

**AGENDA
CASCADE CHARTER TOWNSHIP
REGULAR BOARD MEETING**

Wednesday, March 13, 2019

7:00 P.M.

Cascade Branch of the Kent District Library, Wisner Center
2870 Jacksmith, S.E.

Expected Meeting Procedures

1. During public comments you may speak on any item not noted on the agenda for a public hearing.
2. Please limit comments to 3 minutes per person and the Board may or may not choose to respond.
3. Please limit your comments to a specific issue.
4. Please turn OFF cellular phones.

Article 1. Call to Order, Roll Call

Article 2. Pledge of Allegiance to the Flag

Article 3. Approval of Agenda

Article 4. Presentations

Article 5. Public Comments-Anything on the Agenda not scheduled for a public hearing. (limit comments to 3 minutes)

Article 6. Approval of Consent Agenda

- a. Receive and File Various Meeting Minutes
 1. Regular Board Meeting Minutes 02/27/2019.
- b. Receive and File Reports
 1. Building Department February Monthly Report.
 2. Kent County Sheriff Department Annual Report for 2018.
- c. Receive and File Communications
 1. Letter from Charter Communications – re: New Channel Additions.
 2. Public Notice from DEQ – re: Proposed Project for Gerald R. Ford International Airport.
- d. Education Requests
 1. Aaron Newton – MMTA 2019 Basic Institute – April 28 - May 3, 2019 – Mt. Pleasant, MI.

Article 7. Financial Actions

Article 8. Unfinished Business

Article 9. New Business

016-2019 Consider Approval of Library Maintenance Issues.

017-2019 Consider Tentative Preliminary Approval of Freedom Farms Subdivision – 8585 52nd St.

- 018-2019** Consider Approval of Request from KDL for Music Programming Funding.
- 019-2019** Consider Approval of 2019 Local Road Improvements.
- 020-2018** Consider Approval of Consumers Energy – Franchise Agreement Renewal Resolution.
- 021-2019** Consider Approval of Contract with Hamilton Helicopter Inc. for Gypsy Moth Suppression Services.

Article 10. Public Comments – Any comments...whether it is on the Agenda or not.
(limit comments to 3 minutes)

Article 11. Manager Comments

Article 12. Board Member Comments

Article 13. Adjournment

**MINUTES OF THE
CASCADE CHARTER TOWNSHIP
REGULAR BOARD MEETING**

Wednesday, February 27, 2019
7:00 P.M.

- Article 1.** Supervisor Beahan called the meeting to order.
Present: Supervisor Beahan, Treasurer Peirce, Clerk Slater, Trustees Lewis, Koessel, Shipley and McDonald.
Absent: None
Also Present: Manager Swayze and those listed in Supplement #1.
- Article 2.** Supervisor Beahan led the Pledge of Allegiance to the Flag.
- Article 3.** Motion was made by Trustee Shipley and supported by Trustee McDonald to approve the Agenda as presented. Motion carried unanimously.
- Article 4. Presentations**
- Article 5. Public Comments-Anything on the Agenda not scheduled for a public hearing. (limit comments to 3 minutes)**
- Article 6. Approval of Consent Agenda**
- a. Receive and File Various Meeting Minutes
 - 1. Regular Board Meeting Minutes 02/13/2019.
 - b. Receive and File Communications
 - 1. Letter from Comcast – re: New/Loss of Channels.
 - 2. Letter from Right Place – re: Thank You.
 - c. Education Requests
 - 1. James Walker – re: Society of MI EMS Instructor – March 7-10 – Traverse City, MI.
 - 2. Jon Snyder/Mike Poolman – re: Live Fire Academy – April 7-9 – Indianapolis, IN.
 - 3. Dan Huyser/Ken Davis – re: IAEI Michigan – March 26-27 – Lansing, MI.
- Motion was made by Trustee Shipley and supported by Trustee Lewis to approve the Consent Agenda as presented. Motion carried unanimously.
- Article 7. Financial Actions**
- a. **Consider Approval of January, 2019 Payroll, Payables and Transfers.**
Motion was made by Trustee Koessel and supported by Trustee Shipley to approve the January, 2019 Payroll, Payables and Transfers. Motion carried unanimously.
 - b. **Consider Approval of January, 2019 General/Special Funds.**
Motion was made by Trustee McDonald and supported by Trustee Lewis to approve the January, 2019 General/Special Funds. Motion carried unanimously.
- Article 8. Unfinished Business**

Article 9.

New Business

012-2019

Consider Approval of Purchase of New Bobcat

Manager Swayze reviewed the purchase. Motion was made by Trustee McDonald and supported by Trustee Koessel to approve the purchase of a new Bobcat from Carleton Eq. Bobcat of Grand Rapids in the amount of \$60,579.88. Motion carried unanimously.

013-2019

Consider Approval of Resolution to Consolidate Precinct 5&10 for Special School Election on May 7, 2019.

Motion was made by Trustee Shipley and supported by Trustee McDonald to approve the Resolution to Consolidate Precinct 5&10 for Special School Election on May 7, 2019. Motion carried unanimously by roll call vote.

014-2019

Consider Approval of Appointments to Various Boards and Commissions.

Motion was made by Trustee Koessel and supported by Trustee Shipley to approve the proposed appointment to the Board of Review. Motion carried unanimously.

015-2019

a. Public Hearing – Property Assessed Clean Energy Program (PACE)

Motion was made by Trustee Shipley and supported by Trustee Koessel to move into public hearing. Motion carried unanimously.

Tom Williams, Senior Council from Lean & Green Michigan was present to address any questions/concerns regarding the PACE program.

Trustee Koessel addressed his concerns regarding the PACE Program with Mr. Williams.

Discussion followed.

Dan Wiersma, Oxford Partners whose offices are in Centennial Park addressed the Board regarding a piece of property they own on 33rd St.

Motion was made by Trustee Shipley and supported by Trustee Lewis to reconvene into regular session. Motion carried.

b. Consider Approval of Resolution to Establish a Property Assessed Clean Energy Program.

Motion was made by Trustee McDonald and supported by Trustee Shipley to approve the Resolution to establish a property Assessed Clean Energy Program. Motion carried by roll call vote.

Ayes- 6 Nays-1 (Koessel)

Article 10.

Public Comments – Any comments...whether it is on the Agenda or not. (limit comments to 3 minutes)

Dan Wiersma, Oxford Partners, 2900 Charlevoix was present to address the Board regarding Centennial Park and the support of the Township's DDA.

Article 11.

Manager Comments

Manager Swayze offered the following comments:

- Our Senior Accountant Tami Cook gave birth to a Baby girl, Julia on Monday. Both mother and baby are healthy and happy.

Article 12. Board Member Comments

Trustee Koessel offered the following comments:

- Addressed the parties in the audience regarding his views on the PACE program not to be taken personally.

Clerk Slater offered the following comments:

- Will be attending the Clerks Institute in Mt. Pleasant March 11-15; therefore, will not be in attendance at the next regular board meeting.

Trustee McDonald offered the following comments:

- Thanked Mr. Wiersma for his comments regarding the cooperation with the Township/DDA.

Article 13. Adjournment

Motion was made by Treasurer Peirce and supported by Trustee Shipley to adjourn. Meeting adjourned.

Meeting adjourned at 8:14 p.m.

Respectfully submitted,

Denise M. Biegalle
Deputy Clerk

Approved by:

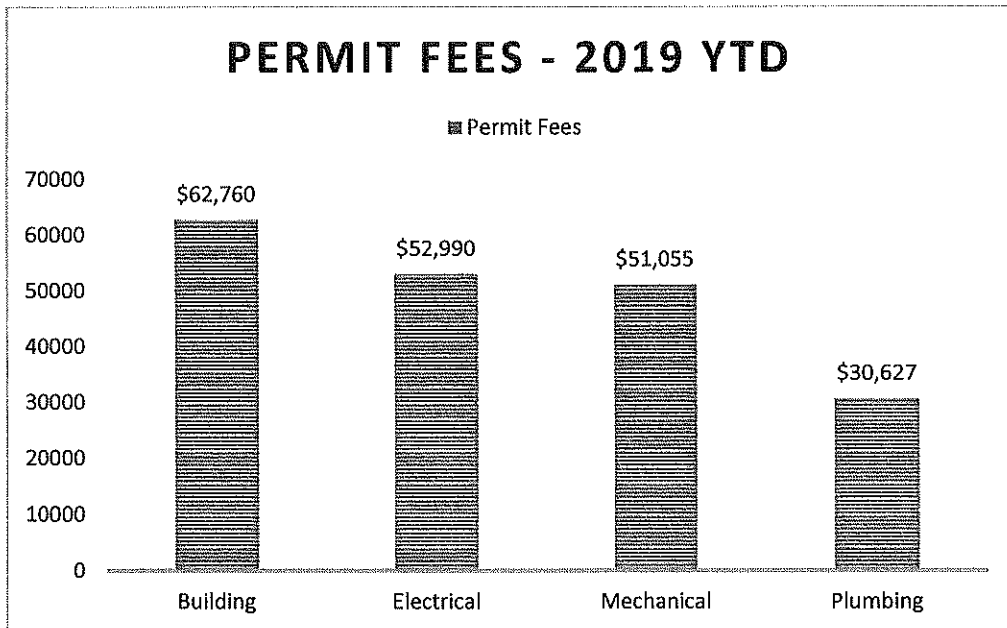
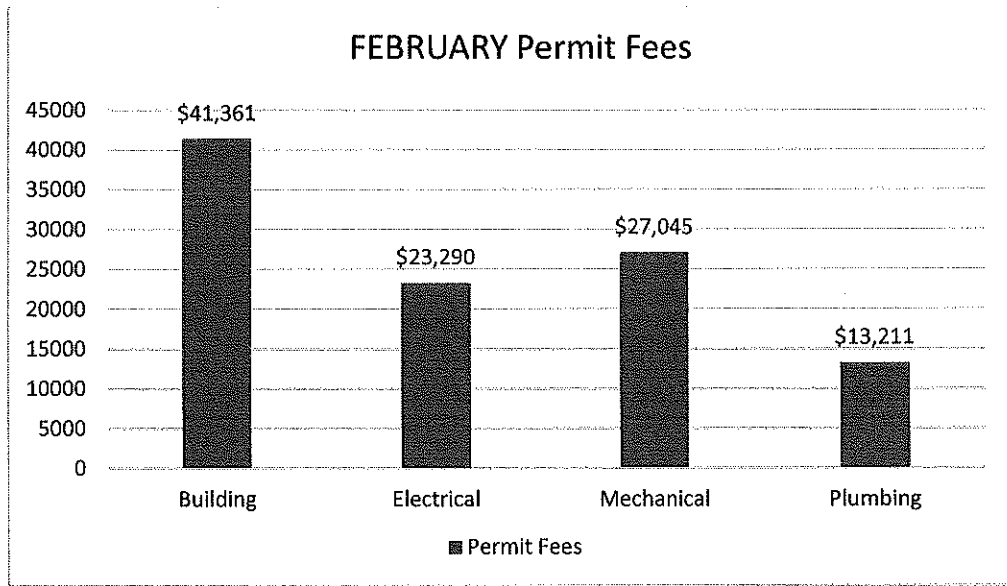
Susan B. Slater, Clerk

Robert S. Beahan, Supervisor

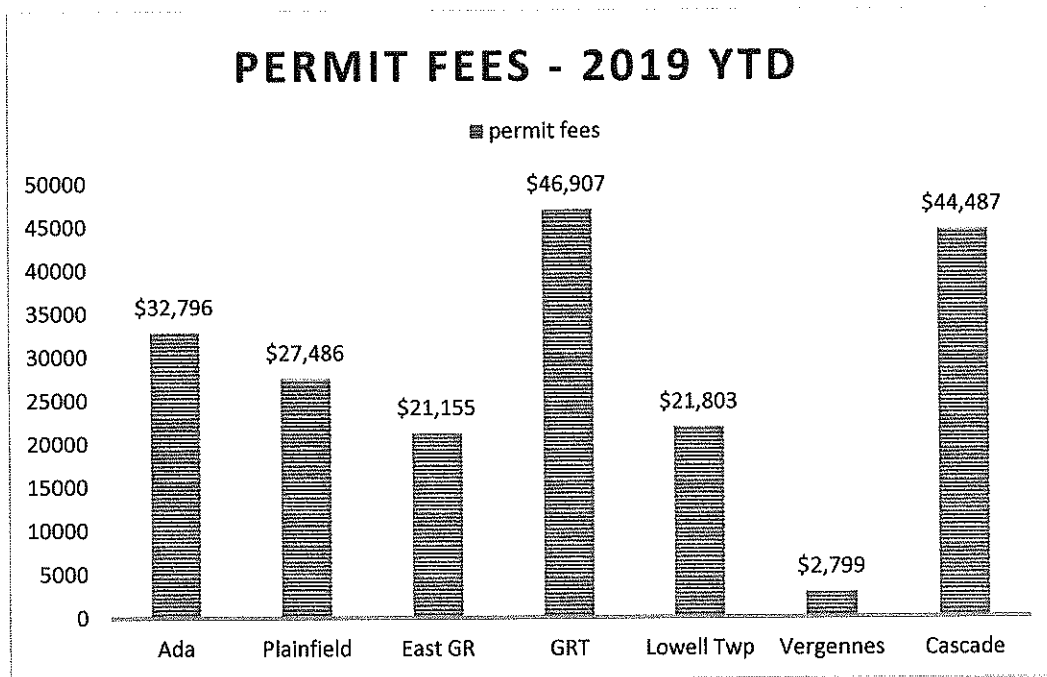
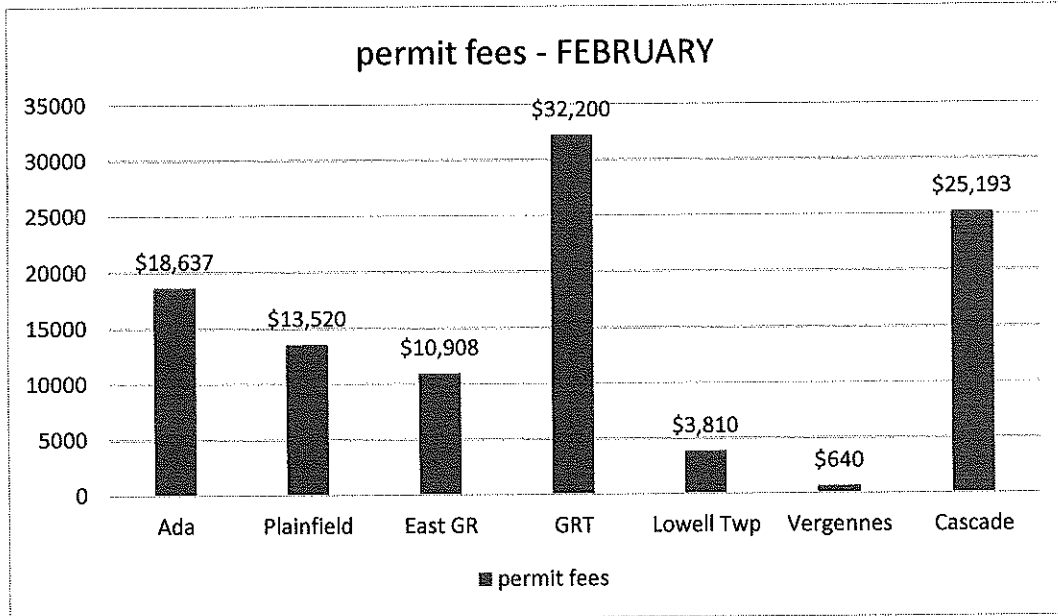
Cascade Inspection Services

FEBRUARY 2019

Permit Fees by Type



Permit Fees by Municipality



Township	#of Per Building	#of Per Electrical	# of Per Mechanical	# of Per Plumbing	Total Permits	Total Fees				
PREV YTD TOTAL	68	\$21,399.00	133	\$29,700.00	222	\$24,010.00	87	\$17,416.00	510	\$92,525.00
FEBRUARY										
Cascade	32	\$6,032.00	25	\$9,292.00	41	\$5,248.00	14	\$4,621.00	112	\$25,193.00
Lowell Twp	6	\$2,172.00	7	\$809.00	5	\$600.00	1	\$229.00	19	\$3,810.00
Ada	26	\$10,746.00	19	\$2,396.00	31	\$3,680.00	14	\$1,815.00	90	\$18,637.00
Vergennes			1	\$60.00	4	\$525.00	1	\$55.00	6	\$640.00
GR Twp	27	\$20,704.00	23	\$3,880.00	41	\$4,900.50	18	\$2,715.00	109	\$32,199.50
EGR	11	\$1,707.00	24	\$2,995.00	33	\$4,591.50	12	\$1,614.00	80	\$10,907.50
Plainfield			28	\$3,858.00	68	\$7,500.00	14	\$2,162.00	110	\$13,520.00
							0		0	\$0.00
MONTH TOTAL	102	\$41,361.00	127	\$23,290.00	223	\$27,045.00	74	\$13,211.00	526	\$104,907.00

2019 YTD	170	\$ 62,760.00	260	\$ 52,990.00	445	\$ 51,055.00	161	\$ 30,627.00	1036	\$ 197,432.00
TOTAL -2018	1705	\$ 920,876.00	2116	\$ 380,754.00	3585	\$ 456,603.00	1654	\$ 238,664.00	9060	\$ 1,996,897.00
TOTAL-2017	1758	\$ 753,389.00	2210	\$ 376,979.00	3273	\$ 412,867.25	1485	\$ 219,324.00	8726	\$ 1,762,559.25
TOTAL-2016	1475	\$529,552.24	1992	\$310,463.00	3217	\$383,718.00	1404	\$190,762.00	8088	\$ 1,414,495.24
TOTAL-2015	1510	\$ 665,025.51	1948	\$ 327,865.00	3070	\$ 385,822.30	1361	\$ 216,089.00	7889	\$ 1,594,801.81
TOTAL-2014	1354	\$ 615,191.80	1780	\$ 297,971.00	2860	\$ 359,989.90	1257	\$ 196,553.00	7251	\$ 1,469,705.70
TOTAL-2013	1241	\$644,712.00	1667	\$288,442.06	2583	\$334,045.70	969	\$142,474.00	6460	\$ 1,409,673.76
TOTAL-2012	1,122	\$511,272.00	1,349	\$188,766.99	2,134	\$247,625.30	835	\$118,335.00	5,440	\$ 1,065,999.29
TOTAL-2011	949	\$410,550.75	990	\$148,549.50	1585	\$189,180.10	753	\$111,023.00	4277	\$ 859,303.35
TOTAL-2010	850	\$309,779.00	1330	\$162,994.00	1644	\$188,927.25	625	\$94,790.00	4449	\$ 756,490.25
TOTAL-2009	712	\$222,039.00	875	\$125,848.00	1313	\$149,101.75	554	\$74,397.00	3463	\$ 571,382.75
TOTAL-2008	848	\$582,100.75	1043	\$147,674.00	1348	\$164,271.30	697	\$91,695.00	3933	\$ 951,266.55
TOTAL-2007	1032	\$336,749.55	1069	\$137,857.00	1447	\$151,002.60	778	\$98,270.00	4326	\$ 723,879.15
TOTAL-2006	1181	\$481,673.30	1547	\$215,121.00	2147	\$243,076.90	1243	\$162,020.00	5173	\$ 940,523.41
TOTAL-2005	1032	\$419,355.30	1369	\$191,694.00	1874	\$211,234.15	1111	\$144,926.00	5386	\$ 967,209.45

CASCADE CONSOLIDATED FEES

YEAR 2019

MONTH	Building		Electrical	Mechanical	Plumbing	TOTAL
	Comm.	Residential				
JANUARY	\$2,335.00	\$3,398.00	\$4,084.00	\$5,960.00	\$3,517.00	\$19,294.00
FEBRUARY	\$1,177.00	\$4,855.00	\$9,292.00	\$5,248.00	\$4,621.00	\$25,193.00
MARCH						
APRIL						
MAY						
JUNE						
JULY						
AUGUST						
SEPTEMBER						
OCTOBER						
NOVEMBER						
DECEMBER						
YEAR END TOTAL	\$3,512.00	\$8,253.00	\$13,376.00	\$11,208.00	\$8,138.00	\$44,487.00
PERMIT # FOR MONTH	8	24	25	41	14	112
PREV PERMIT TOTAL	12	9	23	49	21	114
PERMIT TOTAL FOR YR	20	33	48	90	35	226
YEAR TO DATE	2019	\$44,487.00				
YEAR TO DATE	2018	\$48,121.05				
UNDER	\$3,634.05					

CASCADE SINGLE FAMILY HOMES

	FEB	YTD 2019	2018	2017	2016
Number of Permits					
New Residential Homes	2	5	43	57	56
VALUE - RESIDENTIAL	\$ 790,473.00	\$ 1,858,974.00	\$ 28,327,352.00	\$ 32,980,308.00	\$ 24,019,640.00

Cascade Twp -Permit Report by Category/ Fee

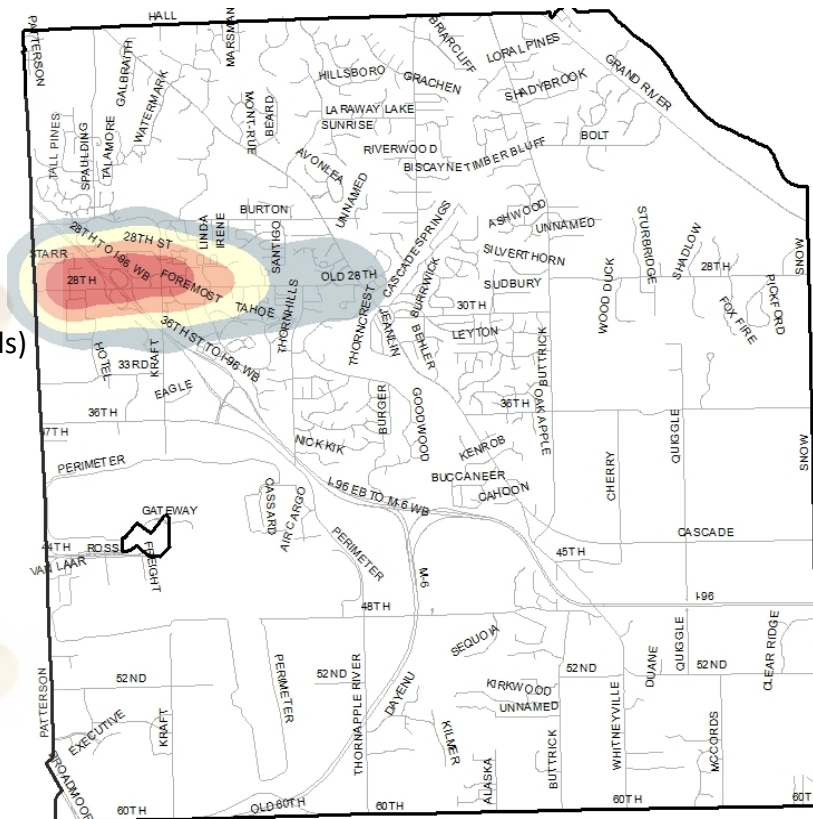
2/1/2019 12:00:0 to 2/28/2019 12:00:

Permit	Applicant	Address	Issue Date	Project Value	Permit Fee	Work Description
Res. Single Family						
PB19000108	INFINITI CUSTOM HO	7769 GLENWOOD POND DR SE	02/05/2019	378,473	953.00	RESIDENCE
PB19000133	HILBRAND JORDAN	2720 ORANGE CT SE	02/13/2019	412,000	715.00	RESIDENCE W/FINISHED BASEME
				790,473	1,668.00	
2	Permits	Value Total		790,473	1,668.00	Fee Total



Kent County Sheriff Department

Calls for Service "Hotspot" Map



1 ●●●

-
-
- **Total Reported Offenses: 1,331 (4th)**
- **Top 3 Calls For Service:** ●●●²
 1. Alarm (821 Calls)
 2. Suspicious Condition/Noise/Subject (353 Calls)
 3. Assist (336 Calls)
- **Top 3 Repeat Call Addresses:** ●●●³
 1. 5100 Blk 28th St SE (261 Calls)
 2. 5500 Blk 28th St SE (248 Calls)
 3. 5800 Blk 28th St SE (204 Calls)
- **Top 3 Responding Units:** ●●●⁴
 1. 4121 (783 Calls)
 2. 4321 (748 Calls)
 3. 4225 (705 Calls)
- **Avg. # of Units Assigned Per Call: 1.85**
- **Avg. Hold Time: 7 Min, 11 Seconds** ●●●⁵
- **Avg Response Time: 16 Min, 49 Seconds** ●●●⁶
- **Top 3 Crimes** ●●●⁷
 1. Retail Fraud - 239
 2. Obstructing Justice - 165
 3. Driving Law Violations - 162
- **Total Detective Bureau Time: 1,158 Hours (5th)**

Legend

- Low Density
- Medium
- Medium High
- High Density



8

Click on flame for hotspot details



February 28, 2019



T4 P1 571 *****AUTO**ALL FOR AADC 493
Cascade Township
2865 Thornhills Ave. SE
Grand Rapids, MI 49546-7195

Dear Franchise Official:

This letter is to inform you of **new channel additions** to the local Charter Channel line-up taking effect on or after March 29, 2019:

- **Cheddar TV Network** on the Spectrum SPP Tier 1 HD on channel 117. Cheddar is a live streaming financial news network broadcasting live daily from the floor of the New York Stock Exchange, NASDAQ, the Flatiron Building in New York City, and the White House lawn and briefing room in Washington, D.C. covering new products, technologies, and services.
- **Cine Sony Network** on SPP Latino View HD on channel 322. Cine Sony is a Spanish language channel offering a wide variety of popular feature length films and select television programs delivered in Spanish 24-hours a day.
- **Pasiones TV** on SPP Latino View HD on channel 363. Pasiones TV is the place for new and favorite classic Latin telenovelas 24 hours a day, 7 days a week.

Charter Communications customers in your community are already receiving information regarding these channel additions. Should you have questions, you may reach me at (616) 607-2377.

Sincerely,

Marilyn Passmore
Director, Charter State Government Affairs, Michigan
Charter Communications



**State of Michigan
Department of Environmental Quality**

Water Resources Division - Lansing
Transportation Review Unit
P.O. Box 30458
Lansing, MI 48909

Site Name: 41-Gerald R Ford International Airport
Submission Number: HNM-JJ3P-TN6C3
Date: February 25, 2019

PUBLIC NOTICE

The Gerald R. Ford International Airport, 5500 44th Street SE, Grand Rapids, Michigan 49512, has applied to this office for a permit under authority of Part 301, Inland Lakes and Streams of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). The applicant proposes to excavate approximately 68,030 cubic yards of material and place approximately 135,630 cubic yards of fill impacting 3.49 acres of primarily emergent wetland to facilitate the airport's Master Plan and Wildlife Hazard Management Plan. The project also includes the enclosure of 1,071 feet of an unnamed stream. Wetland mitigation is proposed at a ratio of 1.5:1.0, 5.24 acres, to be purchased within the Grand River Watershed when emergent wetland credits become available. Stream mitigation is likely to be proposed in a similar Grand River Watershed stream system.

The project is located in T06N, R11W, Section 30, Cascade Township, Kent County, Michigan, in accordance with plans attached to this notice.

THIS NOTICE IS NOT A PERMIT

The proposed project may also be regulated by one or more additional parts of the NREPA that are administered by the Department of Environmental Quality (DEQ), Water Resources Division (WRD). The requirements of all applicable parts are considered in determining if a permit can be issued. When a permit application is received requesting authorization to work in or over the inland waters of the State of Michigan, pursuant to Part 301 of the NREPA, the NREPA provides that the DEQ submit copies for review to the department of public health; the city, village, or township and county where the project is to be located; the local soil conservation district; and any local watershed council organized under Part 311, Local River Management, of the NREPA. Additional notification is provided to certain persons as required by statute or determined by the DEQ.

Those persons wanting to make comments on the proposed project shall furnish this office with their written comments no later than 20 days from the date of this notice. Written comments will be made part of the record and should reference the above application number. Objections must be factual, specific, and fully describe the reasons upon which any objection is founded. Unless a written request is filed with the DEQ within the 20-day public comment period, the DEQ may make a decision on the application without a public hearing. The determination as to whether a permit will be issued or a public hearing held will be based on an evaluation of all relevant factors, including the public comments received and the effect of the proposed work on the public trust or interest, including navigation, fish, wildlife, and pollution. The specific permit decision criteria can be found in the parts of the NREPA applicable to this application and listed above. Copies of these parts of the NREPA are available on the public notice Web site. Public comments received will also be considered.

This application will be reviewed by federal agencies in accordance with an agreement with the United States Environmental Protection Agency (USEPA), under provisions of Section 404 of the federal Clean Water Act Amendments of 1977.

The entire copy of the public notice package may be viewed at the WRD's district office listed on the top of this public notice or online at:

<https://miwaters.deq.state.mi.us/miwaters/#!/external/publicnotice/search>.

To access the public notice page online, search for the public notice by location or applicant name, and view by clicking on the "Documents" tab. Comments may be sent electronically by clicking on the "Add Comment" tab.

cc: Clint Nemeth, Applicant

Mark Sargent, DNR, Wildlife Division

Brian Gunderman, DNR, Fisheries Division

Kent County Clerk

Cascade Township Clerk

Kent County Drain Commissioner

Kent County Health Department

Kent County Conservation District

Kent CEA

Charlie Simon, USACE

Jack Dingledine, USFWS

Melanie Burdick, USEPA

Colleen O'Keefe, DEQ, WRD, 404 Program Coordinator

Keto Gyekis, DEQ, WRD T&E Coordinator

Matt MacGregor, King and MacGregor

Adjoining Property Owners

Local Postmaster

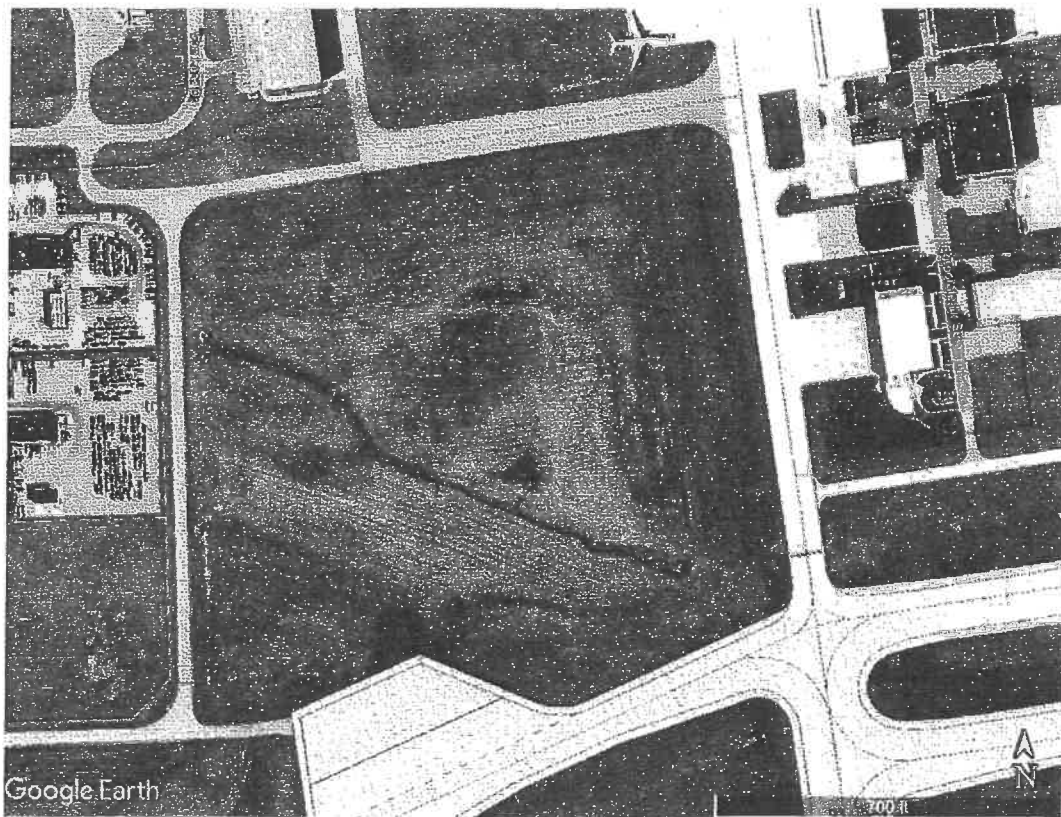
**Gerald R. Ford International Airport
MDEQ Permit Application -Stream Mitigation Concept**

Project Description

The proposed development intends to expand the corporate aviation area to provide eight corporate lease-area building sites with associated infrastructure including enclosure of 1,071 linear feet of stream. This expansion is proposed to accommodate current and near-term demand for corporate hangar facilities. This project also provides the opportunity to mitigate wildlife habitat near taxiways and the main runway in accordance with the airport authority's Wildlife Hazard Management Plan.

Existing Conditions

The proposed development area is approximately 20-acres in size. It is the only remaining undeveloped land adjacent to the existing corporate aviation facilities. The lowest portion of this area is currently being used as a stormwater detention and flow-through area that is a remnant of site development that has occurred over time. The existing stream channel is approximately 1,071 feet in length. The source of hydrology for this stream is storm water discharge from hard surface areas near the airport terminal and nearby runway and taxiways. This wetland and stream area attracts waterfowl and is regularly maintained by cutting vegetation to discourage its use.



In an effort to characterize the stream, a *Function-Based Framework for Stream Assessment and Restoration Projects* (USEPA, 2012) was used to provide a mechanism for assessing the biotic and abiotic functions of a stream. Stream functions are grouped by "levels," with the abiotic functions serving as the "base" for the higher levels of biologic activity (Figure 1). Within this

**Gerald R. Ford International Airport
MDEQ Permit Application -Stream Mitigation Concept**

framework, individual parameters can also be assessed qualitatively as “functioning,” “functioning-at-risk,” or “not functioning” and that assessment can be used to characterize the existing quality of a stream, quantify the impacts (“debts”) associated with a proposed activity and “credits” associated with a proposed stream mitigation plan. Shown below is such an assessment of the unnamed stream.

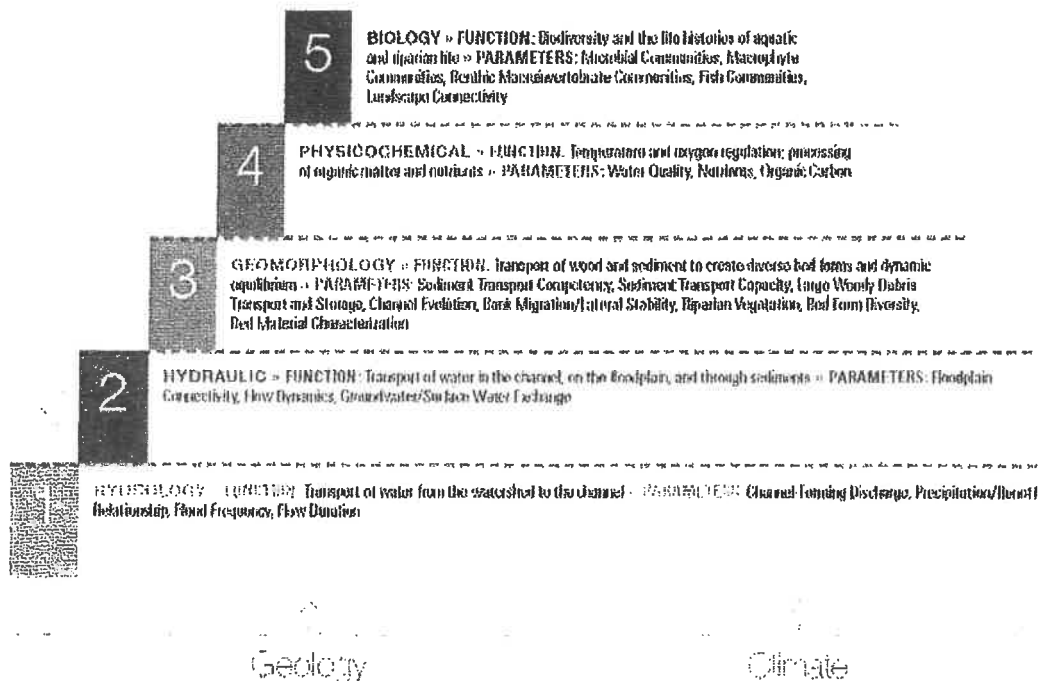


Figure 1: Stream Functions Pyramid

In September 2018, an on-site evaluation of the unnamed stream was performed by King & MacGregor Environmental, Inc. staff. This evaluation included a geomorphic study of the existing stream and an overall qualitative assessment of the existing habitat. From this evaluation, a summary of the existing condition of the unnamed stream is provided in Table 1 below.

Table 1. Assessment of Stream Functional Parameters

USEPA Pyramid Level	Functional Parameter	Observations	Current Condition
1: Hydrology	Channel Forming Discharge	The existing channel dimensions appear to correlate to the size of the contributing watershed which is evidence that the channel is a function of natural fluvial processes.	Functioning
	Precipitation / Runoff Relationship	The on-site watershed drains to the stream channel via a storm pipe	Functioning-at-risk

**Gerald R. Ford International Airport
MDEQ Permit Application -Stream Mitigation Concept**

		therefore a proper correlation between precipitation and runoff cannot be assumed.	
	Flood Frequency	Given an abnormal precipitation / runoff relationship, a proper flood frequency cannot be assumed.	Functioning-at-risk
	Flow Duration	The stream flow is intermittent pending precipitation or snow melt.	Functioning
2: Hydraulic	Floodplain Connectivity	The stream exists in a riparian corridor with sufficient bankfull floodplain capacity.	Functioning
	Flow Dynamics	The stream is used as detention and is designed to back water up with a small pipe opening at the downstream end.	Not functioning
	Groundwater/surface water exchange	Existing soils are loamy.	Functioning-at-risk
3: Geomorphology	Sediment transport competency	The existing stream dynamics appear competent to move bed load.	Functioning
	Sediment transport capacity	No specific observations were made	----
	Large woody debris transport and storage	Large woody debris transport is unlikely given the small stream size.	Not functioning
	Channel evolution	No significant bank erosion, bed degradation, or bed aggradation was observed, suggesting the channel is not currently evolving.	Functioning
	Bank migration / lateral stability	No significant bank migration or lateral instability was observed	Functioning
	Riparian vegetation	The stream exists within a herbaceous riparian corridor.	Functioning-at-risk
	Bed form diversity	Diversity such as riffle-pool sequence are not present.	Not functioning
	Bed material characterization	Bed materials are dominated by intact loamy soils.	Functioning-at-risk
4: Physicochemical	Water temperature	On-site watershed is dominated by surface flow over concrete airport	Not functioning

**Gerald R. Ford International Airport
MDEQ Permit Application -Stream Mitigation Concept**

		infrastructure; no riparian trees are present.	
	Nutrients	No specific observations were made	-----
	Organic carbon	Fine organic materials (small woody debris, leaf litter) were not observed	Functioning-at-risk
5: Biology	Microbial communities	No specific observations were made.	-----
	Macrophyte communities	Macrophytes observed within the stream corridor were primarily herbaceous vegetation without significant woody cover.	Functioning-at-risk
	Benthic macroinvertebrate communities	No specific observations were made, however, little substrate diversity is present.	Functioning-at-risk
	Fish communities	Given the intermittent nature of stream flow and the stormwater pipe infrastructure up and downstream of this site, fish are not likely to utilized this resource.	Not functioning
	Landscape connectivity	The on-site stream corridor is part of a larger system of developed and undeveloped lands	Functioning-at-risk

Of the 20 parameters evaluated, the un-named stream is scored as functioning on 6 parameters, functioning-at-risk on 9 parameters, and not functioning on 5 parameters. This combination of parameter scoring equates to a pre-disturbance condition of "low" quality.

Proposed Stream Mitigation

Mitigation for the proposed impacts associated with the enclosure of 1,071 linear feet of stream will be provided as required by the regulatory agencies. Stream improvement projects are being considered within the Grand River watershed to mitigate, to the extent possible, the stream's functions and values.

Gerald R. Ford International Airport – Development Site 16

Project Purpose, Need and Alternatives

Project Purpose & Need

Gerald R. Ford International Airport (GFIA) is the second largest/busiest airport in the State of Michigan serving over three million airline passengers per year and continues to see growth. In accordance with GFIA Master Plan, the improvements to Development Site 16 is currently proposed (see attached draft Airport Layout Plan currently under FAA review and the MDEQ wetland permit plan set). The proposed development intends to expand corporate aviation to provide eight corporate lease-area building sites with associated infrastructure. This expansion is proposed to accommodate current and near-term demand for corporate hangar facilities.

GFIA is a financially self-supported entity. It does not receive any funding from property taxes, general funds, or special taxes. The airport authority generates its own revenue to support the operation and development of the GFIA. Operational requirements are met through rates and charges assessed to airport tenants and airport patrons for the use of airport services and facilities. This proposed expansion of the corporate lease area is intended to generate additional revenue to enable continued improvement of overall airport operations.

The current GFIA Wildlife Hazard Management Plan dated July 1, 2016 addresses the mitigation of wetland near runways in the 2018 Master Plan update currently under review by the Federal Aviation Administration (FAA). In accordance with the Memorandum of Agreement (MOA) Between the Federal Aviation Administration, the U.S. Air Force, the U.S. Army, the U.S. Environmental Protection Agency, the U.S. Fish and Wildlife Service and the U.S. Department of Agriculture to Address Aircraft-Wildlife Strikes, the GFIA proposes to fill a wetland area, that is currently maintained to discourage bird and waterfowl use, in order to eliminate this potential hazard while appropriately mitigating for the loss of wetland via purchase of wetland mitigation banking credits.

Alternative Locations

This approximately 20-acre area is the only remaining undeveloped land adjacent to the existing corporate aviation facilities. The lowest portion of this area is currently acting as a stormwater detention and flow-through area that is a remnant of historic site development. Development Site 16 has been part of the airport Master Plan which includes wildlife hazard mitigation. Master Plan approval is ultimately authorized by the FAA.

In order to improve, update and expand the airport facilities to maintain the high-quality operations offered at the GFIA, the proposed corporate aviation hangars are ideally placed in proximity to existing corporate operations. This area leverages existing taxiway infrastructure and keeps the corporate aviation portion of the airport consolidated for improved aviation safety, security and site management.

As is shown on the draft Airport Layout Plan almost all aviation-related development is proposed north of the existing east-west runway.

It is also important to note that the only fuel facility at this time is immediately northwest of Development Site 16. If another location were feasible for development at this time, it would require construction of new fuel farm, since excess travel of fuel trucks around the airport is a safety concern. Therefore, any alternative location would be a cost-prohibitive option. This is

Gerald R. Ford International Airport – Development Site 16

Project Purpose, Need and Alternatives

further justification that development of the interior core of the airport is the most feasible and prudent alternative.

Alternative Site Layouts

8-Hangar Site Alternative (proposed alternative)

In order to accommodate the proposed hangar sites and certain east-west alignments, connectivity to existing and proposed taxiways are required. This option also eliminates the potential wildlife hazard associated with the wetland/detention area. Therefore, there are no layout alternatives for the proposed eight-site development that could reduce or minimize wetland impacts.

4-Hangar Site Alternative

Constructing only a portion of Development Site 16 does not provide adequate use of the property and does not eliminate the potential wildlife hazard associated with the wetland/detention area. Therefore, this alternative is not considered feasible or prudent.

No-Build Alternative

The "no-build" alternative does not allow GFIA to maintain the quality of operations, keep up with demand for these facilities or generate additional revenue. Therefore, restricting development is not a feasible or prudent option.

Taxiway Improvement

The taxiway improvement is located immediately south of the proposed corporate hangar sites. No alternatives to this taxiway expansion are available. The goal of this necessary alignment is to eliminate a bottle-neck caused by the narrowing of the taxiway by straightening to provide improved safety, access and circulation to and from the corporate facilities, terminal building and the east-west runway.

Avoidance & Minimization – proposed alternative

In order to eliminate the potential hazard associated with the wetland/stormwater detention area and accommodate the proposed corporate hangar expansion and required taxiway improvements, no avoidance or minimization of impact was feasible or prudent. In accordance with the MOA to address aircraft wildlife strikes and MDEQ requirements, mitigation of this wetland impact will be performed as outlined below.

The drainage course within the subject wetland intermittently contains water mainly during stormwater runoff events. It was historically part of the Heintzelman Drain but was abandoned in anticipation of airport development back in 1995. The Heintzelman Drain currently begins at Patterson Avenue west of Development Site 16.

Gerald R. Ford International Airport – Development Site 16 Project Purpose, Need and Alternatives

Stormwater Detention

Some stormwater detention will occur within the proposed storm pipe. However, additional stormwater detention may be required as part of this development and will likely be constructed west of the fuel farm adjacent to Patterson Avenue. This will allow for detention while providing some separation of this area from the airport taxiways and runway. It is intended that a dry basin with outlet to the existing stream/drainageway will be provided. This has not yet been designed but if it is determined that an MDEQ minor permit is required, a separate permit application or revision to this existing permit, if applicable, will be submitted.

Proposed Wetland Mitigation

The purchase of 5.25 acres of emergent wetland bank credits from a DEQ-approved wetland mitigation bank is proposed (1.5:1 ratio) to mitigate for the impacts to 3.5 acres of emergent wetland when credits become available.

s:\kme ref # folders\2018 folder\18157 kent county international airport\mdeq permit app docs\alt docs\gfia site 16- purpose_need_alt-2-7-19 draft.docx



**Cascade Charter Township
Seminar/Conference Attendance Request Form**

This form must be filled out if the employee is requesting Township payment or reimbursement for the employee's attendance to a seminar or conference.

Conditions:

1. Cascade Charter Township will reimburse employees for approved registration for work related seminars and conferences. Individual seminars and conferences must be related to the employee's current job duties or a foreseeable-future position in the organization in order to be eligible for educational assistance.
2. Some seminars/conferences that an employee may attend may be unrelated to their particular job or government in general, and are therefore not covered by this assistance policy.
3. Any request that requires an overnight stay or expenditure over \$200 requires Township Board approval before the seminar/conference is attended.
4. Under extenuating circumstances, the Township Manager may approve an overnight stay or expenditure over \$200 for a conference or seminar prior to Township Board approval. The request must be made before attendance to a seminar/conference. The Township Board will be informed of request at their next scheduled meeting.

This form must be completed by the employee and approved by the Township Manager and/or Township Board before the seminar/conference is attended.

Name: Aaron Newton

Application Date: Feb 27, 2019

Location of Seminar/Conference: Mt. Pleasant, Michigan

Name of Proposed Seminar/Conference: _____

Michigan Municipal Treasurers Association 2019 Basic Institute

Description of Seminar/Conference: (may also be attached) Attached

(over)

How will the Seminar/Conference benefit the employee and the township? _____

MMTA Basic Institute is a 3 year program designed to enhance the overall job performance of treasurers in both small and large municipalities. The instruction covers a wide array of topics to ensure that every graduate has a thorough introduction and understanding of municipal treasury. Attendance shall benefit the employee through increased knowledge and core competency.

Cost of the Seminar/Conference: (Registration) \$550.00 _____

(Lodging) \$ \$467.25 (Travel) \$ \$145.00

Account #: 253 101-253-724-000

Your Signature: Aaron Newton

Approvals:

Department Head: Ken Pewce Date: 2/28/2019

Township Manager: _____ Date: _____

Clerk's Signature: _____ Date: _____

(Showing Township Board approval)

Original to personnel file

1 copy to applicant

1 copy to Accounting

2019 Basic

Register

**2019 BASIC INSTITUTE**

Sunday, April 28 - Friday, May 3
Courtyard Marriott, Mt. Pleasant

Reaching New Heights • Soaring Together

Basic Institute is an incredible opportunity to:

- 1) Learn more about your job and responsibilities
- 2) Meet and build relationships with others in your field
- 3) Earn professional credentials by becoming a Michigan Certified Professional Treasurer (MiCPT)

Basic Institute is a three year program with a defined curriculum to ensure that no matter when you start, you'll receive the full slate of topics by the time you graduate in your third year.

This year's classes include the following topics:

- Principles of a Good Investment Policy
- Internal Controls: Back to Basics
- Embezzlement: When Internal Controls Fail
- The Good Place: the Daily Role of Ethics
- Do the Right Thing: Making Ethics Your Brand
- Understanding Conflict of Interest Issues
- New & Changing Laws Affecting Treasurers
- Settlement Requirements Affecting Treasurers
- Financial Reporting Filing Requirements
- Working with the Department of Treasury
- Presenting Reports to Your Board
- Revenue Collection Strategies: How to Get Paid
- Revenue Collection Panel Discussion
- Revenue Collection Q&A: Ask the Attorney
- Communication & Active Listening
- Conducting Efficient & Effective Meetings
- Communication Skills for Workplace Success
- How a Bill Becomes a Law & the Impact of Changing Government
- Don't Click There! Cyber Security & How to Protect Your Office

Cost & Registration

Basic Institute costs \$550 to attend; this covers all sessions, materials, and most meals (see schedule below for details). Register online at www.MMTA-MI.org to pay with a credit card or by check. Attendees must be MMTA members. Registrations received after Friday, April 12 will be subject to a \$50 late fee. Scholarships are available for registration - call or see website for details. Cancellations must be received by Monday, April 15; refunds are subject to board review and a \$25 fee. Make lodging reservations directly with the hotel (see more information below).



2019 BASIC INSTITUTE

Sunday, April 28 - Friday, May 3
Courtyard Marriott, Mt. Pleasant

Reaching New Heights • Soaring Together

Sunday

3:00 - 7:00 pm
Registration
3:00 pm
Hotel Check In
5:30 - 7:00 pm
First Year Students Only
Orientation & Dinner

Monday

7:30 - 9:00 am
Registration & Breakfast
9:00 am - 5:00 pm
Sessions, Lunch & Breaks
5:30 - 7:00 pm
Dinner & Networking

Tuesday

8:00 am - 5:00 pm
Breakfast, Sessions, Lunch & Breaks
5:30 - 7:00 pm
Dinner & Networking

Wednesday

8:00 am - 4:00 pm
Breakfast, Sessions, Lunch & Breaks
Dinner On Your Own

Thursday

8:00 am - 5:00 pm
Breakfast, Sessions, Lunch & Breaks
5:30 - 6:30 pm
Reception
6:30 - 8:30 pm
Dinner & Award Ceremony

Friday

8:00 - Noon
Breakfast, Sessions & Breaks
Lunch On Your Own

*Note: all sessions are mandatory
unless otherwise noted.
Schedule may change.*



Location & Accommodations - NEW for 2019

Basic Institute is held at the Courtyard Marriott in Mt. Pleasant at Central Michigan University, (2400 East Campus Drive). A block of rooms is reserved for Institute participants starting at \$89/night. Reference MMTA by March 31 to get this low rate. Call the Courtyard directly for your reservations at 989-773-1444. Make sure to reference "MMTA" to receive this special room rate. For tax-exempt billing, provide your agency's tax-exempt number to the hotel; cancellation for rooms must be made 48 hours prior to scheduled arrival.

Contact MMTA at info@dovetailvs.com or 989.820.8389 for more information.

MEMORANDUM

To: Cascade Charter Township Board
From: Steve Peterson, Community Development Director
Subject: Library Maintenance
Meeting Date: March 13, 2019

Township staff has been working on some maintenance issues at the library at the same time the Library (KDL) has been working on other proposed improvements. To make sure we are as efficient as possible we have had our architects at FTCH essentially act as a construction manager to put together a coordinated maintenance program.

While the Buildings and Grounds staff is performing the basic maintenance issues the attached list are tasks that are beyond what our grounds crew is capable of. While each job is relatively small together the project totals \$23,120.

These items were not budgeted in 2019 but we have over \$50,000 in the library fund to accommodate the work. The Infrastructure Committee has reviewed the project and is recommending that we move forward with the work as detailed in the FTCH memo dated March 1, 2019.

Because each item is so small, we don't have multiple bids for each item but FTCH is confident based on their experience that the prices that we have received are competitive.

Attachments: FTCH memo dated March 1, 2019

MEMO

TO: Steve Peterson, Community Development Director
Cascade Township

FROM: Adam J. Nelson

DATE: March 1, 2019

PROJECT NO.: 190073

RE: KDL Cascade Township Library
Deferred Maintenance Repair Pricing

FTCH invited subcontractors to bid on deferred maintenance repair items, which were identified during two site visits with KDL staff and a contractor walk-through meeting on February 1, 2019. Below are the costs associated with completing the list of repairs. They have been grouped by types of repair for economies of scale in pricing. The subcontractor that will address each grouping is indicated with each heading.

The groupings may be chosen individually if the budget does not allow for completion of all the items. Feel free to call Chad Everts or me (Direct: 616-464-6240) with any questions, approvals, and to get the work scheduled for completion.

Location	Item:	Cost
Library		
L1	Door Finish Repair (<i>River Town Painting Co.</i>) Item #1 Door - Touch up/Finish Item #2 Door-Touch Up/Finish Item #5 Door touch up/finish	\$ 1,590.00
L2	Vinyl Wallcovering and Wall Repair (<i>River Town Painting Co.</i>) Item #3 Remove VWC and apply sealant. Skim walls, prime and paint. Item #4 Remove VWC and corner guard. Skim walls, prime and paint. Item #15 Fix VWC and apply corner guard. Item #17 Replace wainscot VWC at entry knee-walls and interior of room. Item #20 Adhesive seams of VWC. Item #23 Adhere VWC seams. Item #25 Replace marker board wall covering. Item #28 Remove VWC from door to inside wall corner. Skim, prime and paint.	\$ 6,780.00
L3	Wall Repair and Painting (other than VWC locations) (<i>River Town Painting Co.</i>) Item #6 Skim coat and repaint 4 columns. Item #10 Skim coat wall and repaint. Item #12 Skim coat wall and repaint. Item #14 Skim coat columns and repaint. Item #21 Skim coat column and repaint. Item #30 Skim coat wall and repaint.	\$ 3,160.00



Location	Item:	Cost
L4	Finish Carpentry, Trim Repair and Staining (<i>River Town Painting Co.</i>) Item #7 Clean crown molding at ceiling and clerestory window heights and grills. Item #11 Touch up stain on molding. Item #13 Clean base boards and touch up stain. Item #16 Refinish wood cap molding. Item #19 Remove wallpaper glue from top of chair rail. Item #24 Refinish wood cap molding and chair rail. Item #32 Replace plan back & side splashes at sink adjacent to door. Item #34 Touch up stain at defense desk and back shelf.	\$ 3,370.00
L5	Replace EWC with new fixture (<i>DHE Plumbing</i>) Item #52 Replace EWC with new fixture	\$ 2,810.00
L6	Roof Repair adjacent to Group Study rm #115 (<i>River Town Painting Co.</i>)	\$ 3,600.00
L7	Refinish Runtal Radiators at Reading Rooms (<i>River Town Painting Co.</i>) Item #18 Refinish Runtal radiator. Item #27 Refinish Runtal radiator in room.	\$ 780.00
L8	Replace Children's Reading Room Light Sconces (<i>Allied Electric</i>) (final cost dependent upon fixture selected)	\$ 770.00
Subtotal =		\$ 22,860.00
Wisner Center		
W1	Vinyl Wallcovering and Wall Repair (<i>River Town Painting Co.</i>) Item #35 Adhere seams of VWC.	\$ 90.00
W2	Wall Repair and Painting (other than VWC locations) (<i>River Town Painting Co.</i>) Item #36 Patch holes in soffit and repaint.	\$ 170.00
Subtotal =		\$ 260.00
Grand Total =		\$ 23,120.00

Attachments

cc: Lindsey Dorfman, KDL
 Vanessa Walstra, KDL
 Chad Everts, FTCH

Memorandum

To: Cascade Charter Township Board
From: Steve Peterson, Community Development Director
Subject: 17-3392/Freedom Farms Subdivision
Meeting date: March 13, 2019

The applicant is asking for Tentative Preliminary Approval of the proposed site condominium subdivision. This approval allows the developer to proceed with getting other agency permits. When those are received, they will go back to the Planning Commission for Preliminary Approval and will come back to the Township Board for the same.

The Planning Commission recommended tentative preliminary approval at their March 6, 2019 meeting.

I recommend awarding tentative preliminary approval.

Attachments: Planning Commission staff report

STAFF REPORT

TO: Cascade Charter Township Planning Commission
FROM: Steve Peterson, Community Development Director
REPORT DATE: February 25, 2019
MEETING DATE: March 4, 2019
CASE: #17-3392/ Freedom Reins Farm

GENERAL INFORMATION

- A. Applicant: Jim Morgan RJM Design
1971 East Beltline Ave
Suite 217
Grand Rapids MI 49525
Telephone: 336-6071
Email: jmorgan@rjm-design.com

- B. Status of Applicant: designer for owner

- C. General Location: The property is located on the north side of 52nd st just east of Whitneyville Ave.

- D. Requested Action: develop into 12 detached single-family site condominium project.

- E. Existing Zoning on Subject Parcels: ARC

- F. Zoning on Adjoining Parcels: ARC

- G. Parcel Size: Approximately 43 acres

- H. Existing Land Use on Subject Parcel: Vacant

- I. Adjacent Area Land Uses:
 - North - I-96
 - East - Residential
 - South - Residential
 - West - Residential

STAFF ANALYSIS

1. The applicant is requesting Tentative Preliminary approval. The development would allow for a new site condominium subdivision for 12 single family detached homes on a new private road. A site condominium subdivision that is not asking for exceptions does not require a public hearing.
2. The development will not be seeking any deviations from our subdivision ordinance.
3. The property is zoned ARC and is Master planned Suburban Residential, which is essentially an extension of the residential zoning district.
4. The area is not served by water and sewer and therefore the property would have to get approval from the KCHD for on-site well and septic.
5. The KCRC has issued a drive permit for access to 52nd St. the developer has changed the name of the road. However, the plans have not been updated to incorporate the new name.
6. There are no projects in the Capital Improvement Plan that would be activated as a result of this project.
7. The applicant has chosen the "50% private open space" method for determining minimum lot size. This method requires a minimum lot size of 50,000 sq.ft. The open space provided is calculated after removing the non-buildable portion of the property.
8. The lots range in size from 50,042 to almost 65,661 sq ft. with an average lot size of 50,707 sq ft.
9. This plan meets our subdivision ordinance for density and lot size requirements.
10. The process follows our platting process which is a little different than what you are used to seeing with the PUD rezoning process. The platting process does not require a public hearing but does require the applicant to submit more detailed information each time. For this stage you are providing a recommendation to the Township for their consideration.
11. As with all of our residential developments, the developer will be required to install an airport recognition statement in the deed restrictions.
12. The applicant has not indicated any light poles or street trees on the plan.
13. The subdivision is located outside the utility service area.
14. The applicant has submitted some private deed restrictions but has not yet submitted the master deed and bylaws. These documents will need to be reviewed by the township to ensure there are no inconsistencies with township ordinances.
15. As with all of our residential developments, an airport recognition statement will be required. This will need to be incorporated into the master deed and/or bylaws.
16. The Township Engineer has reviewed and approved the plans. A storm water maintenance agreement will be required.

17. Tentative Preliminary Approval shall guarantee that the general terms and conditions under which approval was granted will not be changed by the Township, and further, shall confer upon the subdivider approval of lot sizes, lot orientation, and street layout for a period of one (1) year from the date of tentative approval. Such tentative approval may be extended if applied for by the subdivider and granted by the Township Board in writing.

STAFF RECOMMENDATION

Staff believes this project meets the requirements for tentative preliminary plat approval of our subdivision ordinance is consistent with the Master Plan. Staff Recommends approval of the plan with the following conditions:

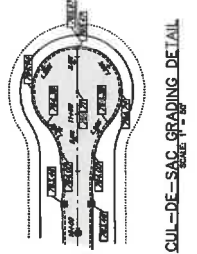
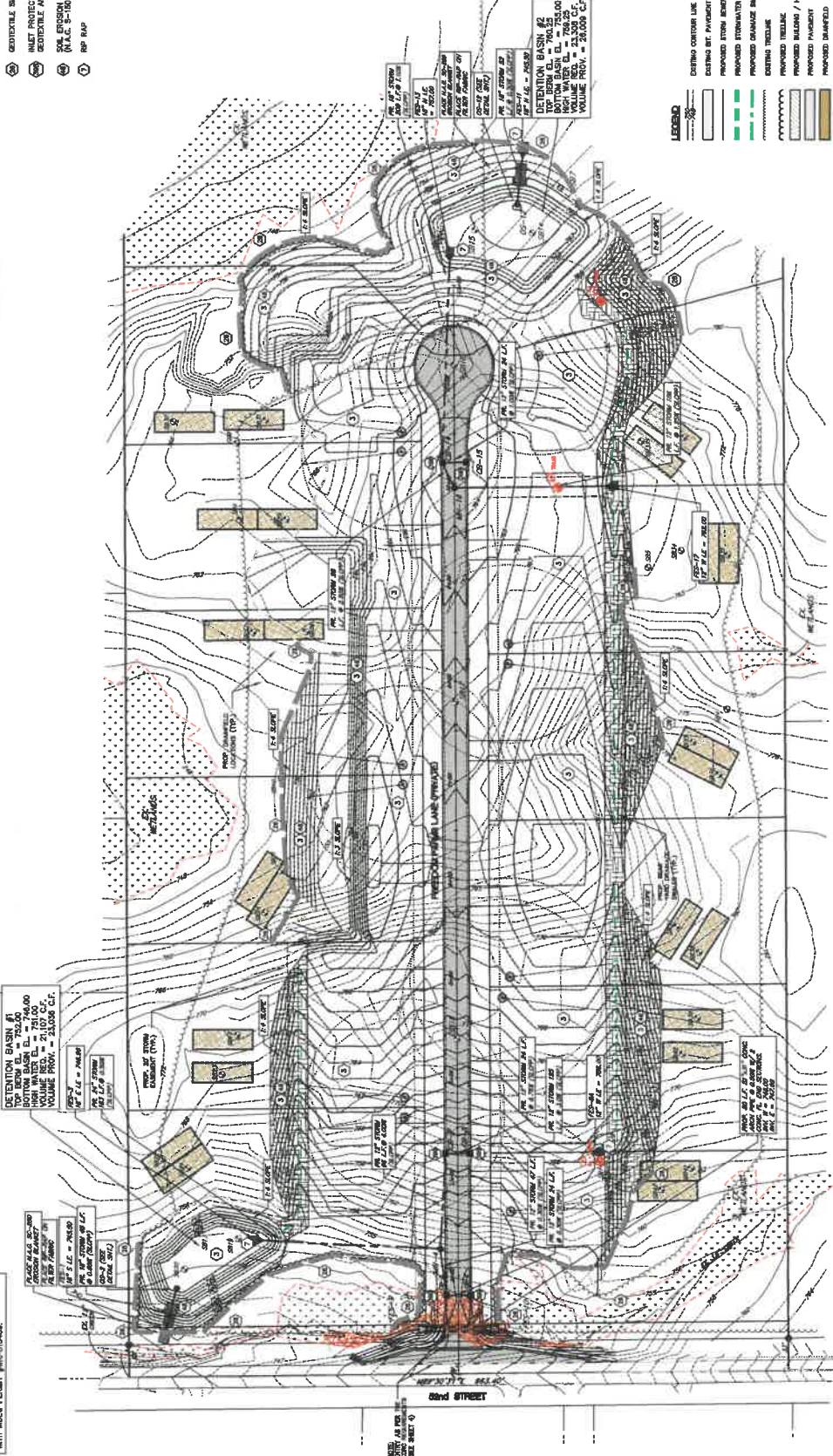
1. Submit the required information for Final Preliminary Plat approval.
2. Execute the storm water maintenance agreement.
3. Update the plans to include new road name and approval from KCRC for road name.
4. Copy of the proposed deed restrictions, including the airport recognition statement and storm water agreement.
5. Show location and type of light poles.
6. Show location and type of street trees.
7. Block grading plan for storm water runoff from home sites.

If you approve the plan, the development will go before the Township Board for tentative preliminary approval. Once approved by the Township Board, it will come back to you again with the additional information for final preliminary plat approval.

811 - CALL BEFORE YOU DIG
 COMPLETE NEILAND WORK BY ACCORDANCE
 WITH NECA PERMIT APPROVAL 3-2-20

BENCHMARK NO. 1 EL. = 734.92 NAVD83
 NGS BM DP2228

- SOLL EROSION CONTROL KEY**
- 1 PERMANENT/TEMPORARY SEDING
 - 2 GEOTEXTILE BELT FENCE
 - 3 INLET PROTECTION WITH GEOTEXTILE AND STONE
 - 4 50% PERFORATED CONTROL BLANKET (M.A.S. - 18" OR 24")
 - 5 RFP RAP



- LEGEND**
- 1 EXISTING CONTOUR LINE
 - 2 EXISTING ST. PAVEMENT
 - 3 PROPOSED ST. PAVEMENT
 - 4 PROPOSED STORMWATER MANAGEMENT BASIN
 - 5 PROPOSED DRAINAGE SWALE
 - 6 EXISTING TREELINE
 - 7 PROPOSED TREELINE
 - 8 PROPOSED BALDING / NOISE
 - 9 PROPOSED DRAINAGE
 - 10 EXISTING WETLANDS
 - 11 EXISTING WETLANDS RESTORATION
 - 12 PROPOSED RIGHT-OF-WAY
 - 13 PROPOSED PRIVATE UTILITY EASEMENT
 - 14 PROPOSED BALDING DETAIL
 - 15 PROPOSED STREETLIGHT
 - 16 PROPOSED MAJOR OUTLINE
 - 17 PROPOSED MAJOR OUTLINE

GRAPHIC SCALE
 90' 0' 20' 50'
 (IN FEET)
 1 Inch = 50 ft.

CLIENT
 FREEDOM BEND FARMS, LLC
 838 52ND STREET SE
 ADA, WA 98001

PROJECT NO.
 171386

SHEET
 C.C.1

STORM MOUNT + GRADING PLAN
 PR. RESIDENTIAL SITE CONDO
 PART OF SECTION 26, T9N, R10W
 CASCADE CHARTER TOWNSHIP, KENT COUNTY, MI

DESIGNED BY
 WOODS BAGOT & ASSOCIATES
 2000 PARKWAY, SUITE 200
 TOLSON, MI 49783

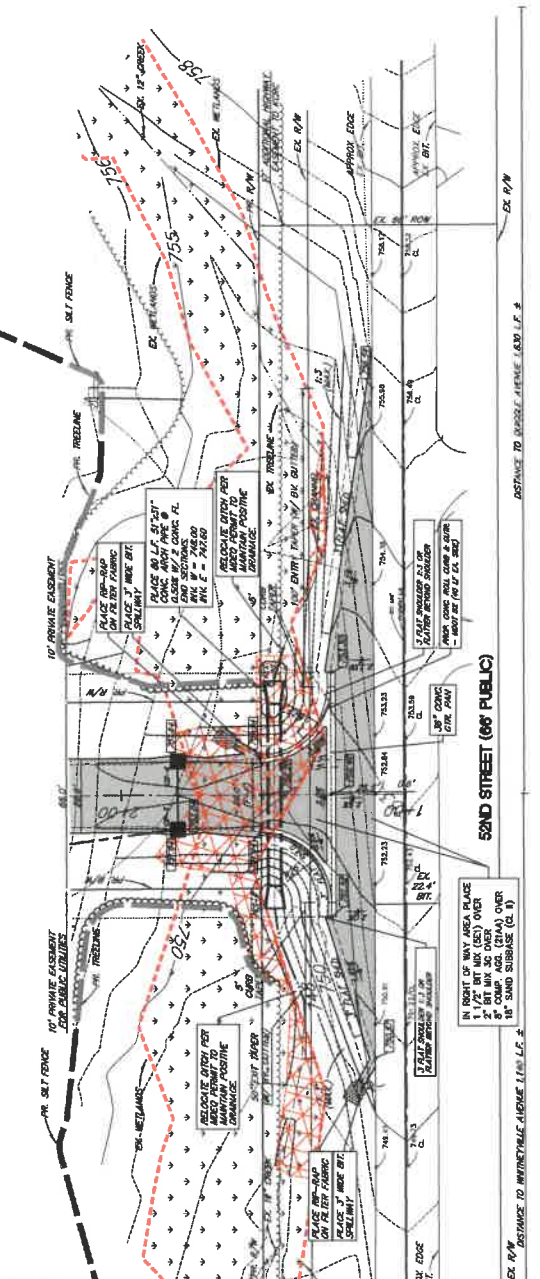
APPROVED BY
 DATE: MARCH 13, 2018
 PROJECT NO. 171386

REVISIONS

- 1. 03/13/18: REVISED PER THE KEY
- 2. 03/13/18: REVISED PER THE KEY
- 3. 03/13/18: REVISED PER THE KEY

811 - CALL BEFORE YOU DIG
 CHECK FOR ALL UTILITIES IN ACCORDANCE WITH MOVED PERMIT REGULATIONS.
 MOVED PERMIT NO. 1, CL. = 100000

KCRC GENERAL NOTES
 1. All construction shall conform to the latest editions of the International Building Code (IBC) and the International Residential Code (IRC) as adopted by the State of Maryland.
 2. All construction shall conform to the latest editions of the International Fire Code (IFC) as adopted by the State of Maryland.
 3. All construction shall conform to the latest editions of the International Mechanical Code (IMC) as adopted by the State of Maryland.
 4. All construction shall conform to the latest editions of the International Plumbing Code (IPC) as adopted by the State of Maryland.
 5. All construction shall conform to the latest editions of the International Electrical Code (IEC) as adopted by the State of Maryland.
 6. All construction shall conform to the latest editions of the International Fire and Safety Code (IFSC) as adopted by the State of Maryland.
 7. All construction shall conform to the latest editions of the International Fire and Safety Code (IFSC) as adopted by the State of Maryland.
 8. All construction shall conform to the latest editions of the International Fire and Safety Code (IFSC) as adopted by the State of Maryland.
 9. All construction shall conform to the latest editions of the International Fire and Safety Code (IFSC) as adopted by the State of Maryland.
 10. All construction shall conform to the latest editions of the International Fire and Safety Code (IFSC) as adopted by the State of Maryland.



- LEGEND**
- EXISTING OUTLINE LINE
 - EXISTING BT. FURNISH
 - PROPOSED EXIST. W/RE
 - EXISTING RETAINING WALL
 - PROPOSED FURNISH
 - EXISTING UTILITIES
 - PROPOSED 18\"/>
 - PROPOSED PRIVATE UTILITY EASEMENT
 - PROPOSED MAINT. CENTER
 - PROPOSED DRIVE CENTER
 - PROPOSED DRAINAGE
 - PROPOSED SPOT ELEVATION
 - EXISTING SPOT ELEVATION



NOTE: THESE PLANS DO NOT ASSURE THE PRESENCE OR LOCATION OF UTILITIES. THE CONTRACTOR SHALL VERIFY THE PRESENCE AND LOCATION OF UTILITIES (9) DAYS BEFORE THE START OF CONSTRUCTION, EXCLUDING SATURDAYS, SUNDAYS AND HOLIDAYS.

NOTE: THE STREET FOR THIS LOCUS ONLY - 1' CLEARANCE AND SOIL REMOVAL SHALL BE REQUIRED.

NOTE: NO WORK REQUIRING LANE CLOSURES SHALL BE PERMITTED WITHOUT THE APPROVAL OF THE KENT COUNTY ROAD COMMISSION.

NOTE: CONTRACTOR MUST CONTACT AND COORDINATE WITH KRCRC FOR LANE CLOSURE PROCEDURES.

Rossion & Associates
 ENGINEERS AND ARCHITECTS

1000 W. BROADWAY, SUITE 100
 ANN ARBOR, MI 48106
 PHONE: 734.769.1234
 FAX: 734.769.1235
 SHEET: C5.0

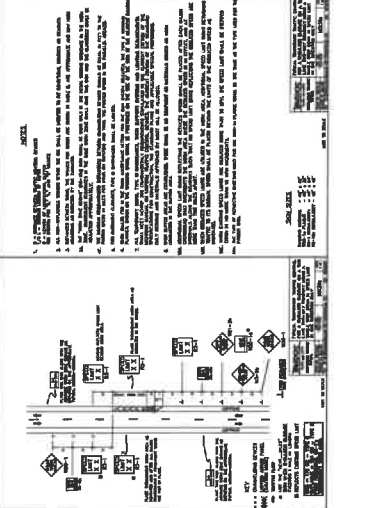
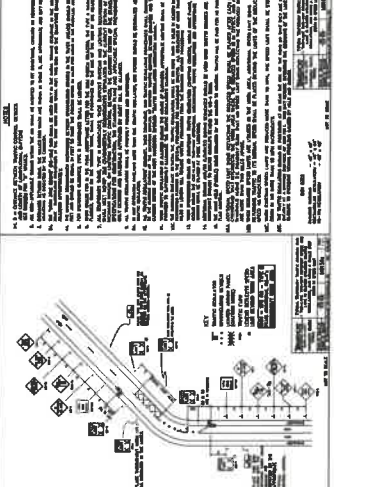
KENT COUNTY ROAD COMMISSION DRIVEWAY PLAN FOR:
 SAND STREET DRIVEWAY
 SAND STREET DRIVEWAY LLC
 ADA, MI 48301

Project Address: 6645 SAND STREET SE, ADA, MI

APPROVED: _____ DATE: _____
 KRCRC DEPUTY MANAGING DIRECTOR - ENGINEERING

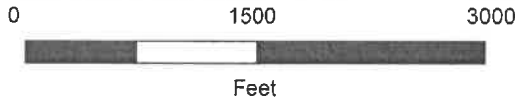
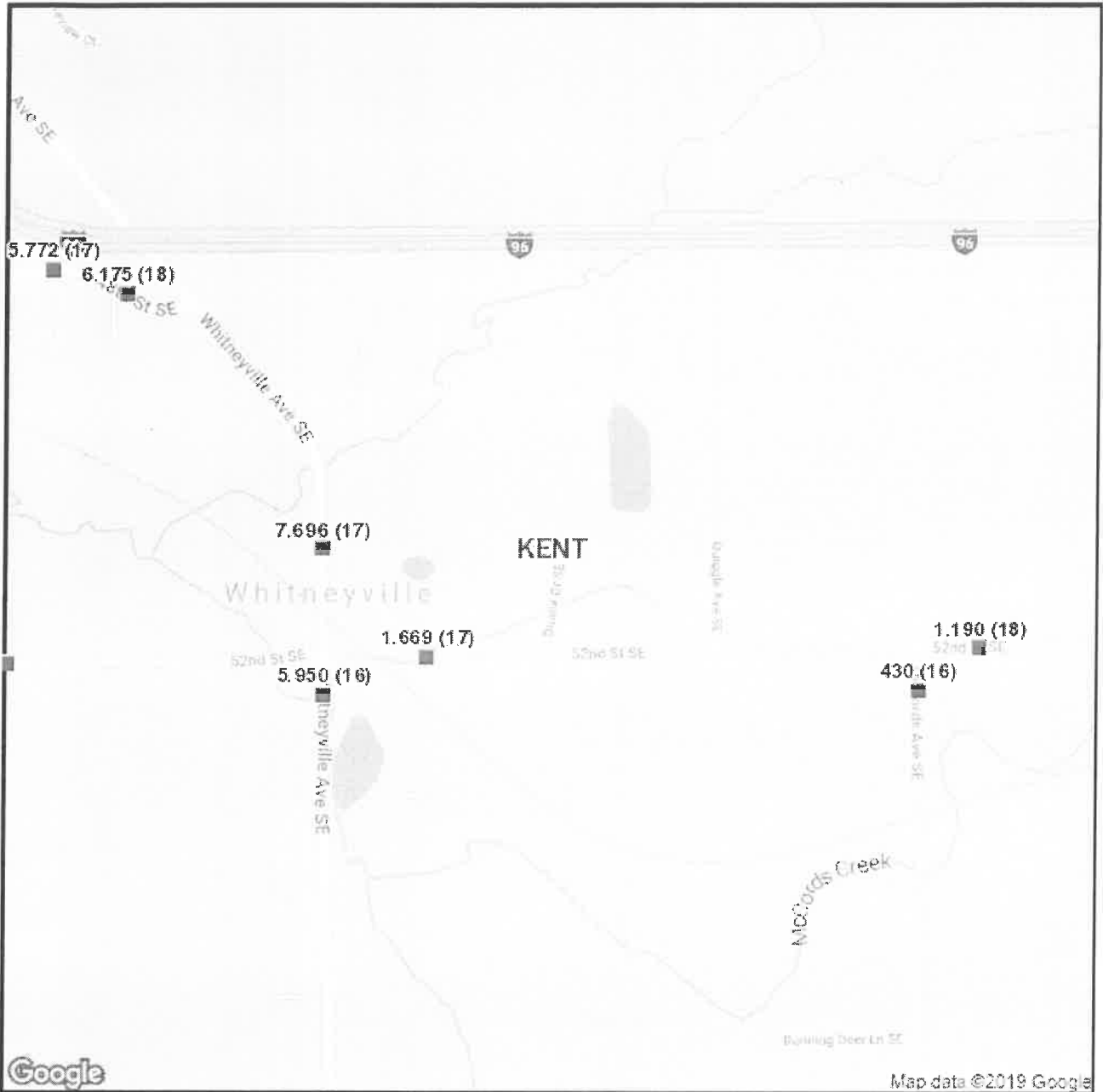
PERMIT NO. ISSUED: _____ DATE: _____
 KRCRC DIRECTOR OF TRAFFIC AND SAFETY

PLAN NUMBER: 18-082
 NOVEMBER 27, 2018



EXISTING SPOT ELEVATION DATA

STATION	ELEVATION
1+00	75.12
1+20	75.15
1+40	75.18
1+60	75.21
1+80	75.24
2+00	75.27
2+20	75.30
2+40	75.33
2+60	75.36
2+80	75.39
3+00	75.42
3+20	75.45
3+40	75.48
3+60	75.51
3+80	75.54
4+00	75.57
4+20	75.60
4+40	75.63
4+60	75.66
4+80	75.69
5+00	75.72
5+20	75.75
5+40	75.78
5+60	75.81
5+80	75.84
6+00	75.87
6+20	75.90
6+40	75.93
6+60	75.96
6+80	75.99
7+00	76.02
7+20	76.05
7+40	76.08
7+60	76.11
7+80	76.14
8+00	76.17
8+20	76.20
8+40	76.23
8+60	76.26
8+80	76.29
9+00	76.32
9+20	76.35
9+40	76.38
9+60	76.41
9+80	76.44
10+00	76.47
10+20	76.50
10+40	76.53
10+60	76.56
10+80	76.59
11+00	76.62
11+20	76.65
11+40	76.68
11+60	76.71
11+80	76.74
12+00	76.77
12+20	76.80
12+40	76.83
12+60	76.86
12+80	76.89
13+00	76.92
13+20	76.95
13+40	76.98
13+60	77.01
13+80	77.04
14+00	77.07
14+20	77.10
14+40	77.13
14+60	77.16
14+80	77.19
15+00	77.22
15+20	77.25
15+40	77.28
15+60	77.31
15+80	77.34
16+00	77.37
16+20	77.40
16+40	77.43
16+60	77.46
16+80	77.49
17+00	77.52
17+20	77.55
17+40	77.58
17+60	77.61
17+80	77.64
18+00	77.67
18+20	77.70
18+40	77.73
18+60	77.76
18+80	77.79
19+00	77.82
19+20	77.85
19+40	77.88
19+60	77.91
19+80	77.94
20+00	77.97
20+20	78.00
20+40	78.03
20+60	78.06
20+80	78.09
21+00	78.12
21+20	78.15
21+40	78.18
21+60	78.21
21+80	78.24
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86+40	87.93
86+60	87.96
86+80	87.99
87+00	88.02
8	



TCDS Locations

- Short
- Continuous
- WIM
- Located Short
- Located Continuous
- Located WIM



2/26/2019



February 27, 2019
Project No. 170168

Mr. Steve Peterson
Cascade Charter Township
2865 Thornhills Avenue, SE
Grand Rapids, MI 49546-7192

Re: Freedom Farms
Site Plan Review

Dear Steve:

We have reviewed the site plan for Freedom Farms, prepared by Roosien & Associates. The current site plan and basis of this review are dated October 29, 2018. The proposed project is a new private road, lot split, and associated stormwater improvements. The site is located in the Thornapple River watershed, sub-drainage district Cascade Southeast

Stormwater and Drainage

Flood Control

The Cascade Charter Township Storm Water Ordinance (SWO), Section 1.04, states the Ordinance shall apply to all development that requires any permit for work which will alter the stormwater drainage characteristics of the development site. The site is located in Stormwater Management Zone A, which requires retention of the 100-year storm event and infiltration to the greatest extent possible. Where soil conditions or other factors do not allow for adequate infiltration, the SWO requires detention of the 25-year storm event with a controlled release and a direct connection for stormwater runoff for the 100-year storm event, or detention of the 100-year storm event. The SWO also requires the first 0.5-inch of stormwater runoff be detained and released over a 24-hour period (Water Quality Control) and the 2-year storm event release rate be limited to 0.05 cfs/acre (Bank Erosion Control).

The applicant provided the results of a geotechnical investigation including soil borings and infiltration tests. The soil borings indicate the existing soils at the proposed detention basin locations are predominately heavy with loamy sand and clay present. Four double-ring infiltrometer tests were performed with results ranging from 0.4 to 8.3 inches/hour. It was determined the existing soils are not favorable for stormwater infiltration.

Therefore, the stormwater detention basins were designed with a controlled release for the 100-year storm event. Two detention basins are proposed for the site, one at the south end of the site and the other at the north end. Stormwater runoff from the development will be collected by a series of catch basins and conveyed by storm pipe to the detention basins. The proposed stormwater management design is in accordance with the SWO.

Water Quality Control and Bank Erosion Control

The SWO requires the first 0.5 inch of stormwater runoff be detained and infiltrated where conditions permit, or released over a 24-hour period, and the 2-year storm event release rate be limited to 0.05 cfs/acre. The proposed detention basins include an outlet control structure with three separate orifice openings, one each for the water quality control, bank erosion control, and flood control discharges. The applicant provided design details and stormwater calculations indicating this SWO requirement has been met.

Stormwater Runoff

The applicant provided stormwater calculations to size the proposed detention basins. All stormwater runoff from the private street and developed site will discharge to the detention basin. Therefore, the site will not see an increase in rate of stormwater leaving the site.

Z:\2017\170168\WORK\CORR\LT_PETERSON_FREEDOM_FARMS_2019_0227.DOCX



Drainage Plan

The applicant has submitted drawings, calculations, and additional documentation as required in the SWO Section 2.03, Drainage Plan. Please refer to the attached checklist for items and comments on each item. Please note a maintenance agreement is required before construction begins. The agreement should be submitted to the Township for review. The maintenance agreement and plan should include at a minimum removal of accumulated sediment from catch basins, detention basins, and outlet structures as well as landscape maintenance of the detention basins.

Private Street Requirements

The proposed private street is required to meet the design standards outlined in the Township Ordinance for private streets. FTCH reviewed the proposed private road for right-of-way width, road and travel lane width, road grade, pavement cross section including aggregate base and subbase design, stormwater drainage, etc. The proposed private road was found to meet the requirements outlined in the Township Ordinance for private streets.

Utilities

The residential lots will have onsite water wells and septic systems. A permit from the Kent County Health Department will be required prior to construction of the houses taking place. Construction of the private road may take place without the health department permit.

Soil Erosion and Sedimentation Control

Soil Erosion and Sedimentation Control (SESC) measures are provided on the plan drawings. The applicant has included silt fence along the limits of disturbance, silt sacks in catch basins, and erosion control matting on disturbed slopes. SESC falls under the review and approval of the Kent County Road Commission and a permit is required before construction can begin. The SESC measures indicated on the drawings appear appropriate given the expected work.

Summary

The proposed stormwater management design meets the Township SWO requirements for new developments. The applicant will need to apply for and obtain an SESC permit prior to road construction. A permit from the Kent County Health Department will also be required for the onsite water wells and septic systems prior to house construction. We recommend approval of the site plan from an engineering standpoint. If you have any questions or require additional information, please contact me at 616.464.3786 or nrtorrey@ftch.com.

Sincerely,

FISHBECK, THOMPSON, CARR & HUBER, INC.

A handwritten signature in black ink, appearing to read "N. Torrey", is positioned above the printed name.

Nathan R. Torrey, PE

jlk

Attachment

By email

cc: Michael L. Berrevoets, PE – FTCH



Cascade Charter Township

Storm Water Ordinance, Ordinance 7 of 2002, as amended by Ordinance No. 2 of 2008, 5/14/2008

Reviewing Engineer Comments are Italicized

OK – Received and Acceptable

NA – Not Applicable

NR – Not Received, Needs Follow-up, See Comments

Freedom Farms

Drainage Plan Checklist

- OK (1) Location of the development site and water bodies that will receive storm water runoff
Stormwater runoff from the new private street and developed area will be collected in a series of catch basins and discharged to one of two detention basins.
- OK (2) Existing and proposed topography of the development site, including the alignment and boundary of the natural drainage courses, with contours having a maximum interval of one foot (using USGS datum). The information shall be superimposed on the pertinent Kent County soil map
Existing and proposed contours for the private drive have been provided.
- OK (3) Development tributary area to each point of discharge from the development
Stormwater calculations and tributary areas were provided by the applicant.
- OK (4) Calculations for the final peak discharge rates
The applicant provided calculations for the design of the onsite storm sewer system and detention basins.
- OK (5) Calculations for any facility or structure size and configuration
The applicant provided calculations for the design of the onsite storm sewer system and detention basins.
- OK (6) Drawing showing all proposed storm water runoff facilities with existing and final grades
The applicant provided a utility plan showing all proposed stormwater runoff facilities.
- OK (7) The sizes and locations of upstream and downstream culverts serving the major drainage routes flowing into and out of the development site. Any significant off-site and on-site drainage outlet restrictions other than culverts should be noted on the drainage map
There are no culverts or significant offsite flows indicated on the site plan.
- OK (8) An implementation plan for construction and inspection of all storm water runoff facilities necessary to the overall drainage plan, including a schedule of the estimated dates of completing construction of the storm water runoff facilities shown on the plan and an identification of the proposed inspection procedures to ensure that the storm water runoff facilities are constructed in accordance with the approved drainage plan
A construction schedule was included on the plans.
- OK (9) Plan to ensure the effective control of construction site storm water runoff and sediment track-out onto roadways
The SESC measures shown on the plan appear appropriate given the expected work. SESC falls under the review and approval of the KCRC and a permit is needed before construction can begin.



- OK (10) Drawings, profiles, and specifications for the construction of the storm water runoff facilities reasonably necessary to ensure that storm water runoff will be drained, stored, or otherwise controlled in accordance with this ordinance
The applicant provided calculations and design details for construction of the onsite storm sewer system.
- NR (11) Maintenance agreement, in form and substance acceptable to the Township, for ensuring maintenance of any privately owned storm water runoff facilities. The maintenance agreement shall include the developer's written commitment to provide routine, emergency, and long-term maintenance of the facilities and, in the event that the facilities are not maintained in accordance with the approved drainage plan, the agreement shall authorize the Township to maintain any on-site storm water runoff facility as reasonably necessary, at the developer's expense
Maintenance agreement was not provided and is required.
- OK (12) Name of the engineering firm and the registered professional engineer that designed the drainage plan and that will inspect final construction of the storm water runoff facilities
- NA (13) All design information must be compatible for conversion to Grand Valley Regional Geographic Information System (REGIS)
This is a privately owned system and will not be uploaded to REGIS.
- OK (14) Other information necessary for the Township to verify that the drainage plan complies with the Township's design and performance standards for drains and storm water management systems

Project Name: **Hickory Pointe Woods**
 Project Number: **171386**
 Date: **2/13/2019**

Project Site Area: 43.93 ac
Min. Required Open Space: 50%

Parcel Coverage:

Lot	Size (sft)	Size (ac)	%
1	51,652	1.19	2.7%
2	50,154	1.15	2.6%
3	50,139	1.15	2.6%
4	50,125	1.15	2.6%
5	50,110	1.15	2.6%
6	50,101	1.15	2.6%
7	50,042	1.15	2.6%
8	50,106	1.15	2.6%
9	50,120	1.15	2.6%
10	50,135	1.15	2.6%
11	50,150	1.15	2.6%
12	65,661	1.51	3.4%

Project Site Area:	1,913,742 sft
	43.93 acres
Non Developable Areas:	
<u>Right-of-way</u>	
Existing	59,343 sft
Proposed	<u>80,097 sft</u>
	3.20 ac
<u>Wetlands</u>	<u>347,244 sft</u>
	7.97 ac
<u>100-year Floodplains</u>	- sft
(50%)	<u>- sft</u>
	- ac
<u>Steep Slopes</u>	<u>81,022 sf</u>
	1.86 ac
<u>Moderate Slopes</u>	<u>67,082 sft</u>
(50%)	<u>33,541 sft</u>
	0.77 ac
<u>Water Bodies</u>	- sf
	- ac
Developable Acreage:	1,312,495 sft
	30.13 ac
Open Space:	1,155,806 sft
	26.53 ac
less Undevelopable Land in OS:	
Wetlands	(299,759) sft
100-year Floodplain	- sft
Steep Slopes	(81,022) sft
Moderate Slopes	(33,541) sft
Water Bodies	- sft
Open Space (total):	17.02 ac
Open Space vs Developable Acreage:	56%
Current Zoning:	ARC
Min. 50% Open Space:	Yes
Therefore, use:	
Minimum Lot Width:	115 ft
Minimum Lot Area:	50,000 sft



CASCADE CHARTER TOWNSHIP

2865 Thornhills SE Grand Rapids, Michigan 49546-7140

Date: March 13, 2019
To: Supervisor Beahan and Township Board Members
From: Ben Swayze, Township Manager
Subject: Request from KDL for Music Programming Funding

FACTS:

The Township has received a request from the Kent District Library to participate in funding for the fifth year of their monthly live music program at the Cascade Library titled Sunday Afternoon LIVE!

It is anticipated that the program will be held each month on a Sunday afternoon from October 2019 – April 2020 and feature musical acts from a variety of genres and locations. Over the history of the program the average attendance for the concerts is 110 people. KDL is seeking a financial contribution from Cascade Township of \$3,500 to support this event. KDL staff is also seeking funding from a variety of other sources including themselves (KDL), Friends of the Cascade Library, the Cascade Community Foundation, the Downtown Development Authority and individual gifts and donations. The DDA is being asked to contribute \$1,500 to the event. Cascade Township funded the 1st year of the event at \$3,000 and each subsequent year at \$3,500.

Vanessa Walstra, Cascade Library Branch Manager, will be present to review the proposed program and answer any questions the Township Board may have.

Attached for your review is:

- Program funding request from KDL
- Proposed budget for the 2019-2020 program

ANALYSIS & CONCLUSIONS:

Currently, Cascade Township does not directly provide any music related programming to the community. As recently as 2012 the Township assisted the Cascade Community Foundation in presenting the summer music series at Tassel Park. There have been talks between the DDA and the KDL staff of partnering to provide a summer music series. The DDA and KDL also fund the summer family entertainment series. The Township, through the DDA, also sponsors the Metro Cruise Warm-Up event, which features an expanded musical presence.

The Sunday Afternoon LIVE! events have provided no issues that the Township is aware of and have been well received by the community.

FINANCIAL CONSIDERATIONS:

The Township has budgeted \$3,500 for this event in the FY2019 budget.

RECOMMENDED ACTION:

Consider the request from the Kent District Library to provide \$3,500 in funding to the Sunday Afternoon LIVE! music program at the Cascade Library.



Sunday Afternoon LIVE! Season 5

Proposal for the Cascade Charter Township Board

Season 4 of Sunday Afternoon LIVE! continued the trend of great music and great crowds. This series showcased country, bluegrass, jazz, blues, Latin, and Celtic sounds and the concerts averaged 110 attendees. Our lowest attended concert took place during a blizzard and still attracted nearly 50 people who risked life and limb to attend.

The Cascade Township Library remains an attractive venue for local musicians who continue to approach the Sunday Afternoon LIVE! staff eager to perform. Our Wisner Center lends itself to a very interactive concert feel, and the coffee and snacks we offer add to the entertainment value. Concert goers often thank the staff for continuing the series and offering them the chance to experience a wide array of local (as well as international) bands.

We want to continue this popular and quality series with a Fifth Season in 2019-20. The concerts continue to:

- Create excitement for the library and its sponsors
- Highlight the library as a destination for quality activities
- Bring attention to Cascade Township as a supporter of quality events
- Draw potential patrons for local businesses

As in previous years, Sunday Afternoon LIVE! is proposed to be a partnership between Kent District Library, Cascade Charter Township, Cascade Township DDA, Cascade Community Foundation and the Friends of the Cascade Library.

Dates of project: October 2019 through April 2020

Amount Requested: \$3500

Total project cost: \$24,390

Sunday Afternoon LIVE
Season 5
Proposed Budget

Revenues

Cascade Charter Township	\$ 3,500.00
Cascade Community Foundation	\$ 3,500.00
Friends of the Cascade Library	\$ 3,540.00
Cascade DDA	\$ 1,500.00
Kent District Library (in kind)	\$ 12,250.00
Kingsland Ace Hardware (in kind)	\$ 100.00
Total	\$ 24,390.00

Expenditures

Bands	\$ 11,250.00
Promotion: Fliers, posters, bookmarks (in kind from KDL)	\$ 7,500.00
Staffing (in kind from KDL)	\$ 4,750.00
Refreshments and paper supplies	\$ 750.00
Popcorn (in kind from Kingsland)	\$ 100.00
Facebook paid advertising (paid by Friends)	\$ 40.00
Total	\$ 24,390.00



CASCADE CHARTER TOWNSHIP

2865 Thornhills SE Grand Rapids, Michigan 49546-7140

Date: March 13, 2019
To: Supervisor Beahan & Cascade Township Board
From: Benjamin Swayze, Township Manager
Subject: Approval of 2019 Local Road Improvements

FACTS:

Each year, Cascade Township budgets general fund dollars to go towards the improvement of local roads. The process for identifying local roads for improvement typically begins in early spring when a list for potential road improvements is developed by Cascade Township staff, and provided to the KCRC for further investigation. The initial list of roads compiled by the Township is developed utilizing resources such as road PASER ratings supplied by the KCRC, complaints and requests by Township resident and businesses, and visual inspections by the Township staff.

The KCRC then takes the possible project list and provides recommendations to the Township on maintenance/repair activities and cost estimates. This list is further reviewed by Township staff to select the highest priority projects, considered within the construct of the budgeted allocation for road repair, and is presented to the Infrastructure Committee and ultimately the Township Board for approval.

In 2018, with assistance from the Kent County Road Commission, the Township developed a multi-year local road program. The focus for the multiyear program is all of the local roads located on the east side of the Thornapple River. This area has the highest concentration of roads rated "POOR" on the PASER scale. In 2018 the Township/KCRC was able to do a complete mill and fill (3.5" depth) on approximately 12 miles of local roads.

Attached for your review are:

- PASER map of the Cascade Township Local Road System (2019 proposed roads are highlighted)
- Multi-year local road maintenance presentation and recommendations from KCRC (from 2018)
- Proposed work orders for the 2018 Local Road Improvements Program

ANALYSIS & CONCLUSIONS:

As outlined in the KCRC presentation, Cascade Township has 73.92 miles of local paved roads. The local paved roads include both neighborhood roads and section-line roads. These are the roads that Cascade Township typically contributes funding towards (the KCRC does do 2-3 miles per year of section line roads that the Township does not contribute towards.) In addition to the local paved roads network, the Township has 40.92 miles of primary roads (federal aid eligible, typically fully funded by the KCRC) and 4.91 miles of local gravel roads.

Of the 73.92 miles of local paved roads, the roads can be divided into 3 categories based on the roads PASER ratings. Before the beginning of the 2018-19 two year program, the Township had 10.9 miles of local roads rated "GOOD" (10-8 PASER rating), 28.9 miles of local roads rated "FAIR" (7-5 PASER rating), and 34 miles of local roads rated "POOR" (4-1 PASER rating). The KCRC has several repair options that are available for the local paved road system. The repairs range from a full-depth mill and fill (\$300,000 per centerline mile) to micro-surfacing (\$50,000 per centerline mile). Certain treatments are appropriate for certain road conditions. Roads that are in the "Good" or "Fair" category may be eligible for less intensive treatments, while "Poor" roads often need full depth mill and fill or similar work. It should be noted that there is also diminishing return on investments for certain treatments when they have been applied multiple times. For example, a road that is micro-surfaced may have 7 years added to its useful life. The second time that same treatment is applied to the same road, it may only extend the useful life of the road 3-4 years.

As part of the 2-year program, the Township staff and the KCRC identified the local road system east of the Thornapple River as the target area for a multi-year local road treatment program. After reviewing the road map and road conditions, 17.65 miles of road were identified for treatment. Most of the area that was recommended for full-depth mill and fill work given the age and condition of the roads.

Based on the 2-year program that was developed in 2018, the KCRC has prepared a work order for the 2019 local road program. The program calls for 8.6 miles of local road repair, with all but approximately 1/3 mile a full depth mill and fill. The total estimated cost of the program is \$2,944,000, with \$1,472,000 coming from the Township. If approved, this will complete the 2-year local road program.

Township staff has reviewed the proposed program the Infrastructure Committee. After reviewing the proposed program with the Infrastructure Committee, they have recommended that the Township pursue completion of the 2-year program as recommended by Township staff and the KCRC. It is clear that these sections of roads in the Township are in bad shape and an aggressive treatment program is necessary for the Township to "catch-up" on local road maintenance.

While aggressive, the committee felt the timing was right for the Township to invest heavily in the local road system. Items considered by the committee in formulating the recommendation include:

- For every \$1 the Township invests, the KCRC will also invest \$1. This means the KCRC will also invest \$1,472,000 in the Township this year, money that would be spent elsewhere in the County if the Township does not invest.
- The KCRC has seen an influx in revenue over the past year due to the new gas tax and additional appropriations from the State and felt the Township should tap into these resources before other communities do.
- At the end of 2017 the Township had a General Fund fund balance of over \$9,000,000, with anticipation that the amount will remain steady once the 2018 FY audit is completed.

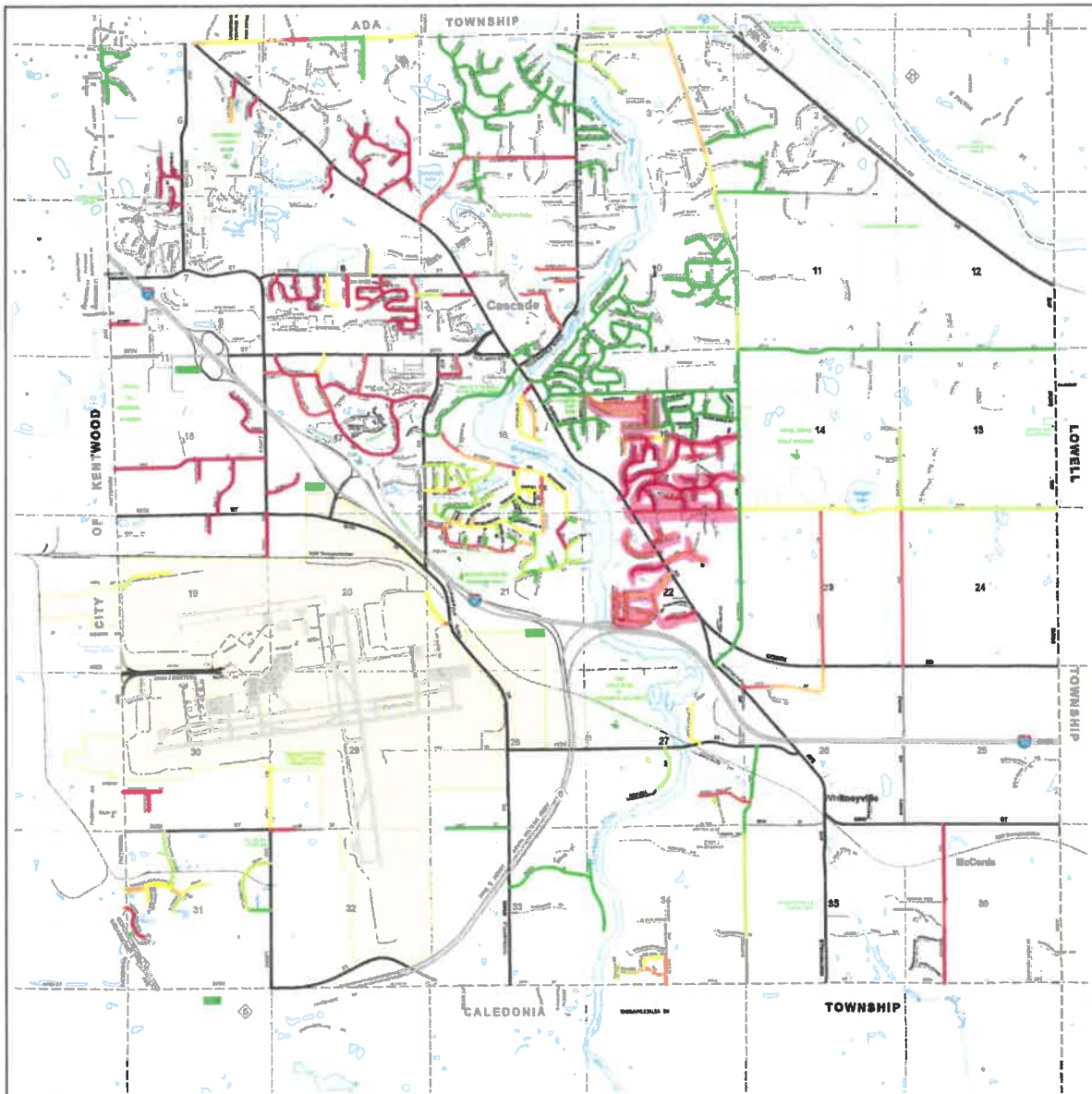
It should be noted that the above amounts are estimates only. If approved by the Township Board, the work will be bid out by the KCRC and more accurate costs will be obtained. The above estimates should be considered conservative.

FINANCIAL CONSIDERATIONS:

The projected cost to the Township for the proposed local road program as recommended by the Infrastructure Committee is \$1,472,000. In the FY2019 budget, the Township has budgeted \$400,000 for local road maintenance, therefore a budget amendment will be needed for this work. Additional funds will be taken from the General Fund fund balance, which was estimated above \$9,000,000 at 12/31/18. The final budget amendment will be recommended once the true cost of the proposed program is known.

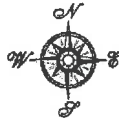
RECOMMENDED ACTION:

To approve the FY 2019 Cascade Township local road program as recommended by the Infrastructure Committee.



ROAD CONDITION

- POOR (1 OR 2)
- POOR (3)
- POOR (4)
- FAIR (5)
- FAIR (6)
- FAIR (7)
- GOOD (8-10)



Updated: 11/06/2018



CASCADE CHARTER TOWNSHIP
 KENT COUNTY, MICHIGAN
2018 LOCAL PASER MAP





Kent County
Road Commission

Cascade Township Program

Local Paved Road Program 2018-2020

- 50% Cascade Township and 50% KCRC
- Typical Combined Program increased from \$392,000 in 2014 to \$621,000 in 2017
- Proposed Combined Program = \$1,000,000
- KCRC Recommendation: Plat Mill & Fill or Cape Seal, Centerline Chip Seal, Plat Maintenance



Kent County
Road Commission

Cascade Township

Certified Centerline Mileage*

- | | |
|----------------------|-------------|
| • Primary Roads | 40.92 miles |
| • Local Paved Roads | 73.92 miles |
| • Local Gravel Roads | 4.91 miles |

*Per 2017 Certification Report

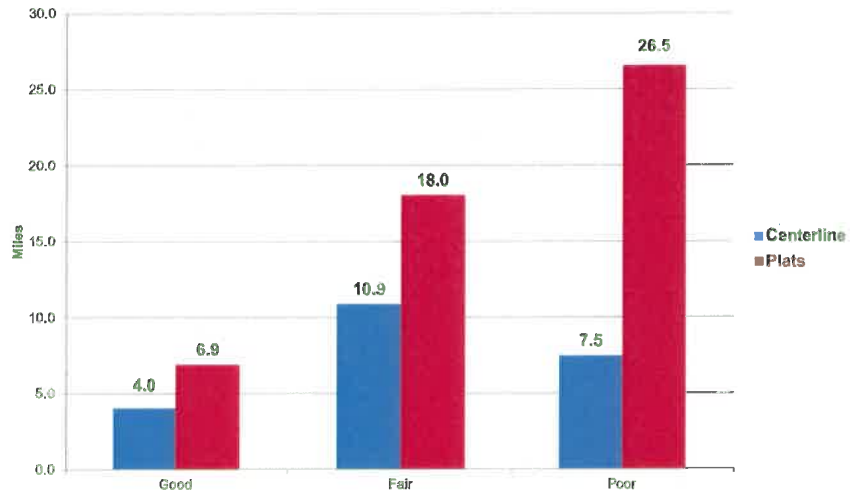


Kent County
Road Commission

Local Road Condition

2017 Local Paved Condition

Cascade Local Miles



Kent County
Road Commission

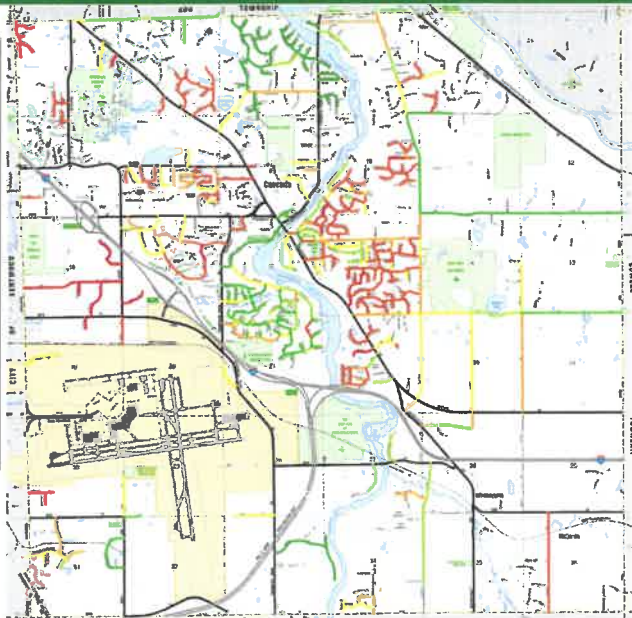
Road Condition Ratings

Cascade Township

PASER

ROAD CONDITIONS

- POOR (1 OR 2)
- POOR (3)
- POOR (4)
- FAIR (5)
- FAIR (6)
- FAIR (7)
- GOOD (8-10)





Kent County
Road Commission

Proposed Treatments

Treatment cost by mile

- ◆ Mill & Fill Full Depth - \$300,000
- ◆ Crush & Shape - \$250,000
- ◆ Mill & Fill Single Course - \$150,000
- ◆ Cape Seal - \$100,000
- ◆ Chip Seal (Paver) - \$90,000
- ◆ Micro Surface - \$50,000

Life expectancy

- ◆ Mill & Fill Full Depth – 13 to 15 years
- ◆ Crush & Shape – 10 to 12 years
- ◆ Mill & Fill Single Course – 12 to 14 years
- ◆ Cape Seal – 6 to 7 years
- ◆ Chip Seal (Paver) – 5 years
- ◆ Micro Surface – 7 years

- ◆ **Current road condition determines treatment type**



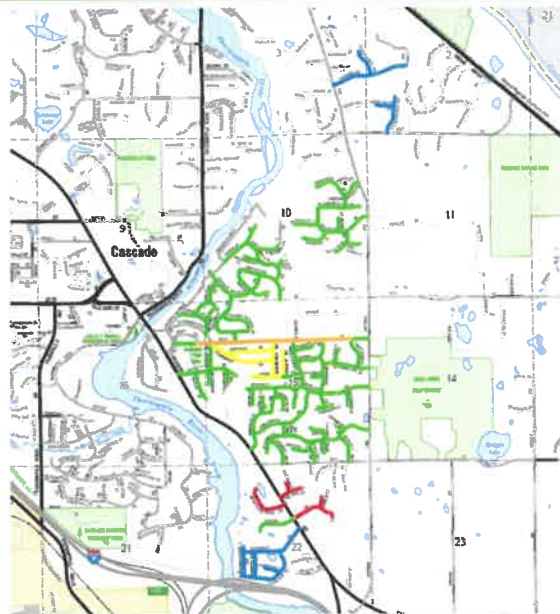
Kent County
Road Commission

Preferred Program

Cascade Township

Treatment

- Cape Seal
- Mill & Fill Full
- Micro Surface
- Crush & Shape
- Mill & Fill Single





Preferred program cost

- ◆ Cape Seal (0.83 miles) - \$83,000
- ◆ Crush & Shape (0.93 miles) - \$232,500
- ◆ Mill & Fill Full Depth (12.38 miles) - \$3,714,000
- ◆ Mill & Fill Single Course (2.22 miles) - \$333,000
- ◆ Micro Surface (1.29 miles) - \$63,500

Program Summary

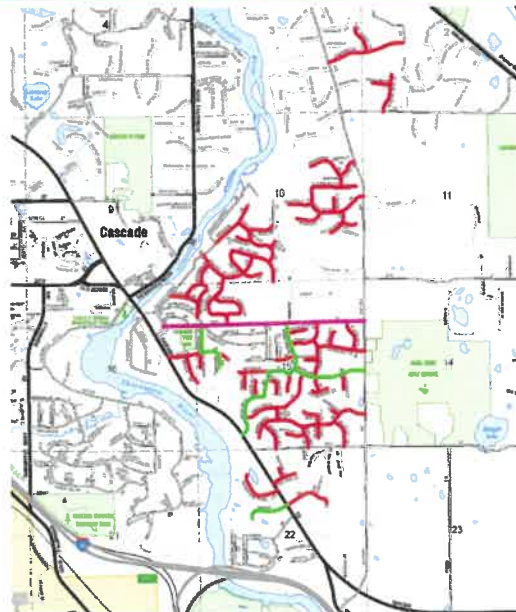
- ◆ Program total = **\$4,427,000 (17.65 miles)**
- ◆ \$1,000,000 per year combined program = 5+ years to complete
- ◆ Program life expectancy = 9 to 14 years
- ◆ Program does NOT include maintenance of other areas. Areas west of the Grand River will need maintenance in addition to this program.



Cascade Township

Treatment

- Cape Seal
- Mill & Fill Full
- Chip Seal (Paver)





Limited Program

Preferred program cost

- ◆ Cape Seal (11.89 miles) - \$1,189,000
- ◆ Chip Seal (Paver) (1.21 miles) - \$108,900
- ◆ Mill & Fill Full Depth (1.98 miles) - \$594,000

Program Summary

- ◆ Program total = **\$1,891,900 (15.08 miles)**
- ◆ \$800,000 per year combined program = 3+ years to complete
- ◆ Program life expectancy = 6 to 7 years
- ◆ 2.57 miles less than preferred program
- ◆ Program does NOT include maintenance of other areas. Areas west of the Grand River will need maintenance in addition to this program.

9



Future Considerations

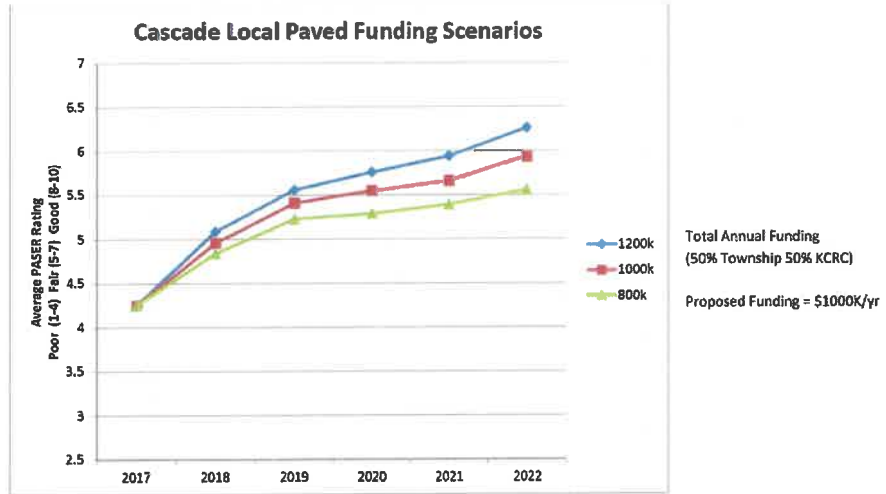
- ◆ A realistic program, depending on spending level, will be some compromise between preferred and limited program.
- ◆ KCRC will chip seal some local centerline roads as part of annual program. Currently about 6 miles are scheduled through 2020.
- ◆ Proper continued maintenance of recent work needs serious consideration. The programs here do not include maintenance.
- ◆ Most centerline roads can continue to be chip sealed



Kent County
Road Commission

Funding Scenarios

Cascade Township Five year road condition trend



Total Local Paved Miles: 73.92

KENT COUNTY ROAD COMMISSION
WORK ORDER

DATE 1/30/2019

WORK ORDER _____

PROJECT _____

MUNICIPALITY Cascade Township IF OTHER: _____

ROAD TYPE Local

LENGTH 8.6 Miles

TYPE OF WORK Mill and Fill

LOCATION See attached list

CATEGORY Reconstruction

ACTIVITY 489

PROJECT YEAR 2019

UTILITIES NO

BUDGET

WORK TYPE 000109 - Surface Maintenance _____

WORK TYPE 000128 - Restoration _____

WORK TYPE _____

WORK TYPE _____

WORK TYPE _____

WORK TYPE _____

WORK TYPE _____

TOTAL \$ 2,944,000

ESTIMATED COST VALID UNTIL _____

FUNDING

% KCRC 50.00% \$ 1,472,000

% TOWNSHIP 50.00% \$ 1,472,000

TOTAL \$ 2,944,000

NOTES Total number of streets receiving a mill/fill may be adjusted

NOTES based on bid prices and Cascade Township's multi-share program

TOWNSHIP SIGNATURE _____ DATE _____

FINANCE USE ONLY

CUSTOMER # _____ AR _____

PROJECT _____ REV _____

2019 Cascade Township Local Road Estimates

<u>Length</u>	<u>Road</u>	<u>Eng Est</u>	<u>Totals</u>
2125'	Thomcrest Drive: 30 th St. to Colchester Dr:		
1550'	Sheffield Drive: Thorncrest Dr. to Colchester Dr.		
1165'	Colchester Drive: 30 th St. to Leyton Dr.		
1095'	Leyton Drive: Howlett Dr. to end	<i>Single Course</i>	
880'	Howlett Drive: Leyton Dr. to end	<i>Single Course</i>	
2350'	Whitburn Drive: Bannockburn Dr. to Buttrick Ave		
475'	Whitburn Court: Whitburn Dr. to end		
485'	Buckhaven Drive: Stonehaven Dr. to Whitburn Dr.		
520'	Stonehaven Drive: end to end		
2620'	Candlewood Drive: Hiddens Hills to Whitburn Ave		
2130'	Woodvale Street: end to end		
2550'	Hidden Hills Ave: Cascade Rd. to Woodvale St.		
625'	Bentwood Drive: Hidden Hills Ave. to end		
500'	Hidden Hills Court: Hidden Hills Ave. to end		
500'	Pinoak Court: Woodvale St. to end		
19,570'	SUB-TOTAL	\$1,184,000	\$1,184,000

395' Vinewood Ave: Aspenwood Dr to Candlewood Dr

4035' Aspenwood Dr: Buttrick Ave. to end

250' Aspenwood Ct: Aspenwood Dr. to end
945' Westcott Dr: 36th St. to Aspenwood Dr.
745' N. Applecrest Ct: Aspenwood Dr. to end
385' S. Applecrest Ct: Aspenwood Dr. to end
695' Apple Hill Drive: 36th St to Aspenwood Dr.
575' Apple Hill Court: Apple Hill Dr. to end
900' Vinewood Avenue: 36th St. to Aspenwood Dr.

8925'	SUB-TOTAL	\$623,000	\$1,807,000
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740' Pine Park Drive: Cascade Rd to end
290' Pine Park Court: Pine Park Dr. to end
1420' Whispering Ridge Drive: Cascade Rd to end
1430' Kenrob Dr. (West): Cascade Rd to end
1360' Kenrob Dr. (East): Cascade Rd to end
335' Kenrob Court: Kenrob Dr. to end
1015' Cahoon Drive: Cascade Rd. to end

6590'	SUB-TOTAL	\$502,000	\$2,309,000
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2220' Buccaneer Dr: Cascade Rd to Maracaibo Shores

1000' Maracaibo Shores Ave: Doubloon Dr. to end

840' Rum Run Ave: Doubloon Dr to Buccaneer Dr

2100' Doubloon Dr: Maracaibo Shores to Buccaneer Dr

500' Pirates Cove Ct: Doubloon Dr. to end

6660'	SUB-TOTAL	\$402,000	\$2,711,000
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3665'	36 th Street: Cascade Road to Buttrick Ave.	\$233,000	
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3665'	SUB-TOTAL	\$233,000	\$2,944,000
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CASCADE CHARTER TOWNSHIP

2865 Thornhills SE Grand Rapids, Michigan 49546-7140

Date: March 13, 2019
To: Supervisor Beahan and Township Board Members
From: Ben Swayze, Township Manager
Subject: Consumers Energy – Franchise Agreement Renewal Resolution

FACTS:

Cascade Township currently has a franchise ordinance with Consumers Energy, which allows Consumers to serve Cascade Township residents and businesses with electricity. The current ordinance, which had a 30-year term, is set to expire on May 5, 2019.

Electric service in the State of Michigan is regulated by the Michigan Public Service Commission, and the Township has very little say in the operation of the electric utility. However, the franchise is a requirement for operation.

The proposed electric franchise ordinance for Consumers Energy is attached, which mirrors the current franchise. In order to consider the ordinance, the Township must set a public hearing. It is recommended the Public Hearing be set for the regularly scheduled Township Board meeting on March 27, 2019.

Attached for your review are:

- Proposed Consumers Energy Electric Franchise Ordinance

ANALYSIS & CONCLUSIONS:

The Township Attorney has reviewed the ordinance and has offered no additional changes or recommendations. It was pointed out that the ordinance is not exclusive (the Township may grant other electric franchises with service areas overlapping Consumers service area) and that it may be revoked with 60 days notice.

The Township has received very few complaints regarding the business practices of Consumers Energy, and nothing that would bring into question the renewal of the Consumers Energy franchise agreement. The primary complaint has been in regards to outages.

The requested action is to set the public hearing for the proposed ordinance for March 27, 2019 at the regularly scheduled Township Board meeting. Karen McCarthy, the Community Affairs Manager from Consumers Energy, will attend the meeting. If it so chooses, the Township Board may approve the proposed ordinance at the March 27th meeting, or any subsequent meeting.

FINANCIAL CONSIDERATIONS:

The Township will incur minimal costs by setting the public hearing, primarily printing and publishing costs. Approval of the Consumers Energy Franchise Ordinance will have no material financial impact on the Township.

RECOMMENDED ACTION:

Set a public hearing for the Consumers Energy Company Electric Franchise Ordinance for March 27, 2019 at the regularly schedule Township Board meeting.

ORDINANCE NO. _____

CONSUMERS ENERGY COMPANY ELECTRIC FRANCHISE ORDINANCE

AN ORDINANCE, granting to CONSUMERS ENERGY COMPANY, its successors and assigns, the right and authority to construct, maintain and commercially use electric lines and related facilities including but not limited to towers, masts, poles, crossarms, guys, wires and transformers on, under, along, and across public places including but not limited to highways, streets, alleys, bridges, and waterways, and to conduct a local electric business in the CHARTER TOWNSHIP OF CASCADE, KENT COUNTY, MICHIGAN, for a period of thirty years.

THE CHARTER TOWNSHIP OF CASCADE ORDAINS:

SECTION 1. GRANT and TERM. The CHARTER TOWNSHIP OF CASCADE, KENT COUNTY, MICHIGAN, hereby grants to Consumers Energy Company, its successors and assigns, hereinafter called "Consumers" the right and authority to towers, masts, poles, crossarms, guys, wires and transformers on, under, along, and across public places including but not limited to highways, streets, alleys, bridges, and waterways, and to conduct a local electric business in the CHARTER TOWNSHIP OF CASCADE, KENT COUNTY, MICHIGAN, for a period of thirty years.

SECTION 2. CONDITIONS. No public place used by Consumers shall be obstructed longer than necessary during construction or repair, and shall be restored to the same order and condition as when work was commenced. All of Consumers' electric lines and related facilities shall be placed as not to unnecessarily interfere with the public's use of public places. Consumers shall have the right to trim or remove trees if necessary in the conducting of such business.

SECTION 3. HOLD HARMLESS. Consumers shall save the Charter Township free and harmless from all loss, costs and expense to which it may be subject by reason of the negligent construction and maintenance of the lines and related facilities hereby authorized. In case any action is commenced against the Charter Township on account of the permission herein given, Consumers shall, upon notice, defend the Charter Township and its representatives and hold them harmless from all loss, costs and damage arising out of such negligent construction and maintenance.

SECTION 4. EXTENSIONS. Consumers shall construct and extend its electric distribution system within said Charter Township, and shall furnish electric service to applicants residing therein in accordance with applicable laws, rules and regulations.

SECTION 5. FRANCHISE NOT EXCLUSIVE. The rights, power and authority herein granted, are not exclusive.

SECTION 6. RATES and CONDITIONS. Consumers shall be entitled to provide electric service to the inhabitants of the Charter Township at the rates and pursuant to the conditions as approved by the Michigan Public Service Commission. Such rates and conditions shall be subject to review and change upon petition to the Michigan Public Service Commission.

SECTION 7. REVOCATION. The franchise granted by this ordinance is subject to revocation upon sixty (60) days written notice by either party. Upon revocation this ordinance shall be considered repealed and of no effect past, present or future.

SECTION 8. MICHIGAN PUBLIC SERVICE COMMISSION JURISDICTION. Consumers remains subject to the reasonable rules and regulations of the Michigan Public Service Commission applicable to electric service in the Charter Township and those rules and regulations preempt any term of any ordinance of the Charter Township to the contrary.

SECTION 9. REPEALER. This ordinance, when enacted, shall repeal and supersede the provisions of any previous electric franchise ordinance adopted by the Charter Township including any amendments.

SECTION 10. EFFECTIVE DATE. This ordinance shall take effect on _____.

We certify that the foregoing Franchise Ordinance was duly enacted by the Charter Township Board of the CHARTER TOWNSHIP OF CASCADE, KENT COUNTY, MICHIGAN, on the ____ day of _____, 20__.

Rob Beahan, Charter Township Supervisor

Attest:

I, _____, Clerk of the CHARTER TOWNSHIP OF CASCADE, KENT COUNTY, MICHIGAN, DO HEREBY CERTIFY that the ordinance granting Consumers Energy Company, an electric franchise, was properly adopted by the Charter Township Board of the CHARTER TOWNSHIP OF CASCADE, KENT COUNTY, MICHIGAN, and that all proceedings were regular and in accordance with all legal requirements.

Sue Slater, Charter Township Clerk

Dated: _____, 20__



CASCADE CHARTER TOWNSHIP

2865 Thornhills SE Grand Rapids, Michigan 49546-7140

Date: March 13, 2019
To: Supervisor Beahan and Township Board Members
From: Ben Swayze, Township Manager
Subject: Contract with Hamilton Helicopter Inc. for Gypsy Moth Suppression Services

FACTS:

In the fall of 2018 Cascade Township contracted with Aquatic Consulting Services LLC to conduct gypsy moth egg mass surveys to determine areas that require aerial spraying for 2019. As a result of that survey, it has been recommended that approximately 1,889 acres of the Township be sprayed for gypsy moth suppression. It should be noted that the recommended acreage is significantly higher than the acreage we have sprayed in recent years. In 2017 the Township sprayed 433 acres and 1,115 acres in 2018. Our biologist, Aquatic Consulting Services, attributes the additional spraying acreage to "...gypsy moth populations across the West Michigan area [that] are representative of a strong growth phase in the invasive species curve gypsy moths undergo." Additionally he notes, "...while Cascade does certainly have a Gypsy moth issue, areas untreated over the past few seasons are in much worse shape. Overall I anticipate good results for next season."

The Township had utilized Mid-Michigan Helicopter Inc. for Gypsy Moth Suppression services since the onset of our program until 2015. In 2015 Mid-Michigan Helicopter was bought by Hamilton Helicopter, and they have overseen our spraying program for the last four years. Our spray program last year was successful with no known issues reported from the contractor or residents in the affected areas. The Township last sprayed for gypsy moths in spring of 2018, when we sprayed 1,115 acres. The follow up report from Aquatic Consulting Services in summer of 2018 indicated the spray program was successful in suppressing the gypsy moth population in a majority of the indicated spray areas.

In 2018 the Township agreed to a 3-year spray contract with Hamilton Helicopter. Under the terms of the contract, in each year the Township must agree to spray a minimum of 500 acres. In return, the Township received a \$3.00 per acre discount on the spray cost. The terms of the contract only allow the price of the spray to increase by the increase in the cost of the *Bacillus Thuringiensis* each year. The 2018 contract rate was \$61.35. The 2019 spray contract proposal from Hamilton Helicopter calls for spraying 1,889 acres at a cost of \$61.55 per acres. The anticipated cost of the 2019 spray program is \$116,267.95.

The program will take place in the time period between May 1st and June 15th, with a more specific date to be available when the weather breaks. The Township is required to notify all residences in the spray block areas of the program. Any objectors to the spray program are eligible to be removed from the spray block at the discretion of the Township.

Attached for your review are:

- Proposed agreement with Hamilton Helicopter Inc. for Gypsy Moth Suppression Services.
- Communication from Aquatic Consulting Services regarding spray program
- Map of the proposed spray blocks for 2019
- Gypsy Moth information brochure published by the MSU Extension
- Information regarding Bacillus Thuringiensis pesticide.

ANALYSIS & CONCLUSIONS:

The Township has participated in the gypsy moth spray program in conjunction with Mid-Michigan Helicopter Inc/Hamilton Helicopter and Aquatic Consulting Services going on 21 years. The Township has participated in the program because of the acknowledgement of the devastating effect the gypsy moth population could have on the tree canopy cover of the Township.

During the onset of the program it was not uncommon for the Township to spray 1000 – 2000 acres per year. The continued treatment has allowed the program to be successful and our gypsy moth populations to be controlled. The partnership with both Aquatic Consulting Resources and Hamilton Helicopters Inc. has allowed us to efficiently allocate our financial resources to this program. The survey ensures that the aerial spray program effectively targets areas of infestation above the set thresholds, and on several occasions has saved us from unnecessarily spraying, as was the case in 2013 and 2010-11

The Infrastructure Committee reviewed the gypsy moth program at their February meeting. Based on the report from Aquatic Consulting Services the committee has recommended the Board approve the contract with Hamilton Helicopters to spray the full 1,889 acres recommended by Aquatic Consulting Services.

FINANCIAL CONSIDERATIONS:

The proposed agreement with Hamilton Helicopter Inc. is for a rate of \$61.55 per acre, which is \$0.20 per acre more than the 2018 contract and represents the increased cost of Bacillus Thuringiensis. The total cost of the program will come to \$116,267.95. The Township has budgeted \$70,000 for this program in 2019 (our 2018 spray program), so a budget amendment in the amount of \$46,267.95 will be needed if the Township chooses to spray the entire recommended area. Currently the General Fund has unallocated revenues of approximately \$50,000 for FY 2019.

RECOMMENDED ACTION:

Approve the agreement with Hamilton Helicopter Inc. for Gypsy Moth Suppression Services.

GYPSY MOTH SUPPRESSION 3 YEAR SERVICE AGREEMENT
2nd Year of 3

This agreement is made as of _____, 2019, between Cascade Charter Township, a Michigan municipal corporation at 2865 Thornhills Ave. SE, Grand Rapids Michigan. 49546. (Hereafter referred to as the Township), and Hamilton Helicopter Inc. (hereafter referred to as Hamilton Helicopters).

Whereas the Township desires to control the gypsy moth population within its boundaries, and Hamilton Helicopters is interested in and capable of participating in a Gypsy moth suppression program with the Township.

NOW, therefore, the parties agree as follows.

- A With regard to the gypsy moth suppression program, the Township shall provide or arrange for the following to be performed.
- (1) Determination of spray blocks.
 - (2) Provide homeowner notification of the spraying program, and make all public notices required, and make sure there are no objectors in the spray blocks.
 - (3) Provide location of all objectors in and outside the spray blocks, and exclude and defend Hamilton Helicopters from any action, legal or otherwise, that should arise from the "no exclusion policy".
 - (4) Provide digitized maps of the spray blocks.
 - (5) Provide traffic and crowd control at the time of spraying, in the spray blocks and at the load site if deemed necessary by the parties.
 - (6) Provide a central loading site.
- B With regard to the gypsy moth suppression program, Hamilton Helicopters shall.
- (1) Have and maintain insurance coverage during the term of this agreement in the amount of \$2,000,000.00 single limit bodily injury and property damage. The Township and its employees shall be named as "additional insured". All liability for Hamilton Helicopters and its employees will be limited to the insurance policy provided.
 - (2) Will apply to the F.A.A. for a (workable) congested area spray plan for the time period from May 1, 2019 to June 15, 2019.
 - (3) Provide Bacillus Thuringiensis 'BT' at the rate of 19 B.I.U. per acre to cover 1898 acres for the Township in 2019.
 - (4) Coordinate the spray timing with Aquatic Consulting Services.
- C This Service agreement listed in paragraphs A and B will be a 3 year contract starting with 2018 spray season. There is a 500 acre application minimum per year. The price for 2019 is \$61.55 per acre. The price for the next year can only be increased by the increase cost of the BT (Bacillus Thuringiensis) which has been relatively small .50-.80 cents per acre per year. Payment is to be made within 30 days of billing
- D In the event Hamilton Helicopters is prevented from spraying as a result of legal action, court injunction, terrorist related problems or any problems beyond the control of

Hamilton Helicopters, the Township will pay \$15.00 per acre to cover some of the costs incurred.

E For the purposes of this contract, the contractor and its employees shall be considered Independent contractors.

F This agreement may be amended by mutual consent of the parties.

IN WITNESS THERE OF, the parties here have executed this agreement by and through their authorized representatives as of the date written above.

Cascade Charter Township

Hamilton Helicopters Inc.

Its _____ DATE _____

Its _____ DATE _____



Aquatic Consulting Services

P.O. Box 530, Sanford, MI 48657
www.aquaticremedies.com

989-689-0223

December 13, 2018

Mr. Ben Swayze,
Cascade Charter Township
2865 Thornhills, S.E.
Grand Rapids, MI 49546

Dear Mr. Swayze:

We have completed the gypsy moth surveys, maps and report for the 2018 season in Cascade Charter Township. I have included JPG and PDF map files of the results for you to review and to post on your website as needed. Both JPG and PDF files are printable for your purposes although I believe the PDF file will be more user friendly on your website. I have also included a short report on the conditions in each recommended spray block.

During my survey, I found several areas with persistent gypsy moth populations. Considering the challenging conditions present in the West Michigan area the past few years, I am happy to report that while we are in a battle, our efforts appear to be paying off. Egg mass numbers are down in most blocks, although high residual numbers do still warrant treatment. Accordingly, many of the areas treated last spring will require treatment again this spring. We have the nuisance and tree damage thresholds well described, so I am confident our survey and spray methods will prevail, as long as we stay on top of things. I must emphasize, when in a growth phase, gypsy moth populations can be quite resilient and several years of treatment and monitoring are often needed. Unfortunately, some blocks increased in size or changed shape, with a few new areas recommended. Accordingly, there was an increase of 774 to a total of 1,889 acres recommended for spray in spring 2019. This increase is certainly substantial, but it must be stressed that I only recommended areas with significant gypsy moth populations. Gypsy moth science identifies refuge areas as the most common means of population persistence. This is the primary reason for an increase in size of several spray blocks from the last few seasons. I know you are aware of the frustrating gypsy moth infestation currently impacting the entire West Michigan area. I have acquired more work around the area this fall and can attest, while Cascade does certainly have a gypsy moth issue, areas untreated over the past few seasons are in much worse shape. Overall, I anticipate good results for next season, but encourage Cascade Township to continue with a monitoring program.

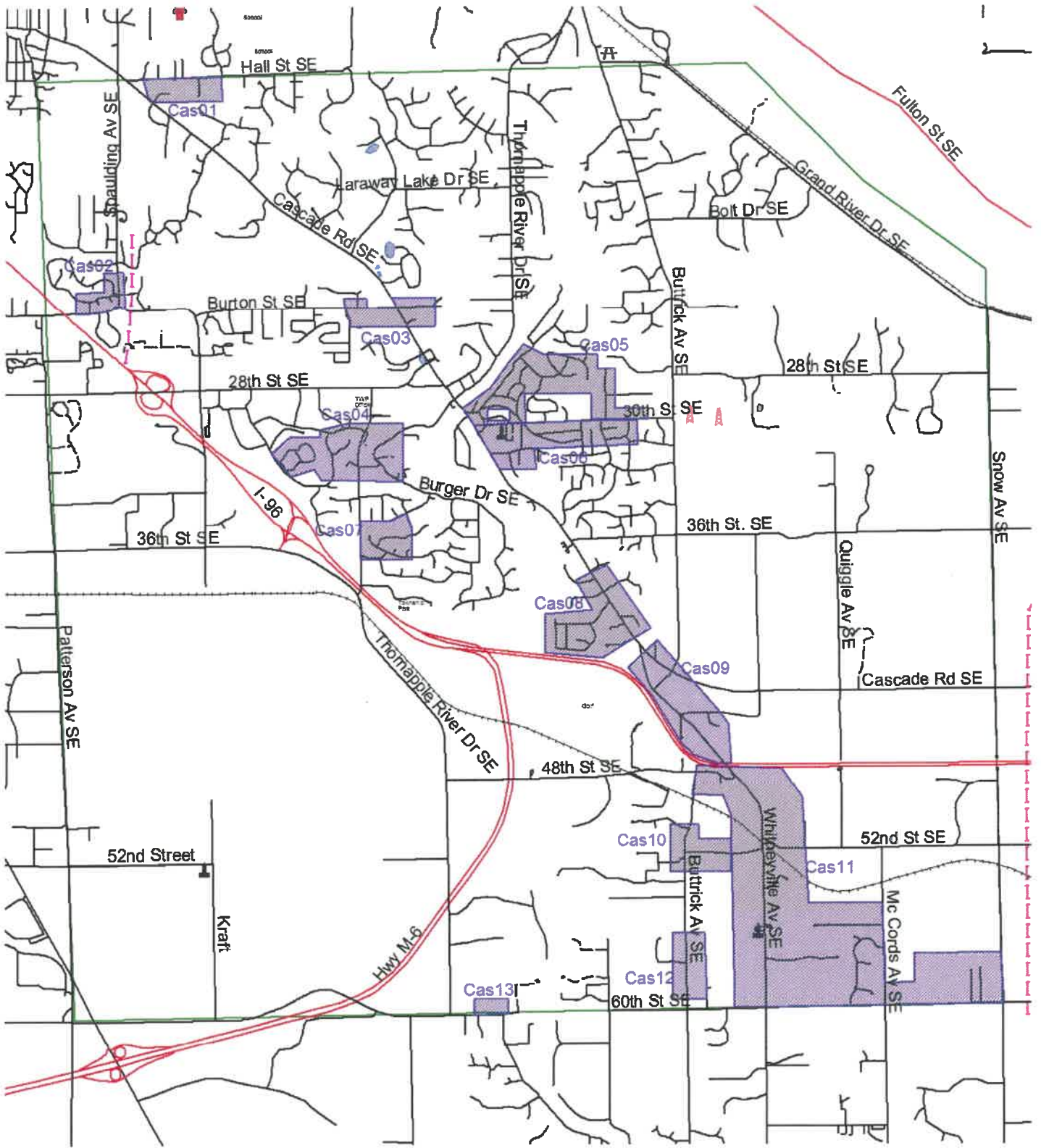
I will hold off for a few months on digitizing the spray blocks for the pilot's use until you have had a chance to review the map. If it meets with your approval, I will put a final package together for the aerial applicator you choose. They will contact you to negotiate this season's spray contract.

Thank you again for the opportunity to work for Cascade Township. Please let me know if you need anything further. (989) 689-0223 or gypsymoth@aquaticremedies.com.

Sincerely,

Neal Swanson
Owner/Biologist

Cascade Township Gypsy Moth Survey Report Map for 2019 Season



Shaded areas are recommended for
aerial B.t. spray in Spring 2019



— Township Border

2018 Aquatic Consulting Services

Cascade Charter Township
Recommended Gypsy Moth Spray Areas 2019

By
Aquatic Consulting Services LLC
December 2018

Block #	Acres	Reason for Spray
Cas01	47	A remnant population in very good habitat. The block borders an untreated area in adjacent Ada Township. Spray to limit nuisance suppress population growth.
Cas02	34	An established population in good habitat. Spray to reduce nuisance and suppress further population growth.
Cas03	60	A rising population is very good habitat. Nuisance and tree damage thresholds are already reached. Spray to reduce tree damage, contain spreading, and suppress growth.
Cas04	159	An established population that has spread into adjacent habitat. Spray to contain spreading, suppress growth, and prevent tree damage.
Cas05	179	A persistent remnant population in prime habitat. Nuisance and tree damage thresholds have been reached. Population appears to be on the decline, but still quite numerous. Spray to reduce nuisance, and limit further tree damage.
Cas06	125	A continuation of Cas05. Spray to maintain suppression efforts.
Cas07	53	An established population in very good habitat. Spray to limit nuisance and suppress further population growth
Cas08	148	A persistent remnant population that has spread to adjacent habitat. Spray to contain spreading and limit nuisance and tree damage.
Cas09	146	An established population in prime habitat. Nuisance level is elevated, and tree damage has occurred throughout. Population has the potential to cause tree mortality in coming years. Spray to limit further tree damage and reduce nuisance.
Cas10	62	A remnant population in good habitat. Spray to further suppress population and limit spreading.
Cas11	806	A robust established population in prime habitat. Widespread tree damage has occurred and nuisance level is quite high. Population has the potential to cause tree mortality in coming years. Spray to limit tree damage and reduce nuisance.
Cas12	57	A rising population in good habitat. Spray to suppress population growth and contain spreading.
Cas13	13	An isolated population in good habitat. Nuisance threshold has been reached. Spray to reduce nuisance and suppress population growth.

Total Acreage = **1,889 acres**

All blocks are recommended for spray in Spring 2019. Potential for further tree damage is quite high in several blocks, and significant nuisance has been expressed across the area.

Gypsy Moth in Michigan

Michigan State University Extension & Michigan State University Department of Entomology
& the Michigan Department of Agriculture

The following information was taken from the
Gypsy Moth in Michigan Homeowner's Guide

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Gypsy Moth Management Starts At Home

You are the first line of defense for protecting your trees and shrubs from damage by gypsy moth, other insects, nematodes and diseases. Being knowledgeable about the life cycle of the gypsy moth will pay off in money saved, labor expended and peace of mind.

Depending upon where you live in Michigan, gypsy moth outbreaks may last from two to several years or may never occur. Why gypsy moth populations explode from time to time is not entirely clear. Outbreaks will eventually collapse, usually from natural causes.

Until a local gypsy moth population crashes, however, there are several techniques that homeowners can employ to keep damage and nuisance to an affordable minimum.

Monitoring

Hopefully, the mind set of dragging the sprayer out of the garage and spraying insecticide on trees and shrubs just because something might be out there lurking is no longer a part of the Michigan mentality. Years ago this was called "insurance spraying" when everybody was spraying chlorinated hydrocarbon insecticides (e.g., DDT) on everything that moved. We all know where that got us!

Take time to inspect your trees and shrubs periodically for the various life forms of gypsy moth. Especially look for the caterpillars when they begin to hatch, usually in early May.

Contrary to popular belief, population explosions in a locality do not happen suddenly! An area will undergo a gradual population buildup for a time before the population goes into a phase of rapid release. This gives vigilant homeowners, neighborhoods and communities time to assess local conditions and take appropriate action.

The gypsy moth is in the egg mass form for nearly nine months, plenty of time to find and destroy them before they hatch in the spring. While it may not be possible to find and destroy all of the egg masses in and around your backyard, this activity will complement management activity taken in the spring.

Management Non-Pesticide Techniques:

Water and Fertilize

We often take trees and shrubs for granted, figuring that they are indestructible and meant to last forever. Trees and shrubs have specific nutrient and water requirements. Take the time to determine what they need, and water and fertilize properly. There are bulletins available at all county extension offices and garden centers. Most insects and diseases select trees and shrubs that are being stressed. Keeping your trees and shrubs healthy will reduce the pests and diseases attracted to your foliage and lessen the damage done if they are attacked.

Sanitation

Keep your yard as clean as possible. Remove discarded items, dead branches (from the ground and out of the trees), stumps, etc., where the adult female moth is likely to lay egg masses. It is very important that homeowners be watchful when obtaining firewood from areas infested by the gypsy moth. A good rule of thumb is to never get more firewood in the summer or fall than you can burn by spring.

Each fall, check recreation vehicles (boats, trailers, campers, etc.) for gypsy moth egg masses. Vehicular movement is how gypsy moth came to Michigan.

Destroy Egg Masses

As mentioned, gypsy moth egg masses are around for nearly nine months before they hatch. Homeowners can help reduce gypsy moth population on their property and in their neighborhood by seeking out and destroying egg masses each year.

When a gypsy moth caterpillar is about to pupate, it will look for a protected area such as a loose flap of bark, something flat nailed to a tree, woodpile of the underside of branches, etc. Once a suitable location is found, it weaves a loose net of silk around itself and

transforms into a pupa. This is the resting state where the caterpillar undergoes the miracle transformation from caterpillar to moth. This takes about two weeks.

Upon emergence, the female gypsy moth is creamy white and has a wingspan of about two inches. The male moth is smaller in size and camouflage brown with black mottling. Both have a distinguishing mark on their forewings: an inverted black V often referred to as a chevron marking.

The female generally deposits egg masses from early July to mid-August depending upon local weather conditions. The female cannot fly, so she will lay egg masses near where she was in the pupal (cocoon) stage.

The adult female lives about a week. Her only purpose in life is to breed as quickly as possible and lay her eggs. She cannot fly, so she emits a chemical odor to attract the nearest male for mating, the male flies off to mate several more times before dying. After mating, the female spends about a day depositing her egg mass, falls to the ground and dies. Neither the male or female moth feed.

Each egg mass can contain from 50-1,000 eggs. The eggs are intertwined in a matting of hair from the body of the female. The hair is a tan-buff color and helps insulate eggs.

The egg masses begin hatching the following May. Hatching coincides with the bud break of aspen and the flowering of serviceberry.

Homeowners are encouraged to search out and destroy egg masses. This is accomplished by scraping them from the surface to which they are attached into a coffee can or similar receptacle. They can be buried or burned. Remember that each egg mass destroyed probably eliminated 400-500 caterpillars. Destroying egg masses is not a cure all. Many times egg masses are overlooked or inaccessible. However, it is a very good and certainly very cheap way to significantly impact the gypsy moth population in your yard and neighborhood.

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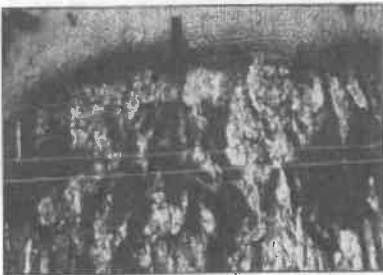
Barrier Bands

Sticky, or slippery bands can be placed around tree trunks to help curtail, though not necessarily prevent, the caterpillars movement into and out of the tree canopy.

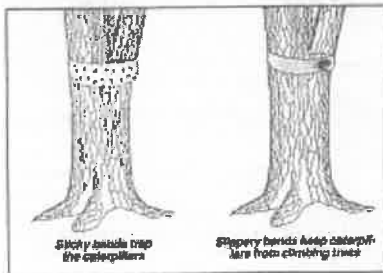
Sticky bands can be purchased or made using a nonporous material that can be wrapped around a tree trunk, then coated with a commercially made, vegetable-based sticky material. **Never put sticky material directly on the tree trunk.** This will permanently stain the bark and may harm the tree.

Sticky bands should not be put on the tree until the caterpillars are about an inch long. Smaller caterpillars usually stay in the tree canopy. Sticky bands eventually lose their effectiveness due to rain and other weather factors, the sticky material has to be reapplied periodically. Bands covered completely with caterpillars need to be cleaned or replaced.

Slippery bands are also intended to interrupt the daily migration of the caterpillar. They prevent the caterpillar from climbing up into the canopy.



Gypsy moth caterpillars use cloth bands to hide during daylight hours. Scrape the caterpillars into a bucket of soapy water



Sticky bands trap the caterpillars

Slippery bands keep caterpillars from climbing trees

Hiding Bands

Cloth, or hiding bands, can be homemade from medium weight dark cloth about 12 to 18 inches wide and long enough to completely wrap

around the tree. Fasten each band at chest height around the tree with twine, cord or wire about midway from the bottom of the cloth. Then fold the top part of the cloth down over the bottom half.

Caterpillars descending the tree in the morning in search of a secluded daytime resting spot will hide under the flap of the band. Remove and destroy caterpillars each day by scraping them into a bucket of soapy water.

Pesticide Techniques

Biological Pesticide

Many pesticides are registered for use against gypsy moth in Michigan. A biological pesticide commonly used on gypsy moth is *Bacillus thuringiensis* var. *kurstaki*. B.t. is a common soil bacteria. It is commercially formulated and sold under various labels (e.g., Dipel, Foray, Thuricide and Bactur to name a few). B.t. can be applied from the ground or by aerial spraying.

B.t. formulations are quite safe to humans. There is no apparent human toxicity, although there have been rare cases of allergic reaction by humans to certain formulations of B.t. In fact, B.t. is only known to be toxic to the caterpillars of moths and butterflies. While there are many species of caterpillars affected by B.t., this pesticide is the most "selective" product available.

To be effective in minimizing defoliation, B.t. must be applied when caterpillars are less than one inch long. As caterpillars get larger, the efficacy of B.t. diminishes. B.t. has a reported residual activity (i.e. how long it remains potent) of about a week. It is broken down by sunlight. In instances where there are very high gypsy moth populations, two applications five days apart might be needed.

Most chemical pesticides are 95% - 99% effective. B.t.k. is probably is 80% - 85% efficient in field applications. This is a desirable attribute of B.t.k.. That may sound like a contradiction, but it isn't. pesticides that are highly efficient will eventually work against the pest manager.

Insects, through natural selection, will develop resistance to the pesticide. By

leaving 15% of the population intact, selection for resistance is slowed. B.t.k. has been used against gypsy moth for over twenty-five years and no resistance has been discovered. There is, quite naturally, a trade off. When B.t.k. is applied there are still some caterpillars crawling around. However, nuisance is reduced to a minimum, defoliation lowered below damaging levels.

Soap and Water

In addition to destroying egg masses, homeowners can use other non-pesticide methods to reduce defoliation of their yard trees.

Watch for the appearance of the small caterpillars in the spring. A garden hose has sufficient water pressure to knock them off the foliage. Spraying them with water under pressure kills many of them.

Garden centers carry various brands of "insecticidal soap." An insecticidal soap is not a soap with a synthetic insecticide but instead refers to the ability of the soap to kill certain insects. Spraying gypsy moth caterpillars with a hose with an attachment to dispense soap can be effective. Always follow label directions on the insecticidal soap container. Small and large caterpillars can be drowned when submerged into a bucket of soapy water.

Chemical Insecticides

A number of chemical pesticides are registered against gypsy moth in Michigan. Many are available at your local garden center or nursery. Some of the most common are formulations of acephate, carbaryl, and malathion.

If you choose to use chemical insecticides, apply them judiciously and wisely. Besides gypsy moth they can have a potential impact on a variety of beneficial insects, including valuable predators, parasites and honeybees.

Regardless of what insecticide you choose, read the label instructions and follow them exactly. If you have any potential personal health concerns regarding pesticides, discuss them with a physician or contact your local health department.

Trees and shrubs defoliated by gypsy moth

Although gypsy moth caterpillars feed primarily on deciduous tree species such as oak or aspen, this insect is known for its wide-ranging appetite. When populations of gypsy moth are very high, the caterpillars quickly devour the leaves of their preferred host tree species. Once their favored food source disappears, the hungry caterpillars do not hesitate to seek out new sources of food. When this occurs, almost any deciduous or conifer tree, shrub or other landscape plant may be at risk of suffering some amount of defoliation.

Consequently, it is difficult to state exactly how susceptible a tree or shrub species is to defoliation by gypsy moth caterpillars. Therefore, the following list is offered only as a guide to homeowners. This list does not guarantee that any species listed as minimally at risk will never be defoliated by the gypsy moth.

More importantly, homeowners need to recognize that gypsy moth caterpillars do have preferences for certain types of trees and thrive best on those species. Typically these favored food sources are usually the first ones attacked in a homeowner's yard, especially tall, large crowned trees. These are the trees most likely at risk to defoliation.

Generally speaking, when gypsy moth caterpillars move into less preferable food sources, the caterpillars do not thrive as well and often only cause minor damage.

However, regardless of this insect's food preferences, close inspection of yard trees and outdoor fixtures and prompt action by the homeowner to destroy egg masses and small caterpillars is crucial. This is the real key to minimizing the discomfort and, to some degree, the defoliation caused by large numbers of gypsy moth caterpillars.

If a homeowner is able to minimize the amount of defoliation from the gypsy moth, it will lessen the overall impact on tree health. When a hardwood tree is heavily defoliated, the needed energy to regrow a new set of leaves causes stress. This stress often weakens a tree which may lead

to additional tree health problems. Moreover, conifer species, such as spruce or pine, are at greater risk than hardwoods because conifers are not able to regrow needles lost to defoliation. Thus complete defoliation of conifers by gypsy moth is usually fatal.

Trees and Shrubs Most at Risk to Defoliation

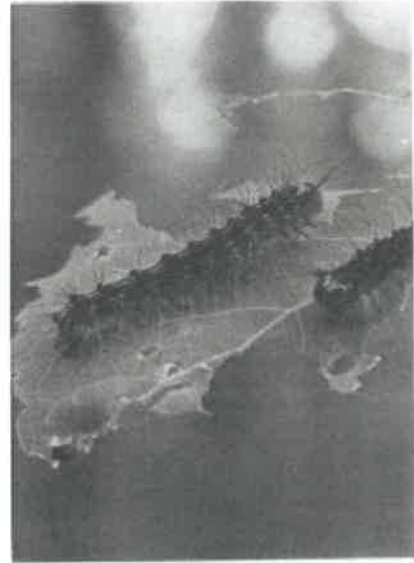
All Oak (*Quercus*).
All aspen and poplar (*Populus*).
Gray, paper (white), and river birch (*Betula*).
All willow (*Salix*).
All apple and crabapple (*Malus*).
All thornapple and hawthorne (*Craetagus*).
White pine (*Pinus*).
Blue spruce (*Picea*).
American beech (*Fagus*).
Basswood (*Tilia*).
Sweetgum (*Liquidambar*).
Juneberry or serviceberry (*Amelanchier*).
Witch hazel (*Hamamelis*).
Hazelnut (*Corlus*).
Mountain ash (*Sorbus*).

Trees and Shrubs Somewhat at Risk to Defoliation

Black walnut and butternut (*Juglans*).
All cherry and plum (*Prunus*).
Norway, red and sugar maple (*Acer*).
Hophornbeam or ironwood (*Ostrya*).
Alder (*Alnus*).
Elm (*Ulmus*).
Hickory (*Carya*).
Eastern redbud (*Cercis*).
Sassafras (*Sassafras*).
Paw paw (*Asimina*).
White and Norway spruce (*Picea*).
Balsam fir (*Abies*).
Eastern hemlock (*Tsuga*).
Red, jack, scotch and Austrian Pine (*Pinus*).

Trees and Shrubs at Minimal Risk to Defoliation

Ash (*Fraxinus*).
Tulip tree or yellow poplar (*Liriodendron*).
Sycamore and London plane tree (*Plantanus*).
Northern catalpa (*Catalpa*).
Honey locust (*Gleditsia*).
Black locust (*Robinia*).
Horsechestnut (*Aesculus*).
Dogwood (*Cornus*).



Gypsy moth caterpillars prefer to eat leaves of certain tree species, including poplar.

Eastern redcedar (*Juniperus*).
Juniper (*Juniperus*).
Yew (*Taxus*).
Lilac (*Syringa*).
Azalea (*Azalea*).
Rhododendron (*Rhododendron*).
Arborvitae (*Thuja*).
Viburnum (*Viburnum*).

Homeowners considering planting trees or shrubs in areas prone to high gypsy moth population build-ups should choose species that are at minimal risk to defoliation. Contact your local MSU Extension office for bulletins and information on tree selection, planting and care.



Be careful about quick fixes for your gypsy moth problem

Struggling with the effects of the gypsy moth can be frustrating enough without unscrupulous people trying to take advantage of the homeowner by offering quick fixes.

There are no quick fixes, declares Russell Kidd, MSU Extension district forestry agent in Roscommon County.

He advises homeowners to be wary of products or services that promise or imply they can end gypsy moth problems in the backyard or woodlot.

Be careful of salespeople who want to spray your trees with chemicals that are "guaranteed" to control the gypsy moth. In some cases, these may be worthless or even dangerous.

Homeowners should ask what chemical is to be used, its hazard, what its effect will be and what precautions will be taken to minimize spray drift to nearby objects.

Homeowners should also ask to see proof that the company and the individual are certified and licensed to

apply such a material. Michigan law requires that commercial pesticide spraying companies be certified and licensed by the Michigan Department of Agriculture.

Remember that chemical sprays are effective only during the caterpillar stage of the gypsy moth. Spraying trees before the eggs hatch or after the caterpillars have pupated or emerged as adults moths is worthless. (See the gypsy moth life cycle chart).

Be wary of unrealistic claims about products or techniques to rid your property of the gypsy moth by themselves.

Some products, such as sticky bands, are indeed useful, but they will not control the gypsy moth completely, especially when used alone. Only a combination of control treatments, used diligently by the homeowner, will achieve satisfactory control of the gypsy moth.

Other products may not do what their names imply. Take, for instance, the gypsy moth trap. The

purpose of the trap is to attract and capture the adult gypsy moth.

Traps are used to monitor gypsy moth populations. They will not control or eliminate next year's gypsy moth problem in your yard because one adult male moth can mate with many female moths and one or two traps will not capture enough males to interfere with mating or cause the population to decline significantly next year.

Be very careful about timber buyers who offer to buy standing trees that have been defoliated. Unscrupulous timber buyers may use gypsy moth infestations in an area as a scare tactic to persuade people to sell valuable timber at low prices before the tree die.

Timber owners should always consult with professional foresters before they decide to sell any standing timber.

Your county MSU Extension office can provide the names of professional foresters in your area.



Be careful with pesticides!



Use proper recycling procedures for disposing of pesticide containers.

This publication contains pesticide recommendations based on research and pesticide regulations. However, changes in pesticide regulations occur constantly. Some pesticides mentioned may no longer be available, and some may no longer be legal. If you have questions about the legality and/or registration status for using pesticides, contact your MSU Extension county office.

To protect yourself and others and the environment, always read the label before applying any pesticide. For information about pesticide labels see Extension Bulletin E-2182 *Reading a Pesticide Product Label*.

For more information about pesticide safety, see Extension Bulletin E-2215, *Using Pesticides Safely: A Guide for the Applicator*; Extension Bulletin E-1546 *Take Cover! Protect Yourself from Exposure. (Pesticides)*.

For more information about safe disposal of pesticide containers see Extension Bulletin AM-95 *Rinsing and Recycling Pesticide containers*.

Dozens of other Extension bulletins on safe application of pesticides are also available.

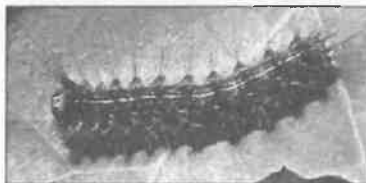
Gypsy Moth Life Cycle

1) Small Larvae. This stage lasts for 7-10 days after eggs hatch in early May (or sooner in warmer weather). Larvae are less than 1.2 inch long and usually black. They linger around the egg cluster for several days if the weather is cool or rainy, then climb trees or other objects, trailing silken threads as they move. When the larvae reach the top of the tree, they do not feed but drop on silken threads and are dispersed by the wind.

2) Large Larvae. Feeding at night for 4 to 6 weeks, large larvae generally rest during the day unless populations are very large, then they wander constantly. They grow until they are about 2 inches long.



1. Small Larvae—May



2. Large Larva—June



3. Pupae—July



4. Adults—August

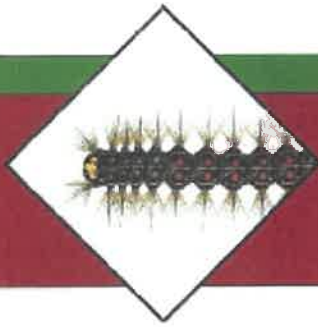


5. Egg masses—August

3) Pupae. During this stationary stage the larvae are changing into moths. This generally occurs from the end of July until early August. After about 10 days in the dark colored pupal cases, the adult moths emerge, leaving the pupal cases behind.

4) Adults. The female moth is creamy white and does not fly but emits a chemical called a pheromone to attract a male moth. The male is brownish and flies in a zigzag pattern looking for the female. A single male can mate with many females. Both sexes have chevron markings (V or notch-shaped marking) on each forewing.

5) Egg masses. The buff-colored egg masses contain between 50 and 1,500 eggs. The female deposits the eggs on any convenient surface. The masses are usually covered with hairs from the female's abdomen. The egg masses are quite cold resistant and can survive temperatures as low as -20 degrees F. Egg masses hatch during May.



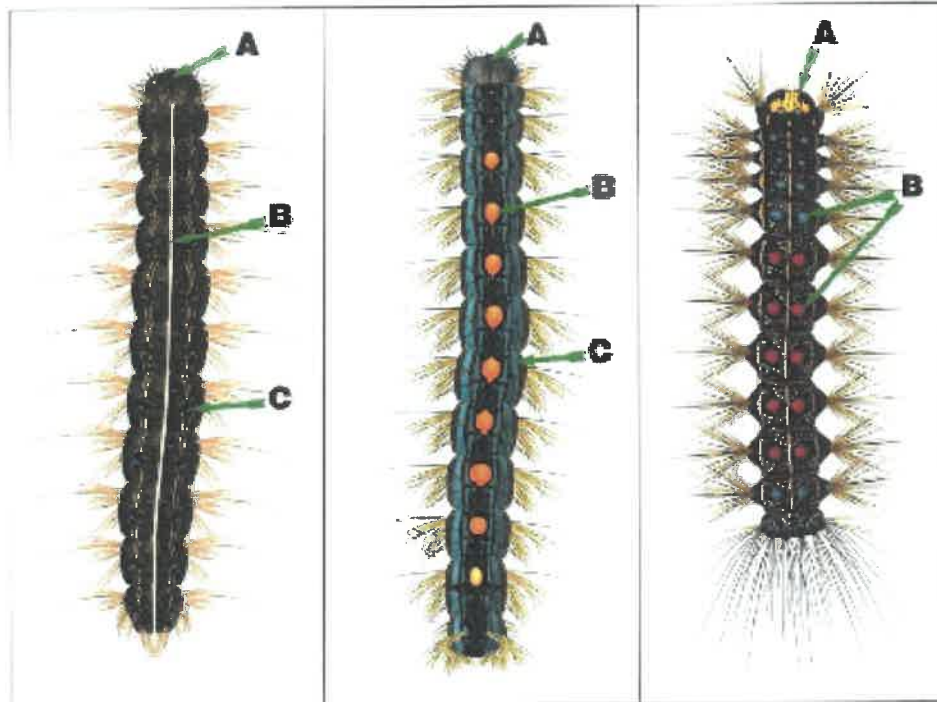
Comparison of the Eastern Tent Caterpillar, Forest Tent Caterpillar and Gypsy Moth

Michigan State University Extension

These three insects are often found feeding on the leaves of hardwood trees early in the summer. They can be easily confused with one another. The illustrations and information here will help you to identify which caterpillar is feed-

ing on your trees. Contact your local MSU Extension office or regional Dept. of Natural Resources office for more information on the biology and management of these insects.

Illustrations by Peter Gernigley

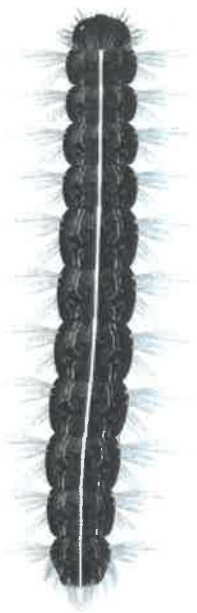

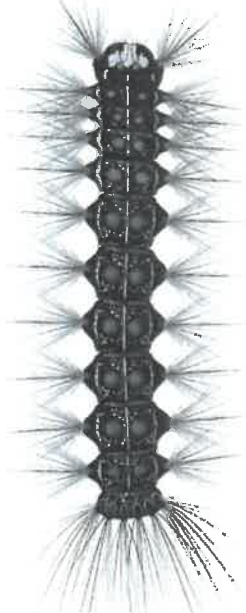





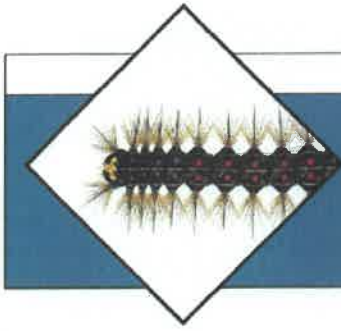
	Eastern Tent Caterpillar <i>Malacosoma americanum</i>	Forest Tent Caterpillar <i>Malacosoma disstria</i>	Gypsy Moth Caterpillar <i>Lymnaea dispar</i>
Markings	A) Dark head; B) prominent white or yellow stripe down the center of the body; C) small blue spots to the side.	A) Blue head; B) prominent central row of white or yellow markings in keyhole or footprint shape; C) bluish on sides of body.	A) Yellow head with black markings; B) prominent blue and red spots.
Tents	Prominent silk tent in branch junction.	They do not spin silk tents; resting sites on leaves may have small silk layer.	No silk tents.

(2002)



Comparison of the Eastern Tent Caterpillar, Forest Tent Caterpillar and Gypsy Moth

	 <p>Eastern Tent Caterpillar (<i>Malacosoma americanum</i>)</p>	 <p>Forest Tent Caterpillar (<i>Malacosoma disstria</i>)</p>	 <p>Gypsy Moth Caterpillar (<i>Lymantria dispar</i>)</p>
Egg Mass	<p>Dark, spindle-shaped mass wrapped around twigs; rough varnished texture.</p> 	<p>Similar to eastern tent caterpillar.</p> 	<p>Tan color; covered with fine hairs; 1 to 3 inches long; usually on tree bark.</p> 
Preferred Host Trees	Black cherry, apple, crabapple.	Aspen, sugar maple, oaks, birch, black gum.	Oaks, aspen, birch, willow and more than 250 other species.
Populations	Native insect; silk tent is unattractive, but feeding rarely harms trees; common pest of ornamental trees in urban settings.	Native insect; outbreaks occur at roughly 10-year intervals and usually last 2 to 4 years; most common in forests, especially where aspen is abundant.	Exotic pest; severe defoliation during outbreaks can occur for 2 to 3 years in urban and forested areas, especially where oaks are abundant.



Entomophaga maimaiga - A Natural Enemy of Gypsy Moth

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The gypsy moth (*Lymantria dispar* L.) is an exotic pest of urban and forest trees. Gypsy moth caterpillars feed on the leaves of oaks, aspens, and many other hardwood and conifer trees. During gypsy moth outbreaks, trees may be completely stripped of leaves. Although gypsy moth caterpillars rarely kill trees by themselves, trees weakened by heavy defoliation may become more susceptible to drought, disease or other insect pests. In addition, the large hairy caterpillars annoy people living or recreating in outbreak areas.

Managing gypsy moth requires the integration of a variety of control tactics. Biological control, the use of natural enemies to control a pest, can be an important part of an integrated pest management program for gypsy moth. One biocontrol agent that has recently shown much promise is a fungal pathogen, *Entomophaga maimaiga*.

Origin of *Entomophaga maimaiga*

Entomophaga maimaiga is a common disease in gypsy moth populations in its native country of Japan. The fungus was first released into the United States near Boston in 1910 as part of a program to introduce natural enemies of gypsy moth. Scientists could find no evidence that the fungus had become established and the project was abandoned a few years later. However, the fungus appeared unexpectedly in several northeastern states in 1989 and caused high mortality in many gypsy moth populations. Although scientists have several theories, the strange reappearance of the fungus is still a mystery.

Entomophaga maimaiga was first brought into Michigan in 1991 by scientists at Michigan State University and the USDA Forest Service. It was released in three sites in northern lower Michigan and monitored closely.

Additional introductions have since occurred and the fungus also is spreading naturally. *Entomophaga maimaiga* has now been found throughout most of Lower Michigan.

Life history of *Entomophaga maimaiga*

Entomophaga maimaiga passes the winter as a tough, thick-walled "resting spore" in the soil and on tree bark. In May and June, resting spores germinate and produce sticky spores at the end of a stalk that grows just above the soil surface. Gypsy moth caterpillars come into contact with these spores in the spring as they search for suitable leaves to feed on. The fungus digests its way through the exoskeleton of the caterpillar and grows inside the body of the caterpillar. Infected caterpillars may die within one week.

When young caterpillars are affected early in the summer, the fungus will produce a second type of spore called conidia. These microscopic spores are spread by the wind and can infect other caterpillars. The cycle of conidia production and infection may occur four to nine times during the summer. When the fungus develops in large caterpillars, it produces the overwintering resting spores.

Weather plays an important role in determining how effective *Entomophaga maimaiga* will be. Like most fungi, its spores need moisture and high humidity to germinate. Frequent rainfall during May and June contributes to the start and spread of *Entomophaga maimaiga* through a gypsy moth population. Temperatures of 50 to 80 degrees F enhance fungal growth.



Entomophaga maimaiga – A Natural Enemy of Gypsy Moth



Figure 1. Gypsy moth larva killed by NPV hanging in an inverted "V" position.



Figure 2. Dead larva covered with conidia of *Entomophaga maimaiga*.



Figure 3. Larvae killed by *Entomophaga maimaiga* often remain attached to trees.

Distinguishing *Entomophaga maimaiga* from NPV

Another disease is common in outbreak populations of gypsy moth. NPV (nuclearpolyhedrosis virus) is a virus disease that often causes gypsy moth outbreak populations to collapse. One important difference between the two diseases is that NPV is seldom prevalent until gypsy moth populations reach very high levels. In contrast, *Entomophaga maimaiga* may be found even when gypsy moth populations are low.

Caterpillars killed by NPV often remain attached to the stem or branches of trees. The bodies of the dead caterpillars are soft, filled with a brown liquid and disintegrate rapidly. Usually they hang limply in an upside-down "V" position (Fig. 1).

Caterpillars killed by *Entomophaga maimaiga* will also remain attached to tree stems or branches. However, the bodies tend to be stiff and straight, and the legs extend stiffly from the body. Some of the dead caterpillars may have tiny white conidia attached to the hairs on the body (Fig. 2). The cadavers may remain on the stem well into autumn (Fig. 3).

The future of *Entomophaga maimaiga*

Entomophaga maimaiga may become an important biological control of gypsy moth in both low and high populations. Infections may be more common in years with rainy spring weather than in years with dry spring weather. Scientists have found that the fungus is established in a number of areas in Michigan. Laboratory and field studies have shown that *Entomophaga maimaiga* is host specific and poses little risk to other insect populations. It will not affect other animals or humans. Introductions and evaluation will continue. Although there is not likely to be any "silver bullet" for gypsy moth, *Entomophaga maimaiga* should improve our ability to manage this pest in Michigan.

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Gypsy Moth Populations Growing

Robert Bricault, MSU Horticulture Educator

One of the hardest lessons I learned over the years is that information taught in the past may not be remembered tomorrow. Gypsy Moth management was the central focus of my career from 1985 through 1999. I worked in landscaping in Midland and Isabella Counties when Gypsy Moths caused the first defoliation in Michigan in 1985. During the 1990's the insect moved into Southeast Michigan where it continued it's destructive pattern of ravenous eating, stripping thousands of trees of their leaves.



By 1994, Extension worked with the Michigan Department of Agriculture mapping out areas with large Gypsy Moth egg mass counts for aerial spraying with the bacteria, Bt (*Bacillus thuringiensis*). Bt did not kill the caterpillars quickly, but made them sick by changing the pH in their stomachs. Eventually they stopped eating and starved to death.

Bt helped to reduce the population not eliminate it, giving parasites, predators and pathogens a chance to develop. A pathogen called NPV, nucleopolyhedrosis virus, began killing large number of caterpillars leaving them hanging in an upside down V on tree trunks. Unfortunately, NPV only worked well when populations of the insect were very high. A real break came when a soil borne fungus, *Entomophaga maimaiga* started to kill off large numbers of caterpillars in midsummer leaving them hanging straight down on tree trunks. The fungus was effective even in sites with low numbers of Gypsy Moths present. The fungus spreads during periods of consistent rainfall in late spring and early summer. Gypsy Moth populations have been at very low numbers for the past eight years in Washtenaw County mostly due to the *Entomophaga* fungus.

The drought of 2007 reduced the development of the fungus allowing more caterpillars to survive, change into moths and lay eggs. The increasing population of caterpillars led to localized defoliation of trees. The worst damage was on Blue Spruces. Fortunately, we did experience good rainfall in June 2008, allowing the *Entomophaga* fungus to spread and kill many caterpillars. Enough Gypsy Moth did survive in 2008 to produce larger numbers of egg masses than we have seen in over six years. This may cause some localized defoliation of trees again this coming summer, increasing the need to educate residents on managing this pest.

Gypsy moth eggs hatch in mid spring usually about the time serviceberry is in bloom. People often confuse Gypsy Moth with other caterpillars that make tents or webs in trees. Gypsy Moth can hang from silk like strands from a branch but do not make webbed tents. They can spread by wind while hanging from this thread. At this early stage they are susceptible to Bt. Bt works well on young caterpillars, but is ineffective once they get beyond an inch long. Trees can be banded with burlap to trap caterpillars that seek shelter under the burlap during the day. Unfortunately, in blue spruces it is

hard to manage them through banding. Once in the moth stage Gypsy Moth does not feed. The brown male moths can be seen flying around searching for the white female moths that do not fly. The female leaves behind buff colored egg masses that are easy to see.



Fall and winter are great times to go hunting for the buff colored egg masses in trees. If you have spruces check under the branches for the egg masses. If you find egg masses on structures, outdoor furniture or trees, knock them off into soapy water. This sanitation practice greatly reduces the number of caterpillars the following year. Some of their favorite trees include oak, birch, apple, willow, hawthorn, white pine, blue spruce, serviceberry and poplars, but they will eat leaves from maples and other trees that are not their most preferred species. If large populations are found damaging trees it may become necessary to treat the trees with an insecticide. The greatest risk is to evergreens like blue spruces and white pines that do not come back from defoliation as well as deciduous trees will. If using a pesticide make sure it is labeled for control of Gypsy Moth.



We are often asked why the county is not still part of the state's suppression program. The need for the program in Washtenaw and across Michigan declined as Gypsy Moth levels dropped very low across the state. The State's Suppression program actually ended in 2006 and also the availability of federal dollars to assist communities in aerial spray programs. The suppression program did what it was supposed to do, reducing the insects population long enough for other forces that help control Gypsy Moth to develop in our ecosystem.

Through careful monitoring, sanitation practices, banding as well as localized pesticide treatment, you can help to keep Gypsy Moth in check while allowing natural pathogens, predators and parasites to gain back a balance of control. Our hope is that nature will continue to keep Gypsy Moth populations at low levels in most years and eliminate the need for large scale spray programs. If you find large local Gypsy Moth infestations please share this information with the Horticulture staff at the MSU Extension office: 734 997-1678 or contact the Master Gardener Hotline from mid April through October at 734 997-1819.

**Gypsy moth and gardening questions phone:
Washtenaw County, MSU Extension
Master Gardening Hotline at: 734 997-1819**

**Master Gardener Volunteers are available:
mid April through October
Monday through Thursday
9:00 a.m. – 12:00 noon
1:00 p.m. – 4:00 p.m.**

At other times phone the MSU Extension office at 734 997-1678

Bacillus thuringiensis

Fact Sheet No. 5.556

Insect Series | Home and Garden



by W.S. Cranshaw*

Bacillus thuringiensis (Bt) is an insecticide with unusual properties that make it useful for pest control in certain situations. Bt is a naturally occurring bacterium common in soils throughout the world. Several strains can infect and kill insects. Because of this property, Bt has been developed for insect control. At present, Bt is the only “microbial insecticide” in widespread use.

The insecticidal activity of Bt was first discovered in 1911. However, it was not commercially available until the 1950s. In recent years, there has been tremendous renewed interest in Bt. Several new products have been developed, largely because of the safety associated with Bt-based insecticides.

Properties

Unlike typical nerve-poison insecticides, Bt acts by producing proteins (delta-endotoxin, the “toxic crystal”) that reacts with the cells of the gut lining of susceptible insects. These Bt proteins paralyze the digestive system, and the infected insect stops feeding within hours. Bt-affected insects generally die from starvation, which can take several days.

Occasionally, the bacteria enter the insect’s blood and reproduce within the insect. However, in most insects it is the reaction of the protein crystal that is lethal to the insect. Even dead bacteria containing the proteins are effective insecticides.

The most commonly used strain of Bt (*kurstaki* strain) will kill only leaf- and needle-feeding caterpillars. In the past decade, Bt strains have been developed that control certain types of fly larvae (*israelensis* strain, or Bti). These are widely used against larvae of mosquitoes, black flies and fungus gnats.

More recently, strains have been developed with activity against some

leaf beetles, such as the Colorado potato beetle and elm leaf beetle (*san diego* strain, *tenebrionis* strain). Among the various Bt strains, insecticidal activity is specific. That is, Bt strains developed for mosquito larvae do not affect caterpillars. Development of Bt products is currently an active area and many manufacturers produce a variety of products. Effectiveness of the various formulations may differ.

Disadvantages

Bt is susceptible to degradation by sunlight. Most formulations persist on foliage less than a week following application. Some of the newer strains developed for leaf beetle control become ineffective in about 24 hours.

Manufacturers are experimenting with several techniques to increase its persistence. One involves inserting Bt toxic crystal genes into other species of bacteria that can better survive on leaf surfaces (e.g., the M-Trak formulation of *san diego* strain).

The highly specific activity of Bt insecticides might limit their use on crops where problems with several pests occur, including nonsusceptible insects (aphids, grasshoppers, etc.). As strictly a stomach poison insecticide, Bt must be eaten to be effective, and application coverage must be thorough. This further limits its usefulness against pests that are susceptible to Bt but rarely have an opportunity to eat it in field use, such as codling moth or corn earworm that tunnel into plants. Additives (sticking or wetting agents) often are useful in a Bt application to improve performance, allowing it to cover and resist washing.

Since Bt does not kill rapidly, users may incorrectly assume that it is ineffective a day or two after treatment. This, however, is merely a perceptual problem, because Bt-affected insects eat little or nothing before they die.

Bt-based products tend to have a shorter shelf life than other insecticides.

Quick Facts

- *Bacillus thuringiensis* (Bt) is a naturally occurring bacterial disease of insects. These bacteria are the active ingredient in some insecticides.
- Bt insecticides are most commonly used against some leaf- and needle-feeding caterpillars. Recently, strains have been produced that affect certain fly larvae, such as mosquitoes, and larvae of leaf beetles.
- Bt is considered safe to people and nontarget species, such as wildlife. Some formulations can be used on essentially all food crops.
- Bt is used in agriculture as a liquid applied through overhead irrigation systems or in a granular form for control of European corn borer.

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Figure 1: Alfalfa webworms killed by *Bacillus thuringiensis*.

Manufacturers generally indicate reduced effectiveness after two to three years of storage. Liquid formulations are more perishable than dry formulations. Shelf life is greatest when storage conditions are cool, dry and out of direct sunlight.

Advantages

The specific activity of Bt generally is considered highly beneficial. Unlike most insecticides, Bt insecticides do not have a broad spectrum of activity, so they do not kill beneficial insects. This includes the natural enemies of insects (predators and parasites), as well as beneficial pollinators, such as honeybees. Therefore, Bt integrates well with other natural controls. For example, in Colorado, Bt to control corn borers in field corn has been stimulated by its ability to often avoid later spider mite problems. Mite outbreaks commonly result following destruction of their natural enemies by less selective treatments.

Perhaps the major advantage is that Bt is essentially nontoxic to people, pets and wildlife. This high margin of safety recommends its use on food crops or in other sensitive sites where pesticide use can cause adverse effects.

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Table 1. Primary strains of *Bacillus thuringiensis* used in managing insects.

<i>Bacillus thuringiensis</i> strain (Common name)	Susceptible insects
<i>aizawi</i>	Many Lepidoptera larvae
<i>kurstaki</i>	Many Lepidoptera larvae
<i>israelensis</i>	Larvae of mosquitoes, black flies, fungus gnats
<i>japonensis</i>	Larvae of scarab beetles (Coleoptera: Scarabaeidae)
<i>tenebrionis</i> (sandiego)	Larvae of leaf beetles (Coleoptera: Chrysomelidae)
<i>CryIAb delta-endotoxin</i> ¹	Many Lepidoptera larvae
<i>Cry3Bb1 variant</i> ¹	Corn rootworm larvae (Coleoptera: Chrysomelidae)

¹Only used in production of genetically modified crops

Insects Controlled by Bt

Kurstaki strain (Biobit, Dipel, MVP, Steward, Thuricide, etc.):

Vegetable insects

- Cabbage worm (cabbage looper, imported cabbageworm, diamondback moth, etc.).
- Tomato and tobacco hornworm.

Field and forage crop insects

- European corn borer (granular formulations have given good control of first generation corn borers).
 - Alfalfa caterpillar, alfalfa webworm.
- Fruit crop insects
- Leafroller.
 - Achemon sphinx.

Tree and shrub insects

- Tent caterpillar.
- Fall webworm.
- Leafroller.
- Redhumped caterpillar.
- Spiny elm caterpillar.
- Western spruce budworm.
- Pine budworm.
- Pine butterfly.

Israelensis strains (Vectobac, Mosquito Dunks, Gnatrol, Bactimos, etc.)

- Mosquito.
- Black fly.
- Fungus gnat.

San diego/tenebrionis strains (Trident, M-One, M-Trak, Foil, Novodor, etc.)

- Colorado potato beetle.
- Elm leaf beetle.
- Cottonwood leaf beetle.

Application

The greatest use of Bt involves the *kurstaki* strain used as a spray to control caterpillars on vegetable crops. In addition, Bt is used in agriculture as a liquid applied through overhead irrigation systems or in a granular form for control of European corn

borer. The treatments funnel down the corn whorl to where the feeding larvae occur.

Many formulations (but not all) are exempt from pesticide tolerance restrictions and may be used up to harvest on a wide variety of crops. This also makes Bt useful in applications where pesticide drift onto gardens is likely to occur, such as treating trees and shrubs. The exceptional safety of Bt products also makes them useful where exposure to pesticides is likely during mixing and application.

To control mosquito larvae, formulations containing the *israelensis* strain are placed into the standing water of mosquito breeding sites. For these applications, Bt usually is formulated as granules or solid, slow-release rings or brickettes to increase persistence. Rates of use are determined by the size of the water body. Make applications shortly after insect eggs are expected to hatch, such as after flooding due to rain or irrigation. Bt persistence in water is longer than on sun-exposed leaf surfaces, but reapply if favorable mosquito breeding conditions last for several weeks. Although the *israelensis* strain is quite specific in its activity, some types of nonbiting midges, which serve as food for fish and wildlife, also are susceptible and may be affected. For information on mosquito control, see fact sheet 5.526, *Mosquito Management*.

Use of Bt (*israelensis*) for control of fungus gnat larvae involves drenching the soil. Bt applied for control of elm leaf beetle or Colorado potato beetle (*san diego/tenebrionis* strain) is sprayed onto leaves in a manner similar to the formulations used for caterpillars. Bt does **not** control shore flies, another common fly found in greenhouses.

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