MAGNOLIA RIDGE-FINAL DRAINAGE PLAN

13.04.085 Request by applicant for plan review and approval.

A. All requests for drainage plan approval shall be made by the applicant to the drainage board through the county surveyor's office by the presentation to the surveyor of the drainage plan and the supporting data, all in duplicate, by the close of the business day two full weeks prior to the meeting at which approval of the drainage plan shall be sought.

C. Included with the Drainage Plan shall be the following information regarding the applicant that shall be provided on FORM 801. **Provided-signed by William Lee Chandler, Senior/Managing Partner**

13.04.095 Conditions of drainage plan approval.

In order for an applicant to obtain approval of a final drainage plan, the following requirements must be met:

A. The applicant shall be eligible under the terms of this chapter to apply for and obtain drainage plan approval.

B. The drainage plan and supporting submittals required by this chapter shall have been prepared and submitted in a timely and proper manner in accordance with the provisions of this chapter. **Submitted September 27, 2018. Revised October 24, 2018 and October 30, 2018, emails October 16 and October 25, 2018**

C. The drainage plan and supporting submittals shall reflect compliance with the requirements of this chapter, and compliance with any conditions of approval applied to the plan by the drainage board. **Required Revisions are shown in red.**

D. The submitted data shall be gathered, analyzed, assembled into the drainage plan and supporting submittals; and shall be certified, and presented to the drainage board all by a civil engineer or land surveyor regularly engaged in stormwater drainage design, and registered to practice in the state of Indiana. **Provided**

E. An easement has been dedicated to house any off-site drainage facilities if such facilities are required to serve the project's stormwater drainage system. **No offsite proposed**

F. The person, persons, partnership, corporation, or other entity to whom approval of the drainage plan is granted must be the person, persons, partnership, corporation, or entity who will be responsible for accomplishing the project for which the drainage plan is developed. **William Chandler, The Oakridge Group LLC, 1301 Mortensen Lane, Evansville, IN 47715 theoakridgegroup@gmail.com**

13.04.125 Building permits conditioned.

The Vanderburgh County building commissioner shall not allow construction of buildings, or other impervious structures or facilities to commence at the site of a project requiring final drainage plan approval until:

A. Such approval has been expressed by the drainage board;

B. And all storm drainage facilities are constructed.

13.04.130 Phased development of large projects allowed.

Large projects may be divided into phases for the purpose of constructing drainage facilities and obtaining permits in accordance with the requirements of this chapter. **To be constructed in multiple phases with Section 1 being the area north of the existing ditch to be developed first.**

13.04.140 Information submittal and review schedule.

H. For all new major subdivisions as defined in Title 16 of this code, which major subdivisions are shown to discharge an amount of stormwater in addition to that which is discharged prior to new development and all minor subdivisions, C-0 Through M-3, as defined in Title 16 of this code, which minor subdivisions are zoned for commercial use, and all single parcel commercial and industrial parcels zoned C-0 through M-3 of 2 acres in size or greater that are adjacent to agriculture land use or single family homes, the applicant shall notify all adjoining landowners of the proposed drainage plan. The notification shall also be sent to any Registered Neighborhood Association within 1/4 mile of the proposed development and shall meet the criteria of notification. *Not Provided Provided*

1. The notification shall consist of the following language.

"Notice is hereby given that a Drainage Plan for _____ with a location of _____ has been submitted to the Vanderburgh County Surveyors Office, Room 325, Civic Center, Evansville, IN. The submitted Drainage Plan will be heard for approval or disapproval before the Drainage Board meeting on (date and time) at Room 301 of the Civic Center. A copy of the Drainage Plan is available for review in the County Surveyor's Office during normal business hours."

2. Also included in the notice shall be the name of the developer, name of the landowner where the development is to occur and the name of the engineer/engineering firm that has developed the Drainage Plan.

3. The notification shall occur by certified mail, delivery using approved overnight services providing that the overnight services provide a receipt of delivery or by use of United States Postal Service Certificate of Mailing. All mailings must be made at least 7 days in advance of the scheduled Drainage Board meeting in which the Drainage Plan is to be heard.

4. For new subdivisions in which approval of a preliminary plan is sought under Section 13.04.150 to satisfy certain requirements of the Area Plan Commission (APC), the mailing shall give notice of the

preliminary plan. Once noticed for a preliminary plan, notice will not be required for hearing of the final Drainage Plan unless stated by the Drainage Plan as a condition for approval of the preliminary Drainage Plan.

5. Any required notice under this section may be done in conjunction with notice requirements by the Area Plan Commission provided that the required notice is sent at least 7 days in advance of the scheduled Drainage Board meeting in which the Drainage Plan is to be heard.

13.04.150 Preliminary drainage plan allowed.

Presentation of a preliminary form of the final drainage (Preliminary Drainage Plan) plan may be allowed when the applicant is in need of approval of a preliminary drainage plan to satisfy certain requirements of the Area Plan Commission, and it can be shown that the complexity of the project prohibits the submittal of the final drainage plan within the time limits set by the Area Plan Commission for plan submittals.

For the Preliminary Drainage Plan the notices required under Section 13.04.140 H shall be sent as part of the preliminary plan process. As part of the approval of the preliminary drainage plan the Drainage Board shall determine whether additional notifications shall be required with the submittal of the final drainage plan. *Board should determine if any additional notification shall occur prior to final drainage plan based upon any public comment.*

13.04.160 Contents of preliminary drainage plan.

A. The contents of the preliminary drainage plan shall include a map based on the most current county planimetric maps, or a topographic map prepared from a more recent aerial photo reconnaissance that provides more accurate data, complete with contour lines, and showing the following:

1. The extent and area of each watershed affecting the design of the drainage facilities for the project; *Undeveloped shown on Undeveloped Subbasins drawing #1, Developed shown on Developed Basins drawing #2 and Offsite Basins shown on Off-Site Sub-Basins Drawing #3 Where are subbasins OS-2, OS-4, OS-5, OS-6 and OS-7 flowing-do they affect any of the internal drainage designs? Carried offsite through swale to their original discharge point.*

2. The soil types based on the most current information available from the SWCD; *Provided-soils are a Hosmer and Stendal silt loam. Most of the area is relatively flat*

3. Zone "A" floodplain based on the current FIRM panels; *Provided-none of the area is within Zone A*

4. The existing man-made and natural waterways, ponds, basins, pipes, culverts, and other drainage facilities or features within or affecting the project; *One large existing drain which flows west to east through the property which is to remain undisturbed except for road crossings. An existing drain is located offsite to the south which will carry some drainage. No existing ponds.*

5. The preliminary layout and design of the streets, and all stormwater drainage facilities, including depressed pavements used to convey or temporarily store overflow from the heavier storms, and all outlets for the storm water drainage facilities; *Based on the spot elevations, it appears that Road #3 will have to drain toward Green River, so an inlet and pipe will be needed. Easement added but no pipe. Emergency overflow swales will be required at all sags in the street system. When the street plans are submitted, the inlet spacing will be checked to ensure the ordinance requirements are met. Based on the preliminary drainage plan, it appears that the inlet spacing is currently at or near the maximum allowable spacing in several locations. Curb turnout proposed-County Engineer may request inlet and pipe with submittal of road plans.*

6. The existing streams, floodways, and floodplains to be maintained, and new channels to be constructed, their locations, cross sections, profiles, and materials used; *Profiles provided and typical cross section provided. Final Plan will need to show cross sections of existing stream. Swale #10 shows 15.71% Grade-final drainage plan will need to show what erosion control measures will be in place to handle anticipated velocity of channel at this steep grade. Swale #29 flows into Basin #3 adjacent to the outflow pipe. Final Drainage Plan will need to detail the area where this occurs and show how it will be constructed so that the swale does not bypass and directly discharge. Does pipe 617 need to be extended in order to provide the owner with sufficient access to mow and maintain the portion of his lot west of pipe 617? The preliminary plan does not provide enough detail to determine if this is a relatively flat area that can be crossed by a mower, or if it is in an embankment slope for the basin-this will need to be addressed in the final drainage plan.*

7. The proposed culverts and bridges to be built, with the proposed materials to be used; *No bridges; will there be any culverts under Roads 1 and 2 where they intersect with Green River Road? Road #1 needs a culvert to handle all of the drainage along Green River coming from the north. Road #2 will require a culvert and inlets since the high point on Road #2 is about 500' west of Green River. Pipes shown in revised plans. Enough of a sag will have to be provided where Road #2 intersects Green River in order to prevent water from Road #2 from flowing out onto Green River. Provided*

8. Existing detention basins or ponds within the project, or outside the project but affecting it, to be maintained, enlarged, or otherwise altered, together with any new basins or ponds to be built; and their basis of design; *Three ponds proposed pond sizing was provided. How will the emergency overflow be handled once it discharges; is the easement between lot 4 and 5 sufficient? Is AD #538 adequate to handle all flows if the basin is operating in an overflow condition? If that drain is inadequate or becomes obstructed, will the street become impassable at the sag at pipe 531? Pipes are to be designed for 100 year storm and will be shown in Final Drainage Plan calculations.*

9. The estimated depth and amount of storage required of the basins and ponds, and their available freeboards; *Storage and depth provided. Through provided, all freeboards will be checked with Section 440 during final review*

10. The estimated location and percentage of impervious surface existing and expected to be constructed at completion of the project; *Addressed in basin calculations with area of structures, pavement, drives and patios.*

11. Any interim plan which is to be incorporated into the project pending its completion according to the final Drainage Plan. *None proposed*

12. A copy of the Notice of Public Hearing as required by the Area Plan Commission and under Section 13.04.140 H of the Vanderburgh County Drainage Code with a copy of the returned receipts from all certified mailings or proof of Certificate of Mailing. *Not Provided Provided*

B. Notations and Explanations on the Preliminary Plan. All notations necessary to indicate the existing conditions, and the proposed functions of the various features shown thereon; and shall include the following.

C. Geographic Orientation Required. A north arrow, scale, location insert, and other information necessary for geographic clarification shall be included on a preliminary plan. *All provided. Scale at 1"=80' and 1"=60" except for offsite subbasin map which is at 1"=120' to allow for the total watershed areas to show on a single sheet.*

D. Data Required to Accompany Preliminary Plan. Descriptive data sufficient to support the feasibility of the preliminary drainage plan with regard to the requirements of this chapter, including calculations of the predevelopment and post development runoff rates using rainfall data supplied herein shall accompany a preliminary drainage plan. *Provided*

E. Recommendation of Preliminary Plans Restricted. No preliminary drainage plan shall be deemed to meet the requirements of the drainage code by the technical advisors to the Drainage Board unless the preliminary drainage plan shall be a workable plan according to the same criteria as, and capable of being incorporated into, a final drainage plan. *See table under other comments*

F. Determination of Sufficiency. The drainage board shall decide the sufficiency of the preliminary drainage plan, and any conditions or additional requirements to be applied to the preliminary drainage plan. **Sufficient**

OTHER COMMENTS

What is the location and the status of the offsite septic that exists on the property Located in back yards of lots 131-133-will need to be addressed prior to construction in this area.

Drawing #2 states has a note stating lots 67-72 will be graded from the rear of the lot to the front and a second note stating that lots 68-72 will be graded from the rear to the front. Revised drawing C-102 addresses this issue

If Plan B is to be utilized, LMSDE must be extended to County Roads to allow access to outlet pipes. It appears that an additional easement will be needed along the property line of lot 100 in order to provide suitable access to the basin outlet pipe. Provided on Lot 88 for Basin #3-on final plans will be added for Basin #2.

What is the purpose of the 10' Drainage Easement between lots 141 and 142 that extends north through the existing stream to lot 6? Even though it is not labeled, that easement looks like a should be a sanitary sewer easement. Revised Drawing C-101 shows revision to PUE

What guarantees will be placed on Lot 87 and 88 that gutters/swimming pool outlets will not discharge directly into the farm field to the south? Noted on the revised C-102-langauge will need to be placed on the plat

The variance letter should be readdressed to note the #6, #10, #7 and #9 are leaving undetained in the same areas as the outflows of the basins and the runoff is being addressed as per past practice by adjusting the outflow of the basins. For areas #4, #5 and #8 address undetained using the Tech Memorandum. Calculations need to be provided to show #4, #5 and #8 needs to be provided. Variance letter needs changed to show Ben Shoulder as President, Bruce Ungethiem as VP and Cheryl Musgrave as Member. Provided

A drainage easement is shown on the south side of lots 104, 105 and 106 with no swale. What is the purpose of the easement. An adjoining landowner is concerned about additional drainage coming off of these developed lots. Is a swale going to be provided in that easement? A swale is shown as Swale #30 which does not appear to address the issue. If so, will that swale and swale #28 both be directed to the 18" CMP under Green River Road? If so, does that pipe have adequate capacity to handle the flows being directed to that pipe? 18" CMP drains east to west. Calculations show that the area will not generate additional flow. The final drainage plan will need to relook at this area to insure that no additional drainage is being sent to the South.

The plan currently shows undetained areas being directed towards Green River Road. Based on Google photos, there is virtually no existing ditch along Green River along the existing houses next to this subdivision. Are new ditches and/or pipes required along Green River in order handle the flows being directed towards Green River? This will need to be addressed in the Final Drainage Plan or alternative provided

		Area	Q10	Q25	C value	
	UN-1	23.28	32.02			Allowable runoff Basin #1
#1		19.29			Basin #1	MEETS CODE REQUIREMENTS
#6		2.51		5.5		Adjacent to Creek-Basin #1 Discharge is being adjusted for area
#10		1.94		4.69		Adjacent to Creek-Basin #1 Discharge is being adjusted for area
OS #3		1.27		2.21		Allowed pass through
OS #8		9.58		16.87		Allowed pass through
	UN-6	20.3	30.23			Allowable runoff Basin #2
#2		20.55			Basin #2	MEETS CODE REQUIREMENTS
#7		3.27		7.72		Adjacent to Creek-Basin #2 Discharge is being adjusted for area
OS #9		.82		3.82		Allowed pass through
	UN-4	12.88	18.23			Allowable runoff Basin #3
#3		11.77			Basin #3	
#9		.72		2.59		Bypasses #3, adjacent to UN-4-will discharge at same point as basin
OS #1						Flows through site in main ditch
	UN-2	2.06	4.41		0.413	
#4		1.59			4.79	Need to address undetained runoff per Tech Memorandum-does this area release less water after development (Cd x Ad<Cu x Au) Meets Criteria
	UN-3	4.33	5.84		.34	
#5		2.49			.436	Need to address undetained runoff per Tech Memorandum-does this area release less water after development (Cd x Ad<Cu x Au) Meets Criteria
	UN-5	4.29	7.25		.361	
#8		2.98			.452	Need to address undetained runoff per Tech Memorandum-does this area release less water after development (Cd x Ad<Cu x Au) Meets Criteria

13.04.165 Contents of final drainage plan.

The contents of the final Drainage Plan shall include all the items listed above for a preliminary drainage plan, plus:

A. Soils Map. A soils map indicating soils names and their hydrologic classification must be provided for a proposed project; **Provided in Preliminary**

B. Location and Topographic Map. In addition, a location and topographic map must be provided showing the land to be developed, and such adjoining land whose location and topography may affect or be affected by the layout or drainage of the project. The map must also identify all adjoining landowners. **Provided** The contour intervals shown on the topographic map shall be two and one-half feet for slopes less than four percent; and five feet for slopes four percent or greater; or best available; **1'**

C. The location of streams and other stormwater conveyance channels, both natural and man-made; and the vertical and horizontal limits of the one hundred (100) year floodplain, according to FIRM panels, and/or the Building Commissioner; all properly identified; **Provided in Preliminary**

D. The normal shoreline of lakes, ponds, swamps, and basins, their floodplains, and lines of inflow and outflow; **Provided**

E. The location of existing regulated drains, farm drains, inlets and outfalls; **No regulated drains**

F. The location of the following existing storm and water features:

1. Storm sewers and easements; **Provided**

2. Sanitary sewers and easements; **Sanitary located at Green River**

3. Combined sewers and easements; **None located on site**

4. Water lines and easements; **Provided**

and outfalls to any of the above as applies;

G. Wells, septic tank systems, and outfalls, if any; **An adjacent owner's septic system (not shown on maps) is located in the back yards of lots 131-133-what is the status of addressing the system. Per revised write up-negotiations are ongoing-will require 125' sewer extension-will be noted to the Board**

H. Seeps, springs, sinkholes, caves, shafts, faults, or other such geological features visible, or of record; **Per submittal, none visible or of record**

I. The limits of the entire proposed project and the limits of the expected extent of land disturbance required to accomplish the project; **Most of site**

J. The location of the streets, lot lines, and easements; **Provided**

K. A scale, preferably one inch equals fifty (50) feet; **varies-1"=60 and some at 1"=150'**

L. An arrow indicating North. **Provided**

M. On-Site Bench Mark Required. A benchmark is required to be located within the project limits. Approved datum shall be found within the most recently approved Technical Memorandum. **Provided**

N. For all non residential Major Subdivisions and all Minor Subdivisions C-0 through M-3 **(Not Applicable-Residential Subdivision)**

13.04.170 Final drainage plan layout.

A. In addition to the requirements listed for a preliminary drainage plan, the final drainage plan shall depict the following:

1. The extent and area of each watershed tributary to the drainage facilities within the project; **Provided-how are developed basins 16, and 17 being accounted for-they appear to be running off undetained and they are not shown on the calculations. Revised Basin 1 Calculations Where is developed basin 21 and how is it being accounted? Basin 21 was deleted**

2. The final layout and design of proposed storm sewers, their inlet and outfall locations and elevations, the receiving streams or channels; all with the basis of their design; **Pipe 571 and 577 appear to be interchanged on the storm sewer calculation table. Pipe 571 (labeled as 577) shows a Q of 12.36 cfs. Pipe 569 with a Q of 11.87 cfs goes into structure 570 along with Pipe 571. The Q of these two pipes of 24 cfs was not utilized to design pipe 577 (labeled as 571) and therefore the pipe that outlets to the pond appears to be undersized. Corrected and pipe size increased from 24" to 30"**

Does pipe 617 need to be extended in order to provide the owner with sufficient access to mow and maintain the portion of his lot west of pipe 617? The preliminary plan does not provide enough detail to determine if this is a relatively flat area that can be crossed by a mower, or if it is in an embankment slope for the basin. Per email "The south end of pipe 617 terminates at the toe of the fill slope for the basin. The slope from the south end of pipe 617 to the basin will be at a 4:1 slope and the existing slope south of pipe 617 is roughly 11:1."

Pipe 617 is HDPE with no end sections-how is the pipe to be anchored-Noted on detail sheet C-123

3. The location and design of the proposed street system, including depressed pavements used to convey or detain overflow from storm sewers and over-the-curb runoff resulting from heavier rainstorms, and the outlets for such overflows; all with their designed elevations; **Curb turnout proposed at the ends**

of Road #3 and Road #6. Provide a concrete flume from the curbs at the end of the cul-de-sacs to the Green River Road r/w. If these were left as grass lined swales, they would likely be filled in or obstructed by utilities. Provided

The detail on sheet C-111 for Road #3 does not match the plan view of the end of the cul-de-sac shown on sheet C-101. The detail only shows drainage easements, while the plan view shows drainage and public utility easements. To be addressed with road plans

Emergency overflow swales provided between lots 4 and 5, 142 and 143, 88 and 89, 94 and 95, and 98 and 99. Provided

4. The locations, cross sections, and profiles of existing streams, floodways, and floodplains to be maintained, and the same for all new channels to be constructed;

Swale #10 shows 13.26% grade-what erosion control measures will be in place to handle anticipated velocity of channel at this steep grade. Additional design information provided

Swale #29 flows into Basin #3 adjacent to the outflow pipe. Provide details of the area where this occurs and show how it will be constructed so that the swale does not bypass and directly discharge. Drainage in this area is revised and swale will not discharge to basin.

Swales 28 and 31 are shown adjacent to Green River Road; are these in addition to the existing road ditch or are they going to be a rebuilt road ditch. Provide a cross section to show what is to be constructed along Green River Road in the area of these swales. A constructed swale of 3:1 is to be directly adjacent to the road-see sheet C-124

5. The materials, elevations, waterway openings, size, and basis for design of the proposed culverts and bridges; No bridges proposed. Design of culverts provided. Pipe capacities for pipes 533, 535 and 537 do not match water quantities. Per comments for the preliminary drainage plan these pipes were to be designed for 100 year storm-It does not appear that they were designed for these quantities? See 13.04.440K1

Pipe 629 is shown as a 14"x23" RCP that drains to the north. Swale 28 drains to the east into the Green River Road r/w north of P629. This all drains to an existing 15" RCP. Does the 15" RCP have the capacity to handle the flows being directed to that pipe? Per email "We are discharging less runoff for the developed 25-year storm to this pipe than it is currently receiving for the undeveloped 10-year storm. See chart in narrative on page 5."

6. Existing ponds and basins to be altered, enlarged, filled, or maintained; and new ponds, basins, swales, to be built, and the basis of their design; Three Detention ponds designed using Rational

7. The location and percentage of impervious surfaces existing and expected to be constructed; used average lot information for all calculations.

8. The material types, sizes, slopes, grades and other details of all the stormwater drainage facilities; **Provided**

9. The estimated depth and amount of storage required in the new ponds or basins, the freeboard above the normal pool and highwater pool of wet basins, and details of the emergency overflows from the basins; **Provided**

10. For all controlled release basins, a plot or tabulation of the storage volumes with corresponding water surface elevations, and a plot or tabulation of the basin outflow rates for those water surface elevations; **Provided**

11. The location of any applicable "impacted drainage areas" or other areas designated to remain totally undisturbed, natural, or for common and/or recreational use. **See 13.04.175D**

12. The location of Drainage Easements for retention/detention basins, drainage ditches/swales, storm sewers, junction boxes, inlets, or manholes outside of any county right of way. Easements dimensions must be shown on each individual lot to the extent that they can be recreated in the field within the lot boundaries of said lot. **Need to provide on Lot 26-Provided on Lot 25**

B. Protection of Structures From One Hundred Year Flooding. All structures to be occupied as residences or businesses shall have finished floor elevations two feet above the high water calculated to occur during a one hundred (100) year return period storm for the subject building site; and the required floor elevations shall be depicted on the plan drawings for such affected sites. **Per FIRM nothing within 100 year**

13.04.175 Submittal of a written drainage design report.

The final drainage plan shall be accompanied by a written report containing the following:

A. Any significant stormwater drainage problems existing or anticipated to be associated with the project; **The preliminary plan showed of the 23.28 acres of UN1, 19.29 acres were being detained. This plan only shows 10.2 acres of the area being detained with a large amount of the area being undetained. It appears that the piping was altered and that instead of some of the developed watersheds going east they are now going directly to the channel. What was the reason for this change Per conversations with Engineer this was done to reduce the 100 year storm amount going into basin 1 and therefore the amount that would discharge to the road.**

B. The analysis procedure used to identify and evaluate the drainage problems associated with the project; **Rational**

C. Any assumptions or special conditions associated with the use of the procedures, especially hydrologic or hydraulic methods, used to identify and evaluate drainage problems associated with the project; **Provided**

D. Discussion of any permits applications submitted or proposed to be submitted to state and/or federal agencies that will affect the timing and/or construction of the Drainage Plan such as but not limited to United States Corp of Engineers 404 permits (both individual and nationwide), Indiana Department of Environmental permits (401 Water Certification and others), Indiana Department of Natural Resource Permits (Construction in Floodway) and any approvals that may be required to discharge to Indiana State Highways. The report should state the status of the application of such permits. For permits that have been approved, copies of the approval document shall be included with the Drainage Design Report including any conditions on approved permits that could affect the implementation of the Drainage Plan; **Is Basin #1 within the limits of a jurisdictional waterway? Road #2 crosses a jurisdictional stream. Will the crossing be handled under a Nationwide permit and if so what is the status of that submittal? Email provided stating RGP approved**

E. The proposed design of the drainage control system; **Provided**

F. The results of the analysis of the proposed drainage control system showing that it does solve the project's identified and anticipated drainage problems;

G. A detailed description, depiction, and log of all hydrologic and hydraulic calculations or modeling, and the results obtained thereby; together with the input and output files for all computer runs; **Provided**

H. Maps showing individual drainage areas within the project subdivided for use in the analysis thereof. **Provided**

13.04.180 Typical cross sections of drainage facilities.

One or more typical cross sections must be provided for each existing and proposed channel, basin, pond, or other open drainage facility which cross sections:

A. For existing and proposed detention and retention basins and ponds, a minimum of two cross sections per basin with the cross sections being 90 degrees from each other. The cross sections shall show the following: **Cross sections C-C and F-F need to show actual widths. Need to show elevation of Emergency spillway and elevation of flow out of emergency spillway at 100 year storm. Provided**

Minimum bottom of the basin, Pool Elevation (wet basins), side slope of the basins including above and below normal pool elevation for wet basins, elevation of water at designed storm, elevation of water at 100 year storm, elevation (bottom) of emergency spillway and elevation of outflow of 100 year storm within emergency spillway, elevation of existing land immediately adjacent to the basin, proposed surrounding topography including required maintenance pathway of new basins, fencing (if provided) and any easements or obstructions that are intersected by the cross section.

B. For existing ditches and streams – sufficient typical cross sections that capture the existing channel throughout the project area. The cross sections shall show the existing configuration and existing land

immediately adjacent to all drainage facilities as well as any easements, property lines or obstructions that are intersected by the cross section. For all existing ditches a bottom profile line must also be provided. The profile line shall also show any existing structures (culverts, bridges, and other crossings), location of crossing utilities or other obstructions within the ditches or streams. **Not provided for existing stream Provided sheets 1 and 2**

C. For new channels and swales – sufficient typical cross sections that capture the proposed configuration of new channels and swales throughout the project area. The cross sections shall show the proposed configuration of the channels and swales and existing land immediately adjacent to all drainage facilities as well as any easements, property lines or obstructions that are intersected by the cross section. Also a bottom profile line must also be provided. The profile line shall also show any existing structures (culverts, bridges, and other crossings), location of crossing utilities or other obstructions within the ditches or streams. **A cross section is shown for the emergency spillway from basin 1 across lots 4 and 5. Pipe 537 is also shown in the drainage easement. This pipe needs to be shown on the cross section. Is there sufficient cover on the pipe? Provided Sheet C-124**

D. For large projects and subdivisions which will contain multiple swales, a typical cross section of the swale may be provided combined with a swale table listing each swale. The swale table shall include the slope of each swale (in lieu of profile), depth of water at designed storm and type of erosion control to be utilized on the channel bottom and side slopes. **Several of the swales on the chart provided note Erosion Control Blanket or Sod. For those channels in excess of 2% the Erosion Control Protection Required should state "staked sod" and delete the reference to erosion control blanket. Revised Sheet C-123**

E. Typical Cross sections shall be provided in the following situations where proposed excavation is proposed against no controlled properties: **None shown**

1) for any cut that is proposed within 15' of a property line and the cut is 4' or greater and where such cut is not part of an excavation for a channel or swale.

2) the location of any proposed retaining walls greater than 4' within 15' of a property line.

13.04.350 Grass mix matched to site conditions.

The choice of grass mixture for stabilizing open channels shall be based upon specific site conditions such as shade and sun tolerance, velocity tolerance, and waterway maintenance requirements. The proposed seed mixture to be utilized for stabilizing open channels shall be included in the approved Drainage Plan. **Tenbarge Green Alliance**

13.04.440 General detention/retention basin design requirements.

The following design principles shall be observed for detention and retention basins:

A. Dry detention facilities designed to become a permanent part of the stormwater drainage system shall be installed with an additional ten (10) percent capacity to allow for sediment accumulation resulting from development, and to permit the pond to function for reasonable periods between cleanings. **Wet basins**

B. Depth of Stored Water. The maximum depth of stormwater to be stored, without a permanent pool shall not exceed four feet; and the maximum depth of stormwater to be stored above a permanent pool shall not exceed four feet. **See Basin Design Chart-Meets code**

C. Finished Floor Elevations Adjacent to Basins. The lowest floor of any building or structure occupied by humans must be at least two (2) feet above the one-hundred (100) year storm water elevation of detention/retention basins. **See Basin Design Chart-no elevations provided-provided elevations around Basin 1 should be 406.7 which is shown on chart. Drainage map shows 404.7 Need a revised map that shows correct elevations. Revised**

D. Earthen Side Slopes 4:1 Maximum Steepness for Basins. All detention and retention basins with grassed, earthen side slopes shall have side slopes no steeper than four horizontal units of measurement to one vertical unit of measurement (4:1) to the base of dry basins, and to the typical low waterline of wet basins. **Meets code**

E. Riprap Side Slopes 2:1 Maximum Steepness for Basins. Wet retention basins with riprap armored side slopes shall have slopes no steeper than two horizontal units of measurement to one vertical unit of measurement (2:1) at any point in the side slope. **No rip rap proposed**

F. Riprap to Extend Two Vertical Feet Below Waterline. The armored portion of the side slope must extend to a minimum depth below the permanent pool elevation of two vertical feet. **No rip rap proposed**

G. Underwater Earthen Side Slopes 2:1 Maximum Steepness. Nonarmored earthen side slopes shall have slopes no steeper than two horizontal units of measurement to one vertical unit of measurement from a point two vertical feet below permanent pool, thence downward. **The drawings show meeting code.**

H. Safety Ledges and/or Fencing of Wet Basins. Safety fencing surrounding the basin, and/or shallow safety ledges shall be provided if deemed necessary by the design engineer or the developer. **County will not comment on this issue-developer needs to determine if this should be required**

I. Outlet Controls to Operate Automatically. Outlet control structures shall be designed to operate as simply as possible, and shall require little or no maintenance for proper operation. **Pipe and open spillway**

J. Designed Water Level Control Required. A controlled positive outlet shall be required to maintain the designed water level in wet basins, and provide the required detention storage above the designed low water level. Wet basins with greater than 0.5 acres of surface area at normal pool shall have a minimum

depth of 6 feet over 50% of the basin area and no extensive shallow areas shall be allowed except as required for the safety ledge. **Lakes designed with sufficient depth**

K. Emergency Spillway Requirements.

1. An emergency overflow spillway shall be provided for the release of storm runoffs exceeding the designed maximum detention volume, or all overflow volumes in emergency conditions, should the normal discharge devices become totally or partially inoperative. **How is the emergency spillway being handled where it crosses Road 1? Twin culverts handle water once it crosses road. There could be up to 6" of water during 100 year storm. The basin, however, will hold 100 year storm so the outlet from the basin would have to be plugged for this to occur. The drainage plan sheet shows the emergency overflow swale between lots 5 and 6. Shouldn't that be between lots 4 and 5 since that is where the street sag is located? Revised**

2. A minimum freeboard of one-half foot above the calculated elevation of the design storm detention high water level to the elevation of the spillway flowline peak is required as a safety factor for all basins.

3. The emergency overflow spillway shall be clearly marked with a defined weir, either grass, rip rap or paved. The emergency overflow spillway velocities shall be calculated and the necessary erosion control materials shall be specified and utilized in the construction of the overflow spillway and receiving stream. Energy dissipation measures must be employed where required.

L. Automatically Operating Emergency Spillway Required. The emergency overflow spillway shall be designed so that it operates openly, automatically, does not require manual attention, and will pass all the one hundred (100) year return period storm flow with a one-half foot vertical minimum above the one hundred (100) year return storm flow to the lowest dirt elevation in the surrounding earthwork. **See Basin Design Chart-Basin 1 does not meet criteria-storing 100 year storm-request that 0.2 be allowed-OKAY**

M. Dry Detention Basin Criteria. **Wet Basin**

N. Side Slopes to Remain Stable. All side slopes of a basin shall be constructed stable and shall be maintained in a stable condition by the same criteria as specified herein for open channels. **Tenbarge Green Alliance**

O. Wet Basin Cover and Maintenance. The earthen side slopes of wet basins shall be provided with grass cover above the low water elevation, which shall be maintained equal to turfed residential lawns, and in no case shall the cover growth exceed twelve (12) inches in height, or the most current county standard. **Tenbarge Green Alliance**

P. Maintenance Pathway for Basins. A flat pathway with a minimum width of ten (10) feet shall be constructed completely around the top of the embankment of all detention/retention basins. **Provided**

Q. Maintenance Easement for Basins. An easement dedicated for the purpose of accessing and maintaining the basin and its appurtenances shall be provided, and the easement shall be configured so that it includes the entire basin, the entire earthwork encompassing the basin, the maintenance pathways into and around the basin, and all inletting and outletting appurtenances of the basin. The basins and maintenance easements shall not be located with the right of way of any county, state or federal road or highway. For all basins at least one easement of at least 10' in width must be provided to access the basin from a public roadway for the purpose of maintaining the basin. For subdivisions in which no public roadway is to be dedicated the easement must be to the nearest private road or public road. **Provided**

R. Maintenance Report Required for Basin.

1. A brief and concise report shall be prepared, by the design engineer, consisting of a description of the location, intended function of all parts appurtenant to the basin, together with a description of the ways in which the basin and its appurtenances should be maintained, all worded in language easily understood by residential or commercial property owners; and

2. The maintenance report for all subdivisions or summary of the report shall be included on the plat or shall be referenced on the plat to its location as part of the drainage plan.

S. Copy of Report Must be Submitted With the As-Builts or Record Drawings. A copy of the maintenance report described above shall be included with the as-built plans or Record Drawings required to be submitted hereinabove.

T. No tree limbs, trunks, refuse from legally burnt vegetation, nor construction waste, demolition materials, or other man made material may be buried within the area in which an impounding structure will be located. Notice shall be placed on construction drawings noting the prohibition to the burying of any such materials. Certain natural materials such as large rocks may be located in the bottom of wet basins in order to provide fish habitat or habitat breeding areas provided that such materials are not included within the calculations for required storage volumes and will not block outlet structures. **Noted on plans as required**

U. For small sites of less than 5 acres, infiltration trenches may be utilized instead of a wet or dry basin. In utilizing an infiltration trench, the storage volume is equal to the void ratio multiplied by the total volume of the trench. Information must be provided in advance validating the void ratio as well as testing proposal to validate the void ratio. The infiltration trench must have an outlet that restricts the flow per code provisions. **Not Applicable**

V. No retention basin shall be allowed within the flowline of a Regulated Drain of Vanderburgh County. The County Drainage Board cannot use its rights to discretionary decisions granted under Section 13.04.025 to exempt this restriction. **No regulated drain within project**

BASIN DESIGN CHART-Review				
		Basin 1	Basin 2	Basin 3 rev
1	Design Capacity	55,293	79,336	48578
2	(Section A) Dry detention facilities			
3	Normal Pool Elevation or dry basin bottom elevation	402.86	412	414
4	Storage elevation at 25 year storm (50 year for State Highway 100 year for impacted area)	404.19	413.03	414.99
5	(Section B) Depth of Stored Water. The maximum depth of stormwater to be stored, without a permanent pool shall not exceed four feet; and the maximum depth of stormwater to be stored above a permanent pool shall not exceed four feet. (#4-#3)	1.33	1.03	.99
6	Elevation of emergency spillway	405.06	413.75	416
7	Q100	34.64	55.67	43.47
8	Depth of flow through emergency spillway at 100 year storm	0.6	0.5	0.5
9	Flow line at 100 year storm #6 +#8	405.66	414.25	
10	(Section K2) A minimum freeboard of one-half foot above the calculated elevation of the design storm detention high water level to the elevation of the spillway flowline peak is required as a safety factor for all basins. #9-#4 ≥ 0.5	1.47	1.22	
11	Elevation of top of bank	405.86	414.75	417
12	(Section L) Automatically Operating Emergency Spillway Required. The emergency overflow spillway shall be designed so that it operates openly, automatically, does not require manual attention, and will pass all the one hundred (100) year return period storm flow with a one-half foot vertical minimum above the one hundred (100) year return storm flow to the lowest dirt elevation in the surrounding earthwork. (#11-#9 ≥ 0.5')	0.2	0.5	0.5
13	Elevation of home adjacent to basin	Not Provided 404.7	Not Provided 415.4	Not Provided 417.4
	(Section C) Finished Floor Elevations Adjacent to Basins. The lowest floor of any building or structure occupied by humans must be at least two (2) feet above the one-hundred (100) year storm water elevation of detention/retention basins. (#13-#9 ≥ 2') (storing 100Year Storm)	404.67 406.7	413.36	415.32

13.04.460 Responsibility for drainage facility maintenance.

The installation, maintenance, repair, and replacement of all stormwater drainage facilities, and erosion and siltation control measures for a project during the period of construction, and until final approval by the county engineer, shall be the responsibility of the land developer(s), and/or the property owner(s) of record.

The assignment of responsibility for the maintenance and repair of all stormwater drainage systems and facilities outside of county accepted road rights-of-way after the completion of the project, and final approval thereof by the county engineer, shall be determined before the final drainage plan is approved; and shall be documented by appropriate covenants and restrictions applied to the subdivision and to the property deeds thereof, and shall be printed clearly upon all recorded plats of the project. **Plan B**

GENERAL COMMENTS

The Plat for the section that contains Lot 87 and 88 will need to state that gutters/swimming pool outlets will not discharge directly into the farm field to the south. Will be noted to the Board as a suggested condition

Magnolia Ridge-Final Drainage Plan

The final drainage plan was submitted on September 27th, 2018 with revisions submitted on October 24th and October 30th 2018 and email dated October 16th and October 25th 2018. The plan that is requested to be approved consists of the submitted document and revisions and emails on the respective submitted dates along with the following drawings.

Drawings submitted September 27th, 2018

- Drawing 1 Undeveloped Subbasins

Drawings submitted October 24th, 2018

- Drawing 1 Existing Stream Plan & Profile
- Drawing 2 Existing Stream Cross Sections
- C-120
- C-123
- C-124
- Drawing 2 Developed Subbasins
- Drawing 3 Off-site Subbasins

Drawings submitted October 30th, 2018

- C-101
- C-102

Road plans for Reference Only

- C-107
- C-108
- C-109
- C-110
- C-111
- C-112
- C-113