

**CHARTER TOWNSHIP OF VAN BUREN  
PLANNING COMMISSION AGENDA  
Wednesday, September 12, 2018 – 7:30 PM, Board of Trustees Room**

**CALL TO ORDER:**

**ROLL CALL:**

**APPROVAL OF AGENDA:**

**MINUTES:**

**ITEM #1:** Approval of minutes from the regular meeting of August 22, 2018.

**CORRESPONDENCE:**

**PUBLIC HEARING:**

**UNFINISHED BUSINESS:**

**NEW BUSINESS:**

**ITEM #1: CASE 18-0021 – PHASE TWO (2) PRELIMINARY SITE PLAN APPROVAL**

**TITLE:** THE APPLICANT, ACS MICHIGAN, IS REQUESTING PHASE TWO (2) PRELIMINARY SITE PLAN APPROVAL (PER THE APPROVED DEVELOPMENT AGREEMENT) TO CONSTRUCT AN AUTOMOTIVE RESEARCH AND DEVELOPMENT FACILITY.

**LOCATION:** SUBJECT PROPERTY IS LOCATED AT 50015 MICHIGAN AVENUE, OTHERWISE KNOWN AS THE HAROLD SMITH FARM.

**ACTION ITEMS:**

- A. Presentation by the applicant.
- B. Presentation by Township staff.
- C. Planning Commission discussion.
- D. Planning Commission considers phase 2 preliminary site plan approval.

**ITEM #3: 17-029– FINAL SITE PLAN APPROVAL**

**TITLE:** THE APPLICANT, THE VAN BUREN TOWNSHIP DOWNTOWN DEVELOPMENT AUTHORITY, IS REQUESTING FINAL SITE PLAN APPROVAL TO CONSTRUCT AN OFFICE BUILDING AND A PARK AT THEIR PROPERTY ON BELLEVILLE ROAD.

**LOCATION:** 10151, 10065, 10085, & 10101 BELLEVILLE ROAD IS THE SUBJECT OF THE AGENDA ITEM. THE PROPERTY IS LOCATED ON THE EAST SIDE OF BELLEVILLE ROAD, NORTH OF THE I-94 SERVICE DRIVE AND SOUTH OF TYLER ROAD.

**ACTION ITEMS:**

- A. Presentation by the applicant.
- B. Presentation by the Township Staff and Consultants.
- C. Planning Commission discussion.
- D. Planning Commission considers action on the final site plan approval.

**GENERAL DISCUSSION:**

**ADJOURNMENT:**

**CHARTER TOWNSHIP OF VAN BUREN  
PLANNING COMMISSION  
AUGUST 22, 2018  
MINUTES - DRAFT**

Chairperson Thompson called the meeting to order at 7:31 p.m.

**ROLL CALL:**

**Present:** Jahr, Boynton, Atchinson, Budd, Franzoi and Thompson.

**Excused:** Kelley.

**Staff:** Director Akers, Planning Intern Moore and Secretary Harman.

**Planning Representatives:** McKenna Associate, Patrick Sloan and Fishbeck Associate, David Potter.

**Audience:** Three (3).

**APPROVAL OF AGENDA:**

**Motion Atchinson, Boynton second to approve the agenda of August 22, 2018 as presented.**

**Motion Carried.**

**APPROVAL OF MINUTES:**

**Motion Franzoi, Boynton second to approve the regular meeting minutes of August 8, 2018 as amended with a spelling correction to Commissioner Boynton's name. Motion Carried.**

**NEW BUSINESS:**

**ITEM # 1                    18-025 – SITE PLAN APPROVAL**

**TITLE:                        THE APPLICANT, ASHLEY CROSSROADS SOUTH, LLC, IS REQUESTING SITE PLAN APPROVAL TO ADD ADDITIONAL CAR PARKING TO SERVICE THE EXISTING BUILDING 1.**

**LOCATION:                    SUBJECT PROPERTY IS LOCATED AT THE CROSSROADS SOUTH DEVELOPMENT WHOSE ADDRESS IS 41775 & 41873 ECORSE ROAD.**

Joseph Webb, design engineer for Ashley Crossroads South, LLC gave the presentation. The additional parking request is to accommodate FedEx. No representative was present from Ashley Crossroads South, LLC.

Patrick Sloan of McKenna Associates presented his site plan review letter dated 8-3-18 recommending the following revisions be made to the sites plans:

1. That Sheet C1 of the plans be updated to correct the minimum setback requirements.
2. That all proposed parking spaces be double striped per Section 9.104(C) of the Zoning Ordinance and that Sheets C2 and L1 be revised to show the required double striping.
3. That a note be added to the plans that all other parking spaces on the parcel be double striped per Section 9.104(C) the next time they are repainted.
4. That the required barrier free spaces be shown on the plans.
5. That the plans include a note that the filling and truck parking in the southern part of the property was not approved by the Township, and that a note be added to the plans stating

**Motion Boynton, Jahr second to postpone preliminary site plan approval until the conditions and recommendations have been met. Motion Carried.**

**GENERAL DISCUSSION:**

**Item #1: PUBLIC PARTICIPATION PLAN PRESENTATION/DISCUSSION**

Planning Intern, Grace Moore gave a presentation of the Public Participation Plan. The plan is a written commitment and guide to involving the community throughout Van Buren Township's planning and development process. Ms. Moore is currently in the process of drafting the Public Participation Plan; she will share the completed plan with the Planning Commission before presenting it to the Township Board.

**ADJOURNMENT:**

**Motion Boynton, Atchinson second to adjourn at 8:14 p.m. Motion Carried.**

Respectfully submitted,

Christina Harman  
Recording Secretary

# MCKENNA



September 7, 2018

Planning Commission  
Charter Township of Van Buren  
46425 Tyler Road  
Belleville, Michigan 48111

**Subject: VBT-18-021; Project Pancake – Phase 2/Michigan Avenue; Preliminary Site Plan Review #3; Revised Site Plans Dated August 24, 2018.**

Dear Commissioners:

The applicant, ACS Michigan proposes to build a 2-story 63,574-square foot research and development facility building and associated site improvements. The 75-acre site is located on the south side of Michigan Avenue, bound by single family residential neighborhoods to the east and Conrail railroad to the south, and is commonly referred to as the "Harold Smith Farm" parcel.

**Figure 1. Subject Site Location**



Source: Google

The site was recently rezoned from R-1C (Single Family Residential) to M-1 (Light Industrial), with conditions. The rezoning is subject to the Rezoning with Conditions Agreement ("RCA"), and the applicable provisions of the CRA are addressed in this letter.

**HEADQUARTERS**  
235 East Main Street      ☎ 248.596.0920  
Suite 105                      ✉ 248.596.0930  
Northville, Michigan 48167      [MCKA.COM](http://MCKA.COM)

Communities for real life.

A Development Agreement ("DA") for the subject site was approved by the Township Board of Trustees on July 17, 2018. The DA calls for the development of the site in two (2) phases as follows:

- **Phase 1** – The applicant appeared before the Planning Commission on August 8<sup>th</sup>, 2018, and received site plan approval with conditions for Phase 1, which included site grading, and construction of the stormwater detention pond, the building footprint and shell, the parking lot, and the berms.
- **Phase 2, which is addressed in this letter, consists of all other remaining items including, but not limited to, landscaping and screening, signage, woodland and tree preservation, exterior lighting, loading and unloading, site engineering, and utilities.**

At its meeting on August 8, 2018, the Planning Commission approved the Phase 1 site plan, subject to conditions. At its meeting on August 22, 2018, the Planning Commission reviewed the Phase 2 site plan and deferred action on the Phase 2 site plan and recommended plan modifications to be compliant with the Zoning Ordinance. The applicants have resubmitted the Phase 2 site plans, which are accompanied by a response letter (dated 8/24/18) to our previous site plan review letter of August 16, 2018. We have reviewed the site plan for compliance with the conditions of Phase 1 approval, Zoning Ordinance standards, terms of the CRA and DA, and sound planning and design principles. We offer the following comments for your consideration: (Any items that require changes or additional information are underlined.)

#### COMMENTS

1. **Zoning and Use.** The site is zoned M-1 (Light Industrial) district with conditions. The surrounding zoning includes M-2 (General Industrial) to the south, R-1C (Single Family Residential), C-1 (General Business) and RMH (Mobile Home Park) to the north across Michigan Avenue, R-1C (Single Family Residential) to the east and RMH (Mobile Home Park) and M-1 (Light Industrial) to the west.

The proposed use is a research and development facility with laboratories. Laboratories, major and minor are permitted as principal land use in the M-1 district per Section 3.104 of the Zoning Ordinance. The "tire/vehicle storage" structure is minor enough to be considered accessory to the principal permitted use and is permitted by right, subject to compliance with Zoning Ordinance standards accessory buildings. The applicant's response letter dated 8/24/18 states that a general use statement has been added to the cover sheet. However, the note on the cover sheet only pertains to the phasing of the project. As required under conditions of approval for Phase 1, a use statement must be added to the plan consistent with the description in the DA.

2. **Dimensional Requirements.** The revised site plan notes the size of the proposed building as 63,574 square feet. The proposed height of the 2-story building was previously noted as 28 feet, which was within the maximum permitted height of 30 feet for the buildings in the M-1 district. However, the architectural elevations submitted at this time indicate a building height of 30 feet to the parapet of the building, with a maximum height of 36 feet, 10 inches for a portion of the building occupied by the testing area. Per Section 4.103 of the Zoning Ordinance Buildings of greater than the maximum height allowed in Section 4.102 may be allowed in the M-1 district provided front, side, and rear yards are increased by one (1) foot for each additional foot of building height that exceeds the maximum height allowed. The proposed building complies with such an increased setback requirement; however the increased setbacks must be clearly delineated on the site plan. The M-1 district has a minimum required front yard setback of



50 feet, a minimum side yard setback of 40 feet, and a minimum rear yard setback of 40 feet, which would correspondingly be increased to 56'-10", 46'-10" and 46'-10", respectively.

The maximum lot coverage is 35%. Based on the size of the structure proposed, the coverage is likely to be well under the 35% coverage permitted. However, detailed lot coverage calculations must be noted. The required data has not been noted on the plan.

The 2000 Ecorse and Haggerty Road Corridor Plan added Residential Protection Areas to many areas of the township, including industrial areas that abutted residential areas in the northwest part of the township. The subject site was not part of that consideration at that time because it was zoned R-1C; however, a change of the zoning to M-1 with conditions placed an industrial use on the site next to residential areas to the east. As part of the CRA, the applicant is required to maintain the 400-foot residential buffer along the east and west property lines. The site plan indicates the required residential buffer zones.

3. **Required Information.** Section 12.203 of the Zoning Ordinance includes all the requirements for information on a site plan. The following additional items must be included on the site plan (the applicant's response letter dated 8/24/18 states that the information will be provided with final plan submission):
  - a. Name and address of property owner must be noted on final plan.
  - b. Details of proposed trash enclosure.
  - c. Location and details of proposed outdoor mechanical equipment.
  - d. Note hours of operation of the facility and the outdoor vehicle evaluation area. While the response letter states the timing as "dawn to dusk," this is likely to vary based upon the time of the year.

We do not recommend deferring this information to final site plan review.

4. **Detention Pond.** The site plan proposes a large detention pond along the east side of the site, located within the 400-foot residential buffer zone. We defer to the Township Engineer's regarding the proposed design and capacity of the pond. At the Planning Commission meeting on August 8<sup>th</sup>, 2018, there was some discussion on location of the berm on the west side of the pond, rather than east side abutting the single-family residential boundary. The Planning Commission found the proposed berm location acceptable.

As noted in our Phase 1 review letter also, the slope of the detention pond is shown extending up to the east property line and appears to be separated from the abutting parcels by a chain link fence only. The landscape plan on Sheet L-4 still does not indicate any landscaping along the fence line. Section 10.103(K) includes specific standards for landscaping around storm water detention ponds, and the plans do not comply with these requirements. Because Wayne County regulates much of planting around detention ponds, we recommend that the perimeter of the pond be landscaped consistent with Wayne County requirements. The applicant's response letter dated 8/24/18 states "understood;" however, we recommend that this comment be addressed at this time.

Section 8.107(D)(2) requires chain link fence to be vinyl-coated black. The site plan has been revised to note the provision of a 6-foot high black vinyl coated chain link fence; however, the landscape plan sheets



L-1 and L-4 continue to identify it as an 8-foot high fence. All plan sheets must consistently note the fence height as 6 feet.

5. **Access and Circulation.** There is one (1) proposed entrance to the site from Michigan Avenue. The applicant has stated that the approach is still pending MDOT approval. The access drive branches off to provide access to a parking lot on the north side of the building, while the main access drive continues south and forks into 2, allowing access to the vehicle evaluation area and parking lot on the east side of the building. The drive aisles within the parking lot areas are 24 feet wide while the main internal circulation drives through the site vary in width from 30 feet to 32 feet. The south side of the access drive on the south side of the building is missing curbing, which is required by Section 9.104(I) of the Zoning Ordinance. However, the Planning Commission may approve an alternative design when opportunity exists to substantially improve the water quality of the site. Per the applicant, the curb has been eliminated to allow for sheet flow drainage into the swale to its south. The following items regrading access must be addressed on revised and dated set of plans:
- a. Delineate with pavement striping lanes for ingress and egress. Pages OS 02 and 03 identify a driveway width of 28 feet and directional signage; however, no pavement striping is shown to delineate ingress and egress.
  - b. The plan indicates a gate mid-way through the access drive. Details of the gate, including its operation, must be noted. The applicant states in their letter dated 8/24/18 that the information will be provided with final plan submission.
  - c. We defer to the Township Engineer regarding sheet flow drainage in the uncurbed portion of the interior access drive.
  - d. The applicant that signage will be installed in the access drive, at the fork to the vehicle evaluation area. Detailed information will be provided with final plan submission.

Per the applicant's presentation at the August 8, 2018 Planning Commission meeting, the proposed research and development facility receives very limited traffic, and the maximum number of employees at the present time is 100. Although the site is large, the facility is of limited size and has frontage and accesses onto a State Trunk line (pending MDOT approval). The applicant has submitted copy of a traffic impact study conducted by their consultants HRC, dated July 13, 2018. The study includes trip generation data, condition of existing roadways, improvements, access management, turn movements etc. The recommendations of the study include a modification to signal timing and addition of a right-hand turn lane (deceleration lane) on east bund Michigan Avenue. The improvements proposed are under the jurisdiction and review authority of MDOT.

6. **Sidewalks.** Section 9.107 of the Zoning Ordinance requires the provision of a sidewalk long all public streets and major thoroughfares. The site plan does not indicate any sidewalk along Michigan Avenue frontage. *The Planning Commission has the ability to modify the location of interior sidewalks only.* The site plan also indicates 7-foot wide sidewalks next to the parking lots on the north and west side of the building and location of barrier free access ramps. The following items must be addressed:
- a. A 5-foot wide concrete sidewalk is required along the site's Michigan Avenue frontage, unless the applicant has a specific reason to show why it is not possible to install the required sidewalk. The revised site plan indicates a "possible future 5' concrete sidewalk." Further, the applicant's response letter dated 8/24/18 states that "follow-up with MDOT is required if sidewalk is allowed since there is



no existing sidewalk adjacent to this property. The applicant is willing to comply with the installation of the walk, when there is connectivity beyond the applicant's property lines to coincide with adjacent construction". While MDOT approval will likely be required, the applicant cannot base their compliance with Ordinance standards on the future development of adjacent properties. The subject site has a frontage of several hundred feet on Michigan Avenue and the installation of sidewalk would provide significant pedestrian connectivity in the whole area. Unless denied by MDOT in writing, the sidewalk must be installed at this time or a plan proposed for its phased installation. A deviation from this standard cannot be granted by the Planning Commission. While a sidewalk along the frontage of Michigan Avenue would not currently connect to any sidewalks, it would encourage future connections to the subdivision to the east as well as a possible connection to Michigan Ave. and Ecorse Road to the west.

- d. Provide striped crosswalks for safe access to building entrances on all sides, specifically the east side which has overhead doors and no sidewalks for pedestrians. The applicant states that "overhead doors are for vehicle access only." While we understand that, the east side parking area has 52 car parking spaces. Employees parking in these spots will need safe pedestrian access to the building through the doorway proposed on the northeast corner of the building wall. If striping is not proposed, we recommend signage indicating pedestrian crossing.

## 7. Parking and Loading.

- a. **Number of Parking Spaces.** Per Section 9.102(E) of the Zoning Ordinance, parking requirements for research and development and testing facilities are five (5) spaces plus four (4) spaces per 1,000 square feet of gross floor area plus one (1) per employee in peak shift.

Per the applicant's representation at the August 8, 2018 Planning Commission meeting, the proposed building has a gross floor area of 63,500 sq. ft. and a total of 100 employees in a peak shift (as represented by applicant's engineer HRC). Based on the information provided, the site requires **359 spaces** (i.e., **259 spaces** for the floor area and **100 spaces** for the employees). The site plan indicates a total of **197 (previously 194) parking spaces**. The proposed parking is deficient by 162 (previously deficient by 165) spaces. As allowed by Section 9.101(J) of the Zoning Ordinance, the Planning Commission granted a deviation for the minimum required parking spaces at the August 8, 2018 Planning Commission meeting, as presented by the applicant. As required in our previous letter(s), detailed parking calculations as noted above must be on the site plan.

While the applicant previously stated to the Planning Commission that the maximum number of employees on the site will be 100; the traffic study submitted at this time notes the number of proposed employees as "starting with 120 to 140 employees up to a maximum of 180." Such a difference is significant for parking requirements, especially if the employees are present on the same or overlapping shift. The plans must clarify the discrepancy in employee parking because the deviation granted by the Planning Commission must be based on consistent and accurate facts and data.

The site plan also proposes two (2) "future building expansion areas" and "future parking expansion area" with 55 spaces (previously 80 spaces). Section 9.101(H) of the Zoning Ordinance allows for parking deferment where a property owner can demonstrate that the required number of parking spaces is excessive. The applicant states that a parking deferment with supporting documentation



will be provided as part of final site plan submission. Because the parking deferment affects the layout of the plans, we recommend that the deferment request be decided at preliminary site plan review.

- b. **Space Dimensions.** All the proposed parking spaces are 9.5 feet wide and 20 feet deep. The spaces are also shown with double striping, as required by Section 9.104(C) of the Zoning Ordinance.

Section 10.103(B)(2) of the Zoning Ordinance requires the provision of an interior landscape island for every 20 spaces. The site plan has been revised to include landscape islands to comply with this standard; however, the landscape plans must be modified accordingly.

- c. **Barrier Free Spaces.** For parking lots between 151-200 spaces, the ADA requires six (6) barrier free spaces. The revised site plan indicates the required number of spaces. The dimensions of barrier free spaces have been noted and are ADA complaint. The future parking area indicates 55 spaces for which the applicant is seeking a deferment. Because the layout approval is being sought at this time, the total number of spaces on the site will eventually exceed 200, which would require one (1) additional barrier free space. The additional barrier free space is shown in the western parking lot.
- d. **Loading.** Per Section 9.105 of the Zoning Ordinance, the proposed building will require a total of two (2) 10-foot by 50-foot loadings spaces. The revised site plan indicates only one (1) loading space on the east side of the building. A second loading space must be located and dimensioned on the site plan.

8. **Architecture and Building Details.** Section 3.116(E) of the Zoning Ordinance requires building elevations, where visible from residential districts and public rights-of-way, shall incorporate vertical design elements such as spandrel glass, columns, pilasters and/or piers, so as to break up the horizontal mass of the building. The applicant presented elevations for the building shell at the August 8, 2018 Planning Commission meeting and received approval for the same; however, the approval was subject to detailed elevations being provided. The applicant has submitted the elevations and an artistic rendering that indicates the structure will be constructed in shades of silver and black with glass panels and "wall assembly A and B". The applicant must clarify what material the "wall assembly" is. The applicant must also show any mechanical equipment as well as the screening pursuant Section 10.103(J).

At the August 8, 2018 Planning Commission meeting the applicant also noted that the tire/vehicle storage shown along the southeast corner of the east parking lot area is a structure and not merely a parking surface. Sheet APC-01 of the revised plan submittal includes elevations of the structure to be constructed of "wall system B". The applicant must clarify what material this is, proposed colors, and note height of this building.

9. **Landscaping.** Landscaping is subject to the provisions of Section 10.103 of the Zoning Ordinance. Sheets L-0 through L-11 of the site plan submission includes details of proposed landscaping for the site. The Zoning Ordinance describes the landscaping requirements that must be met individually. Our comments are as follows:
- a. **Frontage Landscaping.** Section 10.103(A) states that when a site abuts a public right-of-way, frontage landscaping shall include 1 deciduous or evergreen tree per 40 lineal feet of road frontage +



1 ornamental tree per 100 feet of lineal frontage + 8 shrubs per 40 lineal feet of frontage. Based on a frontage of 1,100 feet on Michigan Avenue, the site requires a total of 28 deciduous or evergreen trees + 11 ornamental trees + 220 shrubs. The plan proposes a total of 33 deciduous trees + 14 ornamental trees + 229 shrubs to meet this requirement. The ornamental and deciduous trees are placed almost entirely with the greenbelt area on the north side of the proposed building and near the main access drive off Michigan Avenue. The northwest frontage of the site along Michigan Avenue has no vegetation; however, the applicant is proposing the installation of a 60-foot wide, 10-foot high berm landscaped with evergreen trees, placed between 50 feet – 360 feet away from the front property line. The area between the berm and the right-of-way line is to be maintained as "non-irrigated" seeded lawn. The applicant has stated that the lawn area will be warranted to have no weeds prior to acceptance by the owner. Sheet L-10 states that all landscaped areas will be irrigated with an automatic irrigation system, and the limits of irrigation are shown on the preceding landscaping sheets.

**b. Parking Lot Landscaping.**

Screening. Section 101.03(B)(1) requires parking lots to be screened from public rights-of-way by landscaping. The parking lots located on the north and west sides of the building are to be screened by the landscaping noted in comment a above. Additionally, 229 Hicks Yew shrubs will be planted on the north sides of these parking lots to screen the lots from the road. The shrubs will be planted at 30 inches in height, so they should attain the required height of 3 feet within 1-2 years. The frontage is also to be planted by a variety of perennials, which enhance the appearance of the frontage. The easternmost parking lot will be screened by the berm.

Interior Lot Landscaping. Section 10.103(B)(2) requires parking lot landscaped areas to be at least 5% of all the paved areas. The site plan shows vehicular surface area as 80,783 square feet, thus requiring 4,040 square feet of landscaped area. While the calculations noted on sheet L-10 state that the landscape area provided is 3,231 (resulting in a shortfall of 809 square feet), the main sheets of site plan set include additional interior landscape area. The landscape plans must be updated to show the additional interior landscape area. The applicant's response letter states that "landscaping sheets will be revised with final site plan submission." The shortfall amount is significant and should not be deferred for future plan review.

Each landscaped island must be at least 360 square feet and shall have at least one (1) tree. Also, there must be at least 1 tree per 300 square feet of vehicular surface landscaped area. The parking lots include several islands, each planted with 2 deciduous trees. We recommend that the areas of the islands must be noted to determine compliance to this standard. Based on the interior lot landscaping standards, a total of 11 trees are required and 13 are proposed. The Zoning Ordinance does not allow for more than 20 spaces in an uninterrupted row without a landscape island. As noted in the previous paragraph, the parking lot layout in the landscape plans must be revised to reflect the parking lot layout in the main sheets of the site plan.

**c. Loading Area Landscaping.** Section 10.103(C) requires loading areas to be screened from view of any adjacent residential district by a fence and/or landscaping. The loading dock area appears to be located on the east side of the proposed building and is screened from view of the residential district



to the east by a 60-foot wide, 10-foot high berm to be planted with a double staggered row of evergreen trees placed 15 feet on center.

- d. **Greenbelt Buffering.** Section 10.103(E) requires screening between a use on an M-1 zoned property and abutting single family residential districts. The Zoning Ordinance requires a 60-foot wide buffer with a double staggered row of evergreens placed 15 feet on center, with a flat horizontal crest area of at least 3 feet. The landscape plan proposes a 60-foot wide, 10-foot high berm on the east side of the building and parking lot, set 320 feet away from the east property line abutting the residential district. The berm is to be planted with a mix of White Spruce, White Pine and Norway Spruce trees placed 15 feet on center. Pursuant to 10.104(B), the height of the evergreen trees must be 8 feet.
  - e. **Open Space Landscaping.** Per Section 10.103(G), all open areas of the site that are not required landscaping areas must be planted with one tree per 3,000 square feet of open area. The site has a total open area of 1,260,000 square feet, which translates to 420 trees, of which 35% (147 trees) are required to be deciduous. The landscape plan notes that 0 trees are proposed to meet this requirement. Per the applicant *"the landscaping within the open space will likely be removed as this site develops due to the need to elevate the site due to ground water levels and existing contours requiring extensive changes in order for the site to be expanded and fully utilized. The site has been a farm absent of trees for over 100 years..."* The applicant is seeking a waiver from this provision of the Ordinance. We recommend that the open area be recalculated to deduct structures (including future expansion areas), ponds, and required landscaping areas, and show the required trees. There are 590 evergreen trees proposed along the berms, so these trees could be considered as justification for the Planning Commission to revise the open space landscaping requirements.
  - f. **Other Requirements.** Sheet L-10 notes that all landscape areas will be irrigated with an automatic irrigation system. The limits of irrigation are shown on the preceding landscaping sheets. We recommend that all trees and shrubs be irrigated, including the interior landscape areas and berms. Section 10.105(C) allows the Planning Commission to waive or modify the irrigation requirements if irrigation is not necessary for keeping the landscaping in good condition. If the applicant seeks a waiver from the requirement to modify the irrigation requirements of the berm, we recommend that the applicant demonstrate how the berm landscaping will be watered during dry periods.
  - g. **Residential Buffer.** Per the DA, the plans submitted include 400-foot wide residential buffer zones along the east and west property boundaries. The parcel is triangle-shaped and the narrow corner at the southwest end is covered by existing vegetation. The plan also indicates a berm along a part of the south property line for screening.
  - h. **Stormwater Pond.** Section 10.103(K) requires a buffer around the detention pond. As noted previously, the detention pond is graded to the east property line with the entire vegetative buffer located along its west boundary. It is our understanding that planting in and around the basin is regulated by the County. The applicant has stated that no mechanical equipment is proposed for the pond.
10. **Tree Removal Permit.** The site was previously farmed and as a result does not have a significant vegetation cover, except for a few trees on the southwest side and a grouping along the site's Michigan



Avenue frontage. A tree removal permit is required if the applicant proposes to remove any trees of 5" caliper or larger per Section 8.106 of the Zoning Ordinance (Woodland and Tree Preservation). Per the applicant's letter dated 8/24/18, one 8" tree is to be removed from the entire site for the berm construction. The applicant notes that tree replacement will be addressed at final site plan submission. However, because there are more deciduous trees proposed on the plans than are required by the Zoning Ordinance, we recommend noting this on the landscape plans.

11. **Fencing.** The revised site plan notes the provision of a 6-foot high black vinyl coated chain link fence around the entire property as required by Section 8.107(D)(2) of the Zoning Ordinance. We had previously recommended that the fence be replaced with a decorative fence along the site's Michigan Avenue frontage. The revised plan notes the provision of a short stretch of "screen fence" along the main entrance drive, and west and east parking lot areas. No details have been provided on this "screen fence" except to reference it as "decorative screening." Typical fence details must be provided. Further, the landscape plan sheets must be corrected to note the fence height as 6 feet and not 8 feet.
12. **Trash Disposal.** The site plan indicates a dual dumpster with gates at the southeast corner of the proposed building. The applicant's letter dated 8/24/18 states that dumpster details will be provided with final site plan submission. Section 7.122 of the Zoning Ordinance requires the enclosure to be at least 6 feet in height constructed of decorative masonry, and provided with steel reinforced wooden gates. The dumpster enclosure should be included with preliminary plans, and the enclosure should be provided with bollards outside the gates to protect them.
13. **Lighting.** The site plan package includes proposed lighting plans on Sheets E01 and E02. The plan indicates single- and dual-head light poles placed in the parking lots and along the drive aisles within the site. A photometric plan noted on sheet FC01 indicates illumination in areas of vehicular traffic on site in compliance with the standards noted in Section 8.105(B)(2) of the Zoning Ordinance. Proposed light pole fixture mounting height is noted as 22 feet. Section 8.105(C) allows for a maximum height of 25 feet to the top of the fixture from grade. The plans must show compliance with this standard. We previously noted that wall mounted light fixtures will be required to illuminate entrances and the loading dock areas. The revised plan includes sheet EBL01 with cut sheet details of shielded wall mounted fixtures for the building exterior. The fixture locations must be shown on the photometric plan. The lighting plan must also include details of any proposed ground mounted fixtures to enhance landscaping on the site. The applicant's letter dated 8/24/18 states that all details will be provided with final site plan submission.  
The landscape island on the westernmost row of the west parking lot is not shown on the photometric plans. The plans must be revised to include the island.
14. **Signs.** A ground-mounted sign is shown on the landscape plan (not labeled) and site plan (labeled). Information regarding proposed ground sign and wall mounted signage, if any, must be provided to determine if it meets the Zoning Ordinance requirements for area, height, setbacks, and design. The applicant notes that the information will be provided with final site plan submission.
15. **Other.** Additional information about the following site plan items must be provided:
  - a. **Refrigerated Storage.** At the August 8, 2018 Planning Commission meeting, the applicant stated that the refrigerated storage unit would appear like a "shipping container." The applicant states that



information will be provided with final site plan submission. However, this is a significant issue that we do not recommend deferring to final site plan review. We have concerns that the unit may appear like outside storage of materials not in keeping with research and development facility. Details of this refrigerated storage unit must be provided, including design, dimensions, proposed use, and screening, if any. While the unit is concealed from view of Michigan Avenue, it is clearly visible from the internal access drives. Because the unit is located adjacent to the dumpster enclosure area, feasibility of screening it similarly must be explored.

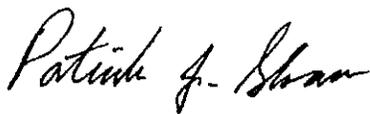
- b. **Vehicle Evaluation Area.** The applicant states that no outdoor parking of vehicles or storage will take place in this area. This note must be added to the site plan.
- c. **Notes.** Some of the information required for compliance to site plan requirements through notes has been addressed by the applicant in a response letter (for example: there will be no storage of hazardous materials on site etc.). Such notes must be on the site plan itself under a "general notes" or site information" heading. For example, a note on Sheet C09 states "Hazardous or Flammable Material" near the gate on the far east side of the site, just north of the pond. Details regarding these materials must be noted. The site plan stands as a complete record by itself and compliance to Zoning Ordinance must be noted on the plans in order for it to be enforceable.

#### RECOMMENDATION

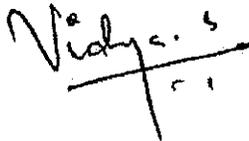
As noted in our previous review letter of August 16, 2018, the DA defers many additional items to Phase 2. At the August 8, 2018 Planning Commission meeting, the applicant received approval for Phase 1 subject to conditions, which allows for them to proceed with engineering and site grading. However, Phase 2 calls for a more detailed review of the plans and with an intention of coverings all the items that were not included as part of Phase 1 or were conditions of approval of Phase 1. The revised plans submitted at this time lack much of the information required for determining compliance to the Zoning Ordinance standards. Although the applicant proposes to defer many of these items to final site plan review, we note that most of these items should be resolved during preliminary site plan review because they affect the site layout and compliance with Zoning Ordinance standards. As a result, we recommend that the applicant submit revised plans addressing the issues noted above.

Respectfully submitted,

McKENNA



Patrick J. Sloan, AICP  
Senior Principal Planner



Vidya Krishnan  
Senior Planner

- c: Ron Akers, Van Buren Township Director of Planning & Economic Development  
Matt Best, Van Buren Township Director of Public Services  
David Potter, FTCH, Township Engineers  
David McNally, Van Buren Township Fire Marshal





HUBBELL, ROTH & CLARK, INC  
CONSULTING ENGINEERS SINCE 1915

**PRINCIPALS**

Daniel W. Mitchell  
Nancy M.D. Faught  
Keith D. McCormack  
Jesse B. VanDeCreek  
Roland N. Alix  
Michael C. MacDonald  
James F. Burton  
Charles E. Hart  
Todd J. Sneathen

**CONTROLLER**

Donna M. Martin

**SENIOR ASSOCIATES**

Gary J. Tressel  
Randal L. Ford  
William R. Davis  
Dennis J. Benoit  
Robert F. DeFrain  
Thomas D. LaCross  
Albert P. Mickalich  
Timothy H. Sullivan  
Thomas G. Maxwell

**ASSOCIATES**

Marshall J. Grazioli  
Colleen L. Hill-Stramsak  
Bradley W. Shepler  
Karyn M. Stickle  
Jane M. Graham  
Aaron A. Uranga  
Salvatore Conigliaro  
Melissa A. Coatta  
Michael P. Darga  
Brian K. Davies  
James E. Scholl  
Matthew G. Slicker  
James J. Surhigh  
Trevor S. Wagenmaker

**HUBBELL, ROTH & CLARK, INC.**

**MAILING:** PO Box 824  
Bloomfield Hills, MI 48303-0824

**SHIPPING:** 555 Hulet Drive  
Bloomfield Hills, MI 48302-0360

**PHONE:** 248-454-6300  
**WEBSITE:** hrcenr.com

**OTHER OFFICE LOCATIONS**

Delhi Township  
Detroit  
Grand Rapids  
Howell  
Jackson  
Kalamazoo  
Lansing

August 24, 2018

Charter Township of Van Buren  
46425 Tyler Road  
Belleville, Michigan 48111

Attn: Planning Commissioners

Re: Project Pancake  
Preliminary Site Plan Review #2 Phase 2 -Response Letter  
VBT-18-021

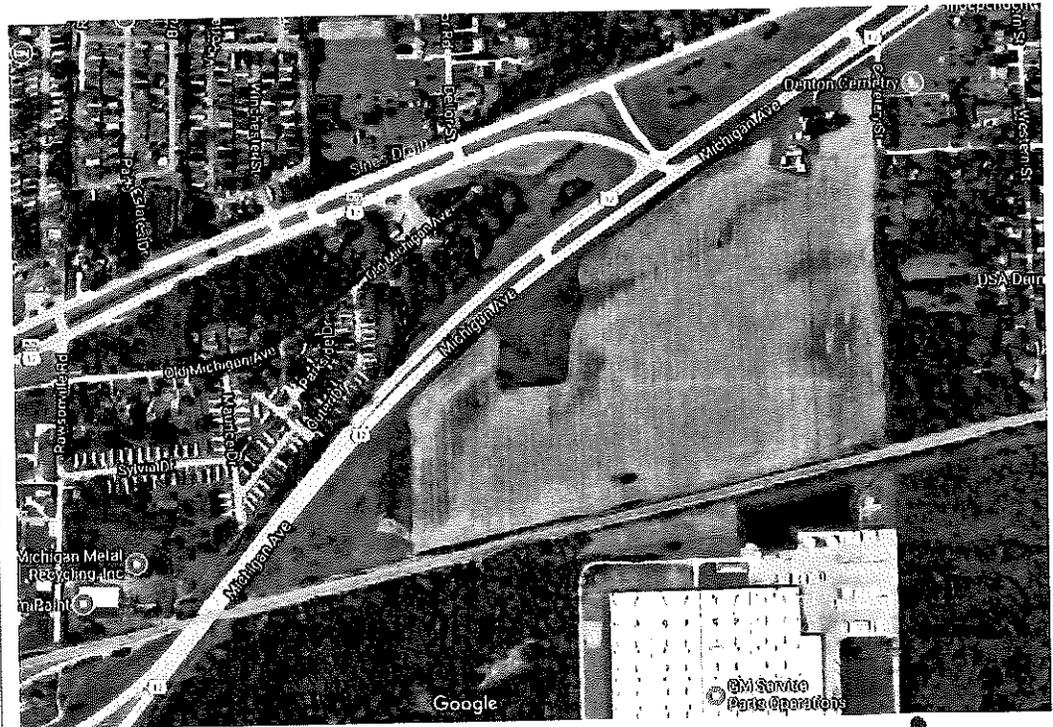
HRC Job No. 20170986

Dear Commissioners:

The following are our responses to McKenna Associates letter dated August 16, 2018;

The applicant, ACS Michigan proposes to build a 2-story 63,500-square foot research and development facility building and associated site improvements. The 75-acre site is located on the south side of Michigan Avenue, bound by single family residential neighborhoods to the east and Conrail railroad to the south, and is commonly referred to as the "Harold Smith Farm" parcel

**Figure 1. Subject Site Location**



The site was recently rezoned from R-1C (Single Family Residential) to M-1 (Light Industrial), with conditions. The rezoning is subject to the Rezoning with Conditions Agreement ("RCA"), and the applicable provisions of the CRA are addressed in this letter.

The 2000 Ecorse and Haggerty Road Corridor Plan added Residential Protection Areas to many areas of the township, including industrial areas that abutted residential areas in the northwest part of the township. The subject site was not part of that consideration at that time because it was zoned R-1C; however, a change of the zoning to M-1 with conditions placed an industrial use on the site next to residential areas to the east. As part of the CRA, the applicant is required to maintain the 400-foot residential buffer along the east and west property lines. The site plan indicates the required residential buffer zones.

**Response: Understood.**

3. **Required Information.** Section 12.203 of the Zoning Ordinance includes all the requirements for information on a site plan. The following additional items must be noted on the site plan:
- a. Notation of Michigan Avenue and the Railroad right-of-way width.

**Response: Plan sheets have been revised to show Michigan Avenue and railroad right of way widths.**

- b. Name and address of property owner/petitioner.

**Response: Address and petitioner is provided on cover sheet. Property owner will be provided at Final Site Plan submission.**

- c. Notation of Township, County and State licenses and permits required.

**Response: See attached list of permits and status, and list will be provided on cover sheet in Final Site Plan approval.**

- d. A note to pick-up debris within the property weekly or as needed.

**Response: See revised cover sheet for note.**

- e. A general use statement on the plan.

**Response: See revised cover sheet for note.**

- f. Notation of square footage of building.

**Response: See Sheet G-002 for main building and Sheet APC-01 for Garage and Tire Storage Building for building square footage.**

- g. Paved surface maintenance agreement language as listed in the Ordinance.

**Response: Will be addressed at Final Site Plan submission.**

- h. Details of proposed trash enclosure.

building, while the main access drive continues south and forks into 2, allowing access to the vehicle evaluation area and parking lot on the east side of the building. The following items regrading access must be addressed on revised and dated set of plans:

- a. Note width of access drive and delineate with pavement striping lanes for ingress and egress.

**Response: See Sheet OS 02 and OS 03.**

- b. The plan indicates a gate mid-way through the access drive. Details of the gate, including its operation, must be noted.

**Response: Will be addressed at Final Site Plan submittal.**

- c. The access drive appears curbed for the most part. However, the south side of the access drive on the south side of the building is missing curbing which is required by Section 9.104(l) of the Zoning Ordinance. At the August 8, 2018 Planning Commission meeting, the applicant stated that the curb was likely not proposed to allow for drainage and that the edge of pavement would be appropriately designed to allow for no vehicle trespass onto landscape areas. We defer to the Township Engineer regarding the drainage; however, if not necessary for drainage, the required concrete curbs must be installed on both sides of all circulation drives.

**Response: The plan shows areas along driveways and the evaluation area will not be curbed to allow runoff to filtrate thru the vegetation before draining to the forebay for water quality.**

- d. Clarify if any signage will be installed in the access drive, at the fork to the vehicle evaluation area.

**Response: Proposed directional signage will be provided at Final Site Plan submittal.**

- e. Note width of drive aisles within parking lot areas.

**Response: See Sheet C02a for drive aisles widths.**

Per the applicant's presentation at the August 8, 2018 Planning Commission meeting the proposed research and development facility receives very limited traffic, and the maximum number of employees at the present time is 100. Although the site is large, the facility is of limited size and has frontage and accesses onto a State Trunk line (pending MDOT approval). Due to the limited traffic to the site, the Planning Commission did not require the submission of a detailed traffic study. However, we recommend that the applicant present trip generation data for the site in writing, to justify a waiver of a traffic impact study.

**Response: Enclosed is the traffic study submitted to MDOT.**

6. **Sidewalks.** Section 9.107 requires the provision of a sidewalk long all public streets and major thoroughfares. The site plan does not indicate any sidewalk along Michigan Avenue frontage. *The Planning Commission has the ability to modify the location of interior*

The site plan also proposes two (2) "future building expansion areas" and "future parking expansion area" with 80 spaces. That applicant should clarify if the parking expansion is to serve the future additions or make up for the parking deficiency at this time and are intended to serve as deferred parking. Section 9.101(H) of the Zoning Ordinance allows for parking deferment where a property owner can demonstrate that the required number of parking spaces is excessive.

**Response: The request for a parking deferment with supporting documentation will be provided as a part of the Final Site Plan submission package.**

- b. **Space Dimensions.** The site plan does not include the parking space dimensions; however, based on scaling of the plans, proposed spaces are 9.5 feet wide by 20 feet deep. The parking space dimensions must be noted. Also, all parking spaces must be double striped as required by Section 9.104(C) of the Zoning Ordinance.

**Response:**

As required for Phase 1 approval, several rows of parking spaces shown have more than 20 spaces in an uninterrupted row. Section 10.103(B)(2) of the Zoning Ordinance requires the provision of an interior landscape island for every 20 spaces. The required islands must be added before the parking layout is finalized. Parking counts must accordingly be adjusted if spaces are lost due to inclusion of islands.

**Response: Site Plan has been revised to provide dimensions and interior landscape islands.**

- c. **Barrier Free Spaces.** Four (4) barrier free spaces are provided. For parking lots between 151-200 spaces, the ADA required six (6) barrier free spaces. Therefore, two (2) additional barrier free spaces must be included. The dimensions of barrier free spaces must also be noted per ADA standards. If approval is being sought for future parking areas at this time, these areas must also show the required number of ADA paces.

**Response: Site plan has been revised to provide 6 barrier free spaces and show future location of one additional barrier free spaces for the future parking spaces.**

- d. **Loading.** Per Section 9.105 of the Zoning Ordinance, the proposed building will require a total of two (2) 10-foot by 50-foot loadings spaces. The loading spaces must be located and dimensioned on the site plan.

**Response: Loading space is located east side of building, see Sheet C02a for information.**

8. **Architecture and Building Details.** Section 3.116(E) of the Zoning Ordinance requires building elevations, where visible from residential districts and public rights-of-way, shall incorporate vertical design elements such as spandrel glass, columns, pilasters and/or piers, so as to break up the horizontal mass of the building. No formal building elevations have been submitted at this time. The applicant presented elevations for the building shell at the August 8th, 2018 Planning Commission meeting and received approval for the same; however, detailed elevations must be submitted to confirm the specifications, colors, and required mechanical screening pursuant Section 10.103(J).

parking lot or headlights from vehicles. We recommend the addition of a low ornamental 3-foot high brick wall at the edge of the north side parking lot to provide a backdrop to the proposed perennials and create a more effective screen.

**Response: A row of hedge plantings is provided along the north side of the parking lots to screen headlights from vehicles.**

Interior Lot Landscaping. Section 10.103(B)(2) requires parking lot landscaped areas to be at least 5% of all the paved areas. The site plan shows vehicular surface area as 80,783 square feet, thus requiring 4,040 square feet of landscaped area. Per calculations noted on sheet L-10, the landscape area provided is 3,231, resulting in a shortfall of 809 square feet. The additional landscape area must be provided. The plan must also delineate the various areas which were used to determine compliance with this standard.

**Response: Civil sheets have been revised for proposed landscape islands, and landscaping sheets will be revised at Final Site Plan submission.**

Each landscaped island must be at least 360 square feet and shall have at least one (1) tree. Also, there must be at least 1 tree per 300 square feet of vehicular surface landscaped area. The parking lots include several islands, each planted with 2 deciduous trees. The area of the islands must be noted to determine compliance to this standard. Based on the interior lot landscaping standards, a total of 11 trees are required and 13 are proposed. The Zoning Ordinance does not allow for more than 20 spaces in an uninterrupted row without a landscape island. As noted in our Phase 1 review letter, several rows of parking in all 3 lots on the site are non-compliant.

**Response: See revised site plan for proposed landscape islands.**

- c. **Loading Area Landscaping.** Section 10.103(C) requires loading areas to be screened from view of any adjacent residential district by a fence and/or landscaping. The loading dock area appears to be located on the east side of the proposed building and is screened from view of the residential district to the east by a 60-foot wide, 10-foot high berm to be planted with a double staggered row of evergreen trees placed 15 feet on center.

**Response: Understood.**

- d. **Greenbelt Buffering.** Section 10.103(E) requires screening between a use on an M-1 zoned property and abutting single family residential districts. The Zoning Ordinance requires a 60-foot wide buffer with a double staggered row of evergreens placed 15 feet on center, with a flat horizontal crest area of at least 3 feet. The landscape plan proposes a 60-foot wide, 10-foot high berm on the east side of the building and parking lot, set 320 feet away from the east property line abutting the residential district. The berm is to be planted with a mix of White Spruce, White Pine and Norway Spruce trees placed 15 feet on center.

**Response: Understood.**

- e. **Open Space Landscaping.** Per Section 10.103(G), all open areas of the site that are not required landscaping areas must be planted with one tree per 3,000 square feet of open

11. **Fencing.** The site plan indicates a proposed 6-foot high chain link fence around the entire property. While the chain link fence is acceptable along the south property line abutting the railroad and pond, Section 8.107(D)(2) of the Zoning Ordinance requires chain link fence to be vinyl-coated black, so we recommend that the plans be revised to state this requirement. In addition, we recommend that the fence be replaced with a decorative fence along the site's Michigan Avenue frontage. The site plan notes the fence height as 6 feet while the landscape plan identifies it as 8 feet. Any discrepancies in plans must be corrected. Typical fence details with color must be noted.

**Response: Proposed fencing is 6 foot high black vinyl coated fence except portions near front of building where a proposed decorative screening fence will be installed.**

12. **Trash Disposal.** The site plan indicates a dual dumpster with gates at the southeast corner of the proposed building. Typical dumpster enclosure details must be noted. Section 7.122 of the Zoning Ordinance requires the enclosure to be at least 6' in height constructed of decorative masonry, and provided with steel reinforced wooden gates. The enclosure should be provided with bollards outside the gates to protect them.

**Response: Details of dumpster enclosure will be provided at Final Site Plan submission.**

13. **Lighting.** The site plan package includes proposed lighting plans on Sheets E01 and E02. The plan indicates single- and dual-head light poles placed in the parking lots and along the drive aisles within the site. A photometric plan noted on sheet FC01 indicates illumination in areas of vehicular traffic on site; however, the data noted is almost illegible for us to determine compliance with the standards noted in Section 8.105(B)(2) of the Zoning Ordinance. Proposed light pole fixture mounting height is noted as 22 feet. Section 8.105(C) allows for a maximum height of 25 feet to the top of the fixture from grade. The plans must show compliance with this standard. The plan also indicates no wall mounted fixtures on the building façade. We anticipate there will be light fixtures to illuminate entrances and the loading dock areas. These fixtures must be added to the lighting plans and elevations and shown on the photometric plan. Manufacturer's cut sheet details for proposed fixtures must be submitted with shielding. The lighting plan must include details of any proposed ground mounted fixtures to enhance landscaping on the site.

**Response: Proposed building fixtures are shown on Sheet EBL01. The photometric plan will be revised at Final Site Plan submittal to include these and make legible.**

14. **Signs.** A ground-mounted sign is shown on the landscape plan (not labeled) and electrical plan (labeled), but not shown on the site plan. Information regarding proposed ground sign and wall mounted signage, if any, must be provided to determine if it meets the Zoning Ordinance requirements for area, height, setbacks, and design.

**Response: Will be addressed at Final Site Plan submission.**

15. **Other.** Additional information about the following site plan items must be provided:
  - a. **Refrigerated Storage.** At the August 8, 2018 Planning Commission meeting, the applicant stated that the refrigerated storage unit would appear like a "shipping container."



## Project Approval/Permit Log

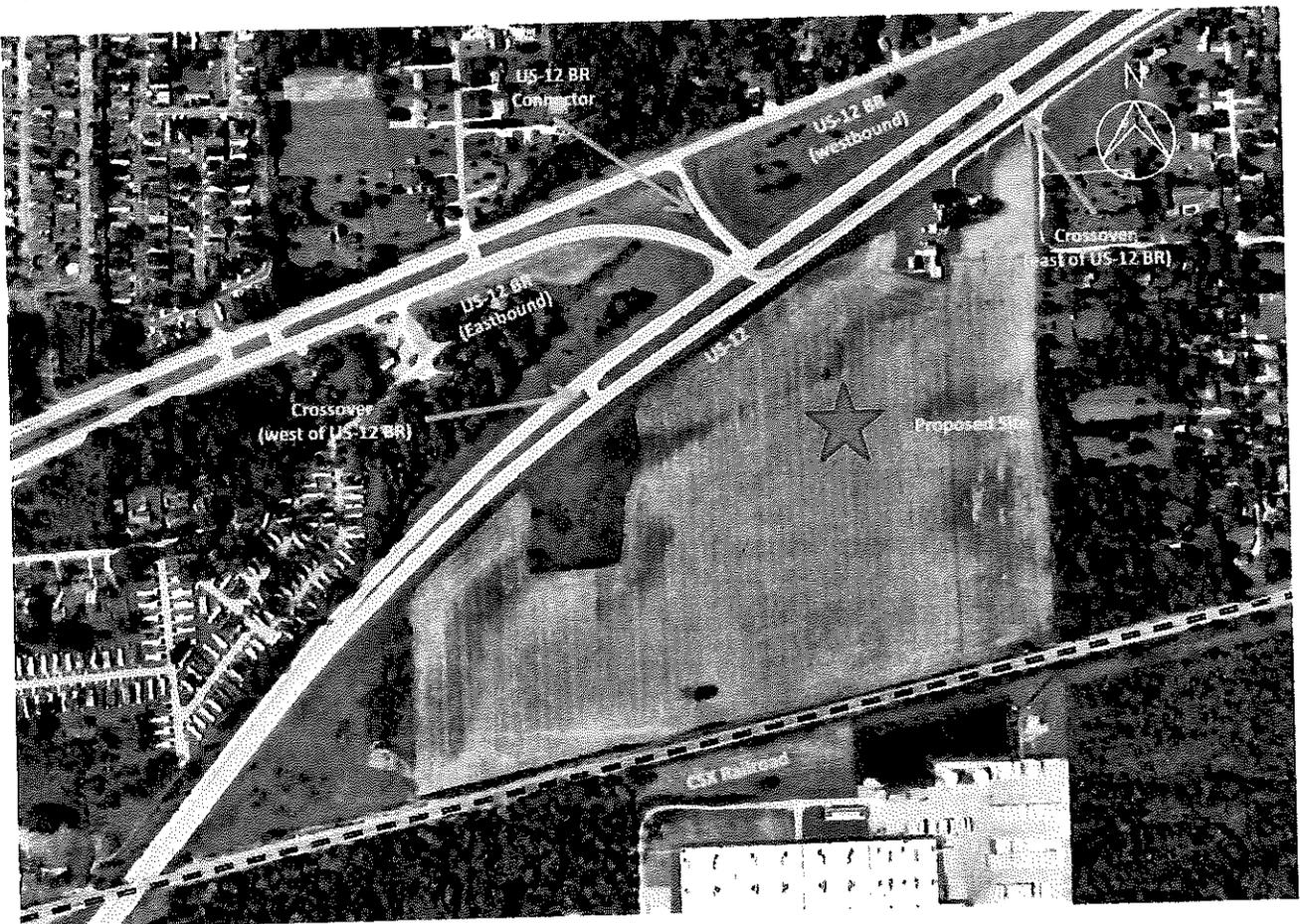
Project Name: SRD Technical Center  
 Project Number: 18307

Item	Type	Agency/ Municipality	Responsible Party to Submit	Fee	Date Submitted	Comments Returned	Target Approval Date	Final Approval Date	Notes	Required prior to starting work on site	CIM Comments
FAA Determination of Hazard to air navigation 7460-2 Notice of Actual Construction or Alteration	Permit	FAA	ACS	\$	7/9/18	N/A	8/9/18	8/6/18	ASN# 2018-AGL-1339-0E No hazard determined Needs to be submitted within 5 days after the construction finishes. 2 1/2 weeks in hand. Need to submit prior to crane being on-site	Yes	
FAA Determination of Hazard to air navigation	Permit	FAA	Contractor/ACS	\$					Must be submitted after FAA determination	No	
Michigan Tall Structure Permit	Permit	State of Michigan Aeronautics Commission	ACS	\$ 150.00	8/15/18					No	
Application For Permit To Erect a Structure	Application	Metropolitan Wayne County Detroit	ACS	\$					This is for the detention pond There is no review fee	Yes	
Storm Water	Permit	Wayne County	HRC	\$ 5,000.00	6/25/18, 8/8/18	8/3/18			Fee is for Engineering Review		
Soil Erosion	Permit	Wayne County	HRC	\$66,500 - Performance Deposit, \$8,440 Permit and inspection	6/25/18	7/23/18		8/8/18	#18-234 Permit can be picked after All approved, and fees are paid	Yes	
Drain Abandonment	Application	Wayne County	Township	\$	8/21/18		9/5/18		Goes to Township Board on 8/20, Tentative Public Hearing and County Approval on 9/5		
Street Vacation	Application	Wayne County	Township	\$			8/23/18		County Approval Meeting 8/23		
Watermain	Application	Township	ACS						Top fees are calculated by Township		
Sanitary Sewer	Application	Township	ACS						Top fees are calculated by Township		
Phase 1 Preliminary Site Plan Approval		Township	HRC				8/24/18		Mass grading, building foundation and shall, detention basin and soil erosion		What activities does this allow us to do?
Final Site Plan, Phase One	Application	Township	HRC	\$ 15,025.00	7/26/18	8/3/18		8/8/18			is there a permit required for our phase 1 work?
Phase 1 Permit Preliminary Site Plan, Phase Two	Application	Township	HRC		8/3/18		9/12/18		Planning Commission Meeting is 9/12		
Final Site Plan and Building, Phase Two	Application	Township	HRC								
Drive Approach	Permit	MDOT	HRC	\$ 702.00	7/19/18	8/16/18			8/16- #56322 has been put on hold. Fee is for Permit Application		
NPOES	Permit	State	ACS	\$ 500.00					For Mass Grading, Need copy of Soil Erosion Permit		
Watermain	Permit	Wayne County/State	HRC						Permit fees are calculated by County. If MDEQ Expedited Permit is required, fee is \$1,000		
Sanitary Sewer	Permit	Wayne County/State	HRC						Permit fees are calculated by County.		

- ≡ Conducted an analysis for the need of a right-turn lane or taper at the development driveway.
- ≡ Provided an analysis of access management for the site including available sight distances at the site driveway.
- ≡ Prepared a letter report with our findings and recommendations.

## Study Area

The Affiliated Construction Services, Inc. (ACS) is looking to develop a research and development center for vehicles in Van Buren Township, Michigan. The site is approximately 78 acres and is located south of the US-12 and US-12 BR/Connector intersection. The site location is shown in **Figure 1**. The site will replace existing farmland and retain the farmhouse located in the northeast corner of the property line and will not affect the residence and garage building located adjacent to the farmhouse.



**Figure 1: Site Location**

The site is bounded by US-12 to the north, Cemetery Road to the east, and the CSX Railroad to the south. The land uses surrounding the site are a combination of residential and industrial. There are residences located both east and northwest of the proposed development and a General Motors service and parts facility located to the south.

**Table 1: Pedestrian and Bicyclist Volumes at Studied Intersections**

Intersection	Crossing Pedestrians		Bicyclists on Roadway	
	AM Peak Hour	PM Peak Hour	AM Peak Hour	PM Peak hour
US-12 and US-12 BR/Connector	0	0	0	1
US-12 and Crossover west of US-12 BR	0	0	0	0
US-12 and Crossover east of US-12 BR	1	0	0	0

The pedestrian and bicycle counts show there is currently little demand for non-motorized facilities within the study area. Right-of-way is also very limited to the west. Pedestrian facilities are not proposed at this time due to the little demand and limited access to right-of-way to the west.

## Background and Future Traffic Growth

The construction schedule projects the research and development center will be open by the end of 2019, which is approximately 1.5 years from the submission of this traffic study. The total population was reviewed between 2015 to 2025 for Wayne County and Van Buren Township provided by the Southeast Michigan Council of Governments (SEMCOG). Wayne County's forecast shows a decrease in population and Van Buren Township shows less than a 1% increase in annual growth. This study assumed a growth rate of 1% based on Van Buren Township's forecast to determine the background traffic. The Summary from SEMCOG's 2045 Regional Development Forecast and background volume diagrams are provided in **Attachments D and E**, respectively.

A future five-year traffic growth factor was also applied to the background traffic to project the volumes to 2024. The future five-year traffic growth factor was determined by the following formula:

$$\text{Future Five-Year Traffic Growth Factor} = (1 + r)^y$$

Whereas:  $r$  = Background Growth Rate (0.01)  
 $y$  = Number of Years (5)

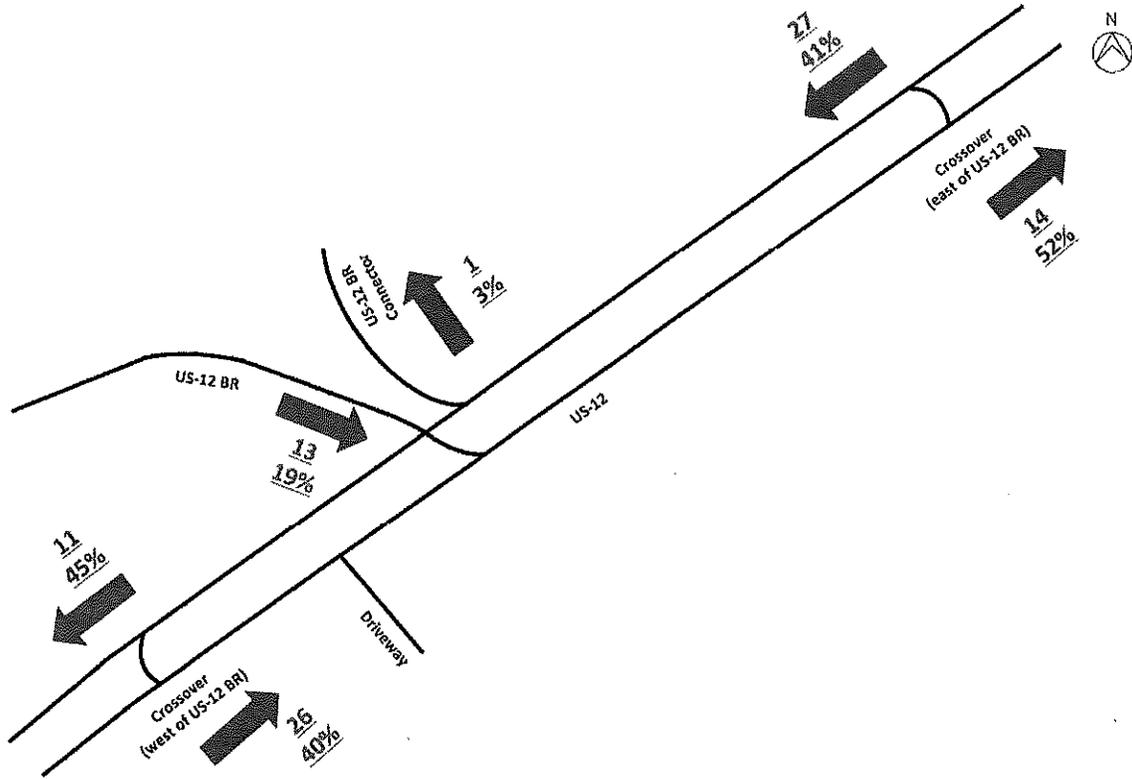
Using the formula above, a future five-year traffic growth factor of 1.05 was used to determine future traffic five years after buildout.

## Trip Generation

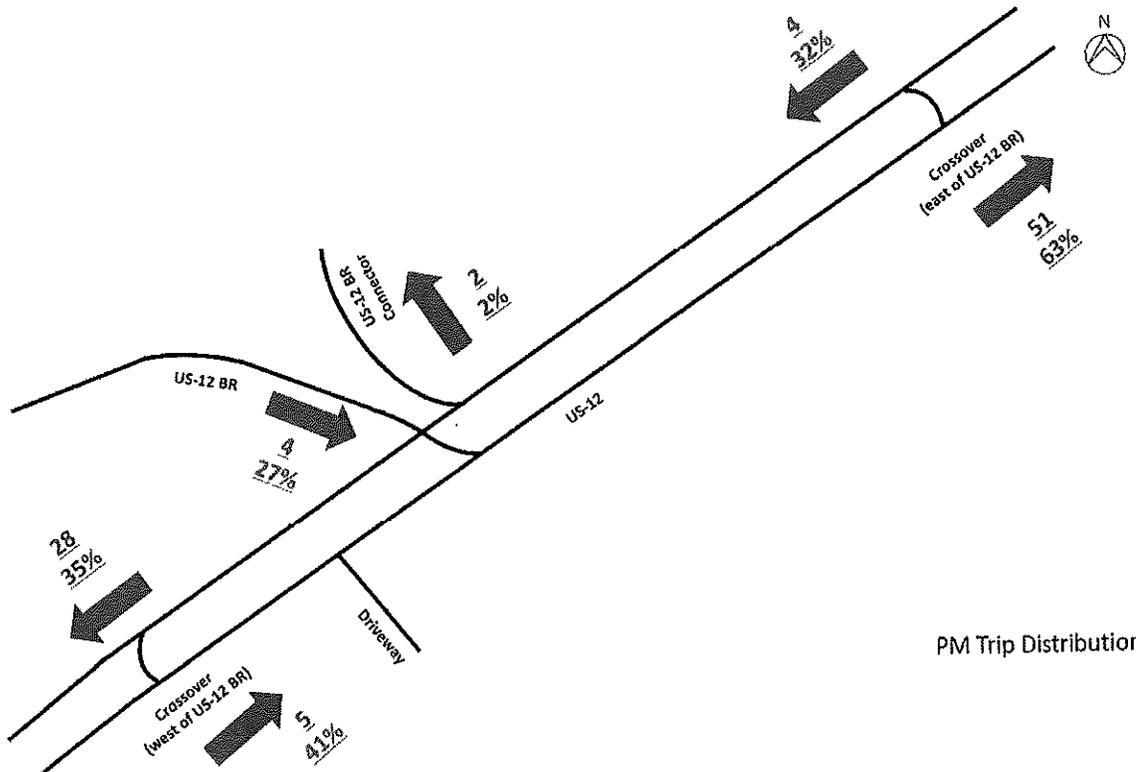
One of the most critical elements of a traffic study is estimating the amount of traffic to be generated by a proposed development. This is usually done by using trip generation rates or equations to provide an estimate of all future trips generated by a proposed development.

Rates are commonly expressed in trips per unit of development. For example, trips per dwelling unit are commonly used for residential developments, while trips per 1,000 square feet (SF) of gross floor area (GFA) are used for offices and retail. Equations provide a direct estimate of trips based upon development units being multiplied in a mathematical relationship.

Trips are defined as a single or one directional movement with either the origin or destination of the trip inside the study site. Thus, a car entering and leaving a site would be recorded as generating two trips. Trip generation estimates are often the most critical factors in assessing impacts and needs of a proposed development.



**Figure 2: Projected AM Trip Distribution of Generated Trips**



PM Trip Distribution

**Figure 3: Projected PM Trip Distribution of Generated Trips**

### Signalized Intersections

For signalized intersections, the HCM defines level of service (LOS) in terms of control delay. Delay may be measured in the field or it may be estimated. Delay is a complex measure and is dependent on several variables, including the quality of progression, the cycle length, the green ratio, and the volume-to-capacity ratio for the lane group or approach in question. **Table 3** indicates the control delay criteria used for determining LOS for signalized intersections.

**Table 3: LOS Criteria for Signalized Intersections**

LOS	Control Delay per Vehicle (seconds)
A	< 10
B	> 10 to < 20
C	> 20 to < 35
D	> 35 to < 55
E	> 55 to < 80
F	> 80

LOS A describes operations with very low control delay up to 10.0 seconds per vehicle. This occurs when progression is exceptionally 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 in the range of 10.1 to 20.0 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for LOS A, causing higher levels of average delay.

LOS C describes operations with control delay in the range of 20.1 to 35.0 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear in this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.

LOS D describes operations with control delay in the range of 35.1 to 55.0 seconds 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 volume-to-capacity ratios. Many vehicles stop and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.

LOS E describes operations with control delay in the range of 55.1 to 80.0 seconds per vehicle. This is considered to be above the limit of acceptable delay for an urban roadway in the study area. These high delay values generally indicate poor progression, long cycle lengths, and high volume-to-capacity ratios. Individual cycle failures are frequent occurrences.

LOS F describes operations with control delay greater than 80.1 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with over saturation (i.e., when arrival flow rates exceed the capacity of the intersection). It may also occur at high volume-to-capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

### Unsignalized Intersections

At an unsignalized intersection with stop control on the minor approach, LOS F occurs when there are not enough gaps of suitable size to allow a minor-street demand to safely cross through traffic on the major street. This is typically evident from extremely long control delays experienced by minor street traffic and by queuing on the minor approaches. LOS F may also appear in the form of drivers on the minor street selecting smaller than usual gaps. In such cases, safety may be a problem and some disruption to the major traffic stream may result. Note that LOS F may not always result in long queues,

**Table 6: PM Peak hour LOS Comparison for Signalized Intersections**

Intersection	Synchro Node	Approach	Movement	Existing		Background		Future No Improvements		Future		Future 5 Year	
				Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
US-12 & US-12 BR/Connector	1010	SEB	LT/RT	43.0	D	44.0	D	43.3	D	32.6	C	33.6	C
			TH	13.8	B	13.9	B	15.1	B	17.2	B	18.6	B
		SWB	RT	9.7	A	9.8	A	9.7	A	10.9	B	11.3	B
	1910	NEB	TH	16.0	B	16.2	B	18.6	B	21.8	C	25.0	C
		SEB	LT	5.4	A	5.6	A	7.0	A	5.4	A	5.5	A

**Table 7: AM Peak Hour LOS Comparison for Unsignalized Intersections**

Intersection	Synchro Node	Approach	Movement	Existing		Background		Future No Improvements		Future		Future 5 Year	
				Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
US-12 & Crossover West of US-12 BR	9000	SWB	LT	Free Flow									
			TH	Free Flow									
	9001	SWB	U-Turn	12.2	B	12.3	B	13.0	B	13.0	B	13.3	B
NEB		TH	Free Flow										
US-12 & Crossover West of US-12 BR	9002	SWB	TH	Free Flow									
			NEB	U-Turn	13.9	B	14.0	B	14.4	B	14.4	B	14.9
	9003	NEB	LT	Free Flow									
TH			Free Flow										
US-12 & Driveway	9004	NEB	TH	N/A				Free Flow					
			RT	N/A				Free Flow					
		NWB	RT	N/A				12.3	B	12.3	B	12.6	B

**Table 8: PM Peak Hour LOS Comparison for Unsignalized Intersections**

Intersection	Synchro Node	Approach	Movement	Existing		Background		Future No Improvements		Future		Future 5 Year	
				Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS
US-12 & Crossover West of US-12 BR	9000	SWB	LT	Free Flow									
			TH	Free Flow									
	9001	SWB	U-Turn	0.0	A	0.0	A	13.8	B	13.8	B	14.2	B
NEB		TH	Free Flow										
US-12 & Crossover West of US-12 BR	9002	SWB	TH	Free Flow									
			NEB	U-Turn	12.5	B	12.5	B	13.6	B	13.6	B	14.1
	9003	NEB	LT	Free Flow									
TH			Free Flow										
US-12 & Driveway	9004	NEB	TH	N/A				Free Flow					
			RT	N/A				Free Flow					
		NWB	RT	N/A				15.2	C	15.2	C	15.8	C

The increase in traffic volume from the site generated traffic along with the turning movements from the proposed driveway will not have a negative impact on the roadway network.

## Access Management and Sight Distance Review

The access management standards for MDOT, including their Geometric Design Guidance Document, GEO-650-D, and Sight Distance Guidelines were reviewed. The following observations have been made regarding the access management and sight distance of the proposed development:

- ≡ The driveway contains one entering lane and one exiting lane. The width of the driveway is 30 feet.
- ≡ The driveway is approximately 320 feet west of the signal at US-12 BR, which exceeds the MDOT desirable corner clearance.
- ≡ The driveway meets the requirement for a dedicated right-turn lane with a taper, which will make it safer for entering vehicles into the proposed development (see Right Lane Guidance section). The storage and taper lengths should be 150 and 225 feet, respectively, per the MDOT requirements. The Geometric Design Guide Plan Sheet for the storage and taper lengths is provided in **Attachment J**.
- ≡ A field review was performed and there are no intersection sight distance issues at the driveway for exiting right-turning vehicles per the MDOT intersection sight distance requirements.
- ≡ It is recommended landscaping surrounding the site along US-12 be placed where it will not compromise the sight distance requirements at the driveway.

## Summary

The traffic study highlights are summarized below:

1. The proposed development includes approximately 70,000 square feet of a research and development building on 78 acres starting with 120 to 140 employees up to a maximum of 180 and is located on the Smith Farm on US-12 east of Ecorse Road.
2. The study area covers approximately 0.35 miles of US-12 and includes the intersection of US-12/US-12 BR/Connector along with the adjacent crossovers.
3. There are currently no public transit services within the study area. The study area also does not contain any pedestrian or bicycle facilities, such as sidewalks, crosswalks, pedestrian signals, or bike lanes. The pedestrian and bicycle counts show there is currently little demand for non-motorized facilities within the study area.
4. The construction schedule projects the research and development center will be open by the end of 2019, which is approximately 1.5 years from the submission of this traffic study. This study assumed a growth rate of 1% based on Van Buren Township's forecast to determine the background traffic.
5. A future five-year traffic growth factor was also applied to the background traffic to project the volumes to 2024. A future five-year traffic growth factor of 1.05 was used to determine future traffic.
6. ITE Land Use 760 – Research and Development Center was selected to generate trips for the proposed site as this land use best fits the operation. Trip generation was performed considering both the total GFA and the number of employees. This study will use the generated trips from the number of employees as this approach is more conservative.
7. Trips were distributed based on the volume of traffic entering and exiting the study area during the AM and PM peak hours. The highest percentage of generated trips are projected to come from northeast US-12 during the AM peak hour and southwest US-12 during the PM peak hour. The highest percentage of generated trips are projected to exit to northeast US-12 during both the AM and PM peak hours.
8. The proposed site plan shows one driveway off US-12 that will provide access in and out of the development. Trip assignment was then determined by the existing turning movement volumes within the study area. With US-12 being a boulevard, it is assumed all exiting trips wanting to go southwest bound on US-12 will use the adjacent crossover northeast of US-12 BR.



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**Attachment A: Site Plan**



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**Attachment B: 24-Hour Turning Movement Counts**

7:45 AM	186	20	0	0	216	0	256	0	0	256	91	20	0	0	111	533
Hourly Total	908	58	0	0	966	0	367	0	0	367	357	66	0	0	423	2256
8:00 AM	202	13	0	0	215	0	182	0	0	182	89	11	0	0	100	497
8:15 AM	203	14	0	0	217	0	218	0	0	218	109	19	0	0	128	563
8:30 AM	190	11	0	0	201	0	181	0	0	181	101	26	0	0	127	509
8:45 AM	155	7	0	0	162	0	160	0	0	160	83	18	0	0	101	423
Hourly Total	750	45	0	0	795	0	741	0	0	741	382	74	0	0	456	1992
9:00 AM	145	3	0	0	148	0	148	0	0	148	95	8	0	0	103	399
9:15 AM	126	8	0	0	134	0	165	0	0	165	110	19	0	0	129	429
9:30 AM	117	5	0	0	122	0	138	0	0	138	115	19	0	0	134	394
9:45 AM	134	11	0	0	145	0	145	0	0	145	82	18	0	0	100	390
Hourly Total	522	27	0	0	549	0	597	0	0	597	402	64	0	0	466	1612
10:00 AM	119	10	0	0	129	0	166	0	0	166	96	17	0	0	113	408
10:15 AM	99	9	0	0	109	0	136	0	0	136	89	13	0	0	102	346
10:30 AM	100	5	0	0	105	0	117	0	0	117	89	16	0	0	105	327
10:45 AM	105	6	0	0	111	0	113	0	0	113	84	11	0	0	95	319
Hourly Total	423	30	0	0	453	0	532	0	0	532	358	57	0	0	415	1400
11:00 AM	95	14	0	0	109	0	122	0	0	122	75	13	0	0	88	319
11:15 AM	108	22	0	0	130	0	135	0	0	135	96	11	0	0	107	372
11:30 AM	128	15	0	0	143	0	129	0	0	129	96	13	0	0	109	381
11:45 AM	115	17	0	0	132	0	117	0	0	117	102	11	0	0	113	362
Hourly Total	446	68	0	0	514	0	503	0	0	503	369	48	0	0	417	1434
12:00 PM	122	12	0	0	134	0	135	0	0	135	92	9	0	0	101	370
12:15 PM	117	6	0	0	123	0	135	0	0	135	102	10	0	0	132	390
12:30 PM	134	5	0	0	139	0	118	0	0	118	109	13	0	0	122	377
12:45 PM	130	8	0	0	138	0	127	0	0	127	94	11	0	0	105	370
Hourly Total	503	31	0	0	534	0	513	0	1	513	417	43	0	0	480	1507
1:00 PM	137	4	0	0	141	0	121	0	0	121	94	16	0	0	110	372
1:15 PM	103	11	0	0	114	0	140	0	0	140	112	16	0	0	128	382
1:30 PM	148	10	0	0	158	0	124	0	0	124	125	17	0	0	142	424
1:45 PM	117	4	0	0	121	0	127	0	0	127	108	12	0	0	120	386
Hourly Total	505	29	0	0	534	0	512	0	0	512	439	61	0	0	500	1546
2:00 PM	165	13	0	0	178	0	143	0	0	143	111	15	0	0	126	447
2:15 PM	146	12	0	0	158	0	166	0	0	166	131	17	0	0	148	472
2:30 PM	146	13	0	0	159	0	170	0	0	170	113	21	0	0	134	463
2:45 PM	155	23	0	0	178	0	184	0	0	184	111	10	0	0	121	483
Hourly Total	612	61	0	0	673	0	663	0	0	663	466	63	0	0	529	1865
3:00 PM	171	19	0	0	190	0	195	0	0	195	114	21	0	0	135	520
3:15 PM	159	16	0	0	175	0	203	0	0	203	136	15	0	0	151	529
3:30 PM	163	19	0	0	182	0	234	0	0	234	128	24	0	0	152	568
3:45 PM	150	17	0	0	167	0	200	0	0	200	129	18	0	0	147	514
Hourly Total	643	71	0	0	714	0	832	0	0	832	507	78	0	0	585	2131
4:00 PM	196	24	0	0	220	0	243	0	0	243	159	23	0	0	182	645
4:15 PM	188	22	0	0	210	0	234	0	0	234	155	9	0	0	164	608
4:30 PM	185	19	0	0	204	0	266	0	0	266	179	25	0	0	204	674
4:45 PM	174	16	0	0	190	0	253	0	0	253	183	16	0	0	199	652
Hourly Total	743	81	0	0	824	0	1006	0	0	1006	676	73	0	0	749	2579
5:00 PM	219	16	0	0	235	0	255	0	0	255	147	27	0	0	174	664
5:15 PM	224	18	0	0	242	0	296	0	0	296	160	24	0	0	184	722
5:30 PM	225	13	0	0	238	0	292	0	0	292	147	18	0	0	165	695
5:45 PM	174	19	0	0	193	0	268	0	0	268	146	17	0	0	165	626
Hourly Total	842	66	0	0	908	0	1111	0	0	1111	802	86	0	0	888	2707

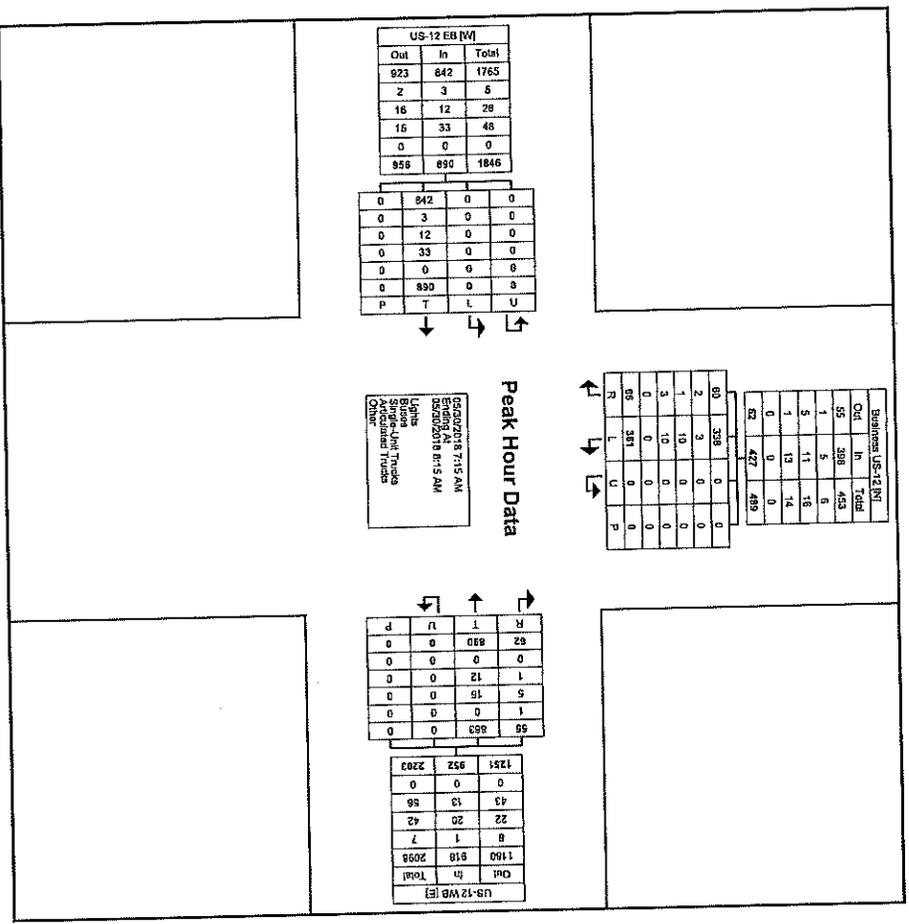




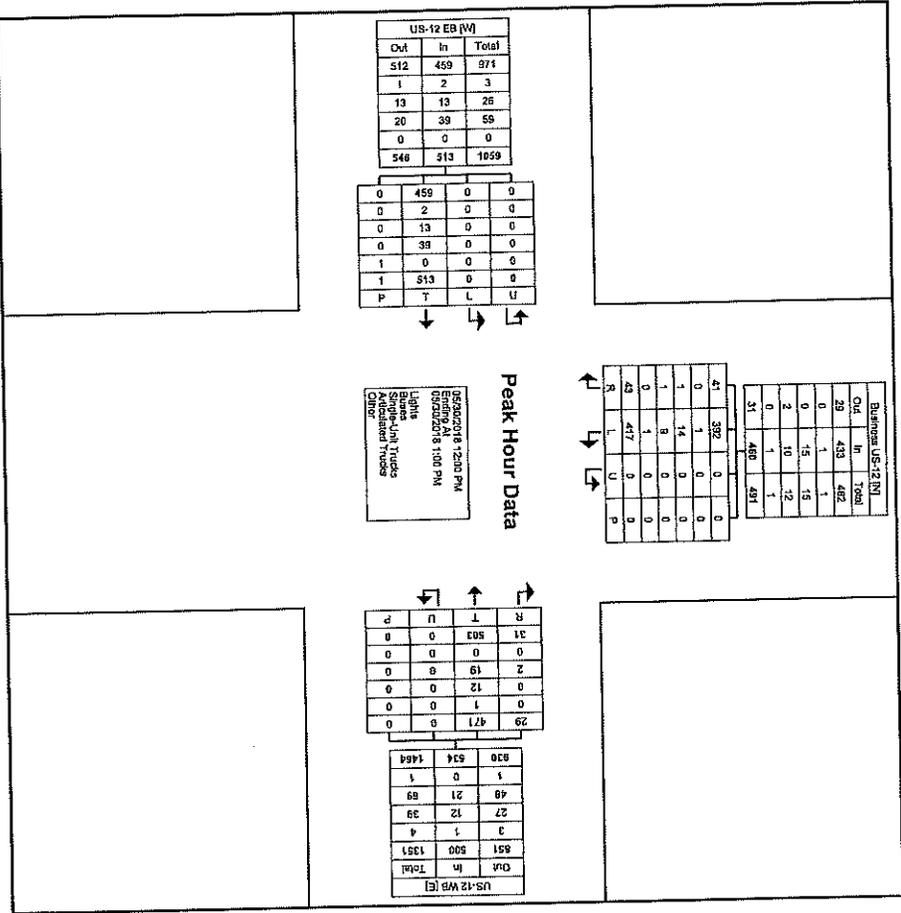
Bloomfield Hills, Michigan, United States 48302  
 248.454.6300 rhclata@hrc-engr.com

Count Name: US-12 and Business US-12  
 Site Code: 20170986  
 Start Date: 05/30/2018  
 Page No. 6

Turning Movement Peak Hour Data Plot (7:15 AM)



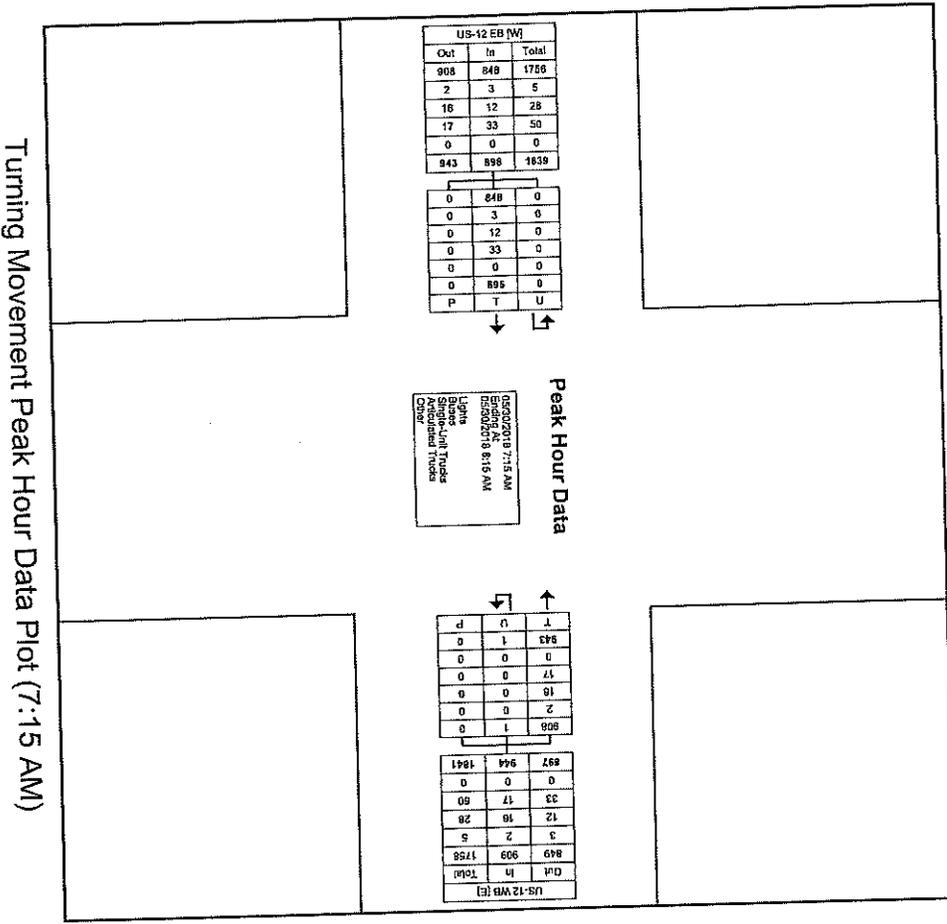
Turning Movement Peak Hour Data Plot (12:00 PM)



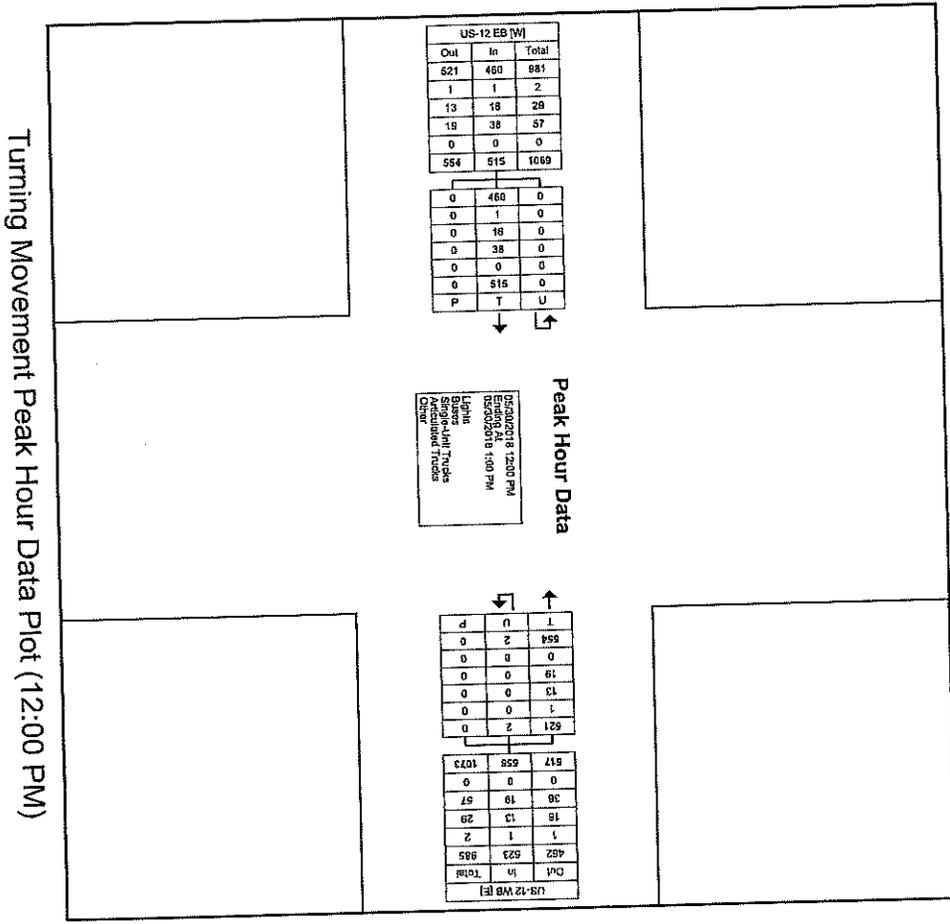


7:45 AM	214	0	0	214	256	0	0	256	470
Hourly Total	966	1	0	967	869	0	0	869	1838
8:00 AM	201	0	0	201	187	0	0	187	388
8:15 AM	240	1	0	241	209	0	0	209	450
8:30 AM	221	0	0	221	188	0	0	188	408
8:45 AM	175	0	0	175	167	0	0	167	342
Hourly Total	837	1	0	838	751	0	0	751	1599
9:00 AM	147	0	0	147	144	0	0	144	281
9:15 AM	145	0	0	145	186	0	0	186	311
9:30 AM	138	1	0	139	137	0	0	137	276
9:45 AM	152	0	0	152	140	0	0	140	292
Hourly Total	582	1	0	583	587	0	0	587	1170
10:00 AM	134	0	0	134	164	0	0	164	298
10:15 AM	116	0	0	116	139	0	0	139	255
10:30 AM	115	0	0	115	120	0	0	120	235
10:45 AM	116	0	0	116	123	0	0	123	239
Hourly Total	481	0	0	481	546	0	0	546	1027
11:00 AM	106	0	0	106	115	0	0	115	221
11:15 AM	120	1	0	121	132	0	0	132	253
11:30 AM	138	0	0	138	129	0	0	129	267
11:45 AM	123	1	0	124	119	0	0	119	243
Hourly Total	487	2	0	489	495	0	0	495	984
12:00 PM	130	0	0	130	134	0	0	134	264
12:15 PM	128	1	0	129	136	0	0	136	285
12:30 PM	153	1	0	154	119	0	0	119	273
12:45 PM	143	0	0	143	126	0	0	126	269
Hourly Total	554	2	0	556	515	0	0	515	1071
1:00 PM	152	0	0	152	124	0	0	124	276
1:15 PM	123	0	0	123	138	0	0	138	281
1:30 PM	157	0	0	157	129	0	0	129	286
1:45 PM	130	0	0	130	128	0	0	128	258
Hourly Total	562	0	0	562	519	0	0	519	1081
2:00 PM	168	0	0	168	142	0	0	142	310
2:15 PM	169	2	0	171	166	0	0	166	327
2:30 PM	160	0	0	160	174	0	0	174	350
2:45 PM	163	0	0	163	187	0	0	187	354
Hourly Total	650	2	0	652	689	0	0	689	1321
3:00 PM	167	2	0	169	200	0	0	200	369
3:15 PM	171	0	0	171	204	0	0	204	375
3:30 PM	179	0	0	179	236	0	0	236	415
3:45 PM	183	0	0	183	215	0	0	215	378
Hourly Total	690	2	0	692	855	0	0	855	1537
4:00 PM	223	0	0	223	232	0	0	232	455
4:15 PM	197	0	0	197	223	0	0	223	420
4:30 PM	210	1	0	211	262	0	0	262	473
4:45 PM	190	0	0	190	259	0	0	259	449
Hourly Total	820	1	0	821	976	0	0	976	1797
5:00 PM	243	0	0	243	250	0	0	250	493
5:15 PM	253	0	0	253	295	0	0	295	548
5:30 PM	239	0	0	239	299	0	0	299	538
5:45 PM	193	0	0	193	280	0	0	280	453
Hourly Total	928	0	0	928	1104	0	0	1104	2032





Turning Movement Peak Hour Data Plot (7:15 AM)



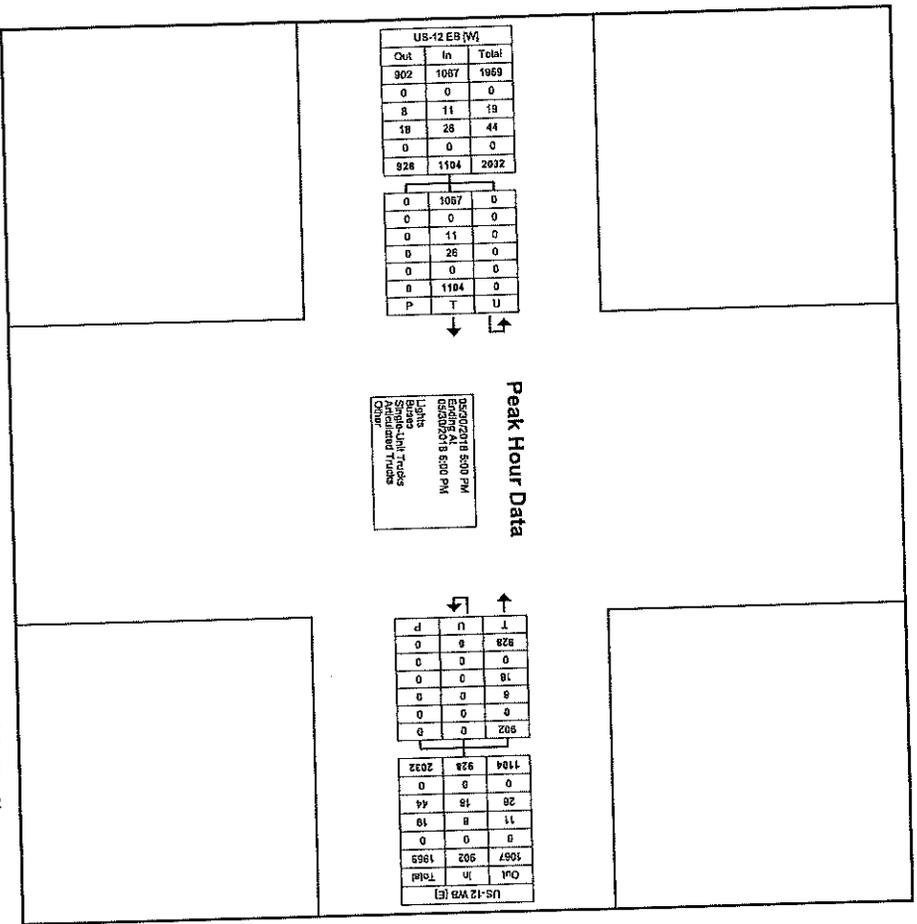


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 555 Hulet Drive

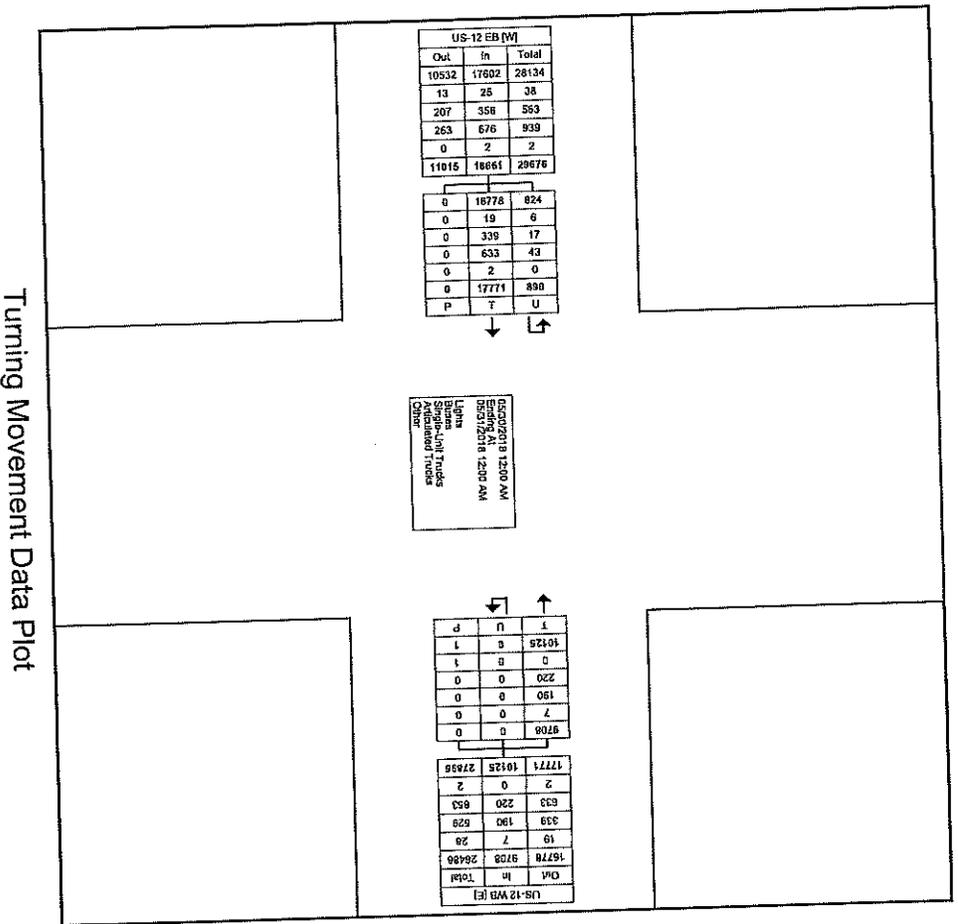
Bloomfield Hills, Michigan, United States 48302  
 248.454.6300 michita@hrc-engr.com

Count Name: Crossover West of US-12  
 Site Code: 20170986  
 Start Date: 05/30/2018  
 Page No: 10

Turning Movement Peak Hour Data Plot (5:00 PM)

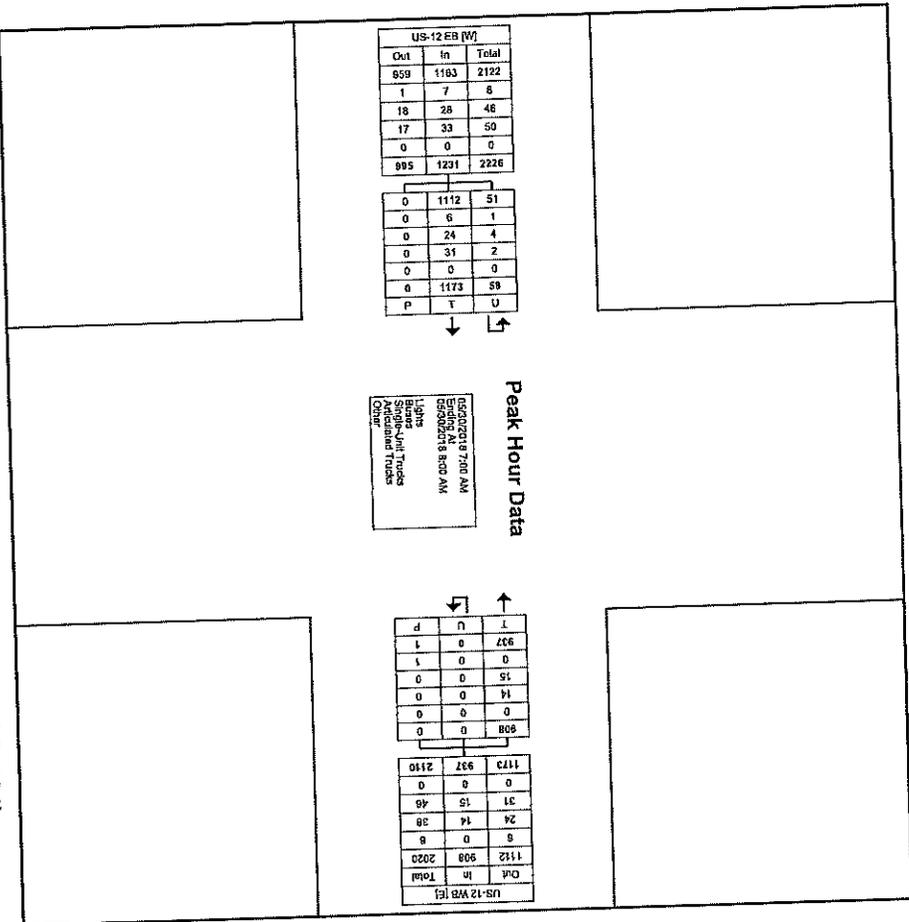


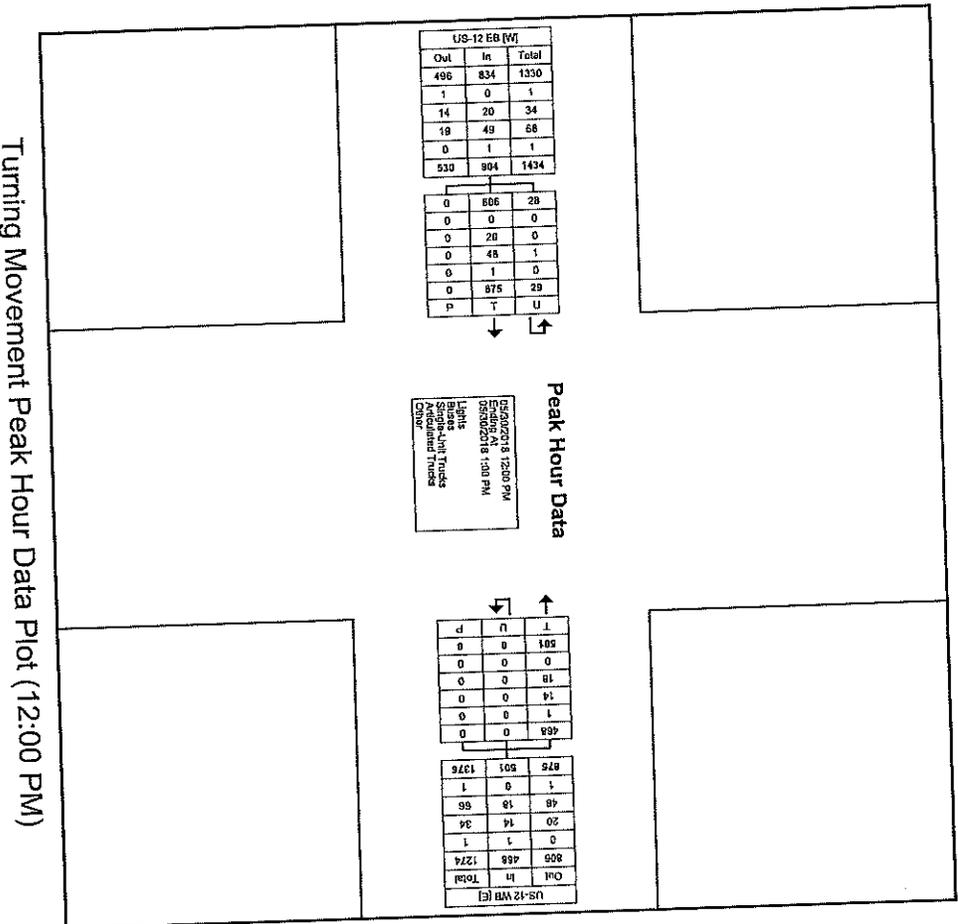
7:45 AM	210	0	0	210	318	19	0	337	547
Hourly Total	937	1	937	1173	58	0	1231	2158	
8:00 AM	198	0	198	248	10	0	280	458	
8:15 AM	211	0	211	321	12	0	331	542	
8:30 AM	194	0	194	279	10	0	289	483	
8:45 AM	167	0	167	224	8	0	232	399	
Hourly Total	770	0	770	1072	40	0	1112	1892	
9:00 AM	137	0	137	222	5	0	227	354	
9:15 AM	128	0	128	262	8	0	270	396	
9:30 AM	118	0	118	231	5	0	236	354	
9:45 AM	138	0	138	196	11	0	207	345	
Hourly Total	519	0	519	911	29	0	940	1459	
10:00 AM	114	0	114	242	13	0	255	369	
10:15 AM	100	0	100	228	7	0	235	335	
10:30 AM	100	0	100	202	5	0	207	307	
10:45 AM	113	0	113	203	5	0	208	321	
Hourly Total	427	0	427	875	30	0	905	1332	
11:00 AM	91	0	91	185	12	0	198	289	
11:15 AM	104	0	104	212	22	0	234	338	
11:30 AM	131	0	131	209	15	0	224	335	
11:45 AM	116	0	116	206	14	0	220	336	
Hourly Total	442	0	442	813	63	0	876	1318	
12:00 PM	122	0	122	210	9	0	219	341	
12:15 PM	114	0	114	244	7	0	251	385	
12:30 PM	133	0	133	212	5	0	217	350	
12:45 PM	132	0	132	209	8	0	217	349	
Hourly Total	501	0	501	875	29	0	904	1405	
1:00 PM	143	0	143	208	4	0	212	355	
1:15 PM	107	0	107	248	9	0	257	364	
1:30 PM	136	0	136	235	11	0	247	353	
1:45 PM	119	0	119	235	3	0	238	357	
Hourly Total	505	0	505	927	27	0	954	1459	
2:00 PM	162	0	162	229	12	0	241	451	
2:15 PM	146	0	146	290	15	0	305	451	
2:30 PM	151	0	151	275	11	0	286	437	
2:45 PM	161	0	161	285	20	0	305	466	
Hourly Total	620	0	620	1079	58	0	1137	1757	
3:00 PM	171	0	171	261	19	0	280	495	
3:15 PM	157	0	157	323	15	0	338	495	
3:30 PM	163	0	163	325	20	0	345	508	
3:45 PM	158	0	158	294	16	0	310	488	
Hourly Total	649	0	649	1203	70	0	1273	1922	
4:00 PM	205	0	205	375	21	0	395	601	
4:15 PM	184	0	184	370	23	0	393	577	
4:30 PM	194	0	194	425	16	0	441	635	
4:45 PM	188	0	188	419	15	0	434	622	
Hourly Total	771	0	771	1589	75	0	1664	2435	
5:00 PM	210	0	210	381	15	0	376	586	
5:15 PM	221	0	221	426	17	0	443	664	
5:30 PM	230	0	230	416	12	0	428	658	
5:45 PM	178	0	178	404	15	0	419	597	
Hourly Total	839	0	839	1607	59	0	1656	2505	



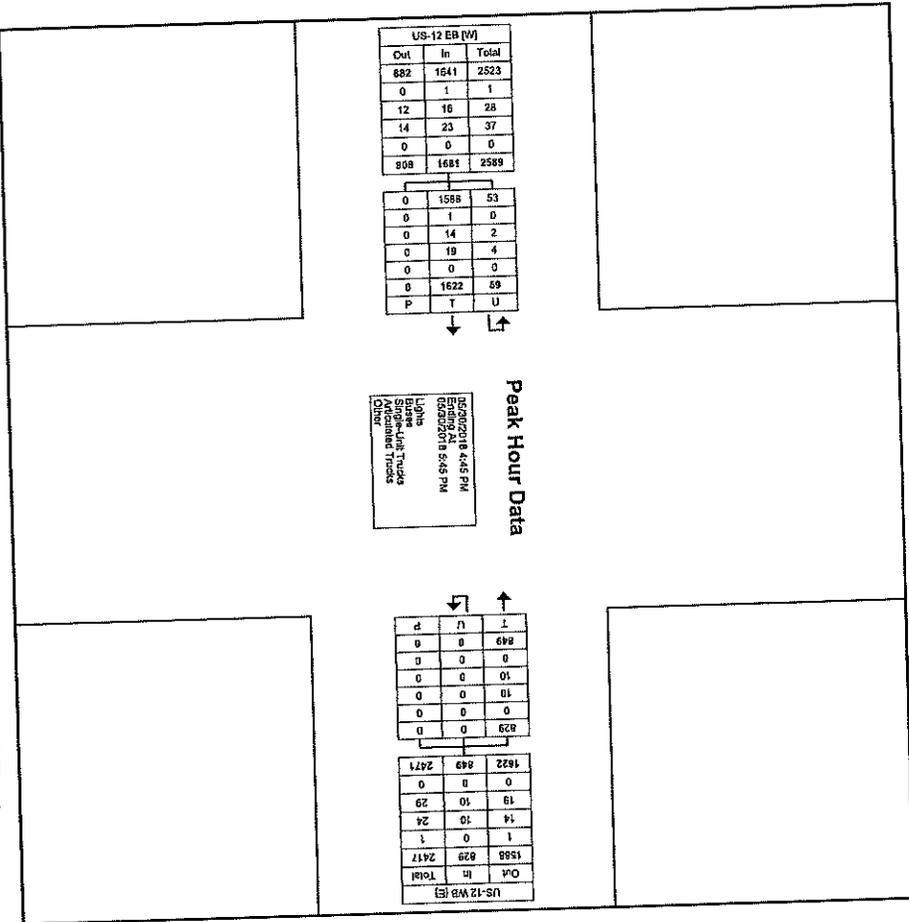
Turning Movement Data Plot

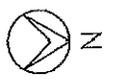
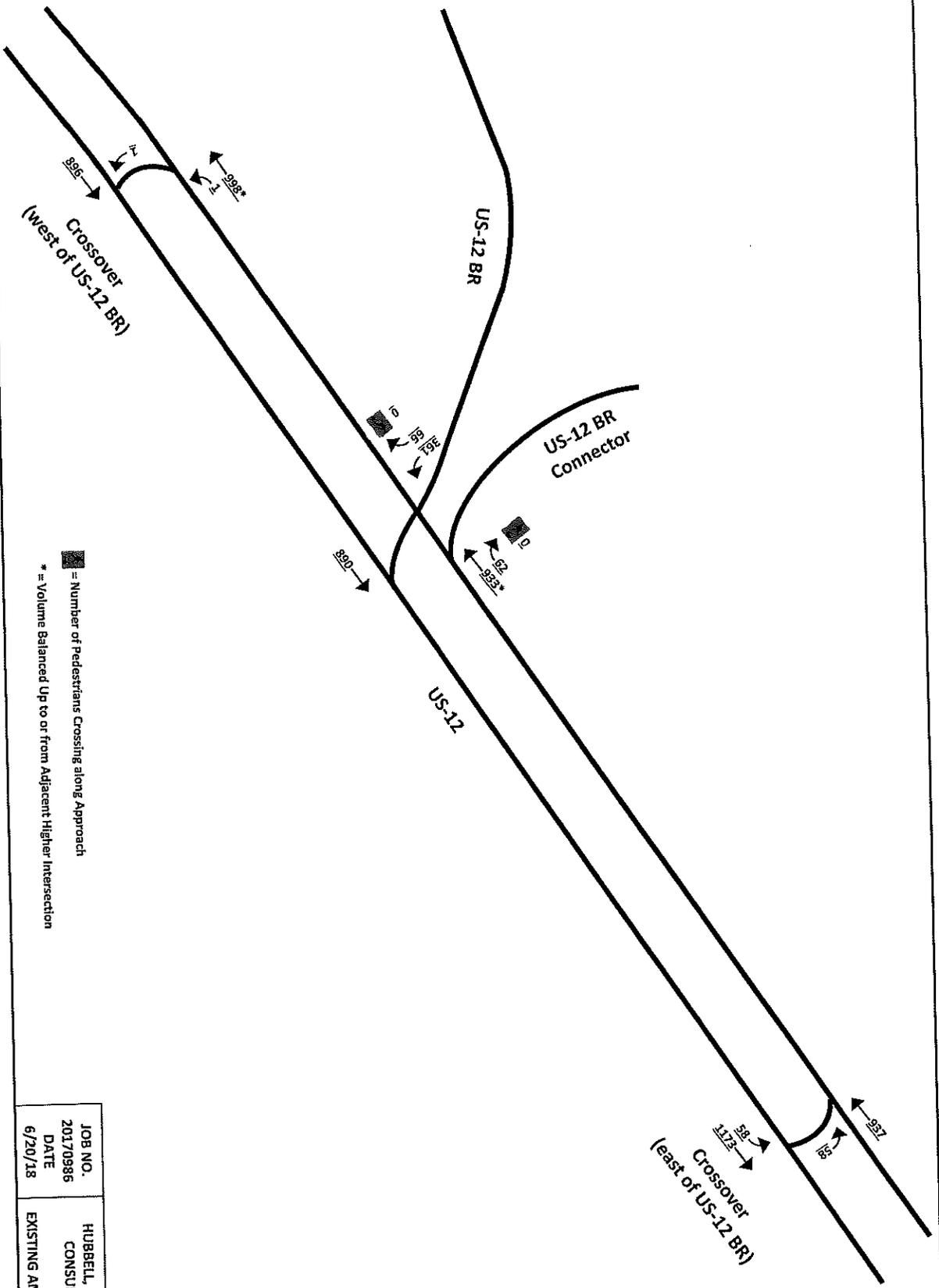
Turning Movement Peak Hour Data Plot (7:00 AM)





Turning Movement Peak Hour Data Plot (4:45 PM)





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6/20/18

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CONSULTING ENGINEER  
EXISTING AM PEAK HOUR T



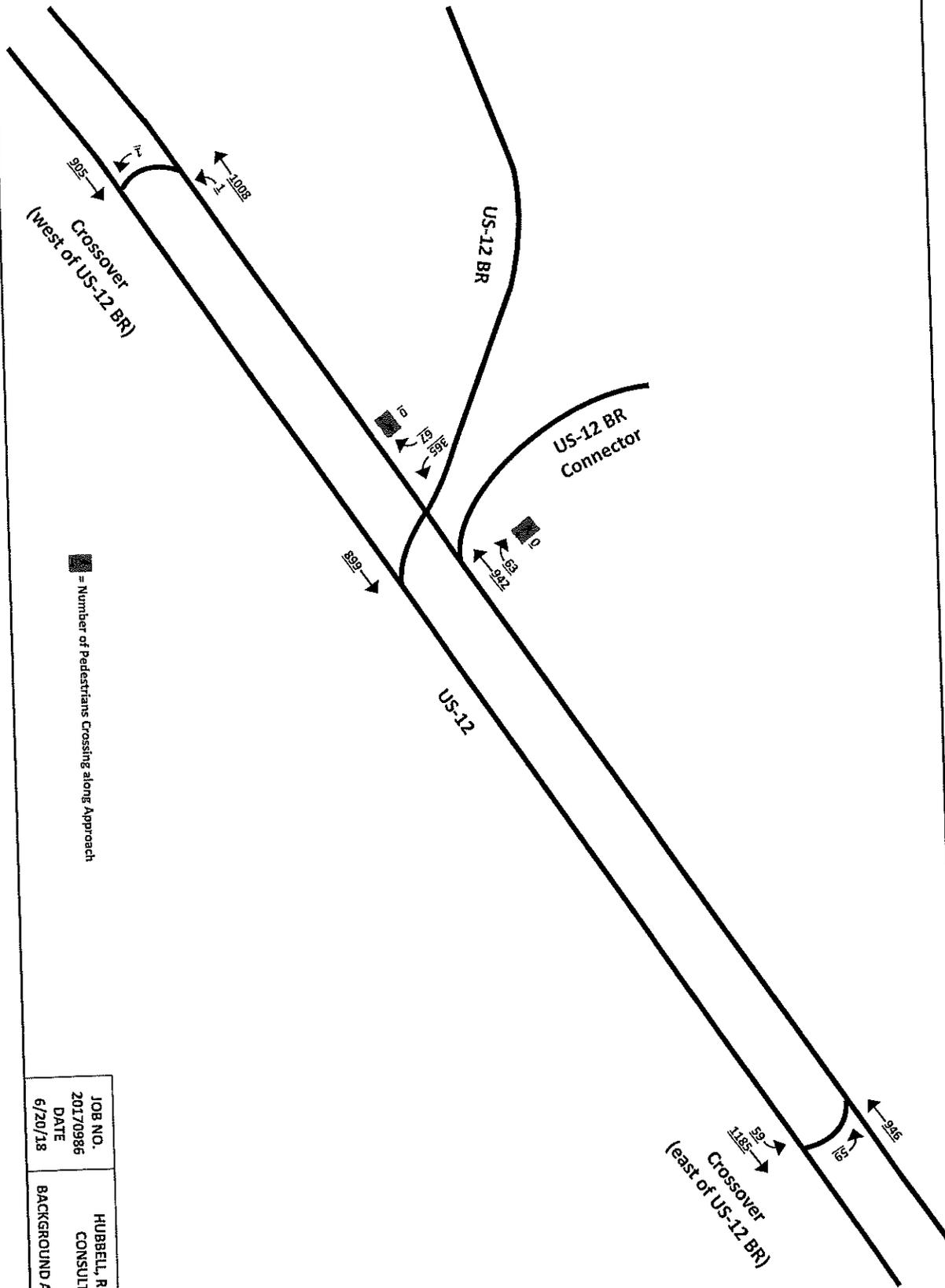
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**Attachment D: SEMCOG 2045 Forecast Summary**

## 2045 Forecast by Community for Wayne County

	2015	2025	2035	2045	Change 2015-45	
					Number	Percent
<b>Rockwood</b>						
Population	2,880	2,704	2,780	2,952	72	2.5%
Households	1,194	1,167	1,180	1,271	77	6.4%
Employment	933	877	879	849	-84	-9.0%
<b>Romulus</b>						
Population	24,010	24,425	24,836	26,330	2,320	9.7%
Households	9,197	9,719	10,131	10,678	1,481	16.1%
Employment	37,490	40,030	40,663	41,333	3,843	10.3%
<b>Southgate</b>						
Population	29,963	29,193	29,834	30,615	652	2.2%
Households	12,954	12,822	13,190	13,326	372	2.9%
Employment	14,680	14,485	14,488	14,646	-34	-0.2%
<b>Sumpter Twp.</b>						
Population	8,323	8,178	8,191	8,641	318	3.8%
Households	3,294	3,238	3,351	3,446	152	4.6%
Employment	2,043	2,017	2,035	2,069	26	1.3%
<b>Taylor</b>						
Population	61,731	57,911	57,844	58,820	-2,911	-4.7%
Households	24,565	24,213	24,532	24,788	223	0.9%
Employment	33,731	33,105	33,037	33,417	-314	-0.9%
<b>Trenton</b>						
Population	17,807	17,324	17,511	18,507	700	3.9%
Households	7,884	7,686	7,752	8,010	126	1.6%
Employment	10,143	10,101	10,082	10,198	55	0.5%
<b>Van Buren Twp.</b>						
Population	29,274	31,898	34,064	35,966	6,692	22.9%
Households	12,276	13,225	14,207	14,950	2,674	21.8%
Employment	14,661	15,942	18,119	19,062	4,401	30.0%
<b>Wayne</b>						
Population	17,010	15,867	15,737	15,910	-1,100	-6.5%
Households	6,915	6,698	6,697	6,685	-230	-3.3%
Employment	15,920	14,910	14,363	14,167	-1,753	-11.0%

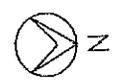
0.9% Annual Growth



■ = Number of Pedestrians Crossing along Approach

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20170986  
DATE  
6/20/18

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BACKGROUND AM PEAK HOUR





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## Attachment F: ITE Trip Generation Excerpts

# Research and Development Center (760)

Vehicle Trip Ends vs: 1000 Sq. Ft. GFA  
On a: Weekday

Setting/Location: General Urban/Suburban  
Number of Studies: 24  
1000 Sq. Ft. GFA: 200  
Directional Distribution: 50% entering, 50% exiting

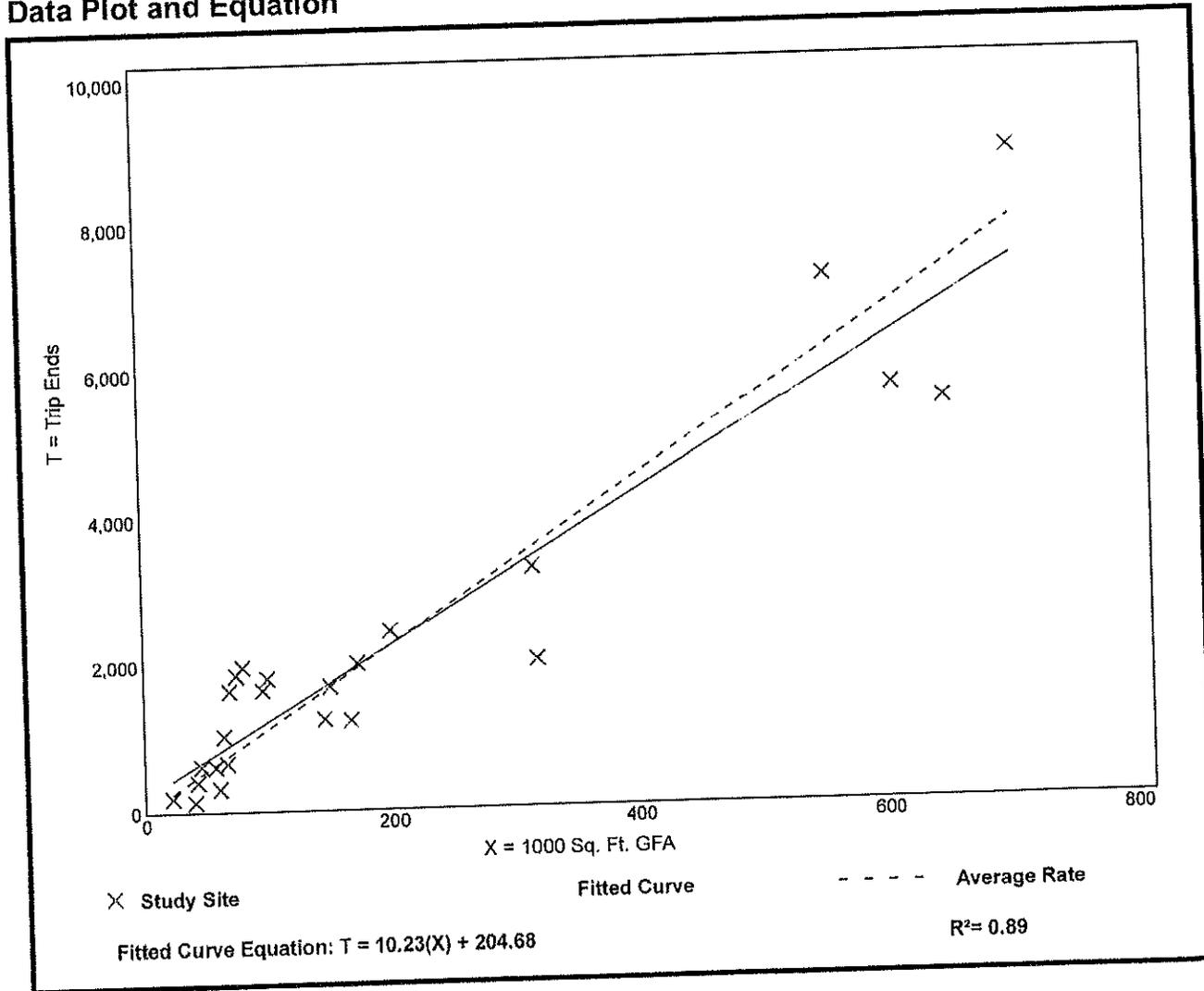
## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate  
11.26

Range of Rates  
3.48 - 24.95

Standard Deviation  
4.07

### Data Plot and Equation



# Research and Development Center (760)

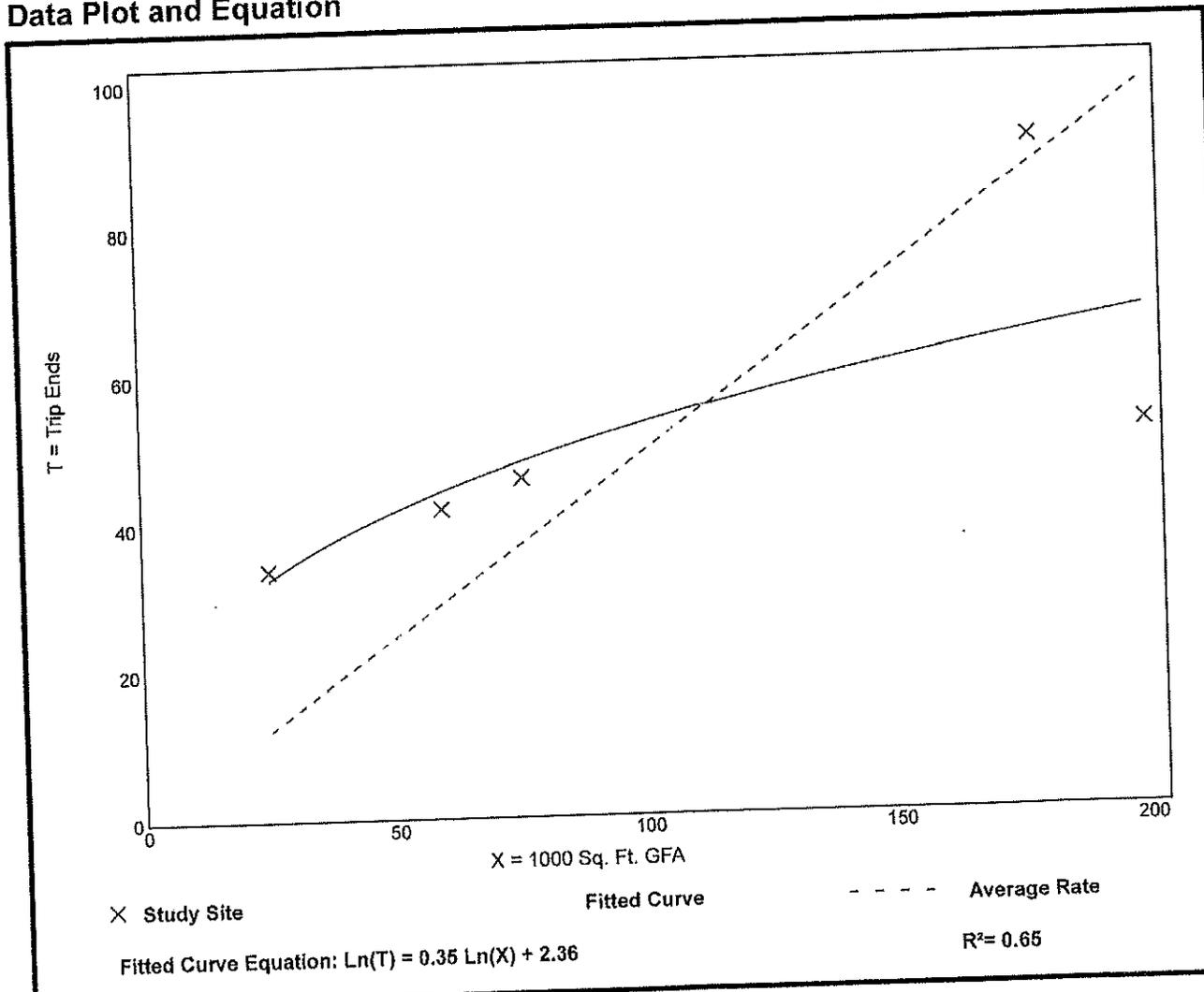
**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 5  
 1000 Sq. Ft. GFA: 108  
 Directional Distribution: 15% entering, 85% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.49	0.26 - 1.35	0.28

## Data Plot and Equation

*Caution - Small Sample Size*



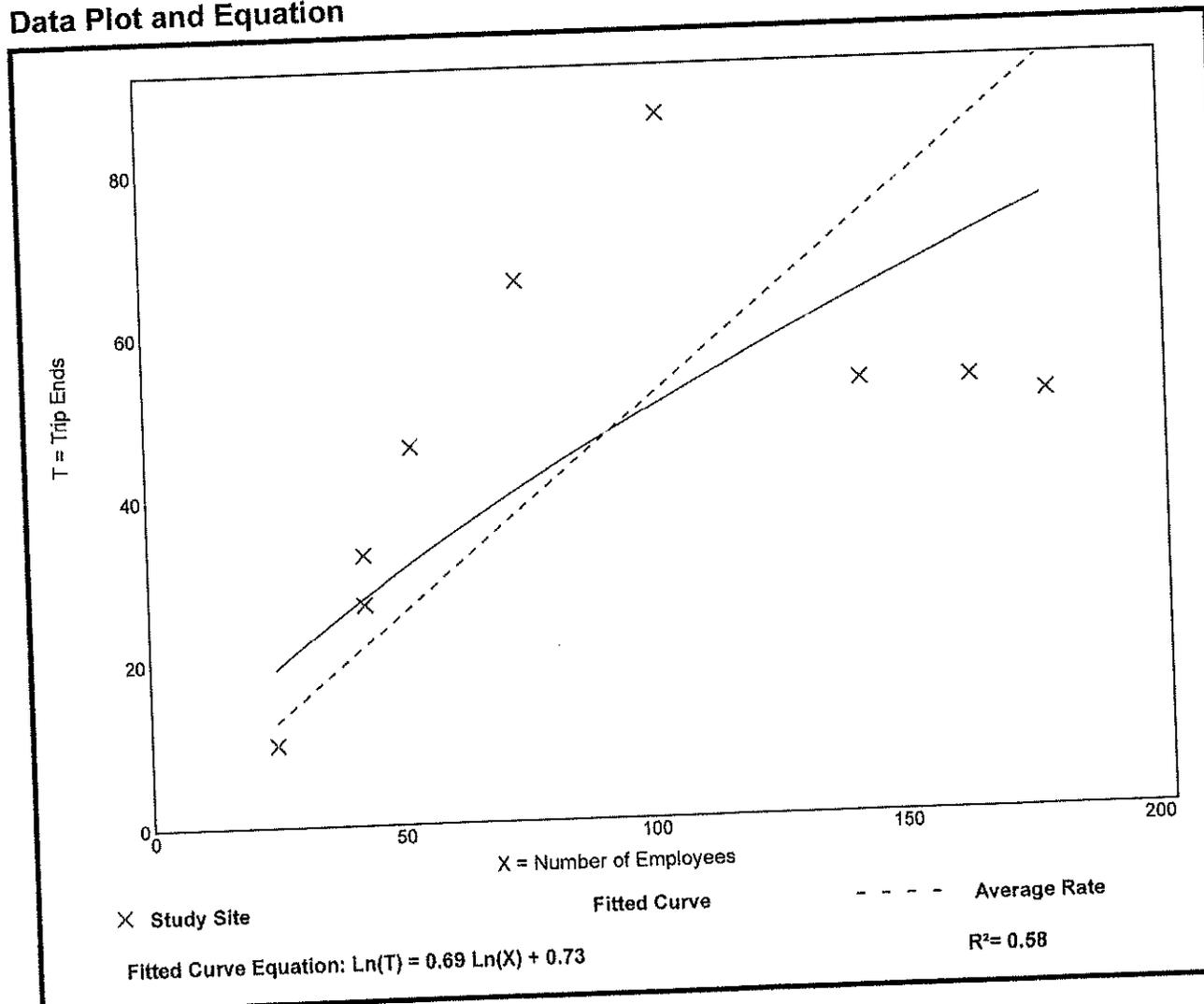
# Research and Development Center (760)

**Vehicle Trip Ends vs: Employees**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**  
**Setting/Location: General Urban/Suburban**  
 Number of Studies: 9  
 Avg. Num. of Employees: 92  
 Directional Distribution: 72% entering, 28% exiting

## Vehicle Trip Generation per Employee

Average Rate	Range of Rates	Standard Deviation
0.51	0.28 - 0.88	0.26

## Data Plot and Equation





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## Attachment G: Trip Generation Calculations

### **Trip Generation for AM Peak Hour of Adjacent Street Traffic vs 1000 SF GFA**

Average Rate = 0.42

Variable: 1,000 SF GFA

Number of Units: 70

Directional Distribution: 75% Entering, 25% Exiting

Total Trips = (Average Rate) (Number of Units)

Total Trips = (0.42) (70)

Total Trips = 29

Trips Entering = (Entering Percentage) (Total Trips)

Trips Entering = (0.75) (29)

Trips Entering = 22

Trips Exiting = (Exiting Percentage) (Total Trips)

Trips Exiting = (0.25) (29)

Trips Exiting = 7

### **Trip Generation for AM Peak Hour of Adjacent Street Traffic vs Employees**

Average Rate = 0.51

Variable: Employees

Number of Units: 180

Directional Distribution: 72% Entering, 28%

Total Trips = (Average Rate) (Number of Units)

Total Trips = (0.51) (180)

Total Trips = 92

Trips Entering = (Entering Percentage) (Total Trips)

Trips Entering = (0.72) (92)

Trips Entering = 66

Trips Exiting = (Exiting Percentage) (Total Trips)

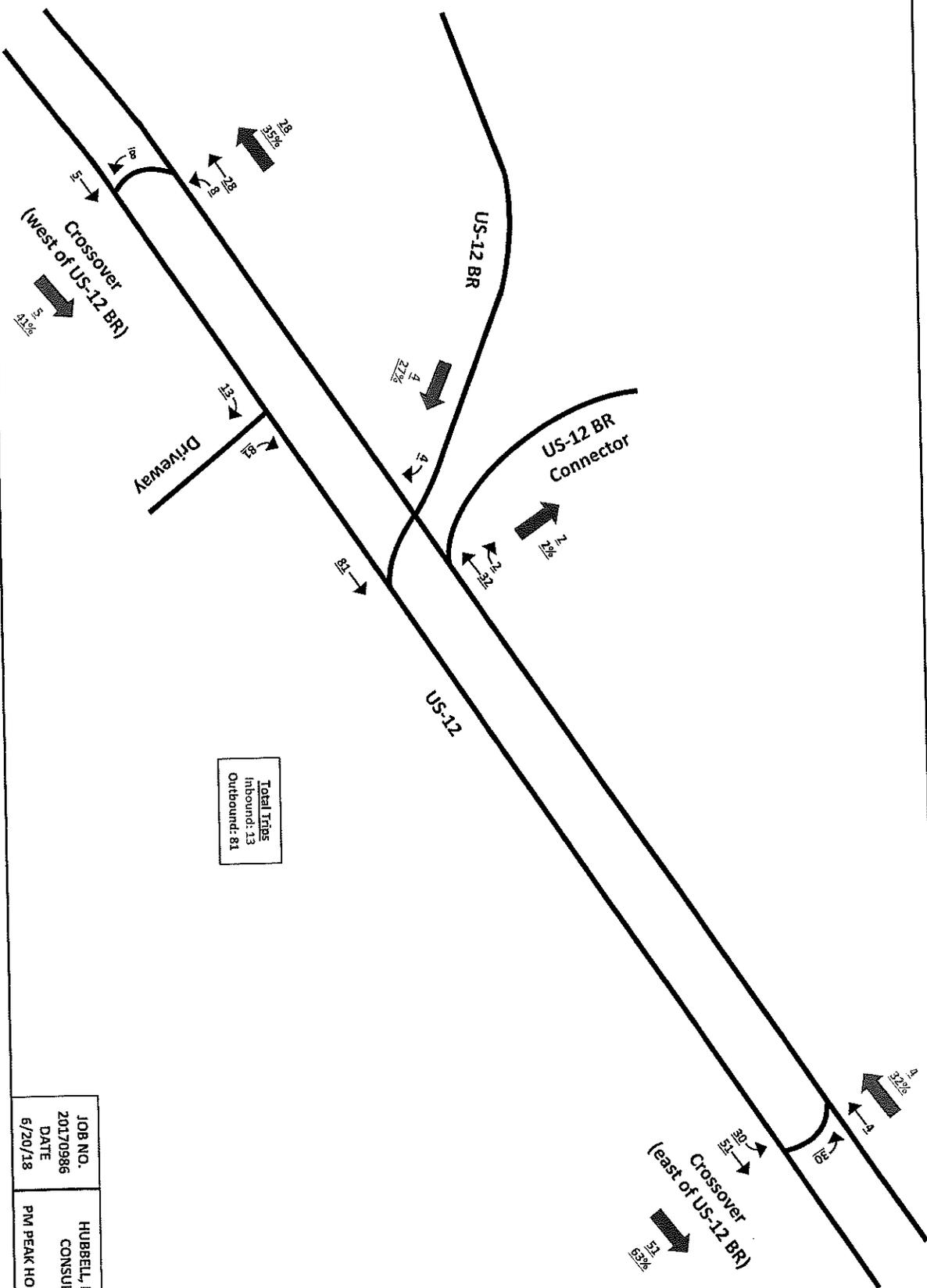
Trips Exiting = (0.28) (92)

Trips Exiting = 26



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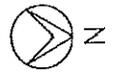
**Attachment H: Trip Distribution, Traffic Assignment, and Future Peak Hour Volume  
Diagrams**

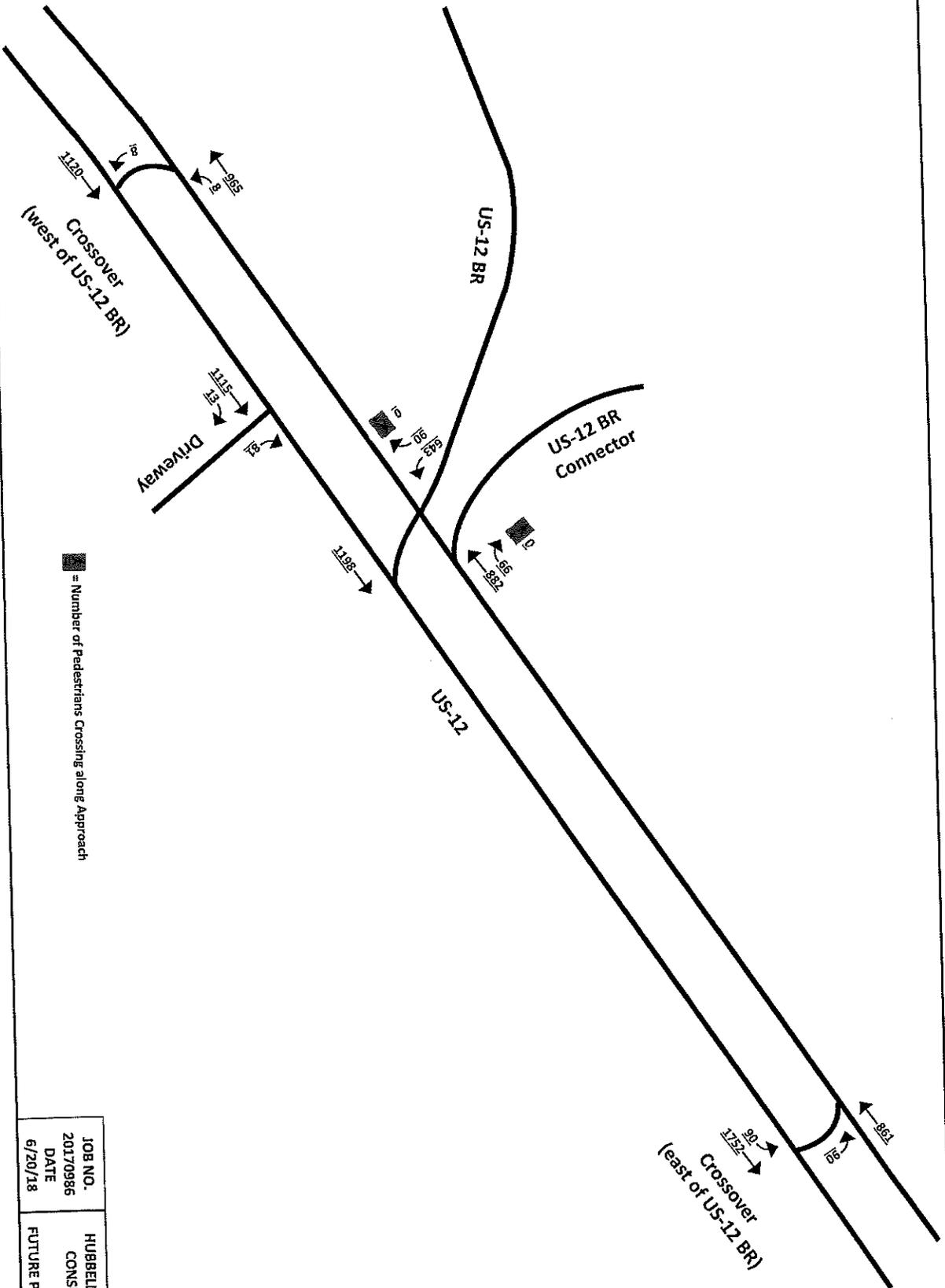


Total Trips  
 Inbound: 13  
 Outbound: 81

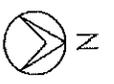
JOB NO.  
 20170986  
 DATE  
 6/20/18

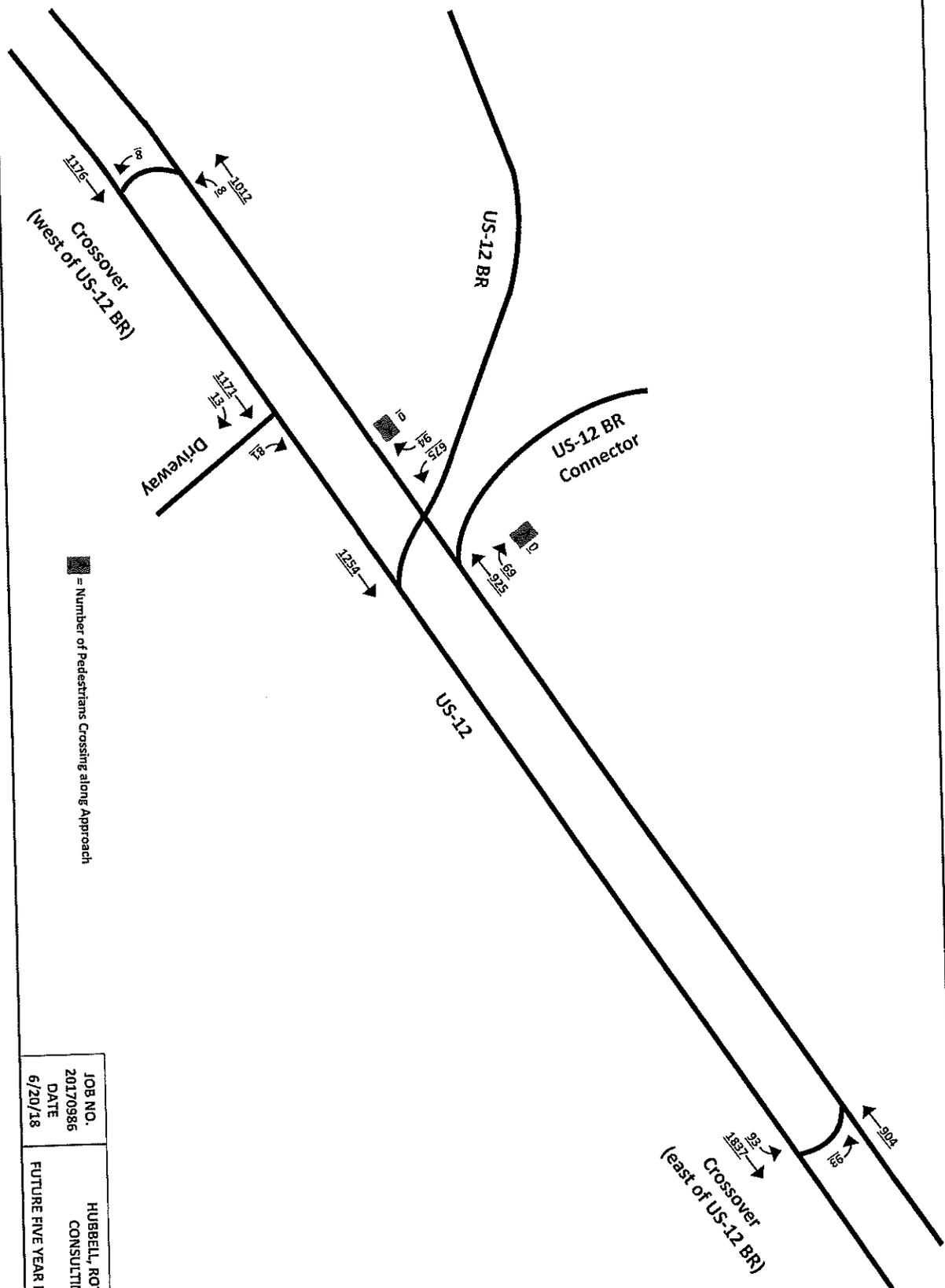
HUBBELL, ROTH & CLARK, II  
 CONSULTING ENGINEERS  
 PM PEAK HOUR TRIP DISTRIBUTION





JOB NO. 20170986	HUBBELL, ROTH & CLARK CONSULTING ENGINEERS
DATE 6/20/18	FUTURE PM PEAK HOUR 7





■ = Number of Pedestrians Crossing along Approach

JOB NO.  
20170986  
DATE  
6/20/18

HUBBELL, ROTH & CLARK, IN  
CONSULTING ENGINEERS  
FUTURE FIVE YEAR PM PEAK HOUR



HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Existing AM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations				
Traffic Volume (vph)	361	66	933	62
Future Volume (vph)	361	66	933	62
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Frt	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2760		3467	1599
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2760		3467	1599
Peak-hour factor, PHF	0.95	0.95	0.81	0.81
Adj. Flow (vph)	380	69	1152	77
RTOR Reduction (vph)	67	0	0	29
Lane Group Flow (vph)	382	0	1152	48
Heavy Vehicles (%)	3%	3%	1%	1%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	14.4		49.6	49.6
Effective Green, g (s)	14.4		49.6	49.6
Actuated g/C Ratio	0.18		0.62	0.62
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	496		2149	991
v/s Ratio Prot	c0.14		c0.33	
v/s Ratio Perm				0.03
v/c Ratio	0.77		0.54	0.05
Uniform Delay, d1	31.2		8.7	6.0
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	7.5		1.0	0.1
Delay (s)	38.7		9.6	6.0
Level of Service	D		A	A
Approach Delay (s)				
Approach LOS				

Intersection Summary

HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Existing AM Peak Hour

						
Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						 
Traffic Volume (veh/h)	0	0	0	0	1	998
Future Volume (Veh/h)	0	0	0	0	1	998
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.60	0.78
Hourly flow rate (vph)	0	0	0	0	2	1279
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	698					
pX, platoon unblocked						
vC, conflicting volume	644	0				0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	644	0				0
tC, single (s)	6.8	6.9				4.1
tC, 2 stage (s)						
tF (s)	3.5	3.3				2.2
p0 queue free %	100	100				100
cM capacity (veh/h)	410	1091				1636
<b>Direction, Lane #</b>						
	SW 1	SW 2	SW 3			
Volume Total	2	640	640			
Volume Left	2	0	0			
Volume Right	0	0	0			
cSH	1636	1700	1700			
Volume to Capacity	0.00	0.38	0.38			
Queue Length 95th (ft)	0	0	0			
Control Delay (s)	7.2	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.0					
Approach LOS						
<b>Intersection Summary</b>						
Average Delay	0.0					
Intersection Capacity Utilization	34.7%		ICU Level of Service	A		
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Existing AM Peak Hour

	→	↘	↙	←	↗	↖
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗↖	
Traffic Volume (veh/h)	0	0	0	937	58	0
Future Volume (Veh/h)	0	0	0	937	58	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.81	0.81	0.76	0.76
Hourly flow rate (vph)	0	0	0	1157	76	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked						
vC, conflicting volume			0		578	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		578	0
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		83	100
cM capacity (veh/h)			1622		444	1081

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	578	578	38	38
Volume Left	0	0	38	38
Volume Right	0	0	0	0
cSH	1700	1700	444	444
Volume to Capacity	0.34	0.34	0.09	0.09
Queue Length 95th (ft)	0	0	7	7
Control Delay (s)	0.0	0.0	13.9	13.9
Lane LOS			B	B
Approach Delay (s)	0.0		13.9	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay		0.9	
Intersection Capacity Utilization		65.0%	ICU Level of Service
Analysis Period (min)		15	C

HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Existing PM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations				
Traffic Volume (vph)	637	85	842	63
Future Volume (vph)	637	85	842	63
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Frbp, ped/bikes	1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00
Frt	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2814		3433	1583
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2814		3433	1583
Peak-hour factor, PHF	0.91	0.91	0.94	0.94
Adj. Flow (vph)	700	93	896	67
RTOR Reduction (vph)	59	0	0	32
Lane Group Flow (vph)	734	0	896	35
Confl. Bikes (#/hr)		1		
Heavy Vehicles (%)	1%	1%	2%	2%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	22.8		41.2	41.2
Effective Green, g (s)	22.8		41.2	41.2
Actuated g/C Ratio	0.29		0.52	0.52
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	801		1767	815
v/s Ratio Prot	c0.26		c0.26	
v/s Ratio Perm				0.02
v/c Ratio	0.92		0.51	0.04
Uniform Delay, d1	27.7		12.7	9.6
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	15.4		1.0	0.1
Delay (s)	43.0		13.8	9.7
Level of Service	D		B	A
Approach Delay (s)				
Approach LOS				
<b>Intersection Summary</b>				
HCM 2000 Control Delay			26.8	HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.67	
Actuated Cycle Length (s)			80.0	Sum of lost time (s) 18.0
Intersection Capacity Utilization			58.4%	ICU Level of Service B
Analysis Period (min)			15	
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Existing PM Peak Hour

						
Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	0	928
Future Volume (Veh/h)	0	0	0	0	0	928
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	1009
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)	698					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	504	0				0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	504	0				0
tC, single (s)	6.8	6.9				4.1
tC, 2 stage (s)						
tF (s)	3.5	3.3				2.2
p0 queue free %	100	100				100
cM capacity (veh/h)	502	1091				1636

Direction, Lane #	SW 1	SW 2	SW 3
Volume Total	0	504	504
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.30	0.30
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		
Approach LOS			

<b>Intersection Summary</b>			
Average Delay		0.0	
Intersection Capacity Utilization		42.0%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Existing PM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↖↗	
Traffic Volume (veh/h)	0	0	0	849	59	0
Future Volume (Veh/h)	0	0	0	849	59	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.87	0.87
Hourly flow rate (vph)	0	0	0	923	68	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked						
vC, conflicting volume				0	462	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				0	462	0
tC, single (s)				4.1	6.9	7.0
tC, 2 stage (s)						
tF (s)				2.2	3.6	3.4
p0 queue free %				100	87	100
cM capacity (veh/h)				1629	516	1068

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	462	462	34	34
Volume Left	0	0	34	34
Volume Right	0	0	0	0
cSH	1700	1700	516	516
Volume to Capacity	0.27	0.27	0.07	0.07
Queue Length 95th (ft)	0	0	5	5
Control Delay (s)	0.0	0.0	12.5	12.5
Lane LOS			B	B
Approach Delay (s)	0.0		12.5	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay			0.9
Intersection Capacity Utilization	76.7%		ICU Level of Service
Analysis Period (min)			15
			D

HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Background AM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations				
Traffic Volume (vph)	365	67	942	63
Future Volume (vph)	365	67	942	63
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Frt	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2760		3467	1599
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2760		3467	1599
Peak-hour factor, PHF	0.95	0.95	0.81	0.81
Adj. Flow (vph)	384	71	1163	78
RTOR Reduction (vph)	67	0	0	30
Lane Group Flow (vph)	388	0	1163	48
Heavy Vehicles (%)	3%	3%	1%	1%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	14.5		49.5	49.5
Effective Green, g (s)	14.5		49.5	49.5
Actuated g/C Ratio	0.18		0.62	0.62
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	500		2145	989
v/s Ratio Prot	c0.14		c0.34	
v/s Ratio Perm				0.03
v/c Ratio	0.78		0.54	0.05
Uniform Delay, d1	31.2		8.7	6.0
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	7.8		1.0	0.1
Delay (s)	39.0		9.7	6.1
Level of Service	D		A	A
Approach Delay (s)				
Approach LOS				
<b>Intersection Summary</b>				
HCM 2000 Control Delay		17.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio		0.61		
Actuated Cycle Length (s)		80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization		51.2%	ICU Level of Service	A
Analysis Period (min)		15		
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Background AM Peak Hour

						
Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	1	1008
Future Volume (Veh/h)	0	0	0	0	1	1008
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.60	0.78
Hourly flow rate (vph)	0	0	0	0	2	1292
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)	None			None		
Median type						
Median storage (veh)	698					
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	650	0				
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	650	0				
tC, single (s)	6.8	6.9				
tC, 2 stage (s)						
tF (s)	3.5	3.3				
p0 queue free %	100	100				
cM capacity (veh/h)	406	1091				

Direction, Lane #	SW 1	SW 2	SW 3
Volume Total	2	646	646
Volume Left	2	0	0
Volume Right	0	0	0
cSH	1636	1700	1700
Volume to Capacity	0.00	0.38	0.38
Queue Length 95th (ft)	0	0	0
Control Delay (s)	7.2	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0		
Approach LOS			

<b>Intersection Summary</b>			
Average Delay		0.0	
Intersection Capacity Utilization		35.0%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Background AM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↖↗	
Traffic Volume (veh/h)	0	0	0	946	59	0
Future Volume (Veh/h)	0	0	0	946	59	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.81	0.81	0.76	0.76
Hourly flow rate (vph)	0	0	0	1168	78	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked						
vC, conflicting volume				0	584	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol				0	584	0
tC, single (s)				4.1	6.9	7.0
tC, 2 stage (s)						
tF (s)				2.2	3.5	3.3
p0 queue free %				100	82	100
cM capacity (veh/h)				1622	440	1081

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	584	584	39	39
Volume Left	0	0	39	39
Volume Right	0	0	0	0
cSH	1700	1700	440	440
Volume to Capacity	0.34	0.34	0.09	0.09
Queue Length 95th (ft)	0	0	7	7
Control Delay (s)	0.0	0.0	14.0	14.0
Lane LOS			B	B
Approach Delay (s)	0.0		14.0	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay			0.9
Intersection Capacity Utilization	65.6%		ICU Level of Service
Analysis Period (min)	15		C

HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Background PM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations				
Traffic Volume (vph)	643	86	850	64
Future Volume (vph)	643	86	850	64
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Frbp, ped/bikes	1.00		1.00	1.00
Flpb, ped/bikes	1.00		1.00	1.00
Frt	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2814		3433	1583
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2814		3433	1583
Peak-hour factor, PHF	0.91	0.91	0.94	0.94
Adj. Flow (vph)	707	95	904	68
RTOR Reduction (vph)	59	0	0	33
Lane Group Flow (vph)	743	0	904	35
Confl. Bikes (#/hr)		1		
Heavy Vehicles (%)	1%	1%	2%	2%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	22.9		41.1	41.1
Effective Green, g (s)	22.9		41.1	41.1
Actuated g/C Ratio	0.29		0.51	0.51
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	805		1763	813
v/s Ratio Prot	c0.26		c0.26	
v/s Ratio Perm				0.02
v/c Ratio	0.92		0.51	0.04
Uniform Delay, d1	27.7		12.8	9.7
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	16.3		1.1	0.1
Delay (s)	44.0		13.9	9.8
Level of Service	D		B	A
Approach Delay (s)				
Approach LOS				

Intersection Summary

HCM 2000 Control Delay	27.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.68		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	58.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Background PM Peak Hour

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations					↘	↗↗
Traffic Volume (veh/h)	0	0	0	0	0	937
Future Volume (Veh/h)	0	0	0	0	0	937
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	0	0	0	1018
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						698
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	509	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	509	0			0	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	499	1091			1636	

Direction, Lane #	SW 1	SW 2	SW 3
Volume Total	0	509	509
Volume Left	0	0	0
Volume Right	0	0	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.30	0.30
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS			
Approach Delay (s)	0.0		
Approach LOS			

<b>Intersection Summary</b>			
Average Delay		0.0	
Intersection Capacity Utilization		42.3%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Background PM Peak Hour



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↖↗	
Traffic Volume (veh/h)	0	0	0	857	60	0
Future Volume (Veh/h)	0	0	0	857	60	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.87	0.87
Hourly flow rate (vph)	0	0	0	932	69	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked						
vC, conflicting volume			0		466	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		466	0
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.6	3.4
p0 queue free %			100		87	100
cM capacity (veh/h)			1629		513	1068

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	466	466	34	34
Volume Left	0	0	34	34
Volume Right	0	0	0	0
cSH	1700	1700	513	513
Volume to Capacity	0.27	0.27	0.07	0.07
Queue Length 95th (ft)	0	0	5	5
Control Delay (s)	0.0	0.0	12.5	12.5
Lane LOS			B	B
Approach Delay (s)	0.0		12.5	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay		0.9	
Intersection Capacity Utilization		77.4%	ICU Level of Service
Analysis Period (min)		15	D

HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Future No Improvements AM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations	↔	↔	↔	↔
Traffic Volume (vph)	365	80	980	64
Future Volume (vph)	365	80	980	64
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Fr't	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2760		3467	1599
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2760		3467	1599
Peak-hour factor, PHF	0.95	0.95	0.81	0.81
Adj. Flow (vph)	384	84	1210	79
RTOR Reduction (vph)	67	0	0	30
Lane Group Flow (vph)	401	0	1210	49
Heavy Vehicles (%)	3%	3%	1%	1%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	14.5		49.5	49.5
Effective Green, g (s)	14.5		49.5	49.5
Actuated g/C Ratio	0.18		0.62	0.62
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	500		2145	989
v/s Ratio Prot	c0.15		c0.35	
v/s Ratio Perm				0.03
v/c Ratio	0.80		0.56	0.05
Uniform Delay, d1	31.4		8.9	6.0
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	9.5		1.1	0.1
Delay (s)	40.8		10.0	6.1
Level of Service	D		B	A
Approach Delay (s)				
Approach LOS				
<b>Intersection Summary</b>				
HCM 2000 Control Delay			18.0	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio			0.64	
Actuated Cycle Length (s)			80.0	Sum of lost time (s)
Intersection Capacity Utilization			52.7%	ICU Level of Service
Analysis Period (min)			15	
c Critical Lane Group				

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Future No Improvements AM Peak Hour

						
Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	41	1019
Future Volume (Veh/h)	0	0	0	0	41	1019
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.60	0.78
Hourly flow rate (vph)	0	0	0	0	68	1306
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)	698					
Upstream signal (ft)						
pX, platoon unblocked	0					
vC, conflicting volume	789	0				
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	789	0				
tC, single (s)	6.8	6.9				
tC, 2 stage (s)						
tF (s)	3.5	3.3				
p0 queue free %	100	100				
cM capacity (veh/h)	318	1091				
<b>Direction, Lane #</b>						
	SW 1	SW 2	SW 3			
Volume Total	68	653	653			
Volume Left	68	0	0			
Volume Right	0	0	0			
cSH	1636	1700	1700			
Volume to Capacity	0.04	0.38	0.38			
Queue Length 95th (ft)	3	0	0			
Control Delay (s)	7.3	0.0	0.0			
Lane LOS	A					
Approach Delay (s)	0.4					
Approach LOS						
<b>Intersection Summary</b>						
Average Delay	0.4					
Intersection Capacity Utilization	50.4%			ICU Level of Service	A	
Analysis Period (min)	15					

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Future No Improvements AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↑↑	
Traffic Volume (veh/h)	0	0	0	973	71	0
Future Volume (Veh/h)	0	0	0	973	71	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.81	0.81	0.76	0.76
Hourly flow rate (vph)	0	0	0	1201	93	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked					600	0
vC, conflicting volume			0			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		600	0
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		78	100
cM capacity (veh/h)			1622		430	1081

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	600	600	46	46
Volume Left	0	0	46	46
Volume Right	0	0	0	0
cSH	1700	1700	430	430
Volume to Capacity	0.35	0.35	0.11	0.11
Queue Length 95th (ft)	0	0	9	9
Control Delay (s)	0.0	0.0	14.4	14.4
Lane LOS			B	B
Approach Delay (s)	0.0		14.4	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay		1.0	
Intersection Capacity Utilization		66.7%	ICU Level of Service
Analysis Period (min)		15	C

HCM Unsignalized Intersection Capacity Analysis  
 9004: Driveway & US-12

Project Pancake Traffic Study  
 Future No Improvements AM Peak Hour

						
Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↑	↑				↑
Traffic Volume (veh/h)	906	66	0	0	0	26
Future Volume (Veh/h)	906	66	0	0	0	26
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	985	72	0	0	0	28
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				340		
pX, platoon unblocked						
vC, conflicting volume			1057		985	492
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1057		985	492
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			655		245	522

Direction, Lane #	EB 1	EB 2	EB 3	NW 1
Volume Total	492	492	72	28
Volume Left	0	0	0	0
Volume Right	0	0	72	28
cSH	1700	1700	1700	522
Volume to Capacity	0.29	0.29	0.04	0.05
Queue Length 95th (ft)	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0			12.3
Approach LOS				B

<b>Intersection Summary</b>			
Average Delay		0.3	
Intersection Capacity Utilization		35.0%	ICU Level of Service
Analysis Period (min)		15	A

HCM Signalized Intersection Capacity Analysis  
1910: US-12 & US-12 BR

Project Pancake Traffic Study  
Future No Improvements PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑			↔↔	
Traffic Volume (vph)	0	1198	0	0	643	0
Future Volume (vph)	0	1198	0	0	643	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0			9.0	
Lane Util. Factor		0.95			0.97	
Fr't		1.00			1.00	
Fl't Protected		1.00			0.95	
Sat'd. Flow (prot)		3471			3400	
Fl't Permitted		1.00			0.95	
Sat'd. Flow (perm)		3471			3400	
Peak-hour factor, PHF	0.87	0.87	0.92	0.92	0.95	0.95
Adj. Flow (vph)	0	1377	0	0	677	0
RTOR Reduction (vph)	0	0	0	0	42	0
Lane Group Flow (vph)	0	1377	0	0	635	0
Heavy Vehicles (%)	4%	4%	0%	0%	3%	3%
Turn Type		NA			Prot	
Protected Phases		1			6	
Permitted Phases						
Actuated Green, G (s)		41.4			20.6	
Effective Green, g (s)		41.4			20.6	
Actuated g/C Ratio		0.52			0.26	
Clearance Time (s)		9.0			9.0	
Vehicle Extension (s)		0.2			4.0	
Lane Grp Cap (vph)		1796			875	
v/s Ratio Prot		c0.40			c0.19	
v/s Ratio Perm						
v/c Ratio		0.77			0.73	
Uniform Delay, d1		15.4			27.1	
Progression Factor		1.00			0.21	
Incremental Delay, d2		3.2			1.3	
Delay (s)		18.6			7.0	
Level of Service		B			A	
Approach Delay (s)		18.6	0.0		7.0	
Approach LOS		B	A		A	

Intersection Summary

HCM 2000 Control Delay	14.8	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

HCM Unsignalized Intersection Capacity Analysis  
 9001: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Future No Improvements PM Peak Hour



Movement	WBL	WBR	SBL	SBR	NEL	NER
Lane Configurations			↶↷			↶↷
Traffic Volume (veh/h)	0	0	8	0	0	1120
Future Volume (Veh/h)	0	0	8	0	0	1120
Sign Control	Free		Stop		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.60	0.60	0.88	0.88
Hourly flow rate (vph)	0	0	13	0	0	1273
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	734					
pX, platoon unblocked						
vC, conflicting volume			636	0	0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
yCu, unblocked vol			636	0	0	
tC, single (s)			6.8	6.9	4.2	
tC, 2 stage (s)						
tF (s)			3.5	3.3	2.2	
p0 queue free %			97	100	100	
cM capacity (veh/h)			415	1091	1607	

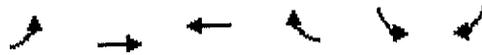
Direction, Lane #	SB 1	SB 2	NE 1	NE 2
Volume Total	6	6	636	636
Volume Left	6	6	0	0
Volume Right	0	0	0	0
cSH	415	415	1700	1700
Volume to Capacity	0.02	0.02	0.37	0.37
Queue Length 95th (ft)	1	1	0	0
Control Delay (s)	13.8	13.8	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	13.8		0.0	
Approach LOS	B			

**Intersection Summary**

Average Delay	0.1		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis  
 9003: US-12 & Crossover East of US-12 BR

Project Pancake Traffic Study  
 Future No Improvements PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↙	↑↑				
Traffic Volume (veh/h)	90	1752	0	0	0	0
Future Volume (Veh/h)	90	1752	0	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.76	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	1904	0	0	0	0
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type						
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol						
tC, single (s)						
tC, 2 stage (s)						
tF (s)						
p0 queue free %						
cM capacity (veh/h)						

Direction, Lane #	EB 1	EB 2	EB 3
Volume Total	118	952	952
Volume Left	118	0	0
Volume Right	0	0	0
cSH	1614	1700	1700
Volume to Capacity	0.07	0.56	0.56
Queue Length 95th (ft)	6	0	0
Control Delay (s)	7.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.4		
Approach LOS			

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		78.9%	ICU Level of Service
Analysis Period (min)		15	D

HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Future Improvements AM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations				
Traffic Volume (vph)	365	80	980	64
Future Volume (vph)	365	80	980	64
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Frt	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2760		3467	1599
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2760		3467	1599
Peak-hour factor, PHF	0.95	0.95	0.81	0.81
Adj. Flow (vph)	384	84	1210	79
RTOR Reduction (vph)	65	0	0	32
Lane Group Flow (vph)	403	0	1210	47
Heavy Vehicles (%)	3%	3%	1%	1%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	16.6		47.4	47.4
Effective Green, g (s)	16.6		47.4	47.4
Actuated g/C Ratio	0.21		0.59	0.59
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	572		2054	947
v/s Ratio Prot	c0.15		c0.35	
v/s Ratio Perm				0.03
v/c Ratio	0.70		0.59	0.05
Uniform Delay, d1	29.4		10.2	6.8
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	4.2		1.2	0.1
Delay (s)	33.6		11.5	6.9
Level of Service	C		B	A
Approach Delay (s)				
Approach LOS				

Intersection Summary

HCM 2000 Control Delay	17.2	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	52.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Future Improvements AM Peak Hour

Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	41	1019
Future Volume (Veh/h)	0	0	0	0	41	1019
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.60	0.78
Hourly flow rate (vph)	0	0	0	0	68	1306
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						698
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	789	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	789	0			0	
iC, single (s)	6.8	6.9			4.1	
iC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			96	
cM capacity (veh/h)	318	1091			1636	

Direction, Lane #	SW 1	SW 2	SW 3
Volume Total	68	653	653
Volume Left	68	0	0
Volume Right	0	0	0
cSH	1636	1700	1700
Volume to Capacity	0.04	0.38	0.38
Queue Length 95th (ft)	3	0	0
Control Delay (s)	7.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.4		
Approach LOS			

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		50.4%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Future Improvements AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↖↗	
Traffic Volume (veh/h)	0	0	0	973	71	0
Future Volume (Veh/h)	0	0	0	973	71	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.81	0.81	0.76	0.76
Hourly flow rate (vph)	0	0	0	1201	93	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked						
vC, conflicting volume			0		600	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		600	0
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		78	100
cM capacity (veh/h)			1622		430	1081

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	600	600	46	46
Volume Left	0	0	46	46
Volume Right	0	0	0	0
cSH	1700	1700	430	430
Volume to Capacity	0.35	0.35	0.11	0.11
Queue Length 95th (ft)	0	0	9	9
Control Delay (s)	0.0	0.0	14.4	14.4
Lane LOS			B	B
Approach Delay (s)	0.0		14.4	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay		1.0	
Intersection Capacity Utilization	66.7%	ICU Level of Service	C
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
9004: Driveway & US-12

Project Pancake Traffic Study  
Future Improvements AM Peak Hour

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↑	↗				↗
Traffic Volume (veh/h)	906	66	0	0	0	26
Future Volume (Veh/h)	906	66	0	0	0	26
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	985	72	0	0	0	28
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)				340		
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1057		985	492
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1057		985	492
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	95
cM capacity (veh/h)			655		245	522

Direction, Lane #	EB 1	EB 2	EB 3	NW 1
Volume Total	492	492	72	28
Volume Left	0	0	0	0
Volume Right	0	0	72	28
cSH	1700	1700	1700	522
Volume to Capacity	0.29	0.29	0.04	0.05
Queue Length 95th (ft)	0	0	0	4
Control Delay (s)	0.0	0.0	0.0	12.3
Lane LOS				B
Approach Delay (s)	0.0			12.3
Approach LOS				B

Intersection Summary

Average Delay	0.3			
Intersection Capacity Utilization	35.0%		ICU Level of Service	A
Analysis Period (min)	15			

HCM Signalized Intersection Capacity Analysis  
 1910: US-12 & US-12 BR

Project Pancake Traffic Study  
 Future Improvements PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑			↔↔	
Traffic Volume (vph)	0	1198	0	0	643	0
Future Volume (vph)	0	1198	0	0	643	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0			9.0	
Lane Util. Factor		0.95			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			3400	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			3400	
Peak-hour factor, PHF	0.87	0.87	0.92	0.92	0.95	0.95
Adj. Flow (vph)	0	1377	0	0	677	0
RTOR Reduction (vph)	0	0	0	0	26	0
Lane Group Flow (vph)	0	1377	0	0	651	0
Heavy Vehicles (%)	4%	4%	0%	0%	3%	3%
Turn Type		NA			Prot	
Protected Phases		1			6	
Permitted Phases						
Actuated Green, G (s)		39.0			23.0	
Effective Green, g (s)		39.0			23.0	
Actuated g/C Ratio		0.49			0.29	
Clearance Time (s)		9.0			9.0	
Vehicle Extension (s)		0.2			4.0	
Lane Grp Cap (vph)		1692			977	
v/s Ratio Prot		c0.40			c0.19	
v/s Ratio Perm						
v/c Ratio		0.81			0.67	
Uniform Delay, d1		17.4			25.1	
Progression Factor		1.00			0.17	
Incremental Delay, d2		4.4			1.1	
Delay (s)		21.8			5.4	
Level of Service		C			A	
Approach Delay (s)		21.8	0.0		5.4	
Approach LOS		C	A		A	

Intersection Summary

HCM 2000 Control Delay	16.4	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	66.5%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 9001: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Future Improvements PM Peak Hour



Movement	WBL	WBR	SBL	SBR	NEL	NER
Lane Configurations			↙↘			↗↖
Traffic Volume (veh/h)	0	0	8	0	0	1120
Future Volume (Veh/h)	0	0	8	0	0	1120
Sign Control	Free		Stop		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.60	0.60	0.88	0.88
Hourly flow rate (vph)	0	0	13	0	0	1273
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None				None	
Median storage (veh)						
Upstream signal (ft)	734					
pX, platoon unblocked			636	0	0	
vC, conflicting volume						
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			636	0	0	
tC, single (s)			6.8	6.9	4.2	
tC, 2 stage (s)						
tF (s)			3.5	3.3	2.2	
p0 queue free %			97	100	100	
cM capacity (veh/h)			415	1091	1607	

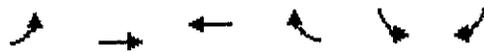
Direction, Lane #	SB 1	SB 2	NE 1	NE 2
Volume Total	6	6	636	636
Volume Left	6	6	0	0
Volume Right	0	0	0	0
cSH	415	415	1700	1700
Volume to Capacity	0.02	0.02	0.37	0.37
Queue Length 95th (ft)	1	1	0	0
Control Delay (s)	13.8	13.8	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	13.8		0.0	
Approach LOS	B			

**Intersection Summary**

Average Delay	0.1		
Intersection Capacity Utilization	42.5%	ICU Level of Service	A
Analysis Period (min)	15		

HCM Unsignalized Intersection Capacity Analysis  
 9003: US-12 & Crossover East of US-12 BR

Project Pancake Traffic Study  
 Future Improvements PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↵	↑↑				
Traffic Volume (veh/h)	90	1752	0	0	0	0
Future Volume (Veh/h)	90	1752	0	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.76	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	118	1904	0	0	0	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)		1084				
pX, platoon unblocked					0.66	
vC, conflicting volume	0				1188	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				264	0
tC, single (s)	4.2				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	93				100	100
cM capacity (veh/h)	1614				435	1091

Direction, Lane #	EB 1	EB 2	EB 3
Volume Total	118	952	952
Volume Left	118	0	0
Volume Right	0	0	0
cSH	1614	1700	1700
Volume to Capacity	0.07	0.56	0.56
Queue Length 95th (ft)	6	0	0
Control Delay (s)	7.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.4		
Approach LOS			

<b>Intersection Summary</b>			
Average Delay		0.4	
Intersection Capacity Utilization		78.9%	ICU Level of Service D
Analysis Period (min)		15	

HCM Signalized Intersection Capacity Analysis  
1010: US-12 & US-12 BR

Project Pancake Traffic Study  
Future Five Year AM Peak Hour

Movement	EBR	EBR2	WBL	WBR
Lane Configurations				
Traffic Volume (vph)	383	83	1027	67
Future Volume (vph)	383	83	1027	67
Ideal Flow (vphpl)	1900	1900	1900	1900
Total Lost time (s)	7.0		9.0	9.0
Lane Util. Factor	0.88		0.97	1.00
Frt	0.85		1.00	0.85
Flt Protected	1.00		0.95	1.00
Satd. Flow (prot)	2760		3467	1599
Flt Permitted	1.00		0.95	1.00
Satd. Flow (perm)	2760		3467	1599
Peak-hour factor, PHF	0.95	0.95	0.81	0.81
Adj. Flow (vph)	403	87	1268	83
RTOR Reduction (vph)	65	0	0	34
Lane Group Flow (vph)	425	0	1268	49
Heavy Vehicles (%)	3%	3%	1%	1%
Turn Type	Prot		Prot	Perm
Protected Phases	2		1	
Permitted Phases				1
Actuated Green, G (s)	16.9		47.1	47.1
Effective Green, g (s)	16.9		47.1	47.1
Actuated g/C Ratio	0.21		0.59	0.59
Clearance Time (s)	7.0		9.0	9.0
Vehicle Extension (s)	4.0		0.2	0.2
Lane Grp Cap (vph)	583		2041	941
v/s Ratio Prot	c0.15		c0.37	
v/s Ratio Perm				0.03
v/c Ratio	0.73		0.62	0.05
Uniform Delay, d1	29.4		10.7	7.0
Progression Factor	1.00		1.00	1.00
Incremental Delay, d2	4.9		1.4	0.1
Delay (s)	34.3		12.1	7.1
Level of Service	C		B	A
Approach Delay (s)				
Approach LOS				
<b>Intersection Summary</b>				
HCM 2000 Control Delay			17.8	HCM 2000 Level of Service
HCM 2000 Volume to Capacity ratio			0.67	B
Actuated Cycle Length (s)			80.0	Sum of lost time (s)
Intersection Capacity Utilization			54.8%	18.0
Analysis Period (min)			15	ICU Level of Service
c Critical Lane Group				A

HCM Unsignalized Intersection Capacity Analysis  
 9000: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Future Five Year AM Peak Hour

						
Movement	NBL	NBR	NET	NER	SWL	SWT
Lane Configurations						
Traffic Volume (veh/h)	0	0	0	0	41	1069
Future Volume (Veh/h)	0	0	0	0	41	1069
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.92	0.92	0.92	0.92	0.60	0.78
Hourly flow rate (vph)	0	0	0	0	68	1371
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	698					
pX, platoon unblocked						
vC, conflicting volume	822	0			0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	822	0			0	
iC, single (s)	6.8	6.9			4.1	
iC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			96	
cM capacity (veh/h)	303	1091			1636	

Direction, Lane #	SW 1	SW 2	SW 3
Volume Total	68	686	686
Volume Left	68	0	0
Volume Right	0	0	0
cSH	1636	1700	1700
Volume to Capacity	0.04	0.40	0.40
Queue Length 95th (ft)	3	0	0
Control Delay (s)	7.3	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.3		
Approach LOS			

<b>Intersection Summary</b>			
Average Delay		0.3	
Intersection Capacity Utilization		37.5%	ICU Level of Service
Analysis Period (min)		15	A

HCM Unsignalized Intersection Capacity Analysis  
 9002: Crossover East of US-12 BR & US-12

Project Pancake Traffic Study  
 Future Five Year AM Peak Hour

	→	↘	↙	←	↗	↖
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations				↑↑	↗↖	
Traffic Volume (veh/h)	0	0	0	1020	74	0
Future Volume (Veh/h)	0	0	0	1020	74	0
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.81	0.81	0.76	0.76
Hourly flow rate (vph)	0	0	0	1259	97	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	1125					
pX, platoon unblocked						
vC, conflicting volume			0		630	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			0		630	0
tC, single (s)			4.1		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		76	100
cM capacity (veh/h)			1622		412	1081

Direction, Lane #	WB 1	WB 2	NB 1	NB 2
Volume Total	630	630	48	48
Volume Left	0	0	48	48
Volume Right	0	0	0	0
cSH	1700	1700	412	412
Volume to Capacity	0.37	0.37	0.12	0.12
Queue Length 95th (ft)	0	0	10	10
Control Delay (s)	0.0	0.0	14.9	14.9
Lane LOS			B	B
Approach Delay (s)	0.0		14.9	
Approach LOS			B	

<b>Intersection Summary</b>			
Average Delay		1.1	
Intersection Capacity Utilization		69.6%	ICU Level of Service
Analysis Period (min)		15	C

HCM Unsignalized Intersection Capacity Analysis  
 9004: Driveway & US-12

Project Pancake Traffic Study  
 Future Five Year AM Peak Hour

	→	↘	↶	←	↙	↷
Movement	EBT	EBR	WBL	WBT	NWL	NWR
Lane Configurations	↑↑	↑				↑
Traffic Volume (veh/h)	950	66	0	0	0	26
Future Volume (Veh/h)	950	66	0	0	0	26
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1033	72	0	0	0	28
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				340		
pX, platoon unblocked						
vC, conflicting volume			1105		1033	516
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1105		1033	516
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	94
cM capacity (veh/h)			628		228	504
<b>Direction, Lane #</b>	<b>EB 1</b>	<b>EB 2</b>	<b>EB 3</b>	<b>NW 1</b>		
Volume Total	516	516	72	28		
Volume Left	0	0	0	0		
Volume Right	0	0	72	28		
cSH	1700	1700	1700	504		
Volume to Capacity	0.30	0.30	0.04	0.06		
Queue Length 95th (ft)	0	0	0	4		
Control Delay (s)	0.0	0.0	0.0	12.6		
Lane LOS				B		
Approach Delay (s)	0.0			12.6		
Approach LOS				B		
<b>Intersection Summary</b>						
Average Delay			0.3			
Intersection Capacity Utilization			36.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Signalized Intersection Capacity Analysis  
 1910: US-12 & US-12 BR

Project Pancake Traffic Study  
 Future Five Year PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations		↑↑			↙↘	
Traffic Volume (vph)	0	1254	0	0	675	0
Future Volume (vph)	0	1254	0	0	675	0
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)		9.0			9.0	
Lane Util. Factor		0.95			0.97	
Frt		1.00			1.00	
Flt Protected		1.00			0.95	
Satd. Flow (prot)		3471			3400	
Flt Permitted		1.00			0.95	
Satd. Flow (perm)		3471			3400	
Peak-hour factor, PHF	0.87	0.87	0.92	0.92	0.95	0.95
Adj. Flow (vph)	0	1441	0	0	711	0
RTOR Reduction (vph)	0	0	0	0	21	0
Lane Group Flow (vph)	0	1441	0	0	690	0
Heavy Vehicles (%)	4%	4%	0%	0%	3%	3%
Turn Type		NA			Prot	
Protected Phases		1			6	
Permitted Phases						
Actuated Green, G (s)		38.3			23.7	
Effective Green, g (s)		38.3			23.7	
Actuated g/C Ratio		0.48			0.30	
Clearance Time (s)		9.0			9.0	
Vehicle Extension (s)		0.2			4.0	
Lane Grp Cap (vph)		1661			1007	
v/s Ratio Prot		c0.42			c0.20	
v/s Ratio Perm						
v/c Ratio		0.87			0.69	
Uniform Delay, d1		18.6			24.9	
Progression Factor		1.00			0.17	
Incremental Delay, d2		6.4			1.2	
Delay (s)		25.0			5.5	
Level of Service		C			A	
Approach Delay (s)		25.0	0.0		5.5	
Approach LOS		C	A		A	

Intersection Summary

HCM 2000 Control Delay	18.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	80.0	Sum of lost time (s)	18.0
Intersection Capacity Utilization	68.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

HCM Unsignalized Intersection Capacity Analysis  
 9001: US-12 & Crossover West of US-12 BR

Project Pancake Traffic Study  
 Future Five Year PM Peak Hour



Movement	WBL	WBR	SBL	SBR	NEL	NER
Lane Configurations			↔↔			↔↔
Traffic Volume (veh/h)	0	0	8	0	0	1176
Future Volume (Veh/h)	0	0	8	0	0	1176
Sign Control	Free		Stop		Free	
Grade	0%		0%		0%	
Peak Hour Factor	0.92	0.92	0.60	0.60	0.88	0.88
Hourly flow rate (vph)	0	0	13	0	0	1336
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)	734					
pX, platoon unblocked						
vC, conflicting volume			668	0	0	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			668	0	0	
tC, single (s)			6.8	6.9	4.2	
tC, 2 stage (s)						
tF (s)			3.5	3.3	2.2	
p0 queue free %			97	100	100	
cM capacity (veh/h)			396	1091	1607	

Direction, Lane #	SB 1	SB 2	NE 1	NE 2
Volume Total	6	6	668	668
Volume Left	6	6	0	0
Volume Right	0	0	0	0
cSH	396	396	1700	1700
Volume to Capacity	0.02	0.02	0.39	0.39
Queue Length 95th (ft)	1	1	0	0
Control Delay (s)	14.2	14.2	0.0	0.0
Lane LOS	B	B		
Approach Delay (s)	14.2		0.0	
Approach LOS	B			

<b>Intersection Summary</b>			
Average Delay		0.1	
Intersection Capacity Utilization		44.5%	ICU Level of Service A
Analysis Period (min)		15	

HCM Unsignalized Intersection Capacity Analysis  
 9003: US-12 & Crossover East of US-12 BR

Project Pancake Traffic Study  
 Future Five Year PM Peak Hour



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations	↖	↑↑				
Traffic Volume (veh/h)	93	1837	0	0	0	0
Future Volume (Veh/h)	93	1837	0	0	0	0
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.76	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	122	1997	0	0	0	0
<b>Pedestrians</b>						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage (veh)						
Upstream signal (ft)		1084				
pX, platoon unblocked					0.63	
vC, conflicting volume	0				1242	0
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	0				194	0
tC, single (s)	4.2				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	92				100	100
cM capacity (veh/h)	1614				453	1091

Direction, Lane #	EB 1	EB 2	EB 3
Volume Total	122	998	998
Volume Left	122	0	0
Volume Right	0	0	0
cSH	1614	1700	1700
Volume to Capacity	0.08	0.59	0.59
Queue Length 95th (ft)	6	0	0
Control Delay (s)	7.4	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.4		
Approach LOS			

<b>Intersection Summary</b>			
Average Delay		0.4	
Intersection Capacity Utilization		82.4%	ICU Level of Service E
Analysis Period (min)		15	

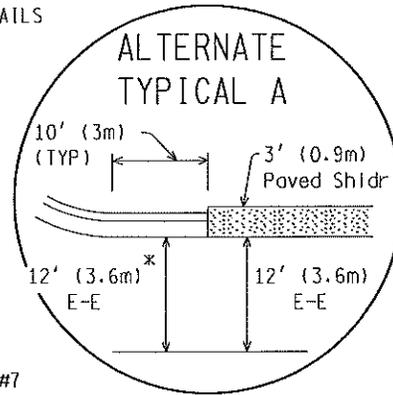
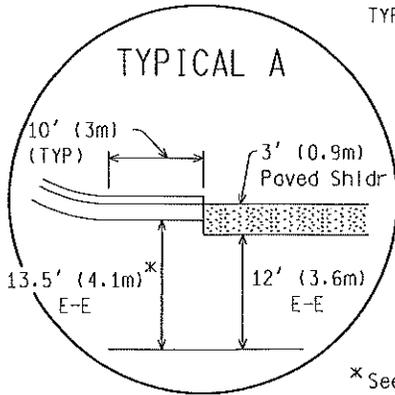


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**Attachment J: Geometric Design Guide Plan Sheet**

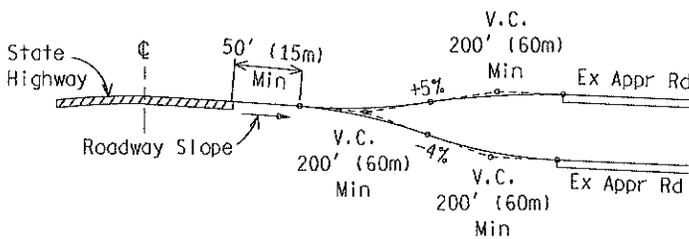
## CURB RETURN OFFSET DETAILS

TYPICAL FOR ALL DETAILS



\*See Note #6 on Sht #7

### ALLOWABLE APPROACH ROAD GRADES

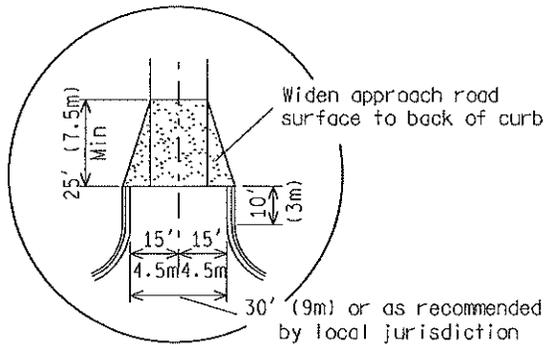


### AUXILIARY LANE TAPER TABLE

Not to be used for transitioning through traffic. The taper rate is the same for both curbed and uncurbed roadways.

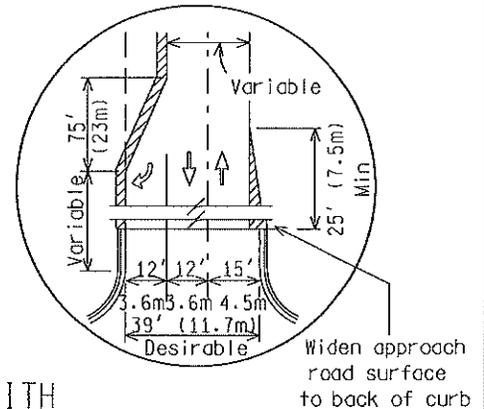
Posted Speed MPH (kph)	Taper Ft (m)
≤ 35 (≤ 60)	75 (23)
40 (60)	100 (30)
45 (70)	130 (40)
50 (80)	180 (55)
55 (90)	225 (70)

### INTERSECTING ROAD WITH OR WITHOUT SHOULDERS

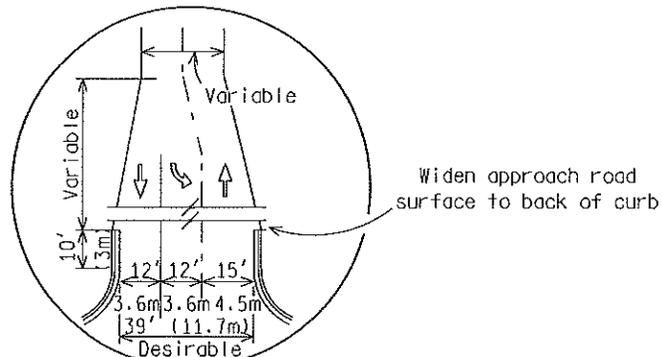


### INSETS

### INTERSECTING ROAD WITH ADDED RIGHT TURN LANE



### INTERSECTING ROAD WITH ADDED LEFT TURN LANE



NOT TO SCALE



August 20, 2018  
FTCH Project No. 181273  
VBT Project No. 18-021

Ms. Carol Thompson, Chairperson  
Van Buren Township Planning Commission  
46425 Tyler Road  
Van Buren Township, MI 48311

Re: Project Pancake – Phase 2  
Van Buren Township, Michigan

Dear Ms. Thompson:

Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) has completed the second review of the Preliminary Plans, dated August 3, 2018, for the proposed Project Pancake – Phase 2.

It should be noted that our attached review letter dated August 10, 2018, in which we provided review comments for the plans dated July 20, 2018, was never submitted to the Planning Commission because the applicant submitted updated plans dated August 3, 2018, for review.

This letter reflects the second review for the Phase 2 Preliminary Plans, and was prepared in conjunction with a plan resubmittal (plan date August 3, 2018) and includes all items required by the *Engineering Standards Manual, Charter Township of Van Buren (April 2014)* that were not previously reviewed as part of the Phase 1 and initial Phase 2 reviews for the plans dated July 20, 2018. This second review also includes a cursory review of the items listed as part of the Phase 1 review letter (dated August 3, 2018).

The proposed project is part of a multi-phased construction project. The overall proposed project entails constructing a Research and Development Facility which includes a 2-story 63,500 square foot building, parking lots with 194 spaces, a separate paved low speed vehicle evaluation area, and room for future building and evaluation area expansion. The proposed site utility layout includes a 12-inch water main loop which crosses Michigan Avenue (US-12) northwest of the site and ties into the existing 8-inch system to the east at Cross Street; a proposed 10-inch sanitary system extension (Sheet C18); and a storm sewer system to accommodate building, parking lot, and site runoff with a dual forebay detention pond system.

### **Phase 1 Review Compliance**

The items listed below are items that were listed as part of the Phase 1 review, which were not completed with the updated plan set dated August 3, 2018. It is our understanding the plans were produced prior to receiving the Phase 1 Plan Review Letter, thus they are listed for reference and shall be included in the next submittal.

#### **Comments:**

1. *Site Drainage, Storm Sewer, and Storm Water Storage Comment No. 1:* The updated plans have addressed the “trapped water” issue flowing south to north by adding culverts through the berms; however, the overall flow route once it hits the berm is still not displayed. Add flow arrows indicating the concentrated flow from each district as it hits the berms.
2. *Site Drainage, Storm Sewer, Storm Water Storage Comment No. 5:* There has been no official documentation received from the Federal Aviation Administration (FAA) by the Township regarding the requirement for “No



Permanent Pools” within the vicinity of the airport. The applicant is to forward on correspondence to the Township for their records.

3. *Paving and Grading Comment No. 1:* For land balancing operations, is there a truck haul route established?

Following is a summary of our Phase 2 review comments for plans dated August 3, 2018.

### General

The following items are general requirements established as part of the *Engineering Standards Manual*, which the applicant must include as part of the preliminary plans.

1. All elevations must be in NGVD 29 datum.
2. The following items must be included on the project title sheet:
  - a. Provide a list of private utility contacts with facilities within the project limits.
  - b. The location map must include section lines and township/range/section data.
  - c. The project map must include an outline of the site features (building footprint, utility linework, detention outline, berms, etc.) relative to their location on the map; manhole numbers and directional flow arrows are not required.
  - d. Provide a listing of permits required.
3. The square footage of the proposed buildings must be provided in plan view.
4. Existing utility information must be included on the plans. Provide existing information including pipe diameter and material for all utility types, including the force mains within the Michigan Avenue right-of-way (ROW). Update legend to show all utility types (i.e. force mains).
5. Show and label all existing and proposed easements; those anticipated to be abandoned shall be labeled as such (i.e. the Denton Drain easement).
6. Basis for design flow computations for sanitary sewers and storm sewers shall be submitted for both phases and total development. Calculations for total development shall include all development phases, present and future, and existing and future offsite areas tributary to the system.
7. Parking spaces, maneuvering lanes, and driveway locations shall be shown on the site plan. Typical dimensions and angles of parking spaces, maneuvering lanes, and driveways shall be noted.
8. Radii of driveway returns and all other points of curvature.
9. Soil borings indicating the ground water elevation must be provided.
10. The following required notes must be added to the plans:
  - a. A statement that all construction shall conform to the current standards, specifications, and general conditions to the Township.
  - b. The Developer is responsible for resolving any drainage problems on adjacent properties which are the result of the Developer’s actions.
11. Show and label underground utilities (existing to remain and proposed) on grading plans and all other sheets that have potential earth disturbance.
12. The final location of perimeter fencing relative to the proposed alignment of public utilities will be determined during final engineering plan review by the Township.

### Water Main Service

#### **Existing:**

The Township water main records indicate an existing asbestos cement (AC) 8-inch water main running east to west along Cross Street on the east side of the property. In addition, there is a 12-inch Township water main located northwest of the property, on the north side of Michigan Avenue (US-12) at Old Michigan Avenue.



**Proposed:**

The applicant's proposed plan shows a proposed 12-inch water main loop connection to the existing 12-inch water main near Old Michigan Avenue. The proposed 12-inch main then extends southeasterly, crosses Michigan Avenue (US-12), and enters the proposed site near the main driveway entrance, loops around the proposed building, connecting to onsite fire hydrants and the building service taps, before exiting the site on the east side of the property where it ties into the existing 8-inch water main on Cross Street.

**Comments:**

1. The proposed water main profile indicates the entire 12-inch water main being encased in a 20-inch steel casing. What is the reasoning behind the encasement? Any unnecessary encasement makes maintenance and repair very difficult. Eliminate the unnecessary casing or provide explanation for its need.
2. Label all water main fittings in both plan and profile views. Indicate description of each fitting and give rim elevations for any water structure.
3. Indicate connection type to the existing mains: tee (cut-in or tapping sleeve) or direct connection with reducer.
4. Label all existing water main sizes and clearly show removal limits for any existing pipe and features to be removed.
5. Label proposed water main material, where encasement begins and ends, and any other items associated with the water main construction (plan and profile).
6. Prior to Engineering Plan Approval, the Township Water & Sewer Department will review and determine final hydrant and valve needs and locations.
7. Verify and show how the existing Smith Farm building and the building located in the separate lot northeast of the Smith Farm building is being serviced by water. In addition, the applicant must show how these two buildings will be serviced via connections to the proposed water main.
8. Final required water main easements will be determined by the Township during the final engineering plan review phase.

**Water Demand Analysis**

During the review process, the applicant requested that FTCH model the water system without the proposed Michigan Avenue (US-12) crossing being installed as part of this project. Instead, they wanted to see the available flows from the existing 8-inch AC water main along Cross Street. Based on the current water main system and planned pressure reducing valve (PRV) settings for the inclusion of the Project Pancake site, the available flows are as follows:

VB-6 PRV Setting	Available Fire Flow (existing system)	Available Fire Flow (Proposed US-12 loop)
53 psi (Current)	950 gpm	3,300 gpm
58 psi (Future)	970 gpm	3,500 gpm

In discussions with the Township, any additional normal demand that may be proposed to be placed on the existing Cross Street water main without the proposed US-12 water main loop will first need to be discussed with the Water and Sewer Department. There are concerns with the age and condition of the AC pipe if the site requests to add in its own pump station or fire flow booster pumps for fire flows. Further discussion will be necessary.

**Site Drainage, Storm Sewer, and Storm Water Storage**

**Existing:**



Existing topography shows drainage flowing predominately north toward the center and north side of the property, into a regulated Michigan Department of Environmental Quality (MDEQ) wetland. The wetland discharges into the enclosed existing Denton Drain, a Wayne County legally-established county drain established in the early 1900s. It is believed the enclosed drain is an 8-inch drain. The Denton Drain flows easterly.

**Proposed:**

The applicant's proposed plan shows a combination of overland flow through swales, earthen berms, and open-ended culverts; an underground system that intercepts flow from paved areas; and a detention basin system that collects all flow through two separate forebays. A new pipe run replaces the existing enclosed Denton Drain from the wetland, which outlets into the detention basin system as well. The culvert and sewer sizes within the system range from 12-inch to 36-inch. The overall detention for the site is controlled by a single 36-inch riser with a restricted 8-inch outlet. The outlet taps and discharges into the existing 12-inch storm system (enclosed Denton Drain) that also collects runoff from Cemetery Road.

**Comments:**

1. The restricted discharge from the proposed detention basin is flowing into the existing 12-inch Denton Drain. It is assumed the applicant has investigated and received approval from the Wayne County Drain Commissioner to connect and discharge into the Denton Drain.
2. The detention basin overflow in excess of the 100-year storm is shown to discharge easterly, to flow toward the existing Denton Drain via overland surface flow through private properties also located to the east. The applicant must show that concentrated flow is not being directed to the property immediately east of the discharge point. A stormwater mitigation measure, such as a level spreader, may be considered and must be addressed during engineering plan level drawings.
3. No flow is accounted for from MH28 (future development) for any downstream features in the sewer calculations. Based on capacity checks for storm sewer, the outlet pipe between MH22 and ES-21 does not have capacity as currently designed, and does not include future expansion. How is this pipe going to handle future capacity?
4. Clarify the asterisk within the storm drain calculations for the wetland inlet (IN-10). The area contributing to the wetland inlet is in excess of 22 acres, but not accounted for within the applicant's calculations. Does this storm drain have capacity? What impacts does the apparent lack of capacity have on Michigan Avenue, when large storm events occur. Does Michigan Avenue drain to this wetland as well?
5. Applicant must provide certified documentation that the Denton Drain easement has been successfully vacated in its current alignment and location.
6. The applicant must include culvert location markers to indicate the location of the culvert inlet, so in the event the culvert is plugged, it can be readily located and cleared.

**Sanitary Sewer**

**Existing:**

The existing property is serviced by a 10-inch gravity sewer which extends westerly from Cross Street and terminates at the applicant's noted structure as MH1. The Smith Farm building are currently serviced via two 6-inch sanitary service leads.

**Proposed:**

The applicant's proposed plan is to tie into the existing 10-inch sewer onsite, via a sanitary sewer system consisting of 10-inch PVC pipe discharging from the north side of the proposed building.



The proposed sanitary sewer service lead is shown to tap directly into the existing sanitary manhole, noted as MH1, in the northeast corner of the property, where flow then heads easterly to the Cross Street sanitary sewer main. No additional improvements to the onsite sanitary line are shown on the plans.

**Comments:**

1. See Note No. 6 under General Comments. A basis of design must be included.
2. Verify size of proposed sanitary sewer. Utility plans show 12-inch proposed line, while the profile sheet shows 10-inch (plan and profile).
3. Indicate the location of the existing sanitary service lead tap locations on the profile.
4. All service leads must be connected via a wye connection to the proposed sanitary sewer downstream of the final upstream manhole. No direct connection of a sanitary sewer service lead directly to a sanitary manhole will be permitted.
5. Label sanitary sewer material type, lengths, and slope for each segment on all utility sheets.
6. Verify and show if an existing sanitary sewer easement was recorded for the existing 10-inch line servicing the Smith Farm building and the buildings located in the separate lot located northeast of the Smith Farm building.
7. Final required sanitary sewer easements will be determined by the Township during final engineering plan review phase.

**Paving and Grading**

1. Clarify the location of curb types vs. detail names. The plans show Type "A" and Type "B" curb, but only indicate Type "B" in the legend. Plans do not make it clear where one curb type begins and one curb type ends. The typical section for Michigan Avenue calls out DET F4 curb, but shows a DET D type curb. Clarify all curb locations and types.
2. All driveways and all sides of parking lots must have concrete curb and gutter to delineate the drive aisles and to direct storm runoff to the stormwater management system.
3. Grading plans need to show proposed flow arrows and have proposed contours to clearing indicate the overland flow route. Proposed flow arrows along the berms must show high/low points and reflect the overall drainage flow to the cross culverts.
4. Show limits of disturbance around all proposed earthwork on any sheet that shows "Approximate limits of grading." Berm edges show grading out to match existing; however, it is only indicated on some sheets.

**Soil Erosion and Sedimentation Control (SESC)**

1. An SESC Plan shall be provided in accordance with the *Engineering Standards Manual*, Chapter II, Plan Requirements, Paragraph D, SESC Plan Requirements, and in accordance with Wayne County SESC standards. A permit must be acquired from the Wayne County SESC County Enforcing Agency (CEA).  
<https://www.waynecounty.com/departments/environmental/landresources/soil-erosion.aspx>
2. Silt fence must not be used in areas of concentrated flow nor in front of or below culverts. The applicant shall use sediment traps and checkdams to eliminate sediment prior to entering a culvert.
3. Verify the plans show ALL inlets with silt sacks.
4. Straw mulch blankets shall be used on 3:1 slopes or greater.

**General Plan Sheet Comments**

1. All Sheets – Label section lines with type and section number, carrying this through to all locations.



2. Sheet C02 – Show Section, Township, Range info for each section within the property. Show proposed utility lines to give overall site reference to all utilities.
3. Sheet C03 – Provide Bench Mark and Control Point numbers and provide soil boring locations (when available).
4. Sheet C04 – Provide aerial photo date captured for future reference.
5. Sheet C18 – Label manhole numbers on plan view.

**Recommendation**

We are recommending the Planning Commission grant Project Pancake – Phase 2 Preliminary Site Plan approval, subject to the review comments noted above and in accordance with the *Engineering Standards Manual*.

If you have any questions regarding this project, please contact me at 248.324.4791 or [dpotter@ftch.com](mailto:dpotter@ftch.com).

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.

A handwritten signature in black ink, appearing to read "David L. Potter".

David L. Potter, PE, CSI-CCCA

A handwritten signature in black ink, appearing to read "Paul J. Kammer".

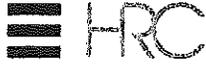
Paul J. Kammer, PE

nac

Attachments

By email

cc: Mr. Ron Akers – Township  
Mr. Gary Tressel – HRC



HUBBELL, ROTH & CLARK, INC  
CONSULTING ENGINEERS SINCE 1915

**PRINCIPALS**

Daniel W. Mitchell  
Nancy M. D. Faught  
Keith D. McCormack  
Jesse B. VanDeCreek  
Roland N. Alix  
Michael C. MacDonald  
James F. Burton  
Charles E. Hart  
Todd J. Sneathen

**CONTROLLER**

Donna M. Martin

**SENIOR ASSOCIATES**

Gary J. Tressel  
Randal L. Ford  
William R. Davis  
Dennis J. Benoit  
Robert F. DeFrain  
Thomas D. LaCross  
Albert P. Mickalich  
Timothy H. Sullivan  
Thomas G. Maxwell

**ASSOCIATES**

Marshall J. Grazioli  
Colleen L. Hill-Stramsak  
Bradley W. Shepler  
Karyn M. Stickel  
Jane M. Graham  
Aaron A. Uranga  
Salvatore Conigliaro  
Melissa A. Coatta  
Michael P. Darga  
Brian K. Davies  
James E. Scholl  
Matthew G. Slicker  
James J. Surhigh  
Trevor S. Wagenmaker

**HUBBELL, ROTH & CLARK, INC.**

MAILING: PO Box 824  
Bloomfield Hills, MI 48303-0824

SHIPPING: 555 Hulet Drive  
Bloomfield Hills, MI 48302-0360

PHONE: 248-454-6300

WEBSITE: hrcengr.com

**OTHER OFFICE LOCATIONS**

Delhi Township  
Detroit  
Grand Rapids  
Howell  
Jackson  
Kalamazoo  
Lansing

August 24, 2018

Van Buren Township Planning Commission  
46425 Tyler Road  
Van Buren Township, Michigan 48311

Attn: Ms. Carol Thompson, Chairperson

Re: Project Pancake – Phase 2 of Development Agreement HRC Job No. 20170986  
Response Letter to FTCH 2<sup>nd</sup> Review of Preliminary Plans

Dear Ms. Thompson:

The following are our responses to FTCH letter dated August 20, 2018:

Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) has completed the second review of the Preliminary Plans, dated August 3, 2018, for the proposed Project Pancake – Phase 2.

It should be noted that our attached review letter dated August 10, 2018, in which we provided review comments for the plans dated July 20, 2018, was never submitted to the Planning Commission because the applicant submitted updated plans dated August 3, 2018, for review.

This letter reflects the second review for the Phase 2 Preliminary Plans, and was prepared in conjunction with a plan resubmittal (plan date August 3, 2018) and includes all items required by the *Engineering Standards Manual, Charter Township of Van Buren (April 2014)* that were not previously reviewed as part of the Phase 1 and initial Phase 2 reviews for the plans dated July 20, 2018. This second review also includes a cursory review of the items listed as part of the Phase 1 review letter (dated August 3, 2018).

The proposed project is part of a multi-phased construction project. The overall proposed project entails constructing a Research and Development Facility which includes a 2-story 63,500 square foot building, parking lots with 194 spaces, a separate paved low speed vehicle evaluation area, and room for future building and evaluation area expansion. The proposed site utility layout includes a 12-inch water main loop which crosses Michigan Avenue (US-12) northwest of the site and ties into the existing 8-inch system to the east at Cross Street; a proposed 10-inch sanitary system extension (Sheet C18); and a storm sewer system to accommodate building, parking lot, and site runoff with a dual forebay detention pond system.

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**Comments:**

1. *Site Drainage, Storm Sewer, and Storm Water Storage Comment No. 1:* The updated plans have addressed the “trapped water” issue flowing south to north by adding culverts through the berms; however, the overall flow route once it hits the berm is still not displayed. Add flow arrows indicating the concentrated flow from each district as it hits the berms.

**Response: Flow arrows have been added to the plans.**

2. *Site Drainage, Storm Sewer, Storm Water Storage Comment No. 5:* There has been no official documentation received from the Federal Aviation Administration (FAA) by the Township regarding the requirement for "No Permanent Pools" within the vicinity of the airport. The applicant is to forward on correspondence to the Township for their records.

**Response: Correspondence with the FAA at Detroit Metro Airport is being submitted by ACS, and will be forwarded to all parties when received.**

3. *Paving and Grading Comment No. 1:* For land balancing operations, is there a truck haul route established?

**Response: If off site fill is required to bring the site to the proposed elevations, the access for all traffic will be from Michigan Avenue only. HRC has applied to MDOT for both the temporary and permanent connection to Michigan Avenue.**

Following is a summary of our Phase 2 review comments for plans dated August 3, 2018.

**General**

The following items are general requirements established as part of the *Engineering Standards Manual*, which the applicant must include as part of the preliminary plans.

1. All elevations must be in NGVD 29 datum.

**Response: Bench marks and datum reference to NGVD29 has been added to the drawings.**

2. The following items must be included on the project title sheet:
  - a. Provide a list of private utility contacts with facilities within the project limits.

**Response: HRC will provide this at the time of Final Site Plan approvals.**

- b. The location map must include section lines and township/range/section data.

**Response: The ALTA Survey with all section lines and all section corners and ¼ section corners is shown on Sheet C-05 of the plans for clarity.**

- c. The project map must include an outline of the site features (building footprint, utility linework, detention outline, berms, etc.) relative to their location on the map; manhole numbers and directional flow arrows are not required.

**Response: The proposed site plan labeled C-02 shows the buildings proposed and existing detention and berms for clarity, HRC has shown the existing and proposed utilities on Sheet C-07.**

- d. Provide a listing of permits required.

**Response: See attached list for permits and status, and list will be provided on cover sheet in Final Site Plan approval.**

3. The square footage of the proposed buildings must be provided in plan view.

**Response: The total area of 63,547 sft. has been added to the contract drawings.**

4. Existing utility information must be included on the plans. Provide existing information including pipe diameter and material for all utility types, including the force mains within the Michigan Avenue right-of-way (ROW). Update legend to show all utility types (i.e. force mains).

**Response: The legend was updated for force main. HRC has been researching the existing utilities within Michigan Avenue to add the documents. If the Township has this information available, please provide so we can add to the drawings.**

5. Show and label all existing and proposed easements; those anticipated to be abandoned shall be labeled as such (i.e. the Denton Drain easement).

**Response: Existing easements are shown on Sheet C05 – ALTA Survey. HRC will add proposed easement to the Final Engineering documents once the reviews are completed for utility alignments and any adjustments are made.**

6. Basis for design flow computations for sanitary sewers and storm sewers shall be submitted for both phases and total development. Calculations for total development shall include all development phases, present and future, and existing and future offsite areas tributary to the system.

**Response: Basis of design of total development for sanitary and storm have been provided on plans. HRC is developing the phasing information and will provide it on the Final Site Plan submission package.**

7. Parking spaces, maneuvering lanes, and driveway locations shall be shown on the site plan. Typical dimensions and angles of parking spaces, maneuvering lanes, and driveways shall be noted.

**Response: HRC has added Sheet C-02A to the drawings to allow adequate upsizing to show this information.**

8. Radii of driveway returns and all other points of curvature.

**Response: HRC has added Sheet C-02A to show this information.**

9. Soil borings indicating the ground water elevation must be provided.

**Response: The soil borings will be contained within the contract documents that address ground water elevations, and as these fluctuate, we prefer to leave the soils reports to address this issue.**

10. The following required notes must be added to the plans:

- a. A statement that all construction shall conform to the current standards, specifications, and general conditions to the Township.

**Response: The note has been added to the cover sheet.**

- b. The Developer is responsible for resolving any drainage problems on adjacent properties which are the result of the Developer's actions.

**Response: Understood – none anticipated.**

11. Show and label underground utilities (existing to remain and proposed) on grading plans and all other sheets that have potential earth disturbance.

**Response: The proposed utility structures are referenced on the grading plans.**

12. The final location of perimeter fencing relative to the proposed alignment of public utilities will be determined during final engineering plan review by the Township.

**Response: Understood.**

### **Water Main Service**

#### **Existing:**

The Township water main records indicate an existing asbestos cement (AC) 8-inch water main running east to west along Cross Street on the east side of the property. In addition, there is a 12-inch Township water main located northwest of the property, on the north side of Michigan Avenue (US-12) at Old Michigan Avenue.

#### **Proposed:**

The applicant's proposed plan shows a proposed 12-inch water main loop connection to the existing 12-inch water main near Old Michigan Avenue. The proposed 12-inch main then extends southeasterly, crosses Michigan Avenue (US-12), and enters the proposed site near the main driveway entrance, loops around the proposed building, connecting to onsite fire hydrants and the building service taps, before exiting the site on the east side of the property where it ties into the existing 8-inch water main on Cross Street.

#### **Comments:**

1. The proposed water main profile indicates the entire 12-inch water main being encased in a 20-inch steel casing. What is the reasoning behind the encasement? Any unnecessary encasement makes maintenance and repair very difficult. Eliminate the unnecessary casing or provide explanation for its need.

**Response: Casing has been eliminated.**

2. Label all water main fittings in both plan and profile views. Indicate description of each fitting and give rim elevations for any water structure.

**Response: HRC will provide this at the time of Final Site Plan approvals.**

3. Indicate connection type to the existing mains: tee (cut-in or tapping sleeve) or direct connection with reducer.

**Response: HRC will provide this at the time of Final Site Plan approvals.**

4. Label all existing water main sizes and clearly show removal limits for any existing pipe and features to be removed.

**Response: HRC will provide this at the time of Final Site Plan approvals.**

5. Label proposed water main material, where encasement begins and ends, and any other items associated with the water main construction (plan and profile).

**Response: HRC will provide this at the time of Final Site Plan approvals.**

6. Prior to Engineering Plan Approval, the Township Water & Sewer Department will review and determine final hydrant and valve needs and locations.

**Response: Understood.**

7. Verify and show how the existing Smith Farm building and the building located in the separate lot northeast of the Smith Farm building is being serviced by water. In addition, the applicant must show how these two buildings will be serviced via connections to the proposed water main.

**Response: Water services to these structures already exist and will not be impacted by this development.**

8. Final required water main easements will be determined by the Township during the final engineering plan review phase.

**Response: Understood.**

**Water Demand Analysis**

During the review process, the applicant requested that FTCH model the water system without the proposed Michigan Avenue (US-12) crossing being installed as part of this project. Instead, they wanted to see the available flows from the existing 8-inch AC water main along Cross Street. Based on the current water main system and planned pressure reducing valve (PRV) settings for the inclusion of the Project Pancake site, the available flows are as follows:

VB-6 PRV Setting	Available Fire Flow (existing system)	Available Fire Flow (Proposed US-12 loop)
53 psi (Current)	950 gpm	3,300 gpm
58 psi (Future)	970 gpm	3,500 gpm

In discussions with the Township, any additional normal demand that may be proposed to be placed on the existing Cross Street water main without the proposed US-12 water main loop will first need to be discussed with the Water and Sewer Department. There are concerns with the age and condition of the AC pipe if the site requests to add in its own pump station or fire flow booster pumps for fire flows. Further discussion will be necessary.

**Response: 12" water main crossing Michigan Avenue will be installed as a part of this project.**

**Site Drainage, Storm Sewer, and Storm Water Storage**

**Existing:**

Existing topography shows drainage flowing predominately north toward the center and north side of the property, into a regulated Michigan Department of Environmental Quality (MDEQ) wetland. The wetland discharges into the enclosed existing Denton Drain, a Wayne County legally-established county drain established in the early 1900s. It is believed the enclosed drain is an 8-inch drain. The Denton Drain flows easterly.

**Proposed:**

The applicant's proposed plan shows a combination of overland flow through swales, earthen berms, and open-ended culverts; an underground system that intercepts flow from paved areas; and a detention basin system that collects all flow through two separate forebays. A new pipe run replaces the existing enclosed Denton Drain from the wetland, which outlets into the detention basin system as well. The culvert and sewer sizes within the system range from 12-inch to 36-inch. The overall detention for the site is controlled by a single 36-inch riser with a restricted 8-inch outlet. The outlet taps and discharges into the existing 12-inch storm system (enclosed Denton Drain) that also collects runoff from Cemetery Road.

**Comments:**

1. The restricted discharge from the proposed detention basin is flowing into the existing 12-inch Denton Drain. It is assumed the applicant has investigated and received approval from the Wayne County Drain Commissioner to connect and discharge into the Denton Drain.

**Response: Approvals are being reviewed by Wayne County and are anticipated shortly.**

2. The detention basin overflow in excess of the 100-year storm is shown to discharge easterly, to flow toward the existing Denton Drain via overland surface flow through private properties also located to the east. The applicant must show that concentrated flow is not being directed to the property immediately east of the discharge point. A stormwater mitigation measure, such as a level spreader, may be considered and must be addressed during engineering plan level drawings

**Response: Will be addressed at Final Site Plan submission.**

3. No flow is accounted for from MH28 (future development) for any downstream features in the sewer calculations. Based on capacity checks for storm sewer, the outlet pipe between MH22 and ES-21 does not have capacity as currently designed, and does not include future expansion. How is this pipe going to handle future capacity?

**Response: Will be addressed at Final Site Plan submission.**

4. Clarify the asterisk within the storm drain calculations for the wetland inlet (IN-10). The area contributing to the wetland inlet is in excess of 22 acres, but not accounted for within

the applicant's calculations. Does this storm drain have capacity? What impacts does the apparent lack of capacity have on Michigan Avenue, when large storm events occur. Does Michigan Avenue drain to this wetland as well?

**Response: The note was revised to provide clarification. Details will be addressed at Final Site Plan submission.**

5. Applicant must provide certified documentation that the Denton Drain easement has been successfully vacated in its current alignment and location.

**Response: August 22, 2018 the Township Board passed a resolution to vacate the drain, which will be finalized at the Wayne County Commissioner's meeting of September 5, 2018.**

6. The applicant must include culvert location markers to indicate the location of the culvert inlet, so in the event the culvert is plugged, it can be readily located and cleared.

**Response: Understood.**

#### **Sanitary Sewer**

##### **Existing:**

The existing property is serviced by a 10-inch gravity sewer which extends westerly from Cross Street and terminates at the applicant's noted structure as MH1. The Smith Farm building are currently serviced via two 6-inch sanitary service leads.

##### **Proposed:**

The applicant's proposed plan is to tie into the existing 10-inch sewer onsite, via a sanitary sewer system consisting of 10-inch PVC pipe discharging from the north side of the proposed building.

The proposed sanitary sewer service lead is shown to tap directly into the existing sanitary manhole, noted as MH1, in the northeast corner of the property, where flow then heads easterly to the Cross Street sanitary sewer main. No additional improvements to the onsite sanitary line are shown on the plans.

##### **Comments:**

1. See Note No. 6 under General Comments. A basis of design must be included.

**Response: Basis of design is shown on Sheet 18.**

2. Verify size of proposed sanitary sewer. Utility plans show 12-inch proposed line, while the profile sheet shows 10-inch (plan and profile).

**Response: HRC has confirmed the existing sanitary sewer is a 10" line, and has adjusted the notes on the plans.**

3. Indicate the location of the existing sanitary service lead tap locations on the profile.

**Response: Understood – will be submitted as a part of Final Site Plan package.**

4. All service leads must be connected via a wye connection to the proposed sanitary sewer downstream of the final upstream manhole. No direct connection of a sanitary sewer service lead directly to a sanitary manhole will be permitted.

**Response: Understood – will be submitted as a part of Final Site Plan package.**

5. Label sanitary sewer material type, lengths, and slope for each segment on all utility sheets.

**Response: Understood – will be submitted as a part of Final Site Plan package.**

6. Verify and show if an existing sanitary sewer easement was recorded for the existing 10-inch line servicing the Smith Farm building and the buildings located in the separate lot located northeast of the Smith Farm building.

**Response: The existing 10" sanitary sewer easement is shown on the plan.**

7. Final required sanitary sewer easements will be determined by the Township during final engineering plan review phase.

**Response: Understood.**

#### **Paving and Grading**

1. Clarify the location of curb types vs. detail names. The plans show Type "A" and Type "B" curb, but only indicate Type "B" in the legend. Plans do not make it clear where one curb type begins and one curb type ends. The typical section for Michigan Avenue calls out DET F4 curb, but shows a DET D type curb. Clarify all curb locations and types.

**Response: Understood – will be submitted as a part of Final Site Plan package.**

2. All driveways and all sides of parking lots must have concrete curb and gutter to delineate the drive aisles and to direct storm runoff to the stormwater management system.

**Response: The plans show areas along driveways and the evaluation area will not be curbed to allow runoff to filtrate thru the vegetation before draining to the forebay for water quality.**

3. Grading plans need to show proposed flow arrows and have proposed contours to clearly indicate the overland flow route. Proposed flow arrows along the berms must show high/low points and reflect the overall drainage flow to the cross culverts.

**Response: Understood – will be submitted as a part of Final Site Plan package.**

4. Show limits of disturbance around all proposed earthwork on any sheet that shows "Approximate limits of grading." Berm edges show grading out to match existing; however, it is only indicated on some sheets.

**Response: Understood – will be submitted as a part of Final Site Plan package.**

**Soil Erosion and Sedimentation Control (SESC)**

1. An SESC Plan shall be provided in accordance with the *Engineering Standards Manual*, Chapter II, Plan Requirements, Paragraph D, SESC Plan Requirements, and in accordance with Wayne County SESC standards. A permit must be acquired from the Wayne County SESC County Enforcing Agency (CEA). <https://www.waynecounty.com/departments/environmental/landresources/soil-erosion.aspx>

**Response: Permit has been approved and is awaiting the storm water approvals from Wayne County prior to issuance.**

2. Silt fence must not be used in areas of concentrated flow nor in front of or below culverts. The applicant shall use sediment traps and checkdams to eliminate sediment prior to entering a culvert.

**Response: Details have been reviewed and approved by Wayne County.**

3. Verify the plans show ALL inlets with silt sacks.

**Response: Details have been reviewed and approved by Wayne County.**

4. Straw mulch blankets shall be used on 3:1 slopes or greater.

**Response: Details have been reviewed and approved by Wayne County.**

**General Plan Sheet Comments**

1. All Sheets – Label section lines with type and section number, carrying this through to all locations.

**Response: Understood – will add at time of Final Site Plan approval.**

2. Sheet C02 – Show Section, Township, Range info for each section within the property. Show proposed utility lines to give overall site reference to all utilities.

**Response: Understood – will add at time of Final Site Plan approval.**

3. Sheet C03 – Provide Bench Mark and Control Point numbers and provide soil boring locations (when available).

**Response: Bench marks have been added to the cover sheets. Do you want to use NAV88 instead of NGVD29? The rest of the information will be provided at Final Site Plan approval.**

4. Sheet C04 – Provide aerial photo date captured for future reference

**Response: Understood.**

5. Sheet C18 – Label manhole numbers on plan view.

Ms. Thompson  
August 24, 2018  
HRC Job Number 20170986  
Page 10 of 10

**Response: This information has been added.**

**Recommendation**

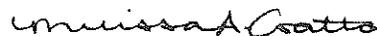
We are recommending the Planning Commission grant Project Pancake – Phase 2 Preliminary Site Plan approval, subject to the review comments noted above and in accordance with the *Engineering Standards Manual*.

**Response: Some items as noted we are requesting be delayed until Final Site Plan submission.**

If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.



Melissa A. Coatta, P.E.  
Associate

MAC/nef

pc: FTCH; D. Potter, P. Kammer  
Van Buren Township; R. Akers  
ACS; C. Miller, D. Bono, D. Goldman  
HED; G. Philo, M. Karaba  
HRC; G. Tressel, File

David C. McNally II  
Fire Marshal  
O: 734-699-8900 ext. 9416

Van Buren Fire Department  
46425 Tyler Rd  
Van Buren Twp. MI 48111



Sept 6<sup>th</sup> 2018

Department Building and Planning  
46425 Tyler Road  
Belleville, MI 48111

Re: Project Pancake

18-021  
To whom it may concern:

I have reviewed a digital plan set sent to me by Ron Akers on August 8th. The plan set is also dated June of 2018 and is labeled preliminary engineering approval, by Hubbell, Roth & Clark, INC 555 Hulet Drive Bloomfield Hills, MI

**Project Overview:**

The proposal is to build unknown vehicle testing facility. The plan set was reviewed for Fire and Life Safety using the township adopted fire code NFPA 1 and NFPA 101 2012 editions.

Again, please note that **all** applicable **NFPA** codes and standards apply as adopted by the Township of Van Buren. Please address the following items and return, before I can approve submitted site plans.

1. Knox-Box will need to be ordered and installed by owner where fire department indicates prior to occupancy. [www.knoxbox.com](http://www.knoxbox.com)  
**NFPA 1 16.3.4.3**
2. Van Buren Fire Department apparatus require a **65ft** outside wheel turning radius. Turning radius of a fire department access road shall be as approved by the AHJ.  
**NFPA 1 18.2.3.4.3.1**
3. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first floor of the building is located not more than 150 ft. from fire department access roads as measured by an approved route around the exterior of the building or facility.  
**NFPA 1 18.2.3.2.2**
4. Dead-end fire department access roads in excess of 150ft. in length shall be provided with approved provisions for fire apparatus to turn around. Loop access between parking lots is

**Our Mission:** The members of the Van Buren Fire Department shall work together in a professional and caring way to protect life and property from the adverse effects of fire, trauma, illness and dangerous conditions. Our services will be provided in a fair, honest, and ethical manner with the highest respect and dignity to all.

requested to accommodate requirements and provide access to current and future buildings proposed.

**NFPA 1 18.2.3.4.4**

**Hammer head turn around for apparatus being added per phone conversation 9/6/18**

- ~~5. Sliding gate access, how does the company plan on allowing access to fire department?~~
6. Building construction and use is needed to identify, suppression requirements and subsequent placement of hydrants and fire department connections.
- ~~7. How will fire department have access to future vehicle evaluation area listed on plans?~~
8. Vehicle evaluation area building, use and construction, will determine hydrant and FDC locations around that building as well.  
**FDC will be placed within 50ft of hydrant on South side of building per phone call on 9-6-2018**
9. Two-Way Radio Communication Enhancement Systems are required for all new construction, unless after finished construction the occupant can prove through a signal test with the AHJ that it is not needed. NFPA 1 2012 11.10.1 In all new and existing buildings, minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ. I have attached the requirements for the above required equipment regulated by the State of Michigan.

**NFPA 72.24.5.2.2.3**

**Plans are approved with conditions**

If you have any questions about this plan review report, please feel free to contact me

Respectfully submitted,

David C McNally  
Fire Marshal  
Van Buren Fire Department



HUBBELL, ROTH & CLARK, INC  
CONSULTING ENGINEERS SINCE 1915

**PRINCIPALS**

Daniel W. Mitchell  
Nancy M. D. Faught  
Keith D. McCormack  
Jesse B. VanDeCreek  
Roland N. Alix  
Michael C. MacDonald  
James F. Burton  
Charles E. Hart  
Todd J. Sneathen

**CONTROLLER**

Donna M. Martin

**SENIOR ASSOCIATES**

Gary J. Tressel  
Randal L. Ford  
William R. Davis  
Dennis J. Benoit  
Robert F. DeFrain  
Thomas D. LaCross  
Albert P. Mickalich  
Timothy H. Sullivan  
Thomas G. Maxwell

**ASSOCIATES**

Marshall J. Grazioli  
Colleen L. Hill-Stramsak  
Bradley W. Shepler  
Karyn M. Stickel  
Jane M. Graham  
Aaron A. Uranga  
Salvatore Conigliaro  
Melissa A. Coatta  
Michael P. Darga  
Brian K. Davies  
James E. Scholl  
Matthew G. Slicker  
James J. Surhigh  
Trevor S. Wagenmaker

**HUBBELL, ROTH & CLARK, INC.**

MAILING: PO Box 824  
Bloomfield Hills, MI 48303-0824

SHIPPING: 555 Hulet Drive  
Bloomfield Hills, MI 48302-0360

PHONE: 248-454-6300  
WEBSITE: hrcengr.com

**OTHER OFFICE LOCATIONS**

Delhi Township  
Detroit  
Grand Rapids  
Howell  
Jackson  
Kalamazoo  
Lansing

August 24, 2018

Van Buren Township  
46425 Tyler Road  
Van Buren Township, Michigan 48111

Attn: Department Building and Planning

Re: Project Pancake  
Preliminary Site Plan Review #1 – Fire Department -Response Letter  
VBT-18-021

HRC Job No. 20170986

Gentlemen:

The following are our responses to Van Buren Fire Department letter dated July 31, 2018;

I have reviewed a digital plan set sent to me by Ron Akers on July 25th. The plan set is also dated 7-20-18 and is labeled preliminary site plan approval by Hubbell, Roth & Clark, INC 555 Hulet Drive Bloomfield Hills, MI

**Project Overview:**

The proposal is to build unknown vehicle testing facility. The plan set was reviewed for Fire and Life Safety using the township adopted fire code NFPA 1 and NFPA 101 2012 editions. Again, please note that all applicable NFPA codes and standards apply as adopted by the Township of Van Buren. Please address the following items and return, before I can approve submitted site plans.

1. Knox-Box will need to be ordered and installed by owner where fire department indicates prior to occupancy. [www.knoxbox.com](http://www.knoxbox.com)  
**NFPA 1 16.3.4.3**

**Response: Understood.**

2. Van Buren Fire Department apparatus require a **65ft** outside wheel turning radius. Turning radius of a fire department access road shall be as approved by the AHJ.  
**NFPA 1 18.2.3.4.3.1**

**Response: See Sheet C-46 – Proposed Fire Department Apparatus Route.**

3. Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first floor of the building is located not more than 150 ft. from fire department access roads as measured by an approved route around the exterior of the building or facility.  
**NFPA 1 18.2.3.2.2**

**Response: See Sheet C-46 – Proposed Fire Department Apparatus Route.**

4. Dead-end fire department access roads in excess of 150ft. in length shall be provided with approved provisions for fire apparatus to turn around. Loop access between parking lots is requested to accommodate requirements and provide access to current and future buildings proposed.  
**NFPA 1 18.2.3.4.4**



HUBBELL, ROTH & CLARK, INC.  
CONSULTING ENGINEERS SINCE 1915

Department of Building and Planning  
August 24, 2018  
HRC Job Number 20170986  
Page 2 of 2

**Response: See Sheet C-46 – Proposed Fire Department Apparatus Route.**

5. Sliding gate access, how does the company plan on allowing access to fire department?

**Response: Company will provide security code for sliding gate access.**

6. Building construction and use is needed to identify, suppression requirements and subsequent placement of hydrants and fire department connections.

**Response: Understood and will be submitted as a part of Final Site Plan package.**

7. How will fire department have access to future vehicle evaluation area listed on plans?

**Response: See Sheet C-46 – Proposed Fire Department Apparatus Route.**

8. Vehicle evaluation area building, use and construction, will determine hydrant and FDC locations around that building as well.

**Response: Understand and will be submitted as a part of Final Site Plan package.**

9. Two-Way Radio Communication Enhancement Systems are required for all new construction, unless after finished construction the occupant can prove through a signal test with the AHJ that it is not needed. NFPA 1 2012 11.10.1 In all new and existing buildings, minimum radio signal strength for fire department communications shall be maintained at a level determined by the AHJ. I have attached the requirements for the above required equipment regulated by the State of Michigan.

**Response: Understood.**

**Plans are approved with the understanding that the above items will be incorporated or corrected prior to c/o**

If you have any questions or require any additional information, please contact the undersigned.

Very truly yours,

HUBBELL, ROTH & CLARK, INC.

Melissa A. Coatta, P.E.  
Associate

MAC/nef

pc: Van Buren Township Fire Department; David C. McNally  
Van Buren Township; Ron Akers  
ACS; D. Bono, C. Miller, D. Goldman  
HED; J. Philo, M. Karaba  
HRC; G. Tressel, File



# Charter Township of Van Buren

## BOARD OF TRUSTEES

SUPERVISOR Kevin McNamara	CLERK Leon Wright	TREASURER Sharry A. Budd	
TRUSTEE Sherry A. Frazier	TRUSTEE Kevin Martin	TRUSTEE Reggie Miller	TRUSTEE Paul D. White

September 7, 2018

Planning Commission  
Charter Township of Van Buren Township  
46425 Tyler Road  
Van Buren Township, MI 48111

**RE: Final Site Plan Review SPR # 17-029 DDA Placemaking Project**

Honorable Commissioners,

The applicant, the Van Buren Township Downtown Development Authority (DDA), proposes to construct a 2,314 square foot building for a local governmental office use and a associated small park on the east side of Belleville Road between Tyler Road and the I-94 North Service Drive. The subject site is made up of multiple parcels which total approximately 1.6 acres in size. The proposed project is commonly referred to as "the Placemaking Project" and the applicant has received preliminary site plan approval from the Planning Commission at their October 25, 2017 meeting.

I have reviewed the revised site plans which were submitted on August 24, 2018 for compliance with the conditions of preliminary site plan approval and offer the following comments.

### Comments:

- 1. Changes for Site Plan:** Based on the prior reviews there have been a few changes to the site plan. They are as follows:
  - a. Additional Parking:** There is an added parking area adjacent to the proposed building which adds 4 additional parking spots, including two (2) additional barrier free parking spots. This solves the Commission's concern regarding handicap access to the building. This parking area will be accessed from the same entrance as the real estate office on the site and a gate is proposed to be installed at this entrance. The DDA's plan for the gate is to keep it open during business hours and during public meetings/events, but to have it closed when the offices are closed. Keeping this gate open during business hours is important to handicap access to the building and keeping this gate open during events and business hours should be a condition of final site plan approval.
  - b. Removal of the Restroom Building:** Due to financial considerations and concerns regarding the recent vandalism of some of the public restrooms in the community, the DDA has elected to remove the restroom building from the project. I acknowledge that it is accounted for in some of the civil engineering drawings, but these have it marked as a future building. I have reviewed the zoning ordinance standards regarding accessory buildings and have found no conflicts with this removal.
- 2. Lot:** The parcels on the site have not been officially combined as of the date of the letter. Combing the properties into one parcel should be a condition of final site plan approval.
- 3. Parking:** The following items need to be addressed with the parking requirements:
  - a. Space Dimensions:** The additional information requested during preliminary site plan approval has been provided and the new parking areas have been reviewed for compliance with the Zoning Ordinance standards. Based on this review those areas are compliant.

46425 Tyler Road, Van Buren Twp., MI 48111-5217 Website: vanburen-mi.org

Telephone 734-699-8900 Fax 734-699-5213



# Charter Township of Van Buren

## BOARD OF TRUSTEES

SUPERVISOR Kevin McNamara	CLERK Leon Wright	TREASURER Sharry A. Budd	
TRUSTEE Sherry A. Frazier	TRUSTEE Kevin Martin	TRUSTEE Reggie Miller	TRUSTEE Paul D. White

- b. **Number of Spaces:** The total required parking spaces for the site is 23 parking spaces and currently 26 have been provided. This along with the shared parking agreement demonstrate that the applicant has complied with the standards of the Zoning Ordinance.
  - c. **Barrier Free:** The new parking areas add barrier free handicap spaces immediately adjacent to the building which will provided adequate handicap access to the office building. The four (4) barrier free spaces exceed the minimum requirement of two (2) spaces so this requirement has been met.
  - d. **Shared Parking Agreement:** The DDA still needs to provide a signed copy of the shared parking agreement. This should be a condition of final site plan approval.
4. **Access and Circulation.** There should be markings indicating that the parking lot is a one-way parking lot. This should be a condition of final site plan approval.
  5. **Photometric Drawings:** A photometric drawing was provided in the set of approved preliminary site plans, but was not included in the set of final site drawings. Despite the DDA project being exempt from the exterior lighting standards in the Zoning Ordinance, the photometric plan should be included in the final set. The addition of the photometric plan should be a condition of final site plan approval.
  6. **Pedestrian Cross Access Easements:** The DDA will need to provide evidence of the pedestrian cross access easements to the adjacent sites. Providing evidence of these should be a condition of final site plan approval.
  7. **Parking Lot Landscaping:** The applicant has added the requested notes to the landscaping plan, but the table in the notes does not indicate a sufficient number of trees to be planted to comply with the standard. After reviewing the site plan, there are a sufficient number of trees adjacent to the parking lot to comply with the parking lot tree requirement of 1 tree per 300 square feet (at 2,009 square feet of parking landscaping area seven (7) trees would be required). The applicant will need to adjust the table to reflect the four (4) additional trees.

### Recommendation

Based on the above mentioned comments staff recommends granting final site plan approval for case# 17-029 to the DDA Placemaking Project, based on the analysis and findings in Township staff report dated 9-7-18, This final site plan approval shall be conditioned upon the following:

1. The applicant shall keep the gate between the real estate office and the additional parking area for the DDA building open during business hours, public meetings, and DDA events.
2. The applicant shall provide a copy of the executed shared parking agreement between the real estate office and the DDA.
3. The applicant shall update their parking lot landscaping calculations to depict the correct number of trees in the parking lot landscaping.
4. The applicant shall combine all of the parcels into one (1) parcel.



September 7, 2018

Charter Township of Van Buren  
46425 Tyler Road  
Van Buren, MI 48111

Attention: Ms. Carol Thompson, Chairperson  
Van Buren Township Planning Commission

Re: Downtown Development Authority  
Construction Plan Review No. 2 and Final Site Plan Review  
2016 Placemaking Project  
Van Buren Township Case No. 17-019

Dear Ms. Thompson:

At the request of Van Buren Township, Fishbeck, Thompson, Carr & Huber, Inc. (FTCH) has completed the second review of the construction plans for the proposed Downtown Development Authority (DDA), 2016 Placemaking Project, which is located at 10151 Belleville Road, Van Buren, MI 48111. The previous review (letter dated October 20, 2017) did not recommend approval, and since, the site design has changed due to requirements from Wayne County. The update plans, dated August 21, 2018, were reviewed for both Construction and Final Site Plan approval.

This review includes all items required by the Van Buren Township (VBT) *Engineering Standards Manual, Charter Township of Van Buren (April 2014)*. The proposed project involves construction of a new DDA facility, pavilion, parking lot storage; a connection to existing garage structure; renovation of existing workshop; demolition of existing storage facility; and a site renovation with new landscaping. FTCH recommended Preliminary Plan approval in our letter dated August 31, 2017.

The following is a summary of our review comments for your use.

#### General

The following items are general requirements established as part of the *Engineering Standards Manual, Charter Township of Van Buren (April 2014)*. The applicant must include the following items as part of the plans.

1. All elevations shall be on NGVD 29 datum. Elevations are on NAVD 88 datum and conversion factor to NGVD 29 datum has been provided. *This requirement must be noted on the "issued for construction" set of construction documents.*
2. Soil borings indicating the existing ground water elevation must still be provided. *This information must be noted on the "issued for construction" set of construction documents.*
3. The plans indicate an existing utility pole near the northeast corner of the Remerica property, next to the existing one-story aluminum siding building that is shown to be removed. The existing utility pole is shown to remain but the down guy wire is shown to be removed. We understand the guy wire is to be relocated. *This requirement must be noted on the "issued for construction" set of construction documents.*
4. *All required easements must be executed, but not recorded until after the as-built plans have been prepared and submitted to the Engineer for final review. Once accepted the applicant shall record the easements and provide a certified copy of the document to the Township.*



### Water Main Service

#### **Existing:**

The survey from the proposed plans indicate there is an existing 8-inch water main located just south of the south property line, north of the Westlake Circle, services the Westlake Apartments. There is no indication of any onsite water service.

#### **Proposed:**

The applicant's proposed plan indicates an 8-inch water main connecting to the existing 8-inch water main located just south of the south property line. The 8-inch water main is proposed to enter the site on the south property line and connect to the proposed buildings via an 8x4 reducer and a 4-inch water service.

#### Comments:

1. Hydrant shall be located at least 10 feet from driveways. Provide dimension on the plan from proposed hydrant to proposed driveway. *This requirement must be noted on the "issued for construction" set of construction documents.*

### Sanitary Sewer Service

#### **Existing:**

The survey from the proposed plans indicate there is an existing 12-inch sanitary sewer pipeline running north-south along Belleville Road on the west side of the property. There is no indication of existing onsite sanitary sewer facilities.

#### **Proposed:**

The applicant's proposed plan indicates a proposed 20-foot easement centered on the proposed 10-inch sanitary public sewer. The 10-inch sanitary sewer splits into separate sanitary sewer leads for each proposed building location.

### Stormwater Management

#### **Existing:**

Existing topography indicates drainage flowing predominately southeast toward the south and east sides of the property onto the adjacent properties.

#### **Proposed:**

The applicant's proposed plan indicates a combination of overland flow through swales, an underground system that intercepts flow from paved areas including an underground detention basin system that collects flow from the parking lot and a bioretention area that collects flow from the area around the proposed buildings. The proposed stormwater discharge outlet for this development is to connect to an existing 12-inch offsite private storm sewer system.

#### Comments:

1. The note on sheet C-5 states the owner's permission is required for this proposed storm connection. An easement agreement is being developed with the adjacent owner.
2. A proposed 20-foot easement is shown centered on the property line and is located on and offsite.
3. Minimum size for storm sewer must be 12 inches in diameter. We understand the Wayne County Department of Public Services has required that the outlet pipes downstream of the outlet structure be 6-inch and 8-inch respectively. A letter reflecting this requirement shall be provided to the Engineer.



4. Hydraulic grade line for ten-year storm event shall be indicated at each manhole and catch basin on storm sewer profile.
5. The water table depths must be determined to verify potential impacts to the underground detention system. Soil borings indicating the existing ground water elevation must still be provided. *This requirement must be noted on the "issued for construction" set of construction documents.*
6. The proposed stormwater treatment structure has different invert elevations on sheets C-5 and C-8. Invert elevations must match. We understand the inverts on sheet C-5 are correct. *This requirement must be noted on the "issued for construction" set of construction documents.*

Site Access

- Work in Wayne County Right-of-Ways will require a permit.

Soil Erosion and Sedimentation Control Plan

- Soil Erosion and Sedimentation Control details and details for the proposed earth changes in accordance with the Charter Township of Van Buren, Engineering Standard Manual, April 2014, Chapter II – Plan Requirements, D. Soil Erosion and sedimentation Control Plan Requirements are included on the drawings.

At this time, we are recommending approval of the Construction Plans and Final Site Plan, dated August 21, 2018, subject to comments and requirements noted above.

If you have any questions regarding this project, please contact me at 248.324.2137 or [dpotter@ftch.com](mailto:dpotter@ftch.com).

Sincerely,  
FISHBECK, THOMPSON, CARR & HUBER, INC.

A handwritten signature in black ink, appearing to read 'P-Kammer', is positioned above the name Paul Kammer.

Paul Kammer, PE – FTCH

A handwritten signature in black ink, appearing to read 'David L. Potter', is positioned above the name David L. Potter.

David L. Potter, PE – FTCH

ag2  
Email

cc: Mr. Ron Akers, Director Planning and Economic Development  
Mr. Matthew Best, Deputy Director Planning and Economic Development  
Mr. James Taylor, Director of Public Works

David C. McNally II  
Fire Marshal  
O: 734-699-8900 ext 9416

Van Buren Fire Department  
46425 Tyler Rd  
Van Buren Twp, MI 48111



8-30-2018

Department Building and Planning  
46425 Tyler Road  
Belleville, MI 48111

Re: 17-029  
DDA 10151 Belleville Rd

To whom it may concern:

I have reviewed the plans and have listed the following items for comment.

**Project Overview:**

The proposal is to build multiuse building and renovation of other buildings on the site.

Please note that **all** applicable **NFPA** codes NFPA 1, and 101 apply, as adopted by the Township of Van Buren. These should be referenced when moving forward with this project.

1. ~~Hydrant will need to be located near maintenance drive to DDA building and existing garage~~
2. ~~Must maintain 16 ft. width all the way to existing garage. Plan now shows required width.~~
3. Knox Box for the DDA building and a Knox lock for the gate will also be required
4. This building is not sprinkled, thus any interior door will not be allowed to have door stops on them.
5. Address is required on site sign.

Review and approval by the Authority Having Jurisdiction shall not relieve the applicant of the responsibility of compliance with these codes.

Plans are approved with remaining items addressed during construction and before C/O issued.

Respectfully submitted,

David C McNally  
Fire Marshal  
Van Buren Fire Department

**Our Mission:** The members of the Van Buren Fire Department shall work together in a professional and caring way to protect life and property from the adverse effects of fire, trauma, illness and dangerous conditions. Our services will be provided in a fair, honest, and ethical manner with the highest respect and dignity to all.