castle Ct.**

According to the data, there were no crashes for this section of 34 Mile Road over the last five years.

**D. Blake's Farms Pedestrian Crashes**

As discussed above, there weren't any crashes near Blake's Farms that involved pedestrians. Currently, nearly 2,500 pedestrians cross Armada Center Road between the south parking area and Blake's Farms during the annual weekend peak hour. A traffic signal located between Drive #3 and Drive #4 facilitates these crossings. In addition, the marked crossing includes a marked crosswalk and pedestrian crossing warning signs. Based upon field review, Blake's Farms employees diligently patrol this crossing to ensure all pedestrians crossing Armada Center Road utilize this crossing resulting in extremely good compliance from patrons.

Due to the high-speed limit on Armada Center Road (55 mph), the current pedestrian provisions are nearly as extensive as possible and clearly mitigate current pedestrian safety concerns. However, should Blake's Farms determine an improvement to the existing pedestrian crossing facilities are necessary, FHWA Safety Countermeasures Report FHWA-SA-21-044 reports that addition of a pedestrian refuge island results in an average of 56% reduction in pedestrian-related crashes. Investigation into a pedestrian refuge island may be provided if/when necessary to mitigate the risk of pedestrian-related crashes.



## **VI. SUMMARY AND RECOMMENDATIONS**

This study reviewed the current traffic operations on the roadway network surrounding the Blake's Farms development, including the driveways servicing the development during the peak business season (October) for Blake's Farms. It included review of the existing pedestrian traffic signal which provides gaps in vehicular traffic on Armada Center Road to allow pedestrians to cross to/from the parking areas south of Armada Center Road.

Alternative access plans were examined during this analysis including:

- Option 1: Require all Blake's Farms patrons to enter from:
  - Drive #1 (off Romeo Plank Road),
  - Drive #3 (access to the north Blake's Farms parking lot), or
  - Drive #5 (off 34 Mile Road)and exit from one of the three (3) Blake's Farms drives on Armada Center Road (Drives #2, #3, and #4)
- Option 2: Open Drive #1 (off Romeo Plan Road) and Drive #5 (off 34 Mile Road) to entering traffic
- Option 3: Retain the existing drive layouts and functionality however install a boulevard section on Armada Center Road in the vicinity of Blake's Farms
- Option 4: Open Drive #1 (off Romeo Plank Road) to entering traffic, construct a center left-turn lane on Armada Center Road, and eliminate left-turns into and out of Drive #2 (western access to the south Blake's Farms parking lot)

Based on the traffic and safety analysis conducted for this report, it was observed that some traffic operational issues are present during the existing annual peak hour however, no correctable crash patterns were present. Field review showed that Blake's Farms employees perform well in directing traffic to appropriate parking and pedestrian crossing locations, improving operations and safety during high volume periods.

Review of the alternative access plans showed improvements under each plan however, Option 4, Open Drive #1 to entering traffic, construct a center left-turn lane on Armada Center Road, and eliminate left-turns into and out of Drive #2 (western access to the south Blake's Farms parking lot) provided the greatest improvement to traffic operations. Implementation of this option should be considered after appropriate on-site improvements are made which may include:

- Construct a center left-turn lane on Armada Center Road
- Construct a raised median island at Drive #2 to restrict left turns into and out of Drive #2
- Construct on-site improvements to allow traffic to appropriately utilize Drive #1. Improvements may include:
  - Clear signing directing traffic to the appropriate driveway
  - Widening and leveling of access roads/driveways as needed to allow for two-way traffic

- On-site signage/visual cues directing traffic to appropriate parking/access areas.



## **APPENDIX A**

### **Level of Service Definitions**

### Definitions of Level of Service for Unsignalized Intersections

Level of Service	Expected Delay to Minor Street Traffic	Control Delay Per Vehicle (sec)
A	Little or no delay	$\leq 10$
B	Short traffic delays	$> 10$ and $\leq 15$
C	Average traffic delays	$> 15$ and $\leq 25$
D	Long traffic delays	$> 25$ and $\leq 35$
E	Very long traffic delays	$> 35$ and $\leq 50$
F	*	$> 50$

\* When extreme delays will be encountered with queuing, which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.

The Highway Capacity Manual describes level of service for unsignalized intersections and the quality of traffic operation in terms of control delay. Control delay is the total elapsed time from a vehicle joining the queue until its departure from the stopped position at the head of the queue. Control delay includes initial deceleration delay, queue move-up time, stopped and final acceleration delay.

Levels of service range from A to F, with A describing traffic operations with little or no delay. Level of service F describes operating conditions where average total delay exceeds 45 seconds per vehicle (control delay exceeds 50 seconds per vehicle).

Level of service analysis for unsignalized intersections considers all the turning movements of the minor street and the left-turns from the major street entering the minor street. The number of gaps in traffic is then compared to the number of vehicles waiting for a break in traffic. In all cases, the level of service of unsignalized intersections describes the delay for drivers waiting to exit the minor street or waiting to turn into the minor street. Therefore, the majority of traffic traveling through an intersection will usually operate under a better level of service, as the minor street will have little or no effect on through traffic.

### Definitions of Level of Service for Signalized Intersections

Level of service describes the quality of operation in terms of delay to the driving public. Levels range from A to F. Definitions for levels of service follow. The level of service analysis provides a basis for assessing the potential impact of traffic both in terms of how traffic conditions would change and also whether the existing transportation system would be inadequate for the additional traffic both in terms of how traffic conditions would change and also whether the additional transportation system would be inadequate for additional traffic.

Level of service for signalized intersections is defined in terms of delay. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time. The Highway Capacity Manual describes level of service for signalized intersections and the quality of traffic operation in terms of control delay per vehicle for a 15-minute analysis period. Control delay includes initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Control delay may also be referred to as signal delay. The criteria for level of service are given in the following table.

Level of Service	Control Delay Per Vehicle (sec)
A	$\leq 10$
B	$> 10$ and $\leq 20$
C	$> 20$ and $\leq 35$
D	$> 35$ and $\leq 55$
E	$> 55$ and $\leq 80$
F	$> 80$

Delay is a complex measure and is dependent on a number of variables including: the quality of traffic progression, the cycle length, and the relative amount of green time for the lane group or approach in question.

LOS A describes operations with very low control delay, up to 10 sec per vehicle. The level of service occurs when progression is extremely favorable and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.

LOS B describes operations with control delay greater than 10 and up to 20 sec per vehicle. This level of service generally occurs with good progression, short cycle lengths, or both. More vehicles stop than with LOS A, causing higher levels of average delay.

LOS C describes operations with control delay greater than 20 and up to 35 sec per vehicle. These higher delays may result from fair progression, longer cycle lengths, or both. Individual cycle failures may begin to appear at this level. Then number of vehicles stopping is significant at this level, though many still pass through the intersection without stopping.

LOS D describes operations with control delay greater than 35 and up to 55 sec per vehicle. At level D, the influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with control delay greater than 55 and up to 80 sec per vehicle. This level is considered by many agencies to be the limit of acceptable delay. These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.

LOS F describes operations with control delay in excess of 80 sec per vehicle. This level, considered to be unacceptable to most drivers, often occurs with oversaturation, that is, when arrival flow rates exceed the capacity of the intersection. It may also occur at high v/c ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be contributing factors to such delay levels.



## **APPENDIX B**

### **Level of Service Summary Table**

Intersection	Approach/Movement		2021 Existing Conditions		2021 - Option 1		2021 - Option 2		2021 - Option 3		2021 - Option 4	
			LOS	Delay (Sec/veh)	LOS	Delay (Sec/veh)	LOS	Delay (Sec/veh)	LOS	Delay (Sec/veh)	LOS	Delay (Sec/veh)
Armada Center Road & Romeo Plank Road	EB	LTR	B	12.5	B	11.5	B	10.8	B	12.5	B	10.8
	WB	LTR	E	46.2	F	127.2	D	28.4	E	28.4	D	28.4
	NB	LTR	E	38.7	C	16.1	C	15.5	E	38.7	C	15.5
	SB	LTR	B	11.3	B	12.1	B	10.3	B	11.3	B	10.3
	Overall		E	37.9	F	232.2	C	20.9	E	37.9	C	20.9
Armada Center Road & Drive #2	EB	Thru/Right	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
	WB	Thru/Left	A	1.5	A	0.0	A	1.4	A	9.1	A	0.0
	NB	Left/Right	A	0.0	F	142.0	A	0.0	A	0.0	A	0.0
	Overall		A	0.7	B	14.4	A	0.8	A	0.7	A	0.0
Armada Center Road & Drive #3	EB	Thru/Left	A	3.3	A	4.4	A	3.6	A	8.6	A	3.4
	WB	Thru/Right	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
	SB	Left/Right	C	22.9	F	116.3	C	22.3	C	17.3	C	15.0
	Overall		A	7.0	C	22.3	A	7.0	A	5.6	A	5.6
Armada Center Road & Drive #4	EB	Thru/Right	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
	WB	Thru/Left	A	4.5	A	8.6	A	4.4	A	9.0	A	5.9
	NB	Left/Right	F	356.3	E	43.4	F	340.5	F	210.3	F	236.7
	Overall		F	161.3	B	19.1	F	156.4	F	95.8	F	109.8
Romeo Plank Road & Drive #1	WB	Left/Right	D	25.1	A	0.0	C	20.5	D	25.1	C	21.2
	NB	Thru/Right	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
	SB	Thru/Left	A	0.0	A	5.2	A	0.1	A	0.0	A	0.1
	Overall		A	4.4	A	3.4	A	3.7	A	4.4	A	3.7
Romeo Plank Road & 34 Mile Road	EB	LTR	C	18.1	C	17.9	C	17.9	C	18.1	C	18.1
	WB	LTR	C	19.9	C	19.9	C	19.9	C	19.9	C	19.9
	NB	LTR	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1
	SB	LTR	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1
	Overall		A	1.2	A	1.2	A	1.2	A	1.2	A	1.2
34 Mile Road & Drive #5	EB	Thru/Left	A	0.0	A	4.5	A	4.5	A	0.0	A	0.0
	WB	Thru/Right	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
	SB	Left/Right	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
	Overall		A	0.0	A	3.8	A	3.8	A	0.0	A	0.0





## **APPENDIX C**

### **Synchro Level of Service Printouts**



**Synchro/HCS Level of Service Printouts**  
**Existing (2021) Annual Peak Hour**

Existing 2021 Weekend Annual Peak  
3: Romeo Plank Road & Armeda Center Road

11/22/2021

Intersection

Intersection Delay, s/veh 37.9

Intersection LOS E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	83	28	277	163	2	49	23	443	3	28	7
Future Vol, veh/h	5	83	28	277	163	2	49	23	443	3	28	7
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	3	3	3
Mvmt Flow	6	102	35	334	196	2	54	25	487	4	35	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.5	46.2	38.7	11.3
HCM LOS	B	E	E	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	4%	63%	8%
Vol Thru, %	4%	72%	37%	74%
Vol Right, %	86%	24%	0%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	515	116	442	38
LT Vol	49	5	277	3
Through Vol	23	83	163	28
RT Vol	443	28	2	7
Lane Flow Rate	566	143	533	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.895	0.273	0.924	0.099
Departure Headway (Hd)	5.695	6.859	6.247	7.372
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	634	521	580	483
Service Time	3.74	4.931	4.299	5.456
HCM Lane V/C Ratio	0.893	0.274	0.919	0.099
HCM Control Delay	38.7	12.5	46.2	11.3
HCM Lane LOS	E	B	E	B
HCM 95th-tile Q	11	1.1	11.6	0.3

Existing 2021 Weekend Annual Peak  
6: Romeo Plank Road & 34 Mile Road

11/22/2021

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	8	11	7	3	5	6	501	12	5	365	4
Future Vol, veh/h	3	8	11	7	3	5	6	501	12	5	365	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	93	93	93	87	87	87
Heavy Vehicles, %	23	23	23	0	0	0	1	1	1	1	1	1
Mvmt Flow	5	13	18	12	5	8	6	539	13	6	420	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	999	999	423	1008	995	546	425	0	0	552	0	0
Stage 1	435	435	-	558	558	-	-	-	-	-	-	-
Stage 2	564	564	-	450	437	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.73	6.43	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.707	4.207	3.507	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	203	224	588	221	247	541	1140	-	-	1023	-	-
Stage 1	561	546	-	518	515	-	-	-	-	-	-	-
Stage 2	475	476	-	592	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	194	220	588	202	243	541	1140	-	-	1023	-	-
Mov Cap-2 Maneuver	194	220	-	202	243	-	-	-	-	-	-	-
Stage 1	557	542	-	514	511	-	-	-	-	-	-	-
Stage 2	459	472	-	555	578	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.1	19.9	0.1	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1140	-	-	312	267	1023	-	-
HCM Lane V/C Ratio	0.006	-	-	0.118	0.094	0.006	-	-
HCM Control Delay (s)	8.2	0	-	18.1	19.9	8.5	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.3	0	-	-

Existing 2021 Weekend Annual Peak  
9: 34 Mile Road & Drive #5

11/22/2021

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	23	11	0	0	0
Future Vol, veh/h	0	23	11	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	60	60	92	92
Heavy Vehicles, %	13	13	0	0	2	2
Mvmt Flow	0	38	18	0	0	0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	18	0	-	0	56	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	38	-
Critical Hdwy	4.23	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.317	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1530	-	-	-	952	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	984	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1530	-	-	-	952	1061
Mov Cap-2 Maneuver	-	-	-	-	952	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	984	-

Approach EB WB SB

HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1530	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-



Existing 2021 Weekend Annual Peak  
10: Romeo Plank Road & Drive #1

11/22/2021

Intersection

Int Delay, s/veh 4.4

Movement WBL WBR NBT NBR SBL SBT

Lane Configurations	W	W	N	N	S	S
Traffic Vol, veh/h	82	64	501	0	0	339
Future Vol, veh/h	82	64	501	0	0	339
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	74	74	93	93	86	86
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	111	86	539	0	0	394

Major/Minor Minor1 Major1 Major2

Conflicting Flow All	933	539	0	0	539	0
Stage 1	539	-	-	-	-	-
Stage 2	394	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209	-
Pot Cap-1 Maneuver	298	546	-	-	1034	-
Stage 1	589	-	-	-	-	-
Stage 2	686	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	298	546	-	-	1034	-
Mov Cap-2 Maneuver	298	-	-	-	-	-
Stage 1	589	-	-	-	-	-
Stage 2	686	-	-	-	-	-

Approach WB NB SB

HCM Control Delay, s	25.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt NBT NBRWBLn1 SBL SBT

Capacity (veh/h)	-	-	372	1034	-
HCM Lane V/C Ratio	-	-	0.53	-	-
HCM Control Delay (s)	-	-	25.1	0	-
HCM Lane LOS	-	-	D	A	-
HCM 95th %tile Q(veh)	-	-	3	0	-

Existing 2021 Weekend Annual Peak  
12: Drive #2 & Armeda Center Road

11/22/2021

Intersection

Int Delay, s/veh 0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Vol, veh/h	387	179	78	402	0	0
Future Vol, veh/h	387	179	78	402	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	82	82	92	92
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	421	195	95	490	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	616
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.11
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.209
Pot Cap-1 Maneuver	-	-	969
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	969
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	969	-
HCM Lane V/C Ratio	-	-	-	0.098	-
HCM Control Delay (s)	0	-	-	9.1	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0.3	-

Existing 2021 Weekend Annual Peak  
18: Armada Center Road & Drive #3

11/22/2021

Intersection

Int Delay, s/veh 7

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations						
Traffic Vol, veh/h	150	237	300	33	55	180
Future Vol, veh/h	150	237	300	33	55	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	82	82	86	86
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	163	258	366	40	64	209

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	406	0	-	0	970	386
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	584	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1158	-	-	-	283	666
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	561	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1158	-	-	-	237	666
Mov Cap-2 Maneuver	-	-	-	-	237	-
Stage 1	-	-	-	-	578	-
Stage 2	-	-	-	-	561	-

Approach EB WB SB

HCM Control Delay, s	3.3	0	22.9
HCM LOS			C

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1158	-	-	-	468
HCM Lane V/C Ratio	0.141	-	-	-	0.584
HCM Control Delay (s)	8.6	0	-	-	22.9
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.5	-	-	-	3.7



Existing 2021 Weekend Annual Peak  
26: Drive #4 & Armeda Center Road

11/22/2021

Intersection

Int Delay, s/veh 161.3

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↔			↔	↔	
Traffic Vol, veh/h	264	28	277	284	49	443
Future Vol, veh/h	264	28	277	284	49	443
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	83	83	60	60
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	303	32	334	342	82	738

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	335	0	1329 319
Stage 1	-	-	-	-	319 -
Stage 2	-	-	-	-	1010 -
Critical Hdwy	-	-	4.11	-	6.4 6.2
Critical Hdwy Stg 1	-	-	-	-	5.4 -
Critical Hdwy Stg 2	-	-	-	-	5.4 -
Follow-up Hdwy	-	-	2.209	-	3.5 3.3
Pot Cap-1 Maneuver	-	-	1230	-	173 ~ 726
Stage 1	-	-	-	-	741 -
Stage 2	-	-	-	-	355 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1230	-	115 ~ 726
Mov Cap-2 Maneuver	-	-	-	-	115 -
Stage 1	-	-	-	-	741 -
Stage 2	-	-	-	-	236 -

Approach EB WB NB

HCM Control Delay, s	0	4.5	\$ 356.5
HCM LOS			F

Minor Lane/Major Mvmt NBLn1 EBT EBR WBL WBT

Capacity (veh/h)	475	-	-	1230	-
HCM Lane V/C Ratio	1.726	-	-	0.271	-
HCM Control Delay (s)	\$ 356.5	-	-	9	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	49.4	-	-	1.1	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined \*: All major volume in platoon



## **Synchro/HCS Level of Service Printouts**

### **Option 1 (2021) Annual Peak Hour**

Option 1: Redirect Entering Trips  
3: Romeo Plank Road & Armeda Center Road

11/22/2021

Intersection

Intersection Delay, s/veh 232.2

Intersection LOS F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	51	60	714	207	22	5	3	269	2	29	7
Future Vol, veh/h	5	51	60	714	207	22	5	3	269	2	29	7
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	3	3	3
Mvmt Flow	6	63	74	860	249	27	5	3	296	3	37	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.5	327.2	16.1	12.1
HCM LOS	B	F	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	2%	4%	76%	5%
Vol Thru, %	1%	44%	22%	76%
Vol Right, %	97%	52%	2%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	277	116	943	38
LT Vol	5	5	714	2
Through Vol	3	51	207	29
RT Vol	269	60	22	7
Lane Flow Rate	304	143	1136	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.474	0.227	1.68	0.089
Departure Headway (Hd)	6.974	6.579	5.323	8.286
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	521	550	682	435
Service Time	4.974	4.579	3.385	6.286
HCM Lane V/C Ratio	0.583	0.26	1.666	0.11
HCM Control Delay	16.1	11.5	327.2	12.1
HCM Lane LOS	C	B	F	B
HCM 95th-tile Q	2.5	0.9	63.5	0.3

Option 1: Redirect Entering Trips  
6: Romeo Plank Road & 34 Mile Road

11/22/2021

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	8	11	7	3	4	6	466	47	5	365	4
Future Vol, veh/h	3	8	11	7	3	4	6	466	47	5	365	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	93	93	93	87	87	87
Heavy Vehicles, %	23	23	23	0	0	0	1	1	1	1	1	1
Mvmt Flow	5	13	18	12	5	7	6	501	51	6	420	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	980	999	423	989	976	527	425	0	0	552	0	0
Stage 1	435	435	-	539	539	-	-	-	-	-	-	-
Stage 2	545	564	-	450	437	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.73	6.43	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.707	4.207	3.507	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	210	224	588	228	253	555	1140	-	-	1023	-	-
Stage 1	561	546	-	530	525	-	-	-	-	-	-	-
Stage 2	487	476	-	592	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	202	220	588	208	249	555	1140	-	-	1023	-	-
Mov Cap-2 Maneuver	202	220	-	208	249	-	-	-	-	-	-	-
Stage 1	557	542	-	526	521	-	-	-	-	-	-	-
Stage 2	473	472	-	555	578	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	17.9	19.9	0.1	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1140	-	-	315	265	1023	-	-
HCM Lane V/C Ratio	0.006	-	-	0.116	0.088	0.006	-	-
HCM Control Delay (s)	8.2	0	-	17.9	19.9	8.5	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.3	0	-	-



Option 1: Redirect Entering Trips  
9: 34 Mile Road & Drive #5

11/22/2021

Intersection

Int Delay, s/veh 3.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↖	↗		↖	↗
Traffic Vol, veh/h	35	23	10	1	0	0
Future Vol, veh/h	35	23	10	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	60	60	92	92
Heavy Vehicles, %	13	13	0	0	2	2
Mvmt Flow	58	38	17	2	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	19	0	0 172 18
Stage 1	-	-	- 18 -
Stage 2	-	-	- 154 -
Critical Hdwy	4.23	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.317	-	- 3.518 3.318
Pot Cap-1 Maneuver	1529	-	- 818 1061
Stage 1	-	-	- 1005 -
Stage 2	-	-	- 874 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1529	-	- 786 1061
Mov Cap-2 Maneuver	-	-	- 786 -
Stage 1	-	-	- 966 -
Stage 2	-	-	- 874 -

Approach	EB	WB	SB
HCM Control Delay, s	4.5	0	0
HCM LOS			A

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1529	-	-	-	-
HCM Lane V/C Ratio	0.038	-	-	-	-
HCM Control Delay (s)	7.4	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	-

Option 1: Redirect Entering Trips  
10: Romeo Plank Road & Drive #1

11/22/2021

Intersection

Int Delay, s/veh 3.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W	W	T	T	T	T
Traffic Vol, veh/h	0	0	327	139	388	421
Future Vol, veh/h	0	0	327	139	388	421
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	74	74	93	93	86	86
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	0	0	352	149	451	490

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	1819	427	0
Stage 1	427	-	-
Stage 2	1392	-	-
Critical Hdwy	6.4	6.2	4.11
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.3	2.209
Pot Cap-1 Maneuver	86	632	1068
Stage 1	662	-	-
Stage 2	233	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	36	632	1068
Mov Cap-2 Maneuver	36	-	-
Stage 1	662	-	-
Stage 2	98	-	-

Approach	WB	NB	SB
HCM Control Delay, s	0	0	5.2
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	1068	-
HCM Lane V/C Ratio	-	-	0.422	-
HCM Control Delay (s)	-	-	10.8	0
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	2.1	-

Option 1: Redirect Entering Trips  
12: Drive #2 & Armeda Center Road

11/22/2021

Intersection

Int Delay, s/veh 14.4

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	↶			↷	↷	↷
Traffic Vol, veh/h	359	0	0	835	146	0
Future Vol, veh/h	359	0	0	835	146	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	0
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	82	82	92	92
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	390	0	0	1018	159	0

Major/Minor Major1 Major2 Minor1

Conflicting Flow All	0	0	390	0	1408	390
Stage 1	-	-	-	-	390	-
Stage 2	-	-	-	-	1018	-
Critical Hdwy	-	-	4.11	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	-	-	2.209	-	3.518	3.318
Pot Cap-1 Maneuver	-	-	1174	-	~ 153	658
Stage 1	-	-	-	-	684	-
Stage 2	-	-	-	-	349	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1174	-	~ 153	658
Mov Cap-2 Maneuver	-	-	-	-	~ 153	-
Stage 1	-	-	-	-	684	-
Stage 2	-	-	-	-	349	-

Approach EB WB NB

HCM Control Delay, s	0	0	142
HCM LOS			F

Minor Lane/Major Mvmt NBLn1 NBLn2 EBT EBR WBL WBT

Capacity (veh/h)	153	-	-	-	1174	-
HCM Lane V/C Ratio	1.037	-	-	-	-	-
HCM Control Delay (s)	142	0	-	-	0	-
HCM Lane LOS	F	A	-	-	A	-
HCM 95th %tile Q(veh)	8.1	-	-	-	0	-

Notes

~: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined \*: All major volume in platoon



Option 1: Redirect Entering Trips  
18: Armeda Center Road & Drive #3

11/22/2021

Intersection

Int Delay, s/veh 22.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	150	209	655	33	55	180
Future Vol, veh/h	150	209	655	33	55	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	82	82	86	86
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	163	227	799	40	64	209

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	839	0	0 1372 819
Stage 1	-	-	- 819 -
Stage 2	-	-	- 553 -
Critical Hdwy	4.11	-	- 6.4 6.2
Critical Hdwy Stg 1	-	-	- 5.4 -
Critical Hdwy Stg 2	-	-	- 5.4 -
Follow-up Hdwy	2.209	-	- 3.5 3.3
Pot Cap-1 Maneuver	800	-	- 163 379
Stage 1	-	-	- 437 -
Stage 2	-	-	- 580 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	800	-	- 125 379
Mov Cap-2 Maneuver	-	-	- 125 -
Stage 1	-	-	- 335 -
Stage 2	-	-	- 580 -

Approach	EB	WB	SB
HCM Control Delay, s	4.4	0	116.3
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	800	-	-	-	257
HCM Lane V/C Ratio	0.204	-	-	-	1.063
HCM Control Delay (s)	10.6	0	-	-	116.3
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.8	-	-	-	11.2



Option 1: Redirect Entering Trips  
26: Drive #4 & Armeda Center Road

11/22/2021

Intersection								
Int Delay, s/veh	19.1							
Movement	EBT	EBR	WBL	WBT	NBL	NBR		
Lane Configurations	↻			↻	↻	↻		
Traffic Vol, veh/h	236	0	0	639	49	443		
Future Vol, veh/h	236	0	0	639	49	443		
Conflicting Peds, #/hr	0	0	0	0	0	0		
Sign Control	Free	Free	Free	Free	Stop	Stop		
RT Channelized	-	None	-	None	-	None		
Storage Length	-	-	-	-	0	0		
Veh in Median Storage, #	0	-	-	0	0	-		
Grade, %	0	-	-	0	0	-		
Peak Hour Factor	87	87	83	83	60	60		
Heavy Vehicles, %	2	2	1	1	0	0		
Mvmt Flow	271	0	0	770	82	738		
Major/Minor	Major1		Major2		Minor1			
Conflicting Flow All	0	0	271	0	1041	271		
Stage 1	-	-	-	-	271	-		
Stage 2	-	-	-	-	770	-		
Critical Hdwy	-	-	4.11	-	6.4	6.2		
Critical Hdwy Stg 1	-	-	-	-	5.4	-		
Critical Hdwy Stg 2	-	-	-	-	5.4	-		
Follow-up Hdwy	-	-	2.209	-	3.5	3.3		
Pot Cap-1 Maneuver	-	-	1298	-	257	773		
Stage 1	-	-	-	-	779	-		
Stage 2	-	-	-	-	460	-		
Platoon blocked, %	-	-	-	-	-	-		
Mov Cap-1 Maneuver	-	-	1298	-	257	773		
Mov Cap-2 Maneuver	-	-	-	-	257	-		
Stage 1	-	-	-	-	779	-		
Stage 2	-	-	-	-	460	-		
Approach	EB		WB		NB			
HCM Control Delay, s	0		0		43.4			
HCM LOS					E			
Minor Lane/Major Mvmt	NBLn1		NBLn2		EBT	EBR	WBL	WBT
Capacity (veh/h)	257	773	-	-	-	-	1298	-
HCM Lane V/C Ratio	0.318	0.955	-	-	-	-	-	-
HCM Control Delay (s)	25.4	45.4	-	-	-	-	0	-
HCM Lane LOS	D	E	-	-	-	-	A	-
HCM 95th %tile Q(veh)	1.3	14.6	-	-	-	-	0	-



## **Synchro/HCS Level of Service Printouts**

### **Option 2 (2021) Annual Peak Hour**

Option 2: Open Drives #1 & #5 to Entering Traffic  
3: Romeo Plank Road & Armeda Center Road

11/22/2021

Intersection

Intersection Delay, s/veh 20.9  
Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	79	32	277	163	2	49	23	269	3	28	7
Future Vol, veh/h	5	79	32	277	163	2	49	23	269	3	28	7
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	3	3	3
Mvmt Flow	6	98	40	334	196	2	54	25	296	4	35	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.8	28.4	15.5	10.3
HCM LOS	B	D	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	4%	63%	8%
Vol Thru, %	7%	68%	37%	74%
Vol Right, %	79%	28%	0%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	341	116	442	38
LT Vol	49	5	277	3
Through Vol	23	79	163	28
RT Vol	269	32	2	7
Lane Flow Rate	375	143	533	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.567	0.234	0.815	0.088
Departure Headway (Hd)	5.446	5.89	5.507	6.615
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	660	604	655	545
Service Time	3.518	3.975	3.564	4.615
HCM Lane V/C Ratio	0.568	0.237	0.814	0.088
HCM Control Delay	15.5	10.8	28.4	10.3
HCM Lane LOS	C	B	D	B
HCM 95th-tile Q	3.6	0.9	8.4	0.3

Option 2: Open Drives #1 & #5 to Entering Traffic  
6: Romeo Plank Road & 34 Mile Road

11/22/2021

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	8	11	7	3	4	6	466	47	5	365	4
Future Vol, veh/h	3	8	11	7	3	4	6	466	47	5	365	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	93	93	93	87	87	87
Heavy Vehicles, %	23	23	23	0	0	0	1	1	1	1	1	1
Mvmt Flow	5	13	18	12	5	7	6	501	51	6	420	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	980	999	423	989	976	527	425	0	0	552	0	0
Stage 1	435	435	-	539	539	-	-	-	-	-	-	-
Stage 2	545	564	-	450	437	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.73	6.43	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.707	4.207	3.507	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	210	224	588	228	253	555	1140	-	-	1023	-	-
Stage 1	561	546	-	530	525	-	-	-	-	-	-	-
Stage 2	487	476	-	592	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	202	220	588	208	249	555	1140	-	-	1023	-	-
Mov Cap-2 Maneuver	202	220	-	208	249	-	-	-	-	-	-	-
Stage 1	557	542	-	526	521	-	-	-	-	-	-	-
Stage 2	473	472	-	555	578	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	17.9		19.9		0.1		0.1	
HCM LOS	C		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1140	-	-	315	265	1023	-	-
HCM Lane V/C Ratio	0.006	-	-	0.116	0.088	0.006	-	-
HCM Control Delay (s)	8.2	0	-	17.9	19.9	8.5	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.3	0	-	-



Option 2: Open Drives #1 & #5 to Entering Traffic  
9: 34 Mile Road & Drive #5

11/22/2021

Intersection

Int Delay, s/veh 3.8

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	35	23	10	1	0	0
Future Vol, veh/h	35	23	10	1	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	60	60	92	92
Heavy Vehicles, %	13	13	0	0	2	2
Mvmt Flow	58	38	17	2	0	0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	19	0	-	0	172	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	154	-
Critical Hdwy	4.23	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.317	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1529	-	-	-	818	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	874	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1529	-	-	-	786	1061
Mov Cap-2 Maneuver	-	-	-	-	786	-
Stage 1	-	-	-	-	966	-
Stage 2	-	-	-	-	874	-

Approach EB WB SB

HCM Control Delay, s	4.5	0	0
HCM LOS			A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1529	-	-	-	-
HCM Lane V/C Ratio	0.038	-	-	-	-
HCM Control Delay (s)	7.4	0	-	-	0
HCM Lane LOS	A	A	-	-	A
HCM 95th %tile Q(veh)	0.1	-	-	-	-

Option 2: Open Drives #1 & #5 to Entering Traffic  
10: Romeo Plank Road & Drive #1

11/22/2021

Intersection

Int Delay, s/veh 3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	W		T			T
Traffic Vol, veh/h	82	64	327	139	4	339
Future Vol, veh/h	82	64	327	139	4	339
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	74	74	93	93	86	86
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	111	86	352	149	5	394

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	831	427	0
Stage 1	427	-	-
Stage 2	404	-	-
Critical Hdwy	6.4	6.2	4.11
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.3	2.209
Pot Cap-1 Maneuver	342	632	1068
Stage 1	662	-	-
Stage 2	679	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	340	632	1068
Mov Cap-2 Maneuver	340	-	-
Stage 1	662	-	-
Stage 2	675	-	-

Approach	WB	NB	SB
HCM Control Delay, s	20.5	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	426	1068
HCM Lane V/C Ratio	-	-	0.463	0.004
HCM Control Delay (s)	-	-	20.5	8.4
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	2.4	0

Option 2: Open Drives #1 & #5 to Entering Traffic  
12: Drive #2 & Armada Center Road

11/22/2021

Intersection

Int Delay, s/veh 0.8

Movement EBT EBR WBL WBT NBL NBR

Lane Configurations	EBT	EBR	WBL	WBT	NBL	NBR
Traffic Vol, veh/h	363	24	78	402	0	0
Future Vol, veh/h	363	24	78	402	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	82	82	92	92
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	395	26	95	490	0	0

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	421	0	1088
Stage 1	-	-	-	-	408
Stage 2	-	-	-	-	680
Critical Hdwy	-	-	4.11	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.209	-	3.518
Pot Cap-1 Maneuver	-	-	1144	-	239
Stage 1	-	-	-	-	671
Stage 2	-	-	-	-	503
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1144	-	212
Mov Cap-2 Maneuver	-	-	-	-	212
Stage 1	-	-	-	-	671
Stage 2	-	-	-	-	446

Approach	EB	WB	NB
HCM Control Delay, s	0	1.4	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1144	-
HCM Lane V/C Ratio	-	-	-	0.083	-
HCM Control Delay (s)	0	-	-	8.4	0
HCM Lane LOS	A	-	-	A	A
HCM 95th %tile Q(veh)	-	-	-	0.3	-



Option 2: Open Drives #1 & #5 to Entering Traffic  
18: Armeda Center Road & Drive #3

11/22/2021

Intersection

Int Delay, s/veh 7

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	150	213	300	33	55	180
Future Vol, veh/h	150	213	300	33	55	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	82	82	86	86
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	163	232	366	40	64	209

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	406	0	-	0	944	386
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	558	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1158	-	-	-	293	666
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	577	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1158	-	-	-	246	666
Mov Cap-2 Maneuver	-	-	-	-	246	-
Stage 1	-	-	-	-	579	-
Stage 2	-	-	-	-	577	-

Approach EB WB SB

HCM Control Delay, s	3.6	0	22.3
HCM LOS			C

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1158	-	-	-	476
HCM Lane V/C Ratio	0.141	-	-	-	0.574
HCM Control Delay (s)	8.6	0	-	-	22.3
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.5	-	-	-	3.5



Option 2: Open Drives #1 & #5 to Entering Traffic  
26: Drive #4 & Armeda Center Road

11/22/2021

Intersection						
Int Delay, s/veh	156.4					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	P			P	Y	
Traffic Vol, veh/h	264	4	277	284	49	443
Future Vol, veh/h	264	4	277	284	49	443
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	83	83	60	60
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	303	5	334	342	82	738

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	308	0	1316
Stage 1	-	-	-	-	306
Stage 2	-	-	-	-	1010
Critical Hdwy	-	-	4.11	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.209	-	3.5
Pot Cap-1 Maneuver	-	-	1258	-	176
Stage 1	-	-	-	-	751
Stage 2	-	-	-	-	355
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1258	-	118
Mov Cap-2 Maneuver	-	-	-	-	118
Stage 1	-	-	-	-	751
Stage 2	-	-	-	-	239

Approach	EB	WB	NB
HCM Control Delay, s	0	4.4	\$ 340.5
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	485	-	-	1258	-
HCM Lane V/C Ratio	1.691	-	-	0.265	-
HCM Control Delay (s)	\$ 340.5	-	-	8.9	0
HCM Lane LOS	F	-	-	A	A
HCM 95th %tile Q(veh)	48.2	-	-	1.1	-

Notes			
~: Volume exceeds capacity	\$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



## **Synchro/HCS Level of Service Printouts**

### **Option 3 (2021) Annual Peak Hour**

Option 3: Boulevard Section Near Blake's Farms  
3: Romeo Plank Road & Armeta Center Road

11/22/2021

Intersection

Intersection Delay, s/veh 37.9  
Intersection LOS E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	5	83	28	277	163	2	49	23	443	3	28	7
Future Vol, veh/h	5	83	28	277	163	2	49	23	443	3	28	7
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	3	3	3
Mvmt Flow	6	102	35	334	196	2	54	25	487	4	35	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.5	46.2	38.7	11.3
HCM LOS	B	E	E	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	10%	4%	63%	8%
Vol Thru, %	4%	72%	37%	74%
Vol Right, %	86%	24%	0%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	515	116	442	38
LT Vol	49	5	277	3
Through Vol	23	83	163	28
RT Vol	443	28	2	7
Lane Flow Rate	566	143	533	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.895	0.273	0.924	0.099
Departure Headway (Hd)	5.695	6.859	6.247	7.372
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	634	521	580	483
Service Time	3.74	4.931	4.299	5.456
HCM Lane V/C Ratio	0.893	0.274	0.919	0.099
HCM Control Delay	38.7	12.5	46.2	11.3
HCM Lane LOS	E	B	E	B
HCM 95th-tile Q	11	1.1	11.6	0.3

Option 3: Boulevard Section Near Blake's Farms  
6: Romeo Plank Road & 34 Mile Road

11/23/2021

Intersection												
Int Delay, s/veh	1.2											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	3	8	11	7	3	5	6	501	12	5	365	4
Future Vol, veh/h	3	8	11	7	3	5	6	501	12	5	365	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	93	93	93	87	87	87
Heavy Vehicles, %	23	23	23	0	0	0	1	1	1	1	1	1
Mvmt Flow	5	13	18	12	5	8	6	539	13	6	420	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	999	999	423	1008	995	546	425	0	0	552	0	0
Stage 1	435	435	-	558	558	-	-	-	-	-	-	-
Stage 2	564	564	-	450	437	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.73	6.43	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.707	4.207	3.507	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	203	224	588	221	247	541	1140	-	-	1023	-	-
Stage 1	561	546	-	518	515	-	-	-	-	-	-	-
Stage 2	475	476	-	592	583	-	-	-	-	-	-	-
Platoon blocked, %								-	-	-	-	-
Mov Cap-1 Maneuver	194	220	588	202	243	541	1140	-	-	1023	-	-
Mov Cap-2 Maneuver	194	220	-	202	243	-	-	-	-	-	-	-
Stage 1	557	542	-	514	511	-	-	-	-	-	-	-
Stage 2	459	472	-	555	578	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.1	19.9	0.1	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1140	-	-	312	267	1023	-
HCM Lane V/C Ratio	0.006	-	-	0.118	0.094	0.006	-
HCM Control Delay (s)	8.2	0	-	18.1	19.9	8.5	0
HCM Lane LOS	A	A	-	C	C	A	A
HCM 95th %tile Q(veh)	0	-	-	0.4	0.3	0	-



Option 3: Boulevard Section Near Blake's Farms  
9: 34 Mile Road & Drive #5

11/23/2021

Intersection

Int Delay, s/veh 0

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations		↑	↑		Y	
Traffic Vol, veh/h	0	23	11	0	0	0
Future Vol, veh/h	0	23	11	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	60	60	92	92
Heavy Vehicles, %	13	13	0	0	2	2
Mvmt Flow	0	38	18	0	0	0

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	18	0	-	0	56	18
Stage 1	-	-	-	-	18	-
Stage 2	-	-	-	-	38	-
Critical Hdwy	4.23	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.317	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1530	-	-	-	952	1061
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	984	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1530	-	-	-	952	1061
Mov Cap-2 Maneuver	-	-	-	-	952	-
Stage 1	-	-	-	-	1005	-
Stage 2	-	-	-	-	984	-

Approach EB WB SB

HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1530	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Option 3: Boulevard Section Near Blake's Farms  
10: Romeo Plank Road & Drive #1

11/23/2021

Intersection

Int Delay, s/veh 4.4

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	Y		T			T
Traffic Vol, veh/h	82	64	501	0	0	339
Future Vol, veh/h	82	64	501	0	0	339
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	74	74	93	93	86	86
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	111	86	539	0	0	394

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	933	539	0	0	539
Stage 1	539	-	-	-	-
Stage 2	394	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.11
Critical Hdwy Stg 1	5.4	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.209
Pot Cap-1 Maneuver	298	546	-	-	1034
Stage 1	589	-	-	-	-
Stage 2	686	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	298	546	-	-	1034
Mov Cap-2 Maneuver	298	-	-	-	-
Stage 1	589	-	-	-	-
Stage 2	686	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	25.1	0	0
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	372	1034
HCM Lane V/C Ratio	-	-	0.53	-
HCM Control Delay (s)	-	-	25.1	0
HCM Lane LOS	-	-	D	A
HCM 95th %tile Q(veh)	-	-	3	0

Option 3: Boulevard Section Near Blake's Farms  
12: Drive #2 & Armeda Center Road

11/23/2021

Intersection

Int Delay, s/veh 0.7

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↑		↑	↑	↑	↑
Traffic Vol, veh/h	387	179	78	402	0	0
Future Vol, veh/h	387	179	78	402	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	82	82	92	92
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	421	195	95	490	0	0

Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	616
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.11
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.209
Pot Cap-1 Maneuver	-	-	969
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	969
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	1.5	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	969	-
HCM Lane V/C Ratio	-	-	-	0.098	-
HCM Control Delay (s)	0	-	-	9.1	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0.3	-



Option 3: Boulevard Section Near Blake's Farms  
18: Armada Center Road & Drive #3

11/23/2021

Intersection

Int Delay, s/veh 5.6

Movement EBL EBT WBT WBR SBL SBR

Lane Configurations	↰	↑	↱		↰	
Traffic Vol, veh/h	150	237	300	33	55	180
Future Vol, veh/h	150	237	300	33	55	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	82	82	86	86
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	163	258	366	40	64	209

Major/Minor Major1 Major2 Minor2

Conflicting Flow All	406	0	-	0	970	386
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	584	-
Critical Hdwy	4.11	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	1158	-	-	-	283	666
Stage 1	-	-	-	-	691	-
Stage 2	-	-	-	-	561	-
Platoon blocked, %	-	-	-	-	-	-
Mov Cap-1 Maneuver	1158	-	-	-	243	666
Mov Cap-2 Maneuver	-	-	-	-	374	-
Stage 1	-	-	-	-	594	-
Stage 2	-	-	-	-	561	-

Approach EB WB SB

HCM Control Delay, s	3.3	0	17.3
HCM LOS			C

Minor Lane/Major Mvmt EBL EBT WBT WBR SBLn1

Capacity (veh/h)	1158	-	-	-	563
HCM Lane V/C Ratio	0.141	-	-	-	0.485
HCM Control Delay (s)	8.6	-	-	-	17.3
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.5	-	-	-	2.6



Option 3: Boulevard Section Near Blake's Farms  
26: Drive #4 & Armeda Center Road

11/23/2021

Intersection

Int Delay, s/veh 95.8

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↱	↱	↱	↱
Traffic Vol, veh/h	264	28	277	284	49	443
Future Vol, veh/h	264	28	277	284	49	443
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	83	83	60	60
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	303	32	334	342	82	738

Major/Minor	Major1	Major2	Minor1			
Conflicting Flow All	0	0	335	0	1329	319
Stage 1	-	-	-	-	319	-
Stage 2	-	-	-	-	1010	-
Critical Hdwy	-	-	4.11	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	-	-	2.209	-	3.5	3.3
Pot Cap-1 Maneuver	-	-	1230	-	173	~ 726
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	355	-
Platoon blocked, %	-	-		-		
Mov Cap-1 Maneuver	-	-	1230	-	126	~ 726
Mov Cap-2 Maneuver	-	-	-	-	214	-
Stage 1	-	-	-	-	741	-
Stage 2	-	-	-	-	258	-

Approach	EB	WB	NB
HCM Control Delay, s	0	4.5	210.3
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	586	-	-	1230	-
HCM Lane V/C Ratio	1.399	-	-	0.271	-
HCM Control Delay (s)	210.3	-	-	9	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	37.5	-	-	1.1	-

Notes

~: Volume exceeds capacity    \$: Delay exceeds 300s    +: Computation Not Defined    \*: All major volume in platoon



**Synchro/HCS Level of Service Printouts**  
**Option 4 (2021) Annual Peak Hour**

Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
3: Romeo Plank Road & Armda Center Road

12/22/2021

Intersection

Intersection Delay, s/veh	20.9
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	5	79	32	277	163	2	49	23	269	3	28	7
Future Vol, veh/h	5	79	32	277	163	2	49	23	269	3	28	7
Peak Hour Factor	0.81	0.81	0.81	0.83	0.83	0.83	0.91	0.91	0.91	0.79	0.79	0.79
Heavy Vehicles, %	2	2	2	1	1	1	1	1	1	3	3	3
Mvmt Flow	6	98	40	334	196	2	54	25	296	4	35	9
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	10.8	28.4	15.5	10.3
HCM LOS	B	D	C	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	14%	4%	63%	8%
Vol Thru, %	7%	68%	37%	74%
Vol Right, %	79%	28%	0%	18%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	341	116	442	38
LT Vol	49	5	277	3
Through Vol	23	79	163	28
RT Vol	269	32	2	7
Lane Flow Rate	375	143	533	48
Geometry Grp	1	1	1	1
Degree of Util (X)	0.567	0.234	0.815	0.088
Departure Headway (Hd)	5.446	5.89	5.507	6.615
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	660	604	655	545
Service Time	3.518	3.975	3.564	4.615
HCM Lane V/C Ratio	0.568	0.237	0.814	0.088
HCM Control Delay	15.5	10.8	28.4	10.3
HCM Lane LOS	C	B	D	B
HCM 95th-tile Q	3.6	0.9	8.4	0.3

Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
6: Romeo Plank Road & 34 Mile Road

12/22/2021

Intersection

Int Delay, s/veh 1.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↕			↕			↕			↕		
Traffic Vol, veh/h	3	8	11	7	3	5	6	501	12	5	365	4
Future Vol, veh/h	3	8	11	7	3	5	6	501	12	5	365	4
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	60	60	60	60	60	60	93	93	93	87	87	87
Heavy Vehicles, %	23	23	23	0	0	0	1	1	1	1	1	1
Mvmt Flow	5	13	18	12	5	8	6	539	13	6	420	5

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	999	999	423	1008	995	546	425	0	0	552	0	0
Stage 1	435	435	-	558	558	-	-	-	-	-	-	-
Stage 2	564	564	-	450	437	-	-	-	-	-	-	-
Critical Hdwy	7.33	6.73	6.43	7.1	6.5	6.2	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.33	5.73	-	6.1	5.5	-	-	-	-	-	-	-
Follow-up Hdwy	3.707	4.207	3.507	3.5	4	3.3	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	203	224	588	221	247	541	1140	-	-	1023	-	-
Stage 1	561	546	-	518	515	-	-	-	-	-	-	-
Stage 2	475	476	-	592	583	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	194	220	588	202	243	541	1140	-	-	1023	-	-
Mov Cap-2 Maneuver	194	220	-	202	243	-	-	-	-	-	-	-
Stage 1	557	542	-	514	511	-	-	-	-	-	-	-
Stage 2	459	472	-	555	578	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	18.1	19.9	0.1	0.1
HCM LOS	C	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1140	-	-	312	267	1023	-	-
HCM Lane V/C Ratio	0.006	-	-	0.118	0.094	0.006	-	-
HCM Control Delay (s)	8.2	0	-	18.1	19.9	8.5	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.4	0.3	0	-	-



Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
9: 34 Mile Road & Drive #5

12/22/2021

Intersection

Int Delay, s/veh 0

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Traffic Vol, veh/h	0	23	11	0	0	0
Future Vol, veh/h	0	23	11	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	60	60	60	60	92	92
Heavy Vehicles, %	13	13	0	0	2	2
Mvmt Flow	0	38	18	0	0	0

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	18	0	0 56 18
Stage 1	-	-	- 18 -
Stage 2	-	-	- 38 -
Critical Hdwy	4.23	-	- 6.42 6.22
Critical Hdwy Stg 1	-	-	- 5.42 -
Critical Hdwy Stg 2	-	-	- 5.42 -
Follow-up Hdwy	2.317	-	- 3.518 3.318
Pot Cap-1 Maneuver	1530	-	- 952 1061
Stage 1	-	-	- 1005 -
Stage 2	-	-	- 984 -
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1530	-	- 952 1061
Mov Cap-2 Maneuver	-	-	- 952 -
Stage 1	-	-	- 1005 -
Stage 2	-	-	- 984 -

Approach	EB	WB	SB
HCM Control Delay, s	0	0	0
HCM LOS			A




Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1530	-	-	-	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	-	0
HCM Lane LOS	A	-	-	-	A
HCM 95th %tile Q(veh)	0	-	-	-	-

Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
10: Romeo Plank Road & Drive #1

12/22/2021

Intersection

Int Delay, s/veh 3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	82	64	327	174	4	339
Future Vol, veh/h	82	64	327	174	4	339
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	74	74	93	93	86	86
Heavy Vehicles, %	0	0	2	2	1	1
Mvmt Flow	111	86	352	187	5	394

Major/Minor	Minor1	Major1	Major2
Conflicting Flow All	850	446	0
Stage 1	446	-	-
Stage 2	404	-	-
Critical Hdwy	6.4	6.2	-
Critical Hdwy Stg 1	5.4	-	-
Critical Hdwy Stg 2	5.4	-	-
Follow-up Hdwy	3.5	3.3	-
Pot Cap-1 Maneuver	334	617	-
Stage 1	649	-	-
Stage 2	679	-	-
Platoon blocked, %		-	-
Mov Cap-1 Maneuver	332	617	-
Mov Cap-2 Maneuver	332	-	-
Stage 1	649	-	-
Stage 2	675	-	-

Approach	WB	NB	SB
HCM Control Delay, s	21.2	0	0.1
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	416	1034
HCM Lane V/C Ratio	-	-	0.474	0.004
HCM Control Delay (s)	-	-	21.2	8.5
HCM Lane LOS	-	-	C	A
HCM 95th %tile Q(veh)	-	-	2.5	0



Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
12: Drive #2 & Armeda Center Road

12/22/2021

Intersection

Int Delay, s/veh 0

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↰			↱	↰	↱
Traffic Vol, veh/h	363	24	0	402	0	0
Future Vol, veh/h	363	24	0	402	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	82	82	92	92
Heavy Vehicles, %	1	1	1	1	2	2
Mvmt Flow	395	26	0	490	0	0





Major/Minor	Major1	Major2	Minor1
Conflicting Flow All	0	0	421
Stage 1	-	-	-
Stage 2	-	-	-
Critical Hdwy	-	-	4.11
Critical Hdwy Stg 1	-	-	-
Critical Hdwy Stg 2	-	-	-
Follow-up Hdwy	-	-	2.209
Pot Cap-1 Maneuver	-	-	1144
Stage 1	-	-	-
Stage 2	-	-	-
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	-	-	1144
Mov Cap-2 Maneuver	-	-	-
Stage 1	-	-	-
Stage 2	-	-	-

Approach	EB	WB	NB
HCM Control Delay, s	0	0	0
HCM LOS			A

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	-	-	-	1144	-
HCM Lane V/C Ratio	-	-	-	-	-
HCM Control Delay (s)	0	-	-	0	-
HCM Lane LOS	A	-	-	A	-
HCM 95th %tile Q(veh)	-	-	-	0	-

Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
18: Armada Center Road & Drive #3

12/22/2021

Intersection						
Int Delay, s/veh	5.6					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	150	213	222	33	55	180
Future Vol, veh/h	150	213	222	33	55	180
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	82	82	86	86
Heavy Vehicles, %	1	1	1	1	0	0
Mvmt Flow	163	232	271	40	64	209

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	311	0	0 849 291
Stage 1	-	-	- - 291 -
Stage 2	-	-	- - 558 -
Critical Hdwy	4.11	-	- - 6.4 6.2
Critical Hdwy Stg 1	-	-	- - 5.4 -
Critical Hdwy Stg 2	-	-	- - 5.4 -
Follow-up Hdwy	2.209	-	- - 3.5 3.3
Pot Cap-1 Maneuver	1255	-	- - 334 753
Stage 1	-	-	- - 763 -
Stage 2	-	-	- - 577 -
Platoon blocked, %	-	-	- -
Mov Cap-1 Maneuver	1255	-	- - 291 753
Mov Cap-2 Maneuver	-	-	- - 413 -
Stage 1	-	-	- - 664 -
Stage 2	-	-	- - 577 -

Approach	EB	WB	SB
HCM Control Delay, s	3.4	0	15
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1255	-	-	-	631
HCM Lane V/C Ratio	0.13	-	-	-	0.433
HCM Control Delay (s)	8.3	-	-	-	15
HCM Lane LOS	A	-	-	-	C
HCM 95th %tile Q(veh)	0.4	-	-	-	2.2

Option 4: Open Drive #1 to Entering Traffic and Left-Turn Modifications on Amarda Center  
26: Drive #4 & Armeda Center Road

12/22/2021

Intersection						
Int Delay, s/veh	109.8					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↱		↱	↱	↱	
Traffic Vol, veh/h	264	4	355	206	49	443
Future Vol, veh/h	264	4	355	206	49	443
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	0	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	87	87	83	83	60	60
Heavy Vehicles, %	2	2	1	1	0	0
Mvmt Flow	303	5	428	248	82	738

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	308	0	1410
Stage 1	-	-	-	-	306
Stage 2	-	-	-	-	1104
Critical Hdwy	-	-	4.11	-	6.4
Critical Hdwy Stg 1	-	-	-	-	5.4
Critical Hdwy Stg 2	-	-	-	-	5.4
Follow-up Hdwy	-	-	2.209	-	3.5
Pot Cap-1 Maneuver	-	-	1258	-	154
Stage 1	-	-	-	-	751
Stage 2	-	-	-	-	320
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1258	-	102
Mov Cap-2 Maneuver	-	-	-	-	178
Stage 1	-	-	-	-	751
Stage 2	-	-	-	-	211

Approach	EB	WB	NB
HCM Control Delay, s	0	5.9	236.7
HCM LOS			F

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	562	-	-	1258	-
HCM Lane V/C Ratio	1.459	-	-	0.34	-
HCM Control Delay (s)	236.7	-	-	9.3	-
HCM Lane LOS	F	-	-	A	-
HCM 95th %tile Q(veh)	39.9	-	-	1.5	-



## **APPENDIX D**

### **Traffic Analysis Files**

Spalding DeDecker  
Armada Center Road Reconstruction

**Option Description:** This option will reconstruct Armada Center Road with a 12" nonreinforced concrete pavement on 12" of 21AA aggregate base with a 3-lane (center left-turn lane) configuration from 330' west of Drive #2 to 330' east of Drive #4 (per MDOT Geometric Guideline #650), including a raised median from 330' west of Drive #2 to Drive #3 while providing a 250' eastbound left-turn lane at Drive #3. The pavement will have an 8' paved plus 2' gravel shoulder at the edge of the travel lane per MDOT Road Design Manual Appendix 3A.

Item	Pay Item Code	Unit	Quantity	2022		
				Unit Cost	Item Cost	Subtotal Cost
Safety Related Work						
Mainline Pavement						
HMA Surface, Rem	5010005	Syd	5,393	\$4.00	\$21,572.00	
Subbase, CIP	3010002	Cyd	0	\$10.00	\$0.00	
Aggregate Base, 4 inch	3020010	Syd	0	\$6.00	\$0.00	
Aggregate Base, 12 inch	3020030	Syd	9,670	\$18.00	\$174,060.00	
Underdrain, Subbase, 6 inch	4040063	Ft	861	\$5.00	\$4,305.00	
Curb and Gutter, Conc, Det B3	8020017	Ft	3,129	\$23.50	\$73,531.50	
Sidewalk Ramp, Conc, 6 inch	8030036	Sft	304	\$12.50	\$3,800.00	
Conc, Pavt, Nonreinf, 12 inch	6020112	Syd	5,313	\$85.00	\$451,605.00	
Conc Pavt, Misc, Nonreinf, 8 inch	6020054	Syd	2,781	\$50.00	\$139,066.67	
HMA Approach	5010061	Ton	69	\$120.00	\$8,316.00	
Joint, Contraction, Cp	6020200	Ft	742	\$9.25	\$6,863.50	
Joint, Contraction, C3p	6020201	Ft	1,566	\$3.75	\$5,872.50	
Turf Grading	8167011	Syd	6,954	\$2.50	\$17,385.00	
Seeding, Mixture THM, Modified	8167011	Syd	6,954	\$2.00	\$13,908.00	
Embankment, CIP	2050010	Cyd	1,160	\$9.00	\$10,440.00	
Excavation, Earth	2050016	Cyd	2,763	\$6.50	\$17,959.50	
Sidewalk, Conc, 6 inch	8030046	Sft	2,363	\$6.00	\$14,178.00	
Underdrain Outlet, 6 inch	4040093	Ft	444	\$13.50	\$5,994.00	
Underdrain, Outlet Ending, 6 inch	4040113	Ea	7	\$165.00	\$1,155.00	
Geotextile Separator	3080005	Syd	9486	\$1.50	\$14,229.00	
Granular Material, CI II	2050023	Cyd	117	\$21.00	\$2,457.00	\$987,000
Drainage						
Drainage (5%)					\$49,000.00	\$49,000
Permanent Signs						
Permanent Signing (4%)					\$39,000.00	\$39,000
Permanent Pavement Markings						
Permanent Pavement Markings (2%)					\$20,000.00	\$20,000
Environmental						
Environmental (1%)					\$10,000.00	\$10,000
Bridge Work						
Subtotal Construction Cost						
						\$1,105,000
Miscellaneous						
Contingency for Context Sensitive Design	8507051	LSUM	0.00%		\$0.00	
Minor Traf Devices	8120170	LSUM	0.50%		\$5,525.00	
Mobilization, Max	1500001	LSUM	5.00%		\$55,250.00	
Contractor Staking	8240001	LSUM	2.00%		\$22,100.00	
Project Cleanup	2090001	LSUM	0.25%		\$2,762.50	
Incentive Contingency	n/a	LSUM	0.00%		\$0.00	
Miscellaneous Project Contingency	n/a	LSUM	15.00%		\$165,750.00	
MOT Contingency	n/a	LSUM	5.00%		\$55,250.00	
Traffic Signal Replacement	n/a	LSUM	1.00	\$300,000.00	\$300,000.00	
Staking Plans Errors and Extras, One Person	8240020	Hr	12.00	\$42.00	\$504.00	
Staking Plans Errors and Extras, Two Persons	8240021	Hr	5.00	\$77.00	\$385.00	
Staking Plans Errors and Extras, Three Persons	8240022	Hr	7.00	\$6.75	\$47.25	
Right-of-Way (Consent to Grade)	n/a	LSUM			\$0.00	
Conc Quality Initiative, Special	6027060	Dir		\$34,109.06	\$34,109.06	
Engineering Costs						
CE			10.00%		\$172,000.00	
PE			8.00%		\$137,000.00	\$951,000
Total Estimated Construction Costs						
						\$2,056,000
Total Estimated Construction Costs ONLY						
						\$1,746,683







# Memorandum

**TO:** Administrative Review Committee, Armada Township  
**FROM:** Laura Haw, AICP, NCI  
**SUBJECT:** Achatz Pie Company Fence – Amended Site Plan: Administrative Review #1  
**DATE:** February 10, 2022

We have reviewed the amended site plan for an (installed) obscuring fence at Achatz Pie Company, 75700 North Avenue (received January 25, 2022). The subject site is zoned the B-1, Business District and adjacent to the R-1, Residential District. Directly across the street are properties zoned the AG, Agricultural-Preservation District.

## APPLICABLE ZONING STANDARDS

Section 12.03 (footnote 2) requires that when a B-1 property abuts an R-1 parcel, an obscuring wall or fence, or a greenbelt, shall be provided. As the applicant has an approved landscaping plan for this area, the subject fence is essentially an extension of this required buffer.

Per section 2.14: Fences, Walls, and Other Protective Barriers, the following five standards (edited for brevity) apply to the subject fence. Additionally, the clear vision triangle must be maintained - due to the distance of the existing fence from the drive approach, the required clear vision triangle is not obstructed.

- 1) **No fences shall be erected along the line dividing lots or located within any required side or rear yard in excess of six feet or less than three feet in height above the average finished grade of the land on either side of said fence.**  
*Complies, the existing fence is 6-feet in height.*
- 2) **Only decorative, non-obscuring split-rail, picket or other open style fences, 24 to 42 inches high, as measured from the average finished grade of the land on either side of said fence, shall be permitted in a front yard. Similar fences which are utilized and designed for the sole purpose of being an architectural/landscape feature, may be reviewed and approved by the Planning Commission.**  
*Can comply, see #5 below.*
- 3) **All fences hereafter erected shall be constructed of materials customarily used for fences (wood, wood simulated vinyl, chain link, wrought iron) and be properly maintained at all times.**  
*Complies, the existing fence is comprised of a vinyl material and is in good repair.*
- 4) **The decorative side of the fence shall be directed outwards and be visible to adjacent properties. Further all fences and walls shall be kept in an acceptable and safe manner.**  
*Compiles, both sides of the existing fence present a finished appearance.*



- 5) **Fences constructed as a part of any non-residential use may be constructed up to a height of six feet in the front yard subject to site plan approval by the Planning Commission.**

*Can comply. The approved site plan details the required landscaping screen along the southern property line, which was approved as a double, staggered row of evergreen trees, 6- to 8-feet in height (at the time of planting). This approved landscape screen is partially located within the front yard of the site.*

*The obscuring fence installed by the applicant runs alongside the approved evergreen screen, and projects approximately 25-feet further west into the front yard. To comply with the original site plan, the new obscuring fence should not extend any further into the front yard than the approved evergreen trees.*

### **RECOMMENDATION**

To maintain compliance with the originally approved site plan (and screening requirements for a commercial business), it is recommended that the amended site plan be approved by the Administrative Review Committee, contingent that the existing fence be reduced in length by approximately 25-feet from the west. This change must be identified on an updated site plan and furnished to the Township for its permanent record.



①

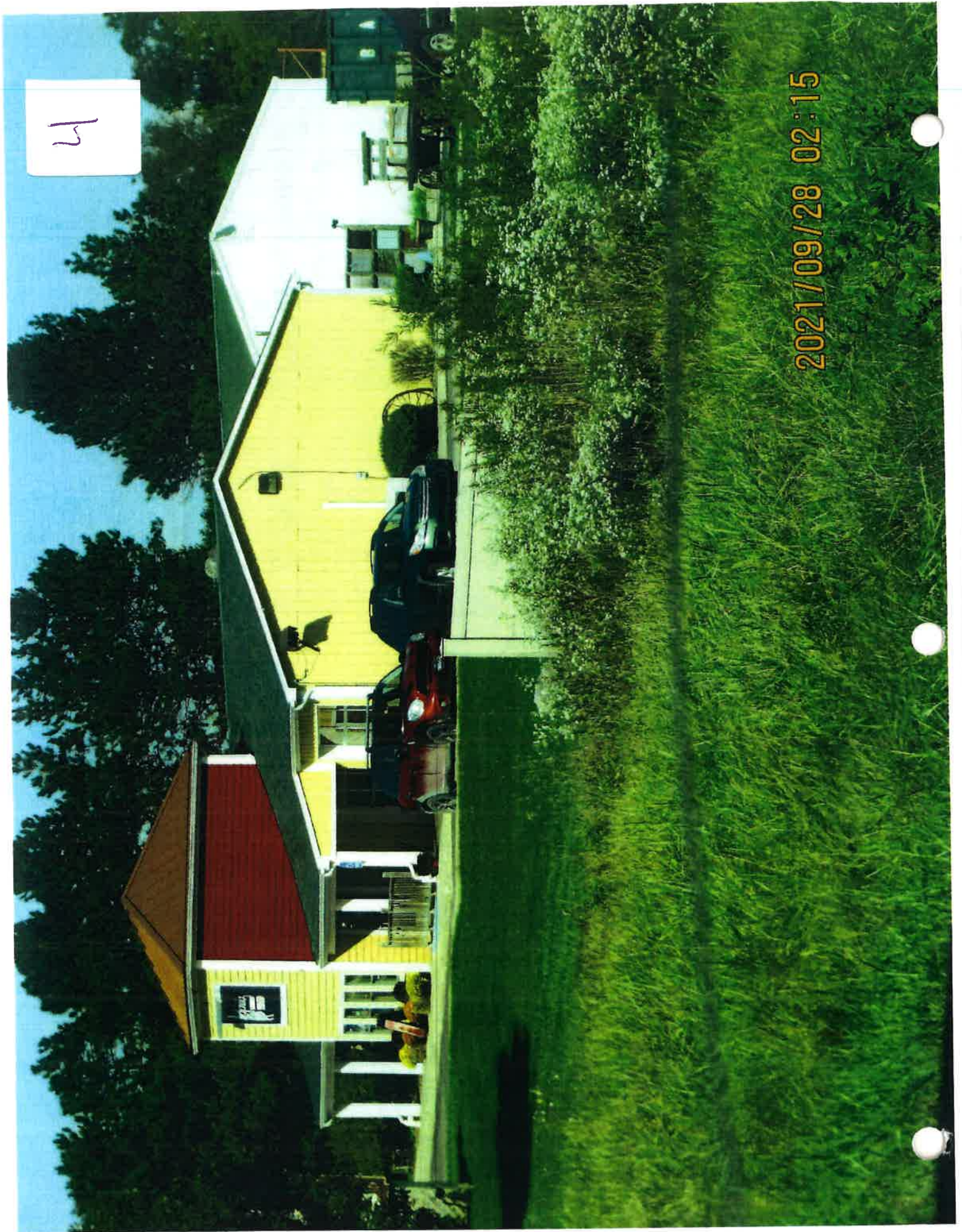


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**From:** Citizen Planner Program <cplanner@msu.ccsend.com> on behalf of Citizen Planner Program <cplanner@msu.edu>  
**Sent:** Wednesday, February 16, 2022 9:08 AM  
**To:** planning@armadatwp.org  
**Subject:** Citizen Planner February Newsletter



## Upcoming Programs and Events

**[Macomb County 2022 Citizen Planner Live via Zoom](#)**  
**[Registration has been extended!](#)**



LIVE ON ZOOM



MICHIGAN STATE UNIVERSITY | Extension

# CITIZEN PLANNER

Macomb County

THURSDAYS  
FEBRUARY 24-  
APRIL 7, 2022



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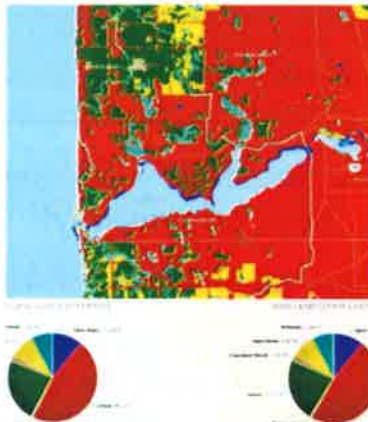
Enroll any time at  
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MICHIGAN STATE UNIVERSITY | Extension

Do you have fellow planning commissioners that have yet to take Citizen Planner? Citizen Planner Online is a completely online, self-paced version of the program designed for individuals who can't fit a six-week course into their schedule or who prefer this style of learning. It takes approximately 15 hours or so to complete, and can be accessed 24/7 so that individuals can do as much or as little at one time as fits their schedule.

LEARN MORE

## Master Citizen Planner Corner



# 2022 MASTER CITIZEN PLANNER WEBINAR SERIES

**[CLICK HERE FOR MORE INFORMATION](#)**

Cost per Webinar: \$20 (\$10 for MCPs)

<https://events.anr.msu.edu/MCPWeb2022/>

MICHIGAN STATE  
UNIVERSITY

Extension

The 2022 Master Citizen Planner (MCP) Webinar Series is designed to offer participants the latest updates and information on current topics. Using Zoom Webinar, MSU Extension educators will provide an overview of topics of interest to planning and zoning officials. Webinars fall on the third Thursday in April, May, June, September, October, and November. Webinars take place from 6:30-7:30 p.m. ET. Each session is available individually or participants can register for all six at once. All webinars will be recorded and sent to registrants.

Learn More and Register

## MCPs in Action

### Our Monthly Spotlight on a MCP who is moving the needle in their community!

Starting this month, and with some regularity going forward, the Citizen Planner Team would like to highlight one of our Master Citizen Planners who is 'moving the needle' by advancing the planning and/or zoning programs in their community.

This month we'd like to highlight **Mary Babcock**, Master Citizen Planner (MCP) and Hancock city manager. Mary has been leading her community through the city's first comprehensive zoning ordinance update in more than 50 years. The zoning ordinance will help implement recommendations in the city's 2018 master plan and aligns with the Michigan Economic Development Corporation's [Redevelopment Ready Communities](#) program. Noteworthy amendments to the zoning ordinance include a downtown mixed-use zoning district, a shoreline mixed-use district, and changes to the city's sign regulations. Mary says "It has been a tough road, hopefully we are on the final stretch." She also notes MSU Extension training and information on the [MSUE planning website](#) has been invaluable in the process. Mary is also a graduate of the MSU Extension [Zoning Administrator Certificate Program](#). Read more about Mary's efforts in [Hancock residents weigh in on zoning ordinance](#).

Are you a MCP? If so, we'd put money on a bet that you're also leading your community in noteworthy ways. Send us a note and let us know what you're doing to advance your community planning and zoning decision-making!

### Hancock Residents Weigh in on Zoning Ordinance



CITY OF  
**HANCOCK**







February 21, 2022 - DRAFT

Planning Commission  
23121 East Main Street  
Armada, MI 48005



# PLANNING COMMISSION 2021 ANNUAL PLANNING REPORT TO THE TOWNSHIP BOARD

ARMADA TOWNSHIP, MICHIGAN

## Introduction and Purpose

As required per the Michigan Planning Enabling Act (MPEA) Act 33 of 2008, as amended, the Planning Commission shall submit a report of its yearly activities:

*"A planning commission shall make an annual written report to the legislative body concerning its operations and the status of planning activities, including recommendations regarding actions by the legislative body related to planning and development."*

In addition to fulfilling this requirement, the Annual Report increases information-sharing between staff, commissions and the Board of Trustees, and allows for the anticipation of upcoming priorities. The Planning Commission's Annual Report is intended to serve as a planning document that outlines the past year and is a communication tool to share recent achievements and plans for future community goals.

## Meetings

The Armada Township Planning Commission met seven times in 2021. This complies with the requirement of the MPEA, which requires a minimum of four meetings annually.

The public is welcome to attend all Planning Commission meetings and 'public comment' is an agenda item at every meeting.

1. Wednesday, February 3, 2021
2. Wednesday, April 7, 2021
3. Wednesday, May 5, 2021
4. Wednesday, June 2, 2021
5. Wednesday, September 1, 2021
6. Wednesday, October 6, 2021
7. Wednesday, November 3, 2021

## Membership

The Armada Township Planning Commission is comprised of seven members who offer a range of backgrounds and expertise for the community. We thank the following Commission members for their time commitment and hard work:

- D.J. Kehrig, Chair
- Beth Abercrombie, Vice-Chair
- Joe Jabara, Secretary
- Sara Murray, Board of Trustee Liaison
- Randy Finlay
- Maureen Finn
- Norm Wieske

Additionally, Christine White serves as the Planning and Zoning Administrator for the Township and attends and prepares the minutes for all Commission meetings, as well as coordinating and preparing all meeting packets and development reviews.

Prepared with the assistance of



## 2021 IN REVIEW

The table below outlines the various development reviews (site plan, special land use, etc.) that were considered by the Township in 2021. No rezonings (map amendments) were proposed.

Date (2021)	Project Type	Location / Project Name	Description	Status
February 3	Site Plan Extension Request	Hidden River	Request for an extension to the Hidden River residential development.	Denied
April 7	Site Plan Review	Henshaw Garage	Request to amend the approved site plan to construct a ±6,300 SF accessory structure to be used for as a garage for storage.	Approved
April 7	Site Plan Review	17985 Armada Center Road / Blake's Orchard & Cider Mill	Request for landscaping (along within and along the parking lot on Armada Center Road) and for a traffic study to be conducted.	Tabled
May 5	Site Plan Review	Township Park	Review of three scoreboard signs to be located at the baseball facilities in Township Park.	Approved
June 2	Special Land Use Review	72025 North Avenue / Krause Pet Crematoria	Request for a special land use to use an existing pole barn on the property for an animal crematorium.  Recommended for approval to the Township Board contingent on site-plan approval and three conditions: (1) the cremation unit will be maintained on a monthly basis; (2) any remains left will be mixed with soil and spread along field at the property; and (3) evergreen landscaping will be added to the site plan.	Approved
June 2	Site Plan Review	72025 North Avenue / Krause Pet Crematoria	Approval granted, with the following conditions: (1) six evergreens be provided for screening; (2) the site plan be revised to detail the species, size, and irrigation method of the proposed evergreens; (3) the site plan and application be revised to note the proper zoning district (the B-2, General Business District); (4) all engineering approvals and permits are met, as identified by Spalding DeDecker; and (5) all building department and fire requirements are met.	Approved

## Zoning Ordinance Text Amendments

The Planning Commission considered several text amendments to the zoning code, including:

- Administrative Site Plan Review - Adopted.** Recommendation to the Township Board to amend section 4.04 to specify that both the Planning Commission Chair and Vice-Chair are members of the administrative review committee; to clarify what constitutes an acceptable change to an approved landscape plan; and to specify the process for the Building Official to request Planning Commission review of an administrative site plan.
- Agri-Business - Adopted.** Recommendation to the Township Board to amend section 8.01(B.2) to reduce the 55% requirement to 50% for value added farming operations of an agri-business. This reduction ensures that the Township's code is consistent with the requirements provided by the State of Michigan GAAMPs (Generally Accepted Agricultural and Management Practices).
- Medical Marijuana - Adopted.** Recommendation to the Township Board to amend section 2.03 to provide that medical marijuana caregivers may only operate in the M-1 and M-2 Industrial Zoning Districts and to establish regulations for such operations.
- Shipping Containers - Not Adopted: Requires Further Review.** Consideration of provisions to permit shipping containers as accessory structures within one-family residential districts was discussed at several meetings throughout 2021. An amendment to section 2.03 was ultimately recommended to the Township Board; however, this amendment was rescinded back to the Planning Commission for further review: clarity was requested regarding provisions on the exterior finish material and appearance. It is anticipated this discussion will continue in 2022.





# SUMMARY: 2021 AGENDA ITEMS BY MONTH

## JANUARY

Cancelled.

## FEBRUARY

The Commission reviewed and adopted the 2021 regular meeting dates, and the 2020 Annual Report of Planning Commission activities was presented (a request was made for more detail to be added before submission to the Township Board, this item was then tabled until the next regular meeting). Amendments to the zoning code for administrative site plan reviews was discussed. An extension request for the Hidden River residential development was presented and recommended for denial.

A public hearing was held regarding a special land use request for a pet crematorium (Krause Veterinary) and after discussion, the Commission tabled this item to allow the applicant additional time to submit a site plan and make necessary revisions.

Township Attorney Christine Anderson also provided a presentation on GAAMPs (Generally Accepted Agricultural and Management Practices) and how the Township's ordinance relates to the Right to Farm Act (Act 93 of 1981, as amended).

## MARCH

Cancelled.

## APRIL

The Commission reviewed an amended site plan request for a ±6,300 SF accessory structure to the existing Henshaw industrial development, which was approved contingent on addressing concerns from the fire department and engineer. The revised 2020 Annual Report was reviewed and submitted to the Township Board, and the election of officer's was conducted. A zoning text amendment for shipping containers was presented and the language was finalized for a future public hearing.

Lastly, Blake's Farm was discussed, specifically the need for a traffic study to be done and for an updated landscape plan to be provided to the Township; this item was tabled.

## MAY

The Commission reviewed and approved three new scoreboards for Township Park. On-going text amendments to the zoning code were also discussed (i.e., administrative site plan reviews, agri-business, tents, small scale entertainment, second homes on property; seasonal worker clause, and the size of attached garages).

## JUNE

Revised plans for the special land use (pet crematorium) were presented and recommended for approval to the Township Board, with conditions; the corresponding site plan was also approved. A support letter for Blake's traffic study & road safety partnership was curated and recommended to the Township Board for consideration. The Commission also discussed rules and procedures for public hearings.

## JULY & AUGUST

Cancelled.

## SEPTEMBER

Commissioner Maureen Finn gave a presentation regarding medical marijuana (as part of her Master Citizen Planner certification). A motion to authorize the township planner and township attorney to draft an ordinance amendment on medical marijuana was made. Discussion on the on-going text amendments continued (including small scale entertainment, second homes on properties, seasonal workers, the size of attached garages, and accessory structures).

## OCTOBER

The Commission further discussed the zoning ordinance text amendments from the September meeting and set a public hearing for the next available meeting to formally consider four draft amendments.

A resident presented their vision to the Planning Commission regarding the adaptive reuse of their historic barn and property as a boutique wedding/event venue. Another resident presented their ideas to the Commission to divide and rezone the "Deneweth" property (adjacent to the Armada Fair Grounds) to build a small retirement village (duplexes or detached condos).

## NOVEMBER

Public hearings for four different zoning ordinance text amendments were held, as follows:

1. Shipping Containers as Accessory Buildings to One-Family Residential Uses
2. Agri-Business (Value Added Farming Operations, Acceptable Ancillary Uses)
3. Administrative Site Plan Review
4. Medical Marijuana – Primary Care Givers

All amendments were recommended for approval to the Township Board.

## DECEMBER

Cancelled.





# PLANNING AND ZONING IN 2022

## Zoning Amendments

In 2022, the Planning Commission intends to continue their review of the Zoning Ordinance and recommend amendments to improve/clarify the code. It is anticipated that shipping containers as accessory structures will be further discussed, among other amendments.

One change that would help streamline the code (and was discussed by the Planning Commission at a previous meeting) is to create a table of permitted uses; this would be an addition to the code so that all districts and uses can be understood quickly. The image to the right is an example of such a use table, which was created for Dexter Township.

### Article 4. SCHEDULE OF REGULATIONS

DEXTER TOWNSHIP ZONING ORDINANCE 2020



COMMERCIAL LAND USE	AG	RR	LR	MHR	CU	RC	PI	PR	C
Microbrewery or distillery									P
Motel or hotel									S
Motor vehicle sales									S
Motor vehicle service station or maintenance and repair									S
Outdoor dining area									S
Open air sales									S
Personal service establishment that performs services on site within a completely enclosed building									S
Professional office that performs services on site within a completely enclosed building									P
Recycling collection or transfer station									P
Retail businesses that supply commodities on the premises within a completely enclosed building, such as food, drugs, alcohol, furniture, clothing, dry goods, books, flowers, jewelry, or hardware							S	S	S
Roadside stand	S	P							P
Sales of new industrial and construction equipment or the service and repair of such items									P
Self-storage facility									S
Sit-down restaurant or other establishment that serves food and drink for on-site consumption, including an outdoor dining area							S	S	S
Sit-down restaurant or other establishment that serves food or drink for on-site consumption							S	S	S
Sod farm									P
Special event facility	S	S							P
Veterinary Clinic	S	S				S			P
Watercraft sales, repair, or storage	P	S							P
Winery	S	S				S		S	P
INDUSTRIAL LAND USE	AG	RR	LR	MHR	CU	RC	PI	PR	C
Biofuel production, large	S	S				S			S
Biofuel production, small	P	S				S			S
Extractive operation	S					S			P

■ Permitted Use  
■ AP Accessory Permitted Use  
■ Special Land Use  
■ AS Accessory Special Land Use



## Master Plan Implementation

The reaffirmed 2020 Master Plan recommends the following implementation strategies as 'near-term' projects that the Commission and Township may wish to consider this year. Many of these Master Plan recommendations involve text amendments to the Zoning Ordinance.

- Incorporate lot size recommendations in the Master Plan into the Zoning Ordinance (work with the Macomb County Health Department to determine if further changes to standards are necessary).
- Establish a site plan review standard that specifically addresses the treatment of nature features in new development.
- Pursue grants to fund implementation of the adopted Recreation Master Plan.
- Establish industrial development standards based on the Master Plan and incorporate into the Ordinance.
- Develop design guidelines that govern the appearance of development and establish a feel that respects the Township's rural heritage based on the framework elements of the Master Plan. Specifically, consider a Rural Character Design Overlay for the 32 Mile and North Avenue corridors.
- Produce a development guide promoting the Township's Open Space and Farmland Communities Option.
- Market the Township as a family-friendly place with excellent schools and amend Ordinances to allow for diverse housing options to attract young families.
- Enable residential retrofits for accessibility and plan for a diversity of housing styles.
- Identify road types and develop a set of standards for non-motorized accommodations for each type.
- Develop Complete Street guidelines for new developments.
- Work with the Macomb County Road Commission and Michigan Deer Crash Coalition to improve warning signage for large animals.
- Introduce speed-calming measures on the Macomb Orchard Trail at rail crossings; improve signage and striping on the roads.
- Establish a Wolcott Mill Metropark-Macomb Orchard Trail link, working with the Macomb County Non-Motorized Plan.

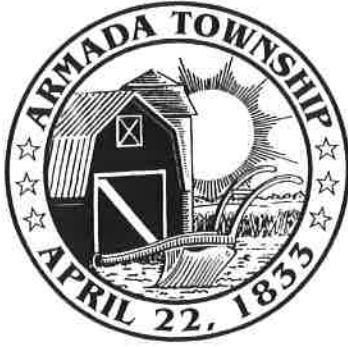


## Joint Meetings and Training

Joint meetings are a best practice. In 2022, we recommend the Planning Commission hold at least one joint meeting with the Township Board; McKenna is happy to facilitate. This would be an ideal time to discuss implementation of the Master Plan and other shared goals and objectives.







# **Armada Township**

## **PLANNING COMMISSION**

23121 E. Main Street

P.O. Box 578

Armada, Michigan 48005

Telephone: (586) 784-5200

Facsimile: (586) 784-5211

### **Armada Township Planning Commission**

#### **Open Meetings Resolution 2022**

January 5, 2022, 7:00 p.m.

February 2, 2022, 7:00 p.m.

March 2, 2022, 7:00 p.m.

April 6, 2022, 7:00 p.m.

May 4, 2022, 7:00 p.m.

June 1, 2022, 7:00 p.m.

July 6, 2022, 7:00 p.m.

August 3, 2022, 7:00 p.m.

September 7, 2022, 7:00 p.m.

October 5, 2022, 7:00 p.m.

November 2, 2022, 7:00 p.m.

December 7, 2022, 7:00 p.m.







# Memorandum

**TO:** Ms. Christine White, Planning and Zoning Administrator  
Planning Commission, Armada Township

**FROM:** Laura Haw, AICP, NCI

**SUBJECT:** 2022 On-Going Zoning Ordinance Considerations for the Planning Commission

**DATE:** February 21, 2022

Throughout 2022, it is anticipated that the Planning Commission will continue to review the Zoning Ordinance and recommend amendments to improve / clarify the code. The following is a compilation of the current ordinance provisions under consideration; this document will be updated for each Planning Commission meeting in an effort to maintain momentum on potential text amendments.

A listing of on-going text amendments to the Armada Township Zoning Ordinance, #114 for discussion / consideration include:

1. **Shipping Containers** – *Township Board requested further review by the Planning Commission*
2. **Small Scale Entertainment** – *tabled by the Commission until additional research can be done*
3. **Garage Size Limitations and Accessory Uses in the Front Yard** - *tabled by the Commission until additional research can be done*
4. **Second Homes on Properties / Seasonal Workers Clause** – *ready for discussion by the Planning Commission*



## **REGULATING SHIPPING CONTAINERS AS ACCESSORY BUILDINGS**

Consideration of provisions to permit shipping containers as accessory structures within one-family residential districts was discussed at several meetings throughout 2021. An amendment to section 2.03 was ultimately recommended to the Township Board; however, this amendment was rescinded back to the Planning Commission for further review: **clarity was requested regarding provisions on the exterior finish material and appearance.**

Proposed text amendments:

### **Article XX – Construction of Language and Definitions**

#### **Section 20.01: Definitions**

*SHIPPING CONTAINER: An industrial, standardized, reusable, and portable metal container originally and specifically designed for the intermodal shipping of goods or commodities by transport on trucks, rail cars, and ships and typically made of steel. A cargo container may also be known as a cargo container, ISO (International Standard Organization) container, intermodal container, conex (container for export) box, or sea can.*

*TRUCK TRAILER: A trailer designed to be towed behind a semi-truck or other vehicle for purposes of carrying cargo. Truck trailers are not permitted as accessory structures on non-agricultural properties.*

### **Article II – General Provisions**

#### **Section 2.03: Accessory Buildings to One-Family Residential Uses**

5. Shipping containers used as an accessory building shall meet the following:

- a. Shipping containers shall meet all requirements of Section 2.03.1-4 and shall be included in the total number of accessory buildings and square footage of permitted accessory buildings for a property.
- b. Shipping containers shall not be used for advertising and shall not include signage and/or writing.
- c. Exterior finishing materials that obscure the shipping container's appearance and provide continuity to surrounding residential building designs are encouraged.



### **SMALL SCALE ENTERTAINMENT**

At the May 5, 2021 Planning Commission meeting, the Commission discussed the existing provision and agreed that the intent was to allow for non-permanent seating. The language below has been revised to reflect that.

The maximum capacity of 1,500 persons was also discussed, concern was expressed that this number may be too high (**highlighted** text below).

**This item was tabled under further research can be done, including a comparison of other community examples, the Macomb County Heath Department standards (limit at 1,500?), and considerations of commercial/agricultural weddings.**

Proposed text amendments:

#### **Section 20.01: Definitions**

*SMALL SCALE ENTERTAINMENT - A specified area or areas dedicated for the purpose of providing a family orientated entertainment which has a general, non-permanent seating capacity of not more than **one thousand five hundred (1,500) persons**. ~~Seating shall consist of individual seats, bleachers (two linear feet of bleacher equals one (1) seat), or five (5) square feet of general seating area, (such area shall equal one seat).~~ Small scale entertainment uses shall not be conducted for more than three (3) consecutive hours or for more than three (3) hours in any four (4) hour span.*



## **GARAGE SIZE LIMITATIONS & ACCESSORY USES IN THE FRONT YARD**

At the May 5, 2021 Planning Commission meeting, the Commission identified the special land use process for accessory structures (when located in the front yard) and the size of garages when attached structures (see highlighted text below).

**Additional considerations were raised at the September 2021 meeting, this item has been tabled to allow for further research and future discussion.**

The following ordinance provisions currently control for these two items:

---

### **Section 2.03 ACCESSORY BUILDINGS TO ONE-FAMILY RESIDENTIAL USES**

*Accessory buildings or structures in all residential districts shall be customarily incidental to and subordinate in size and scope to the principal building or use, and shall be subject to the following regulations. Farm structures shall not be regulated by the following regulations, however, such structures shall meet the required setbacks of the district in which they are located.*

- 1. Where the accessory building is structurally attached to the principal building, it shall conform to all regulations applicable to the principal building and shall be considered a garage not an accessory building.*
- 2. No accessory building shall be constructed prior to the enclosure of the principal residence. An accessory building shall not be used for any business, profession, trade or occupation, except where recognized or approved by the Township as a home-based business.*
- 3. One storage building or shed with an area of 200 square feet or less shall be permitted on each residential lot.*
- 4. Accessory Buildings and/or Structures:*
  - a. Shall not be located in the front yard nor extend past the front of the house.*
  - b. Shall not be located in the required side setback. Accessory buildings may be located in the non-required side yard or within the rear yard. On corner lots, accessory buildings shall not be located within the required street setback.*
  - c. Accessory buildings may be permitted in the non-required front yard or the non-required street-side yard as a special land use providing the following conditions are met:*
    - 1) The accessory building is in harmony with the principal structure, the environment, the topography and the surrounding properties.*
    - 2) There is proportionality between the size of the lot, street frontage and the size of the accessory building.*
  - d. Shall not be located closer than ten (10) feet to any other building on-site.*
  - e. Shall not have a sidewall height greater than sixteen (16) feet nor shall they exceed a total height of twenty-six (26) feet measured to the top of the ridge line.*
  - f. 2,400 square feet or less in area shall not be located within fifteen (15) feet of a property line. Accessory buildings over 2,400 square feet shall not be located within twenty-five feet (25) of a property line.*



*g. Shall have the following maximum size limits: (combined total square footage of all accessory buildings).*

<b><u>Parcel Size</u></b>	<b><u>Maximum Permitted Size</u></b>
0.01 acres - 0.99 acres	1,400 square feet
1.00 acres - 1.49 acres	1,600 square feet
1.50 acres - 1.99 acres	1,800 square feet
2.00 acres - 2.49 acres	2,000 square feet
2.50 acres - 2.99 acres	2,200 square feet
3.00 acres - 3.49 acres	2,400 square feet
3.50 acres - 3.99 acres	2,600 square feet
4.00 acres - 4.49 acres	2,800 square feet
4.50 acres - 4.99 acres	3,000 square feet
5.00 acres - 5.49 acres	3,200 square feet
5.50 acres - 5.99 acres	3,400 square feet
6.00 acres - 6.49 acres	3,600 square feet
6.50 acres - 6.99 acres	3,800 square feet
7.00 acres - 7.49 acres	4,000 square feet
7.50 acres - 7.99 acres	4,200 square feet
8.00 acres - 8.49 acres	4,400 square feet
8.50 acres - 8.99 acres	4,600 square feet
9.00 acres - 9.49 acres	4,800 square feet
9.50 acres - 9.99 acres	5,000 square feet

Buildings over the maximum size permitted above may be permitted on any lot size as a Special Approval Land Use, subject to the following:

1. The provisions of Section 1601.
2. Site Plan Review.
3. The increase in size of the building is proportional to the size of the parcel.





## SECOND HOMES ON A LOT AND SEASONAL WORKERS

Currently, the zoning ordinance regulates Seasonal Farm Labor Housing in Section 2.38. Farm labor housing has played an important role in Michigan farming operations over the decades; for instance, in 2021, it was approximated that 40,000 seasonal workers were employed and housed in the Grand Traverse region.

Examples of the Michigan MDARD housing requirements include electrical and heating affidavits.

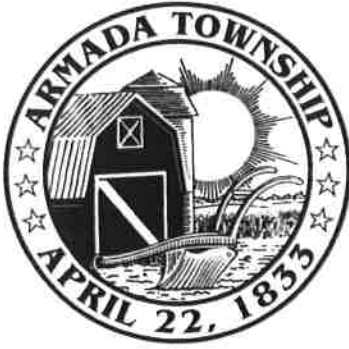
The underlined text below is recommended for discussion among the Commission:

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### SEASONAL FARM LABOR HOUSING.

It is the intent of this section to provide for the establishment of dwellings as part of an active farm operation. Such dwellings shall consist of seasonal / farm labor residences for migratory laborers and their family members and shall be reviewed and approved by the Planning Commission as a Special Land Use, subject to the following standards:

- A. Seasonal and farm labor housing shall be subject to the requirements of this Ordinance and all applicable County and State regulations. This includes living quarters for five (5) or more migratory laborers [on a property] engaged in agricultural activities must be inspected and licensed prior to occupancy by MDARD.
- B. The minimum parcel size shall be 10 acres.
- C. Housing for seasonal and farm labor shall be considered accessory uses to a bona fide farming operation and shall be located on the same property as the principal use. It is the responsibility of the property owner to provide evidence of annual occupancy to the Township.
- D. Housing structures shall be setback a minimum of 100 feet from parcel lines and public roads.
- E. The minimum living area per unit shall be one hundred (100) square feet.
- F. Termination. If not used for two (2) seasons in a row, such housing must be demolished within six (6) months of the close of the second season, and the land graded and seeded. A season consists of the time between April 15<sup>th</sup> to November 15<sup>th</sup>.



# **Armada Township**

## **PLANNING COMMISSION**

23121 E. Main Street

P.O. Box 578

Armada, Michigan 48005

Telephone: (586) 784-5200

Facsimile: (586) 784-5211

## **Memo**

From: Christine White  
Planning & Zoning Secretary  
[planning@armadatwp.org](mailto:planning@armadatwp.org)

To: Planning Commissioners

Re: Reports and Correspondences  
April 6, 2022

- 2022 Spring CES Presentation by ROWE
- Notice of Intent to Update Master Plan Ray Township
- E-mail from Attorney Christine Anderson in regard to Administrative Review
- Updated copies of Ordinances



## 2022 SPRING CES PRESENTATION

For: Local officials, planning commissioners, and local government administrators.

### Marijuana Regulation Update and Refresh:

The landscape surrounding local government regulation of marijuana, whether recreational or medicinal continues to shift. During this session, ROWE's planning staff will review recent trends, discuss best practices, and provide an overview of approaches taken by various communities to regulate everything from primary caregivers to retail, processing, and grow facilities.

### Recalibrating Fee Schedules:

With costs increasing for nearly everything, it is important for local units of government to ensure the fees assessed for permits address the costs for processing them. If your community has not reviewed its fee structure recently, it is likely due for a significant update. During this session, ROWE staff will provide examples of fee structures and discuss an approach to performing an update.

### What Can Your Capital Improvement Plan Do for You?

Most communities with a Master Plan are required by the Michigan Planning Enabling Act to have a Capital Improvement Plan (CIP). While CIPs are a requirement, they can also serve as an important tool that connects land use decisions, economic development priorities, infrastructure decisions, and municipal finance. ROWE staff will review best practices for creating and maintaining your CIP and discuss the plan's support of strong decision-making.

Seating is limited to 45 participants. \* Please RSVP early, the number of allowable attendees may change due to COVID-19 guidelines. A reminder email will be sent the week and day of presentation.

Free on-street parking in the flat lot located at Kearsley Street and N. Saginaw Street after 5:30 p.m. in downtown Flint.



### DATE

April 19<sup>th</sup>, 2022

### TIME

7:00 P.M. - 9:00 P.M.

### LOCATION

The ROWE Building  
540 S. Saginaw Street,  
Suite 200, Flint, MI

**RSVP BY NOON  
APRIL 14<sup>th</sup>, 2022**

**TO LIN CALLAHAN**

lcallahan@rowepsc.com  
or (810) 664-9411







# TOWNSHIP OF RAY

County of Macomb

64255 Wolcott Road, Ray Township, MI 48096

Phone: (586) 749-5171

Fax: (586) 749-6190 Website: [www.raytwp.org](http://www.raytwp.org)

## Board of Trustees

Joseph Jarzyna, Supervisor

Lori Lascoe, Clerk

Betsy Bart, Treasurer

Betty Grader, Trustee

Doug Stier, Trustee

## Notice of Intent to Update the Township Master Plan

In accordance with the requirements of the Michigan Planning Enabling Act, PA 33 of 2008 and related amendments, this is to notify you that the Ray Township, Macomb County, Michigan is initiating the process to complete a Master Plan Update for the Township.

The Township is requesting your cooperation and assistance in this process. Specifically, we would like to know if you have any thoughts, concerns, or issues you feel should be addressed in this effort that would allow us to work more cooperatively when planning for our area.

Later in the process, the Township will be issuing a draft copy of the Plan for public review and comment, as required by the Act. At that time, we would appreciate all comments regarding the Plan's content and how it may affect planning efforts in your community.

PLEASE BE NOTIFIED that you are invited to send a letter and/or email stating your opinions, position, or questions to the Ray Township Clerk, Lori Lascoe, 64255 Wolcott Road, Ray, Michigan 48096, [clerk@raytwp.org](mailto:clerk@raytwp.org)

We thank you for your cooperation and assistance.

Respectfully,

Lori R. Lascoe, MiPMC  
Ray Township Clerk



**From:** Christine Anderson <CAnderson@seibertanddloski.com>  
**Sent:** Monday, March 28, 2022 5:17 PM  
**To:** planning@armadatwp.org  
**Cc:** Mary Swiacki (clerk@armadatwp.org); John Paterek (supervisor@armadatwp.org)  
**Subject:** Section 4.04 (Administrative Review Authority) to the Armada Township Zoning Ordinance

Dear Christine:

This email will confirm our recent telephone conference during which we discussed Section 4.04 of the Armada Township Zoning Ordinance and the applicable provisions of the Open Meetings Act, MCL 15.261, *et seq.* As we discussed, the current provisions of Section 4.04, which create an administrative review committee and give that committee authority to review and approve minor amendments to an existing plan renders the administrative review committee a public body requiring the committee to comply with the provisions of the Open Meetings Act. As we discussed, the Ordinance could be amended to provide for minor technical amendments of approved site plans, which amendments would be reviewed by one specific government official or individual; moreover, if the scope and type of minor amendments are set forth in detail in the Ordinance and the process established as appropriately ministerial in nature, rather than as an exercise of governmental authority, such a process would not violate the provisions of the Open Meetings Act.

Please do not hesitate to call me should you have any questions or concerns.

Sincerely,

*Christine D. Anderson*

**Seibert and Dloski, PLLC**  
19500 Hall Road, Suite 101  
Clinton Township, MI 48038  
Telephone (586) 469-3800  
Facsimile (586) 469-2443  
Email: [canderson@seibertanddloski.com](mailto:canderson@seibertanddloski.com)  
Website: [www.SeibertandDloski.com](http://www.SeibertandDloski.com)

Leslie A. Fantene, Legal Assistant  
Email: [lfantene@seibertanddloski.com](mailto:lfantene@seibertanddloski.com)



**Agri-Business: Value Added Farming Operations – Acceptable Ancillary Uses** *(to reduce the 55% requirements to 50%)*

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## **Section 8.01 USES PERMITTED**

A. General and specialized farming and agricultural activities, including the raising or growing of crops, livestock, poultry, bees and other farm animals, products and foodstuffs. Any building or structure may be located thereon and used for the day-to-day operation of such activities, for the storage or preservation of said crops or animals, products and foodstuffs until consumed on the premises or until moved to an off-premise place of collection, distribution, or processing, and for the incidental sale of the crops, products and foodstuffs raised or grown on said parcel or in said building or structure

B. Agri-Business (Value Added Farming Operations)

1. Intent

The Township recognizes the need for farming and its ancillary uses to evolve as the broader market and economic conditions of farming evolve. Further that, to maintain the remaining farms and orchards within the Township, preserving the agricultural heritage of the community, as well as furthering the goals and objectives of the Township Master Plan, it is necessary to allow ancillary uses connected with the typical farm and farm operations which may have a slightly more commercial nature. The long term preservation of farming operations was listed as one of the Township residents main objectives within a survey released by Michigan State University Extension in November of 2002. This section of the Ordinance is intended to provide a mechanism to allow agribusinesses or value added farming operations on existing farm facilities while protecting the long term planning interests of the Township. As part of the agri-business approval process noted below, a farm must produce some form of recognition from the State of Michigan that the subject site is a bona fide farm. If any question arises such documentation shall be available for inspection by the Township Supervisor, the Township Code Enforcer, or other appointed designee. These methods may include tax records, enrollment in state or federal programs, or other acceptable means as determined by the Township Board.

2. Acceptable Ancillary Uses

The following uses shall be deemed acceptable ancillary uses as part of an overall agribusiness. These uses shall require a site plan and the appropriate permits and inspections in any instance where the general public is allowed internal access to a building. Site plan and engineering review shall also be required for any paved parking areas. Other ancillary uses not falling into these two categories shall not require a site plan. Where required, site plans shall include the following:

- A to-scale drawing on a survey showing the location and extent of proposed uses and/or paved areas, including north arrow, setback distances.
- Basic





- elevations showing the height and appearance of proposed building(s).
- An aerial image of the surrounding area to provide context (images from online mapping services are acceptable).
- Basic floor plans of any publicly accessible building, drawn to scale.
- A narrative describing the intended use of the building.

Site plans may focus only on the area proposed for development, and bona fide farms need not provide a full site plan for the entire farm site.

- a. Agricultural products grown on site, including but not limited to farm markets, you-pick farms, greenhouses and nurseries (a minimum of fifty (50) percent grown by the operator).
- b. Cider mills or wineries derived from produce grown primarily on site (a minimum of fifty (50) percent grown by the operator).
- c. Bakeries selling baked goods containing produce grown primarily on site (a minimum of fifty (50) percent grown by the operator).
- d. Children play areas including inflatables (not including motorized vehicles or rides).
- e. Petting zoos (limited to farm animals) and pony rides.
- f. Small scale entertainment on a minimum of twenty (20) acres (not including permanent seating areas).
- g. Gift shops for the sale of crafts and antiques limited to twenty-five (25) percent of all indoor retail square footage on site.
- h. Family orientated animated barns (fun houses, haunted house, or similar) and hayrides on a minimum of twenty (20) acres.
- i. Kitchen facilities along with the sale of cider, doughnuts, fruit, etc. operation limited to eight (8) months out of the year. Kitchen facilities do not include restaurant.
- j. Indoor storage facilities for the storage of automobiles, recreational vehicles and items similar in nature. Indoor storage may only occur in buildings that existed at the time of the adoption of this Ordinance.
- k. Processing farm products (a minimum of fifty (50) percent grown by the operator).
- l. Accessory or other similar uses to those listed above as approved by the Planning Commission. If the Commission determines that the type of use is not similar to an above stated acceptable ancillary use or that the impacts from such a use may be of a more intense nature, the Planning Commission may consider the use as a special land use approval and if approved, may place appropriate conditions on the use to ensure that the health, safety, and general welfare of the Township are protected. m. Accessory uses which include mud bogs, race tracks, tractor pulls, the use of motor vehicles or off road vehicles for entertainment, charitable or for profit purposes, shall not be considered acceptable ancillary uses. This shall not include the use of tractors for hayrides or other similar events or normal farm related activities.



## **Administrative Site Plan Review**

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### **Section 4.04 ADMINISTRATIVE REVIEW AUTHORITY**

- A. There is hereby created an administrative review committee consisting of the Planning and Zoning Administrator, the Planning Commission Chair and Vice-Chair, and the Township Planner. The administrative review committee shall have the authority to review and approve minor amendments to an existing site plan.
1. Minor Amendments may include:
- a. Changes in landscape specifications and designs that do not reduce the total amount of landscaping on the site (provided the intent of the original approval is maintained).
  - b. Changes to the building façade which do not create additional square footage (subject to (d) below).
  - c. Fences within any nonresidential development or district.
  - d. Changes in location of previously approved sidewalks, dumpsters, heating and cooling units, and the like.
  - e. Temporary buildings such as construction trailers and the like.
  - f. The Building Official shall have the option to request Planning Commission consideration of site plans eligible for administrative review. All appeals of administrative review determinations shall be made to the Planning Commission. In such cases, the Planning Commission shall review the site plan in accordance with the procedures outlined in Article IV – Site Plan Review Requirements and Procedures.
- B. The administrative review committee shall also:
- 1. Have the authority to consult with any other Township department head, consultant or other appropriate agency regarding site plan issues.
  - 2. Refer any issue to the full Planning Commission for their review should they deem such necessary.
  - 3. Provide a report to the Planning Commission each month regarding the issues which the administrative review committee heard.
- C. Any and all costs associated with the administrative review shall be paid by the applicant prior to the issuance of a building permit.





## **Medical Marijuana Uses – General Provisions**

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### **Section 2.43 MEDICAL MARIJUANA USES**

#### **A. Intent**

1. Voters in the State of Michigan approved the referendum authorizing the use of marijuana for certain medical conditions, being the Michigan Medical Marihuana Act, MCL 333.26421, et seq. (“The Act”).
2. The specified intent of the Act is to enable certain specified persons who comply with the registration provisions of the law to acquire, possess, cultivate, grow and use marijuana as well as to assist specifically registered individuals identified in the statute without being subject to criminal prosecution under state law in limited, specific circumstances.
3. Despite the specific provisions of the Act and the activities identified in the Act, marijuana remains a controlled substance (Schedule 1 drug) under Michigan law. The activities set forth in the Act have a potential for abuse. Such activities should be closely monitored and, to the extent permissible, regulated by local authorities.
4. If not closely monitored or regulated, the presence of marijuana even for the purposes specified by the Act may present an increase for illegal conduct and/or activity which adversely affects the health, safety and welfare of the residents of Armada Township.
5. Nothing in this Ordinance shall be construed to allow persons to engage in conduct that endangers others or causes a public nuisance, or to allow use, possession or control of marijuana for non-medical purposes or allow any other activity relating to cultivation/ growing, distribution or consumption of marijuana that is otherwise illegal.
6. This Section is intended to protect and preserve the public health, safety and welfare of the community, the quality of life and the stability of property values including but not limited to the value of residential, commercial, and industrial districts.
7. This Section is intended to prohibit a caregiver’s cultivation of marijuana in residential and commercial districts in order to protect and preserve peace, order, property and safety of persons as a result of issues associated with the growth of marijuana in residential and commercial districts including problems with insufficient or improper electrical supply, problems with ventilation leading to mold, offensive odors, or other health hazards and other hazards which are associated with the cultivation of marijuana in residential and commercial settings and which is otherwise often difficult to detect and regulate.

#### **B. Medical Marijuana Dispensary, Compassion Centers or other similar operation for the consumption or distribution of medicinal marijuana.**

It shall be unlawful for any person or entity to own, manage, conduct, or operate a medical marijuana dispensary, compassion center, grow facility, growth cooperative or other similar operation, or to participate as an employee, contractor, agent or volunteer, or in any other manner or capacity, in any medical marijuana dispensary, compassion center, grow facility, growth cooperative or other similar operation in Armada Township.



C. Registered Primary Caregiver Operations.

Any registered primary caregiver may acquire, possess, cultivate, manufacture, transfer, or transport medical marijuana compliant with the MMMA. Cultivation of medical Marijuana by a registered primary care giver as defined under the MMMA, is prohibited in any zoning district, except the M-1 and M-2 Industrial Districts; and further subject to the following:

1. A registered primary caregiver may only grow, cultivate, manufacture, process, and store marijuana on a parcel in the M-1 and M-2 Industrial Districts and in an enclosed locked facility.
2. The registered primary caregiver is responsible for utilizing an enclosed locked facility upon the industrial zoned parcel, compliant with the MMMA for cultivating, growing, manufacturing, processing, and storing marijuana for medical use only. The enclosed locked facility utilized by the primary registered caregiver, shall provide separation by fully enclosed walls or fences, for plants that are grown on behalf of each registered qualifying patient, on whose behalf the registered primary caregiver is furnishing marijuana for medical use, so it is accessible only to the primary caregiver and registered patient. The processing and storing of medical marijuana is permitted only by registered primary caregivers and their registered qualifying patients.
3. The registered primary caregiver may grow up to a maximum of 72 plants, but no more than 12 plants for each individual registered qualifying patient as set forth in the MMMA.
4. The registered primary caregiver is responsible for providing the security necessary to assure that the growing marijuana and usable product are accessible only by the primary registered caregiver and/or registered qualifying patients who are registered to the registered primary caregiver through the state registration system. The security must fully comply with the provisions of the MMMA, and Administrative Rules promulgated by the State of Michigan.
5. Each parcel upon which enclosed locked facilities with marijuana for medical use are present, must be a minimum of 1,000 feet from any parcel upon which any school, school facility, child care facility (excluding home school activities), place of worship, or public park is situated. Measurement of the buffer shall be from property line to property line.
6. A Certificate of Occupancy is required and must be obtained from the Township before the presence of marijuana is allowed on the parcel.
7. The consumption, transfer, or use of marijuana, in public, or a place opened to the public is prohibited.
8. No person other than the primary caregiver shall be engaged or involved in the growing, processing, dispensing, delivering or handling of medical marijuana except to the extent that the primary caregiver lawfully transfers medical marijuana to a qualifying patient to whom the primary caregiver is linked through the state registration system.

D. Certificate Required. The operations of a registered primary caregiver within the M-1 and M-2 Industrial Districts shall only be permitted upon the issuance of a Zoning Certificate to Cultivate Medical Marijuana. Such certificate is required to be renewed annually and is



subject to inspections by the building and fire department as well as the Macomb County Sheriff's Department for compliance with the provisions of this Ordinance and for the issuance of the certificate and its renewals.

1. A complete and accurate application shall be submitted on a form provided by the Township along with submission of the application fee. The application fee and renewal fee shall be in an amount determined by resolution of the Township Board.
2. The certificate application shall include the name and address of the applicant; the address of the property; a copy of the current state registration card issued to the primary caregiver; a full description of the nature and types of equipment which will be used in marijuana cultivation and processing; and a description of the location at which the use will take place. The Township Zoning Administrator shall review the application to determine compliance with this Ordinance, the MMMA and any applicable Michigan Regulatory Agency General Rules. A certificate shall be granted if the application demonstrates compliance with the Zoning Ordinance, the MMMA and Administrative Rules.
3. The use shall be maintained in compliance with the requirements of this Ordinance, the MMMA and Administrative Rules promulgated by the State of Michigan. Any departure shall be grounds to revoke the certificate and take other lawful action. If a certificate is revoked, the applicant shall not engage in the activity unless and until a new Zoning Authorization to Cultivate Medical Marijuana certificate is granted.
4. Information treated as confidential under the MMMA, including the primary caregiver registry identification card and any information about qualifying patients associated with the primary caregiver, which is received by the Township, shall be maintained separately from public information submitted in support of the application. It shall not be distributed or otherwise made available to the public and shall not be subject to disclosure under the Freedom of Information Act.





## **Medical Marijuana Uses – Definitions**

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### **Section 20.01 DEFINITIONS**

**MMMA.** The Michigan Medical Marijuana Act, MCL 333.26421 et seq., as amended.

**Registered primary care giver.** A person meeting the definition of caregiver under the MMMA and who has been issued and possesses a registry identification card and possesses the documentation that constitutes a valid registry under the MMMA.

**Marijuana.** Marijuana means that term as defined in Section 7106 of the Public Health Code, 1978 PA 368, MCL 333.7106.

**Medical use.** The acquisition, possession, cultivation, manufacture, extraction, use, internal possession, delivery, transfer, transportation of marijuana, marijuana infused products or paraphernalia relating to the administration of marijuana to treat or alleviate a registered qualifying patient's debilitating medical condition, or symptoms associated with the debilitating medical condition, as further defined under the MMMA.

**Registered qualifying patient.** A person who has been diagnosed by a physician as having a debilitating medical condition and who has been issued and possesses a registry identification card which is valid under the MMMA, as amended.

**Enclosed locked facility.** A closet, room or other comparable stationary and fully enclosed area equipped with secure locks or other functioning security devices that permit access only by a registered primary care giver, or registered qualifying patient.

**Transfer.** To convey, sell, give, deliver or allow the possession by another person or entity.



## **Medical Marijuana Uses – Industrial Districts**

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### **Section 14.01 PERMITTED USES** (*M-1 Industrial District*)

All uses in this district shall be conducted wholly within a building.

- A. Warehousing and wholesale establishments, storage and mini warehouses.
- B. The compounding, processing, packaging, or treatment of such products as: bakery goods, candy, toiletries, food products, hardware and cutlery.
- C. The manufacture, compounding, assembling, or improvement of articles or merchandise from the following previously prepared materials: canvas, cellophane, cloth, cork, feathers, felt, fiber, fur, glass, hair, leather, paper, plastics, precious or semi-precious metals or stones, shells, textiles, tobacco, wax, wire, wood and yarns or such other similar materials as approved by the Planning Commission.
- D. The manufacture of pottery and figurines or other similar ceramic products using only previously pulverized clay, and kilns fired only by electricity or gas.
- E. Manufacture of musical instruments, toys, novelties, and metal, plastic or rubber stamps, or other small molded products.
- F. Manufacture and repair of electric or neon signs, light sheet metal products, including heating and ventilating equipment, cornices, eaves and the like.
- G. County, State, or Federal Uses.
- H. Automobile Repair and Service Centers Excluding Paint and Collision Shops (Section 16.06).
- I. Utility service buildings, water supply and water and gas tanks.
- J. Farms as defined in 8.01 A., E., F.
- K. Small solar energy systems.
- L. Medium solar energy systems.
- M. Large solar energy systems.
- N. Accessory uses and accessory outside storage customarily incidental to any of the above uses. Outside storage shall be limited to currently licensed and operable cars, trucks, and recreation vehicles, finished and semi-finished manufactured materials produced on the premises and equipment necessary as an accessory to the principal use.





O. Uses expressly prohibited under this Article include the following:

- a. Used auto parts and used building materials.
- b. Storage of loose minerals, including soil, stone, sand, gravel, coal, cinders and similar materials.
- c. Incubation, raising, killing or storage of poultry.
- d. Residential uses, including dwelling units.

P. Registered Primary Caregivers.



## **Medical Marijuana Uses – Industrial Districts**

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### **Section 15.00 PERMITTED USES** (*M-2 General Industrial District*)

- A. Any principal and special land use permitted in the M-1 Light Industrial District, (with the exception of any commercial uses allowable in the M-1 District).
- B. Industrial uses to be conducted wholly within a building or within a building and/or an area enclosed within a chain-link fence; the fence shall be not less than six (6) feet high, located not less than fifty (50) feet from the front property line or side street property line; outside of the fence shall be planted a twenty (20) foot greenbelt planting strip, which shall be not less than eight (8) feet or more in height, to screen view of storage materials from the street and adjacent properties. On a side and/or rear property line abutting residential, the fence shall be located on the property line and a twenty (20) foot greenbelt planting strip, not less than eight (8) feet in height, shall be planted and maintained along the fence inside of the property to screen view of storage materials from adjacent properties.
  - a. Building materials storage yards.
  - b. Equipment rental or storage yards.
  - c. Feed and fuel yards.
  - d. Trucking terminals and transfer warehouses with outside storage for trucks, trailers, etc. when direct access is available to County highways.
- C. Industrial uses conducted wholly within a building, with a landscaped front yard and with the side or rear yard used for loading and unloading and parking.
- D. Small solar energy systems.
- E. Medium solar energy systems.
- F. Large solar energy systems.
- G. No use in this district shall be permitted whose operation may violate the performance standards set forth in this Section of this Ordinance.
- H. Registered Primary Caregivers.

No outdoor storage shall be permitted unless it is part of an approved site plan. If no outdoor storage will be created, then the site plan shall contain a signed certified statement to that effect by the owner of the property.

