

# Analysis of Gainer Plat Flooding Issues and Solutions

Allegan County Land Information Services – 11/15/2010

## Findings:

The water table in the county tends to rise and fall cyclically and we are currently in a high water table phase. As a result, there is a significant amount of standing water in the pond on the north side of 110<sup>th</sup> Ave and runoff from any significant rainfall event is quickly filling the pond to its pour point of 745ft at which time water starts to flow across 110<sup>th</sup> Ave causing flooding in the backyards of the first four houses along the east side of Gainer Rd south of 110<sup>th</sup> Ave. In 2004, aerial imagery shows the pond was nearly dry, 1999 imagery shows there to be roughly ½ as much water as today. During drier periods, the pond has a greater ability to absorb significant amounts of runoff before water begins to flow across the road (LIS – Topography and Aerial Imagery Interpretation)

Due to the surrounding topography, the only viable outlet for water from the pond (natural flow or engineered flow) is across 110<sup>th</sup> Ave (LIS – Topographic Site Evaluation).

There is currently no culvert under 110<sup>th</sup> St (from Bill Nelson – Road Commission).

The inlet to the pond is on the east side where it enters via a couple of culverts from the east side of the Consumers Power corridor (LIS - Aerial Imagery Interpretation).

The local topography makes the area susceptible to flooding and the area along Gainer Rd is generally not well suited for residential development (LIS – Topographic Site Evaluation)

During rain events, after flooding first four properties, water generally flows overland to the southeast until it hits Gainer Rd. Water then flows along Gainer Rd south to the end and then spills into the wetland south of the subdivision (from Bill Nelson – Road Commission)

Water from the McVean drain outlets through the culvert at 112<sup>th</sup> Ave. During low water table years, water is absorbed and retained through series of stepped wetlands between 112<sup>th</sup> Ave and 110<sup>th</sup> Ave connected by a culvert under 10<sup>th</sup> St. However, there is a fairly clear channel between 112<sup>th</sup> and 110<sup>th</sup> that facilitates rapid drainage of this area.

Distances along the drainage route are as follows:

7500 feet from upper end of watershed to beginning of McVean Drain.

5350 feet along McVean Drain to beginning of McVean Drain Extension.

3770 feet along McVean Drain Extension to end of drain at 112<sup>th</sup> Ave. culvert.

6700 feet through wetlands and overland flow to pond on north side of 110<sup>th</sup> Ave.

3350 feet overland flow to wetland at south end of Gainer Plat.

5650 feet overland flow along swale through fields to Gun River.

Drainage areas for portions of the watershed are as follows:

Outlet	Drainage Area (square miles)	Cumulative (square miles)	Cumulative Percentage (%)
McVean Drain	0.947	0.947	20
McVean Drain Ext	1.298	2.245	50
Pond (N. side of 110 <sup>th</sup> Ave	1.349	3.594	80
South end of Gainder Plat	0.444	4.038	90
Gun River	0.478	4.516	100

**Below are evaluations of the options presented:**

- 1. Dredge Lake or Pond** – This is not likely to be a viable option. Given that approximately 80% of the watershed (3.6 square miles of land) drains into the relatively small pond, it seems like extensive dredging of the pond would be needed to absorb any significant amount of water. The pond also appears to be a sinkhole with steep sides making it difficult to get heavy equipment into the site. Also, there would be no on-site location to put the dredged material necessitating trucking and disposal one dump-truck at a time. Dredging may also precipitate the slumping of surrounding lands including 110<sup>th</sup> Ave towards the pond.
- 2. Build a dam out of the road** – This is not likely to be a viable option. Standard engineering practices do not recommend making dams out of roads, especially if they don't include an outlet. Raising the road bed would require extensive fill due to the steep bank and close proximity of the pond on the north side of 110<sup>th</sup> Ave. In addition, if the water level continued to rise behind the created dam, it would exert increasing pressure on the roadway with the risk of a catastrophic failure / breach resulting in extensive damage to the road, residential structures and properties downstream. Given the steep nature of the terrain on the north side of 110<sup>th</sup> Ave., the cost of constructing an adequate dam to mitigate the risk of a catastrophic failure would likely exceed the cost of other alternatives.
- 3. Petition to Extend the McVean Drain to the Gun River.** This is a viable though costly option. It would entail the installation of at least two culverts and establishing three miles of new drain. In actual terms, the upper end of this new drain already has a fairly well established channel between 112<sup>th</sup> Ave and 10<sup>th</sup> St. From 10<sup>th</sup> St., there is flow through a wetland south east through a possible culvert to a wetland on the east side of the Consumers Energy corridor. From there, a creek runs south about 2,000 feet before

turning west and running through a couple of culverts into the pond. It is likely that very little if any engineering work would be needed through this upper section. From a new culvert under, 110<sup>th</sup> Ave. an open drain would have to be constructed through the Gainer Plat and then on further to the Gun River. Two routes could be considered:

- a. Extend drain 5650 feet using to the Gun River by excavating new ditches and connecting existing drainage if existing capacity was inadequate.
- b. Put a closed drain through the hill south of the Gainer Plat and then run an open ditch directly south to the Gun River. The total distance would be about 3,800 feet from the wetland instead of 5650 feet across the fields to the east. However, it would entail getting permission from Consumers Energy to bury a 1,300 foot long underground drain to connect the 736 ft contours between the north and south sides of the hill. 700 feet of this would need to be excavated to a depth of at least 10 feet to achieve the slope necessary for drainage. It appears that this hill has been partially excavated already to accommodate the power lines as the cut is about 15 feet deep and 20 feet wide at the bottom and it is not certain that this can be excavated further, even on a temporary basis until the drain is buried. This option would eliminate most of the lands east of the Consumers Energy corridor that lie south of 110<sup>th</sup> St. from the assessment district. Intuitively, it seems that costs would be considerably higher in terms of the excavation needed through the hill and the material costs of the 1,300 feet of closed drain needed as opposed to the additional 1,850 feet of open drain needed to follow the route described above.

Both solutions would require a petition to extend the McVean Drain (see process notes below).

4. **Put culvert under 110<sup>th</sup> Ave. to drain water through Gainer Plat as a Road Commission Project, Township Project or Petition to create a new County Drainage Assessment District.** Almost identical to the solution above, it should be possible to put a culvert under 110<sup>th</sup> Ave and engineer open or closed drainage through the Gainer Plat to gradually drain water from the pond on the north side of 110<sup>th</sup> Ave to an acceptable level that can accommodate a specific amount of runoff and mitigate flooding to the four properties currently affected. The culvert under 110<sup>th</sup> Ave could be sized to limit the flow and situated at a height to drain the pond down to an acceptable level without affecting downstream properties. At the downstream end, the receiving wetland is no larger than the pond being drained (each is about 0.025 square miles in surface area) and there is some risk that this solution may simply move the flooding issue further downstream. It is not known if there is a culvert connecting this southern wetland with the natural drainage on the east side of the Consumers Energy corridor although it

appears that there should be one from the aerial imagery. If there is a culvert and it has adequate capacity, then this solution might alleviate the flooding problem without causing new issues further downstream. The main issue with this solution is one of payment, equity and maintenance. Without including the Gainder Plat in a county drainage assessment district, the initial costs would need to be borne by the residents, the township, the road commission or a combination thereof. However, there would be no long term mechanism to pay for regular maintenance and repair of the drain. Alternately a petition could be submitted to establish a new drainage district just for the Gainder Plat. It is not clear where the assessment district boundary would fall if a new drain district is established (see process notes below)

5. **Put retention ponds in to slow water and reduce amount of water filling the pond.** This option may be feasible although the flood control structure would have to be north of 112<sup>th</sup> St in the McVean Drainage District. The terrain between the downstream end of the McVean drain and the pond is gently sloping wetland. As a result, trying to create small dams anywhere through this stretch doesn't create significant storage capacity without threatening additional properties and public infrastructure with flooding. Given the steep terrain through this section on either side of the wetlands, there aren't any good locations to put in a retention pond of an adequate size to make a difference in flow rates and again there is the question of who will pay the bill. The only location where some kind of retention may be possible is in the wetland at the downstream end of the McVean Drain on the north side of 112<sup>th</sup> Ave. This is a large wetland and there do not appear to be any structures within close proximity elevation-wise to the base elevation of the wetland. It may be possible to create a flood control structure just upstream of 112<sup>th</sup> Ave. to store some water in this +/-0.1 square mile wetland and reduce/regulate downstream flow which is currently significant through the culverts under both 112<sup>th</sup> Ave and 10<sup>th</sup> St. Even with a flood control structure, it may still prove necessary to put a culvert under 110<sup>th</sup> Ave and control drainage through the Gainder Plat. It is not clear what changes (if any) would be needed to the McVean Drain District to fund the construction of such a flood control structure if an engineering study found this to be a feasible solution.
6. **Pursue FEMA grants to buy houses that are flooded.** It doesn't appear that this is viable. Under the Flood Mitigation Assistance (FMA) Program, FEMA does offer Project Grants, but their intent is to reduce or eliminate claims under the National Flood Insurance Program (NFIP). The Project Grants can be used to implement measures to reduce flood losses, such as elevation, acquisition, or relocation of NFIP-insured structures. Priority is given to repetitive loss properties (structures with 2 or more losses each with a claim of at least \$1,000 within any ten-year period since 1978). While Gun Plain Township is an NFIP participant thereby making flood insurance available to any residents on a voluntary basis, the project grants would only be available if any of the

affected homeowners have flood insurance (and in this case all four would need it to fully solve the flooding issue). Given the cost of flood insurance, homeowners typically don't purchase it unless required, but it could be explored. The approximate value of the four properties combined is about \$300,000.

7. **Pursue Hazard Mitigation Grant Program (HMGP) through State Emergency Management and Homeland Security Division?** Grants may be available to acquiring and relocating flood prone structures but these may be difficult to obtain if the actual structures aren't being significantly affected in a repetitive way. The township would have to apply for the HMGP grants. Applications are filed and funds are released to selected projects whenever there is a disaster declaration in Michigan. Information is available at: [http://www.michigan.gov/msp/0,1607,7-123-1593\\_3507\\_8950-15282--,00.html](http://www.michigan.gov/msp/0,1607,7-123-1593_3507_8950-15282--,00.html)
8. **Purchase affected properties without FEMA funds.** Given the approximate value of the properties at about \$300,000 it may be more cost-effective to acquire the properties and turn the area into a park or natural area as an alternative to spending funds on an engineered drainage solution. The area is likely plagued by a high water table regardless of the direct flooding from pond overflow. The homeowner's willingness to sell their property would need to be explored and a determination made on who would fund the acquisition.
9. **Establish a method and procedure for pumping water out of the pond as needed to mitigate flood risk.** It may be feasible to pump water out of the pond to lower water levels and increase the pond's ability to retain storm runoff without flowing across 110<sup>th</sup> Ave. A water elevation level would need to be established at which pumping would be initiated to bring the level down to an established minimum at which time pumping would be stopped. A couple of keys to this solution are establishing the minimum and maximum water surface elevations for the pond, finding a suitable outlet for pumping water to (may require a small culvert under 110<sup>th</sup> Ave to carry the outlet pipe), calculating how long it will take to pump out the needed water, and who would pay for and operate the pumping equipment. The County Drain Commission limits its activities to passive solutions and would not be willing to take on the responsibility of operating and maintaining pumping equipment. Potentially, the township and or the road commission may be able to fund and contract with someone to operate the equipment on a one-time basis to reduce the water level. With a bit of work, this may be a fairly low cost solution that has a potential to resolve the issue for quite some time although the pump itself may be somewhat of a noise nuisance for a period of time. Some rough calculations are as follows: The surface of the pond is about 500,000 square feet and there are 7.5 gallons of water per cubic foot. Thus, to lower the water surface by 1 foot

using a pump operating 24 hours a day (a bit unrealistic given the need to refill the gas tank numerous times a day, it would take from 2.5 days with a 1,000 gallon per minute pump to around 6 days with a 430 gallon per minute pump. The pumping capacity would need to be carefully matched with the capacity of the outlet area to absorb and manage the discharge.

10. **Do nothing.** While easily done, this should probably be an option of last resort until all other options have been exhausted in terms of feasibility and cost.

**Additional considerations:**

- Any solution involving constructing drainage across private property would require the acquisition of easements from affected property owners.
- Any solution involving changing water levels in wetland areas would likely require approval from the DNRE.
- Any solution that involved the potential to raise water levels even temporarily would require floodplain easements.

**Petition process (Confirm with Drain Commissioner):**

***To extend the McVean Drain***

Petition needs five signatures and a deposit, it then goes to a Board of Determination without a preliminary analysis. Decision by Board is binding.

***To create a new district:***

Two step process. First is an application with 10 signatures from people liable for assessment with a preliminary petitioner's deposit. An engineering study is conducted to determine feasibility, route and course. Then a second petition is needed with signatures from 50% of the traversed property owners. If collected, the petition goes to a Board of Determination for a binding decision. Application and petition can be handled by the municipality.