



Engineering  
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Operations

123 West Front Street  
Traverse City, Michigan 49684  
231 946 5874   
231 946 3703 

December 11, 2017

Mr. Brian VanDenBrand, Director of Planning and Zoning  
Peninsula Township  
13235 Center Road,  
Traverse City MI 49686

RE: Additional Storm Water and Soil Erosion and Sedimentation Control Review:  
The 81 on East Bay – PUD  
The 81 on East Bay Development Company  
Parcel I.D.'s: 28-11-114-001-00 & -002-00  
Parcel Address': 15634 Smokey Hollow Road & 15636 Bluff Road  
Section 14, Township 29 North, Range 10 West,  
Peninsula Township, Grand Traverse County, Michigan

Dear Mr. VanDenBrand,

GFA has completed a second review of The 81 on East Bay – PUD Plans (the plans), dated September 7, 2016 and the storm water package and supplemental data, dated January 19, 2015, May 7, 2015 and August 2, 2016 as prepared by Mansfield Land Use Consultants (the Design Engineer). The proposed project was appealed in Grand Traverse Circuit Court and a Decision and Order was issued and remanded back to the Township in January 2016. To address specific issues related to this remand, the Township requested that GFA complete another review of the project as it pertains to soil erosion, grading and storm water. The plans detail a Planned Unit Development on the above mentioned parcels (the site) consisting of a 41 residential sites, private roads, and community access and a dock on East Grand Traverse Bay. We have reviewed the plans for its accordance to Peninsula Township's Storm Water Control Ordinance Number 33 and Soil Erosion Control Ordinance Number 25 including Appendices, hereinafter referred to the Ordinance. A summary of our review is contained below. These comments are to be considered supplemental and in addition to the Supplemental Fact of Findings Remand (Draft Version) dated December 12, 2017, Issued GTC SESC Permit and ASTI Environmental Soils Management Plan (Final Version).

## **EXISTING CONDITIONS**

### **A. Storm Water Conditions**

GFA has reviewed the plans and the storm water package to understand the existing storm water characteristics on the site. According to the Design Engineer, the site soils range from somewhat poorly drained to excessively drained sands with permeability rates from about one-half of an inch to nearly 20 inches per hour. Our review of the plans indicated that a large ridge exists on the east (bayside) portion of the property. Storm water run-off from the top of the ridge and east flows east toward the bay and runoff from the top of the ridge and west flows west into the site's valley to two low-points located on the southcentral portion of the site. One of the low-points is labeled as a wetland as was identified by GEI



Consultants whom conducted a delineation in June 2015. The design engineer has provided USDA soils data that describes general soil types and locations on the site. We also have reviewed the soil boring logs on sheet C6.0 and the logs generally appear to represent the soils identified by the USDA soils data.

## **PROPOSED SITE PLAN**

### **A. General Comments on the Plans**

The following general observations should be addressed

1. Updates to the construction schedule narrative on Sheet C3.0 and Sheet 1 of 3 (Fire Lane)
2. The Overall Grading Plan (sheet C5.0) should include proposed contour labels to aid in Township, agency, and contractor review. The plan should also state the proposed contour interval range which appears to be five feet.
3. It is unclear on the plans where snow storage is proposed and should be identified on the plans
4. A Notice of Coverage is required to be obtained through the MDEQ. Copies of the NOC should be provided to the Township. The Developer, the Design Engineer, and the Township need to establish who will be ensuring the NOC requirement compliance prior to construction.
5. A ROW and Access Drive permit will be need to be obtained from the County Road Commission as a private road is proposed to be constructed off of Boursaw Road. All road entrance details shall be compliant with their requirements.
6. Due to the complex nature of the project and size, it is recommended the Township consider the project as sequential as allowed by the Ordinance. Sequential applications are two (2) phases; 1<sup>st</sup> is approval of overall concept for entire development followed by detailed plans for sections of the project. All permits processed by the Township moving forward would be issued per phase with the nature of the work clearly defined.

### **B. Determination of Surface Run-Off**

The design engineer provided storm water calculations that indicated the use of the Rational Method to determine both the two-year, 24-hour, pre-development run-off volume, and the proposed 25-year, 24-hour and back-to-back 100-year, 24-hour, post-development run-off volumes, along with HydroCAD and StormCAD summaries. The determination of surface run-off appears to be adequate based on the requirements of the Ordinance. However, we have the following comments that needs to be addressed:

1. A plan showing the sites overall drainage areas should be provided for review including identification of existing and proposed watersheds to verify onsite storm water generated by existing conditions and the proposed development are adequately allocated within the site. Computations were provided however illustrations defining these boundaries would be beneficial to support this. A drawing for the Fire Lane was provided with this depiction but not for any other portion of the development.
2. Review of the plans indicates that some of the sites were not included in the post development storm water calculations and/or will be integrated in the proposed site storm water control measures. It is common practice in situations as these that a "Typical Site Storm Water Control Plan" be provided to the Township for review. The typical plan should show an individual site's



means of controlling storm water meeting the requirements of the Ordinance. It is our understanding that such drawings for sites 1-41 have been submitted for Township consideration. Furthermore the property owner for each lot will be responsible to obtain a respective soil erosion and storm water permit from the Township prior to construction.

### **C. Conveyance Controls**

The proposed storm water conveyance controls are summarized as follows:

#### 81 Avenue Private Road (Storm Sewer Subsection)

This private road is designed with a traditional crown and concrete curb on each side. Storm water catch basins are proposed to collect roadway run-off and route run-off through storm sewer to the storm water basin located near the site's low-point. The Design Engineer provided storm sewer summaries that included analyzing the storm sewer network piping for a 10-year, 24-hour storm event as required by the Ordinance. The review of the summaries and the proposed details of the storm sewer network to serve 81 Avenue appears to be adequate, however, we have the following comment that needs to be addressed:

1. The Design Engineer should also provide a summary that evaluates the effects of a 25-year, 24-hour storm event to ensure no adverse increase in water elevation off the development property, or flooding of structures within the development, per the Ordinance requirements.

#### The 81 East Private Road (Waterway)

This private road is designed to be sloped toward the west to convey roadway run-off either into the gutter line of a raised asphalt curb (along the curve) then into a roadside ditch with a one-foot wide bottom or directly into the ditch. The cul-de-sac turnaround is graded such that run-off is directed into the center of the turnaround. Based on the review of the summary it appears the Design Engineer proposes to use the ditch as a means of storage as opposed to conveyance, however, we have the following comment that needs to be addressed:

1. Due to the topographical relief (25 feet of elevation change) longitudinally from south to north, the ditch appears to act as more of the conveyance measure. The Design Engineer should provide ditch flow capacity calculations to ensure the ditch can handle flows from the proposed 10-year, 24-hour events as required by the Ordinance. The evaluation shall be based on Manning's equation with an allowable range of 1.5 to 4 ft/s velocity for grassed waterways and 4 to 8 ft/s range for rip rap lined. In situations where this velocity is exceeded the inclusion of grade control structures shall be installed to prevent siltation and/or erosion. From our review, it is our understanding it is the intent of the design engineer to install check dams however the location and/or quantity are unclear.

#### The Fire Lane (Waterway)

This Fire Lane is designed to be sloped toward the north and to convey roadway run-off into a two-foot deep roadside ditch with a one-foot wide bottom. The proposed Fire Lane and ditch will have two low-points, the first being near station 2+00 and the second near station 9+50. We reviewed a letter from the Design Engineer to the Township that detailed the design of the Fire Lane and its roadside ditch which



indicated soils in the vicinity of the Fire Lane are highly infiltrative. A 15 inch Corrugated Metal Pipe culvert is proposed beneath the only fill section within the Fire Lane to maintain the existing drainage pattern outside of the roadway to continue. We have the following comment that needs to be addressed:

1. Due to the topographical relief (10 feet of elevation change), longitudinally from east to west, the ditch should be designed to handle runoff transport despite the presence of highly infiltrative soils. The Design Engineer should provide ditch flow capacity calculations to ensure the ditch can handle flows from the proposed 10-year, 24-hour events as required by the Ordinance. The evaluation shall be based on Manning's equation with an allowable range of 1.5 to 4 ft/s velocity for grassed waterways and 4 to 8 ft/s range for rip rap lined. In situations where this velocity is exceeded the inclusion of grade control structures shall be installed to prevent siltation and/or erosion.

## **STORM WATER FACILITIES**

### **A. Retention / Infiltration Systems**

We characterized the site storm water facilities into three individual systems as outlined below:

1. 81 Avenue Private Road, turf areas, and proposed buildings

#### **Design Criteria**

Based on the review of the storm water calculations it appears that the storm water basin is proposed to be designed to handle storm water runoff from the proposed development including all impervious and pervious surfaces that drain into the basin. The Design Engineer proposes to construct a storm water basin to handle a back-to-back 100-year storm event less the two-year, pre-development run-off volume and infiltration into the soils beneath the basin. The design storage appears to be adequate given the basin does not have an outlet and the Design Engineer's indication of highly infiltrative soils in the vicinity of the basin.

Based on the storm water calculation summary and HydroCAD reports the required basin storage is 488,237 cubic feet and the volume provided in the basin (with infiltration) is 489,349 cubic feet. A design infiltration rate of 5.95 inches per hour was used for the storage calculations. The soils in the vicinity of the basin were identified to have infiltration rates ranging from 5.95 to 19.98 inches per hour. The peak basin depth during a back-to-back 100-year, 24-hour event was determined to be 3.87 feet. It can be determined that the basin would fully drain in about 23 hours, based on the drain time calculation provided in the Ordinance and an infiltration rate half of the design infiltration rate which is considered acceptable.

#### **Pre-Treatment Criteria**

Treatment forebay – It does not appear that a treatment forebay is not provided nor is required because its proposed use does not match the uses that would require the use of a treatment forebay (outlined in Appendix 1 of the Ordinance).



Sediment forebay – Most paved areas appear to drain into the catch basins with downturn elbows and sumps which are acceptable industry practice to capture sediments.

- a. Inlet Design – The proposed catch basin inlets appear to be consistent with typical inlets used on roadways.
- b. Outlet Design/Emergency Overflow – The storm sewer outlets do not appear to be in conflict with the Storm Water Basin. Outlet A is proposed to be about one-half foot above the bottom of the basin and the other three outlets are at least eight feet above the design top elevation. Each outlet is proposed to be protected by Heavy Riprap placed on geotextile fabric. The Storm Water Basin appears to be designed without an outlet or emergency overflows consistent with the requirements of the Ordinance and based on the site topography.

## 2. The 81 East Private Road

### Design Criteria

Based on the review of the storm water calculations and the submittal letter prepared by the Design Engineer it appears that the first 230 feet of the road drains south toward the intersection with 81 Avenue (and was included in the previous run-off calculation) and the remaining portion of the road drains into a roadside ditch on the west side of the road. Based on the Cul-De-Sac grading detail found on sheet C5.0 it appears that the majority of the cul-de-sac will be graded to drain into its stone lined center area. The letter also indicates soils in the vicinity of the road are highly infiltrative. The storm water calculations show that the ditch is designed to handle in excess of a back-to-back 100-year, 24-hour storm event less the two-year, pre-development run-off volume and infiltration into the soils beneath the ditch.

Based on the storm water calculation summary the required basin storage is 8,257 cubic feet and the volume provided in the ditch (with infiltration) is 8,564 cubic feet. A design infiltration rate of one-half an inch per hour was used for the storage calculations. The soils in the vicinity of the basin were identified to have infiltration rates ranging from 5.95 to 19.98 inches per hour. Although the ditch does not purely store the “ditching volume” as described in the conveyance section due to the centerline slope of the ditch, the calculations use a design infiltration rate nearly 12 times less than what is expected in this area at a minimum and appears to justify storage assumptions. No detailed storm water calculations for the cul-de-sac area were provided for our review however given the size of the area and the soils that appear to be present in its vicinity this does not appear to be an issue.

### Pre-Treatment Criteria

Treatment forebay – It does not appear that a treatment forebay is not provided nor is required because its proposed use does not match the uses that would require the use of a treatment forebay (outlined in Appendix 1 of the Ordinance).

Sediment forebay – The portion of roadway graded towards the ditch and drains directly into the ditch making a sediment forebay not feasible for construction. Periodic maintenance and cleaning of the ditch will be required and should be outlined in the site maintenance plan.

- a. Inlet Design – No inlet design is needed to be reviewed for proposed ditch.
- b. Outlet Design/Emergency Overflow – As proposed it does not appear that the ditch has a proposed constructed outlet or emergency overflow and stops at or near station 7+00. In the



event that the ditch becomes inundated it appears that runoff would overland flow around the north end of the cul-de-sac and toward the Bay potentially causing erosion and washouts. It is suggested the design engineer review and address.

### 3. The Fire Lane

#### **Design Criteria**

Based on the review of the storm water calculations and the submittal letter prepared by the Design Engineer it appears that the proposed Fire Lane will be constructed with a roadside ditch matching the construction of the 81 East Road cross-section. The Fire Lane and ditch are proposed to have two low-points. Calculations for the drainage areas for both of these low-points were provided to show that the ditches were designed to handle in excess of a 25-year storm, 24-hour storm event less the two-year, pre-development run-off volume. We note that infiltration was not utilized in the design calculations although the Design Engineer indicated the presence of highly infiltrative soils in the ditches' vicinity. The 25-year, 24-hour storm event design criteria appears to be sufficient since the ditches would outlet into the existing drainage course in the event the ditches became inundated.

Based on the storm water calculation summary the required ditch storages are 2,231 cubic feet and 4,952 cubic feet for Drainage Areas 1 and 2, respectively. The volumes provided in the ditches (without infiltration) are 6,832 cubic feet and 10,976 cubic feet for Drainage Areas 1 and 2, respectively. Although the ditches do not purely store the "ditching volume" as described in the conveyance section due to the centerline slope of the ditches, the calculations do not use an infiltration rate and appears to justify storage capability assumptions.

#### **Pre-Treatment Criteria**

Treatment forebay – It does not appear that a treatment forebay is provided nor is required because its proposed use does not match the uses that would require the use of a treatment forebay (outlined in Appendix 1 of the Ordinance).

Sediment forebay – The Fire Lane road surface graded towards the ditches and drains directly into the ditches making a sediment forebay not feasible for construction. Periodic maintenance and cleaning of the ditches will be required and should be outlined in the site maintenance plan.

- a. Inlet Design – No inlet design is needed to be reviewed for proposed ditch.
- b. Outlet Design/Emergency Overflow – As described in the Design Engineer's Fire Lane submittal letter, in the event a release is necessary from the ditches run-off will follow the existing drainage course and no adverse impact is perceived.

#### **SOIL EROSION AND SEDIMENTATION CONTROL**

GFA has reviewed the plans Soil Erosion and Sedimentation Control (SESC) Plan, Soil Erosion and Sedimentation Control Permit and ASTI Soil Management Plan. Based on our review we have the following additional comments regarding the site grading and SESC control plans:



1. Construction Note number 11 indicates that slopes steeper than 3:1 (three feet of horizontal to one feet of vertical change) shall be restored with mulch blanketing, as necessary. It appears that some of the grading areas over Site's 33 through 33 are nearly 2:1 (two feet of horizontal to one feet of vertical change) and depending on the actual conditions encountered during grading activities the use of Turf Reinforcement Matting (TRM) should be a considered and included as an option in the project.
2. In addition to all the other conditions stipulated in the SESC Permit, an additional comment noted in their preliminary review letter (dated January 23, 2015) was a requirement for a grading and stabilization plan to be submitted to them by the contractor prior to grading the steep slopes near the bluff. It is recommended this request be enforced and subject to SESC and Township approval.

### **MAINTENANCE**

We have reviewed the Maintenance Plan and Budget for the proposed Storm Water Management System's prepared for the site. The plan and budget appears to be satisfy the requirements of the Ordinance and have the additional following comments:

1. The plan indicated that an LLC or homeowners association will be designated to maintain the plan once the project is completed. In compliance with the ordinance it is recommended that a binding agreement that identifies the terms and requirements for storm water, erosion and sedimentation control between the entities be created, executed and recorded with the County before final acceptance is granted.

### **INSPECTION AND GUARANTEE**

To adequately ensure construction is completed in compliance with the Township ordinances, proposed project permits and recommendations of ASTI, inspection is imperative. The Township has the authority to act as the enforcement agent and retains the discretion to enforce Ordinances 33 and 25 as follows:

1. Acting in this capacity, the Township has the ability to establish and escrow for an amount adequate to assure installation and completion consistent with the approved plans, per Section 6 and 7 of the ordinance. Considering the size and nature of the project, it is recommended that the Township authorize GFA to act as representative to conduct weekly and daily inspections consistent with the terms of the permit conditions. For cost considerations, this could be conducted in conjunction with the other utility and road construction and inspection services being completed. Example checklists are attached for your reference.
2. The Township and/or designated representative must conduct a final inspection within 10 days after notice of project completion and must either approve or deny. In addition, this should include being provided record drawings to reflect modifications (as-builts).
3. In addition, as a condition of the permit it is recommended that a defined security (letter of credit and/or bond) be provided to ensure completion of storm water measures that were initially approved. The security amount would be retained by the Township for 1 year and/or released when final inspection approval is conducted.



**CONCLUSION**

Hopefully this information was found beneficial and has provided some talking points for consideration and inclusion with the supplemental findings of fact being prepared by the Township. We appreciate the opportunity to assist the Township during review of this project. If you have any questions, please don't hesitate to contact me at (231) 946-5874.

Sincerely,

A handwritten signature in blue ink, appearing to read 'J. Hodges', written over the typed name.

Jennifer Hodges, P.E.  
Project Manager



# Stormwater Maintenance BMP Resource Guide

## Stormwater Ponds

Inspection Activities		Maintenance Activities	
	d. Joint failures?		d. Determine why joints are failing, note the type of joint and if groundwater is seeping through the failed joint. Use methods and materials appropriate to the situation.
	e. Corroded metal components?		e. Clean area of corrosion and determine the cause. Depending on the extent of the corrosion and the cause, the area could be cold galvanized or require more extensive repairs.
	f. Dents/malformations that cause the structure and pond to not function properly?		f. Repair to proper capacity.
	g. Are pipes and/or structures clogged? (Sediment, trash, other debris). Is there excessive sediment build up in front of the inlet, impeding water flow?		g. Remove sediment and debris. Depending on extent of clogging, this may be handwork or require the use of jetting equipment to clean upstream system.
	h. Is there erosion or scour holes forming around inlets?		h. Fill eroded areas. Repair aprons and add riprap as necessary to prevent recurrence. Reestablish vegetation (i.e. seed, install plants, erosion control). Match seed mix to intended design.
	i. Is structure misaligned? Has it settled?		i. Reconstruct/modify as necessary. Reestablish vegetation (i.e. seed, install plants, erosion control). Match seed mix to intended design.
	j. Are aprons failing (disconnected or becoming disconnected from pipe)?		j. Reattach apron and tie joints. Compact soil under apron and place new riprap in front and around sides of apron. For severe problems, construct concrete cutoff wall under apron.
15.	If there is a pond drain valve, is it:	15.	
	a. NOT operational?		a. Replace.
	b. NOT properly secured?		b. Secure.
16.	Are safety features present and functional?	16.	Ensure items such as trash guards, fencing and grates are present, clear of debris and properly secured.
17.	Measure pond depth to determine if sediment is significantly reducing pond storage.	17.	Draw down pond, excavate sediment and dispose off site.
18.	Are sediment forebays or ponds >50% full of sediment?	18.	Remove sediment with backhoe and dispose off site.
19.	Is there excessive sediment buildup (impeding water movement)?	19.	Remove and dispose of sediment off site.
	a. Near storm drain aprons?		a. Hand remove from apron. Outside of apron, remove sediment with backhoe.
	b. Other locations?		b. Remove sediment with backhoe.
20.	Will sediment accumulations negatively impact plant health?	20.	Draw down pond, excavate sediment and dispose off site.
21.	Are there any irregularities that indicate upstream problems?	21.	Discuss with engineer to determine probable cause. Follow up investigation.
22.	Are there signs of illicit discharges?	22.	Determine potential source(s) of discharge. Notify your supervisor.
23.	Are there any obstructions to getting maintenance equipment down to the pond?	23.	Stabilize slopes and drive path, clear vegetation or other work as appropriate.
24.	Are there any encroachments into stormwater treatment area or access areas?	24.	Notify your manager.



# Stormwater Maintenance BMP Resource Guide

## Stormwater Ponds

**Table 1: Stormwater Ponds  
Detailed Inspection and Maintenance Activities**

Inspection Activities		Maintenance Activities	
1.	Is there any erosion associated with:	1.	Determine cause of erosion (i.e. clogged outlet, inadequate initial stabilization).
	a. Slopes/embankments?		a. Excavate to solid soil, repack with soil/clay, topsoil dressing, reestablish vegetative cover. For recurring problems at the same location, determine if erosion control blanket or permanent turf reinforcement is required.
	b. Riprap areas?		b. Place larger/more riprap.
	c. Storm drain aprons/inlets?		c. Place new riprap.
	d. Headwalls or endwalls?		d. Extend wall or repack soils and reestablish vegetation cover.
	e. Spillways and/or outlet structures		e. Place new riprap and/or reestablish vegetative cover.
	f. Other?		f. As applicable.
2.	Are there obstructions/debris blocking the emergency spillway and/or outlet structure?	2.	Remove debris or obstruction and dispose off site.
3.	Is there debris in trash racks?	3.	Handwork to remove and dispose of trash.
4.	Is there trash on pond slopes or in the water?	4.	Handwork to remove and dispose of trash. Check to see if outlet structure is operating correctly.
5.	Are there any animal burrows/nests that impact pond fill slopes or cause the pond to not function properly?	5.	Repack with soil/clay, topsoil dressing, reestablish vegetative cover. Handwork to remove nests and dispose of off site.
6.	Is there any vandalism that needs repair?	6.	As applicable.
7.	Are there any public hazards? (specify)	7.	As applicable.
8.	Has water level NOT returned to normal elevation within designated drawdown period? (wet ponds)	8.	Determine reason (i.e. outlet structure or downstream pipe clogged) and take appropriate action.
9.	Is water level lower than expected elevation? (wet pond)	9.	Determine reason (i.e. slow leak).
10.	Has water NOT completely drained out within designated drawdown period? (dry ponds)	10.	Determine reason (i.e. excess sediment, compaction, clogged outlet pipes).
11.	Is there any undesirable vegetation growth, such as:	11.	Remove and dispose of off site.
	a. Young, volunteer trees or shrubs?		a. Handwork or careful application of appropriate herbicide.
	b. Invasive species on pond slopes?		b. Handwork or careful application of appropriate herbicide.
	c. Invasive aquatic species?		c. Handwork or careful application of appropriate herbicide.
12.	Are there any spots >1 sq ft that are barren of vegetation on the side slopes?	12.	Reestablish vegetation (i.e. seed, sod, install plants, erosion control).
13.	Are desired plant species showing signs of stress or disease on:	13.	
	a. Pond slopes or buffer		a. Determine cause of stress/disease and determine remediation.
	b. Pond edges (wet ponds)		b. Determine cause of stress/disease and determine remediation.
	c. Emergents (wet ponds)		c. Determine cause of stress/disease and determine remediation.
14.	For inlet and overflow structures, are there any:	14.	
	a. Cracks >1/8" in concrete components?		a. Remove all deteriorated concrete, dirt and bond-inhibiting material from the failed area. Inject with crack sealant approved for this application.
	b. Minor spalling of concrete (<1")		b. Monitor.
	c. Major spalling of concrete (rebar exposed)?		c. Clean rebar, remove loose concrete, apply bonding agent and patch with material approved for this application.

