Ingham County Drain Commissioner's Response to City of Lansing Park Board Request for Clarification Re: Groesbeck Park Drain Drainage Project

January 27, 2016

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Photo taken by Drain Commissioner Pat Lindemann at Bancroft Park, City of Lansing. (2008)

Drain Commissioner's Response; General History of Groesbeck Park Drain Project

This is a response to your letter dated January 14, 2016 requesting clarification relative to the Groesbeck Park Drain Project. While all the issues and the answers to them have been discussed many times over, this communication reviews the underlying need for this project, along with the terms of the contract and easements given by the City of Lansing that have been agreed to and approved by the Park Board of the City of Lansing, Lansing City Council and the Mayor of the City of Lansing.

It must also be noted that the public has also agreed and concurred with the scope of this project. There were dozens and dozens of meetings and public hearings that were attended by property owners in the district (residential and the commercial). Many dessisions in the court system at many levels have upheld this project, including two by the Michigan Supreme Court. Meetings where also held at various locations, including on site at Bancroft Park, and Foster Community Center on Lansing's east side, and they were well attended by the general public outside of the drainage District.

I apologize if throughout the course of this document I repeat some statements. But I believe they need to be repeated.

Many years of hard work have been devoted to understanding the complexities of designing a flood abatement project for the Groesbeck Park Drain. One of the most important activities undertaken was to ensure that all interest groups were heard, and resolutions to their concerns integrated into project plans. For over fifteen years, my staff and I have met with all interested stakeholders, groups and individuals, to hear them and design a project that answers their concerns.

Stakeholder concerns are unique and complicated. As you can imagine, the solutions are equally unique and complex. While we, the project planners, sought to develop acceptable solutions to all concerns, it is impossible to satisfy every individual's concerns or wishes completely. We are, however, pleased that, through our fifteen years of effort, this project comes extremely close to satisfying most of our stakeholders' concerns.

Flooding in Medical Building Parking Lot on Lake Lansing Road

Pat's Definition of a Watershed 1996

A watershed is a system of many complex and interrelated sets of an ecosystem (layers) that are interdependent on a common flow of energy, material transport (waste removal), and nutrient input and output as a result of water collection, storage and movement.

Because of the complexity of the plans for this project, changing one part of it changes every other part. A truer statement was never said than "every action has an equal and opposite reaction," (Newton's 3rd law of the laws of motion). That phrase is appropriate to this discussion because it is important to understand that the water budget for this project has been carefully calculated. Changes at this stage will have significant dollars-and-cents implications, as well as negative ecological impacts. The current plan, developed in keeping with stakeholder comments, would be compromised by every change made to it.

Flooding south of Lake Lansing Road and North of Bancroft Park (the park can be seen by the trees in the back round)

To best understand this, we should take a moment to understand the existing problem. This watershed was largely undeveloped in the

Drain Commissioner's Response, *cont.*

1940s. With region-wide development in the 50s, 60s and 70s, the need for sand and gravel was great. The Mason Esker was easy to mine and brought a fair amount of profit. The Esker's stratified glacial sand and gravel deposits were mixed with cement to satisfy growth in the nearby area during the above-mentioned decades. Prior to that development, the watershed had very little stormwater run-off due to the porosity of the sand and gravel that made up the stratified Esker and the surrounding soils.

As more and more development occurred in this watershed, greater volumes of polluted stormwater runoff also occurred. Increasing imperviousness in this watershed created a major flooding problem. Stormwater and snow melt now moves more quickly and, with no place else to go, travels directly to the gravel pit created by the mining operation in the northwest corner of Bancroft Park. This pit was dug in the 1950s and lies immediately south of the Lansing Board of Water & Light's (LBWL) contaminated gravel-pit/landfill/ash-pit. Once at the Esker, polluted stormwater runoff makes a straight flow line to the source of our drinking water. As the polluted water recharges into the ground, it creates significant head pressure that forces the existing pollution plumes from the Board of Water & Light's ash-pit and the Goodyear landfill along a southwest gradient. This pushes pollution further into the groundwater table, putting us all at risk.

Flooding on Lake Lansing Road

Both the Goodyear contaminated site and the LBWL contaminated site have been or are being stabilized and/or mitigated, (docs starting on page 21). The LBWL ash-pit has been contained with a bentonite slurry wall at an approximate cost of $4.6 million. The Goodyear firm is spending more than $60 million over the next 20-30 years to extract pollution from the aquifer and clean the water. The cleaned water will be discharged into the new outlet structure for the Groesbeck Park Drain, for ultimate discharge to the river.

Increased imperviousness in the watershed has greatly increased surface water flow volumes into Bancroft Park. These new flows from stormwater runoff are polluted. Currently, the only outlet for this polluted runoff is into the groundwater at the northwest corner of Bancroft Park. This drainage project is part of a more permanent solution to the groundwater pollution problem in our drinking-water aquifer. Goodyear has made an initial payment of $80,000 and will continue to pay an annual fee to rent space in the Groesbeck Park Drain discharge outlet to the Grand River.

The impetus for this project is to mitigate flooding that has damaged property and poses an ongoing risk to the health, safety and welfare of residents of and visitors to the Lansing Township and the City of Lansing. The Groesbeck Park Drain Project design elements include a berm that is necessary to preserve a large wetland site, as required by the Michigan Department of Environmental Quality (MDEQ.) The berm is part of collection and filtration systems throughout the site that will contain and redirect increased stormwater flows to the new outlet located at Lake Lansing Road, so that they do not further pressure an already contaminated subsurface aquifer. This is critical to understanding the need for this project.

We are so lucky to be in a country where we take for granted the lack of environmental threats. We think that we are safe, but are we? When drinking water, flood control, sewage removal and transportation systems are jeopardized or break down, we are not safe at all. This project and its water budget are precariously perched in a balancing act that can be disrupted by design changes. The current plan prevents the recharging of polluted surface water into the drinking water we count on for the quality of life we now enjoy. Again, this plan was developed as a result of a decade and a half of public engagement.

Now, after countless public hearings and two Michigan Supreme Court decisions affirming the validity of the project, we are hearing concerns from Mr. Potter and his very small number of followers. His concerns include, but are not limited to, the construction of a paved path that would provide ADA-compliant access

Drain Commissioner's Response, *cont.*

to the park, the building of the berm designed to protect the perched wetland, and the relocation of the Groesbeck Golf Course 7th tee. As noted above, the berm is the last line of defense for our drinking water supply. This seemingly-small part of the project is included in the MDEQ wetland permit and cannot be changed without jeopardizing the successful outcome of the project as a whole, not to mention the very real potential it has to damage our groundwater supply.

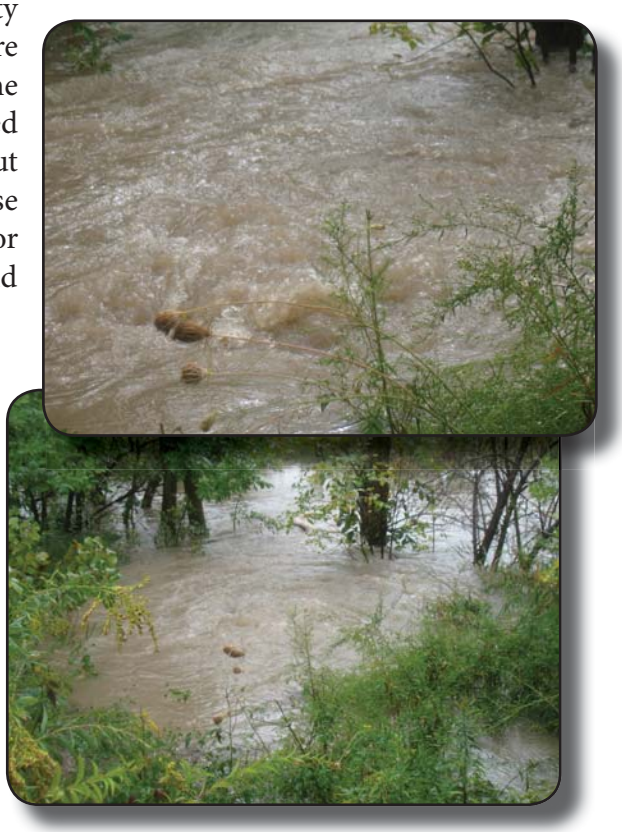
Photographed by Drain Commissioner Lindemann at Bancroft Park, 2008

Consider Flint, Michigan's drinking water supply and its contamination. This urban disaster is a perfect example of what happens when we compromise our commitment to protecting our water resources. This project was designed and will stand as a way to mitigate flooding in a way that also protects our drinking water, enhances fragile ecosystems, while allowing economic development to flourish.

Mr. Potter has said much that is misleading. His accusations are many, yet there is little truth to them. He would have you believe that this project will harm the Bancroft Park portion of the Groesbeck Park Drain in some way. The purpose of this document is to clarify the underlying issues and uncover the untruth to his statements.

Photographed by Drain Commissioner Lindemann at Bancroft Park, 2008

First, Mr. Potter is not, as he has claimed to be, a representative of any of the neighborhoods (Groesbeck, Bancroft, and Eastside) that surround this project. Neither does he represent the citizens of the City of Lansing that are the owners of the Park. He is entitled to his opinion, but he has no expertise of which I am aware that would entitle him to deference for his claim to representation of the public. He is entitled to and should represent himself.



Millions of gallons of polluted stormwater flow uncontrolled into and through the park as a result of increased imperviousness

This park is one of a few preserved portions of the Mason Esker. The Esker functions as a direct gateway to the groundwater. The surrounding park offers a widely diverse habitat niche for many wonderful creatures native to Michigan. The plant life here is unique and in danger of being damaged or destroyed. These native plants need to be protected. Included with this document is our descriptive inventory listing some of the Midwest flowers that live there.

All of these are in danger of being lost, if not guarded. I have been visiting this park since I was 8 years old. I know its unique qualities very well.

Opportunities to provide habitat niches within the scope of this design were considered with a great deal of care and seriousness. Any ecosystem is just that, a system. To be whole, the plant and

animal communities within it need an opportunity to thrive. This project, including the paved path, provides that opportunity.

Some may argue, as Mr. Potter has, that the area should not be touched and the paved path not constructed because Bancroft Park is a natural ecosystem. This argument is wrong. The ecosystem in this park is drastically altered from its natural state. Numerous human activities have already fundamentally affected this system. Millions of gallons of pollutted water are being forced through this park that would have never gone there without human activities such as the digging of sand and gravel, clear-cutting timber in the area, and commercial or residential development. The negative impacts caused by these increased flows are what this project was designed to stop.

The park can, with careful planning, survive and become more like it was before we the people changed it. It could be the jewel of Lansing's park system. If we fail to execute the mitigation this plan would implement, we are in danger of destroying what is left of a beautiful and fragile fragmented ecosystem.

Let's talk about some of the negative impacts that are taking place today. The increased stormwater runoff from development to the north is the biggest immediate threat to Groesbeck Park Drain and Bancroft Park. This polluted runoff makes its way into the groundwater along a path created by buildings and roads, traveling through various channels that cannot withstand the volume and velocity of the increased flows. The design we developed will make sure these waters are slowed, retained, filtered and polished, assuring that water is cleaned, before it is diverted to the river. This will stop sheet runoff that erodes surface soils and prevent unwanted surface water recharge into the groundwater near the Mason Esker, reducing head pressure on existing plumes of pollution.

Some of the images I have provided to the Lansing Park Board with this document show a quantity and diversity of wildflowers at Bancroft Park that is greater than I've seen in any urban setting. Human activity that takes place in the Park now has led to the development of many walking paths through the wooded area. If you take a moment to look at these paths, you will see compacted soils that have higher erosion potentials. Activities such as riding bicycles, operating motorcycles, running or sliding down these hills risk damaging and destroying this wonderful diversity of Michigan Midwest wildflowers.

The trees throughout this Park are not old-growth trees. This area has been clear-cut before. Some of the trees that exist are of ill-health, some are healthy. The City should concentrate on managing this forest over the next few years. For the purpose of constructing the paved path, this project will remove just 7 trees, all of them being of small diameter and some of them already dead. It is our goal to do the least possible damage to existing trees.

It is important to note that in Bancroft Park, north of the open field, there are at least 12 perched wetlands. Most of these are vernal wetlands, seasonal depressional wetlands that vary in size and are ponded only during the wet-weather times of the year (spring and fall). They are extremely valuable and sensitive to the overall diversity of this ecosystem. Vernal wetlands are essential as a breeding area for a number of herpetological species, such as frogs, turtles, and salamanders. In the spring, wildflowers often bloom in brilliant circles of colors that follow the receding shoreline of these pools. These wetland spots have been modified over time by human activity. This project will not alter their current condition and would help to protect them from further damage.

In one of his communications to the Parks Board, Mr. Potter referred to the larger wetland in this area as

Drain Commissioner's Response, *cont.*

Kettle Lake. It is by no means a lake nor even a kettle pond. It is a perched wetland that is rarely without standing water. The MDEQ permit for this project requires us to construct protections for this wetland. The permit also requires continued water flow into this wetland that is sufficient to maintain ponding. The project preserves some of the flow from the drainage pipe under the nearby hill, while diverting excess flows that previously passed through the park into the Esker. (The berm is necessary to do this)

Outlet under the path in Bancroft Park, after leaving the perched wetland located in the middle of the park. Note side-wall erosion. Soon the surface and then the sub-surface of the Esker will be destroyed by this erosion. This flow must stop.

Under state law and in keeping with the federal Clean Water Act, the Michigan Department of Environmental Quality requires that we protect this pond. This project does that in part by constructing a berm. I cannot change MDEQ permits that require that berm to be built. Nor should I. The berm facilitates two outcomes. First, it maintains ponding of water according to the requirements of the permit. The other function of the berm is to actually stop the polluted water from going to the large sand pit at the northwest corner of the Park and recharging into the ground.

This piece of land has been influenced by human activity in such a way that we can no longer say that it's natural. One of the benefits of this flood-control project, an element requested by residents and other stakeholders, will be the restoration of this ecosystem's value, functionality, and habitat niches. This project has been designed to address all the other problems associated with human activity, i.e., development to the north, golf course to the east, neighborhood to the west. Being a good steward of the environment isn't accepting a hundred years of abuse at a site, calling it "natural" and leaving it to its own demise. We're going to interact with the park and we must do it in a way that rebuilds its beauty while mitigating any of our surrounding activity and the activity taking place in the park itself. This can only happen if we work together and embrace good stewardship.

Given the modifications to the landscape within this watershed over the last 150 years, it is no wonder that there are some issues to be addressed. Large parking lots, buildings and roads that meet our needs do not accommodate the needs of the salamander or frog. This project builds the habitat necessary for salamanders, frogs, turtles, snakes, and other creatures that live on and in this kind of landscape. You will see, at the conclusion of this project's development/construction, an environment that will include habitat for ground-dwelling creatures of the forest, migrating birds and other mammals. Bancroft Park will be a truly unique place to experience and visit.

Northwesterly outlet from the perched wetland in the middle of the park. Notice the incision/ erosion taking place to the Esker's surface. Look to the middle right of the picture. You can see part of the Esker disappearing.

After this project is completed, all of the wonderful outcomes we envision for flood prevention, habitat creation, species diversity, passive non-competitive recreation, pollution prevention, aquifer protection, and economic

More About the Mason Esker

This diagram illustrates how an Esker forms. A crack at bottom of the ice in a glacier develops, widening and shrinking with weather changes. As the glacier melts, water seeks the path of least resistance and runs through the tunnel formed by this crack. Sand and gravel fall out of that water column, forming layers or strata on top of the base layer of glacial till. Eskers are commercially valuable because sand and gravel are pre-sorted by particle size, making them easy to mine. The base glacial till and the material within the Esker are highly porous, allowing surface water to easily move through the sand and gravel to the water tables below. That is why it is imperative to divert our polluted stormwater away from this Esker and its ready-made flow-path to the lower water tables that are the source of our drinking water. The engineered design for this project calls for the construction of a berm at the north end of the larger perched wetland. This will preserve the wetland as required by MDEQ while also protecting the Esker from erosion and preventing excessive polluted surface water from entering the subsurface water tables.

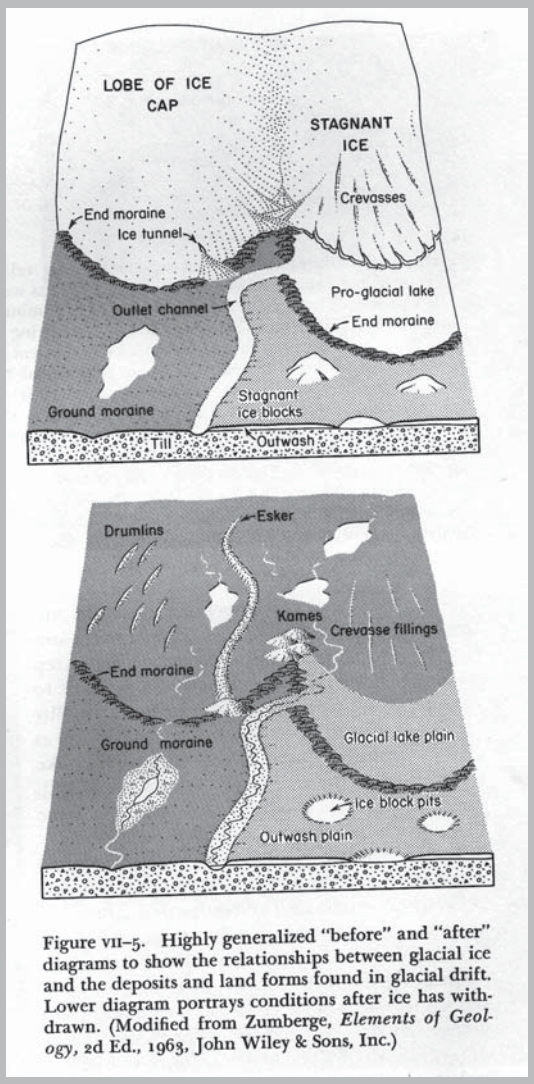


Figure VII–5. Highly generalized "before" and "after" diagrams to show the relationships between glacial ice and the deposits and land forms found in glacial drift. Lower diagram portrays conditions after ice has withdrawn. (Modified from Zumberge, *Elements of Geology*, 2d Ed., 1963, John Wiley & Sons, Inc.)

The Mason Esker is about 23 miles in length. Its southern terminus is in the City of Mason next to I-127; its northern end is near State Road in Ingham County. Key features of this Esker, as it meanders from the north to the south, are highlighted by high and low points in its topography. You may recognize some of these features, such as behind Martin Block on Main Street in Lansing, where the Esker has been mined for the purpose of concrete production. Another portion of this long Esker can be seen along Cedar Street, southeast of Holt, where a series of gravel pits have been mined for commercial purposes. There are dozens of additional mining operations along this Esker. The only visible and mostly unmined above-surface portion of this formation is in Bancroft Park, making it one of the "crown jewels" in Lansing's park system.

Drain Commissioner's Response, *cont.*

development will come to be. According to current park policy, all parks are to be maintained and improved so as to encourage the largest number of visitors and users. The paved path will make it convenient for visitors of all ages and abilities to enjoy this wonderful resource. During public comment, a overwhelming number of residents expressed the desire for a paved path.

Visitors to the park who are using wheelchairs, skateboards, bicycles, baby strollers and other wheeled conveyances should be encouraged to stay on the paved path. The use of mechanical devices off the paved path should be discouraged, as they are harmful to the wildflowers and breeding habitats that are unique to this extraordinary park.

The Easement granted to the Groesbeck Park Drain by the City of Lansing requires that all of the above-mentioned design features be implemented. Most of this watershed is in Lansing Charter Township, where increased imperviousness resulting from development has created large flows of water through the Groesbeck Park Drain that trespass onto the City's Groesbeck Golf Course and Bancroft Park. The Drainage District paid $1 million to obtain the easement and has developed agreed-upon solutions to alleviate the flooding problems resulting from the trespass. The solution to this trespass of water is contained in the design of this project. The design has been agreed upon by the Lansing's Park Board, Lansing's Mayor, Lansing's City Council and by neighborhood groups and individual citizens.

The state and federal statutory requirements, as well as standards in local ordinances and policies, have all been met. The process of design and subsequent litigation has already been lengthy and thorough. It is time to execute the elements within this design including flood prevention and positive enhancements to the park. At this time, every element has been negotiated and vetted through all interested parties. I will not be changing the design or eliminating the features within the design that have been criticized by Mr. Potter.

As you know, within the last year, there have been many meetings, both private and public, with Mr. Potter and his very small group of supporters. I hope this communication clarifies my position as requested in the letter dated January 14, 2016 that was sent to my office by the Parks Board. The next section of this document addresses Mr. Potter's questions, in specific.

Some of the attached material is meant to clarify and verify the statements that I have made. I could have attached thousands of other documents but they would have just made my response unwieldy. The length of this response is not by chance. As I mentioned earlier, the complexity of this project is difficult to understand. But I know the outcome of this project. We'll have the desired effect that we are all looking for.

In closing my opening remarks, I would like to thank the Director of Lansing's Parks and Recreation Department and all of the board members for taking the time to understand the complexity of this issue and the necessity for this project. As always it is a pleasure to work with others who have the best interest of our community at heart. It is not easy to be a representative of the public and try to pick and choose between options presented regarding various issues. This project was no different.

I would also like to thank all of those who put in hundreds of hours going over all of the issues that have come up with this project's plan and design. My staff and I have put hundreds of hours in meetings, personal visits to the park, in one-on-one conversations in person or over the phone with literally hundreds of citizens. The outcome of all of this time spent and ideas discussed has come to the design that is in front of us. I would like to thank all of the people who have given encouragement and support to complete this project and those who have partaken in the decisions for its design.

My staff and you have gone over and above the normal public hearing processes to hear from the public. This current design is in the best interest of the public and more importantly it adds protections into the longevity and health of the ecosystem in Bancroft Park, which is so precious to us all.

Mr. Potter's concerns, being well meaning, are appreciated. They are, however, based upon lack of understanding of this issue. I believe his arguments are not in the best interest of this park, but are in the best interest of his "Lansing Bicycle Party". When I first met with Mr. Potter at my office, he indicated that his interest in this park was for the purpose of riding mountan bikes on the hills in this park, which he felt are perfect for that activity. I, along with many other citizens in this county, enjoy bicycling. But we would never think of taking our bicycles off the main path in a destructive fashion to destroy the delicate ecosystems that exist at this park.

To clearly state my position, I will not be changing the design of this project which was agreed upon by the Lansing Parks Board, Lansing City Council, the Mayor of Lansing and hundreds of participating

citizens through public hearings, one-on-one meetings, small group meetings, meetings at citizens homes, dozens (if not hundreds) of phone conversations. This design does represent the will of the people. It is not in the best interest of this park to change the design, which will broaden the protection of the park while allowing many more residents to enjoy it.

Included in this document are excerpts of evidence that clearly show we did not take lightly our responsibility in serving the public's needs. Between my office and all of our consultants, there are somewhere around a hundred banker boxes of information. Included in them are minutes of meetings which clearly indicate public input. I did not include all of them in this document, but clearly public input was listened to and taken into account in this design. The public clearly wants the path paved. The Lansing Parks Board also had lots of input and concured with this project design, including the paved path. Please consider posting the Park as "*foot traffic only off main path.*" This will go a long way in assisting in the preservation of the Park's unique and fragile ecosystem.

As always it is a great honor and Privilege to serve and represent you and the citizens of Ingham County as your elected Drain Commissioner.

Pat E Lindemann

These Pictures where taken by Drain Commissioner Lindemann in 2008 in the Bancroft Park, Lansing Michigan

I have received comments from many people who had a part in the public input on this issue in the past. They where pleased with the outcome. They want a paved path. They told me that they feel hurt and brushed aside by Mr. Potter's statements that no public input took place. I told them that their concerns would be mentioned in my letter back to you.

Re: Wetland Features and Function, Drainage Infrastructure, and the Esker

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Reducing the experience of hills damages the uniqueness of the park. People come to experience the Esker and its hills."

DC Answer: We're not changing the hills… The topography of this Esker is currently and increasingly eroded by the flow of polluted stormwater from the north. Everything we are doing is to protect the hills and unique topography of this Esker.

PE Answer: We aren't regrading any hills or reducing any hills along the path. The grading along the existing path and adjustment in the height are only very minor changes.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The removal and relocation of part of the Mason Esker through grading to construct both the road and an earthen berm at the edge of the Kettle Lake permanently changes the natural topography of this regionally unique and well-known geologic feature. The Mason Esker should be preserved and protected from any further disturbances. It should be celebrated and highlighted with improved interpretative signage at the entrance. Cumulative impacts have already resulted in the loss of most of the Esker, the section remaining in Bancroft Park must be left alone so that future generations may enjoy it and learn about Michigan's geological history. The Mason Esker is significant from a statewide perspective, not just local."

DC Answer: See above opening statement. We are not leveling the Esker. We are not relocating material from the Esker to the berm. Again, Mr. Potter's statements are just untrue.

PE Answer: The existing connection (an existing basin and culvert) between the wetland you refer to as "Kettle Lake" and the exposed Esker is being removed. It doesn't function well and, when water from storm events fills the wetland, it flows over the path and travels to the exposed Esker to the northwest. Right now, untreated stormwater runoff from north of David Street discharges to the golf course pond north of hole #7. Flows are then directed to the Bancroft Park wetland ("Kettle Lake") through an existing pipe before being conveyed, by way of the aforementioned small basin and culvert, to the exposed portion of the Esker (sometimes referred to as the "sandpit") where they flow through to the aquifer.

This creates pressure on and mobility in the aquifer near the pollution plume from the Motor Wheel superfund site. The Drain Commissioner plans to stop this environmental damage by preventing excess water from coming into Kettle Lake from the upstream areas north of David Street through the installation of stormwater treatment ponds and also by redirecting outflow from wetland to a point about 90 feet south of the current outflow. Some grading will be done at the lowest point of the trail and the current pipe will be removed. This stretch of trail has been labeled a "berm" on some maps, but it is not significantly higher than the normal height of the pond and is being raised only about 1-foot.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The earthen berm will impede the flow of water that supports the perennial stream which flows into the pond north of Kettle Lake. This will negatively affect the aquatic plants and animals that depend on the stream for habitat."

DC Answer: The earthen berm Mr. Potter refers to is designed specifically to impede the flow of water. The perennial stream that he refers to is not a perennial stream. It is one of the eroded and damaged parts of the Esker created by the excessive polluted stormwater flows from the north. Mr. Potters assumtion this

erosive flow is natural is another example of his lack of knowledge and stretching the truth. The flow paths for stormwater generated on the site, in the park, coming from the south and from both sides of the path, were man-made.

Mr. Potter refers to a Kettle Lake. There is no such Lake in this park. In this case there is a depression in the Esker that is a mind pit. It was mined many years ago and is the lowest point in the park. Throughout this document there will be references this pit being located in the north west corner of Bancroft Park. Mr. Potter also makes reference to wetlands in the middle of the park as a Kettle Lake or Pond. It is neither. It is a perched wetland that has been abused for many many years due to excess flows of stormwater polluted by the land outside of the park. These flows have created damages to the park that this project will fix. None of the aquatic plants or animals in Bancroft Park have historically or currently depend on the excessive water he calls a perennial stream. The opposite is true. These flows are damaging this park and must be stopped.

Lake Lansing in Meridian Township was made up of two such kettle holes. Over the 12,000 years since the ice melted, stratified layers of material, mostly bio-mass, have filled in the holes. In the late 1800s a dam

> *How Kettle Lakes and Ponds are formed*
> *As the Glacial front recedes, blocks of ice are left stranded. These ice blocks may subsequently be partially covered with glacial deposits. But when they finally melt away, they leave behind ice block pits or kettle holes. Also referred to as Kettle Lakes or Ponds when they hold water.*

was erected at the out fall of those depressions, creating Lake Lansing. It is not a natural lake.

Nether the sand pit nor the wetland are a ice block pit. Rather sand pit is a hole created by human activity to profit from the Esker's sand and gravel, not natural at all. The wetland is natraly formed but not from a ice block pit. And both have taking the brunt of the negative impacts from land use changes created by man.

PE Answer: I am not aware of any such pond. To the extent they mean the low point called the "sandpit", impeding water flow to it is essential to correcting serious environmental harm. The berm is designed to redirect flow, not impede it (see answer above).

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The constructed mound will permanently alter and damage the natural topography around Kettle Lake."

DC Answer: Again Mr. Potter is making statements that are just not true. As previously stated, this isn't a Kettle Lake. And we know that this berm will permanently protect Bancroft Park. Just a note about the berm, it will only be a foot high with some variation not exceeding 2 feet.

PE Answer: The way the stormwater flows now through Bancroft Park (see previous answer) is certainly not natural. The work we are doing will reduce the amount of untreated stormwater that flows directly into the exposed portion of the Mason Esker, thereby reducing further dispersion of the pollution plume in the aquifer.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Riprap and Culvert Placement In and Over Perennial Stream - The placement in a natural setting is not aesthetically appropriate for this park."

DC Answer: This flow only happens during/in response to storm events. These storms produce polluted

flow of stormwater that is an erosive force in and on the Esker. Repeating myself, this flow is not natural and is harmful to the Esker. This is not a "Perennial Stream". The riprap and Culvert replacement will stabilize the existing erosion and well prevent any further erosion of the Esker from happening in this location.

PE Answer: There is already a pipe under the path, this simply provides erosion protection and some realignment. All work in this area is part of an approved DEQ permit.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The culvert under the trail is not appropriately aligned with the channel of the stream as it is a 90 degree angle to the channel. It will continuously erode and the placement of riprap will not alleviate this problem if water continues to flow through the perennial stream."

DC Answer: Again, Mr. Potter is wrong. See PE's answer.

PE Answer: The culvert alignment in relation to the current pipe alignment is nearly identical. Both are at the same angle across the path. The new crossing area in the approved plan is approximately 90-feet south of the existing culvert. Installing riprap will reduce erosion issues. All work in this area is part of an approved DEQ permit.

Re: Public Involvement

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Neither the neighborhood nor the larger public was informed by the group or by officials for the City, County, Drain Commissioner's Office or Park leadership. As soon as the public found out about the plan they got together and studied the details and the public does not accept the plan as it currently exists. The public has a vital role to play as part of the team making stakeholder decisions about the park. The public can bring a wide range of feedback and expertise to ensure that plans best serve all needs. The public rejects the Drain Commissioner's plans for Bancroft Park. Therefore, we request that Lansing, Ingham County, and perhaps Lansing Township officials come together with the public in discussions, design workshops, and more to create a great plan for water management (once understood and justified), park enhancements, park programming and related solutions agreeable to all parties."

DC Answer: The assertion that the public was not informed and not involved in creating the approved and permitted plans for Bancroft Park is patently untrue. The Drain Code (Public Act 40 of 1956) sets forth the timing of public notice. We have proof in the Drain Commissioner's office of public notice. There are Meeting Minutes. There have been newspaper articles about this project. There have been other public notices published in the newspaper, and letters written to all the property owners within the drainage District. There were dozens of meeting with citizens both on the property and other locations about this project. There were meetings with the Parks Department. There were meetings with the Lansing Parks Board. There were meetings with the Lansing City Council. Some of these meetings were televised and all of them we're publicly noticed. Again I would clearly like to state most of these public meetings I'm not even required by law to hold. But I like to have public input prior to making a final decision. So I push for more meetings with public not less. The MDEQ had a Public Hearing Period on this project, it too, was published. Because Mr. Potter never attended any of these meetings, is no indication that they didn't exist. To imply otherwise it is just not true.

PE Answer: All the work affecting inland lakes and streams or wetlands has been approved by a MDEQ permit. All legal channels for project approval were exhausted long ago. The money for the project has

been received. Project plan elements that would affect the DEQ permit, signed agreements, or easements cannot be changed. The plans for improvements to the park and golf course are all part of a signed agreement between the City and Drain Commissioner to use the area to store a regional stormwater detention and treatment system. Aspects of the plan were all negotiated, discussed, and vetted with the public, various municipal boards and governmental officials. The resulting design elements are tied to easements that were given for use of the property and to a $1-million payment made to the City for the easements and signing of the agreement. Had Lansing Township not fought their assessment for the last 2 ½ years, the project would be completed by now and all this discussion would be moot.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The Groesbeck Drain Project spans over 20 years and was reportedly part of the original Toll Gate drain project built in the mid-90s. For some reason Bancroft was put on hold. Nevertheless, Friends of Bancroft continued to meet, hold events and advocate for the park. However, it has now been confirmed a small group was somehow persuaded years ago to accept this current plan. Most members of the original Friends of Bancroft group, neighbors and advocates were not aware or a part of this decision. "

DC Answer: The two Drain are separate. They could not be more separate if they where 100's of miles apart.

PE Answer: This project is completely separate from the Tollgate project. As to the Groesbeck Park Drain, countless meetings were held in 2006, 2007 and 2008, with attendance by and involvement with Friends of Bancroft Park - among many other groups, agencies, and individual citizens. Input from all these various stakeholders was used to develop the plan that is being implemented for the park area.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Most significantly, a plan that speaks to what's in the best interest for this unique heritage park loved by generations of neighbors and visitors, and important from a geological perspective for all citizens in the State of Michigan. We wish to leave a beautiful park for future generations to enjoy and love."

DC Answer: This project as planned does all of that and more.

PE Answer: Bancroft Park will certainly remain a beautiful park for future generations to enjoy and love after this project is completed.

Re: Paved Path for visitor access and maintenance purposes

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The road will permanently change the users' trail experience in a negative way. The uniqueness of Bancroft Park is the sense of being away from it all in a unique geologic setting. An asphalt road removes the sense of being in an undeveloped, natural setting."

DC Answer: Not true

PE Answer: The road was designed to be ADA compliant, which the entire path will be except for a small portion on the very north end where, because of a slope issue, removal of a significant number of trees would have been necessary to make that section ADA compliant. The ADA compliance issue was a large factor in the initial discussions and design of Bancroft Park drain facilities with the prior City Park Director. The path serves to provide access for all future drain/stormwater maintenance, it is essential for testing and inspection and will prevent maintenance trucks from creating ruts and damaging existing vegetation.

The width of the path is standard size for many City Parks and is the same width as paths in Hawk Island or the recently constructed Crego Park.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Asphalt roasts require maintenance. They heave and break up in a few years. The natural pathway requires far less upkeep, needing only basic erosion prevention."

DC Answer: Not true. Mr. Potter would have you believe that maintenance costs for asphalt pathways in a park environment are more costly than that of a gravel pathway in the same environment. The opposite is true. The upfront cost of asphalt or concrete pathway is more expensive in upfront cost than that of a gravel pathway. However the long-term maintenance clearly makes up for the difference. The annual upkeep of gravel pathways is very expensive and tedious because they are constantly eroding. Highly used asphalt pathways have a life of 15 to 20 years before they need to be resurfaced. That is so if regular maintenance of the pathway is performed. This regular maintenance on asphalt pathways is drastically less in that of gravel pathways. Not to mention the fact that asphalt pathways will allow a wider range of users then gravel pathways. Please refer to some of the pictures that I have included with this communication. Adding new gravel annually and constantly reforming Gravel services it is very costly. In almost all cases this is an annual process.

PE Answer: If asphalt paths are constructed properly with proper sub-base (which this one will have), then they will be maintenance free for 10+ years, with limited maintenance from 10-20 years. I'm not sure what maintenance measures are done on the path now or if gravel is used. I'm not sure what they are referring to regarding basic erosion prevention. Exposed ground with no vegetation will erode much more than an asphalt path and this will be exacerbated by bike riding, running, etc.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The scale of a 10-ft-wide road, plus even wider grading, in this compact "jewel" park is jarring to visitors. The grading extends to 30 feet wide in places. A small forest requires a small trail. There has never been an issue regarding access by maintenance vehicles in the 100 year history of the park — this was confirmed by interviews of neighbors and former Lansing Parts and Recreation staff."

DC Answer: see PE answer

PE Answer: There aren't any locations where there is 30-feet wide of grading. The most that could be found on the plans is 22-24 feet wide and no more than 11-13 feet on any one side outside the limits of the path. Every effort will be made to reduce the impact and amount of grading outside the limits of the proposed pathway.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Asphalt roads cause greater impact to walkers' and runners' feet and knees due to the hard surface. Natural pathways do not, Bancroft Park has historically been a destination for cross country teams and athletes seeking hilly terrain for training. Asphalt when wet or icy or leaf covered is slippery, much more so than gravel."

DC Answer: see path pros and cons

PE Answer: I'm not a sports doctor so I can't comment on runners' feet and knees and impacts to those between the two. It would seem to me that someone can trip more easily and hurt themselves on a natural, yet rougher path than a smooth paved path. Wet leaves are slippery regardless of gravel or asphalt paths.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"There is already a problem with mini bikes and motorcycles riding on the trails. An asphalt road and more paved access points will increase this problem and presents a safety concern to local residents who may be walking the trails. Gates will not prevent high speed motorcycle access."

DC Answer: see PE answer

PE Answer: The gates will certainly deter motorcycle access, much more than now. It would seem to me that someone wanting to take a mini dirt bike on a path would want to do it more on an unpaved path than a paved path, where they can find almost anywhere.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"Encouraging sustainable four-season and winter sports is key to the revival of Lansing, our parks, and local fitness/health. Passive and active use has been characteristic of Bancroft for decades. Such low impact four season sports are making a bid (sic) comeback and are an important base activity. Bancroft Part is a great cross-country skiing, snow shoeing, and winter hiking venue as is Groesbeck Golf Course. The two provide unmatched, time proven individual and family opportunities in an urban setting. Building a paved road will ruin this in two ways: Pavement is unskiable, and grading to reduce slope damages the skiing value. Additionally, soil erosion is unavoidable front (sic) the runoff generated by the impermeable surface. This hilly forest creates the best natural ski trail in the area. The canopied shade holds snow better than anywhere else in town. Paving means the loss of an entire natural winter sport for this park."

DC Answer: see PE answer

PE Answer: The golf course will still be skiable. I have cross-country skied since I was 5 years old and raced in over 25 events across Michigan (Vasa, White Pine Stampede, etc.). You can ski on pavement, I've done it many times and places, you just need to have enough base of snow over the top of it is all. The only reason there is a difference than the bare ground or gravel path is that pavement tends to stay warmer longer and also conducts more heat in the winter and usually melts more of the snow over the top of it and has less of a frost layer than the ground. The statement that more soil erosion will take place because of impermeable surfaces is completely wrong. The whole point of reducing soil erosion is providing permanent measures that limit contact and erosion of water and wind with exposed soil. Paving, seeding, rip rap are all soil erosion and sedimentation control measures recognized by the DEQ and are practices used every day.

Re: Relocating Golf Tee 7

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The reason given for moving Tee 7 is the grass won't grow. Placing a tree within a pocket of forest that is surrounded by large canopy trees on the south, west and north sides will not grow grass either unless more canopy trees are removed to allow more sunlight penetration during daylight hours."

DC Answer: see PE answer

PE Answer: City planners had a number of reasons for selecting the site of the new 7th tee; grass growth was only one of those reasons. All planning elements related to golf course hole relocations, tee relocations, and change in hole playability were determined by the City in consultation with the golf course architect they hired. The City will be charged by the Drainage District for construction of those elements and any other improvements specific to the golf course.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The destruction of trees, especially trees over 100 years old for the sake of moving a golf tee is unnecessary and irresponsible from a stewardship perspective. Removal of Esker material is also involved. The park should be preserved and protected."

DC Answer: See answer above to previous issue.

PE Answer: See answer above to previous issue.

Issue: Statement made by Mr. Potter in an e-mail to Brian Cenci, P.E., project engineer:

"The new golf tee location intrudes into the forest and damages the forest and trail experience for users. As users enter the trail and scan the forest within the first 100 yards they will see the tee and both see and hear golfers. Right now the straight property line and the golf course pond create a critical separation between golf course and natural forest Esker area."

DC Answer: See answer above to previous issue.

PE Answer: See answer above to previous issue.

Detailed Response to issues Raised by Mr. Potter, Correspondence Timeline

Following is a listing of some of the correspondence exchanged or meetings attended by Brian Cenci, P.E., in regard to Friends of Bancroft Park, Mr. Potter and the issues raised regarding Bancroft Park and the Groesbeck Park Drain project.

Nov. 19, 2014 – Believe was the first meeting w/ Pete Bosheff, Jeff Potter & friend @ ICDC office
March 5, 2015 – Brian, Paul and Pat met w/ Pete Bosheff, Jeff Potter and friend @ ICDC office regarding Bancroft Park work

(In March 2015 the Michigan Supreme Court ruled against the Lansing Townships arguments against the project and the assessment that they would receive.)

May 11, 2015 – Email from Barb Barton (indicated in email "Elected Spokesperson for the FOBP") with a list of questions regarding the work on the part. Brian responded on May 11, 2015.
May 12, 2015 – Brian Cenci attended a special meeting with entire Friends of Bancroft Park group (approximately 25 – 30 people present) at Bancroft Park Community Bldg.
July 8, 2015 – Brian Cenci attended City of Lansing Parks Board Mtg. to specifically discuss issues raised by FOBP and answer questions of the Parks Board
Aug. 10, 2015 – Email correspondence between Jeff Potter & Brian Cenci regarding various questions on Bancroft Park and Groesbeck Park Drain project
Nov. 10, 2015 – Email correspondence between Jeff Potter & Brian Cenci regarding various questions on Bancroft Park and Groesbeck Park Drain project

(In November 2015, the bond proceeds of the $12.6 million received by the Drainage District for the project)

Nov. 18, 2015 – Brian Cenci provided an extensive response (4 pages) to a list of questions and concerns to the City of Lansing Parks Board. Concerns / Questions generated by the FOBP.
Dec. 11, 2015 – Jeff Potter sent Construction Letter reg. Groesbeck Park Drain project
Jan. 13, 2016 – Extensive list of questions emailed from Jeff Potter to Brian Cenci regarding Bancroft Park. BJC responded to questions and email on Jan. 14, 2016

Detailed Response to Issues Raised by Mr. Potter, *cont.*

Note from Brian Cenci, P.E.: "In addition to the Timeline provided, Pat and I met with Jeff Potter and his biking friends twice at the Ingham County Drain Commissioner's Office. For one of those meetings, prior engagements required me to leave after 20 minutes but Pat continued meeting and discussing their issues after my departure.

"Also, I came across this **email from Sue Eareckson, Past-President and current member of Friends of Bancroft Park**, to Paul on April 27, 2015 that states things well. It basically indicates that these new people raising the issues weren't part of FOBP and recently discovered Bancroft as part of their Lansing Bike Party group. It also indicates that, at one time, the Park was paved. I've highlighted the sentences I think are particularly valid regarding the issues:

> *"Paul, I'm attaching photos I took of the notice that the new "Friends of Bancroft Park" put up in the park.* ***Despite whatever happened when they met with Pat, it's pretty clear that they don't understand that they have arrived very late in the game. One of their objections is to paving what they believe is a natural trail through the north end of the park - of course, it was once paved*** *(and had a spur extending northeast to David Street), and the easement agreement between the city and the Drain Commissioner was signed some years ago.* ***I haven't met any of them yet, but the new folks are a loosely organized group called Lansing Bike Party,*** *which goes for bicycle rides in various locations around the Lansing area,* ***and has recently found Bancroft Park. Their notice claims that there has been no public input. Pete knows better - ! , but the rest of the Lansing Bike Party folks weren't around Bancroft Park years ago when the public input occurred.*** *Brett Kaschinske is planning to come, and I believe that will be helpful. It turns out that the city is creating an off-road bicycle course somewhere on the west side of town.* ***Brett also tells me that having a lot of bicycle traffic on the unpaved trails through the park would be very damaging. I believe that the bicyclists want to go on some of the smaller trails as well, where they almost certainly would be damaging vegetation.*** *Those of us who have been around for a while do understand why the road and parking lot in the park have been so neglected. But if we have some newcomers to the neighborhood in attendance, it can't hurt to bring them up to speed while we are educating Lansing Bike Party. Should the Drain Commissioner choose to send representation to the meeting, please let me know - but we will not be expecting you otherwise. Thanks very much. Sue"*

Timeline of Meetings During the Planning Phase, including but not limited to:

- Mtg. w/ Friends of Bancroft Park representatives – May 2, 2006.
- Blair Webster meeting with Cynthia Cornell to review critical locations of wildflowers in the park and how to protect them – December 6, 2006
- Mtg. w/ Friends of Bancroft Park representatives – December 14, 2006. Specifically discusses Park Director wanting the path and need for paving of the path and getting as much of it ADA compliant.
- Mtg. w/ Friends of Bancroft Park – May 1, 2007. Site meeting with large group of FOBP, reviewed new path and trees that were dying and would need to be removed for safety reasons.
- Mtg. w/ Friends of Bancroft Park – June 5, 2007
- Mtg. w/ Friends of Bancroft Park – July 6, 2007

Pros and Cons for Path Surfaces

Reasons for asphalt over gravel

Hard, all-weather pavement surfaces are generally preferred over those of crushed aggregate, sand, clay, or stabilized earth. Since unpaved surfaces provide a lower level of service, it may cause bicyclists to more easily lose traction (particularly bicycles with narrower, higher-pressure tires), and may need more maintenance. Some users, such as inline skaters, are unable to use unpaved paths.

In areas that experience frequent or even occasional flooding or drainage problems, or in areas of moderate or steep terrain, unpaved surfaces will often erode and are not recommended. Additionally, unpaved paths are difficult to plow for use during the winter. (Guide for the Development of Bicycle Facilities, 2012, Fourth Edition).

Hard surface materials are preferred for shared-use trails. (A Guideline for the Design and Construction of HMA Pavements for Trails and Paths, 2002, National Asphalt Pavement Association). High use trails passing through developed areas or fragile environments are commonly surfaced with asphalt or concrete to maximize the longevity of the shared-use path surface and promote bicycle and inline skating use. (Shared Use Path Design, Chapter 14, Federal Highway Administration).

> Asphalt or Portland cement concrete provides good quality, all-weather pavement structures. (Guide for the Development of Bicycle Facilities, 2012, Fourth Edition).

> Asphalt surfaces are softer and therefore preferred by runners and walkers over concrete. (Guide for the Development of Bicycle Facilities, 2012, Fourth Edition).

The typical life expectancy of an asphalt path is 15-20 years. (Guide for the Development of Bicycle Facilities, 2012, Fourth Edition). Hard surface materials provide years of service with low maintenance. (A Guideline for the Design and Construction of HMA Pavements for Trails and Paths, 2002, National Asphalt Pavement Association).

The pavement structure is designed like a roadway. The pavement section is capable of occasional use of light pickup truck and Vactor truck usage during wet events, a situation that would quickly compromise a gravel system of equivalent depth. A soils investigation should be conducted to determine the load carrying capabilities of the native soil. The effects of freeze thaw cycle should be anticipated. The total pavement depth should include a base course under the asphalt pavement.

> Paths should be designed to sustain wheel loads of occasional emergency, patrol, maintenance, and other users of the system. (Guide for the Development of Bicycle Facilities, 2012, Fourth Edition).

> Paving of paths will also prevent weed growth through the surface.

Although gravel paths can also be designed to be ADA compliant, HMA paths provide the better solution for maintaining a consistent maximum 2% cross slope. The HMA path will be more stable and not wash away from heavy rains or flood action. Bicyclists, roller-bladers, walkers, wheel chairs, and strollers are all more easily used on asphalt paths be people of all ages including children and the elderly.

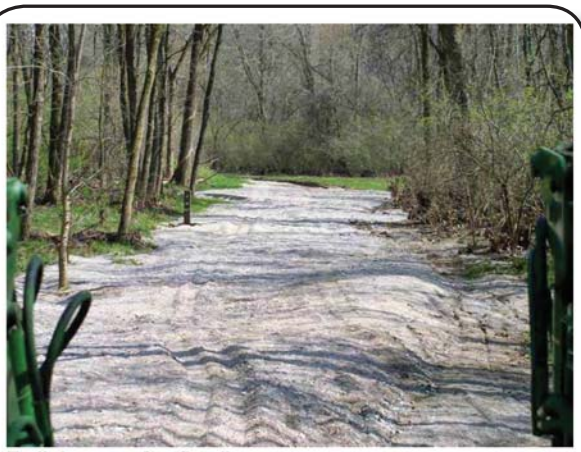
Paving a shared use path encourages users to stay on the path, an important feature when traversing through a sensitive area, such as Bancroft Park. Paving techniques allow asphalt pavement to be placed on minor slopes, over undulating topography, and blended into the existing landscape. The free flow lines of asphalt pavement do not detract from the natural environment. (A Guideline for the Design and Construction of HMA Pavements for Trails and Paths, 2002, National Asphalt Pavement Association).

Asphalt paths will attract and retain thermal energy from the sun, therefore will clear quicker than non-asphalt paths, in the winter.

Asphalt pavement maintenance will be minimized through proper design and construction. Asphalt pavement repairs can be made quickly and are less costly; repairs blend readily into the existing pavement structure. Mountain trails may be subject to springtime flooding and washout. These sections, when constructed with asphalt pavement, are not nearly as expensive to replace. (A Guideline for the Design and Construction of HMA Pavements for Trails and Paths, 2002, National Asphalt Pavement Association). Paved surfaces should be provided in areas that are subject to flooding or drainage problems, in areas with steep terrain, and in areas where bicyclists or in line skaters are the primary users. (Shared Use Path Design, Chapter 14, Federal Highway Administration).

Pros and Cons for Path Surfaces

Gravel Trails Pros and Cons


Trail damage after flooding.

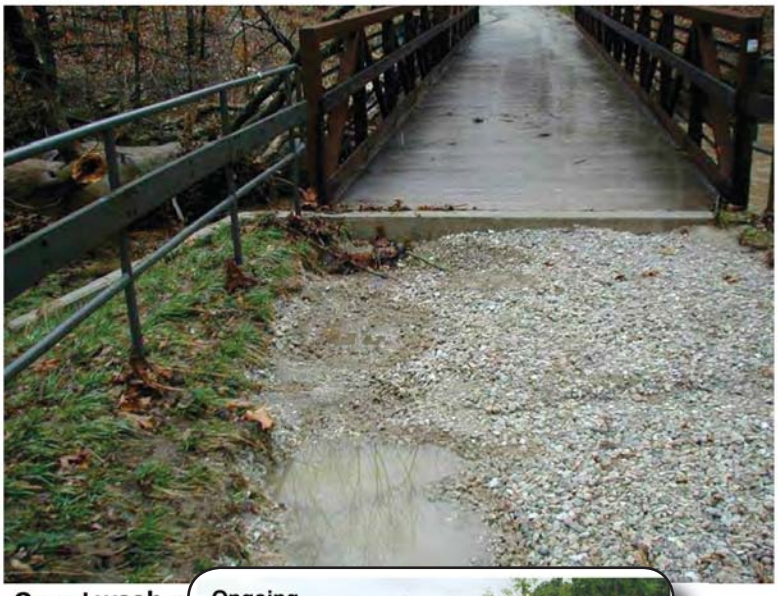
PROS

- Considered by some to be more natural looking.
- Good for flat areas out of flood plains.
- Softer on joints (for running).
- Cheaper initial installation cost.

CONS

- High ongoing maintenance costs.
- Difficult to maintain consistent surface quality.
- Environmental damage caused by gravel erosion.
- More difficult to use in winter due to soft, wet and dirty conditions.
- Gravel migrates on steep trail slopes.
- Difficult to ride bikes on steep slopes and in loose gravel.
- Difficult to remove silt deposits after heavy rains.
- A dirty surface during and many days after rains.
- Very difficult to meet ADA surface standards.
- Less stability for running and walking in loose gravel.


Dirty surface after rain events is hard on clothes and bikes.

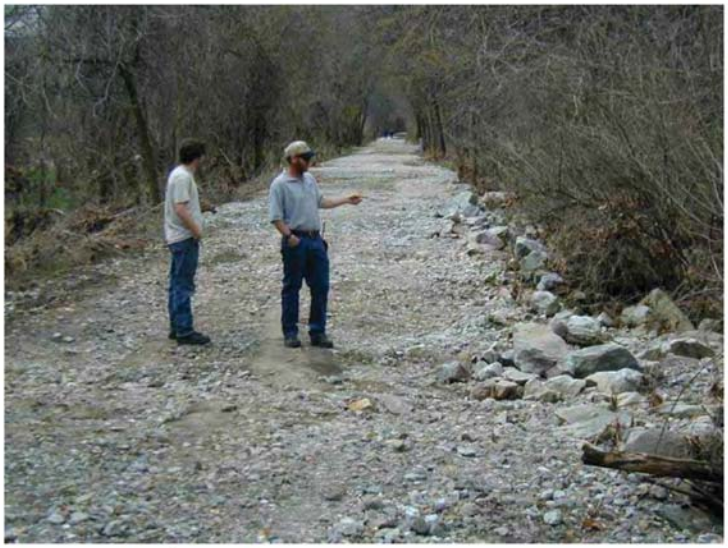

Gravel wash o


Ongoing Maintenance

Removing mud deposits after floods along the Bear Creek Trail.

Gravel build-up in natural areas after flooding.

- We replace about 179 tons of gravel that washes into the adjacent creeks after every major storm event.
- On average over 1000 tons of gravel each year.



Replacing rock after flooding along the MKT Trail.

Compacted gravel with fines is not very pervious.

Gravel build-up in natural areas after flooding.

Response Action Plan for the North Lansing Landfill

Final Report

Prepared for:

Lansing Board of Water & Light
123 West Ottawa Street
P.O. Box 13007
Lansing, MI 48901

Prepared by:

Science & Technology Management, Inc.
2511 North 124th Street, Suite 205
Brookfield, WI 53005
(414) 785-5940

May 1995

Report No. STMI/163/95-02

Bruce Hensel, P.G., C.G.W.P.
Senior Hydrogeologist

Kenneth J. Ladwig
Vice President, Groundwater & Solid Waste

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INTERIM RESPONSE ACTIONS

BACKGROUND

Before determining an Interim Response Action for the North Lansing Landfill, the following observations were considered:

- Selenium and sulfate appear to be leaching from portions of the landfill where coal ash is now saturated. These constituents may leach from ash for decades, so it is possible that they will continue to impact groundwater as long as the ash remains saturated. Transport modeling indicated that selenium concentrations may eventually exceed the MCL several hundred feet from the landfill if it continues to leach at high concentrations. LEAVE BWL Property

- The most recent analyses of water samples from monitoring well B3 found selenium concentrations of 66.7 µg/L in February 1995, and 38.8 µg/L in May 1995. The latter value is below the water quality standard of 50 µg/L.

- Because the primary source of contamination at NLL appears to be saturated ash, control measures taken to limit infiltration at the ash surface will not have a significant positive impact on groundwater quality. That is because limiting infiltration over an area the size of the landfill will not significantly change the elevation of the water table and will not affect the flow of groundwater through the saturated ash. 3 would 3 HELP

- A planned stormwater drainage diversion will reduce or eliminate stormwater ponding in the landfill excavation, which will have a positive impact because the saturated thickness of ash should decrease. However, some of this positive impact may be negated if the stormwater diverted to Groesbeck Park is allowed to recharge the glacial aquifer, where it could cause additional water table rise. mounding due to recharges in pond # 3 maybe a large source

A plume of southward moving groundwater contaminated with organic and inorganic constituents from the MWDS lies immediately west of NLL. SO What ?

- If remedial actions for the MWDS plume involve groundwater extraction, they could positively impact contamination at NLL, at least during the life of the remediation, by

↘ sulate/ selenium not related to MWD

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The ash is underlain by fill that is 10 to 35 or more feet thick beneath Areas I and II. The upper 10 to 15 feet in these areas consists of coarse to silty fine sand with concrete and asphalt debris, and the lower 5 to 15 feet consists of silty clay to clayey silt gravel washings. There are no direct data on the thickness or composition of fill beneath Area III. Based on anecdotal reports, it is estimated to extend down to the lower till unit.

Water Table Elevation

The water table at NLL lies within the esker sands, where it has been rising since monitoring records were first kept at this site (Figure 6 & 7). It now lies at an elevation between 817 and 820 feet, which indicates that ash in the western portion of Area I is saturated. Borings B1 and B3 lie immediately upgradient and downgradient, respectively, of the western portion of Area I, where the ash base elevations in borings G6, G14, and G26 are respectively 814, 812, and 816 feet. Comparison of water elevations in B1 and B3 to the ash base elevations revealed by these borings indicates that the lowest portions of ash were saturated by 1987. By 1993, groundwater elevations were high enough to saturate low-lying ash throughout the western portion of Area I.

Surface Water Ponding

Groesbeck Drain

The landfill excavation receives runon water from an area north and east of the facility. Recently, a runon water pond has developed in Area II. Water quality in this pond does not appear to be contributing to groundwater quality problems. However, the pond, which is three to five feet higher than the water table, may be increasing the thickness of saturated ash in the western portion of Area I and may be saturating otherwise unsaturated ash in the southeastern portion of Area III.

IS THIS SURFACE H_2O ONLY

KEY

The Ingham County Drain Commission is now in the process of developing a stormwater drainage system that should alleviate much of this problem. The drainage system will divert stormwater to an infiltration cell to be located in Groesbeck Park, approximately ½ mile southwest of NLL. While this diversion eliminates much of the runon water to the landfill, it raises concerns about its effects on the water table in the glacial aquifer. The commission is aware of the rising water table in this area, and its potential impacts at NLL, and is attempting to implement this plan in a way that will minimize water table rise at NLL.

EAST

DECREASE PRESENT VOL OF RUNOFF + WETLANDS WILL HOLD [illegible] LARGE % OF THIS.

NEED hydrogeologist FOR GROESBECK DR[illegible]

EAST OF NLL IN EXISTING GOLF COURSE

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE MANAGEMENT DIVISION

In the matter of the
administrative proceedings against
Lansing Board of Water and Light
North Lansing Landfill
Lansing, Michigan
located in the S 1/2, Section 3, T4N, R2W
Lansing Township, Ingham County, Michigan

WMD Order No. 115-01-98

CONSENT ORDER

This Consent Order is to resolve disputed allegations of the Michigan Department of Environmental Quality ("MDEQ") that the Lansing Board of Water and Light ("LBWL") doing business in S 1/2, Section 3, T4N, R2W, Lansing Township, Ingham County, Michigan, is in violation of Part 115, Solid Waste Management ("Part 115"), of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended, MCL 324.101 *et seq.* ("NREPA"), and the administrative rules promulgated under Part 115. The LBWL and the MDEQ agree to fully and finally resolve the MDEQ's allegations by entry of this Consent Order.

I. STIPULATIONS

The LBWL and the MDEQ stipulate as follows:

1.1 Pursuant to its authority under Section 105 and Part 115 of the NREPA, the MDEQ promulgated administrative rules necessary to implement Part 115. These rules are set forth at Michigan Administrative Code ("MAC") R 299.4101 *et seq.* and became effective on October 8, 1993.

1.2 Pursuant to the NREPA and Executive Order No. 1995-18, the Director of the MDEQ is the state official and the MDEQ is the state agency charged with the administration and enforcement of Part 115 of the NREPA. This Consent Order is authorized under Section 11519(2) of the NREPA.

1.3 The LBWL is a "person" as defined by Section 301(g) of the NREPA.

1.4 The LBWL owns and operates a Type III landfill ("Landfill") on approximately 40.86 acres in S 1/2, Section 3, T4N, R2W, Lansing Township, Ingham County, Michigan. It has operated the Landfill and been continuously licensed since 1979.

1.5 The Landfill consists of the existing unit, consisting of Area I, Area II, Area IIIA, and Area IIIB which occupy approximately 40.86 acres. Attachment A sets forth the approximate boundaries of these areas of the Landfill.

1.6 Solid Waste Disposal Area License No. 8143 ("License No. 8143") was issued to the LBWL on January 7, 1994, to authorize disposal of solid waste in the existing unit of the Landfill. The expiration date of License No. 8143 was January 7, 1996. Before expiration, an application for renewal of the solid waste disposal area license was received by the MDEQ on December 27, 1995. The license remained in effect during the MDEQ review period.

1.7 The LBWL alleges that for reasons other than operations at the Landfill, the groundwater has risen over the past two decades and the bottommost portions of ash that were deposited previously in compliance with licensing are now intersected by the groundwater. The MDEQ alleges that notwithstanding the reason, the Landfill is in non-compliance with Part 115 and the administrative rules promulgated thereunder.

1.8 On July 7, 1994, the MDEQ requested LBWL to initiate investigation of the phenomena of the rising water table and the impact on ash. The LBWL alleges that between July 7, 1994 and February 23, 1996, the LBWL has responded to the request for investigation and has taken actions, including the installation of 14 monitoring wells, the submittal to the MDEQ of two hydrogeological studies, the submittal of a saturated ash study, the submittal to the MDEQ of two Response Action Plans, and the submittal to the MDEQ of a revised and upgraded hydrogeological monitoring program. The MDEQ alleges that, notwithstanding exchanges of letter or other documents, the submittals did not meet the requirements of Part 115 and the rules.

1.9 On March 25, 1996, the MDEQ set forth alleged violations in a letter, denying the application for renewal of License No. 8143 ("Denial"). The Denial is incorporated by reference as Attachment B. On April 22, 1996, an informal hearing was held to provide the LBWL an opportunity to address why the MDEQ should not order the LBWL to cease the Landfill's operations based upon the violations set forth in the Denial. The LBWL submitted the "Response by Lansing Board of Water and Light to Notice of Operating License Denial, Showing of Compliance and Showing of Cause Why the Department Should Not Order Cessation of Operations" and its attached Exhibits A-H (Attachment C). A statement of findings ("SOF") dated May 28, 1996, was developed by the MDEQ based on the responses by the LBWL to the Denial. The SOF is herein incorporated as Attachment D.

1.10 Upon the receipt of the Denial, the LBWL filed a petition for a contested case under the authority of MCL 24.291(2), the Administrative Procedures Act, 1969 PA 306, as amended, which further

extends License No. 8143 issued to the LBWL. As a result, LBWL has not operated the Landfill without a license being in effect.

1.11 By entering into this Consent Order, the LBWL makes no admissions that the law or the Part 115 rules have been violated. However, the LBWL does not contest the effectiveness of this Consent Order and agrees to be bound by its terms and obligations.

1.12 The LBWL agrees to comply with all provisions of Part 115 of the NREPA, the administrative rules promulgated pursuant to Part 115, and all other applicable state and federal laws.

1.13 Within ten (10) days of the effective date of this Consent Order, the LBWL agrees to withdraw the contested case petition filed with the MDEQ on May 23, 1996.

1.14 In entering this Consent Order, the mutual objectives of the LBWL and the MDEQ are to (a) have in place a revised hydrogeological monitoring plan approved by the MDEQ; (b) terminate waste receipt at the Landfill until a monitorable unit is in place; (c) complete closure of present operations of the Landfill; (d) complete a remedial investigation of any contaminated groundwater; (e) based on results of the remedial investigation, propose a feasibility study in accordance with Part 115, R 299.4319, Part 201, Environmental Remediation, of the NREPA, R 299.5511 and R 299. 5513; and (f) based on the feasibility study, develop and implement a Remedial Action Plan in accordance with Part 201 and R 299.5515.

1.15 The LBWL stipulates to the issuance and entry of this Consent Order and that entry of this Consent Order is proper and acceptable. This Consent Order shall be considered a final order of the MDEQ and shall become effective on the date it is signed by the Chief of the Waste Management Division, designee of the Director.

1.16 On December 5, 1997, the MDEQ approved the "North Lansing Landfill Groundwater Monitoring Plan" prepared by Science and Technology Management, Inc., dated May 1997 and revised by pages submitted in a letter dated October 14, 1997, replacement Figures 4 and 5 from a letter dated November 25, 1997, and replacement Tables 6a and 6b from a letter of December 2, 1997 ("Hydrogeological Monitoring Plan").

1.17 On January 16, 1998, the MDEQ approved the "Lansing Board of Water and Light North Lansing Landfill Remedial Investigation Work Plan" prepared by Science and Technology Management, Inc., dated December 1997 ("Remedial Investigation Plan").

II. COMPLIANCE PROGRAM

In order to resolve these matters, the LBWL agrees to achieve and maintain compliance with all of the applicable requirements of the NREPA and the rules promulgated pursuant to the act and shall achieve compliance with the requirements specified below in accordance with the following schedule:

2.1 The LBWL terminated waste receipt at the Landfill pursuant to License No. 8143 on or before January 31, 1997. To resume disposal operations at the Landfill in the future, the LBWL shall apply for approval of a new operating license subject to all statutes and rules in effect at the time. However, a new construction permit shall not be required as long as the new unit is constructed within the footprint of the existing Landfill, and site disposal capacity does not exceed the capacity allowed under the engineering plans submitted March 13, 1979, and accepted as approved on a schedule of compliance dated March 10, 1980.

A. HYDROGEOLOGICAL MONITORING PROGRAM

2.2 The Hydrogeological Monitoring Plan is hereby incorporated into and becomes part of the Consent Order and shall be subject to the enforcement provisions of the Consent Order. The LBWL shall implement the schedule contained within the approved Hydrogeological Monitoring Plan.

B. REMEDIAL INVESTIGATION

2.3 The Remedial Investigation Plan is hereby incorporated into and becomes part of this Consent Order and shall be subject to the enforcement provisions of this Consent Order.

2.4 The Remedial Investigation Plan shall meet the requirements of R 299.5511(3) and address all the factors of R 299.5511, including, but not limited to, the following factors that have been determined to be those appropriate to the site: source identification and characterization with contaminant isoconcentration maps of the site compared to known off-site isoconcentration plume geometry maps; statistical evaluation of groundwater data from the existing monitoring wells and newly installed monitoring wells to assist in determination of the sources of elevated contaminants in groundwater at the site; an evaluation of all contaminants detected by the facility's hydrogeological monitoring program; landfill hydrogeology, including groundwater flow patterns, rate, and direction; the nature and extent of contamination at the site with an identification of the full horizontal and vertical extent, rate of movement, and characteristics of any groundwater contamination at and emanating from the landfill; and an evaluation of the horizontal and vertical extent of any contamination of soils due to LBWL's operations and disposal activities at the site.

2.5 The LBWL shall implement the MDEQ-approved Remedial Investigation Plan in accordance with the schedule contained therein.

2.6 The LBWL shall make all reasonable efforts to obtain permission for the LBWL, its consultants, and the MDEQ to enter off-site property to place monitoring wells, conduct surveys, take samples, or complete other tasks as may be necessary for the completion of the studies and plans required by this Consent Order.

2.7 The MDEQ may approve, disapprove, or approve with specific minor modifications, the Remedial Investigation Plan in accordance with Section IV of this Consent Order.

2.8 In accordance with the schedule contained in the approved Remedial Investigation Plan, the LBWL shall submit to the MDEQ final results and conclusions of the Remedial Investigation, including all data, in the form of an approvable written report ("Remedial Investigation Report").

C. FEASIBILITY STUDY/REMEDIAL ACTION

2.9 If contamination above Section 324.20120a(1)(a) of the NREPA, the generic residential criteria, and above background levels is found during the Remedial Investigation, the LBWL shall submit to the MDEQ within ninety (90) days of the MDEQ's approval of the Remedial Investigation Report, for review and approval, a Feasibility Study, consistent with the requirements of R 299.5513(2)-(3), being Rule 513 of the administrative rules promulgated pursuant to Part 201 of the NREPA.

2.10 In the Feasibility Study, the LBWL shall evaluate, among other alternatives, the feasibility of removal of the waste from those cells without the four feet isolation distance, as well as other alternative final remedies, as provided in R 299.5513 and consistent with Part 115 closure requirements.

2.11 The MDEQ may approve, disapprove, or approve with specific minor modifications the Feasibility Study in accordance with Section IV of this Consent Order.

2.12 Within one hundred and twenty (120) days of the MDEQ's approval of the Feasibility Study, the LBWL shall submit to the MDEQ a plan for remedial action (hereinafter the "Remedial Action Plan") to remediate, to the extent necessary in accordance with the NREPA and its rules, the contaminated groundwater, surface water, soils and sediments at and emanating from the site caused by the Landfill. The Remedial Action Plan shall meet the requirements of R 299.5515 and Part 115 and include a schedule of implementation. The Remedial Action Plan shall, when

implemented, comply with Section 20120a of Part 201 of the NREPA for hazardous substances from a landfill unit or other sources at the facility. Upon approval by the MDEQ, the Remedial Action Plan shall be incorporated into and become part of this Consent Order and shall be subject to the enforcement provisions of this Consent Order.

2.13 The MDEQ may approve, disapprove, or approve with specific minor modifications, the Remedial Action Plan in accordance with Section IV of this Consent Order.

2.14 Upon MDEQ approval of the Remedial Action Plan, the LBWL shall implement the plan in accordance with the schedule included within the approved Remedial Action Plan.

III. FINANCIAL ASSURANCE

3.1 Within sixty (60) days of the effective date of this Consent Order, the LBWL shall provide to the Director of the MDEQ, either a cash bond, an irrevocable letter of credit, a surety bond, or other financial instrument acceptable to the MDEQ ("Financial Instrument") in the amount of $1,000,000.00, which does not include LBWL's obligations pursuant to Sections 11523 and 11525 of Part 115. The Financial Instrument shall provide assurance for the implementation and completion of the study(ies), investigation(s) and/or remedial action(s) described in this Consent Order. The Financial Instrument shall not be construed to either increase or decrease the LBWL's obligations under Section 11523 and Section 11525 of Part 115 of the NREPA, as amended by 1996 PA 359, or any future amendments of the act. The Director of the MDEQ may utilize the Financial Instrument to complete any study(ies), investigation(s) and/or remedial action(s) required by this Consent Order in the event the LBWL fails to meet these requirements. The Financial Instrument shall continue in effect until completion of the study(ies), investigation(s) and/or remedial action(s) required by this Consent Order. Upon certification of completion of the remedial action(s), the MDEQ shall refund to the LBWL any remaining balance of the Financial Instrument. The LBWL shall deliver the Financial Instrument to the Chief, Enforcement Section, Waste Management Division, Michigan Department of Environmental Quality, John Hannah Building, P.O. Box 30241, Lansing, Michigan 48909.

IV. APPROVAL OF SUBMITTALS

For any work plan, proposal, or other document, excluding applications for permits or licenses, that is required by this Consent Order to be submitted to the MDEQ by the LBWL, the following process and terms of approval shall apply:

4.1 To be approved by the MDEQ, any work plan, proposal, or other document required to be

submitted by this Consent Order shall include all of the information required by the applicable statute and/or rule, along with all the information which is required by the applicable paragraph(s) of this Consent Order.

4.2 The MDEQ may approve, disapprove, or approve with specific minor modifications, the required work plan, proposal, or other document. Upon MDEQ approval of the work plan, proposal, or other document, such work plan, proposal, or other document shall become a part of this Consent Order and shall be enforceable in accordance with the provisions of this Consent Order.

4.3 If the MDEQ disapproves a work plan, proposal, or other document, it shall state, in writing, the specific reasons for such disapproval. The LBWL shall submit, within thirty (30) days of receipt of such disapproval, a revised work plan, proposal, or other document which adequately addresses the reasons for the MDEQ's disapproval.

4.4 If the MDEQ approves with specific minor modifications a work plan, proposal, or other document, it shall state, in writing, the specific modifications required prior to implementation and the specific reasons for such modifications. The MDEQ may require the LBWL to submit, prior to implementation and within thirty (30) days of receipt of such approval with specific modifications, a revised work plan, proposal, or other document which adequately addresses such modifications.

4.5 Failure by the LBWL to submit a required work plan, proposal, or other document, complete and in accordance with the requirements of the NREPA, its rules, and this Consent Order, within the applicable time period specified above, shall subject the LBWL to the stipulated penalty provisions of this Consent Order, commencing on the date the original work plan, proposal, or other document was due and accumulating until an approvable work plan, proposal or other document is submitted.

4.6 Any delays caused by the LBWL's failure to submit a required work plan, proposal, or other document, complete and in accordance with the requirements of the NREPA, its rules, and this Consent Order, shall in no way affect or alter the LBWL's responsibility to comply with any other deadline(s) specified in this Consent Order.

V. REPORTING

5.1 The LBWL shall make all submittals required by this Consent Order to the Shiawassee District Supervisor, Waste Management Division, Michigan Department of Environmental Quality, 10650 Bennett Drive, Morrice, Michigan 48857-9792, unless specifically directed otherwise within this Consent Order. If the address of the District Supervisor changes, the LBWL will be

notified in writing and shall make all subsequent submittals to any new address of which they are notified.

5.2 The LBWL shall notify the District Supervisor of the MDEQ's Waste Management Division, in writing, of the date of completion of each requirement of this Consent Order within twenty-eight (28) days of such completion.

5.3 The LBWL shall verbally report any violation(s) of the terms and conditions of this Consent Order to the District Supervisor of the MDEQ's Waste Management Division by no later than the close of the next business day following detection of such violation(s) and shall follow such notification with a written report within five (5) business days following detection of such violation(s). The written report shall include a detailed description of the violation(s), as well as a description of any actions proposed or taken to correct the violation(s). The LBWL shall report any anticipated violation(s) of this Consent Order to the above-referenced individual in advance of the relevant deadlines whenever possible.

VI. MODIFICATIONS AND EXTENSIONS

6.1 At the request of the LBWL, plans approved by the MDEQ, with the exclusion of schedules, may be modified by the Shiawassee District Supervisor of the Waste Management Division.

6.2 The LBWL and the MDEQ agree that the Chief of the Waste Management Division may, but in no circumstances is obligated to, grant the LBWL an extension of the specified deadlines set forth in this Consent Order for no more than one hundred eighty two (182) days. Any extension shall be preceded by a timely written request which shall include:

a. An identification of the specific deadline(s) of this Consent Order that will not be met.

b. A detailed description of the circumstances which will prevent the LBWL from meeting the deadline(s).

c. A description of the measures the LBWL has taken and/or intends to take to meet the required deadline.

d. The length of the extension requested and the specific date on which the obligation will be met.

6.3 Any extensions of greater than one hundred eighty-two (182) days or other modifications or amendments shall require a formal written modification to this Consent Order, shall be signed by both parties, shall have as their effective date the date on which they are signed by the MDEQ, and shall be incorporated into this Consent Order.

VII. RIGHT OF ENTRY

7.1 The LBWL agrees that the MDEQ, its agents, employees, and representatives shall have the right to enter upon the Landfill and surrounding property owned by the LBWL at any reasonable time for the purposes of inspecting, investigating, photographing, testing, and monitoring the surface and sub-surface areas of the Landfill, removing soil, sediment and water samples, and determining compliance with the provisions of this Consent Order and any applicable state and federal law.

VIII. GENERAL PROVISIONS

8.1 The MDEQ reserves the right to pursue any other legal remedies available for any failure on the part of the LBWL to comply with the requirements of any state or federal law, including the NREPA and the rules promulgated pursuant to the statute.

8.2 Nothing in this Consent Order shall be considered to affect any liability the LBWL may have for natural resources damages caused by the LBWL's ownership and/or operation of the Landfill. The State of Michigan does not waive any right to bring an appropriate action to recover any such damages to the natural resources.

8.3 The parties agree that the terms and conditions of this Consent Order will be enforceable in circuit court. The parties further agree that the appropriate venue for the enforcement of this Consent Order shall be the Circuit Court for the County of Ingham, State of Michigan, which court shall also be appropriate for dispute resolution.

8.4 The provisions of this Consent Order shall be binding on the parties to this Consent Order, their officers, directors, agents, servants, and employees; their successors and assigns; and those persons in active concert or participation with them who receive actual notice of this Consent Order. In the event that the LBWL desires to convey ownership of the Landfill property to another party, the LBWL shall advise the prospective transferee in writing of the existence of this Consent Order in advance of any conveyance of the property. Prior to conveyance, the LBWL shall provide the MDEQ with written notice of the proposed conveyance, the name and address of the transferee, and confirmation that notice of this Consent Order has been provided to the transferee.

8.5 This Consent Order in no way affects LBWL's responsibility to comply with any other applicable state, federal, or local laws or regulations, including, without limitation, any corrective action or similar requirements applicable to the Landfill pursuant to the NREPA and its rules.

IX. DISPUTE RESOLUTION

9.1 The dispute resolution procedures of this Section shall be the exclusive mechanism to resolve disputes arising under this Consent Order and shall apply to all provisions of this Consent Order. Any dispute that arises under this Consent Order shall, in the first instance, be the subject of informal negotiations between the parties. The period of negotiations shall not exceed ten (10) business days from date of written notice by any party that a dispute has arisen, but it may be extended by an agreement of the parties. The period for informal negotiations shall end when the MDEQ provides a written statement setting forth its proposed resolution of the dispute to the LBWL.

9.2 If the parties fail to resolve a dispute by informal negotiations, then the dispute shall be resolved in accordance with the resolution proposed by the MDEQ unless, within ten (10) business days after receipt of the MDEQ's proposed resolution, the LBWL files a petition with a court of competent jurisdiction setting forth the matter in dispute, the efforts made by the parties to resolve it, the relief requested, and the schedule, if any, within which the dispute must be resolved to ensure orderly implementation of this Consent Order.

9.3 Within twenty-one (21) days after receipt of a petition for dispute resolution, the MDEQ shall file its response to the petition, including the administrative record supporting the MDEQ's proposed resolution of the dispute.

9.4 In proceedings on any dispute relating to the selection, extent, or adequacy of any response activities, the LBWL shall have the burden of demonstrating on the administrative record that the position of the MDEQ is arbitrary and capricious or otherwise not in accordance with law. In proceedings on any dispute, the LBWL shall bear the burden of persuasion on factual issues.

Nothing herein shall prevent the MDEQ from arguing that the court should apply the arbitrary and capricious standard of review to all disputes under this Consent Order.

9.5 If the pendency of dispute resolution proceedings prevent the LBWL from complying with one or more obligations or requirements of this Consent Order, then the filing of a petition asking the court to resolve a dispute shall extend or postpone the obligation or requirements of the LBWL under this Consent Order that are in dispute for a period not to exceed the actual time taken to resolve the dispute. The LBWL shall continue to comply, however, with all other obligations and requirements under this Consent Order that are not affected by the dispute resolution proceedings. Payment of stipulated penalties, with respect to the disputed matter, shall be stayed pending resolution of the dispute. Stipulated penalties shall accrue from the first day of any failure or refusal to comply with any term or condition of this Consent Order. In the event that the LBWL does not prevail on the disputed issue, stipulated penalties shall be paid at the conclusion of dispute resolution proceedings as provided in Section XI, unless LBWL can demonstrate to the court's satisfaction that it pursued dispute resolution in good faith, in which case the court may reduce the amount of stipulated penalties by the number of days the court determines the LBWL was delayed by the dispute resolution process.

9.6 Notwithstanding this Section, the LBWL shall pay that portion of a demand for reimbursement of costs or payment of stipulated penalties that is not subject to a good faith resolution, in accordance with and in the manner provided in Section XI.

X. FORCE MAJEURE

10.1 The LBWL shall perform the requirements of this Consent Order within the time limits established herein, unless performance is prevented or delayed by events which constitute a "Force Majeure." Any delay in the performance attributable to a "Force Majeure" shall not be deemed a violation of the LBWL's obligations under this Consent Order in accordance with this Section.

10.2 For the purpose of this Consent Order, "Force Majeure" means an occurrence or non-occurrence arising from causes not foreseeable, beyond the control of and without the fault of LBWL, such as: an Act of God; untimely review of permit applications or submissions by the MDEQ or other applicable authority; and acts or omissions of third parties that could not have been avoided or overcome by the LBWL's diligence and that delay the performance of an obligation under this Consent Order. "Force Majeure" does not include, among other things, unanticipated or increased costs, changed financial circumstances, or failure to obtain a permit or license as a result of the LBWL's actions or omissions.

10.3 The LBWL shall notify the MDEQ by telephone within forty-eight (48) hours of discovering any event which causes a delay in its compliance with any provision of this Consent Order. Verbal notice shall be followed by written notice within ten (10) calendar days and shall describe in detail the anticipated length of delay, the precise cause or causes of delay, the measures taken by the LBWL to prevent or minimize the delay, and the timetable by which those measures shall be implemented. The LBWL shall adopt all reasonable measures to avoid or minimize any such delay.

10.4 Failure of the LBWL to comply with the notice requirements of Paragraph 10.3, above, shall render this Section X void and of no force and effect as to the particular incident involved. The MDEQ may, at its sole discretion and in appropriate circumstances, waive the notice requirements of Paragraph 10.3.

10.5 If the parties agree that the delay or anticipated delay was beyond the control of LBWL, this may be so stipulated and the parties to this Consent Order may agree upon an appropriate modification of this Consent Order. If the parties to this Consent Order are unable to reach such agreement, the dispute shall be resolved in accordance with Section IX regarding Dispute Resolution of this Consent Order. The burden of proving that any delay was beyond the reasonable control of the LBWL, and that all the requirements of this Section X have been met by LBWL, is on LBWL.

10.6 An extension of one compliance date based upon a particular incident does not necessarily mean that the LBWL qualifies for an extension of a subsequent compliance date without providing proof regarding each incremental step or other requirement for which an extension is sought.

XI. STIPULATED SETTLEMENT, PENALTIES, AND COSTS

11.1 Within thirty (30) days of the effective date of this Consent Order, the LBWL shall pay to the General Fund of the State of Michigan a civil fine in the sum of $104,000.00. This sum is in addition to any fees, taxes, or other fines that may be imposed on the LBWL by law.

11.2 Within thirty (30) days of the effective date of this Consent Order, the LBWL shall pay to the State of Michigan the sum of $21,900.00 in partial compensation for the costs of surveillance and enforcement.

11.3 The LBWL shall pay to the General Fund of the State of Michigan a stipulated penalty per violation for each instance of non-compliance with the specifically expressed time provisions and limitations of this Consent Order as follows:

a. $500 a day for day(s) one (1) through fourteen (14) for each violation.

b. $1,000 a day for days fifteen (15) through thirty (30) for each violation.

c. $2,000 a day for each day thereafter for each violation.

Stipulated penalties shall be paid within thirty (30) days after receiving a written demand made by the MDEQ.

11.4 To ensure timely payment of the penalties and costs set forth in paragraphs 11.1, 11.2, and 11.3 above, the LBWL shall pay an interest penalty to the State of Michigan each time it fails to make a complete or timely payment. Interest shall accrue on the outstanding unpaid balance of the amount of any civil fine or costs from the date payment is due until the outstanding payment is made in full. The rate of interest shall be the rate specified in Section 6013(6) of the Revised Judicature Act of 1961, Act No. 236 of the Public Acts of 1961, being Section 600.6013 of the Michigan Compiled Laws.

11.5 The LBWL shall pay the above penalties and costs by certified or cashier's check made payable to the "State of Michigan" and mailed to Michigan Department of Environmental Quality, Cashier's

Office, P.O. Box 30657, Lansing, Michigan 48909-8157, or hand delivered to Michigan Department of Environmental Quality, Cashier's Office, 300 South Washington Square, Suite 457, Lansing, Michigan 48933.

11.6 To ensure proper credit, all payments to this Consent Order must include the Payment Identification Number WMD 3019 on the check.

11.7 The LBWL agrees not to contest the legality of the penalties, costs, or interest penalties assessed pursuant to this Consent Order. The LBWL further agrees not to contest the legality of any stipulated penalties assessed pursuant this Consent Order, but reserves the right to dispute the factual basis upon which a demand by the MDEQ for stipulated penalties is made in a court of competent jurisdiction.

11.8 Liability for or payment of stipulated penalties pursuant to this Consent Order shall not preclude the State of Michigan from seeking injunctive relief or other relief for the LBWL's failure to comply with the requirements of this Consent Order and/or any permits required to comply with this Consent Order.

XII. TERMINATION

12.1 This Consent Order shall remain in full force and effect until expressly terminated by a written Notice of Termination issued by the Chief of the MDEQ's Waste Management Division ("Division Chief"). The LBWL may request that the Division Chief issue a written Notice of Termination at any time after achieving full compliance with this Consent Order. Such a request shall consist of a written certification that the LBWL has fully complied with all of the requirements of this Consent Order and shall include the date any fines, penalties, or costs were paid.

12.2 At the time of the LBWL's request for termination, the Division Chief may request additional relevant information regarding the certification. The Division Chief shall issue a written Notice of Termination unless the MDEQ determines that the LBWL has not submitted the certification required by the preceding paragraph, has failed to submit the information specifically requested by the Division Chief, or has failed to comply with, or complete, all of the requirements of this Consent Order.

XIII. EFFECTIVE DATE

This Consent Order shall be effective upon the date that it is signed by the MDEQ.

XIV. SIGNATORIES

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.

Lansing Board of Water and Light

By: Joseph Pandy Jr
Title: General Manager
Date 4/17/98

By: Mary E. Sova
Title: Corporate Secretary
Date: 4/20/98

DEPARTMENT OF ENVIRONMENTAL QUALITY

Russell J. Harding
Director

By: Jim Sygo
Jim Sygo
Chief, Waste Management Division
Date: 4/28/98

APPROVED AS TO FORM:
Frank J. Kelley
Attorney General

By
John Fordell Leone
Assistant Attorney General
Natural Resources Division

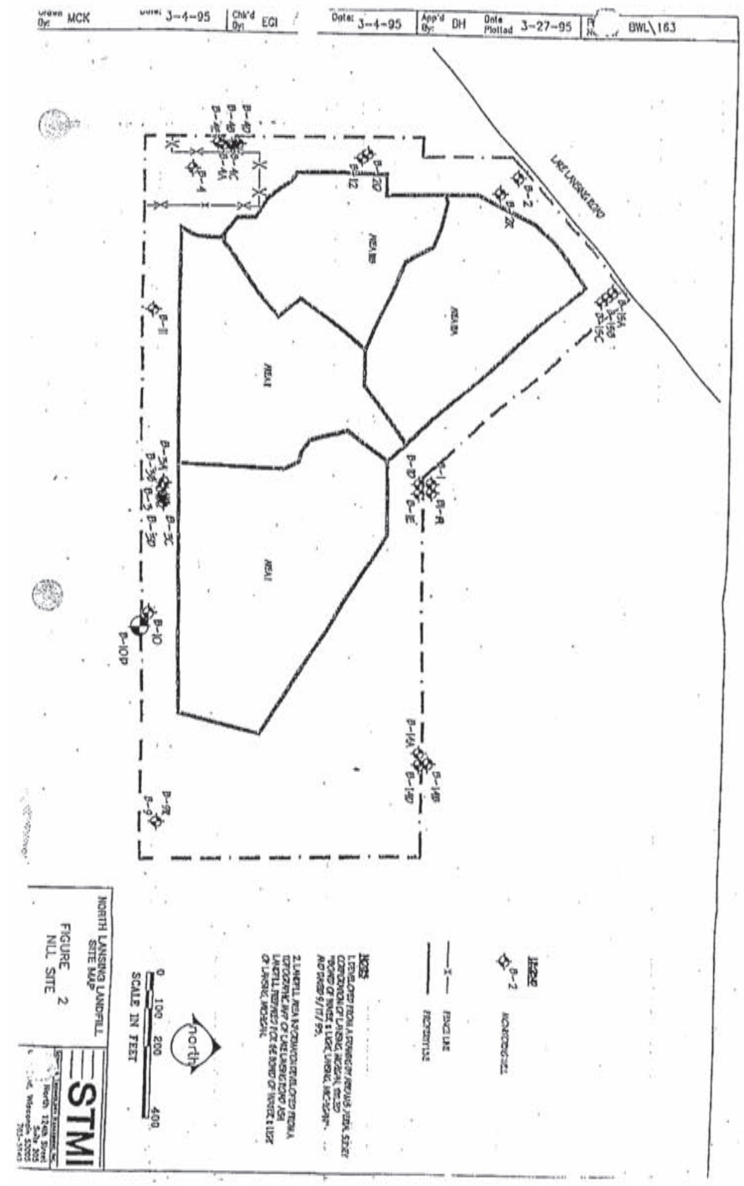
Date: April 6, 1998

Attachment A-Landfill map showing areas
Attachment B-Denials
Attachment C-Showing of Compliance and Showing of Cause Why Department Should Not Order Cessation of Operations
Attachment D-SOF
Attachment E-Review of Hydrogeological Monitoring Program

APPROVED AS TO FORM
Lawrence D. Wilhite
BOARD OF WATER & LIGHT
LEGAL COUNSEL

- 15 -

ATTACHMENT A



STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

February 23, 2006

RECEIVED
MAR - 1 2006
LEGAL DEPARTMENT

cc: Amy C
Jack H
Rick B
Jean P

CERTIFIED MAIL

Ms. Amy M. Cavanaugh
1232 Haco Drive
Lansing, Michigan 48912

Dear Ms. Cavanaugh:

SUBJECT: Amendment to WMD Order No. 115-01-98, Lansing Board of Water and Light (LBWL), North Lansing Landfill

Enclosed please find a fully executed original of the Amendment to Consent Order between Lansing Board of Water and Light and the Department of Environmental Quality (DEQ). The Consent Order became effective on February 14, 2006, the date of the Chief of the Waste and Hazardous Materials Division's signature. The DEQ acknowledges that the Baseline Hydrogeologicial Report required by paragraph 2.6 has been received and is currently being reviewed by staff.

Sincerely,

John Craig

John Craig, Chief
Enforcement Section
Waste and Hazardous Materials Division
517-373-7923

Enclosure
cc/enc: Ms. Celeste Gill, Department of Attorney General
Mr. Lee Carter, DEQ
Mr. James Arduin, DEQ
Ms. Marta Fisher, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE AND HAZARDOUS MATERIALS DIVISION

In the matter of the
Administrative proceedings against
Lansing Board of Water and Light
North Lansing Landfill
Lansing, Michigan
Located in the S ½, Section 3, T4N, R2W
Lansing, Township, Ingham County, Michigan

WHMD Order No. 115-01-98-06A

AMENDMENT TO CONSENT ORDER

This Amendment, which becomes effective on the date it is signed by the Division Chief of the Waste and Hazardous Materials Division, modifies WMD Order No. 115-01-98, dated April 28, 1998, between the Lansing Board of Water and Light ("LBWL") and the Department of Environmental Quality ("DEQ") ("Consent Order").

RECITALS

Since the Consent Order was signed in April 1998, the LBWL has submitted two Remedial Investigation ("RI") Reports to the DEQ. Both of these RI Reports were rejected by DEQ, primarily due to the LBWL's inability to conclusively determine the extent of the groundwater contamination emanating from the landfill, as required by R 299.4319 of the rules promulgated pursuant to Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended ("NREPA") ("Part 115 Rules"). The DEQ acknowledges that the LBWL's inability to conclusively determine the extent of the groundwater contamination from the landfill is caused in part by factors outside of the LBWL's control, including the effect of other contaminated plumes, such as that from the nearby Motor Wheel site, which is a site listed under the Comprehensive Environmental Response, Compensation and Liability Act, 1980 PL 96-510.

The Consent Order requires the LBWL to submit an approvable RI Report before crafting a Feasibility Study ("FS") with corresponding Remedial Action Plan ("RAP"). The DEQ and the LBWL agree that contamination from other sources in the vicinity of the Landfill has resulted in a delay of the completion of an approvable RI meeting the requirements of Part 201, Environmental Remediation, of the NREPA. The DEQ and the LBWL agree that the Consent Order should be amended to allow the LBWL to move forward with source control under an interim response activity plan (Interim ResAP) until such time as an RI could be completed that would meet the requirements of Part 201. Therefore, the parties agree to amend the 1998 Consent Order as follows:

STIPULATIONS

1. Paragraph 1.14, subparagraphs (d), (e), and (f), are hereby modified to read as follows:

   (d) Complete a baseline hydrogeological investigation report of the contaminated groundwater based on the previously submitted draft RI reports and any other data collected to date, pursuant to R 299.5528 of the rules promulgated pursuant to Part 201 ("Part 201 Rules") but which may not, at this time, include the full extent of the plume;

   (e) Based on the hydrogeological information gathered to date, propose an FS in accordance with R 299.5530 of the Part 201 Rules to determine which interim actions are appropriate for the interim response action required in Paragraph 2.3.

   (f) Based on the FS, develop and implement the Interim ResAP.

2. The language in Subsection II.B, Remedial Investigation, and Subsection II.C, Feasibility Study/Remedial Action, shall be stricken in its entirety and replaced with the following:

2.3 On September 30, 2005, the LBWL submitted to the DEQ for review and approval in accordance with Section IV of the Consent Order, an FS based on hydrogeologic information already gathered by the LBWL to meet the requirements for feasibility studies contained in R 299.5530 of the Part 201 Rules. On December 23, 2005, the LBWL submitted additional information in response to a request from the DEQ. The DEQ shall review and either approve or reject with specific comments the FS.

2.4 Within ninety (90) days of DEQ approval of the FS, the LBWL agrees to complete the following interim remediation design measures:

(a) install a well to perform pump tests; and

(b) perform a geotechnical evaluation of the landfill to determine compaction.

2.5 If the interim response action selected in the FS does not include an impermeable barrier (slurry wall), the LBWL shall submit to the DEQ for review and approval, a closure plan for the landfill within sixty (60) days of the DEQ's approval of the FS.

2.6 By January 31, 2006, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, a baseline hydrogeologic report ("Baseline HR"). The Baseline HR will summarize all information known to the LBWL regarding the extent of the contamination from the Landfill. The Baseline HR shall meet all the requirements for a remedial investigation found in R 299.5528 of the Part 201 Rules, with the exception of the extent of the plume emanating from the landfill. The Baseline HR will supersede all previously submitted RI Reports.

2.7 Until this requirement is modified or discontinued in a final remedial action for the site, by December 31st of each year beginning December 31, 2006, the LBWL shall provide to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an annual update of the Baseline HR ("Annual Update Report"). The Annual Update Report of the hydrogeological conditions shall include, but not be limited to, information on the distribution of groundwater concentrations of contaminants originating from the landfill and information on other groundwater contamination conditions existing at the landfill and downgradient of the site. If the DEQ does not approve or disapprove the Annual Update Report within one hundred twenty (120) days of receipt, the Annual Update Report shall be deemed approved.

2.8 Within one hundred twenty (120) days of completion of the activities required in Paragraph 2.4 above, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an interim remediation design report ("Remediation Design Report") that will provide for an Interim ResAP that meets the requirements of R 299.5526, R 299.5538, and R 299.5540 of the Part 201 Rules. If the selected Interim ResAP includes an impermeable barrier, the LBWL shall include the closure plan as part of the Remediation Design Report in lieu of the requirements in Paragraph 2.5, above. In lieu of submitting separate documents for the Interim ResAP and the postclosure plan, the Remediation Design Report shall also include the postclosure plan meeting the requirements of R 299.4447 of the Part 115 Rules. The Remediation Design Report shall include a schedule for implementation and a plan for evaluating the effectiveness of the Interim ResAP.

2.9 Upon approval by the DEQ, the LBWL shall implement the Remediation Design Report in accordance with the schedule contained therein.

2.10 Within five (5) years of the date of startup of the extraction well(s) for source control system, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an evaluation of the effectiveness of the Interim ResAP (hereinafter "Effectiveness Evaluation"). The LBWL and the DEQ agree that the monitoring wells to be used for the Effectiveness Evaluation are identified in Attachment 1 and also agree that Attachment 1 may be modified by mutual agreement. As part of the Effectiveness Evaluation, LBWL shall;

a. Evaluate the source controls installed pursuant to the Remediation Design Report.

b. Determine what, if any, contaminant plume is continuing to emanate from the landfill and if there is a contaminant plume continuing to emanate from the landfill, determine which contaminants are present and at what concentrations, and whether the levels of contamination present exceed the applicable Part 201 criteria.

c. Evaluate the Baseline HR well data and all Annual Update Reports to show what has been happening over time.

d. Make a conclusion based on analytical results from the indicator wells identified in Attachment 1, as to whether Paragraph 2.11, subparagraph (a) or (b), below, applies.

2.11 Within sixty (60) days of the DEQ approval of the Effectiveness Evaluation, the LBWL shall submit to the DEQ for review and approval, either subparagraph (a) or (b), below:

a. If the Effectiveness Evaluation as approved by the DEQ concludes that there is contaminant plume above the applicable Part 201 levels,

then the LBWL shall submit to the DEQ for review and approval, proposed response actions and a schedule for implementation, in compliance with Part 201.

b. If the Effectiveness Evaluation as approved by the DEQ concludes that contaminants emanating from the landfill are present at levels less than the applicable Part 201 levels, then the Effectiveness Evaluation shall be deemed to be an approved RI Report, and the LBWL shall submit an RAP to make the interim response action the final remedial action for the site to meet the requirements of Part 201 including, but not limited to, the need for financial assurance for postclosure care and entering an enforceable document to ensure the remedial actions continue to be operated and maintained.

2.12 Removal of the waste mass at the landfill shall be required only if all other alternatives have been determined to be not feasible.

3. As long as the LBWL is complying with the terms of this Amendment, the DEQ shall hold in abeyance any action based on the DEQ's allegation that the LBWL is in violation of the closure plan requirements of the DEQ's regulations. Moreover, so long as the LBWL is complying with the terms of this Amendment, the DEQ agrees not to claim that the LBWL is in violation of the requirement to submit the RI Report. The LBWL reserves fully its defenses and rights in response to any future DEQ claim, including Circuit Court review.

4. Any provision in the Consent Order not specifically modified by this Amendment remains in full force and effect.

5. The parties agree that this Amendment was drafted through negotiation by both parties and any ambiguity shall be construed neither for nor against either party.

SIGNATORIES

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Amendment to Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.

Lansing Board of Water and Light

By: Sanford Novick
Sanford B. Novick
Title: General Manager
Date: 2/10/06

By: Rosemary Sullivan
Rosemary Sullivan
Title: Acting Secretary
Date: 2-10-06

APPROVED
Amy M. Cavanaugh
BOARD OF WATER & LIGHT
LEGAL COUNSEL
Date: 2/10/06

Department of Environmental Quality

Steven E. Chester
Director

By: George W. Bruchmann
George W. Bruchmann, Chief
Waste and Hazardous Materials Division
Date: 2-14-06

APPROVED AS TO FORM:

Michael A. Cox
Attorney General

By: Celeste Gill
Celeste Gill, P 52484
Assistant Attorney General
Environment, Natural Resources, and Agriculture Division
Department of Attorney General
P.O. Box 30755
Lansing, Michigan 48933

Date: 2/13/06

ATTACHMENT 1

Baseline Hydrogeologic Assessment Monitoring Wells

Sample Location	Aquifer	Hydraulic Position*	Hydrogeologic Assessment[1]	Indicator Wells[2]	Notes
15-01	Saginaw	sidegradient	X		
25-02	Saginaw	upgradient	X		
25-15	Saginaw	downgradient	X		
25-16	Saginaw	downgradient	X		
25-21	Saginaw	downgradient	X		
25-22	Saginaw	downgradient	X		
B01D/Dr	Upper	upgradient	X	-3-	
B01E/M	Upper	upgradient	X	-3-	
B01R/S	Upper	upgradient	X	-3-	
B02	Upper	downgradient	X	-3-	
B02R	Upper	downgradient	X	-3-	
B03	Upper	downgradient	X	-3-	
B03A	Saginaw	downgradient	X	-3-	
B03B	Upper	downgradient	X	-3-	
B03C	Upper	downgradient	X	-3-	
B03D	Upper	downgradient	X	-3-	
B04A	Upper	downgradient	X	-3-	In SS on top of shale
B04B	Upper	downgradient	X	-3-	
B04C	Upper	downgradient	X	-3-	
B04D	Upper	downgradient	X	-3-	
B04E	Saginaw	downgradient	X	-3-	
B09	Upper	downgradient	X	-3-	
B09RR	Upper	downgradient	X	-3-	
B10	Upper	downgradient	X	-3-	
B10D	Upper	downgradient	X	-3-	
B11	Upper	downgradient	X	-3-	
B12	Upper	downgradient	X	-3-	
B12C	Upper	downgradient	X	-3-	In siltstone in shallow shale
B12D	Upper	downgradient	X	-3-	
B14A	Upper	upgradient	X	-3-	
B14B	Upper	upgradient	X	-3-	
B14D	Upper	upgradient	X	-3-	
B15A	Upper	upgradient	X	-3-	
B15B	Upper	upgradient	X	-3-	
B15C	Upper	upgradient	X	-3-	
B16D	Upper	downgradient	X	X	
B16S	Upper	downgradient	X	X	
B17	Upper	downgradient	X	X	
B17A	Saginaw	upgradient	X	X	
B19	Upper	downgradient	X		
B20	Upper	downgradient	X		
B21	Upper	downgradient	X	X	
B22	Saginaw	upgradient	X	X	
GMW-23	Upper	upgradient	X		
GMW-30s	Upper	upgradient	X		
GMW-30d	Upper	upgradient	X		
IC1	Upper	downgradient	X		
IC2	Upper	downgradient	X		
IC7	Upper	downgradient	X		
MW12D	Upper	sidegradient	X		
MW23	Saginaw	downgradient	X		
MW24	Saginaw	downgradient	X		
MW31	Upper	sidegradient	X		
MW34	Upper	downgradient	X		

Baseline Hydrogeologic Assessment Monitoring Wells

Sample Location	Aquifer	Hydraulic Position*	Hydrogeologic Assessment[1]	Indicator Wells[2]	Notes
MW35	Upper	sidegradient	X		
MW36	Upper	sidegradient	X		
MW37	Upper	upgradient	X		
MW38	Upper	downgradient	X		
MW39	Upper	downgradient	X		
MW40	Upper	downgradient	X		
MW42	Upper	downgradient	X	X	
MW43	Upper	downgradient	X	X	
MW44	Upper	downgradient	X	X	
MW45	Upper	downgradient	X		
MW46	Upper	downgradient	X		
MW50	Upper	downgradient	X		
MW53	Upper	downgradient	X		
MW55	Saginaw	downgradient	X		
MW56	Saginaw	downgradient	X		
MW57	Upper	downgradient	2006		Alternative for MW59, begin sampling in 2006
MW60	Upper	downgradient	X		
MW64	Upper	downgradient	X		
MW65	Saginaw	downgradient	X	X	
MW66	Saginaw	downgradient	X	Li only	
MW67	Saginaw	downgradient	X		
MW68	Saginaw	downgradient	X		
MW71	Upper	downgradient	X		
MW75	Saginaw	downgradient	X		
MW77	Upper	upgradient	X		
MW78	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW84	Upper	downgradient	X	X	
MW85	Upper	downgradient	X		
MW86	Upper	downgradient	X		
MW87	Saginaw	downgradient	X		Well damaged as of 2005
MW88	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW89	Saginaw	downgradient	X		Well with packers, *sample shallow interval if possible*
MW90	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW91A	Saginaw	downgradient	X		
MW92	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW94	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
Sample Count			90		

* : Saginaw aquifer wells are hydraulically classified relative to the area of hydraulic connection
1. Any new MWDS wells will be considered
2. Indicator wells are the wells to be used for the puposes outlined in section 2.10 and 2.11 of the Consent Order Amendment
3. Many of these wells may be removed and replaced during barrier construction.

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

JENNIFER M. GRANHOLM
GOVERNOR

STEVEN E. CHESTER
DIRECTOR

May 4, 2006

CERTIFIED MAIL

Mr. Jack Hill, Director
Environmental Health and Safety Division
1232 Haco Drive
Lansing, Michigan 48901-3007

Dear Mr. Hill:

SUBJECT: Second Amendment to WMD Order No. 115-01-98, Lansing Board of Water and Light (LBWL), North Lansing Landfill

Enclosed please find a fully executed original of the Second Amendment to Consent Order (Amendment) between Lansing Board of Water and Light and the Department of Environmental Quality (DEQ). The Amendment, WHMD Order No. 115-01-98-06B became effective on May 3, 2006, the date of the Chief of the Waste and Hazardous Materials Division's signature.

Sincerely,

John Craig

John Craig, Chief
Enforcement Section
Waste and Hazardous Materials Division
517-373-7923

Enclosure
cc/enc: Ms. Celeste Gill, Department of Attorney General
Mr. Lee Carter, DEQ
Mr. James Arduin, DEQ
Ms. Marta Fisher, DEQ

RECEIVED
MAY - 9 2006
WASTE & HAZARDOUS MATERIALS DIVISION
SHIAWASSEE STREET OFFICE

CONSTITUTION HALL • 525 WEST ALLEGAN STREET • P.O. BOX 30241 • LANSING, MICHIGAN 48909-7741
www.michigan.gov • (517) 335-2690

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE AND HAZARDOUS MATERIALS DIVISION

In the matter of the
Administrative proceedings against
Lansing Board of Water and Light
North Lansing Landfill
Lansing, Michigan
Located in the S ½, Section 3, T4N, R2W
Lansing, Township, Ingham County, Michigan

WHMD Order No. 115-01-98-06B

AMENDMENT TO CONSENT ORDER

This Amendment, which becomes effective on the date it is signed by the Division Chief of the Waste and Hazardous Materials Division, modifies WMD Order No. 115-01-98, dated April 28, 1998, between the Lansing Board of Water and Light ("LBWL") and the Department of Environmental Quality ("DEQ") ("Consent Order").

RECITALS

Since the Consent Order was signed in April 1998, the LBWL has submitted two Remedial Investigation ("RI") Reports to the DEQ. Both of these RI Reports were rejected by DEQ, primarily due to the LBWL's inability to conclusively determine the extent of the groundwater contamination emanating from the landfill, as required by R 299.4319 of the rules promulgated pursuant to Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended ("NREPA") ("Part 115 Rules"). The DEQ acknowledges that the LBWL's inability to conclusively determine the extent of the groundwater contamination from the landfill is caused in part by factors outside of the LBWL's control, including the effect of other contaminated plumes, such as that from the nearby Motor Wheel site, which is a site listed under the Comprehensive Environmental Response, Compensation and Liability Act, 1980 PL 96-510.

The Consent Order requires the LBWL to submit an approvable RI Report before crafting a Feasibility Study ("FS") with corresponding Remedial Action Plan ("RAP"). The DEQ and the LBWL agree that contamination from other sources in the vicinity of the Landfill has resulted in a delay of the completion of an approvable RI meeting the requirements of Part 201, Environmental Remediation, of the NREPA. The DEQ and the LBWL agree that the Consent Order should be amended to allow the LBWL to move forward with source control under an interim response activity plan (Interim ResAP) until such time as an RI could be completed that would meet the requirements of Part 201. Therefore, the parties agree to amend the 1998 Consent Order as follows:

STIPULATIONS

1. Paragraph 1.14, subparagraphs (d), (e), and (f), are hereby modified to read as follows:

(d) Complete a baseline hydrogeological investigation report of the contaminated groundwater based on the previously submitted draft RI reports and any other data collected to date, pursuant to R 299.5528 of the rules promulgated pursuant to Part 201 ("Part 201 Rules") but which may not, at this time, include the full extent of the plume;

(e) Based on the hydrogeological information gathered to date, propose an FS in accordance with R 299.5530 of the Part 201 Rules to determine which interim actions are appropriate for the interim response action required in Paragraph 2.3.

(f) Based on the FS, develop and implement the Interim ResAP.

2. The language in Subsection II.B, Remedial Investigation, and Subsection II.C, Feasibility Study/Remedial Action, shall be stricken in its entirety and replaced with the following:

-2-

2.~~3~~ On September 30, 2005, the LBWL submitted to the DEQ for review and approval in accordance with Section IV of the Consent Order, an FS based on hydrogeologic information already gathered by the LBWL to meet the requirements for feasibility studies contained in R 299.5530 of the Part 201 Rules. On December 23, 2005, the LBWL submitted additional information in response to a request from the DEQ. The DEQ shall review and either approve or reject with specific comments the FS.

Within ~~ninety (90)~~ ONE HUNDRED AND TWENTY (120) days of DEQ approval of the FS, the LBWL agrees to complete the following interim remediation design measures:

(a) install a well to perform pump tests; and

(b) perform a geotechnical evaluation of the landfill to determine compaction.

If the interim response action selected in the FS does not include an impermeable barrier (slurry wall), the LBWL shall submit to the DEQ for review and approval, a closure plan for the ~~landfill within sixty (60) days~~ of the DEQ's approval of the FS. (it Does include slurry wall)

By January 31, 2006, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, a baseline hydrogeologic report ("Baseline HR"). The Baseline HR will summarize all information known to the LBWL regarding the extent of the contamination from the Landfill. The Baseline HR shall meet all the requirements for a remedial investigation found in R 299.5528 of the Part 201 Rules, with the exception of the extent of the plume emanating from the landfill. The Baseline HR will supersede all previously submitted RI Reports.

-3-

2.7 Until this requirement is modified or discontinued in a final remedial action for the site, by December 31st of each year beginning December 31, 2006, the LBWL shall provide to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an annual update of the Baseline HR ("Annual Update Report"). The Annual Update Report of the hydrogeological conditions shall include, but not be limited to, information on the distribution of groundwater concentrations of contaminants originating from the landfill and information on other groundwater contamination conditions existing at the landfill and downgradient of the site. If the DEQ does not approve or disapprove the Annual Update Report within one hundred twenty (120) days of receipt, the Annual Update Report shall be deemed approved.

2.8 Within one hundred twenty (120) days of completion of the activities required in Paragraph 2.4 above, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an interim remediation design report ("Remediation Design Report") that will provide for an Interim ResAP that meets the requirements of R 299.5526, R 299.5538, and R 299.5540 of the Part 201 Rules. If the selected Interim ResAP includes an impermeable barrier, the LBWL shall include the closure plan as part of the Remediation Design Report in lieu of the requirements in Paragraph 2.5, above. In lieu of submitting separate documents for the Interim ResAP and the postclosure plan, the Remediation Design Report shall also include the postclosure plan meeting the requirements of R 299.4447 of the Part 115 Rules. The Remediation Design Report shall include a schedule for implementation and a plan for evaluating the effectiveness of the Interim ResAP.

2.9 Upon approval by the DEQ, the LBWL shall implement the Remediation Design Report in accordance with the schedule contained therein.

2.10 Within five (5) years of the date of startup of the extraction well(s) for source control system, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an evaluation of the effectiveness of the Interim ResAP (hereinafter "Effectiveness Evaluation"). The LBWL and the DEQ agree that the monitoring wells to be used for the Effectiveness Evaluation are identified in Attachment 1 and also agree that Attachment 1 may be modified by mutual agreement. As part of the Effectiveness Evaluation, LBWL shall;

a. Evaluate the source controls installed pursuant to the Remediation Design Report.

b. Determine what, if any, contaminant plume is continuing to emanate from the landfill and if there is a contaminant plume continuing to emanate from the landfill, determine which contaminants are present and at what concentrations, and whether the levels of contamination present exceed the applicable Part 201 criteria.

c. Evaluate the Baseline HR well data and all Annual Update Reports to show what has been happening over time.

d. Make a conclusion based on analytical results from the indicator wells identified in Attachment 1, as to whether Paragraph 2.11, subparagraph (a) or (b), below, applies.

2.11 Within sixty (60) days of the DEQ approval of the Effectiveness Evaluation, the LBWL shall submit to the DEQ for review and approval, either subparagraph (a) or (b), below:

a. If the Effectiveness Evaluation as approved by the DEQ concludes that there is contaminant plume above the applicable Part 201 levels,

then the LBWL shall submit to the DEQ for review and approval, proposed response actions and a schedule for implementation, in compliance with Part 201.

b. If the Effectiveness Evaluation as approved by the DEQ concludes that contaminants emanating from the landfill are present at levels less than the applicable Part 201 levels, then the Effectiveness Evaluation shall be deemed to be an approved RI Report, and the LBWL shall submit an RAP to make the interim response action the final remedial action for the site to meet the requirements of Part 201 including, but not limited to, the need for financial assurance for postclosure care and entering an enforceable document to ensure the remedial actions continue to be operated and maintained.

2.12 Removal of the waste mass at the landfill shall be required only if all other alternatives have been determined to be not feasible.

3. As long as the LBWL is complying with the terms of this Amendment, the DEQ shall hold in abeyance any action based on the DEQ's allegation that the LBWL is in violation of the closure plan requirements of the DEQ's regulations. Moreover, so long as the LBWL is complying with the terms of this Amendment, the DEQ agrees not to claim that the LBWL is in violation of the requirement to submit the RI Report. The LBWL reserves fully its defenses and rights in response to any future DEQ claim, including Circuit Court review.

4. Any provision in the Consent Order not specifically modified by this Amendment remains in full force and effect.

5. The parties agree that this Amendment was drafted through negotiation by both parties and any ambiguity shall be construed neither for nor against either party.

SIGNATORIES

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Amendment to Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.

Lansing Board of Water and Light

By: _____

Title: General Manager

Date: 5/2/06

BY: _____

Title: Corporate Secretary

Date: 5/3/06

APPROVED
Amy M. Cavanaugh
BOARD OF WATER & LIGHT
LEGAL COUNSEL
Date 5/2/06

Department of Environmental Quality

Steven E. Chester
Director

By: _____
George W. Bruchmann, Chief
Waste and Hazardous Materials Division

Date: 5-3-06

APPROVED AS TO FORM:

Michael A. Cox
Attorney General

By: _____
Celeste Gill, P 52484
Assistant Attorney General
Environment, Natural Resources, and Agriculture Division
Department of Attorney General
P.O. Box 30755
Lansing, Michigan 48933

Date: 5-3-06

ATTACHMENT 1

Baseline Hydrogeologic Assessment Monitoring Wells

Sample Location	Aquifer	Hydraulic Position*	Hydrogeologic Assessment[1]	Indicator Wells[2]	Notes
15-01	Saginaw	sidegradient	X		
25-02	Saginaw	upgradient	X		
25-15	Saginaw	downgradient	X		
25-16	Saginaw	downgradient	X		
25-21	Saginaw	downgradient	X		
25-22	Saginaw	downgradient	X		
B01D/Dr	Upper	upgradient	X	-3-	
B01E/M	Upper	upgradient	X	-3-	
B01R/S	Upper	upgradient	X	-3-	
B02	Upper	downgradient	X	-3-	
B02R	Upper	downgradient	X	-3-	
B03	Upper	downgradient	X	-3-	
B03A	Saginaw	downgradient	X	-3-	
B03B	Upper	downgradient	X	-3-	
B03C	Upper	downgradient	X	-3-	
B03D	Upper	downgradient	X	-3-	
B04A	Upper	downgradient	X	-3-	In SS on top of shale
B04B	Upper	downgradient	X	-3-	
B04C	Upper	downgradient	X	-3-	
B04D	Upper	downgradient	X	-3-	
B04E	Saginaw	downgradient	X	-3-	
B09	Upper	downgradient	X	-3-	
[redacted]	Upper	downgradient	X	-3-	
B10	Upper	downgradient	X	-3-	
B10D	Upper	downgradient	X	-3-	
B11	Upper	downgradient	X	-3-	
B12	Upper	downgradient	X	-3-	
B12C	Upper	downgradient	X	-3-	In siltstone in shallow shale
B12D	Upper	downgradient	X	-3-	
B14A	Upper	upgradient	X	-3-	
B14B	Upper	upgradient	X	-3-	
B14D	Upper	upgradient	X	-3-	
B15A	Upper	upgradient	X	-3-	
B15B	Upper	upgradient	X	-3-	
B15C	Upper	upgradient	X	-3-	
B16D	Upper	downgradient	X	X	
B16S	Upper	downgradient	X	X	
B17	Upper	downgradient	X	X	
B17A	Saginaw	upgradient	X	X	
B19	Upper	downgradient	X		
B20	Upper	downgradient	X		
B21	Upper	downgradient	X	X	
B22	Saginaw	upgradient	X	X	
GMW-23	Upper	upgradient	X		
GMW-30s	Upper	upgradient	X		
GMW-30d	Upper	upgradient	X		
IC1	Upper	downgradient	X		
IC2	Upper	downgradient	X		
IC7	Upper	downgradient	X		
MW12D	Upper	sidegradient	X		
MW23	Saginaw	downgradient	X		
MW24	Saginaw	downgradient	X		
MW31	Upper	sidegradient	X		
W34	Upper	downgradient	X		

Baseline Hydrogeologic Assessment Monitoring Wells

Sample Location	Aquifer	Hydraulic Position*	Hydrogeologic Assessment[1]	Indicator Wells[2]	Notes
MW35	Upper	sidegradient	X		
MW36	Upper	sidegradient	X		
MW37	Upper	upgradient	X		
MW38	Upper	downgradient	X		
MW39	Upper	downgradient	X		
MW40	Upper	downgradient	X		
MW42	Upper	downgradient	X	X	
MW43	Upper	downgradient	X	X	
MW44	Upper	downgradient	X	X	
MW45	Upper	downgradient	X		
MW46	Upper	downgradient	X		
MW50	Upper	downgradient	X		
MW53	Upper	downgradient	X		
MW55	Saginaw	downgradient	X		
MW56	Saginaw	downgradient	X		
MW57	Upper	downgradient	2006		Alternative for MW59, begin sampling in 2006
MW60	Upper	downgradient	X		
MW64	Upper	downgradient	X		
MW65	Saginaw	downgradient	X	X	
MW66	Saginaw	downgradient	X	LI only	
MW67	Saginaw	downgradient	X		
MW68	Saginaw	downgradient	X		
MW71	Upper	downgradient	X		
MW75	Saginaw	downgradient	X		
MW77	Upper	upgradient	X		
MW78	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW84	Upper	downgradient	X	X	
MW85	Upper	downgradient	X		
MW86	Upper	downgradient	X		
MW87	Saginaw	downgradient	X		Well damaged as of 2005
MW88	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW89	Saginaw	downgradient	X		Well with packers, *sample shallow interval if possible*
MW90	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW91A	Saginaw	downgradient	X		
MW92	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
MW94	Saginaw	downgradient	X		FLUTe well, *sample shallow interval*
Sample Count			90		

* : Saginaw aquifer wells are hydraulically classified relative to the area of hydraulic connection
1. Any new MWDS wells will be considered
2. Indicator wells are the wells to be used for the puposes outlined in section 2.10 and 2.11 of the Consent Order Amendment
3. Many of these wells may be removed and replaced during barrier construction.

JENNIFER M. GRANHOLM
GOVERNOR

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
LANSING

STEVEN E. CHESTER
DIRECTOR

January 3, 2008

Ms. Gail Peterson, P.E., CHMM
Environmental Engineering Department
Lansing Board of Water and Light
1232 Haco Drive
Lansing, Michigan 48901-3007

Dear Ms. Peterson:

SUBJECT: Fourth Amendment to WMD Order No. 115-01-98, Lansing Board of Water and Light (LBWL), North Lansing Landfill

Enclosed please find a fully executed original of the fourth Amendment to Consent Order (Amendment) between LBWL and the Department of Environmental Quality (DEQ). The Amendment, WHMD Order No. 115-01-98-07D, became effective on December 21, 2007, the date of the Chief of the Waste and Hazardous Materials Division's signature.

Sincerely,

John Craig, Chief
Enforcement Section
Waste and Hazardous Materials Division
517-373-7923

Enclosure
cc/enc: Ms. Celeste Gill, Department of Attorney General
Mr. Lee Carter, DEQ
Mr. James Arduin, DEQ
Ms. Marta Fisher, DEQ

STATE OF MICHIGAN
DEPARTMENT OF ENVIRONMENTAL QUALITY
WASTE AND HAZARDOUS MATERIALS DIVISION

In the matter of the administrative proceedings
against Lansing Board of Water and Light
North Lansing Landfill, Lansing, Michigan,
Located in the S ½, Section 3, T4N, R2W,
Lansing Township, Ingham County, Michigan

WHMD Order No. 115-01-98-07D

AMENDMENT TO CONSENT ORDER

This Amendment to Consent Order ("Amendment"), which becomes effective on the date it is signed by the Chief of the Waste and Hazardous Materials Division, modifies WMD Order No. 115-01-98, dated April 28, 1998 ("Consent Order"), between the Lansing Board of Water and Light ("LBWL") and the Department of Environmental Quality ("DEQ").

RECITALS

Since the Consent Order was signed in April 1998, the LBWL has submitted two Remedial Investigation ("RI") Reports to the DEQ. Both of these RI Reports were rejected by the DEQ, primarily due to the LBWL's inability to conclusively determine the extent of the groundwater contamination emanating from the landfill, as required by R 299.4319 of the rules promulgated pursuant to Part 115, Solid Waste Management, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended ("NREPA") ("Part 115 Rules"). The DEQ acknowledges that the LBWL's inability to conclusively determine the extent of the groundwater contamination from the landfill is caused, in part, by factors outside of the LBWL's control, including the effect of other contaminated plumes, such as that from the nearby Motor Wheel site, which is a site listed under the Comprehensive Environmental Response, Compensation and Liability Act, 1980 PL 96-510.

The Consent Order requires the LBWL to submit an approvable RI Report before crafting a Feasibility Study ("FS") with a corresponding Remedial Action Plan ("RAP"). The DEQ and the LBWL agree that contamination from other sources in the vicinity of the landfill has resulted in a delay of the completion of an approvable RI meeting the requirements of Part 201, Environmental Remediation, of the NREPA. The DEQ and the LBWL agree that the Consent Order should be amended to allow the LBWL to move forward with source control under an interim response activity plan ("Interim ResAP") until such time as an RI could be completed that would meet the requirements of Part 201. Therefore, the parties agree to amend the 1998 Consent Order as follows:

STIPULATIONS

1. Paragraph 1.14, subparagraphs (d), (e), and (f), are hereby modified to read as follows:

   (d) Complete a baseline hydrogeological investigation report of the contaminated groundwater based on the previously submitted draft RI reports and any other data collected to date, pursuant to R 299.5528 of the rules promulgated pursuant to Part 201 ("Part 201 Rules") but which may not, at this time, include the full extent of the plume;

   (e) Based on the hydrogeological information gathered to date, propose an FS in accordance with R 299.5530 of the Part 201 Rules to determine which interim actions are appropriate for the interim response action required in Paragraph 2.3;

   (f) Based on the FS, develop and implement the Interim ResAP.

2. The language in Subsection II.B, Remedial Investigation, and Subsection II.C, Feasibility Study/Remedial Action, shall be stricken in its entirety and replaced with the following:

2.3 On September 30, 2005, the LBWL submitted to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an FS based on hydrogeologic information already gathered by the LBWL to meet the requirements for feasibility studies contained in R 299.5530 of the Part 201 Rules. On December 23, 2005, the LBWL submitted additional information in response to a request from the DEQ. The DEQ shall review and either approve or reject, with specific comments, the FS.

2.4 Within one hundred twenty (120) days of DEQ approval of the FS, the LBWL agrees to complete the following interim remediation design measures:

   (a) install a well to perform pump tests; and

   (b) perform a geotechnical evaluation of the landfill to determine compaction.

2.5 If the interim response action selected in the FS does not include an impermeable barrier (slurry wall), the LBWL shall submit to the DEQ for review and approval, a closure plan for the landfill within sixty (60) days of the DEQ's approval of the FS.

2.6 By January 31, 2006, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, a baseline hydrogeologic report ("Baseline HR"). The Baseline HR will summarize all information known to the LBWL regarding the extent of the contamination from the landfill. The Baseline HR shall meet all the requirements for a remedial investigation found in R 299.5528 of the Part 201 Rules, with the exception of the extent of the plume emanating from the landfill. The Baseline HR will supersede all previously submitted RI Reports.

2.7 Until this requirement is modified or discontinued in a final remedial action for the site, ~~by December 31st of each year~~ beginning December 31, 2006, the LBWL shall provide to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an annual update of the Baseline HR ("Annual Update Report"). THE ANNUAL UPDATE REPORT SHALL BE SUBMITTED TO THE DEQ BY JANUARY 31 OF THE YEAR FOLLOWING DATA COLLECTION (E.G., THE 2007 UPDATE WILL BE SUBMITTED BY JANUARY 31, 2008). The Annual Update Report of the hydrogeological conditions shall include, but not be limited to, information on the distribution of groundwater concentrations of contaminants originating from the landfill and information on other groundwater contamination conditions existing at the landfill and downgradient of the site, AS DETERMINED FROM THE HYDROGEOLOGIC ASSESSMENT WELS LISTED IN ATTACHMENT 1. If the DEQ does not approve or disapprove the Annual Update Report within one hundred twenty (120) days of receipt, the Annual Update Report shall be deemed approved.

2.8 ~~Within one hundred twenty (120) days of completion of the activities required in Paragraph 2.4 above~~ BY FEBRUARY 5, 2007, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an interim remediation design report ("Remediation Design Report") that will provide for an Interim ResAP that meets the requirements of R 299.5526, R 299.5538, and R 299.5540 of the Part 201 Rules. ON JANUARY 22, 2007, LBWL SUBMITTED THE SOURCE CONTROL DESIGN REPORT (THE REMEDIATION DESIGN REPORT). ON JUNE 7, 2007, LBWL SUBMITTED A TECHNICAL PLAN AND SPECIFICATION FOR SLURRY WALL CONSTRUCTION. INFORMATION IS STILL NEEDED ON THE CONSTRUCTION QUALITY ASSURANCE (CQA) PLAN AND OPERATIONS AND MAINTENANCE (O&M) PLAN AS THE DETAILED DEVELOPMENT OF THESE PLANS ARE DEPENDENT ON THE METHOD OF SLURRY WALL

CONSTRUCTION FOR THE SLURRY WALL EMPLOYED BY THE SELECTED CONTRACTOR. IT IS AGREED TO MODIFY THE DATE FOR SUBMITTAL OF THE REMEDIATION DESIGN REPORT TO OBTAIN THE INFORMATION NEEDED FOR THE CQA AND THE O&M PLANS TO PROVIDE A COMPLETE INTERIM DESIGN REPORT THAT MEETS THE RULES CITED ABOVE. BY JANUARY 31, 2008, THE LBWL SHALL SUBMIT TO THE DEQ, FOR REVIEW AND APPROVAL, THE REMEDIATION DESIGN REPORT THAT INCLUDES THE CQA PLAN AND THE O&M PLAN, WHICH SHALL BE BASED ON THE CONSTRUCTION METHODS OF THE SELECTED CONTRACTOR. CONSTRUCTION OF THE SLURRY WALL SHALL BEGIN WITHIN 60 DAYS OF DEQ APPROVAL OF THE REMEDIATION DESIGN REPORT. If the selected Interim ResAP includes an impermeable barrier, the LBWL shall include the closure plan as part of the Remediation Design Report in lieu of the requirements in Paragraph 2.5, above. In lieu of submitting separate documents for the Interim ResAP and the postclosure plan, the Remediation Design Report shall also include the postclosure plan meeting the requirements of R 299.4447 of the Part 115 Rules. The Remediation Design Report shall include a schedule for implementation and a plan for evaluating the effectiveness of the Interim ResAP.

2.9 Upon approval by the DEQ, the LBWL shall implement the Remediation Design Report in accordance with the schedule contained therein.

2.10 Within five (5) years of the date of startup of the extraction well(s) for a source control system, the LBWL shall submit to the DEQ for review and approval, in accordance with Section IV of the Consent Order, an evaluation of the effectiveness of the Interim ResAP ("Effectiveness Evaluation"). The LBWL and the DEQ agree that the monitoring wells to be used for the Effectiveness Evaluation are identified in Attachment 1

and also agree that Attachment 1 may be modified by mutual agreement. As part of the Effectiveness Evaluation, LBWL shall:

(a) Evaluate the source controls installed pursuant to the Remediation Design Report.

(b) Determine what, if any, contaminant plume is continuing to emanate from the landfill and, if there is a contaminant plume continuing to emanate from the landfill, determine which contaminants are present and at what concentrations and whether the levels of contamination present exceed the applicable Part 201 criteria.

(c) Evaluate the Baseline HR well data and all Annual Update Reports to show what has been happening over time.

(d) Make a conclusion based on analytical results from the indicator wells identified in Attachment 1 as to whether Paragraph 2.11, Subparagraph (a) or (b), below, applies.

2.11 Within sixty (60) days of the DEQ approval of the Effectiveness Evaluation, the LBWL shall submit to the DEQ for review and approval, either Subparagraph (a) or (b), below:

(a) If the Effectiveness Evaluation, as approved by the DEQ, concludes that there is a contaminant plume above the applicable Part 201 levels, then the LBWL shall submit to the DEQ for review and approval, the proposed response actions and a schedule for implementation in compliance with Part 201.

(b) If the Effectiveness Evaluation, as approved by the DEQ, concludes that contaminants emanating from the landfill are present at levels

less than the applicable Part 201 levels, then the Effectiveness Evaluation shall be deemed to be an approved RI Report, and the LBWL shall submit an RAP to make the interim response action the final remedial action for the site to meet the requirements of Part 201 including, but not limited to, the need for financial assurance for postclosure care and entering an enforceable document to ensure the remedial actions continue to be operated and maintained.

2.12 Removal of the waste mass at the landfill shall be required only if all other alternatives have been determined not to be feasible.

3. As long as the LBWL is complying with the terms of this Amendment, the DEQ shall hold in abeyance any action based on the DEQ's allegation that the LBWL is in violation of the closure plan requirements of the DEQ's regulations. Moreover, as long as the LBWL is complying with the terms of this Amendment, the DEQ agrees not to claim that the LBWL is in violation of the requirement to submit the RI Report. The LBWL reserves fully its defenses and rights in response to any future DEQ claim, including Circuit Court review.

4. Any provision in the Consent Order not specifically modified by this Amendment remains in full force and effect.

5. The parties agree that this Amendment was drafted through negotiation by both parties and any ambiguity shall be construed neither for nor against either party.

SIGNATORIES

The undersigned CERTIFY they are fully authorized by the party they represent to enter into this Amendment to Consent Order to comply by consent and to EXECUTE and LEGALLY BIND that party to it.

Lansing Board of Water and Light

By: _____
J. Peter Lark, General Manager

Date: 12-12-07

Department of Environmental Quality

Steven E. Chester
Director

By: _____
George W. Bruchmann, Chief
Waste and Hazardous Materials
Division

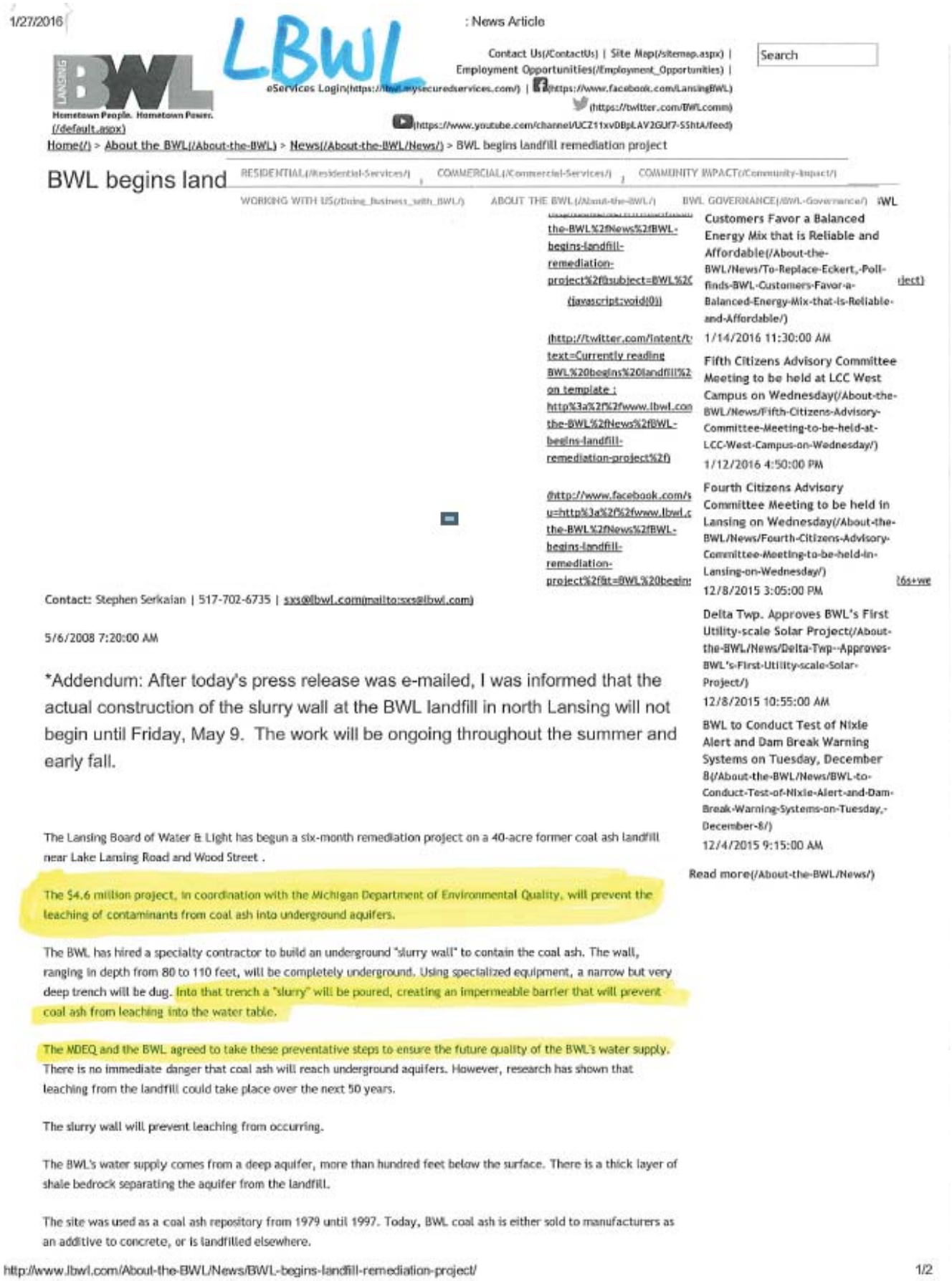
Date: 12-21-07

APPROVED AS TO FORM:

Michael A. Cox
Attorney General

By: _____
Celeste Gill, P52484
Assistant Attorney General
Environment, Natural Resources, and
Agriculture Division
Department of Attorney General
6th Floor, G. Mennen Williams Building
525 West Ottawa Street
Lansing, Michigan 48933

Date: 12-24-07



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Fifth Citizens Advisory Committee Meeting to be held at LCC West Campus on Wednesday(/About-the-BWL/News/Fifth-Citizens-Advisory-Committee-Meeting-to-be-held-at-LCC-West-Campus-on-Wednesday/) 1/12/2016 4:50:00 PM

Fourth Citizens Advisory Committee Meeting to be held in Lansing on Wednesday(/About-the-BWL/News/Fourth-Citizens-Advisory-Committee-Meeting-to-be-held-in-Lansing-on-Wednesday/) 12/8/2015 3:05:00 PM

Delta Twp. Approves BWL's First Utility-scale Solar Project(/About-the-BWL/News/Delta-Twp--Approves-BWL's-First-Utility-scale-Solar-Project/) 12/8/2015 10:55:00 AM

BWL to Conduct Test of Nixle Alert and Dam Break Warning Systems on Tuesday, December 8(/About-the-BWL/News/BWL-to-Conduct-Test-of-Nixle-Alert-and-Dam-Break-Warning-Systems-on-Tuesday,-December-8/) 12/4/2015 9:15:00 AM

Read more(/About-the-BWL/News/)

Contact: Stephen Serkaian | 517-702-6735 | sxs@lbwl.com(mailto:sxs@lbwl.com)

5/6/2008 7:20:00 AM

*Addendum: After today's press release was e-mailed, I was informed that the actual construction of the slurry wall at the BWL landfill in north Lansing will not begin until Friday, May 9. The work will be ongoing throughout the summer and early fall.

The Lansing Board of Water & Light has begun a six-month remediation project on a 40-acre former coal ash landfill near Lake Lansing Road and Wood Street .

The $4.6 million project, in coordination with the Michigan Department of Environmental Quality, will prevent the leaching of contaminants from coal ash into underground aquifers.

The BWL has hired a specialty contractor to build an underground "slurry wall" to contain the coal ash. The wall, ranging in depth from 80 to 110 feet, will be completely underground. Using specialized equipment, a narrow but very deep trench will be dug. Into that trench a "slurry" will be poured, creating an impermeable barrier that will prevent coal ash from leaching into the water table.

The MDEQ and the BWL agreed to take these preventative steps to ensure the future quality of the BWL's water supply. There is no immediate danger that coal ash will reach underground aquifers. However, research has shown that leaching from the landfill could take place over the next 50 years.

The slurry wall will prevent leaching from occurring.

The BWL's water supply comes from a deep aquifer, more than hundred feet below the surface. There is a thick layer of shale bedrock separating the aquifer from the landfill.

The site was used as a coal ash repository from 1979 until 1997. Today, BWL coal ash is either sold to manufacturers as an additive to concrete, or is landfilled elsewhere.

http://www.lbwl.com/About-the-BWL/News/BWL-begins-landfill-remediation-project/ 1/2

Residents and businesses in the area near Wood Street and Lake Lansing Road will experience some construction-like noise during the slurry wall project. The wall is expected to be complete in October.

Once the slurry wall is complete, the surface will be graded and seeded with grass.

Note to members of the media : On-site visits can be arranged by contacting Mark Nixon. Safety apparel will be made available. No open-toed or high heel shoes.

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Lansing Board of Water and Light
1232 Haco Drive
Lansing, Michigan 48912
Phone: (517) 702-6006
E-mail Us(mailto:custservice@lbwl.com)

(https://www.facebook.com/LansingBWL)

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Lansing Online News LBWL

Coal Ash Removal: BWL attacks a legacy of pollution

By Bill Castanier on May 3, 2010

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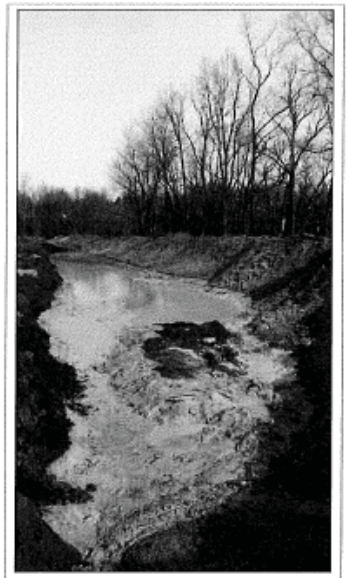

Coal ash is a toxic stew of dangerous chemicals

UPDATE: EPA today, for the first time, proposes regulations for coal-ash cleanup

EDITOR'S NOTE: We want this article to be the first of many about issues related to coal-fired power plants in our area. We encourage citizens, scientists, government officials, environmentalists and anyone else with information or concerns about these issues to contact us to share what they know – and to help us ask the right questions. One of the beauties of the Internet is the "wisdom of the crowd." You know as much or more than we do about these concerns, so please help us make this a dialogue and not a monologue.

———————————

Earlier this year, I was awakened by the throaty sound of bulldozers and trucks behind my house. I live on the Grand River, at the northern edge of where the water turns back on itself, almost cutting the City of Lansing in half. After a little investigation, I learned that the Lansing Board of Water and Light (BWL) is currently conducting a $3million coal-ash cleanup project nearby.

When our family first moved there in 1979, I remember hiking across the river, curious to see what was on the other side. I found an ash dump. A very big one. The place used to be a gravel pit back in the 1950s. Back then, when MLK was called Logan and long before any bridge spanned Grand River, neighborhood kids on Lansingâ€™s far northwest side would hike over to that "beautiful spot" on a hot summer day to enjoy a cooling swim or to fish. Older kids would show up at night for partying.

That swimming and partying came to an abrupt end about 1964, when BWL began filling up the gravel pit with coal ash residue from its now-defunct Ottawa Power Station and possibly from one other power plant. BWL is now spending millions to excavate and remove the coal-ash dumped there inÂ the past.

Coal ash is one of the many forms of residue left over after you burn coal. According to the U.S. Geological Survey, coal ash is a toxic mix of chemicals such as arsenic, cadmium, selenium and mercury, even uranium if the coal is from western states. Itâ€™s not something you would want left lying around, but thatâ€™s exactly what has

happened in Lansing and hundreds if not thousands of other sites across the nation.

> *There are currently 584 impoundments that store coal ash in 35 states, and the vast majority of the sites are not only unmonitored, they have no systems in place to keep the waste from leaking into groundwater. Studies by the Environmental Protection Agency found that toxic elements in coal ash can leach into drinking water at concentrations that far exceed federal safety standards. In 2007, the EPA estimated that some residents who live near unlined ash ponds run a risk of cancer from arsenic contamination as high as one in 50 â€" a level 2,000 times greater than the EPA's threshold for acceptable risk." – Rolling Stone, Coal's Toxic Sludge.*

Fast forward to today when BWL is celebrating its 125th anniversary, while spending the next two years digging up and re-burying that dirty little secret from its past.

In an e-mail response to questions we posed about BWL's on-going coal ash removal, the company confirmed that it is currently excavating and relocating 438,000 cubic yards of toxic coal ash from that remote gravel pit alongside the Grand River, which served as a dumping ground for coal ash from about 1964 to 1978. (Map supplied by BWL.) I care because I live nearby, and only recently have I become informed about how dangerous coal ash can be.

Coal isn't clean yet

The Ottawa Street Plant has since closed. Today, BWL continues to operate the coal-fired Moores Park steam generation plant, built in 1919, as well as two coal-fired electric-generating plants, the downtown Otto Eckert Power Station completed in the mid-1950s, as well as the Erickson Station on Canal Road in Eaton County, built in 1973, according to the BWL website.

BWL Director of Communications Mark Nixon and BWL Environmental Services Technician Fritz Domres took me on a walking tour of the site, but they did not offer an explanation of why the Board had decided at this time to begin the costly removal and reclamation process.

Not on most environmentalists' radar

Environmentalists have long been concerned about pollution from coal, but the emphasis has been on air quality. Back when BWL was dumping coal ash in what was once the popular neighborhood swimming hole, there was little or no regulation for disposal of the mixture. In reality, there still isnâ€™t, though the Environmental Protection Agency is reportedly moving to end that oversight. According to Tiffany Hartung, a Moving Beyond Coal organizer at the Sierra Club of Michigan, the proposed rules should be issued soon, though they may face a lengthy approval process.

The Iowa Independent recently reported that state lawmakers are calling for the Iowa Department of Natural Resources to issue its own rules because the federal Environmental Protection Agency has been so slow in issuing theirs. Hartung said one rumor about the proposed rules is that coal ash would be identified as a â€œhazardous substance,â€ which would mean enactment of stringent removal, storage and monitoring requirements.

By the time the rules are likely to go into effect, BWL will have removed the ash from the 30-plus-acre former gravel pit, which was up to 28 feet deep in some places before being filled in. And frankly that isnâ€™t a bad idea, from an environmental and a business standpoint.

A growing national concern

Lansing is not alone in dealing with legacy coal ash sites. Communities across the country are making plans for proper removal and reburial at certified dump sites that prevent runoff and groundwater contamination. Fortunately for BWL, the nearby Granger Landfills have licensed areas, or "cells," certified to accept the toxic material.

The problem of coal ash disposal recently garnered headlines:

> New York Times (Coal Ash Spill Revives Issue of Its Hazards),
> the Rolling Stone (Coal's Toxic Sludge) and
> a major feature in the Huffington Post (Even the Cows Have Cancer: EPA Weighs Tougher Regulation of Toxic Coal Ash).

The articles focused on the December 2008 coal ash spill in Tennessee, where a dam broke allowing millions of cubic yards of coal ash sludge to pour into a nearby River and onto adjacent land. The current BWL cleanup site never posed a threat comparable to the Tennessee disaster, because it is belowground, while the Tennessee site is aboveground. However, questions remain about whether there has been significant runoff into the Grand River and area groundwater during the past 60 years. (In March, Lansing Online News requested results from water-quality testing, but we have yet to receive any documentation.)

During the walkaround, BWL officials pointed out two nearby water wells that have been closed. In e-mail answers to a series of 30 questions we posed to BWL, their response was that the company â€œhas not abandoned any of its wells based on their proximity to the coal ash site.â€ (However, BWL did not say why the wells were closed.)

BWL also said that "a variety of water testing has occurred at the site," and groundwater testing from shallow water sources was performed, indicating sulfate and trace metals exceeding Part 201 Residential Drinking water cleanup criteria (see below). A follow-up email to BWL requesting an opportunity to examine their records has not been granted. BWL did not identify any trace metals or, if they exist, whether they exceeded proscribed levels.

BWL has already taken action to protect groundwater from coal ash contamination at another site, this one in north Lansing, which was identified in a 2007 Environmental Protection Agency report as a site where there was â€œprovenâ€ damage to groundwater. An article in Michigan Messenger cites an EPA report that says lithium, manganese, potassium and strontium were found to have moved outside the borders of the landfill, and lithium was found to be in excess of levels considered safe.

In 2008, Lansing Capital Gains reported that BWL spent $4.6 million excavating a 80-100 feet deep trench around the site on Lake Lansing Road. The article goes on to say BWL then injected a slurry that hardens into a barrier around the entire site. Although this is a common fix, some environmentalists question whether this approach might later allow leaching, since the barrier is like a bowl with the bottom cut out. When asked, Sierra Club's Hartung said, â€œI think we disagree [about the fix]."

BWL also confirmed that it has one more coal ash disposal site, at the Claude R. Erickson Power Station just off Canal Road in southwest Lansing, which is an aboveground site. In 2009, BWL responded to a request from the EPA about various aspects of Erickson site. (Read the entire response here.) We continue to request information on what the site contains. When asked about any additional sites in the area, BWL did not identify any site near its downtown Otto E. Eckert facility. In its response toÅ the EPA the BWL confirmed that the site had not been inspected since it was constructed in 1973. BWL said it would inspect the site by August 2009, but we received no confirmation of that action.

Our difficulty in gathering comprehensive information about the status of BWL coal-ash disposal sites around Lansing reflects the fact that the potential for problems appears not to be on anyone's radar. Calls to City Council Member Jessica Yorko, in whose ward the current cleanup is taking place, initially said that she knew nothing about the project. Again, environmental groups such as the Sierra Club have long been focused on air

quality instead.

IÅ was a member of the River Forest NeighborhoodÅ Association in Å the mid-1990s whenÅ another nearby coal ash dumping site on the Grand River came to light as an excavation company began dumping fill dirt on the banks of the Grand River. Although the city of Lansing stepped in to stop the dumping after several meeting on the site, most of the coal ash had already been covered up by fill removed from a BWL construction site. In its e-mail response to our questions about the incident, BWL indicated it â€œhas no records or knowledge that property north of the Grand River was utilized in the past for LBWL ash disposal.â€

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Posted in News | *Tagged* board of water and light, bwl, cleanup, coal ash, epa, Lansing, Michigan, toxic chemicals | Leave a response

Bill Castanier
Bill Castanier has been an award-wining weekly newspaper editor, advertising and public relations executive in his 40 year career. In addition, he has been an executive with a newspaper trade association and founded Michiganâ€™s first technology association, I-TE@M. He writes a weekly newspaper feature on Michigan authors and is on the Board of the Kerrytown BookFest and the Michigan Notable Book Awards. He has the only daily blog on Michigan literature (Mittenlit) and founded Spartanpodcast.com.

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LOS ALAMOS

AGREEMENT

The parties to this Agreement are The Goodyear Tire & Rubber Company (Goodyear) and the Groesbeck Park Drain Drainage District ("District") by and through the Ingham County Drain Commissioner ("Commissioner") hereafter referred to as the "Parties," who on this 23 day of October, 2002, sign and agree to the following:

WHEREAS, Goodyear is performing response activities to address contamination effecting the glacial and Saginaw aquifers that is associated with the former operation of the Motor Wheel Disposal Site and the former fertilizer plant located adjacent thereto (referred to collectively as the "Site");

WHEREAS, Goodyear desires to "tie-in" its treated water conveyance lines to the Groesbeck Park Drain ("Drain"); and

WHEREAS, Commissioner believes that response activities to be undertaken by Goodyear are beneficial to the public health and welfare; and

WHEREAS, Goodyear's "tie-in" and conveyance are limited to groundwater to be discharged only when excess capacity is available and that the property from which the discharge will occur does not drain its surface water into the Drain; and

WHEREAS, Commissioner has agreed to allow Goodyear to implement such tie-in and all other activities related to such tie-in;

NOW, THEREFORE, Goodyear shall pay $80,000 as a one-time only access/entry tie-in fee to the Groesbeck Park Drain Drainage District as a full, fair and reasonable fee in return for the right to discharge its treated water to the Drain, using excess capacity only, with volume and chemical constituent limitations consistent with the provisions of the Agreement, as follows:

1. The $80,000.00 payment to the Groesbeck Park Drain Drainage District shall be made when this Agreement is signed by the Parties and in accordance with the terms of this Agreement.

2. This Agreement shall be in effect and continue until the groundwater remediation at the Motor Wheel Disposal Site ceases and Goodyear no longer has the need to convey treated water through Goodyear's pipeline into the Drain.

3. Commissioner grants to Goodyear, its agents and employees, during the term of this Agreement, reasonable access to its premises for the purpose of fulfilling its obligation under this Agreement. Goodyear shall secure any permits required by the Ingham County Road Commission for work performed in county road right-of-way.

4. Goodyear shall pay the District's consultant for engineering review and evaluation work related to the engineering aspect involved in the "tie-in" of the Goodyear line to the Drain. The consultant's fee shall not exceed $2,500.00 total for the above referenced review and evaluation. Such expenses shall be documented with reasonable supporting documentation showing the basis for the requested amount.

5. Goodyear will reimburse the District for outside legal review costs, (Attorney Geoff Seidlein of Hubbard, Fox, Thomas, White & Bengtson P.C.), and such costs shall not exceed the total amount of $2,500.00. Such expenses shall be documented with reasonable supporting documentation showing the basis for the requested amount.

6. The Parties agree to provide reasonable access to each others' records relating to the engineering aspects of the line's tie-in.

7. District shall provide reasonable access to the Drain to Goodyear for the purpose of constructing Goodyear's line, installing the "tie-in", any maintenance, inspection and repair work involving the "tie-in" for as long as the flow of treated water to the Drain is active and in operation, or inactive but potentially needed in the future due to Goodyear's Site remediation work and further the District does grant permission to Goodyear to occupy the District's easement/right-of-way during the term of this Agreement.

8. Goodyear will indemnify, save harmless and defend the District from all liability for loss, damage, or injury to person or property in any manner arising out of or incident to the discharge by Goodyear of water to the Drain in conformance with the requirements of this Agreement.

9. Goodyear will submit "tie-in" plans for the District's engineer to review and approve prior to commencing work and installing the "tie-in" to the Drain.

10. Goodyear will be responsible for any incremental maintenance repair work costing more than the annual maintenance fee provided for in this Agreement that is required on the Drain as a result of and due to Goodyear's treated water input activities.

11. Goodyear will attempt to create a wildlife/ecological habitat at the Motor Wheel Disposal Site at a cost not to exceed $5,000.00 and subject to the requirements/limitation of the Federal Superfund laws (CERCLA) and other applicable federal, state and local laws, regulations and ordinances. The wildlife/ecological habitat enhancement program for the Motor Wheel Disposal Site shall be coordinated/implemented with input from the Commissioner.

12. The volume of treated water discharged into Groesbeck Park Drain Drainage District sewer line shall not exceed 1,100 gallons per minute (gpm) and may only be increased with prior written approval of the Commissioner.

13. The schedule for payment of annual maintenance fees and the one-time access/entry tie-in fees are as follows:

A. An annual maintenance, in the amount of $3,750.00 shall be paid on January 30th for each year that the Agreement is in effect; and

B. The one-time access/entry "tie-in" fee shall be paid at the time of the signing of this Agreement.

Description of the source, pre-treatment and discharge limits of the treated water is as follows:

The extracted water is produced as a result of remedial activities by Goodyear remediation of the glacial and Saginaw aquifers. The pre-treatment will consist of aeration prior to entry into this line. Discharge limits from Goodyear will be in accordance with an existing NPDES permit or future modifications of the NPDES permit that allow for discharge of these waters to the Grand River at the upstream side of the Grand River Avenue bridge. Goodyear will be responsible for its compliance with the NPDES permit.

Attachment A is the current NPDES permit.

14. As additional consideration, Goodyear agrees to install, at its expense, in the Drain, at a location upstream of Goodyear's tie-in to be agreed upon between the Commissioner and Goodyear, water quality monitoring equipment for purposes of withdrawing water samples. Further, for as long as Goodyear discharges water into the drain, or for 10 years from the date of the tie-in, whichever is longer, Goodyear agrees, at its expense, to collect samples, to perform analysis on the collected water samples, and provide the analytical results to Commissioner. The schedule of sampling and analysis to be performed are as specified in Attachment B.

At the conclusion of the Goodyear's use of the line or 10 years whichever is longer, the District shall retain ownership of the water quality monitoring equipment.

15. Goodyear shall be responsible for complying with applicable state and federal laws governing the treated water being discharged at the "tie-ins", including the requirements pertaining to the existing NPDES permit and any future modifications to the NPDES permit.

16. Goodyear will provide Commissioner with regulatory required monitoring reports, which include monthly and annual remediation progress/NPDES reports.

17. The District accepts and agrees that Goodyear will only discharge to the Drain when excess capacity is available. Excess capacity is defined to mean the time during which the storm water contribution to the flow in the District pipe is less than fifty percent (<50%) of such pipe's design flow. Goodyear will install a system that will prevent Goodyear discharges into the Drain except when excess capacity is available so as to not limit or restrict the capacity or operation of the Drain. Goodyear has secured a certificate from a licensed professional engineer stating that the Goodyear discharge, as conditioned herein, will not be a detriment to or diminution of the drainage provided or to be provided in the foreseeable future, to the area of the existing Groesbeck Park Drain Drainage District and that Goodyear's tie-ins to the Drain is the only reasonably available

outlet for the Goodyear input discharge. The above referenced professional engineer's certificate is attached to this agreement as Attachment C.

18. Goodyear shall conduct its activities in a manner which least disrupts the District's operations. Notice of any Goodyear activities related to the Drain shall be given to the Commissioner as soon as it is reasonably possible.

19. If one or more of the terms, words or conditions of this Agreement shall, for any reason, be held to be invalid or unenforceable, such invalidity or unenforceability of terms, words or conditions shall be severable and construed and applied as if not included in this Agreement.

20. The terms and conditions of this Agreement shall be governed by and enforceable in accordance with the laws of Michigan. The parties agree that any and all disputes that arise hereunder shall be submitted to the jurisdiction of the courts in Michigan.

21. There shall be no modification of this Agreement without the written approval of Goodyear and the District.

22. The terms and conditions of this Agreement are severable. The invalidity of any part of this Agreement shall not invalidate the remainder of any portion of this Agreement.

23. This Agreement supersedes all existing Agreements between parties with respect to the line "tie-ins" and related work or activity necessary to complete, maintain and operate the treated water phase of Goodyear's remediation work.

24. Any notice given by either party to the other, under the provisions of this Agreement shall be deemed to have been properly delivered when deposited in the U.S. mail service, adequate postage affixed and addressed to:

The Goodyear Tire & Rubber Company
Attention: Global Environmental Engineer, D/110F
1144 East Market Street
Akron, Ohio 44316-0001

and to:

Office of Ingham County Drain Commissioner
Patrick E Lindemann – Drain Commissioner
P O Box 220, 707 Buhl Avenue
Mason, Michigan 48854-0220

Alternatively, notification requirements may be fulfilled by other mutually acceptable delivery means.

25. This Agreement shall be binding upon the successors and assigns of the Parties to this Agreement.

26. This Agreement shall not be interpreted, construed, or used as evidence of any admission of liability, law or fact, a waiver of any right or defense, except it can be used to enforce the terms provided for herein.

27. Parties shall not assign or otherwise transfer this Agreement without prior written consent of either.

28. This Agreement represents the entire understanding and agreement between the Parties and may be modified or amended only by an instrument in writing signed by both Parties.

29. Each signatory to this instrument warrants and represents that he or she has been fully authorized to execute this document on behalf of the party for whom he or she is signing.

The Parties to this Agreement have caused this instrument to be executed by their respective duly authorized officers on the date appearing at the beginning of this Agreement.

THE GOODYEAR TIRE & RUBBER COMPANY

By: ______________________
J C Whiteley, Vice President

Attest: ______________________
B Bell, Assistant Secretary

GROESBECK PARK DRAIN
DRAINAGE DISTRICT

By: ______________________
Patrick E. Lindemann, Ingham County
Drain Commissioner

F:\Data\Client A-M\Ingham CDC - 9153\Groesbeck - 0003\Groesbeck Park Extension\Goodyear.w accept.changes.agreement.doc

5

GOODYEAR/
LOS ALAMOS

FIRST AMENDMENT TO TIE-IN AGREEMENT

This First Amendment to Tie-in Agreement ("First Amendment") is made and executed as of the 17th day of October, 2005, by and between The Goodyear Tire & Rubber Company ("Goodyear") and the Groesbeck Park Drain Drainage District (the "District"), by and through the Ingham County Drain Commissioner ("Commissioner") with reference to the following facts:

A. The parties entered into a certain agreement dated October 23, 2002 (the "Agreement") that provides for the right of Goodyear to "tie-in" its treated water conveyance lines to the Groesbeck Park Drain (the "Drain") that is operated by the District under the management of the Commissioner, upon the terms and subject to the conditions set forth in the Agreement.

B. The parties desire to amend the Agreement as set forth herein.

NOW, THEREFORE, in consideration of the premises and the mutual promises of the parties, the parties agree as follows:

1. Addition of Tie-in. Goodyear shall be entitled, upon execution of this Agreement, to establish an additional "tie-in" for its treated water conveyance lines to the Drain in the manner and at the location described in Exhibit A attached hereto, and Section 12 of the Agreement is hereby amended to permit Goodyear to discharge into the District's sewer line up to 1,750 gallons per minute (the "New Tie-in").

2. Access/Entry Tie-in Fee. Upon execution of this Agreement, Goodyear shall pay to the District a one-time only access/entry tie-in fee as to the New Tie-in the sum of $24,000.00.

3. Consulting Fees. In addition to the payment by Goodyear of consulting fees of the District of up to $2,500.00 as provided in Section 4 of the Agreement, Goodyear shall pay, as consideration for the New Tie-in, up to an additional $2,500.00 of the District's consulting fees for engineering review and evaluation work relating to the engineering aspects involved in the New Tie-in. Such expenses shall be documented with reasonable supporting documentation showing the basis for the requested amount.

4. Attorney Fees. In addition to the payment by Goodyear of attorney fees of the District of up to $2,500.00 as provided in Section 5 of the Agreement, Goodyear will reimburse the District for reasonable outside legal review costs relating to this First Amendment not to exceed the sum of $1,000.00. Such expenses shall be documented with reasonable supporting documentation showing the basis for the requested amount.

5. Annual Maintenance Fee. Following establishment of the additional tie-in referenced in Section 1 of this First Amendment, the annual maintenance fee provided in Section 13(A) of the Agreement shall be increased from $3,750.00 per year to $5,000.00 per year. For

the calendar year in which the additional tie-in is established, Goodyear shall pay $3,750.00 of the annual maintenance fee on January 30 of that year, with a balance of $1,250.00 due within forty-five (45) days following establishment of the additional tie-in.

6. Authorization. Each party represents and warrants to the other party that the execution of this First Amendment has been duly authorized, and that all necessary approvals for execution of this First Amendment have been obtained.

7. Confirmation of Agreement. Except as amended through this First Amendment, the terms of the Agreement remain in full force and effect, and all of the terms of the Agreement relating to the tie-in referenced in the Agreement shall also be applicable to the New Tie-in.

IN WITNESS WHEREOF, the parties have executed this Agreement as of the date set forth above by their respective duly authorized representatives.

THE GOODYEAR TIRE & RUBBER COMPANY

Attest:

By: [signature]

Bert Bell, Assistant Secretary

Title: Vice President, Product Quality & Fleet Technology

GROESBECK PARK DRAIN DRAINAGE DISTRICT

By: [signature]

Title: Ingham County Drain Commissioner

2

EXHIBIT A

2

For: Motor Wheel Disposal Site
Cleanup Team

From: Publicom Inc.
116 W. Ottawa
Suite 600
Lansing, MI 48933

Contact: Joe Rohatynski
517.487.3700

MOTOR WHEEL DISPOSAL SITE TO BEGIN CLEANUP

For Immediate Release

LANSING, Mich., May 13, 1997 -- One of three Lansing-area Superfund sites will see action this month as construction on a privately-funded, clean-up project estimated to cost $30 million begins at the Motor Wheel disposal site on Lake Lansing Road.

Remediation

With the approval and oversight of the U.S. Environmental Protection Agency (EPA) and the Michigan Department of Environmental Quality (DEQ), activity will begin today to remediate the site and clean-up groundwater contamination in its vicinity.

Current plans call for covering a large portion of the site, first with about 20,000 cubic yards of clean fill, then with a three-foot thick clay cap. The clay cap will encapsulate the waste site and prevent both physical contact and contamination through rainwater runoff. The site will then be covered by about 50,000 cubic yards of clean soil, and then seeded. The final cover above the waste will be approximately five feet thick.

Other remediation efforts will include the construction of an on-site water treatment facility; installation of a network of underground pipes (many along railroad easements) to return off-site contaminated groundwater to the treatment facility, and installation of a secondary pipeline to discharge clean water to the Grand River. All construction activities will be concluded by this fall.

-- more --

Motor Wheel Disposal Site
Begins Cleanup 2-2-2

Site history

From 1938 to 1978 the 24-acre parcel of land was owned and operated by Motor Wheel Corporation, a Lansing-based manufacturer of automotive wheels and brake components. The site was sold to MSV Associates, a sand and gravel excavation firm, in 1978 and last accepted inert solid waste in 1979. In addition to Motor Wheel, the site was used by Michigan Fertilizer, the CWC Castings Division of Textron Automotive, and the Lansing Board of Water & Light.

In 1970, the site had stopped accepting industrial waste and limited further disposal to inert solid wastes. From 1978 until the mid-1980s, MSV Associates mined a portion of the site. In 1986 the site was placed on the EPA's Superfund list. Today the Motor Wheel Disposal Site is one of about 1300 Superfund sites across the country.

Cleanup management team

The principal team leading the proactive cleanup effort consists of Sharp & Associates, a national environmental engineering firm and remediation specialist; representatives of The Goodyear Tire & Rubber Company, which owned Motor Wheel Corporation from 1964 to 1986; the CWC Castings Division of Textron Automotive, and W.R. Grace & Co., which purchased the Michigan Fertilizer manufacturing plant in 1954. The Lansing Board of Water & Light also has been an active participant in discussions and has contributed valuable input.

-- more --

Motor Wheel Disposal Site
Begins Cleanup 3-3-3

Visible activity

"Most of the remediation efforts will be neither seen nor heard by Lansing residents," says Sharp & Associates Project Manager Todd Struttmann. "Thanks to agreements with some of the local railroad companies, much of the underground piping network will run along railroad easements. Construction of the actual water treatment facility will be at the site, which is in a predominately industrial area and on private property."

Struttmann says the project will clean up contamination caused by past waste disposal on the site and prevent further contamination of groundwater.

"There will be some inconvenience to a small portion of residents as additional underground piping is installed and wells are drilled in city rights of way in some areas," adds Struttmann, "similar to normal road work and city maintenance activities."

Community relations

The clean-up team has also implemented a proactive community relations effort designed to keep residents, neighborhood organizations and businesses well-informed of construction and clean-up efforts.

"We fully recognize the sensitivity and concern some may have about this project," says Struttman. "It's natural and we anticipate it. Any time issues concerning the environment, or groundwater are raised, people pay attention–and rightly so.

-- more --

Motor Wheel Disposal Site
Begins Cleanup 4-4-4

"But we also want to assure the community that this clean-up process in no way endangers anyone, that the drinking water provided by the BWL is still among the best in the nation and that safeguards are in place to keep it that way. At the end of this summer, the source of groundwater contamination will be cut off, and groundwater remediation will be underway."

Some of the communication activities the clean-up team is developing in an effort to keep the community informed include:

- a 24-hour telephone answer line (487-2727) enabling callers to ask questions and hear clean-up and construction updates
- door hangers to inform residents and businesses exactly when they may see construction activity in their neighborhoods, and when it will end
- a May 13 town meeting at Cristo Rey Community Center with residents and neighborhood organizations
- briefings with local community and government leaders
- frequent media updates
- and informational brochures and visual aids to be distributed at meetings and other briefings

The Motor Wheel Disposal Site clean-up effort is a privately-funded, $30 million construction project dedicated to a swift and comprehensive clean-up solution, and to ensuring a clean and safe Lansing environment.

-- 30 --

Motor Wheel Disposal Site

History

The site is a 24-acre parcel of land located at 1401 Lake Lansing Road, on the northeast edge of the City of Lansing. The site is located within the Northeast quarter of Lansing Township.

1938-1979
The site was used as a disposal area for industrial wastes until 1970 and for inert solid wastes thereafter. 85-95 percent was non-hazardous solid waste. This type of disposal was common during this period. The last disposal of waste occurred in 1979.

1978
The landfill was sold in August 1978 to MSV Associates, a sand and gravel mining operation and excavation firm. Prior to purchasing the property, MSV obtained a special permit from the City of Lansing for sand and gravel excavation.

1982
Three 10,000 gallon tanks and their contents and degraded fill material were excavated. The tanks and several hundred cubic yards of fill material were removed from the site.

1986
The site was placed on the EPA's National Priorities List on October 4, 1986.

1987
All operations were discontinued at the site. On June 26, 1987, a consent order was filed to require Motor Wheel Corporation, The Goodyear Tire & Rubber Company and W.R. Grace & Co. to conduct a Remedial Investigation and Feasibility Study at the site.

1991
EPA signed a Record of Decision (ROD) indicating the preferred remedy and proposed plan.

1992
An Administrative Order of Consent (AOC) was signed to start a Remedial Design (RD) (i.e. collect all data necessary to design system).

1994
A Consent Decree was filed for Remedial Action (RA).

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1992-1995
Additional studies were conducted to define extent of landfill soil contamination, length of plume. Results were submitted to EPA and DEQ. Additional modifications made to the RD.

1996
Draft final design was submitted to EPA/DEQ.

1997
Estimated final design approved–construction begins in May.

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Motor Wheel Disposal Site

Fact Sheet

Background

- The Motor Wheel Disposal Site (MWDS) is located at 1401 Lake Lansing Road. The 24-acre site sits north of Lake Lansing Road about halfway between Larch Street and U.S. 127.
- The MWDS is one of three Lansing-area Superfund sites, and one of about 1300 sites across the country, as designated by the U.S. Environmental Protection Agency (EPA).
- The site was opened in 1938 and sold in 1978. The site was last used for waste disposal in 1979.
- MWDS was placed on the Superfund list in 1986 because of waste disposed at the site.
- In addition to Motor Wheel, which was owned by The Goodyear Tire & Rubber Company from 1964 to 1986, the site was used by Michigan Fertilizer Company (later acquired by W.R. Grace & Co.); the CWC Castings Division of Textron Automotive; and the Lansing Board of Water & Light to dispose of solid and liquid industrial wastes. This type of disposal was commonplace at the time. (See "site history" for more chronological information.)

Project Mission

- The MWDS Superfund effort is a privately-funded, construction project estimated to cost $30 million and dedicated to a swift and comprehensive clean-up solution, and to ensuring a clean and safe Lansing environment.
- Construction of a water-treatment facility, well-drilling and underground pipe installation will take place from May to November, 1997.

Clean-up Team Management

- The clean-up team is managed by Sharp & Associates, a national environmental engineering firm, with the input of the The Goodyear Tire & Rubber Company, W.R. Grace & Co. and Textron Automotive, with additional input provided by the Lansing Board of Water & Light (BWL).

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Water Quality

- According to national surveys, Lansing has some of the best tasting water supplies in the United States.
- Lansing's drinking water wells are routinely tested and monitored for contaminants by the BWL.
- No BWL well has ever been found to be contaminated as a result of the MWDS.
- Some contaminants in low but unacceptable levels have been found in Lansing-area aquifers. The contaminants include ammonia, fluoride and some chlorinated compounds. These are the contaminants that will be removed from the groundwater through comprehensive clean-up efforts.
- Drinking water wells have been tested by independent laboratories for pollutants from the site and meet all EPA drinking water standards.

Visible Activities

- Underground piping will be installed on private property (i.e. railroad easements) to transport water to a treatment center and various discharge points. Some underground pipes will also be installed in city owned rights of way and streets. Boring and trenching techniques will be used to install pipes.
- Extraction wells will also be installed in various area locations. These, too, will be entirely underground.
- Where appropriate, sidewalk replacement, driveway repairs and lawn reseeding will be completed in a timely fashion.
- On city-owned easements, work will take place between 8:00 am and 5:00 pm, in accordance with city codes.

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Site Activities

- A 2,000 square-foot on-site treatment facility will be constructed and begin operation in October.
- The site itself will first be covered and leveled with 20,000 cubic yards of clean fill.
- A three-foot thick clay cap will be added to encapsulate the waste and prevent physical contact and contamination through rainwater runoff.
- The site will then be covered by 50,000 cubic yards of clean soil to provide a frost protection barrier between the surface and the clay cap to prevent damage caused by thaw-freeze cycles.
- Finally, the site will be seeded and maintained and, with the assistance of the Michigan United Conservation Clubs, may potentially provide a habitat for wildflowers, bats, bluebirds and purple martins.

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http://www3.epa.gov/region5/superfund/npl/sas_sites/michigan/MID980702989.html
Last updated on 8/25/2015

Region 5 Superfund

You are here: EPA Home About Region 5 Superfund National Priority List (NPL) Fact Sheets Michigan MOTOR WHEEL, INC.

MOTOR WHEEL, INC. MOTOR WHEEL

EPA ID# MID980702989

Last Updated: January, 2012

U.S. EPA REGION 5
INGHAM COUNTY
LANSING TOWNSHIP

Congressional District # 08

Site Description

The Motor Wheel Disposal Site (MWDS) is a 24-acre site, located on the northeast edge of Lansing, in Ingham County, Michigan. The site is bordered by abandoned Michigan Central Railroad tracks along the NW border, by the W.R. Grace & Co. plant to the south, and by the Lansing/Lansing Township boundary to the east. The Granger/North Lansing Sanitary Landfill is located northeast of the site, Paulson Street Landfill (currently a park) is located to the north, the Friedland Iron and Metal Company lies to the northwest, and the Board of Water and Light North Lansing Fill No. 2 is located to the southwest. The property was used by Motor Wheel Corporation as a disposal site for industrial waste from 1938 until about 1971.

The MWDS lies in level to gently rolling topography resulting from depositional processes associated with the continental glaciers that covered Michigan during the Pleistocene Epoch. Aquifers in the glacial deposits are fed by precipitation and serve an important role in recharging the deeper aquifers. The glacial deposits in this area were laid down upon bedrock sediments of the Saginaw Formation. The Saginaw Formation comprises a bedrock aquifer that has been extensively exploited in the region, and is the principal source of water for the City of Lansing. The Saginaw Aquifer is recharged in places where it directly contacts the glacial aquifer. The remedy selected for the site includes capping the waste disposal area to limit infiltration, extraction and treatment of contaminated groundwater, land-use restrictions, and monitoring to assess the status of the remedy.

The surrounding area is a mixture of residential and commercial property. Although there have been a number of zoning changes over the years, a similar mix of land uses will likely continue around the waste disposal area. The 24 acre waste disposal area is currently fenced and the contaminated soils are contained under a semi-permeable cap. Groundwater contamination and the infrastructure for the groundwater extraction system for the remedy extend approximately 1.5 miles south of the waste disposal area. The groundwater extraction and treatment portion of the remedy comprises monitoring wells, extraction wells, and a groundwater collection and transfer system to deliver water to a treatment facility located within the waste disposal area.

Site Responsibility

This site is being addressed through federal, state, and potentially responsible party actions.

Threats and Contaminants

Waste buried at the site includes solid and liquid industrial byproducts, paints, solvents, acids,

caustics, sludge, and other materials. Waste was disposed of in tanks, barrels, ponds, and open fill areas. An estimated 210,000 cubic yards of waste material is buried in place at the site. Hazardous substances have been identified in various media. Exposure to soil, groundwater, and sediment are considered significant human health risks due to exceedances of U.S. EPA's risk management criteria for either the average or the reasonable maximum exposure scenarios. Groundwater associated with the site is contaminated with volatile organic compounds (VOCs), including toluene, trichloroethene, tetrachloroethene, vinyl chloride, and the BTEX compounds benzene, toluene, ethylbenzene, and xylene.

Cleanup Progress

In 1970 the Michigan Department of Natural Resources (MDNR) requested that the Motor Wheel Corporation remove all solid waste, paint sludge, and oil from seepage ponds for disposal off-site. Between 1970 and 1982, at least three cleanup actions to excavate contaminated waste were initiated. Excavated waste was disposed of off-site and the former pond areas were backfilled.

On June 26, 1987, Motor Wheel Corporation, W.R. Grace & Co., and Goodyear Tire and Rubber Company signed an Administrative Order on Consent (AOC), agreeing to conduct a Remedial Investigation and Feasibility Study (RI/FS) at the Motor Wheel site. The RI/FS identified risk to human health and the environment associated with waste in the disposal area and an offsite plume of contaminated groundwater. A Record of Decision (ROD) was signed on September 30, 1991, and in 1994 a Consent Decree was signed by the potentially responsible parties (PRPs) and the United States Environmental Protection Agency, requiring the respondents to implement the remedy selected in the 1991 ROD.

Design of the cap portion of the remedy started in 1992 under an Administrative Order on Consent. The final design of the cap was completed in May 1997, and cap construction was completed in July 1999. After the cap was in place, one extraction well and the groundwater treatment system were installed in the waste disposal area, while the PRPs continued to add additional groundwater extraction wells and expand the system. Currently there are six extraction wells installed in the glacial aquifer and five in the Saginaw Aquifer. As of November 2011 six billion gallons of water have been extracted, treated, and discharged. Two additional extraction wells will be installed in the glacial aquifer in early 2012 to address residual vinyl chloride that escaped extraction by up gradient wells. Ongoing activities include the pumping and treatment of affected groundwater, quarterly monitoring, and cap maintenance.

The 2007 Five-Year Review (FYR) found that the remedy is currently protective of human health and the environment. Groundwater monitoring will continue until the completed performance of the remedy can be demonstrated by the attainment of remedial standards. The next FYR will be completed before July 11, 2012.

Contacts

Remedial Project Manager, U.S. EPA
William Ryan (ryan.williamj@epa.gov)
(312) 353-4374

Community Involvement Coordinator, U.S. EPA
Dave Novak
(312) 886-7478

B: 3411 P: 387 02/11/2011 03:41 PM Pages: 10
2011-006891 MISCELLANEOUS Receipt 066085
Curtis Hertel Jr., Ingham County, Michigan

RECEIVED
INGHAM COUNTY REGISTER OF DEEDS
2011 FEB 11 PM 1:50

ACCESS AND ROADWAY EASEMENT AGREEMENT FOR
GROESBECK PARK DRAIN
"GROESBECK ROADWAY EASEMENT"

City of Lansing, a Michigan municipal corporation, whose address is 124 West Michigan Avenue, Lansing, Michigan 48933, ("GRANTOR"), for and in consideration of the benefits stated herein, grants an easement for ingress and egress and for the construction and improvement of a roadway to service a county drain on part of the GRANTOR'S property to the Groesbeck Park Drain Drainage District, whose address is care of the Ingham County Drain Commissioner, 707 Buhl, Mason, Michigan 48854 ("GRANTEE"). Both the GRANTOR-owned property and the Easement Area on that property are described below.

PROPERTY:

The Property owned by the GRANTOR is contained within Parcel Numbers 3301-01-10-204-001, 3301-01-10-226-001, and 3301-01-10-226-011, and within the David Street ROW, and is located in the City of Lansing, County of Ingham, State of Michigan, and legally described as:

3301-01-10-204-001 (Bancroft Park):
The East 1/2 of the West 1/2 of the Northeast 1/4 of Section 10, Town 4 North, Range 2 West, City of Lansing, Ingham County, Michigan.

3301-01-10-226-001 (abuts David St. north of golf course):
Lots 15 & 16 Assessor's Plat No. 50
Liber 12, Page 42

3301-01-10-226-011 (Groesbeck Golf Course):
Com 33 feet West and 297 feet South of NE corner of Section 10, thence South along West line of Wood Street to North line of East Grand River Avenue, West along North line East Grand River Avenue to SE corner Assessor's Plat No. 2, North to NE Corner said plat, West to NW corner said plat, North along North & South 1/8 line to point due West of Beginning, East to Beginning; Sec. 10, T4N R2W.

Said parcel is subject to all easements and restrictions of record, if any.

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EASEMENT AREA:

An easement over all existing roadways and paths within the Property, including the roadway(s) within the Easement Area as will be agreed upon by the parties during the course of construction, but as generally represented in the drawings attached as "Exhibit A" and "Exhibit B."

1. **TITLE.** GRANTOR has good and marketable title to the Easement Area as legally described above, subject to the Ingham County Road Commission's rights to, and jurisdiction over, the David Street Right of Way as a borderline street as well as an easement to the Ingham County Road Commission, and all other utility easements and restrictions of record.

2. **GRANT.** The GRANTEE may use the Easement Area to access the county drain, and to construct and improve a roadway. The roadway shall be at a location approved by the City Director of Parks and Recreation in the approved construction plans. GRANTEE shall have the right, subject to all other provisions of this Easement, to use the Easement Area for a roadway, provided that any use is in compliance with all applicable laws and regulations. This use shall be non-exclusive. Subject to the terms of this easement, the GRANTOR shall retain all surface and subsurface rights, including, but not limited to, the right to use the Easement Area in its current or developed state as a road to access the GRANTOR'S Property described above. Nothing herein shall authorize any activity which interferes with or alters the use of Bancroft Park as a public park and Groesbeck Municipal Golf Course as a public park and municipal golf course.

3. **OTHER PERMITS & GOVERNMENTAL APPROVAL.** GRANTEE shall be responsible for any permits or governmental approvals required, and GRANTEE is responsible for compliance with all environmental laws and rules as they relate to this easement.

4. **ACCEPTANCE.** GRANTEE accepts the Easement Area in the condition existing as of the date of this agreement, and the GRANTOR makes no representation or warranty with respect to the condition of the Easement Area, and GRANTOR shall not be liable for any latent or patent defects in the condition of the Easement Area. GRANTOR has disclosed any latent or patent defects that it is aware of to the GRANTEE.

5. **ACCESS.** Grantee may access this roadway by way of the main entrance to the Property located at or near the intersection of Otto Street and Taft Street, and by way of the David Street entrance to the Property. GRANTEE may also access the county drain through the maintenance garage facilities of the Groesbeck Municipal Golf Course (off Wood Street) only, and through such additional or alternative ingress and egress routes as the parties may mutually agree.

6. **CONSTRUCTION.** Prior to commencement of bid letting, GRANTEE shall submit a copy of the construction plans for the roadway, prepared at GRANTEE'S expense, to the GRANTOR'S Director of Parks and Recreation for his written consent and approval, which shall not be unreasonably delayed or refused. GRANTOR'S Director of Parks and Recreation shall also

approve the construction materials to be used as agreed upon by the parties. In any event, approval shall deemed to be granted if no written objections to GRANTEE'S construction plans are served upon the district within fourteen (14) days of said plans being submitted to GRANTOR. The construction plans and construction shall provide barrier free access from the south drive through to David Street. GRANTEE acknowledges that construction shall conform with the approved construction plans.

7. RESTORATION & MITIGATION. At the end of construction, GRANTEE shall be responsible for site restoration to standards specified in the construction plans approved by the GRANTOR'S Director of Parks and Recreation. GRANTEE shall be responsible for any site restoration to standards specified in the approved construction plans when the park is damaged by GRANTEE'S vehicles or other equipment or maintenance activities, or other causes attributable to GRANTEE. GRANTEE shall not permanently store spoilage on the Property without prior consent of GRANTOR'S Director of Parks and Recreation. GRANTEE shall not place in the Easement Area any dangerous or noxious materials or materials which would create a hazard on the GRANTOR'S property or undue interference with the GRANTOR'S property rights. At minimum, the construction plans shall provide for the following restoration and mitigation activities:

a. A paved ten foot (10') wide access road, constructed over earthon two track trail around the Bancroft Park overflow pond, with access from the David Street dead end and the existing access trail in Bancroft Park. The parties agree that the paved access road is subject to minor changes in alignment of up to five (5) feet, for the purpose of saving as many trees as possible.

b. An outlook along the paved access road. The outlook shall be on the east side of the ponid and shall be a deck only.

c. A boardwalk and deck on the north side of the pond.

d. At least seven (7) turnouts on the roadway.

e. A three (3) bay parking lot where the west leg of the roadway meets the existing Bancroft Park road, with at least one space meeting the size sufficient to be handicap accessible.

f. Two (2) interpretive signs on the trails.

g. Gates at each entryway to the roadway.

h. The GRANTEE shall only remove the trees necessary for construction of the roadway or safety of the public, and shall replace trees removed with trees of no greater than 2" caliper and of a kind and species agreed upon by the parties. Trees shall not be removed without prior approval of the City.

i. The culvert at the west side of Bancroft Pond shall be replaced by GRANTEE.

Design and construction of restoration and mitigation improvements shall be at the sole expense of the GRANTEE.

8. CITY INITIATED IMPROVEMENTS. The parties recognize that the GRANTOR may desire to make additional improvements to the Easement Area at the same time the GRANTEE is conducting construction activities. Therefore, the GRANTOR may, at its discretion, elect to contract with the GRANTEE for the construction, procurement, and installation of additional improvements to benefit the Easement Area at GRANTOR'S sole expense.

9. REPAIR & REPLACEMENT. Following completion of the construction of the drain, and upon written notice from GRANTOR, GRANTEE, at its sole cost and expense, shall repair any damage to the Easement Area to the extent directly caused by GRANTEE, or through GRANTEE'S gross negligence, including replacement of pavement or concrete in the roadway. If, following the completion of construction of the drain, repairs are not made in a workmanlike manner, GRANTOR shall provide written notice to GRANTEE, and GRANTEE shall make said repairs at its sole cost and expense. If GRANTEE fails to make said repairs within thirty (30) days of written notice to GRANTEE, GRANTOR reserves the right to complete the repairs and all reasonable costs and expenses incurred shall be paid for by GRANTEE upon presentation of an invoice.

10. EQUIPMENT. All of GRANTEE'S equipment or other property attached to or otherwise brought onto the Easement Area shall at all times remain personal property of the GRANTEE. If applicable, GRANTEE shall pay any real or personal property taxes, use and occupancy taxes directly attributable to GRANTEE'S use and occupancy of the Easement Area and the county drain use thereof. In the event any gates are placed on the property, the GRANTEE shall provide keys to the GRANTOR.

11. INSURANCE & WAIVER.

(a.). GRANTEE will require all contractors working on the property to be insured and will require liability insurance in the amount of $2,000,000.00 and Worker's Compensation insurance as required by state law during the term of the construction contract.

(b). GRANTEE shall provide, or require the contractor's insurance company to provide a certificate of insurance evidencing all coverages and naming the GRANTOR as an additional named insured. If possible, the insurance company's certificate shall provide that GRANTOR will receive thirty (30) days prior written notice of any cancellation or material change ("Material Change" is defined as any change to the policy of insurance directly affecting the Agreement herein) which notice shall be sent to the GRANTOR by United States Certified Mail.

(c). GRANTEE waives all rights of recovery against the GRANTOR, and the GRANTOR'S officers, employees, affiliates, and agents and assumes all risk of loss for indirect or consequential damages, in connection with this agreement and use of the Easement Area. This includes any necessary, permitted, or inadvertent interruptions caused by the GRANTOR. GRANTEE will instruct its insurance companies to waive any and all rights of subrogation against GRANTOR and the GRANTOR'S commissioners, employees, and agents, except those caused by negligence of the GRANTOR or its agents.

12. GRANTEE INDEMNIFICATION: GRANTEE agrees to indemnify, defend and save harmless the GRANTOR, and the GRANTOR'S, officers, employees, affiliates, and agents from any loss, loss of use, damage, claim, liability, or expense of any kind, including without limitation, claims for bodily injury, sickness, disease, death, property damage, economic loss, or environmental clean-up to the extent said liability and claims arise from the acts and/or omissions of the GRANTEE its agents, assigns and successors in interest. This paragraph shall not be construed to require the GRANTEE to indemnify the GRANTOR for any of the latter's acts or omissions or those of its officers, agents, affiliates, contractors and subcontractors and employees. GRANTEE'S obligations to indemnify, hold harmless and pay the cost to defend as provided for by this paragraph shall survive any release or termination of this Easement. With respect to claims of third parties, this provision is not intended and is not to be construed as a waiver of the defense of governmental immunity otherwise available, nor is it intended to grant third party beneficiary status to any person or entity. GRANTEE'S obligation is subject to the following expressed limitations: it does not extend beyond the limitations placed on a municipality to indemnify another pursuant to law; it shall not abrogate nor diminish the defense of governmental or sovereign immunity against any party; it shall not entitle another party to any claim to which the other party would not otherwise be entitled; and, it shall not include GRANTOR'S negligence.

13. GRANTOR INDEMNIFICATION. GRANTOR agrees to indemnify, hold harmless and pay the cost to defend GRANTEE, its officers, agents, affiliates, insurers, contractors, subcontractors and employees from any federal or state liability for remedial actions, claims for bodily injury, sickness, disease, death, property damage, economic loss or environmental clean-up to the extent said liability and claims arise from the acts and/or omissions of the GRANTOR its agents, assigns and successors in interest. The GRANTEE reserves the right to bring federal or state cost recovery actions arising out of releases of hazardous substances at the property which are attributable to the GRANTOR its agents, assigns and successors in interest. This paragraph shall not be construed to require the GRANTOR to indemnify the GRANTEE for any of the latter's acts or omissions or those of its officers, agents, affiliates, contractors and subcontractors and employees. GRANTOR'S obligations to indemnify, hold harmless and pay the cost to defend as provided for by this paragraph shall survive any release or termination of this Easement. With respect to claims of third parties, this provision is not intended and is not to be construed as a waiver of the defense of governmental immunity otherwise available, nor is it intended to grant third party beneficiary status to any person or entity. GRANTOR'S obligation is subject to the following expressed limitations: it does not extend beyond the limitations placed on a municipality to indemnify another pursuant to law; it shall not abrogate nor diminish the defense of governmental or sovereign immunity against any party; it shall not entitle another party to any claim to which the other party would not otherwise be entitled; and, it shall not include GRANTEE'S negligence.

14. LIENS. GRANTEE shall not permit any liens on the Easement Area for any labor or material furnished GRANTEE in connection with the work performed. Where, for any reason, a lien has been filed against the Easement Area on the basis of work performed for the GRANTEE, GRANTEE shall have the responsibility to contest the validity, nature or amount of any such lien, and, upon the final determination of such question, shall immediately pay any adverse judgment rendered with all proper costs and charges and shall have the lien released at its own expense. GRANTEE shall require contractors to provide any legally required bonds.

15. APPLICABLE LAW. This Easement Agreement shall be governed by the laws of the State of Michigan. If any provision of this Easement Agreement is deemed invalid or nonenforceable, the remainder of this Easement Agreement shall remain in force to the fullest extent permitted by law. No amendment or modification to any provision of this Easement Agreement shall be valid unless made in writing.

16. ENTIRE AGREEMENT. This Easement Agreement constitutes the entire agreement and understanding between the parties, and shall be binding on and inure to the benefit of their successors and transferees in title. This Agreement was negotiated between the parties and is deemed to have been mutually drafted by them.

17. ABANDONMENT. At such time as this easement is no longer required by GRANTEE for the purposes conveyed herein, the easement will be subject to the release and abandonment procedure set forth in Section 6 of the Michigan Drain Code of 1956, as amended (MCL 280.6).

18. AMENDMENT. No amendment or modification to any provision of this Easement Agreement shall be valid unless made in writing signed by duly authorized representatives of the parties.

19. HEADINGS. The headings assigned to the provisions of this Agreement are for the convenience of the parties only and shall not be used to control or affect the meaning, construction, or applicability of those provisions

20. EXEMPTION. This easement is exempt from real estate transfer tax pursuant to MCL 207.505(h)(i) and from real estate transfer tax pursuant to the provisions of MCL 207.526(h)(i).

Witness the hands of the GRANTEE this 19th day of July, A.D. 2010.

GROESBECK PARK DRAIN DRAINAGE DISTRICT

By: [signature]
Patrick E. Lindemann
Ingham County Drain Commissioner

STATE OF MICHIGAN)
)ss.
COUNTY OF INGHAM)

The foregoing instrument was acknowledged before me this 19th day of July, 2010, by Patrick E. Lindemann, Ingham County Drain Commissioner, on behalf o the Groesbeck Park Drain Drainage District.

[signature]
Cheryl J. Nodarse, Notary Public
Clinton County, Michigan
My Commission expires 5-1-2012
Acting in the County of Ingham

Witness the hands of the GRANTOR this 28th day of July, A.D. 2010.

CITY OF LANSING

By: [signature]
Virg Bernero
Its: Mayor

I hereby certify that funds are available
Acct. No. N/A
[signature]
Tom Korkoske Accounting Manager

STATE OF MICHIGAN)
)ss.
COUNTY OF INGHAM)

The foregoing instrument was acknowledged before me this 28th day of July, 2010, ~~2009~~, by Virg Bernero, Mayor of the City of Lansing, a municipal corporation, on behalf of the City of Lansing.

[signature]
Notary Public
Ingham County, MI
Acting in Ingham County
My commission expires:

TRACY L. SCOTT
NOTARY PUBLIC - STATE OF MICHIGAN
COUNTY OF INGHAM
My Commission Expires April 14, 2014
Acting in the County of Ingham

Approved as to form only:
[signature]
Lansing City Attorney's Office

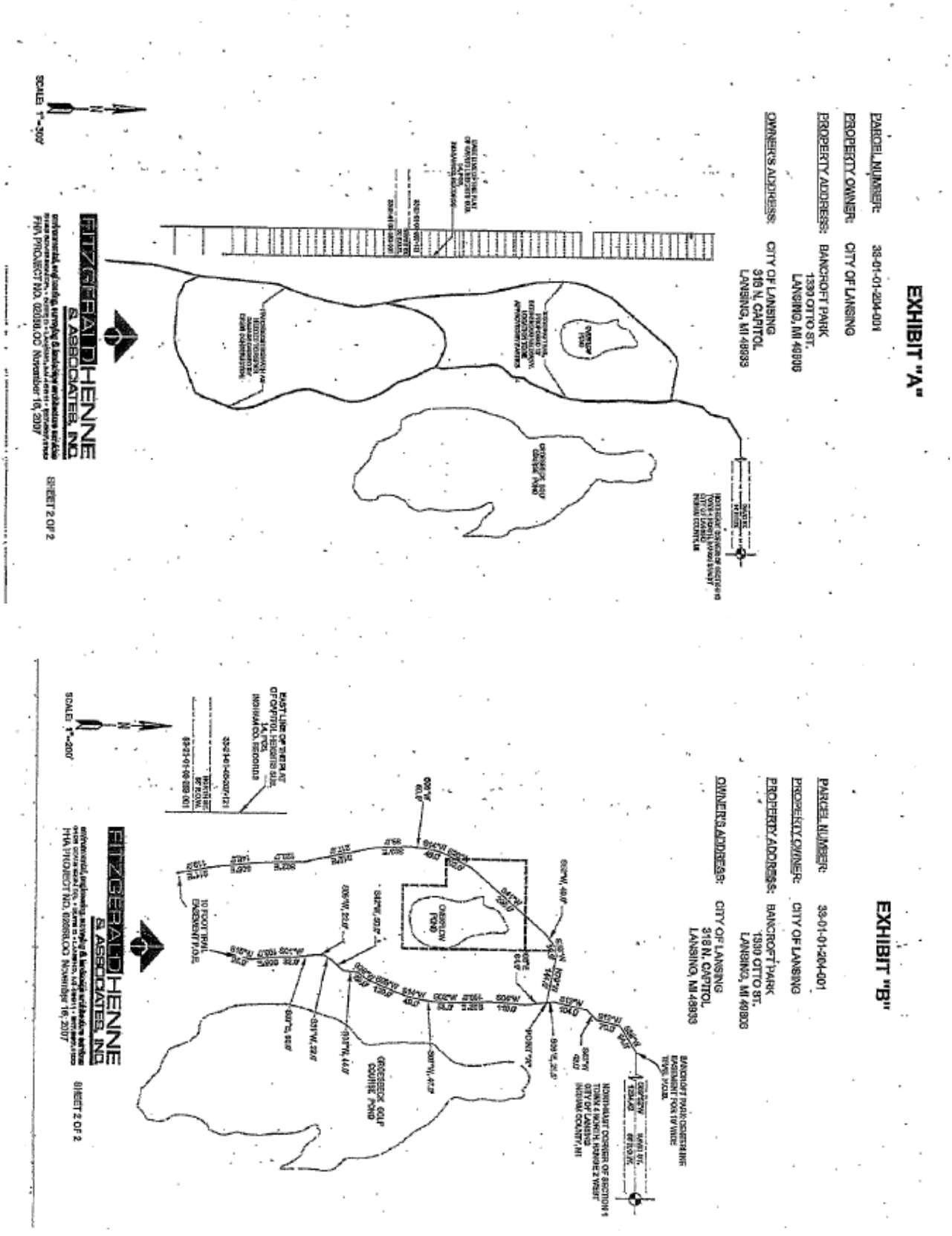
When Recorded Return To:		Drafted By:
Patrick Lindemann Ingham County Drain Commissioner PO Box 220, 707 Buhl Mason, MI 48854-0220 (517) 676-8395		Don Kulhanek P49183 Assistant City Attorney City of Lansing 124 W. Michigan Ave. 5th floor Lansing, MI 48917

W:\Ingham CDC - 9159\Groesbeck - 0003\City Easements as of October 2009\Final Roadway Easement City 10 16 09.doc

8

Agreements

Groesbeck Park Drain Easement Granted by City of Lansing



FILE#02056.0C

United States Census 2010
IT'S IN OUR HANDS

REGULAR MEETING OF THE CITY COUNCIL OF THE CITY OF LANSING, MICHIGAN
CITY COUNCIL CHAMBERS, 10TH FLOOR
LANSING CITY HALL
124 W. MICHIGAN AVENUE

AGENDA FOR MARCH 22, 2010

NOT PRESENT
- HEWITT
- QUINNEY
- DUNBAR

TO THE HON. MAYOR AND MEMBERS OF THE CITY COUNCIL:

The following items were listed on the agenda in the City Clerk's Office by 4:00 p.m. on Thursday, March 18, 2010, in accordance with Section 3-103(2) of the City Charter and will be ready for your consideration at the regular meeting of the City Council on Monday, March 22, 2010 at 7:00 p.m. at the Council Chambers, 10th Floor, City Hall.

I. ROLL CALL

II. MEDITATION AND PLEDGE OF ALLEGIANCE

III. READING AND APPROVAL OF PRINTED COUNCIL PROCEEDINGS

Approval of the Printed Council Proceedings of March 8 and 15, 2010

IV. CONSIDERATION OF LATE ITEMS (Suspension of Council Rule # 11 is needed to allow consideration of late items. Late items will be considered as part of the regular portion of the meeting to which they relate.)

V. TABLED ITEMS (Tabled items, if removed from the table, will be considered as part of the regular portion of the meeting to which they relate.)

VI. SPECIAL CEREMONIES

1. Mayoral and Council Recognition of the Lansing Complete Count Committee and the 2010 United States Census
2. Tribute; Recognizing the 2nd Annual Cesar Chavez Memorial Observance
3. ~~Presentation; Recognizing Taylor Hartner on earning the rank of Eagle Scout~~

MAYOR BERNERO PRESENTS HIS PROPOSED BUDGET FOR FISCAL YEAR 2011

VII. COMMENTS BY COUNCIL MEMBERS AND CITY CLERK

VIII. COMMUNITY EVENT ANNOUNCEMENTS (Time, place, purpose, or definition of event – 1 minute limit)

IX. SPEAKER REGISTRATION FOR PUBLIC COMMENT ON LEGISLATIVE MATTERS

X. MAYOR'S COMMENTS

BUDGET
* 8-6, M-T = 36 HOURS

XI. SHOW CAUSE HEARINGS

XII. PUBLIC COMMENT ON LEGISLATIVE MATTERS (Legislative matters consist of the following items on the agenda: public hearings, resolutions, ordinances for introduction, and ordinances for passage. The public may comment for up to three minutes. *Speakers must sign up on white form.*)

A. SCHEDULED PUBLIC HEARINGS

1. In consideration of a Grant Application to the Michigan Department of Natural Resources and Environment for Crego Park Development
2. In consideration of Public Improvement III; New Sidewalk Construction along the south side of N. Grand River Avenue from Waverly Rd. to Delta River Drive, along the north side of N. Grand River Avenue from Capitol City Blvd. to Remy Drive, and along the south side of N. Grand River Avenue from Culver Avenue to W. North Street excepting all public streets and alleys and other land deemed not benefited

XIII. COUNCIL CONSIDERATION OF LEGISLATIVE MATTERS

A. REFERRAL OF PUBLIC HEARINGS

B. CONSENT AGENDA

1. BY COUNCIL MEMBER KATHIE DUNBAR
   a. Resolution supporting the Greater Lansing Google Fiber for Communities Initiative
2. BY COUNCIL MEMBERS A'LYNNE ROBINSON AND DERRICK QUINNEY
   a. Memorial Resolution honoring Stuart Dunnings, Jr.
3. BY THE COMMITTEE ON DEVELOPMENT AND PLANNING
   a. Approval of an OPRA District Request Submitted by Old Town Temple, LLC for Property Located at 502 E. Grand River
   b. Approval of an OPRA Certificate Request Submitted by Old Town Temple, LLC for Property Located at 502 E. Grand River
   c. Approval of City of Lansing Portion of Brownfield Redevelopment Plan Amendment, Ingham County Brownfield Redevelopment Authority
   d. Setting a Public Hearing for Monday, April 12, 2010 for the Fiscal Year 2011 Consolidated Action Plan

4. BY COMMITTEE ON GENERAL SERVICES

   a. Claim Denial; DuWayne Watkins for property located at 305 N. Pennsylvania Ave.

   b. Claim Denial; Andrew Phillips for property located at 529 N. Butler Blvd.

   c. Claim Settlement; Beatrice Navarro for property located at 529 S. Magnolia Ave.

5. BY COMMITTEE ON PUBLIC SAFETY

   a. Requiring the owner of property located at 3237 Brisbane Dr. to Make Safe or Demolish their property within thirty days from Monday, March 22, 2010 and Rescinding Resolution # 2010-067

6. BY THE COMMITTEE ON PUBLIC SERVICES

   a. Public Improvement I/II; Sidewalk repair and reconstruction for an area bounded by Jolly Rd., Waverly Rd., Stillwell Ave., and Sumpter St. and; Jolly Rd.; Pleasant Grove Rd. to Martin Luther King Blvd. and; An area bounded by E. Grand River Ave., Ballard St., Lake Lansing Rd., David St., and Indiana Ave. excepting all public streets and alleys and other land deemed not benefited

7. BY THE COMMITTEE ON WAYS AND MEANS

   a. Budget Amendment; Subsidy for First Tee Agreement to Operate Sycamore Driving Range for 2010 Season

   b. Budget Transfer - Grant Funds for Region 1 Planning Board for Public Safety Communications Equipment

   c. Budget Transfer - Interoperability Emergency Communications Grant Program Awarded Funds to Michigan Region 1 for Operation Protocols and Emergency Responder Training

   d. Budget Transfer - Homeland Security Grant Program Funds Awarded to Michigan Regional 1 for Security and Preparedness Training

   e. Grant Acceptance; Qualified Voter File's Electronic Poll Book (EPB) Laptop and Accessories Purchase

   f. Michigan Department of Natural Resources and Environment Trust Fund - Crego Park Development

8. BY THE COMMITTEE OF THE WHOLE

   a. Tribute Resolution honoring Cesar E. Chavez and the 2nd Annual Cesar E. Chavez Memorial Observance to be held on March 26, 2010

C. RESOLUTIONS FOR ACTION

1. BY THE COMMITTEE ON DEVELOPMENT AND PLANNING

   a. Approval of Act-3-2009 and Act-7-2009; Groesbeck Drain Easements

D. REPORTS FROM COUNCIL COMMITTEES

1. BY THE COMMITTEE ON PUBLIC SAFETY

   a. Information pertaining to the Public Safety Radios and an appeal letter to the Ingham County Commissioners asking for assistance with cost recovery for malfunctioning equipment

E. ORDINANCES FOR INTRODUCTION and Setting of Public Hearings

F. ORDINANCES FOR PASSAGE

1. BY THE COMMITTEE ON PUBLIC SAFETY

   a. Adoption of an Ordinance of the City of Lansing to Amend Chapter 1284, Section 3 of the Lansing Codified Ordinances by requiring the provision of parking for cabaret patrons on lots containing cabarets

   b. Adoption of an Ordinance of the City of Lansing to Amend Chapter 844, Section 25 of the Lansing Codified Ordinances by restricting the hours during which ice cream and confection peddlers may operate

XIV. SPEAKER REGISTRATION FOR PUBLIC COMMENT ON CITY GOVERNMENT RELATED MATTERS

XV. REPORTS OF CITY OFFICERS, BOARDS, AND COMMISSIONS; COMMUNICATIONS AND PETITIONS; AND OTHER CITY RELATED MATTERS (Motion that all items be considered as being read in full and that the proper referrals be made by the President)

1. REPORTS FROM CITY OFFICERS, BOARDS, AND COMMISSIONS

   a. Letters from the Mayor regarding:

      i. Retirement Incentive Plan; Lansing Employees' Retirement System; Supplemental Actuarial Valuation

ii. Proposed Ordinance Change to Allow Employees' Retirement System Members to Purchase Service Credits

iii. Appointment of Nancy Mahlow to the Traffic Board, 1st Ward term to expire June 30, 2013

iv. Public Improvement IV; Sidewalk Construction and Repair for Assessment Roll #B-092

2. **COMMUNICATIONS AND PETITIONS, AND OTHER CITY RELATED MATTERS**

a. Resolution from the Ingham County Board of Commissioners Approving Legacy Cost Agreements and Authorizing a Request for Proposals for the Designation of an Ingham County 9-1-1 Consolidated Dispatch Center Facility

b. Letter from Miriam Jones of the Eastern Shore Sanctuary and Education Center regarding Keeping of Chickens in Lansing

XVI. MOTION OF EXCUSED ABSENCE

XVII. REMARKS BY COUNCIL MEMBERS

XVIII. REMARKS BY THE MAYOR OR EXECUTIVE ASSISTANT

XIX. PUBLIC COMMENT ON CITY GOVERNMENT RELATED MATTERS (City government related matters are issues or topics relevant to the operation or governance of the city. The public may comment for up to three minutes. *Speakers must sign up on yellow form.)*

XX. ADJOURNMENT

CHRIS SWOPE, CITY CLERK

Persons with disabilities who need an accommodation to fully participate in this meeting should contact the City Clerk's Office at (517) 483-4131 (TDD (517) 483-4479). 24 hour notice may be needed for certain accommodations. An attempt will be made to grant all reasonable accommodation requests.

Greg Minshall

From: Dick Schaefer [DSchaefe@lansingmi.gov]
Sent: Tuesday, January 11, 2011 3:52 PM
To: Greg Minshall
Cc: Murdock Jemerson; Paul Dykema
Subject: Groesbeck Park Drain plan review

Greg

Here are the review comments at this time. Call if you need any clarifications on the items mentioned.

General Comments:
- construction drawings for the golf course portion have not been submitted. Currently the request for sole source for the Albanese & Lutzke design services contract has been sent to the Lansing City Council for review and approval.
- judging from what has been submitted in this 90% review set and the golf course concept plan, many items and sheets will need to modified to accommodate the two holes at Groesbeck - sheets 13,24, 25, 26, 27, 31, 32, 47, 50, 51, 52 and others

Specific Comments:
- Sheet 2 under General Plan Notes add a statement about tree protection per City of Lansing standards (see Paul Dykema at 483-7674)
- Sheet 28 near station 26+90, move trail away from TP
culvert at sta 19+00 flows the wrong direction
can't tell what the pond outlet elevation is but keep bottom of deck higher than the normal water
elevation.
- Sheet 29 detail 3/29 move trail away from light pole
detail 2/29 more detail needed on what the wood backing and how it's attached to post; footing
sign is to be a minimum of 42" in depth
detail 7/42 provide bump out around vehicle gate
detail 1/29 apply sulfur to gravel surface before paving
- Sheet 35 decking for bridge is to be 2", not 3"
- Sheet 36 2" x 4" wire mesh is to be installed with 2" horizontal and 4" vertical (sheet 37 as well)
the 2 x 2 rails are to be replaced with two 1 x 4s, one pair three inches off the deck elevation and
other placed as a mid rail. The 2 x 4 wire mesh is to extend from the top handrail to bottom
1 x 4s. Replicate on sheet 37 railing details as well
- Sheet 37 see notes on sheet 36
- Sheet 42 detail 1/42 see city standard specification from forestry (Paul Dykema at 483-7674)
detail 5/42 12" diameter footing seems to small for a gate application. Check on size. Footing
is to have a minimum depth of 42".
gates need a locking mechanism

Dick Schaefer

1

Brian Cenci

From: Dick Schaefer <DSchaefe@lansingmi.gov>
Sent: Friday, March 25, 2011 2:59 PM
To: Allen Belyea; Murdock Jemerson
Cc: Brian Cenci; Ryan McEnhill; paul@golf-designs.com; Jason Crocker
Subject: Re: Groesbeck Progress Report 3-25-11

Allen:

Several clarifications to the progress meeting notes are to be added:
1. Approval of the plan as shown was made, but only contingent upon review and acceptance of the other items discussed - cart path, trees and irrigation.
2. The tree placement is not only to included north and east of #7 green but both holes owing to the fact that a large percentage of the site will be disturbed by grading operations and a significant number of trees removed. It will be important to re-establish trees to give visual definition to #6 & #7 and enhance the play.
3. Irrigation for both holes is to be included in the work scope.

That's it with my comments. Everything else looks good.

Dick

>>> "Allen Belyea" <allen@golf-designs.com> 3/25/2011 1:06 PM >>>
Murdock,

Attached please find the current progress report. If you have any questions or comments please let me know.

Allen R Belyea

Senior Designer

Albanese & Lutzke

Golf Course Architecture & Construction Management

email: allen@golf-designs.com

Web Site: www.golf-designs.com

1

Brian Cenci

From: Brett Kaschinske <bkaschin@lansingmi.gov>
Sent: Friday, September 07, 2012 5:06 PM
To: Brian Cenci
Cc: dr_pratt@ingham.org; Jason Crocker
Subject: Re: DRAFT - Groesbeck GC temp layout (after Sept 2013) until

Jason has the plans at Groesbeck. We are all set with them. Very little markups. I know Jason has a few questions that were not detailed on the plans

Is Jason going to be in on progress meetings as it relates to the golf course?
We have a concern about the orientation of #7 tees
How close is #7 green to the Nursery green. We also moved some trees that were shown on the nursery green
I need to check the contract with the drain commissioner but is the golf course construction to have oversight by the consulting firm? Who is responsible for golf course construction oversight?

>>> Brian Cenci <cencib@fitzhenne.com> 9/1/2012 11:56 PM >>>
Sounds good. Just let me know. I think Jason was on board with the temporary front 9 sequencing back when we were anticipating a beginning of the year start. I think it still works for starting in September but I would ask Jason or Allen (the GCA) about when things would be ready in 2014.

-Brian

Connected by DROID on Verizon Wireless

-----Original message-----

From: Brett Kaschinske <bkaschin@lansingmi.gov>
To: Brian Cenci <cencib@fitzhenne.com>
Sent: Fri, Aug 31, 2012 21:17:42 GMT+00:00
Subject: Re: DRAFT - Groesbeck GC temp layout (after Sept 2013) until

I will meet with jason on tuesday and get back to you
-----Original Message-----
From: Brian Cenci <cencib@fitzhenne.com>
To: Kaschinske, Brett <bkaschin@lansingmi.gov>
Cc: Crocker, Jason <jcrocker@lansingmi.gov>
Cc: Schaefer, Dick <dschaefe@lansingmi.gov>
Cc: RyanMcEnhill <mcenhillr@fitzhenne.com>
Cc: dr_pratt@ingham.org <dr_pratt@ingham.org>

Sent: 8/31/2012 5:15:34 PM
Subject: Re: DRAFT - Groesbeck GC temp layout (after Sept 2013) until grow-in

It would be close to having play ready. The grow in will take like 2 months so if March was good weather and April maybe like mid -April is a best case scenario. If we have to wait until mid-September of 2013 that means we wont have any GC restoration done in 2013, it would all be in 2014 for the golf course portion. Allen, the GC architect, might be a good resource for the timing and scheduling too.

- Brian

Connected by DROID on Verizon Wireless

1

Brian Cenci

From: Dick Schaefer <RSchaefer@lansingmi.gov>
Sent: Wednesday, September 12, 2012 10:42 AM
To: Brian Cenci
Cc: Jason Crocker
Subject: Re: Groesbeck Park Brain

Brian,

Here are our final review items:
- Jason's comments
1. Move part of the nursery green to the east. The #7 green berm encroaches onto the existing nursery green. This would also allow more room to accommodate the dogwood and firs which are to be planted on the berm (pg 51 & 52).
2. Relocate the irrigation heads and line that serves the nursery green and connect it into the new system (pg 52).
3. Reorient #7 tee boxes to direction of play (pg 51 & 52).

- Dick's comments
1. Stripe small parking area and add handicap sign (pg 29)
2. The outlet to the Bancroft Pond is at 855 or higher which during periods of a major rain event would put the bottom sections of the deck (elevation of 854) under water. Either raise the deck, lower the outlet or some combination of both. Additionally the bottom of the outlet might need rip rap or the like to prevent scouring/erosion from occurring.
3. As mentioned in an earlier email, to add sulfur to trail surface before paving.

That's it for us. Everything looks good.

Dick

>>> Brian Cenci <cencib@fitzhenne.com> 9/11/2012 7:14 PM >>>
Dick,
Thanks. Just get me any comments asap. I am not expecting too much since I think we worked through everything last year but we just need time to get whatever changed and get the plans ready for bid. If you can have Jason forward me his comments too.

Thanks for your help!

-Brian

Connected by DROID on Verizon Wireless

-----Original message-----
From: Dick Schaefer <RSchaefer@lansingmi.gov>
To: Brian Cenci <cencib@fitzhenne.com>
Sent: Tue, Sep 11, 2012 19:29:40 GMT+00:00
Subject: Re: Groesbeck Park Brain

1

Rationale for Constructing the Berm

There is a perched wetland near the center of Bancroft Park that is rarely without standing water. The size of this wetland makes it subject to the jurisdiction of the Michigan Department of Environmental Quality (MDEQ) under Part 303, Wetlands Protection, of the Natural Resources and Environmental Protection Act, 1994 PA 451, as amended (NREPA). The U.S. Environmental Protection Agency has delegated this authority to Michigan under the Federal Clean Water Act.

The MDEQ permit for this project requires the Ingham County Drain Commissioner to construct protections for this wetland. The permit also requires continued water flow into this wetland that is sufficient to maintain ponding. The Groesbeck Park Drain project preserves some of the flow from the drainage pipe under the nearby hill, while diverting excess flows that previously passed through the park into the Esker.

This project protects the wetland in part by constructing a berm. The MDEQ permit requires that the berm be built. The berm facilitates two outcomes. First, it maintains ponding of water according to the requirements of the permit. The other function of the berm is to prevent excess stormwater from going to the large sand pit at the northwest corner of the Park.

Project plans call for the removal of the existing connection (an existing basin and culvert) between the wetland and the exposed Esker. Currently, when water from storm events fills the wetland, excessive and polluted flows travel over the path and to the exposed Esker to the northwest. Right now, untreated stormwater runoff from north of David Street discharges to the golf course pond north of hole #7. Flows are then directed to the Bancroft Park wetland ("Kettle Lake") through an existing pipe before being conveyed, by way of the aforementioned small basin and culvert, to the exposed portion of the Esker (sometimes referred to as the "sandpit") where they flow through to the aquifer.

This creates pressure on and mobility in the aquifer near the pollution plume from the Motor Wheel superfund site. The Groesbeck Park Drain project will install stormwater treatment ponds and redirecting outflow from the wetland (sometimes referred to as Kettle Lake) to a point about 90 feet south of the current outflow. This will reduce this environmental damage by preventing excess water from coming into the wetland from the upstream areas north of David Street. Some grading will be done at the lowest point of the trail and the current pipe will be removed. **This stretch of trail has been labeled a "berm" on some maps, but it is not significantly higher than the normal height of the pond and is being raised only about 1-foot.**

Unique Features of Bancroft Park Flora, Fauna and Geology

MEMO

To: Mr. Patrick Lindemann, Ingham County Drain Commissioner and Mr. Paul Pratt, Deputy

From: Blair Webster, Water and Woods Ecology, LLC

RE: Bancroft Park area natural habitat impact mitigation, avoidance and enhancement, relative to completing construction of the Groesbeck Park Drain

This is an overview of current concerns regarding impacts to the natural and/or native habitat of Bancroft Park, owned by the City of Lansing. All of the issues recently brought to the attention of the Ingham County Drain Commissioner by concerned citizens and the City of Lansing Park Board have been addressed and improved upon as part of the design planning process for mitigation. The final construction design plans reflect years of coordination with the Friends of Bancroft Park, individual citizens, the Department of Environmental Quality, the City of Lansing Parks Department, Groesbeck Golf Course and all applicable public utility companies. Numerous public meetings were held to receive input and recommendations from the above-named entities. The resulting drain design and construction will minimize and/or avoid impacts to the wildflowers, endangered and threatened species, trees and water quality. The minimal temporary impacts to the natural systems of the Bancroft Park area will be more than offset by the completion of the Groesbeck Park Drain infrastructure project. After completion, stormwater entering the park will be filtered and cleansed. Plans include specifications for seeding and planting around the perimeter of all existing and proposed wetland areas, ponds, and stormwater basins. Plant and animal habitat will be enhanced and new habitat created.

Species diversity will be enhanced through seeding and planting of native aquatic and terrestrial wildflowers, trees and shrubs. In addition, there are numerous habitat structures being placed around the ponds, including dead tree snags, whole stumps, rock piles and brush piles. This will provide additional nesting, resting, feeding and hibernation habitat for fish, waterfowl, mammals and reptiles that don't currently exist in the ecosystem of the Bancroft Park area.

Background/History:

1. Wood Lot Conditions, Tree Description and Ages

The overall wood lot within Bancroft Park is a sub-climax, oak-maple association forest, with a predominance of red oak (Quercus rubra). Both black oak (Quercus velutina) and sugar maple (Acer saccharum) are interspersed among the red oaks. There are also isolated ironwood (Carpinus caroliniana), walnut (Juglans nigra), tulip trees (Liriodendron tulipifera) and shagbark hickory (Carya ovata) tree species. The largest diameter trees (red and black oaks) are located mostly around the outer boundary of the wood lot, at 24- to 36-inch in diameter. Trees found in the inner portion of the wood lot are predominantly 12- to 18- inch in diameter. This wood lot is considered "second growth" forest, as the oldest trees in Bancroft Park are less than 120 years old. All the trees in the Park have regrown following the old-growth lumber harvesting and deforestation period of the 1830s to 1880s in the lower half of the lower peninsula of Michigan (http://agilewriter.com/History/Mi_lumber.htm.).

The table titled "Estimating Tree Age by Growth Factor" (see below) was produced by the International Society of Arboriculture. The table is used to estimate tree ages without cutting or taking a core sample to

count growth rings. In Bancroft Park, a black oak 36-inches in diameter was the largest diameter tree identified; using the table, it is estimated to be 126 years old. The largest red oaks, at 24 to 30 inches in diameter, would be 96 to 120 years old. The largest sugar maple is 22 inches in diameter, making it about 121 years old. The 18-inch diameter tulip trees are estimated to be 54 years old. The largest identified white oak is 24 inches in diameter, making it about 120 years old. All other trees larger than six inches in diameter are smaller and much younger, ranging from 60 to 80 years old.

The trail will stabilize soils on the relatively steep slopes in the project area. A consistently-designated trail alignment and width will be defined and the asphalt surface will make it accessible for non-motorized use. The trees that are being considered for removal will be further evaluated at the time of construction to determine if they can be saved by subtle adjustments to the trail. Please note that three of these trees are partially dead or dying. These trees are a risk to trail users, since there are broken and/or dead branches that are leaning toward the trail.

In addition to safety considerations, the main reason trees are proposed to be removed during trail construction is to comply with the Americans with Disabilities Act (ADA). Some of the slopes along the east and north portion of the trail are currently too steep to comply with the ADA standard for accessibility. The Ingham County Drain Commissioner requested an ADA variance from the Lansing Parks Department along two small sections of the trail; the variance would have reduced the cost of moving soil and eliminated the need to remove trees adjacent to the trail, except those deemed a safety hazard. The Parks department denied the requested variance, so the project is currently held to compliance with the ADA standard. Some trees are likely to be removed to meet this standard.

Four trees are proposed for removal to 1) provide access and place a new control structure at the upstream end of the existing drain easement (at the outlet of the existing pond on the east side of the park) and 2) to stabilize the channel at the downstream end of this pipe, where it discharges into the pond in the middle of the park.

In an attempt to verify the growth and development of the Bancroft Park forest, aerial photos were acquired from the Michigan State University, Remote Sensing and Geographic Information System (from 1938, 1950, 1963, 1970, 1981, 1991 and 2012.) While the scale on these photos (1 inch = 500 feet) limits the ability to determine sizes or maturity of trees in Bancroft Park, the trees that are evident on the 1938 photo appear fairly large and consistent with those that are at least 40 years old and 6 to 8 inches in diameter.

2. Existing Native Wildflower Community

We developed an inventory list of native wildflowers that includes many but not all species found within Bancroft Park. The inventory was compiled by Cynthia Cornell, a local resident of the adjoining neighborhood and member of "Friends of Bancroft Park." The species and their general locations have been identified and verified by Blair Webster of Water and Woods Ecology. The species on this list represent a diversity of species typically found in an oak-maple association forest with a semi-open canopy and a mix of loamy sand and clay soil types. While none of the species identified to date are qualified as endangered, threatened or special concern status, they will be protected during project construction. None of the identified locations of these species will be disturbed as a result of the project. Proposed trail work has been shifted and aligned where needed to avoid the wildflowers. The Ingham County Drain Commissioner is dedicated to protecting the integrity of the diverse wildflower and tree community in both the design process and during construction.

3. Endangered and Threatened Species Review

Unique Features of Bancroft Park Flora, Fauna and Geology, *cont*.

A review of the Michigan Natural Features Inventory (MNFI) was conducted to determine the presence of any plant or animal species listed as endangered, threatened or special concern status. This list is compiled by the Endangered Species Program of the Michigan Department of Natural Resources and the Michigan Natural Features Inventory. According to this database, there are no known listed species within the influence of the proposed Groesbeck Park Drain project, especially within Bancroft Park. However, all wildflowers will be protected as if they have listed status.

The most unique plant species identified within Bancroft Park and included on the attached list is what is known as Indian pipe or ghost plant (Monotropa uniflora). According to the MNFI, this species is an herbaceous perennial plant native to temperate regions of North America in isolated locations of mature forests. It is generally scarce or rare in occurrence, since it requires unique soil and light conditions at the base of mature deciduous trees. Unlike most plants, it is white and does not contain chlorophyll. Instead of generating energy from sunlight, it forms a symbiotic relationship with a specific group of bacteria associated with the roots of trees, meaning it ultimately gets its energy from photosynthetic trees. Since it is not dependent on sunlight to grow, it can grow in very dark environments as in the understory of dense forests. This plant is found at the base of a slope along the east side of Bancroft Park near the golf course; it is out of the influence of any construction on the course or in the park. This was verified by Cynthia Cornell, in coordination with "The Friends of Bancroft Park", during a field review.

4. Existing Trail improvements

The existing trail is cut out of native soils and has no stabilizing base or surface material. The trail runs along steep slopes and its limits are not clearly defined. The proposed trail through the park will have an engineered back-fill sub-base and will be graded and paved with asphalt to a ten-foot width. The ten-foot cross section design is typical for trail projects in the City of Lansing, including all segments of and connections to the River Trail system. The alignment will follow the existing route, with minor exceptions where tree and wildflower impacts can be avoided or minimized. An asphalt surface was chosen because it is standard for trail projects of this nature, relatively inexpensive, provides a stable, solid surface and can be placed with small equipment, which reduces impacts to the adjacent plant community. Any other trail surface material is either too expensive or not stable enough to hold soils in place along the steeper slopes of the alignment.

Improvements to the trail include seven bench pad locations contiguous with the trail, an overlook deck for the wetland/pond on the east side, another overlook on the central pond in the woods, and stabilization of all erosion-prone areas on the steeper slopes. The City has plans to place benches on the bench pads.

5. Sledding Hill on Golf Course ("Angel Hill")

As a result of the proposed expansion of stormwater control and wetland mitigation areas, to improve water quality and create a more diverse aquatic ecosystem, the sledding hill downslope area will be reduced. The hill could still be used for sledding but the length of the run will be reduced by about one-third.

6. Golf Course Alterations

Alterations specifically associated with the golf course modifications were designed by a golf course architect hired by the City of Lansing. The City of Lansing will pay for those alterations.

Unique Features of Bancroft Park Flora, Fauna and Geology, *cont*.

7. Enforcement of Park Boundaries

To maximize the natural area of Bancroft Park, it is recommended that all boundaries along the residential area on the west side be enforced. Currently, there is an area behind the houses on Indiana Street, between Whyte and North Streets, where homeowners are mowing into the park from their property line to the edge of the existing trail. It is estimated that there is at least half an acre of Park being maintained as unnatural mowed lawn. This encroachment is not allowing the native vegetation to grow and add to the biodiversity of the functional forest system. It is advisable to keep this area from being maintained. Re-planting it with a native woodland seed mix will jump start the re-development of the plant community in this area and add to the passive recreational spaces of Bancroft Park.

Estimating Tree Age by Growth Factor*

Estimated age of tree = Diameter in inches at 54 inches off the ground
(diameter breast height or dbh) x growth factor = tree age

Tree Species	Growth Factor
American beech (Fagus grandifolia)	6
American elm (Ulmus americana)	4
American sycamore (Platanus occidentalis)	4
Austrian pine (Pinus nigra)	4.5
Black cherry (Prunus serotina)	5
Black Oak (Quercus velutina)	3
Black walnut (Juglans nigra)	4.5
Colorado blue spruce (Picea glauca)	4.5
Cottonwood (Populus	2
White birch (Betula alba)	5
Green ash (Fraxinus pennsylvanica)	4
Ironwood (Carpinus carolinianus)	7
Northern red oak (Quercus rubra)	4
Pin oak (Quercus palustris)	3
Red maple (Acer rubrum)	4.5
Red pine (Pinus resinosa)	5.5
Scotch pine (Pinus silvestris)	3.5
Shagbark hickory (Carya ovata)	7.5
Silver maple (Acer saccharinum)	3
Sugar maple (Acer saccharum)	5.5
Tulip tree (Liriodendron tulipifera)	3
White oak (Quercus alba)	5
White pine (Pinus strobus)	5

*Source : International Society of Arboriculture

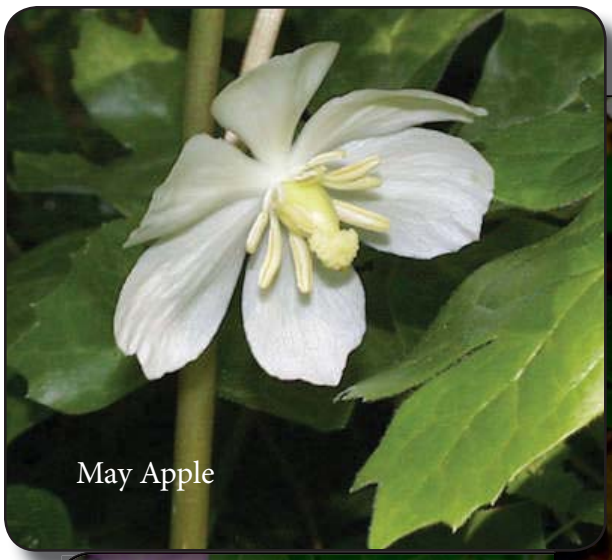
Note: The growth factors listed above are more accurate for forest-grown trees, which grow thinner than street trees. Stressed trees from urban situations such as inadequate soil, damage or topping—will grow slower and weaker than healthy trees.

GROESBECK PARK DRAIN PROJECT
Bancroft Park - Plant Species Identified Along Trail Corridor
by Cynthia Cornell and verified by Blair Webster

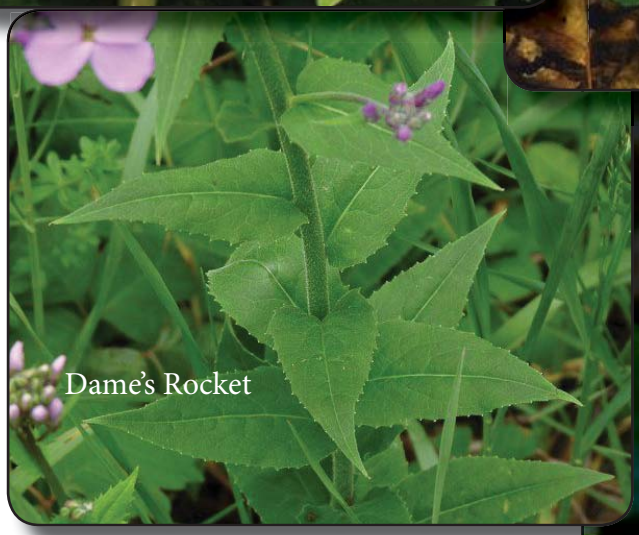
Scientific Name	Common Name
Aquilegia canadensis	Wild Columbine
Asarum canadense	Wild Ginger
Claytonia virginica	Spring Beauty
Dentaria laciniata	Cut-leaf Toothwort
Erythronium americanum	Trout Lily
Euonymous obovata	Trailing Euonymous
Geranium maculatum	Wild Geranium
Hesperis matronalis	Dames Rocket
Hydrophyllum virginianum	Virginia waterleaf
Helianthus divaricatus	Woodland Sunflower
Impatiens capensis	Jewelweed
Monotropa uniflora	Indian Pipe
Phlox divaricata	Blue Phlox
Podophyllum peltatum	Mayapple
Polygonatum biflorum	Solomon's-Seal
Sanguinaria canadensis	Bloodroot
Smilacina racemosa	False Solomon's Seal
Trillium grandiflorum	Trillium
Viola papilionaceae	Blue Violet
Viola pallens?	White Violet
Viola sororia?	Purple Violet
Viola rotundifolia?	Yellow Violet

Indian Pipe

This is not an exhaustive list of wildflowers that exist in Bancroft Park. These, and many more Flora that exist in this environment are easily destroyed by misuse of this park. For example, human activity off the main trail is damaging, if that activity scrapes away and erodes the thin soil horizons that exist on this Esker. This activity usually has to do with tires from bicycles, strollers and the other machines that dig into the soil. Having a well-designed paved path has been proven to protect sensitive areas. Studies around the country show that a paved path encourages people to stay on the path rather than venture off the path and into sensitive areas. The paved path will also encourage a larger number of visitors to enjoy and experience this wonderful park environment.


May Apple


Flowering Bloodroot


Dame's Rocket


Trout Lillies


Solomon's Seal

Unique Features of Bancroft Park Flora, Fauna and Geology, *cont.*

Images: District Flooding, Northern Developed Area

Floods like these pictures indicate happen two or three times every year. This kind of polluted water runoff north of Bancroft Park and the Groesbeck Golf Course must be diverted from flowing through Bancroft Park. This volume of water can be very destructive. When the slurry wall was placed around the contaminated portion of the Board of Water and Light landfill just north of Bancroft Park, the landfill was also capped. By capping that large land area, the flow of runoff has increased once more. This capping was necessary to protect groundwater. It is just as necessary to protect Bancroft Park and stop the recharging of this water for the public health, safety and welfare of our citizens. This project has taken into consideration this increase and accommodates for its storage, cleaning and polishing before being transported to the river.

Images: District Flooding, Northern Developed Area

These pictures of flooding on and near Lake Lansing Road are the result of development without putting a stormwater collection and outlet system together first. All this increased polluted runoff from the parking lots and roof tops makes its way into our groundwater through Bancroft Park. When it moves through Bancroft Park into the recharging area, it is slowly destroying Bancroft Park. This drain project eliminates that destruction and repairs past damage while protecting it from further damage.

Images: District Flooding, Northern Developed Area

BANCROFT PARK
WESTERLY POND OVERFLOW AREA
AFTER RAIN EVENT
4-18-2013

Overflow area from Bancroft Park west pond-1

Overflow area from Bancroft Park west pond-2

Overflow area from Bancroft Park west pond-3

Overflow area from Bancroft Park west pond-4

Overflow area from Bancroft Park west pond-5

Culvert from pond to overflow area at full capacity

BANCROFT PARK
WESTERLY POND AFTER RAIN EVENT
4-18-2013

Westerly pond outlet area-1

Bancroft Park west pond-1

Westerly pond outlet area-2

Bancroft Park west pond-2

Westerly pond outlet area-3

Bancroft Park west pond-3

Appendix/Supporting Documents

Lansing Park Board Request for Clarification re: Groesbeck Park Drain

LANSING PARK BOARD

200 NORTH FOSTER AVENUE
LANSING, MICHIGAN 48912

Rick Kibbey
President
2nd Ward

Rita O'Brien
1st Ward

Rosalinda Hernandez
3rd Ward

James McClurken
4th Ward

Paul Holland
At-Large

Veronica Gracia-Wing
Vice President
At-Large

Clayton King
At-Large

Bryan Beverly
At-Large

January 14, 2016

Mr. Pat Lindemann
Ingham County Drain Commissioner
707 Buhl Avenue
P.O. Box 220
Mason, MI 48854

Dear Mr. Lindemann:

In regard to the proposed project at Groesbeck and Bancroft Park, please be advised the Lansing Park Board has been contacted again by the Friends of Bancroft Park requesting changes to the project.

You and I spoke at length over the holidays and my impression from you at that time was there will not be further changes made to the plan, beyond what has already been negotiated.

The Friends group has attended several Park Board meetings, spoken to board members and staff as well as provided a walk through at Bancroft Park for several board members. The Friends group is under the impression if the Park Board is to make a request to the drain commissioner for the changes they are requesting changes may still occur.

I am writing this letter to provide you with the changes the friends group would like to see made and receive a definite answer from you regarding their requests. At the January 13, 2016 Park Board meeting the Friends vehemently stated they do not want a paved "road" through the woods. There were also questions regarding the necessity of changes to the 7th tee.

At this most recent meeting, several versions of conversations with you were cited. We are only requesting that you clarify in writing your position on a couple of issues in dispute.

The Park Board passed a motion to contact you to obtain definite answers to what changes, if any, can be made at this point to the project pertaining to a limestone path instead of a paved path, and the removal of the 7th tee encroachment into Bancroft Park.

I am hopeful we can obtain definite answers from you to provide to the friends group and put this subject to rest.

If you have any questions or require further information, please do not hesitate to contact me at 485-1154.

Sincerely,

Rick Kibbey, President

Appendix/Supporting Documents

Peer Recognition for the Ingham County Drain Commissioner's Projects. These are just a few of the awards my office and myself have received.

Michigan Association of County Drain Commissioners
Innovation and Excellence Award, 2014
Ember Oaks Drain Improvements Project, Meridian Township, Ingham County

Anderson, Eckstein & Westrick, Inc. and American Counsel of Engineering Companies - Michi-gan
Engineering, Merit Award, 2014
Ember Oaks Drain Drainage District, Meridian Township, Ingham County

Sierra Club
David Dempsey Award For Distinguished Service For The Environment, 2013

Michigan Water Environmental Association (MWEA)
Regulatory Professional Of The Year, 2010

Michigan Association of County Drain Commissioners
Innovation and Excellence Award, 2012
Cook and Thorburn Drain, Watershed Improvements Project, Meridian Township, Ingham County

Michigan Association of County Drain Commissioners
Innovation and Excellence Award, 2010
Briarwood Drain Project, Meridian Township, Ingham County

Charter Township of Meridian –Environmental Commission
Environmental Stewardship Award, 2009
Northport Condominium Development, Detention Pond Revitalization & Renovation

City Pulse News & 92.1 WQTX, Lansing MI
Best Environmentalist – Talk Of The Town Award, 2009

Michigan Association of County Drain Commissioners
Innovation and Excellence Award, 2008
Towar Gardens Drain Project, East Lansing and Meridian Township, Ingham County

Williamstown Township – Chamber of Commerce, Ingham County
Certificate of Appreciation – Speaker Recognition, Business Networking Luncheon, 2008

Michigan Association of County Drain Commissioners
Dedication Of Service & Leadership Award, 2005 - 2007

Clean Water Action-Michigan Chapter
Hero of the Lakes Award, 2007

American Public Works Association, SW Branch:
Public Works Environmental Project of the Year 2007
Briarwood Creek Drain, Meridian Township, Ingham County

Ingham County Sheriff's Office, Ingham County MI
Search & Rescue, Certificate of Appreciation, 2007

Charter Township of Meridian –Environmental Commission
Environmental Stewardship Award, 2002

Michigan Association of County Drain Commissioners
Honorable Mention, 2002
Managing Drainage With A Resident Beaver Population, Meridian Township, Ingham County

Grand River Expedition 2000:
Stewardship Award, 2000

Michigan Section of the American Society of Civil Engineering:
Stream Bank Stabilization, Quality of Life Award, Willow Creek, Aurelius Township, 1997
Honorable Conceptor Award, Tollgate, City of Lansing and Lansing Township, 1999

Michigan Association of County Drain Commissioners:
Rural Drainage and Stormwater Management Award: Willow Creek, 1996.
Urban Storm Water Management Award: Tollgate, 1997.

Ingham County Chapter of Pheasants Forever:
Elected Official Award, 1996.

Michigan Wildlife Habitat Foundation:
Bengal Habitat Award, 1996 and 1998.

Keep Michigan Beautiful Award:
Fairview Park Stormwater Cleansing Basin in Tollgate, 1998.

National Stormwater Control program:
Excellence Award, Nominated, 1998.

Michigan State University Department of Resource Development:
Professional Achievement Award, 1992-93.

Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Cook and Thorburn Drain

MACDC Innovation and Excellence Awards 2012

Project Team (l to r): David Oppliger, Oppliger PLLC; Paul Pratt, Ingham County Deputy Drain Commissioner; James Bridge, P.E., Spicer Group; Patrick Lindemann, Ingham County Drain Commissioner; Blair Webster, Water and Woods Ecology; Michael Thelen, P.E., SME; Tim Bennett, Fishbeck, Thompson, Carr & Huber (FTC&H); Doug Kelly, Clark Hill.

Cook and Thorburn Drain

Patrick E. Lindemann, Ingham County Drain Commissioner

Consultants and Contractors:

- Spicer Group, Inc.
- Fishbeck, Thompson, Carr & Huber
- Soil and Materials Engineers, Inc.
- Clark Hill PLC
- The Oppliger Law Firm
- Water & Woods Ecology
- E.T. MacKenzie
- Mead Brothers Excavating

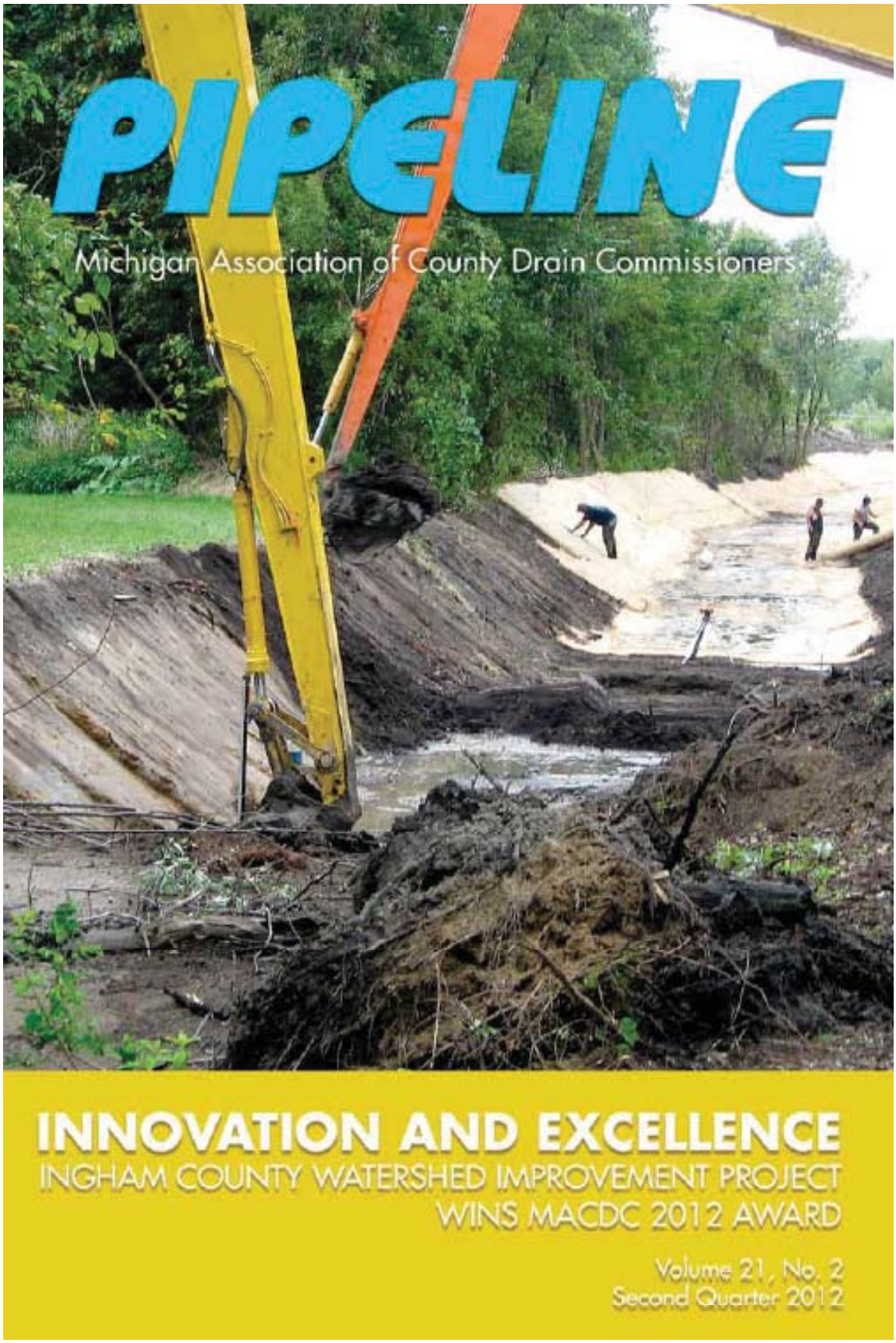
Implementation of a watershed management plan to improve storm water conveyance and water quality, this project incorporated Best Management Practices (BMPs) such as linear treatment wetland systems, mechanical water quality improvement devices, sedimentation basins, gravel filters, agricultural tile drainage systems, storm drainage systems and culvert replacements.

A complete description of this project is scheduled to appear in the Second Quarter 2012 issue of Pipeline.nf project phases 2 and 3 are scheduled for 2013.

Ron Cavaliere of Orchard, Hiltz & McClimant with Washtenaw County Water Resources Commissioner Jason Bobrin. Their project "BMPs at Pioneer High School" won Honorable Mention in MACDC's 2012 Innovation and Excellence award program.

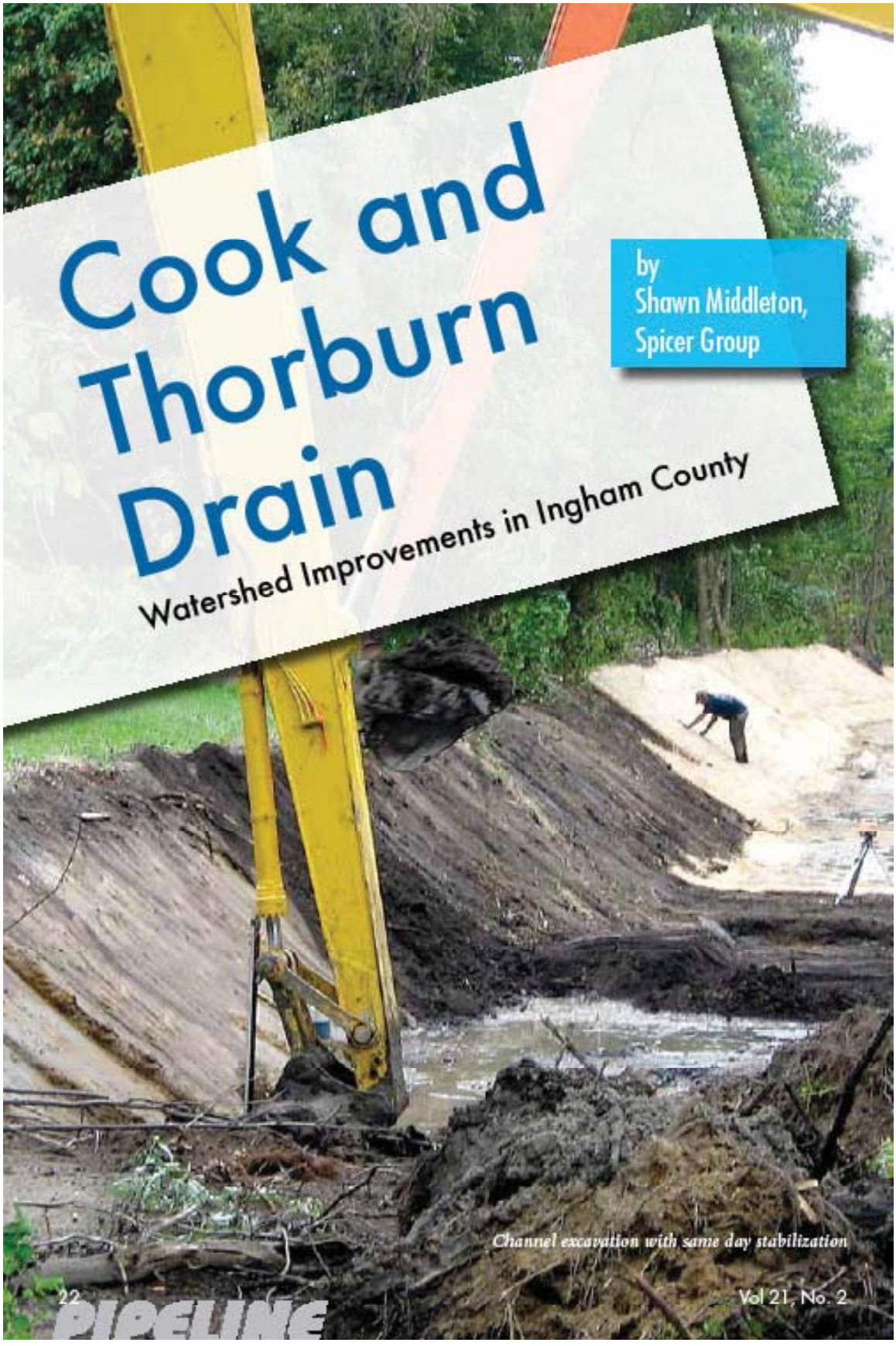
Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Cook and Thorburn Drain



Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Cook and Thorburn Drain



Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Cook and Thorburn Drain

Editor's Note: Editor's Note: Cook and Thorburn Drain Watershed Improvements received MACDC's 2012 Innovation and Excellence Award.

In June of 2006, the MDEQ issued an Order of Determination under section 423 of the Drain Code that directed "...the Ingham County Drain Commissioner (to) cease the direct discharge of any waste, waste effluent, or pollutant from the stream channel connecting the Cook and Thorburn and Hancock Drains to Cedar Lake." This marked the first time this section of the Drain Code had been used by the MDEQ for the purpose of cleaning pollution conveyed by a drain.

The 2006 order resulted in a project focused on water quality and non-point source pollution. This represents a departure from the typical drain petition project that is usually focused on storm water conveyance and relief from flooding.

Township Petitioned for Improvements

In 2000 Delhi Charter Township petitioned Ingham County Drain Commissioner (ICDC) Patrick Lindemann to address upstream flooding, drain capacity issues, and the possible widening of Cedar Street. In response, the ICDC office proposed a larger culvert along with the deepening and widening of the existing open channel utilizing the drain's current route and course.

MDEQ officials opposed this design. The Department had classified the drain as a stream with high habitat values; they therefore indicated that a permit for this proposal would not likely be issued. As an alternative, a bypass channel was designed to convey flows to a former gravel pit, known locally as Cedar Lake. MDEQ issued a permit for the alternative design and the project was constructed in 2003. A diversion weir was put in place to maintain base flows within the Cook and Thorburn Drain's historical route and course. The overflow bypass channel employed a large box culvert to convey higher flows directly into Cedar Lake through a shorter route.

Additionally, the Hancock Drain was diverted into Cedar Lake at this same location. The Drain's historic route and course had entered Cedar Lake at its northern end from the time the pit was excavated. This design simply added a connection from these two drains to Cedar Lake and continued to use the over 400 acre-feet of flood storage it provides. The net benefit of the 2003 project was the reduction of flooding and the lowering of the floodplain by approximately 2 feet in this area.

Project Timeline

- **1914** Established As A County Drain
- **1967** Drain Routed Through Excavated Gravel Pits
- **2003** Overflow Drain Constructed
- **2004** Gravel Pit Turns Black
- **2005** MDEQ Indicates Overflow Drain Caused "black water"
- **2005** ICDC Develops Collaborative Action Plan
- **2006** MDEQ Issues Order Under Section 423
- **2007** Appeals of Necessity Dismissed
- **2008** MDEQ Files Mandamus Action
- **2008-2009** Final Design
- **2009** MDEQ Permit Issued
- **November 2009** Project Letting
- **December 2009** Day of Review
- **January 2010** Board of Review
- **2010-2011** Project Construction

Cedar Lake Revisited

Less than a year after this construction, the area experienced one of the wettest springs on record with over ten inches of rain in May alone. The warm spring run-off contained typical nonpoint source pollutants, such as sediment, nutrients, salts, oils, and grease. Cedar Lake was undergoing normal seasonal thermal stratification.

Due to its nature as a gravel pit, the "lake" contained high iron content in its water and organic matter. The ICDC received notice that water levels in Cedar Lake were high, and subsequently cleared a blocked 48" culvert from the north end of the lake. All these conditions combined to create a biochemical reaction that suspended black particulate matter in the water column. Users of the lake reported that it had "turned black" and complained to the MDEQ. Although the particulate matter eventually settled out, the Drain Commissioner continued developing

Linear treatment wetland with low flow channel, one week post construction.

Linear treatment wetland with low flow channel, one year post construction.

a "Collaborative Action Plan" to address issues raised by the MDEQ. The plan addressed specific areas known to be contributing sediments and or nutrients to the drainage system from land uses within the watershed.

In 2006, MDEQ issued an Order of Determination under Section 423 of the Drain Code, claiming that the 2003 project it permitted had caused the black water in Cedar Lake. Though he disagreed with the MDEQ finding, the Drain Commissioner began investigating water quality solutions for the entire Cook and Thorburn watershed. In August of 2007, a field investigation was conducted with the MDEQ to discuss feasible and prudent alternatives to manage storm water runoff while protecting Cedar Lake.

In March of 2008, the MDEQ filed a Mandamus Action in an attempt to speed up a potential project. The lawsuit listed seven measures the Department wanted the Drain Commissioner to implement. The focus of the Mandamus Action was not on removing pollution from the water but, instead, to divert it around the gravel pit known as Cedar Lake to a downstream gravel pit and then to Sycamore Creek. Implementing these measures would have caused the loss of the 400 acre-ft of available flood storage provided by Cedar Lake. The benefits achieved by the 2003 project would have been negated, resulting in increases to the established floodplain upstream and downstream of Cedar Lake. Consent or condemnation would have to be obtained from multiple landowners to increase the floodplain, including those who paid for the 2003 project. Without their consent, the drain office could not be issued an MDEQ permit under Part 31 of the Natural Resources Environmental Protection Act of 1994, as amended.

Alternatives that maintained floodplain elevations and met the MDEQ proposed measures ranged in cost from $30-50 million. The high costs were primarily attributable to the land acquisition and construction costs necessary to replace the 400 acre-feet of storage currently provided within the gravel pit or to provide significant improvements in conveyance downstream.

Seeking Equilibrium

A balance had to be struck between the goals of keeping pollution generated within the watershed from being conveyed into Cedar Lake while also maintaining flood storage benefits. The Drain Commissioner focused on addressing the pollution at or as close as possible to its source. To reduce costs, the project focused on construction within existing drain rights of way.

The following goals and objectives were established to meet the intent of the 2006 MDEQ Order, maintain the benefits of the previous project, and control project costs:

- Implement source-control practices to treat storm water runoff and improve the

health of the watershed and drainage system and meet the MDEQ order, to the maximum extent practicable.

- Implement a Watershed Management plan to reduce non-point source pollutants at their source and to minimize the discharge of pollutants from future developments to meet the MDEQ Order.
- Maintain the floodplain reduction benefits of the 2003 Project.
- Maintain or lower the existing regulatory floodplain elevations to the maximum extent practicable.
- Maintain or lower current peak discharges from the Cook and Thorburn and tributary drains into Cedar Lake and Sycamore Creek.
- Provide a design that minimizes maintenance and ongoing expenses incurred by the Drainage district as a result of this project.
- Utilize existing drain and road right of way where feasible to reduce project costs.

A project design was finalized early in 2009 based on these goals and objectives, referred to as the 14-point plan. Some of the plan's major components are:

- Approximately 8,000 feet of Linear Treatment Wetland constructed within drain right of way.
- Approximately 12,000 feet of new or replacement storm drain and agricultural tiles.
- Five water quality units were installed either in new locations or retrofitted into existing storm drains.
- Four 3-stage treatment trains consisting of a sedimentation basin, wetland filter, and gravel media filter.
- Control weir with natural stone riffles at Cedar Lake.
- Relocate approximately 1,200 feet of deteriorated storm drain within existing salvage yard.
- 96 feet of box culvert for future road crossing with control gate and low maintenance trash rack at Cedar Lake.
- Eight culverts replaced due to hydraulic capacity, grade, or condition
- Preparation of a Watershed Management Plan to address pollution at its source

Environmental and Water Quality Benefits

The Cook and Thorburn Drain project was ordered by the MDEQ to improve water quality. Multiple design elements were employed to improve the water quality, such as slowing water velocities, increasing travel and biological contact times, mechanical separation units, and a "treatment train" consisting of gravel and wetland filters.

Prior to and during the design process, eight ISCO water sampling units were placed at critical locations throughout the drain system. Water samples collected from multiple rain events were analyzed and the information used to determine placement of the water quality measures. Descriptions and locations of these measures appear later in this article.

The most critical part of improving water quality in the system had nothing to do with the construction efforts but was completed as part of this project. The Cook and Thorburn Watershed Management Plan was produced to address storm water quality concerns within the district at their source. This plan was necessary because the project could only address water quality within the drain right-of-way. The first step in the creation of this plan involved studying existing conditions and land uses, then identifying pollutant loading and sources throughout the watershed. After evaluation, a plan was formed to address areas of concern that include:

- Older residential neighborhoods with no storm water storage or treatment
- Failing agricultural tiles and land use throughout the drainage system
- A tributary, the Gillett Drain routed through an auto salvage yard
- Two golf courses located in the upper end of the watershed

The plan identifies six specific goals to address these areas of concern:

- Protect wetlands
- Protect and enhance surface water quality
- Protect groundwater
- Improve recreational activities
- Implement responsible land use planning
- Increase public awareness.

For each goal, specific issues, locations, strategies, indicators, costs and partners have been identified.

Continuous monitoring of water quality was performed prior to and throughout the construction of the project. Water quality of Cedar Lake was monitored by Water and Woods Ecology. Monitoring included visual observations, sampling, and testing for nutrients. Steady improvement has been observed in Cedar Lake since the May 2004 event and throughout project construction. In-stream water quality was monitored for Total Suspended Solids and nutrient loads by ICDC consultants and for residence / travel times by Penn State University. These data have established a baseline for comparative analysis during and after construction. In-stream testing during construction identified turbidity levels during storm events that were lower than or equal to pre-project testing.

Factors used in development of assessment roll

		Less than 5.00 Acres	Greater than 2.00 Acres	Less Than .50 Acres			
1. Runoff Coefficient	Agriculture	Small Ag w/Home	Low Density Residential	High Density Residential	Commercial/ Industrial	Mixed Use	Wooded Land
	0.20	0.30	0.30	0.60	0.90	0.60	0.15
2. US / DS of Cedar Lake	Upstream of Cedar Lake	Downstream of Cedar Lake					
	1.20	1.00					
3. Storm Water Pretreatment	Floodplain, Wetland, Prairie, etc. (3)		LID / Future Treatment (2)	Treatment System (1)	No Treatment (0)		
	0.40		1.00	1.00	1.30		
4. Land use intensity & pollution contribution (N, Ph, TSS...)	Agricultural	Residential	High Density Residential	Commercial / Mixed			
	0.35	1.00	3.00	0.65			
5. Lake Frontage and Ownership	Lake	Non Lake					
	3.00	1.00					

Appendix/Supporting Documents

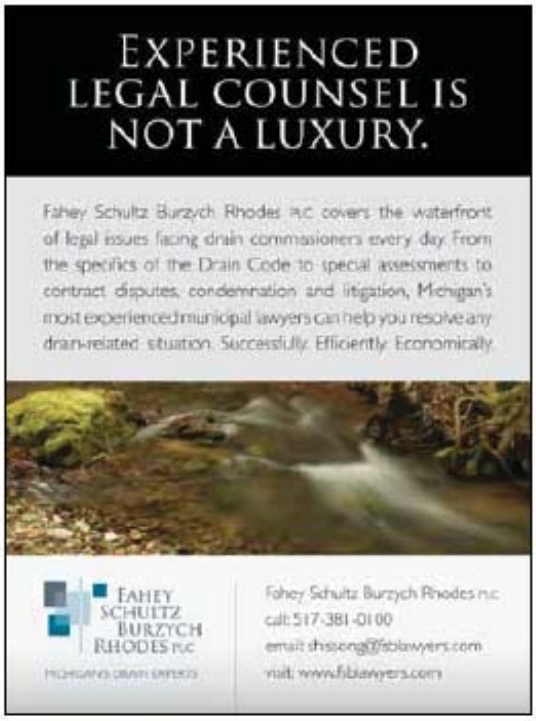
Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Cook and Thorburn Drain

Rock weirs with natural stone riffles at Cedar Lake.

Innovation

Among the most innovative design element employed on the project was modifying almost two miles of existing open drain by excavating the channel so that it had no slope. The channel was also widened to the maximum amount possible, while leaving room for maintenance equipment, without obtaining additional easements. The effect is contradictory to the typical drainage solution of moving the water away as quickly as possible. A seed mix consisting of a variety of native wetland plants was used on the drain bottom and two feet up the banks to further slow water velocities. The overall result is extended retention time, which improves water quality by allowing more sediment to settle out of the water column and the vegetation has more time to absorb nutrients.

The channel excavation was performed "in the dry" to mitigate potential sediment transport concerns to Cedar Lake. The contractor used temporary dams that were filled with water from the drain. At the end of each day's construction, the new channel was seeded and stabilized using polymers on



Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Cook and Thorburn Drain

Linear Treatment Wetland

the banks and mulch blanket throughout.

Overnight, a valve installed underneath the dam allowed flows to continue downstream. This process was repeated numerous times as the contractor moved through the construction site. During the design process, flow rates and potential development in the upstream reaches of the watershed were identified and the need to establish maximum allowable discharges was addressed.

The existing drainage system, originally constructed as a clay tile, has slowly evolved into a mixed network that now includes sections of corrugated metal pipe (C.M.P.), reinforced concrete pipe (R.C.P.), both single and dual-wall plastic pipe, along with some open channel. Known sections of failing tile and locations where sinkholes were observed were marked for replacement. The replacement pipe was sized such that future development would be limited to discharges of 0.05 cubic feet per second (cfs) per acre or less. This significantly slower discharge rate served the dual purpose of reducing project costs and ensuring "environmentally-friendly" discharge rates for future development.

A sheet pile weir installed between the main body of Cedar Lake and the connection to its north lobe was constructed to prevent back water from minor storm events from migrating into the gravel pit. Historically, the 48" pipe that served as an outlet for the Cook and Thorburn Drain as it passed through the north lobe would cause storm water to back up into the lake. With the new control installed, storm water conveying sediment and nutrients in the Cook and Thorburn Drain will only reach Cedar Lake during larger storm events. The new weir complements the diversion weir installed in 2003 that functions to prevent base flows from the Cook and Thorburn from entering Cedar Lake through the overflow drain. The re-designed system improves water quality in the gravel pit while also maintaining flood storage benefits.

Use of New Materials and Technology

The mulch blanket used on the project was constructed with completely biodegradable burlap netting. Unlike other mulch blankets, this product is not dependent on sunlight for degradation and is suitable for use on channels where sunlight is often screened from the netting after the vegetation has established. Although more costly than mulch blanket of the same weight construct-

ed with photodegradable netting, the thicker netting protects against higher shear stresses. Therefore, lighter weight blanket can be used and the majority of the additional costs are offset.

An additional benefit of the larger biodegradable netting is its plant and animal friendliness. The larger gaps and flexible netting minimize the risks of accidental wildlife entrapment. The large gaps also allow the use of live staking and other plantings without compromising erosion control.

Downstream of critical work locations, flocculent logs were installed in-stream to aid in the removal of sediments. Prior to bidding and construction, soil and sediment samples were taken throughout the proposed project site. The samples were sent to the manufacturer's lab for tests to determine which version of the flocculent was appropriate to use at each location. It was determined that 703d#3 was best suited for all construction locations. The flocculent, when introduced into a stream flow and properly mixed, binds small clay particles together, creating larger particles that are more likely to fall out of the water column. Downstream of the flocculent logs, nets were erected to trap flocculated particles that had failed to settle out of the stream flow.

As part of the Soil Erosion and Sedimentation Control (SESC) plan, soil binding polymers were used at all upland locations in conjunction with seeding. Silt Stop 705 series was specified based on the results from bench testing of site soil samples. The polymer stabilizes surface soil particles and reduces erosion from wind and rain. The powder was mixed together with seed at the manufacturer's recommended rate of 30 pounds per acre and then applied using a standard broadcaster. The polymer, used together with mulch blanket on steeper slopes, proved to be very effective at preventing erosion yet did not inhibit vegetation growth.

"Treatment trains" consisting of a sediment basin, wetland filter, gravel media filter, aerating weirs, and riffles were installed at four locations in the watershed. Although wetland plants and gravel are not new material, their use as an in-stream filter system in a county drain constitutes a new use for these familiar materials. Two of the systems are located within larger watershed drains with a base flow. The other two are positioned at subdivision outlets with storm-dependent flow. Both the wetland filter and gravel filter have under-drains that move filtered water into twin header pipes located within the drain banks, parallel to the flow. Flows exceeding the capacity of the under-drains exit the system via overflow structures. Michigan native wetland plants were chosen based on their ability to uptake nutrients from the system.

Between the wetland filters and the gravel media filters, water level control structures were installed to maintain soil saturation levels at an elevation that will maintain wetland plants and promote growth. A gravel media consisting of washed MDOT 34R was chosen as a compromise between flow rate and filtration capabilities. Based on in-place observations, there is a potential for experimenting with other filter media in the future. As with any filter, maintenance will be required in the form of harvesting excessive vegetation and periodic cleaning and or replacement of the gravel media.

One of the new technologies installed on the project was the Suntree Nutrient Separating Baffle Boxes (NSBB). These mechanical treatment systems were strategically placed at locations that were identified as contributing high nutrient loads into the system. The NSBBs provide treatment and separation of nutrient rich vegetation, trapping it above the base flow elevation and preventing it from re-entering the system. Separating the organic matter from the static water also prevents the buildup of bacteria, so the unit will not become septic between storm events. Within the 3 chambers of the baffle box, sediment is collected

Appendix/Supporting Documents

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Peer Recognition for the Cook and Thorburn Drain

Treatment Train Construction Sequence

Bypass Pipe Installation

Under-drain system constructed

Final shaping and grading

Wetland and gravel media fill

Seed & bio-degradable blanket

Completed "treatment train"

and turbulence deflectors prevent the sediment from re-suspending. At the downstream end of the baffle box, a floating boom installed at the water surface skims off any hydrocarbons present in the storm water.

The baffle boxes were installed at two locations as a retrofit within existing storm sewer systems. Installation within existing systems is fairly easy due to the straight through design and minimal head loss across the box. At two other locations, the NSBBs were installed as part of a treatment train at the downstream end of older developments. The ability of the Suntree units to remove large debris and hydrocarbons makes them an ideal complement to the treatment train media filters that filter smaller sediment particles. The fifth NSBB installed on the project was positioned within the Gillett Drain that was relocated to bypass an existing auto salvage yard.

A new technology used to control sediment from leaving the site was the product Sediment Retention Barriers (SRB). They were installed at two locations on the downstream end of construction activities, where sheet flow would enter the existing drain. The SRBs are constructed using existing soil erosion and sedimentation control (SESC) Best Management Practices (BMP). The barrier consists of two rows of high flow silt fence placed parallel to each other, four feet apart, and perpendicular to the sheet flow.

Wood chips from on site clearing activities were mixed with silt stop and then placed between these two rows of silt fence. The SRBs allow for a much higher rate of flow per linear foot than standard silt fence, while still clarifying sediment laden water.

Public Involvement and Education

A major component of cleaning the waters of the Cook and Thorburn Drain involved educating residents in the Drainage District. The primary educational tool was and is the Watershed Management Plan. The plan resulted from collaboration between the ICDC, municipalities, residents of the district, and private consulting scientists and engineers.

The plan explained the existing conditions and pollutants throughout the watershed and included an outline of how these conditions could be improved. Moving forward beyond the construction project, the plan will be a reference that municipalities, commercial businesses and residents can use when making decisions on land use and development.

The primary municipality in the Drainage District is Delhi Charter Township, with 86% of the 5,800 acres in the district. Township staff and consultants were involved with the project early on, working with the Drain Commissioner and helping to develop plans.

Letters were sent to inform landowners in some project locations of potential construction activities or disturbances. Additional communication with landowners was established through the use of a project website. The website was updated with weekly progress reports and upcoming work locations. Delhi Charter Township's website posted a link to the site and the address was included on the multiple letters sent to affected residential and commercial landowners.

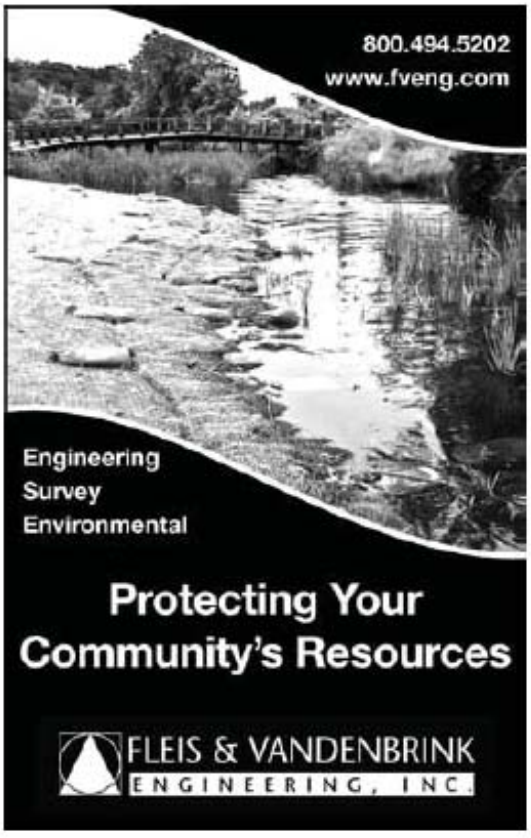
Communication with riparian landowners before, during, and after construction was essential to the success of the project. A plan is in the works to erect interpretive signing at a parcel owned by the Delhi Charter Township Downtown Development Authority; the parcel was used for spoil deposition during construction and will be a park in the future. Additionally, the landowner adjacent to one of the in-stream treatment trains has agreed to allow the Drain Commissioner to use his parking lot to stage educational tours of the project.

Project Challenges

Complexities were encountered in almost every facet of this project, beginning with the fact that the project was deemed necessary under section 423 of the Drain Code, a strategy that had not been used previously for this purpose. Even ordinary events required by the Drain Code, such as assessing the cost of the project based on benefit derived were difficult.

Fifteen lawsuits were filed over the course of four years following the MDEQ Order. Most of these were brought against the Ingham County Drain Commissioner by municipalities, landowners, and the MDEQ. The lawsuits delayed the project and added almost $2 million to the cost.

The complexities of engineering and design started with the competing goals of preventing pollutants from entering Cedar Lake while still maintaining the use of the gravel pit for flood storage. This problem was addressed by focusing on cleaning the entire system rather than focusing on Cedar Lake. The result was an array of Best Management Practices (BMPs) and complex treatment trains throughout the drainage system. Adding difficulty was the need to apply most of these practices within the existing drain easements. An acute understanding of the system hydraulics was critical to determine the floodplain impacts of constructing almost 2 miles of drain with no slope.



The OPPLIGER LAW FIRM
DAVID E. OPPLIGER
ATTORNEY AND COUNSELOR
1111 PINE GROVE AVENUE
PORT HURON MI 48060
(810) 966-1881 • FAX: (810) 966-1893
OPPLIGER@SBCGLOBAL.NET

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Coordination with the Ingham County Road Commission and Delhi Charter Township was critical to ensure that the project would not interfere with their proposed widening of Cedar Street that included plans to enclose approximately 2,800 feet of the Hancock Drain. Soil borings and muck probes identified locations of open channel, tile replacement, and box culvert installation that all had to be addressed.

Construction was complicated by the fact that the MDEQ ordered the project due to the presence of pollutants within Cedar Lake. Preventing sediment and other pollutants from entering the gravel pit during the construction process was vital. To implement the proposed improvements, contractors performed most of the excavation "in the dry." Temporary cofferdams and two of the treatment trains were completely constructed prior to connecting them into the main Cook and Thorburn Drain.

Excavation locations within one mile of the lake were identified as critical zones. The contractor was required to perform daily seeding with silt stop application and mulch blanket. Flocculent logs were installed in two box culverts upstream of the lake, with three floating curtains downstream designed to trap the particles. A line item was included in the bid documents to address the costs associated with any potential additional measures that might be necessary. Turbidity testing was conducted in conjunction with storm water operator inspections; results were consistently below pre-project levels.

Fast Facts

Drainage District:	9.2 square miles (5,900 Acres)
County Drains:	100,000 Feet+ in District
Property in District:	2,000+ Owners - Agricultural - Commercial - Industrial - Residential
Public Entities:	- Delhi Charter Twp. - Aurelius Twp. - Alaiedon Twp. - Ingham County
Road Commission:	Ingham County

Once a design was finalized and approved by regulatory agencies, the project was let for bid and a Computation of Cost was completed and an assessment roll was prepared. The roll was unique in the fact that it needed to address "benefit derived" based on a water quality project and not on a typical water conveyance project. Though the baseline apportionment of project cost was based on runoff, five factors were used that had to account for the contribution of pollution by each landowner and benefits derived by each property from the removal of this pollution. Assessing landowners for drain projects is the most difficult job that a Drain Commissioner has and attempting to quantify the qualities of clean water only added complications to the decisions. The assessment roll was appealed after the Day of Review and a subsequent Board of Review was held.

Communicating the apportionment methodology to the Board of Review was difficult, again, due to the fact that the apportionment was based

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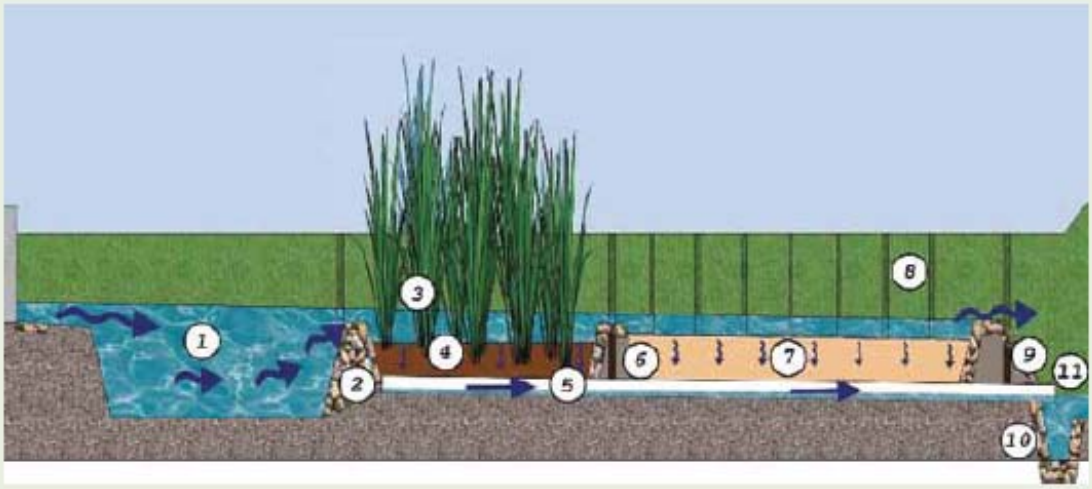
Peer Recognition for the Cook and Thorburn Drain

Schematic of storm water flow through typical treatment train



1. Flow enters the system into a sedimentation basin where velocities are slowed, allowing larger particles to settle out of the system.
2. Water travels through and over a limestone rock weir that provides aeration and increases dissolved oxygen in the water.
3. Wetland specific plants uptake nutrients from the storm water.
4. A portion of the storm water infiltrates through the wetland media into a perforated sub-drainage system.
5. Twin header pipes running parallel to the drain collect filtered water and transport it downstream.
6. A water level control structure maintains a water level in the wetland conducive to the health of the plant, while also allowing for bypass for maintenance purposes.
7. Base flow and high frequency events travel through a gravel media filter into the sub-drainage network.
8. Cleanouts are located throughout the system to allow for future maintenance.
9. High flows are allowed over rock bypass weirs or culverts while providing additional aeration.
10. A plunge pool at the outlet prevents scour and erosion
11. Filtered storm water continues downstream through more than 2,000 feet of linear treatment wetland for additional nutrient uptake.

on water quality and not just storm water run-off. Ultimately the Board of Review approved an assessment roll substantially as proposed by the Drain Commissioner, allowing the project to move forward.

Cost Effectiveness

While a total cost of over $10 million is not inexpensive, comparing it to the alternatives presented by the MDEQ in its Complaint for Mandamus sheds light on just how cost effective the final project was. Cost estimates that involved designs that disconnected the Cook and Thorburn and Hancock Drains from the gravel pit ranged from $30-50 million. Design solutions included a canal from Cedar Lake to Sycamore Creek, re-creation of the lost flood-plain storage, or a treatment facility within the drain. The costliest factor for those alternatives was land acquisition associated with replacing the 400-acre-feet of storm water storage that Cedar Lake provides. Without that storage, in-

creases in the regulated floodplain would occur either downstream of Cedar Lake or along Cedar Street and would have negated the benefits that were attained as part of the Cook and Thorburn construction in 2003. Residents of the district will continue to pay for the 2003 project until 2022.

The project constructed as a result of MDEQ's 2006 Order of Determination can treat lower, more frequent flows before they reach Cedar Lake and also allows lower flows in the Cook and Thorburn to bypass Cedar Lake. The ability to store flood waters from larger events has been retained, eliminating the need to provide costly storage in another location.

Although several new easements were needed, most of the construction work was completed within the previously established drain right of way. The linear treatment wetland and two of the treatment trains were contained within existing easements and still allow for future maintenance work. Shelves built into the sides of the drain leave room for equipment when flows are low, but also provide additional storage during significant runoff events.

This article briefly describes the years-long struggle over what began as a solution to flooding problems. ICDC Lindemann remains convinced that the original 2002 project functioned properly and was well worth the money. He is less enthusiastic about the second project that resulted from the MDEQ mandate. "I did not want to burden the public with a $30-$50 million project that would have undone the success of the first project and caused more flooding," Lindemann said. "We all wanted to protect the lake. In the end, the Drain Office and our consultants achieved that goal at a significantly lower cost than the solution MDEQ tried to impose. We could have done the same and saved money had we been able to work on it over the next eight to ten years, rather than the much shorter time-frame that was thrust upon us through the Department's legal maneuvering."

"Is the drain better off today? I can say yes, we put in some mechanisms that improved water quality and the portion of funds used to accomplish that benefit the drain and drainage district. It's unfortunate, though, that a significant amount of time, energy, and money was spent in legal wrangling over who would decide the appropriate solution."

Project Contributors

Spicer Group

Oppliger Law Firm

Clark Hill PLC

Soil and Materials Engineers. Inc.

Water and Woods Ecology

Fishbeck, Thompson, Carr and Huber

Auburn Dalle, PLC

Delhi Charter Township

Northern Concrete Pipe

Advanced Drainage Supply

Price and Company

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MACDC Project Awards

Jay Zawacki, P.E. (CDM Michigan Inc.); Janis Bobrin, Washtenaw County Drain Commissioner; Dennis Wojcik, Washtenaw County Deputy Drain Commissioner

Mary Beth Doyle Park and Wetland Preserve

Washtenaw County Water Resources Commissioner, Janis A. Bobrin

Engineer: CDM Michigan Inc.
Contractor: Dan's Excavating, Inc., WH Canon Company
Other Consultants: Alexander Resources; InSite Design Studio Inc.; Midwestern Consulting, Inc.; Pollack Design Associates

A complete description of this project appears in this issue of Pipeline.

David Oppliger (Oppliger Law Firm); Jeff Alpers (Wilcox Professional Services), Samir Matta (Wilcox Professional Services); Blair Webster (Water and Woods Ecology); David Mifsud (Herpetological Resource and Management, LLC); Patrick E. Lindemann, Ingham County Drain Commissioner; Cecilia Kramer, Ingham County Deputy Drain Commissioner

Briarwood Drain Drainage District Improvements

Ingham County Drain Commissioner, Patrick E. Lindemann

Engineer: Wilcox Professional Services, design team led by Samir Matta, P.E.
Contractor: Rothemberger, Inc.
Other Consultants: Herpetological Resource and Management LLC; Miller, Canfield, Paddock and Stone, PLC; Dave E. Oppliger, PLLC; Premarc Corporation; Stauder, Barch and Associates, Inc.; Water & Woods Ecology, LLC; Michigan Wildflower Farm

The Briarwood Drainage District encompasses about 550 acres of wooded and landscaped properties, approximately 800 residences, with a series of stormwater detention ponds throughout a number of subdivisions in Meridian Township, Ingham County. In response to resident requests, Ingham County Drain Commissioner reconstructed the pond with a forebay and basin contours to clean stormwater run-off while also providing habitat. Briarwood Drain was retro-fitted with bank stabilization, continuous curvature culvert, and a section of two-stage ditch. *For a complete description of this project, see Pipeline Fourth Quarter 2007 issue.*

Appendix/Supporting Documents

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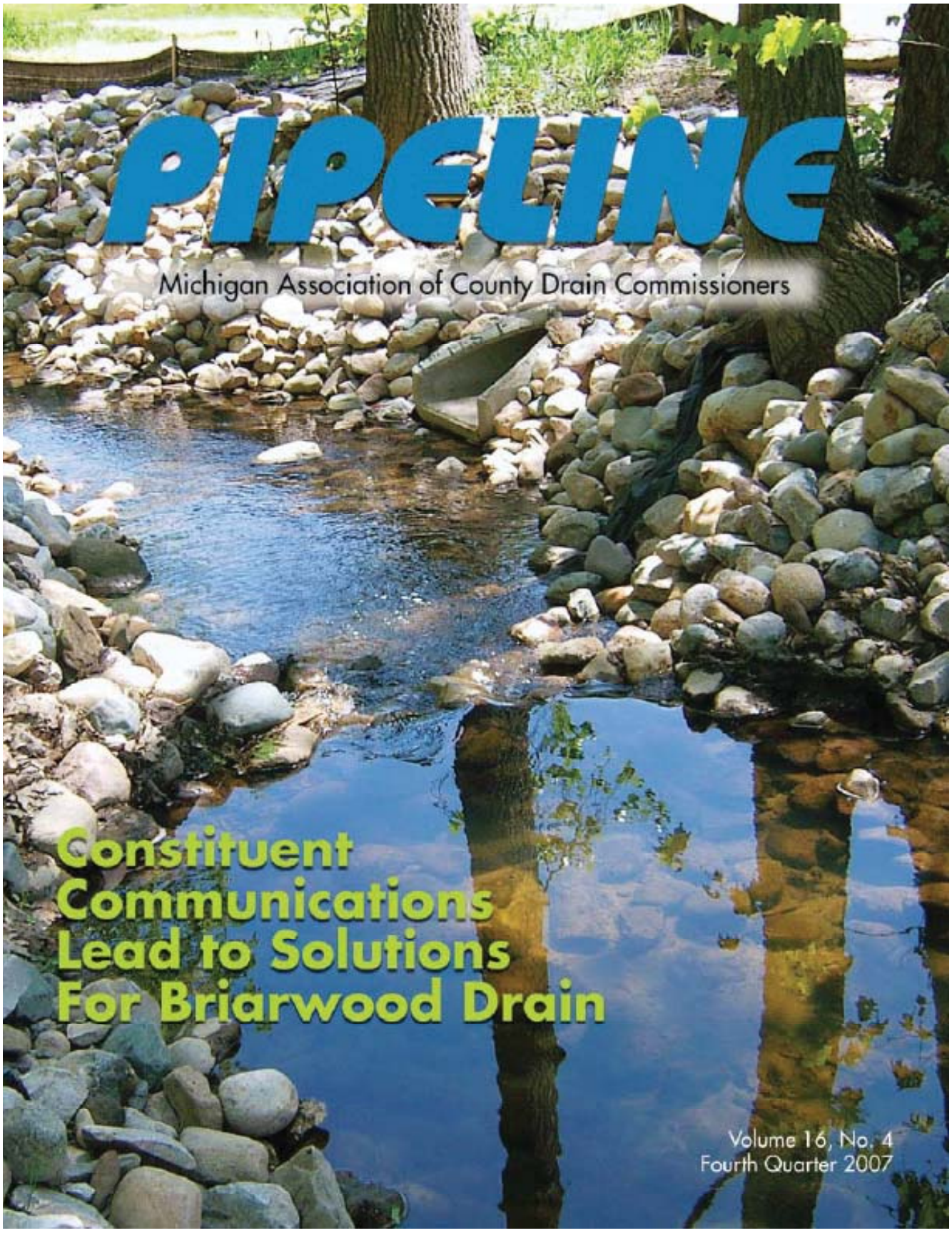
Peer Recognition for the Briarwood Drarin



Constituent Communicat
for the Briarwood D

By Samir Matta, P.E., Wilcox Professional Services, LLC

The Briarwood Drainage District encompasses about 550 acres of beautiful wooded and landscaped properties, approximately 800 residences, with a series of stormwater detention ponds throughout a number of subdivisions. The District is located in the affluent surrounds of Meridian Township in Ingham County. Yet, in the midst of this suburban idyll, residents near the downstream end of the Briarwood District had a problem. Ingham County Drain Commissioner Patrick Lindemann heard from these residents regularly about objectionable odor and related environmental concerns related to the pond located in the Briarwood Subdivision common area.

Detention ponds in subdivisions are typically constructed based on predevelopment rates of flow. Their purpose, of course, is to store excess runoff and allow it to filter through soils, thus reducing discharge of pollutants into downstream waters. Ponds can also provide an aesthetically pleasing atmosphere for nearby property owners. Unfortunately, when poorly maintained, they become an eyesore and a liability for the entire neighborhood. Drain Commissioner Lindemann and other Michigan Drain Commissioners have been more steadfast in demanding, at a minimum, a maintenance agreement that allows them the opportunity to correct displeasing situations when Neighborhood Associations' governing bodies fail to perform.

In the case of the Briarwood pond, Briarwood Association had made many efforts to address concerns over odor and pollutants. Factors outside their control, such as upstream development that contributed extensive amounts of sediments, combined with poor turf management practices to produce the problem.

Maintenance Funds First

The Briarwood Drain is a legally established County Drain comprised of both underground tiles and a section of

Briarwood Drain after bank stabilization measures.

ion Drives Project Scope
rain, Ingham County

open channel. Drain Commissioner Lindemann sought to conserve the District's financial resources by first using allowable maintenance activities to evaluate the validity of residents' environmental concerns. Several years of maintenance activities provided useful inspections of existing infrastructure, along with an inventory of items needing attention.

Assessments performed during maintenance did, in fact, support residents' environmental concerns. Several point and non-point sources were found to be discharging pollutants to Briarwood Pond and Briarwood Drain. Point sources included drain tiles from residential properties, outfalls from storm drains, and sediment eroding into the drain channel from improperly stabilized culverts. Non-point sources included runoff from residential lawns and un-vegetated forested areas within Briarwood subdivision. Pollutants identified included nutrient-laden water, sediment, oils, and suspected contaminants from urban runoff. These pollutants were affecting the downstream reaches of the watercourse that are not designated as a county drain and, ultimately, the Red Cedar River.

Petition Moves Project

Inspections performed during maintenance provided an initial scope for the project. Pursuant to a petition and a meeting of a Board of Determination, the Ingham County Drain Commissioner was authorized to further identify and correct areas of concern within the Briarwood Drain. The project team, led by Drain Commissioner Lindemann, included the Drain Commissioner's representatives Deputy Cecelia Kramer, Mr. Dave Solberg and Ms. Angie Cosman. Staff from Wilcox Professional Services, The Oppliger Law Firm and Wetland and Coastal Resources formed the remainder of the initial Team.

During project evaluation stage, a conflict of interest developed and Wetland and Coastal Resources requested to be excused from the Team. Water and Woods Ecology assumed those responsibilities for the Team. During site visits, the Team confirmed several findings that would lead to important changes in the scope of the project.

Briarwood Pond

left: Severely degraded conditions in the Briarwood Pond.

below: Three feet of contaminated sediment at the bottom of Briarwood Pond.

Determining the functionality of Briarwood Pond for its intended purpose of filtering, detaining, and/or retaining stormwater runoff, and recommending improvements to increase its function, were an integral part of this project. Briarwood Pond is approximately one acre in size and is located in a common area owned by the Briarwood Subdivision Neighborhood Association.

Briarwood Drain Project Team Primary Goals And Objectives

1. Evaluate the Briarwood pond and the downstream open drain section to determine potential improvements.

2. Provide logical, low impact, cost-effective alternatives and solutions that are easy to implement.

3. Determine the extent and validity of the legal drain route and course.

4. Develop an educational pamphlet for residents to encourage better turf management practices and inform them as to best methods to care for the new storm water management components.

5. Assess the performance of the implemented measures and refine during the first two years to better serve the community and the drainage district.

Lawns around the entire perimeter of the pond were maintained to the water's edge. No wetland or submerged aquatic vegetation was identified along the borders or in the littoral zone of the pond. At the time of inspection, water levels were high and portions of nearby lawns were inundated. From the topography of the adjoining and upstream residential lawns, it is apparent that lawn fertilizers and herbicides are washed into the pond through overland runoff and storm drains, especially during high water periods and storm events. The team identified discharges to the pond from three residential roof or yard drains, along with a series of road and storm water drains. Investigations of the various road and stormwater drains show oils, roof grit, dirt, and debris entering the drains. These discharges represent point sources of potential pollutants. All these sources contributed significantly to the nutrient enrichment and degradation of the pond.

While some level of nutrient input is essential for normal plant growth, the nutrient load contributed to Briarwood Pond greatly exceeded the assimilation capacity of the pond's aquatic system. Throughout the spring and summer, the pond hosted large numbers of green and blue-green algae in the form of floating mats, along with excessive growth of rooted aquatic plants. Decay of excessive plant materials typically depletes dissolved oxygen from the water, creating anaerobic conditions that stress fish and other aquatic biota, and causing odor problems. In response to the ongoing algae and odor problems, the pond was chemically treated several times annually. Repeated applications of aquatic herbicides were only minimally effective in reducing algae populations. Over the years, chemical constituents accumulated in the pond's sediment to concentrations above the Statewide Default Background levels, as defined by the Waste Management Division of the Department of Environmental Quality. Site inspection revealed that the pond perimeter extended outside the common area and unto adjacent private property. It is unknown whether the pond was constructed to the correct configuration before expanding to its current state, or mistakenly placed outside the defined common area. Regardless of the cause, the pond extended about 35' onto private property along the northwest corner of the site, and correction was needed.

It was also discovered that the deepest point of the pond is three feet shallower than the twelve feet called for in original design specifications. Our field review indicated that maximum pond depth was 9 feet, of which three feet consisted of contaminated soft sediment bottom. The amount of contaminated soils was estimated at 2000 cubic yards that would need to be dredged and transported for disposal at a Type II Landfill.

Briarwood Drain

The Briarwood Drain continues from an enclosed storm drain system that serves the Briarwood Drainage Watershed. Proposed improvements commenced at the outlet of a 60"

RCP storm drain. The drain is an open channel for a distance of approximately 400 feet to a 76"x48" elliptical culvert, approximately 75 feet long, under Kinawa Drive. The culvert had one 45° bend that deflected alignment from the 30" storm drain serving the Kinawa Drive right of way. After exiting the culvert north of Kinawa Drive, the drain course meanders approximately 1,600 feet and transitions to a wetland area before entering a pipe under the C&O Railroad. The area targeted for improvements is limited to the initial 650 feet as measured along the drain centerline and downstream from the 60" storm drain outlet.

Project evaluation revealed that the open section of the Briarwood Drain had not been officially finalized or properly recorded, even though letters were found that documented an easement agreement. Drain Commissioner Patrick Lindemann and his deputy, Ms. Cecelia Kramer, successfully negotiated and obtained an easement agreement from the School Board for the open drain section. They also coordinated drain improvement characteristics with science teachers at the area middle schools to provide useful teaching tools to students.

Several other storm drains outlet into the Briarwood Drain along the 650 feet of the project area, including a 48" drain from the Briarwood subdivision, two 12" drains that serve nearby localized areas, and a 30" storm drain from Kinawa Drive. The condition and alignment of these outlets, together with the culvert configuration under Kinawa Drive, produced bank erosion and flooding that required improvements.

Bank erosion near this 60" storm drain outlet is typical of conditions along the open section of Briarwood drain.

60" Storm Drain Outlet. The drain reach immediately downstream (north) of the 60" storm drain outfall, where the project would commence, lacked the vegetative cover and root mass necessary to control stream bank erosion. The outlet was misaligned with the drain channel, causing erosion of the western bank. Also, overland stormwater flow had eroded soils along the edges of the 60" RCP.

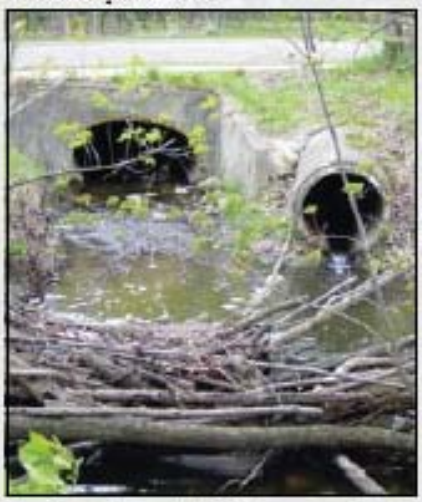
First 12" Storm Drain Outlet. A large amount of sediment had accumulated at the outlet of the first 12" storm drain entering the Briarwood Drain. During storm events, flow swirled around the outlet, eroding the bank and depositing sediment as flow receded. Overland flow also contributed to the erosion and sedimentation around the 12" pipe outlet.

48" Storm Drain Outlet. The existing 48" storm drain outlet caused bank erosion due to poor alignment with the drain. At peak flow periods, the 48" storm drain's flow scoured the opposing bank and contributed sediment throughout this portion of the Briarwood Drain. The lack of vegetative cover around the storm drain outlet intensified sedimentation problems.

Second 12" Storm Drain Outlet. The second of the two 12" storm drain outlets was completely undermined and the last pipe segment sagged into the drain. Bank erosion in this region was typical of conditions found throughout the project area.

Erosion had exposed a pipe segment of this 12" storm drain outlet.

Elliptical Culvert under Kinawa Drive (South.) About 50' past the second 12" outlet, the drain course enters a 76"x 48" elliptical culvert under Kinawa Drive. About 20' into the culvert, the elliptical pipe makes a 45° bend to meet the drain course on the north side of Kinawa Drive. Poor alignment from the inlet to the culvert caused water to back up on the inlet side during high flow periods. This eroded banks around the inlet and, on many occasions, flooded Kinawa Drive. The Team was concerned that erosion could eventually undermine the curb and pavement.



Tree branches and debris form an imperfect and very temporary effort to dissipate effects of high flow.

Elliptical Culvert under Kinawa Drive (North) and 30" Storm Drain. On the north side of Kinawa Drive, the culvert outlet directed flow to the opposing drain bank and caused additional bank erosion. The 30" storm drain outlet from Kinawa Drive also contributed to bank erosion at this site. The combined effect of the two outlets, and the wandering characteristics of the drain, had severely eroded the bank along the first few hundred feet of the drain downstream (north) of Kinawa Drive. Tree branches and other debris were placed across the drain to dissipate the effects of high flow, but were far short of a permanent solution.

Backyard Drainage Issues

During the evaluation and design periods, Drain Commissioner Patrick Lindemann worked with the Team to conduct numerous public meetings. The Team also attended the general meetings of various neighborhood organizations to discuss project status. The Team provided updates, gathered comments, and discussed property owners' concerns at these many meetings. In addition, the Drain office mailed multiple requests to about 4,000 residents in the Drainage District to ask for their comments. Owners of about 164 properties reported drainage issues that warranted further investigation through site visits. Acting as consultant for the Drain Commissioner, Wilcox Professional Services developed selection criteria to evaluate issues that would be considered beyond the initial visit.

Site visits revealed that most of the properties had some kind of drainage issue that required further attention. The Team worked closely with a large number of property owners, providing guidance and technical support to help them mitigate their drainage issues. Some of the "Best Management Practices" recommended for use were:

- Redefine grading on part of the yard to facilitate proper drainage.
- Re-route existing sump pumps and roof drains so they do not create drainage problems.
- Facilitate surface drainage to existing structures in the common area behind the residences.

The Team investigated 164 properties and incorporated about 52 of them into the project's final design and construction. Comments from residents and other constituents were essential to defining the scope of work for the Briarwood Drain Project.

As the final project budget was defined, the Ingham County Road Commission protested their share of the assessment. The Briarwood Subdivision Board and Meridian Township subsequently joined in the appeal process. Drain Commissioner Lindemann convened a three-person panel for a Board of Review to hear their complaints and render a decision. The appeal was settled quickly, as a compromise negotiated by the Drain Commissioner was acceptable to all participants. The Board of Review approved the compromise and the Drain Office issued a bond for the project total budget. The construction contract was awarded to Rothenberger Company, Inc. of Concord, Michigan.

LOW IMPACT DESIGN FOR BRIARWOOD

Drain Commissioner Lindemann's vision for this project centered on low impact, innovative and cost sensitive design solutions that would be easy to implement, operate and maintain in the future.

"Reptile Round Up"

Before work commenced on the pond, Drain Commissioner Lindemann organized a "Reptile Round Up" session. Briarwood Subdivision's young and senior residents, and

Ingham County Drain Commissioner Patrick Lindemann and volunteers at the "Reptile Round Up"

some of those in between, volunteered to collect and relocate reptiles that were living in or near the pond. As required by the State of Michigan, the "Round Up" was completed under the direction of Herpetologist David Mifsud, of Herpetological Resources and Management, a state-licensed authority. The experience was well received by the youngsters of the group and was very educational to all who were present.

Mr. Mifsud also completed a census of the frog and turtle populations for the entire district. The census provided baseline data that will be compared to future population counts as a measure of the success of the pond and forebay design.

Herpetologist David Mifsud (left), with Drain Commissioner Lindemann, supervised collection and relocation of reptiles living near Briarwood Pond.

Solutions for Briarwood Pond

The Team evaluated various methods, both chemical and mechanical, for removing pollutants and reducing nuisance plant populations. The contractor's crews worked diligently with the Team to install the chosen improvements. First, pollutant-laden sediments were dredged and disposed of in a Class II landfill. The pond was reshaped to conform to the easement limits. The new pond depth is 15' to 16', with a smaller surface area. Sinuosity was created in the bottom of the pond to increase retention time and promote mixing of inflow. The varied water depths created by the sinuous pond bed added wildlife habitat in open water, shallow water, and wetland fringe areas; planting a diverse selection of wetland

Above: Contractor reshapes the pond to easement boundaries and adds a forebay. Below: The sinuosity visible here will increase stormwater retention time and improve habitat for aquatic life.

Above: Construction of access drive to forebay. Below: Valve Chamber houses recycling pump and augmentation well valving system to assure pond water doesn't back into the aquifer.

Flow from the forebay cascades over this structure and improves aeration.

Vegetative buffers attenuate flow and absorb pollutants.

plant species for those specific hydrologic regimes further enhanced habitat.

A forebay was constructed to capture and treat stormwater runoff, particularly the "first flush," from the road, storm drain drains, and upstream reaches of the Briarwood Drainage District. The forebay's shape and vegetation were selected to attenuate flow. Extended detention time allows sediment to settle and provides greater opportunity for vegetation to absorb herbicides, pesticides, nutrients, and other pollutants before water is discharged to the pond. The Team chose wetland and aquatic plant species especially adapted to filtering pollutants.

This "polishing basin" can be maintained as needed to remove pollutants and debris without disturbing the entire pond system. An eighteen-foot buffer zone around the pond will ease access for maintenance crews. A grass covered, eleven-foot access drive was established along the west edge of the pond to allow maintenance vehicles to approach the forebay without damaging the surrounding landscape.

Vegetative buffers around and within the littoral zone of the pond will also entrap, filter, and absorb herbicides, pesticides, nutrients, and other pollutants. In addition, the emergent buffer will reduce nutrient inputs by deterring geese; geese prefer well-manicured lawns up to the water's edge and typically avoid ponds with well-established vegetative buffers that can conceal predators.

The 12" storm inlet to the pond was intercepted at the forebay edge and flow directed to an overflow structure. This erosion control structure allowed the forebay to be constructed about 12" higher than the pond. Flow from the forebay cascades over the structure, producing a waterfall effect that aerates water as it enters the main pond.

With a view toward resolving constituents' appeals to reduce nuisance algal growths, the Team also evaluated the effectiveness of increasing flow (e.g. well augmentation) and oxygenation (e.g. aeration devices.) A recycling pump was added between the pond and the forebay to create continuous flow in the forebay during hot weather–low flow conditions, thus introducing cooler water and providing limited aeration. An augmentation well with a limited capacity of 100 gpm was added to maintain a constant water level and supply fresh water to the pond during hot summer months.

Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Briarwood Drarin

Realignment and slope adjustment at the project's point of commencement.

Left: Retrofitting of continuous curvature culvert required precise configuration to harmonize with the pre-existing road profile.

Right: Bank Stabilization along Briarwood Drain

Appendix/Supporting Documents

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Briarwood Drarin

David Solberg of the Ingham County Drain Commissioner's office observes wet weather performance of the riprap reinforcement along Briarwood Drain

Kinawa Drive culvert outlet configuration vastly improved after construction.

Post-construction drainage function improved, and roadway runoff detained.

Storm drain fitted into Kinawa Drive culvert.

A "natural" stream bottom simulated inside the Kinawa Drive culvert.

The depth and capacity of the well were defined as part of an agreement with Meridian Township.

These elements, with minor routine maintenance, are expected to produce a cleaner, more functional, and more aesthetically pleasing pond. Together with improvements to the drain, the forebay and pond improvements aim to reduce pollutant discharges to the drain, downstream reaches of the watercourse and, ultimately, the Red Cedar River.

Solutions for Briarwood Drain

Improvements to Briarwood Drain were designed to prevent bank erosion by stabilizing banks and correcting channel alignment with "hard" elements of the drainage system. The channel cross section was modified slightly to accommodate realignment with the 60" RCP outlet at the beginning of the project area. Side-slope gradients of the drain bank were lessened in several areas. The selected improvements produced minimal change to the drain's overall hydraulics. Only the route and quality of the flow through the drain channel were modified; no additional sources of flow were introduced.

To solve erosion problems near Kinawa Drive, a 10'x3' culvert with a continuous curvature was retrofitted. The new culvert will improve hydraulics and prevent surcharging into the roadway during a storm event. The culvert required precise configuration to redirect flow away from the stream banks, while also allowing the roadway to be replaced without major adjustment to the road profile.

Energy dissipaters were installed to minimize downstream effects of improved hydraulic. Riprap was installed at storm drain outlets and energy dissipaters were added along the channel bottom. Bank stabilization measures were incorporated in stone and vegetative forms. Selected trees along the bank were removed to accommodate the new drain alignment and promote the growth of ground cover vegetation. In the end, roughness of the drain bottom was nearly identical to the overall roughness factor of pre-existing conditions and, with the addition of the bank stabilization and vegetative buffers, a significant improvement was made in the water quality of the Briarwood Drain.

After the main design features were installed, Drain Commissioner Patrick Lindemann charged the Team to construct a two-stage ditch along the open drain section. The "two

"Steps" along the channel bottom create cascades that improve water aeration.

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stages" are separate elevations within the drainage corridor; the higher elevation, or "bench," acts as a miniature flood plain during storm events.

The refined, slightly flattened drain slope was enhanced with multiple steps at various locations along the channel bottom to produce cascades that aerate the water while maintaining positive drainage characteristics. The steady trickle across these steps during low flow conditions creates an impression that is quite serene. Depressions, diversions and refuge areas were defined along the drain bottom to improve conditions for fish, frogs and other reptiles – a diversity of biological life – within the stream.

Lessons Learned

The many neighborhood meetings and multiple mailings to Drainage District residents generated tremendous interest. The drainage issues revealed through these forums were vital in determining project scope. Many owners, even those whose lands were not involved in the construction, were given recommendations for actions they could take to improve their property's drainage characteristics. Resident responses to the solution constructed for Briarwood Subdivision's common area were highly favorable.

As with many projects of this scope, some components worked very well, while others could benefit from some improvements. Some "take-away" lessons from the Briarwood project were:

- Regardless of extensive and repeated communication during the study, design and construction phases, some residents will say they were not informed of the project.
- Expect and adapt to design changes in the field that inevitably result from property owners' displeasure with some features or location of those features.
- Establish a definite "end date" for accepting requests for additional work components and stick with it; residents will continue to request additional work elements even when construction is nearly complete.
- Understand that residents' expectations will be far higher than the results promised them, regardless of the number of clarifications provided.
- Establish a good working relationship with your contractor, while also maintaining operational control and reinforcing the core values of the project. Our contractor performed well overall, especially with guidance to navigate the many challenging situations that developed.
- Maintain close communication with all involved throughout the construction activities and address issues before they become obstacles.
- A confident Team will surely produce a successful result. As a result of mindfulness to maintaining the vision for this project, Drain Commissioner Patrick Lindemann received thank you letters from the neighborhood association and from many residents for a well-run project.

Michigan Association of County Drain Commissioners - Innovation and Excellence Award
Peer Recognition for the Towar Drain Rain Gardens

MACDC Innovation & Excellence Awards

Winning Projects

Towar Drain Rain Gardens, Ingham County
Patrick Lindemann, Drain Commissioner
Engineering: Fitzgerald Henne
Contractor: V.I.L. Construction

Towar Rain Garden project team.

Five years of effort culminated in this economically and environmentally effective project. This "affordable neighborhood" was retro-fitted with rain gardens to solve their chronic problems with flooding and sanitary sewer back-ups. The project cost of $10 million was half the amount of a traditional hard-infrastructure approach. Effluent from this bio-engineered low-impact solution is cleaner than EPA Phase II requirements. The project was funded under the drain code; no grants were obtained.

Towar Rain Garden project was the largest retrofit of its type in any urban area. Old utility infrastructure added a level of complexity. For every tree that was removed more than two were planted. In all, 52,000 plants and 110,000 pounds of seed were installed.

Rain gardens require maintenance; Drain Commissioner Lindemann does not see this as a criticism or deterrent. The $10 million that was saved by using the low-impact method is more than sufficient to maintain the gardens. Homeowners were educated before and during the project; additional information will be distributed in the future to help them recognize and care for this unique utility. Residents report a greatly enhanced quality of life; one owner reported that his sump pump ran 24 hours a day before the project and now runs very infrequently.

Moore Drain, Tuscola County
Sarah Pistro, Drain Commissioner
Engineering: Wade Trim, BMJ
Contractor: Dan's Excavating, L. J. Construction

See article profiling the Moore Drain project in this issue of Pipeline.

Moore Drain project team.

Honorable Mention

L & B Drain, Midland County
Doug Enos, Drain Commissioner

Trickey Drain, Saginaw County
Jim Koski, Drain Commissioner

city maintains the plantings along the lake's 25-foot no-mow buffer. The city participates in an annual goose round-up, to help prevent goose droppings high in phosphorous from entering the lake. To further assist in water quality efforts, the city maintains a stringent street sweeping and catch basin cleaning program to keep sediment out of the lake. To date, there have been no additional costs incurred for maintenance practices, aside from DPW staff labor costs.

Native vegetation for streambank stabilization and runoff infiltration

Source: Hubbell Roth & Clark, Inc.

Riparian education

A workshop to educate the public about the importance of riparian protection was held. It informed riparian homeowners about the purpose and scope of the Quarton Lake project, and educated them on the importance of riparian buffers, restricted activities in the riparian zones (fertilizer use, feeding waterfowl/wildlife, dumping yard wastes, etc.), shoreline stabilization techniques, permitting, and contractor issues and costs.

Towar Rain Garden Drains

The Towar Rain Garden Drains used LID to completely retrofit a rain garden stormwater system in a neighborhood setting. Located in Meridan Township and the City of East Lansing in Ingham County, MI., the system consists of two concurrent drain projects (Towar Snell Drain & Towar Gardens and Branches Drain) that were installed in the Towar Gardens neighborhood in 2006 and 2007. These projects encompass approximately 200 acres and impact over 400 homes.

The Towar neighborhood experienced flooding of yards, roads, and basements for over 80 years prior to this project. The neighborhood is very flat, with only six feet of elevation from the lowest rear yard to the outlet more than a half-mile away. The project used rain gardens and installed them in areas where flooding historically occurred.

All the work was performed under the Michigan Drain Code, with more than 100 easements gathered to install over 5.5-acres of rain gardens along streets and in rear yards. The rain gardens were planted using native species and were constructed with new soil media. More than 110 pounds of native wildflower seed was used to construct the rain gardens and nearly 52,000 plugs were planted. More than eight miles of county drains were constructed during the project.

More than 150 individual rain gardens were constructed throughout the project, ranging from 100 square-feet, to areas larger than 2/3 acre. The main conveyance system consisted of small concrete pipes in the roadways that accepted the stormwater from the ditches and rear yards. This project is believed to be the largest urban retrofit of a stormwater system ever performed in the United States and the largest using rain gardens as the primary function to manage stormwater. It is the largest LID project ever performed under the Drain Code in Michigan. Maintenance costs are variable, since activities will be more intense in the initial years after construction is complete and until native species are fully established. Once established, costs are expected to decrease substantially.

Towar Drain neighborhood

Source: Fitzgerald Henne and Associates, Inc.

The Ingham County Drain Commissioner is responsible for all maintenance activities under the laws of the Drain Code of 1956. Maintenance activities include removing invasive and weed species from the rain gardens, cleaning the perforated pipes from tree roots, and continuing education of the community regarding avoiding mowing and applying herbicide to the native plants.

Rain garden one year after establishment
Source: Fitzgerald Henne and Associates, Inc.

Kresge Foundation Headquarters

The site for Kresge Headquarters is an historic farmstead set within the context of a completely altered landscape on a commercial business site in Troy, MI (Oakland County). The 2.76-acre site is a small oasis within a larger suburban-scale, corporate landscape.

Porous pavers
Source: Conservation Design Forum, Inc.

Site goals

The Kresge site attempts to recreate historical hydrology as an essential component of overall ecological performance, which is a key LID principle. In addition, the site provides habitat for the widest range of plant and animal life given its confined context and location. The site receives all of the rainwater that falls in its 2.76 acres and uses much of it to support a diverse water-based landscape. Any stormwater that is not infiltrated into the existing LID practices is treated onsite in the bioswale system before being released into the city storm drain.

The project objective was to create a workplace that promotes the well-being and productivity of staff and visitors. Because the Kresge Foundation invests in the sustainable development of hundreds of nonprofit facilities each year, sustainable planning of their own construction project was a main goal. As part of this green approach, the overall landscape goals for the Kresge Foundation Headquarters were twofold:

1. To maintain rainwater onsite while using it as a resource, promoting infiltration of surplus stormwater, and
2. To create a healthy, vibrant landscape that could be installed and maintained without use of chemicals, large amounts of supplemental water from municipal sources, and other intensive measures.

The strategy for site ecology was to incorporate LID practices into practically every portion of the site. This project includes the following LID BMPs:

- Minimize total disturbed area,
- Vegetated roof,
- Pervious pavement,
- Native landscaping,
- Bioswales,
- Constructed wetland, and
- Water collection and reuse.

Minimize total disturbed area

The historic farmhouse remains as the cornerstone for the new building. Other historic outbuildings were rearranged to maximize the efficiency of the site. The new building is stacked on two levels and set into the site. The parking lot is tucked on the eastern edge of the site, and has a minimal number of parking spaces. A portion of the building has a vegetated green roof system. The green, or planted, portion of the site is 1.76 acres, or