APPROVED

AUG 2 3 2016

VANDERBURGH COUNTY DRAINAGE BOARD

HECKEL ROAD COMMERCIAL REVISED FINAL DRAINAGE PLAN

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 on June 20, 2016 Revisions submitted August 9, August 15 and August 22, 2016.**

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 *and red italics underlined***

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. **Certified by Indiana Professional Engineer**

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. **Previous easement provided for lake.**

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. **JJ Brodi, LLC**

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. **See comment under Section 13.04.130**

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. **Plans state that lake restoration work is to be completed on or about September 1. Please address timing of installation of storm**

sewers in relation to development of any lots within the subdivision. Addressed in response document dated 8/8/2016; scheduled for 9/1/2016.

13.04.165 Contents of the final drainage plan.

The contents of the final drainage plan shall include all the items listed above for a preliminary drainage plan, plus: (items addressed are only those sections affected by revisions)

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. **Provided**

C. Contour Intervals.

1. 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; **Site Contours at 1'**

2. 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;

3. The normal shoreline of lakes, ponds, swamps, and basins, their floodplains, and lines of inflow and outflow; **Single previously constructed borrow lake for Green River Road that is being utilized by subdivision as well as baseball complex**

5. Storm, sanitary, and combined sewers, and outfalls; **Storm shown and sanitary shown.**

9. The location of the streets, lot lines, and easements; **Provided-easements will be addressed in greater detail with submission of plat**

10. A scale, preferably one inch equals fifty (50) feet; **1"=30'**

11. An arrow indicating North. ; **Provided**

E. For all nonresidential Major Subdivisions and all Minor Subdivisions C-0 through M-3 that per Section 13.04.015 meet the requirements for storage and controlled release of excess stormwater, in which the retention will be achieved by utilizing shared detention and or retention facilities between two or more parcels, a table must be provided with following additional information for each lot. **It appears, that on many of the lots such as lot 9 and the lots on the east side that drainage could be directed to areas that would not eventually end up in the retention pond. In order to avoid any confusion with future development, a table or map should be provided stating for each lot where the developed drainage is to be directed and that no drainage will be directed to Heckel or Green River Roads. Notes provided on drawings C3.0 and C4.0**

1) the assumed weighted Developed C value for each lot, *0.70 is shown in the pipe calculations-for future development on each lot, calculations will need to be provided by the engineer of any proposed lot developer to show that the developed lot will meet this criteria*

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; **It is not clear where the developed watersheds are located that are utilized in runs 1, 2 and 3 Drawings C3.0 and C4.0 specify where the drainage from each lot is to be directed.** *Note on Sheet C3.0 states that lot 10 drainage is to be directed to structure 103. Is this correct; it appears that this drainage would go to structure 102? If this is not the case describe how lot 10 drainage will access structure 103. If structure 102 is the correct discharge point, revise note on drawing C3.0. Revised drawing C3.0 shows drainage going to Structure102. How will lot 13 access structure 104? Addressed on note on drawing C3.0. No pipe stub is shown between lot 13 and str. 104. Label the pipe stub running from str. 100 to lot 3 as str. 100A. The note on lot 3 references str. 100A, but that structure is not currently shown on the plan.* Shown on revised drawing C3.0.

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; **The structure tables show that the calculated flows for a 10 year storm on almost all pipes exceeds the capacity of the pipes. Revised and corrected Also, the calculations were done for 10 year flows instead of 25. Revised and corrected The Tc calculations do not make sense in that they show values of 25-30 minutes on small developed lots. Revised and corrected Where were the values for the rainfall intensities obtained as they are the same even though Tc values vary? Revised and corrected The third storm sewer design sheet references structures 112 through 114; where are these? The description states " We can accomplish this without crossing the road and introducing a pavement cut, which is desirable by the county engineer"; is the statement supposed to read "... and WITHOUT introducing a pavement cut..."? It is unclear what is being proposed for lots 5-8. Is the flow from 5 through 8 to go under the road in the existing pipe, once the 12" storm sewer on the east side is at capacity? If this is the case, the piping under the road appears to be undersized. Addressed in revised comments. Lots 5, 6 and 7 is to be directed to the lake. Lot 8 is to leave undetained. Revised Appendix B was submitted.** *On sheet with upstream manhole 181 the last line 1.05 shows upstream manhole of 105 and downstream structure of 106; should these not be 104 and 105?* Corrected with submittal of 8/15/2016. *On the sheet beginning with upstream manhole #179, no #179 could be found. Shown on revised drawing C4.0.*

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; **If the storm sewer along the west side of lot #1 (between proposed str. no. 101 and the area drain near the NE corner of Heckel and Vieth) is not going to be used, this storm sewer should be removed rather than just being capped south of str. no. 101. A pavement patch detail is required for the road cut needed to install the new storm sewer that crosses Vieth downstream of str. no. 101. 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, **There are no proposed open channels (the previous plan showed one channel that has been converted to a storm sewer). There are two existing channels that most probably cannot be disturbed that carry the outlet and emergency flow from the lake as the streams have been previously addressed by the USCOE.**

5. The materials, elevations, waterway openings, size, and basis for design of the proposed culverts and bridges; **No bridges; culverts are existing;**

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; **One existing basin is on site from previous development.**

7. The location and percentage of impervious surfaces existing and expected to be constructed; **According to submittal, each lot is to have a C value of 0.70.**

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; **Previously calculated in approved plan.**

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. **This should be addressed as entire area appears in the zone A Provided on sheets C3.0 and C4.0 at 386**

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; **No anticipated problems mentioned-plan submitted to meet Vanderburgh County Code**

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; **Need to explain in better detail the lot 5-8 drainage proposal Provided. Lots 5-7 will be drained to the west, lot 8 will leave undetained**

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

E. The results of the analysis of the proposed drainage control system showing that it does solve the project's identified and anticipated drainage problems; **Need to address pipe sizing Addressed**

F. 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**

G. Maps showing individual drainage areas within the project subdivided for use in the analysis thereof. **Used lots**

13.04.180 Typical cross sections of the 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: **Provide x/y cross section of lake showing pool, existing and proposed side slopes and elevation at design storm (cross section of features below pool elevation are not required if unknown) . Drawing C1.1 provided (Appendix A-5)**

A. Must show the elevation of the existing land immediately adjacent to all drainage facilities;

B. Must show the high water elevations adjacent to all waterways and impoundments as expected from the one hundred (100) year storm in relationship to permanent structures

13.04.440 General detention/retention basin design requirements.
The following design principles shall be observed for detention and retention basins:

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. **Need to provide this calculation as well as show flood zone elevations Provided on sheets C3.0 and C4.0 at 386**

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. **Basin to be graded to 4:1 on south and east sides. The request is to leave slopes on north side as they exist. Discussion should state what the final slopes will be and justification for this request should be included (existing vegetation at soccer complex). It will be recommended that regardless of slope, that these areas be dressed and seeded even if steeper slopes are allowed. Provided cross section.** ***It is the opinion of the County Surveyor that all areas regardless of slope should be dressed and seeded. It is also the opinion of the County Surveyor that while the north shore south of the existing retention pond in the soccer complex may be let at its present slope, that portion of the north side of the lake that east of the soccer complex lake (the small rectangular finger north of the emergency spillway) should have the slopes properly graded and reseeded. There appears to be sufficient area to rework the slopes in this area.*** **The revised submittal shows grading in all areas except the east west line on the northern border and that the portion that is east of the soccer complex lake will now be graded. Due to safety concerns no seeding on that portion that is not to be regraded.**

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 measurements to one vertical unit of measurement (2:1) at any point in the side slope. **See D above**

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 measurements from a point two vertical feet below permanent pool, thence downward. **Existing borrow pit**

H. Minimum Depth of Riprap Application. Riprap side slope armor shall be a minimum twelve (12) inches in depth at all points of application. **Not applicable**

I. Drain Recommended for Maintenance of Wet Basins. If possible, a drain should be installed to lower the pool of wet basins to a level sufficient to repair any wave action erosion along the waterline, and to perform other periodic maintenance. **Not provided nor is it required**

J. 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 board. **Basin is located south of soccer fields and east of baseball fields. Access to the basin can occur from the south or the east. The County Surveyor will make no recommendation to the board regarding the elimination of any safety feature. If the developer wishes to not fence the lake they should make a request to the Drainage Board along with a stipulation that the County will not have any liability as a result of not requiring fencing. Safety ledge is proposed on areas where the basin will be resloped. A proposal is to extend a fence and signs in the areas where no sloping is to occur.**

K. 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. **No controls**

L. 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. **Provided**

M. Emergency Spillway Requirements. **Spillway shown at 4 feet wide with 4:1 side slopes; what is the basis for this design? According to comments, spillway was constructed essentially for backwater from Pigeon Creek-response is acceptable.**

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.

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.

N. 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. **Spillway is an open channel-See comment under M above**

Q. 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. **See comment D above**

R. 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. **Side slopes are to be seeded except for North side. See comment D above**

S. 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. **A majority of the lake will have sufficient access except for north side.**

T. 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. **Provided**

U. 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 report shall be attached to the restrictions for the property on which the basin and its parts are located.

3. Such restrictions shall be shown to exist prior to the board's final approval of the drainage plan for a project whose plans include a basin. ***Should be provided with revised maintenance agreement.***

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

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. **According to the report a revised maintenance agreement is being prepared; when will this be submitted? Draft copy provided on 8/10/2016**

Other comments

Mueller, Jeffrey

From: Maria Bulkley <mbulkley@kddk.com>
Sent: Monday, August 15, 2016 4:17 PM
To: Mueller, Jeffrey; Freeman, Linda
Cc: Campbell, Terry; Stoll, John
Subject: RE: Variance on final drainage plans

Jeff: The final drainage plan review for Heckel Road Commercial is headed to the drainage board on Tuesday August 23, 2016. Please allow this correspondence to formally serve as our request for a variance to avoid seeding and sloping a portion of shore line as shown on drawing C 1.0. The request is predicated on a desire not to disturb the nature preserve-like area next to the soccer fields. Please let me know if this email satisfies the requirement for making a written request for this variance on the final drainage plans, or if you require anything further. Thank you in advance.

Sincerely,

Maria L. Bulkley

KDDK KAHN, DEES, DONOVAN & KAHN, LLP
Attorneys & Counselors at Law - Since 1908

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SRM

APPROVED 2-0. 8/23/16

Comm. KIEFER ABSTAINED

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Jeff Mueller

Campbell, Terry

From: Mueller, Jeffrey <jmueller@vanderburghsurveyor.com>
Sent: Monday, August 15, 2016 8:14 AM
To: Campbell, Terry
Cc: Stoll, John; Farny, Jim
Subject: RE: Heckel Road Commercial Sub - 1110117

Terry,

We will need 2 hard copies of the submittal.

Jeff

From: Campbell, Terry [mailto:TCampbell@lochgroup.com]
Sent: Friday, August 12, 2016 4:47 PM
To: Stoll, John; Farny, Jim
Cc: Mueller, Jeffrey
Subject: RE: Heckel Road Commercial Sub - 1110117

1. The extent and area of each watershed tributary to the drainage facilities within the project; **It is not clear where the developed watersheds are located that are utilized in runs 1, 2 and 3 Drawings C3.0 and C4.0 specify where the drainage from each lot is to be directed.** ***Note on Sheet C3.0 states that lot 10 drainage is to be directed to structure 103. Is this correct; it appears that this drainage would go to structure 102? If this is not the case describe how lot 10 drainage will access structure 103. If structure 102 is the correct discharge point, revise note on drawing C3.0. How will lot 13 access structure 104? No pipe stub is shown between lot 13 and str. 104. Label the pipe stub running from str. 100 to lot 3 as str. 100A. The note on lot 3 references str. 100A, but that structure is not currently shown on the plan.***

   The attached drawings [Appendix A-2 (C3.0) and A-3 (C4.0)] address these issues.

2. ***On sheet with upstream manhole 181 the last line 1.05 shows upstream manhole of 105 and downstream structure of 106; should these not be 104 and 105? On the sheet beginning with upstream manhole #179, no #179 could be found.***

   Also attached are revised Appendix B-Storm Sewer Pipe Design Calculations

8/15/2016

Terry Campbell
Office Manager & Administrative Assistant

LOCHMUELLER GROUP

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TCampbell@lochgroup.com

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From: Stoll, John [mailto:JStoll@vanderburghgov.org]
Sent: Friday, August 12, 2016 10:33 AM
To: Farny, Jim <JFarny@lochgroup.com>
Cc: Campbell, Terry <TCampbell@lochgroup.com>; Mueller, Jeffrey <jmueller@vanderburghsurveyor.com>
Subject: RE: Heckel Road Commercial Sub - 1110117

Jim,
Attached are updated comments that Jeff Mueller and I put together for the Heckel Road Commercial Sub.

Also, there are some revisions needed on the letter of credit estimate. First, street signs and stop signs need to be added. The developer will need street signs at the intersection of Green River and Soccer, and at Vieth and Soccer. Stop signs would also be needed on Soccer at Vieth and at Green River. Record drawings also need to be added to the estimate. And I also had a question about the $7000 cost estimate for the lake grading. Is that figure based on an estimate provided by a contractor? That cost sounds low to pump the lake down, cut the safety ledge, and then regrade the banks.

Let me or Jeff know if you have any questions.

John

From: Campbell, Terry [mailto:TCampbell@lochgroup.com]
Sent: Tuesday, August 2, 2016 4:09 PM
To: Stoll, John <JStoll@vanderburghgov.org>
Cc: Farny, Jim <JFarny@lochgroup.com>; Geppert, Alan <AGeppert@lochgroup.com>
Subject: FW: Heckel Road Commercial Sub - 1110117
Importance: High

John,
Please delete the first email I sent you at 2:51 p.m. today. Attached are the correct drawing for your review.

Terry Campbell
Office Manager & Administrative Assistant

LOCHMUELLER GROUP

812.479.6200
TCampbell@lochgroup.com

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From: Campbell, Terry
Sent: Tuesday, August 02, 2016 2:51 PM
To: 'John Stoll (JStoll@Vanderburghgov.org)' <JStoll@Vanderburghgov.org>; 'Ron London (rlondon@evansvilleapc.com)' <rlondon@evansvilleapc.com>; 'Jim McReynolds (jmcreynolds@evansvilleapc.com)' <jmcreynolds@evansvilleapc.com>
Cc: Farny, Jim <JFarny@lochgroup.com>; Geppert, Alan <AGeppert@lochgroup.com>; 'Jim Johnston (jimkjohn@yahoo.com)' <jimkjohn@yahoo.com>
Subject: Heckel Road Commercial Sub - 1110117

John,
Attached for your review is our Cost Estimate for Letter of Credit for the above referenced project, as well as a paving plan for the required work. If you have any questions or comments, please let us know.

Terry Campbell
Office Manager & Administrative Assistant

LOCHMUELLER GROUP

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http://lochgroup.com

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25 YEAR STORM SEWER DESIGN-RATIONAL METHOD

RAINFALL INTENSITY CURVES
YEAR : 25 Yr.
REGION : evll
(INDY,SBND,EVLL,FTWY)

PROJECT: HECKEL SUB RUN1
ENGINEER LOCHMUELLER GROUP
FILENAME: S:\PROJECTS\111-0117-OPD

DATE: 08/12/16
MANNINGS n= 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)	PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)
1.00	181	380.25	182	379.25	226.00	0.70	0.89	0.62	0.62	20.00	20.00	4.43	2.8	15	0.44	4.3	3.51
1.01	182	379.25	101	378.68	80.00	0.70	1.82	1.27	1.90	20.00	21.07	4.29	8.1	18	0.71	8.9	5.03
1.02	101	378.68	102	377.90	330.00	0.70	0.91	0.64	2.53	20.00	21.34	4.25	10.8	24	0.24	11.0	3.51
1.03	102	377.90	103	377.00	275.00	0.70	1.11	0.78	3.31	25.00	25.00	3.80	12.6	24	0.33	13.0	4.13
1.04	103	377.00	104	376.14	348.00	0.70	2.87	2.01	5.32	25.00	26.11	3.69	19.6	30	0.25	20.4	4.17
1.05	104	376.14	105	376.00	16.00	0.70	1.45	1.02	6.34	25.00	27.50	3.54	22.4	30	0.87	38.5	7.84

8/15/2016

25 YEAR STORM SEWER DESIGN-RATIONAL METHOD

RAINFALL INTENSITY CURVES
YEAR : 25 Yr.
REGION : evll
(INDY,SBND,EVLL,FTWY)

PROJECT: HECKEL SUB RUN2
ENGINEER LOCHMUELLER GROUP
FILENAME: S:\PROJECTS\111-0117-OPD

DATE: 08/15/16
MANNINGS n= 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)	PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)	TRAVEL TIME(MIN)
1.00	179	377.50	109	375.90	230.00	0.70	0.96	0.67	0.67	20.00	20.00	4.43	3.0	12	0.70	3.0	3.79	1.01
2.00	107	377.50	108	376.20	150.00	0.70	0.95	0.67	0.67	20.00	20.00	4.43	2.9	12	0.87	3.3	4.23	0.59
2.01	108	376.20	109	376.00	10.00	0.70	1.07	0.75	1.41	20.00	20.59	4.35	6.2	15	2.00	9.2	7.46	0.02
1.03	109	376.70	110	376.00	340.00	0.70	0.00	0.00	2.09	20.00	20.61	4.35	9.1	24	0.21	10.3	3.28	1.73

8/15/2016

Campbell, Terry

From: Campbell, Terry
Sent: Monday, August 15, 2016 11:04 AM
To: 'Stoll, John'; 'Doug Ohning'; 'Mike Labitzke (mlabitzke@ewsu.com)'
Cc: Farny, Jim; 'Jim Johnston (jimkjohn@yahoo.com)'; 'Maria Worthington (mbulkley@kddk.com)'
Subject: RE: Heckel Road Commercial Sub - 1110117
Attachments: CostEstAPC LOC revised_8_15_2016.pdf

John / Doug,
Attached is an updated cost estimate for LOC for the above referenced project. Please review and sign if approved.

Terry Campbell
Office Manager & Administrative Assistant

LOCHMUELLER GROUP

812.479.6200
TCampbell@lochgroup.com

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From: Stoll, John [mailto:JStoll@vanderburghgov.org]
Sent: Friday, August 12, 2016 10:33 AM
To: Farny, Jim <JFarny@lochgroup.com>
Cc: Campbell, Terry <TCampbell@lochgroup.com>; Mueller, Jeffrey <jmueller@vanderburghsurveyor.com>
Subject: RE: Heckel Road Commercial Sub - 1110117

Jim,
Attached are updated comments that Jeff Mueller and I put together for the Heckel Road Commercial Sub.

Also, there are some revisions needed on the letter of credit estimate. First, street signs and stop signs need to be added. The developer will need street signs at the intersection of Green River and Soccer, and at Vieth and Soccer. Stop signs would also be needed on Soccer at Vieth and at Green River. Record drawings also need to be added to the estimate. And I also had a question about the $7000 cost estimate for the lake grading. Is that figure based on an estimate provided by a contractor? That cost sounds low to pump the lake down, cut the safety ledge, and then regrade the banks.

Let me or Jeff know if you have any questions.

John

From: Campbell, Terry [mailto:TCampbell@lochgroup.com]
Sent: Tuesday, August 2, 2016 4:09 PM
To: Stoll, John <JStoll@vanderburghgov.org>
Cc: Farny, Jim <JFarny@lochgroup.com>; Geppert, Alan <AGeppert@lochgroup.com>
Subject: FW: Heckel Road Commercial Sub - 1110117
Importance: High

John,
Please delete the first email I sent you at 2:51 p.m. today. Attached are the correct drawing for your review.

Terry Campbell
Office Manager & Administrative Assistant

LOCHMUELLER GROUP

812.479.6200
TCampbell@lochgroup.com

This e-mail message is for the sole use of the intended recipient(s) and may contain confidential and privileged information. Any unauthorized review, use, disclosure or distribution is prohibited. If you are not the intended recipient(s), please contact the sender by reply e-mail and destroy all copies of the original message. Thank you!

From: Campbell, Terry
Sent: Tuesday, August 02, 2016 2:51 PM
To: 'John Stoll (JStoll@Vanderburghgov.org)' <JStoll@Vanderburghgov.org>; 'Ron London (rlondon@evansvilleapc.com)' <rlondon@evansvilleapc.com>; 'Jim McReynolds (jmcreynolds@evansvilleapc.com)' <jmcreynolds@evansvilleapc.com>
Cc: Farny, Jim <JFarny@lochgroup.com>; Geppert, Alan <AGeppert@lochgroup.com>; 'Jim Johnston (jimkjohn@yahoo.com)' <jimkjohn@yahoo.com>
Subject: Heckel Road Commercial Sub - 1110117

John,
Attached for your review is our Cost Estimate for Letter of Credit for the above referenced project, as well as a paving plan for the required work. If you have any questions or comments, please let us know.

Terry Campbell
Office Manager & Administrative Assistant

6200 Vogel Road, Evansville, IN 47715
812.479.6200
TCampbell@lochgroup.com
http://lochgroup.com

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LOCHMUELLER GROUP

6200 Vogel Road/Evansville, Indiana 47715

August 15, 2016 (revised)

Ron London, Executive Director
Evansville - Vanderburgh County Area Plan Commission
1 N.W. Martin Luther King, Jr. Blvd.
Civic Center Complex - Room 312
Evansville, Indiana 47708

RE: Engineer's Opinion of Probable Cost for Letter of Credit
Heckel Road Commercial Subdivision-Revised
BLA Project No. 111-0117-0PD

Cost Estimate 1 - Roadway Improvements

Item	Quantity	Unit		Unit Price	Total Price
Engineering					
Design, Plat and Construction Drawings	1	LS	@	$1,500.00	$1,500
Construction Staking	1	LS	@	$1,600.00	$1,600
				Subtotal for Engineering =	**$3,100**
Roads					
Roadways	1	LS	@	$63,500.00	$63,500
As-Built Drawings	1	LS	@	$2,000.00	$2,000
				Subtotal for Roadways =	**$65,500**
Lake Grading / Earthwork	1	LS	@	$12,000.00	$12,000
				Subtotal for Lake Grading/Earthwork =	**$12,000**
Sidewalks					
Waiver requested 2/27/2012					$0
				Subtotal for Sidewalks =	**$0**
Storm Sewers					
12" HDPE Pipe	134	LF	@	$35.00	$4,690
15" HDPE Pipe	275	LF	@	$40.00	$11,000
24" HDPE Pipe	969	LF	@	$60.00	$58,140
Inlet E-4	5	EA	@	$2,500.00	$12,500
Inlet A-4	2	EA	@	$2,000.00	$4,000
15" End Section	1	EA	@	$560.00	$560
24" End Section	1	EA	@	$1,310.00	$1,310
As-Built Drawings	1	LS	@	$2,000.00	$2,000
				Subtotal for Storm Sewers =	**$94,200**

Miscellaneous

Erosion and Sediment Control	1	LS	@	$2,500.00	$2,500
Maintenance of Traffic	1	LS	@	$500.00	$500
Seed	440	LBS	@	$4.00	$1,760
Fertilizer	1,700	LBS	@	$1.00	$1,700
Mulch	4	TON	@	$460.00	$1,840
Signage	1	LS	@	$3,000.00	$3,000
Striping	1	LS	@	$5,200.00	$5,200
				Subtotal for Miscellaneous =	$16,500

Cost Estimate 1 - Subtotal =	$191,300
10% Contingency =	$19,130
Cost Estimate 1 - Total =	**$210,430**

Cost Estimate 2 - Sanitary Sewers

Item	Quantity	Unit		Unit Price	Total Price
6" Pipe	280	LFT	@	$100.00	$28,000
As-built Drawings	1	LS	@	$2,000.00	$2,000
				Cost Estimate 2 - Subtotal =	$30,000
				10% Contingency =	$3,000
				Cost Estimate 2 - Total =	**$33,000**

Cost Estimate 3 - Potable Water

Item	Quantity	Unit		Unit Price	Total Price
12" PVC C-900 Pipe	1,510	LF	@	$52.00	$78,520
6" D.I. Pipe	20	LF	@	$35.00	$700
12"x12"x12" Tapping Sleeve	1	EA	@	$1,200.00	$1,200
12"x12"x12" Tee	1	EA	@	$800.00	$800
12"x12"x6" Tee	3	EA	@	$750.00	$2,250
12" Tapping Valve	1	EA	@	$4,500.00	$4,500
12" Gate Valve	4	EA	@	$2,000.00	$8,000
6" Gate Valve	3	EA	@	$1,000.00	$3,000
12" 45° Bend	1	EA	@	$480.00	$480
Automatic Flush Valve	2	EA	@	$1,500.00	$3,000
Fire Hydrant Assembly-Yellow	3	EA	@	$2,500.00	$7,500
3/4" Chlorination Tap	1	EA	@	$500.00	$500
2" Corporation Stop	1	EA	@	$650.00	$650
12" MJ Plug Tap, 2"	2	EA	@	$300.00	$600
Water Testing	1	LS	@	$1,500.00	$1,500
As-Built Drawings	1	LS	@	$2,000.00	$2,000
				Cost Estimate 3 - Subtotal =	$115,200
				10% Contingency =	$11,520
				Cost Estimate 3 - Total =	**$126,720**

Cost Estimate 1 - Total =	$210,430
Cost Estimate 2 - Total =	$33,000
Cost Estimate 3 - Total =	$126,720
Grand Total =	**$370,150**

Respectfully Submitted,
Lochmueller Group

James A. Farny, P.E.
Indiana Registration No. 60020434
August 15, 2016

Approvals:
Cost Estimate 1 - Roadway Improvements

John Stoll, PE - Vanderburgh County Engineer

Cost Estimate 2 and 3 - Sanitary Sewers and Potable Water

Michael Labitzke - Evansville Water and Sewer Utility, Inc.

LOCHMUELLER GROUP

TRANSMITTAL

DATE: August 8, 2016

TO: Vanderburgh County Surveyor
Room 325 Civic Center Complex
Evansville, IN 47708

RE: Heckel Road Commercial Subdivision
Amended Final Storm Drainage Analysis

ATTENTION: Jeffrey Mueller

BLA PROJECT NO.: 111-0117-APD

We Transmit:

☒ Attached ☐ Under Separate Cover ☐ In Accordance With Your Request

Via:

☐ UPS Ground ☐ UPS Next Day Air ☐ First Class Mail ☐ Pick-Up ☒ Messenger

No. Copies	Dated	Description
2	8/08/2016	Engineer's Response to Review of Amended Final Storm Drainage Analysis
2	rev. 8/08/16	Full-size Sheets of Appendices A-1, A-2, A-3, A-4, A-5 (new), A-6 (new)
2	6/29/2016	Full Sets of Construction Plans

REMARKS: Please review and let us know your questions/comments. If you do not think you will have the opportunity to review our response prior to Wednesday, we should reset the meeting.

Sincerely,

LOCHMUELLER GROUP

By: James A. Farny, P.E., L.S.
Senior Project Engineer

/tac

Copies to: John Stoll
File

S:\111-0117\PD\DRAINAGE REPORT\2016 Amended Report\trans_Mueller_reviewResponse.docx

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
8/9/16 CA

6200 Vogel Road
Evansville, Indiana 47715
PHONE: 812.479.6200 •TOLL FREE: 800.423.741

HECKEL ROAD COMMERCIAL REVISED FINAL DRAINAGE PLAN

Responses by James A. Farny, August 8, 2016

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 on June 20, 2016**

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. **Certified by Indiana Professional Engineer**

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. **Previous easement provided for lake.**

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. **JJ Brodi, LLC**

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. **See comment under Section 13.04.130**

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. **Plans state that lake restoration work is to be completed on or about September 1. Please address timing of installation of storm sewers in relation to development of any lots within the subdivision.**

Response: Storm sewers are currently scheduled for construction on or about September 1, 2016

13.04.165 Contents of the final drainage plan.

The contents of the final drainage plan shall include all the items listed above for a preliminary drainage plan, plus: (items addressed are only those sections affected by revisions)

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. **Provided**

C. Contour Intervals.

1. 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; **Site Contours at 1'**

2. 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;

3. The normal shoreline of lakes, ponds, swamps, and basins, their floodplains, and lines of inflow and outflow; **Single previously constructed borrow lake for Green River Road that is being utilized by subdivision as well as baseball complex**

5. Storm, sanitary, and combined sewers, and outfalls; **Storm shown and sanitary shown.**

9. The location of the streets, lot lines, and easements; **Provided-easements will be addressed in greater detail with submission of plat**

10. A scale, preferably one inch equals fifty (50) feet; **1"=30'**

11. An arrow indicating North. ; **Provided**

E. For all nonresidential Major Subdivisions and all Minor Subdivisions C-0 through M-3 that per Section 13.04.015 meet the requirements for storage and controlled release of excess stormwater, in which the retention will be achieved by utilizing shared detention and or retention facilities between two or more parcels, a table must be provided with following additional information for each lot. **It appears, that on many of the lots such as lot 9 and the lots on the east side that drainage could be directed to**

areas that would not eventually end up in the retention pond. In order to avoid any confusion with future development, a table or map should be provided stating for each lot where the developed drainage is to be directed and that no drainage will be directed to Heckel or Green River Roads.

Response: Each lot is provided a storm sewer to which the stormwater flow is to be directed. We concur that no drainage should be directed to Green River Road. We can place a note on the subdivision plat to this effect. The Site Storm Plan-South Half (Appendix A-2) and Site Storm Plan-North Half (Appendix A-3) now shows stormwater routing direction.

1) the assumed weighted Developed C value for each lot, ***0.70 is shown in the pipe calculations-for future development on each lot, calculations will need to be provided by the engineer of any proposed lot developer to show that the developed lot will meet this criteria***

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; **It is not clear where the developed watersheds are located that are utilized in runs 1, 2 and 3**

Response: All lots have storm sewer laterals to be used by each lot developer. All sewers are either directly or indirectly connected to the lake, except for Lot 8. The flow from Lot 8 will backflow into the lake when the creek rises and allows it to. It is at this higher storm frequency when stormwater will backflow into the lake and there is value in detaining stormwater runoff.

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; **The structure tables show that the calculated flows for a 10 year storm on almost all pipes exceeds the capacity of the pipes. Also, the calculations were done for 10 year flows instead of 25. The Tc calculations do not make sense in that they show values of 25-30 minutes on small developed lots. Where were the values for the rainfall intensities obtained as they are the same even though Tc values vary? The third storm sewer design sheet references structures 112 through 114; where are these? The description states " We can accomplish this without crossing the road and introducing a pavement cut, which is desirable by the county engineer"; is the statement supposed to read "... and WITHOUT introducing a pavement cut..."? It is unclear what is being proposed for lots 5-8. Is the flow from 5 through 8 to go under the road in the existing pipe, once the 12" storm sewer on the east side is at capacity? If this is the case, the piping under the road appears to be undersized.**

Response: The incorrect 'Appendix B – Storm Sewer Pipe Design Calculations' were filed with the report. The correct documents are now attached. On these calculations are also changes to the storm sewer as designed in order to better meet the needs of the subdivision. Please note the following:

- **The storm sewers are designed for the 25 year storm.**
- **The pipe capacity meets or exceeds that required for the 25 year storm.**
- **The time of concentration has been reduced.**

The revisions we have made to the sewer does require the pavement to be cut. The entire road will be resurfaced and therefore, the patch will not show.

In order to divert as much flow as possible to the lake, the road cut is necessary. Structure 109 will be constructed with a diversion baffle in it to redirect the runoff from Lots 5, 6 and 7 to the lake. Detail shown in Appendix A-4 – Storm Details.

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; **If the storm sewer along the west side of lot #1 (between proposed str. no. 101 and the area drain near the NE corner of Heckel and Vieth) is not going to be used, this storm sewer should be removed rather than just being capped south of str. no. 101.**

Response: "Remove Pipe" has been added to drawings (Appendix A-2)

A pavement patch detail is required for the road cut needed to install the new storm sewer that crosses Vieth downstream of str. no. 101.

Response: a pavement patch detail has been added to drawings (Appendix A-6-Site Paving Plan)

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, **There are no proposed open channels (the previous plan showed one channel that has been converted to a storm sewer). There are two existing channels that most probably cannot be disturbed that carry the outlet and emergency flow from the lake as the streams have been previously addressed by the USCOE.**

5. The materials, elevations, waterway openings, size, and basis for design of the proposed culverts and bridges; **No bridges; culverts are existing;**

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; **One existing basin is on site from previous development.**

7. The location and percentage of impervious surfaces existing and expected to be constructed; **According to submittal, each lot is to have a C value of 0.70.**

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; **Previously calculated in approved plan.**

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. **This should be addressed as entire area appears in the zone A**

Response: FPG's have been added to all lots (Appendix A-2 and A-3)

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; **No anticipated problems mentioned-plan submitted to meet Vanderburgh County Code**

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; **Need to explain in better detail the lot 5-8 drainage proposal**

Response: All of these lots currently drain to the north. A new pipe connector to the lake has been shown to allow the water from Lots 5, 6 and 7 to backflow into the lake. A baffle in Structure No. 109 will redirect the stormwater to the lake. Because the entire watershed is influenced by backwater flow from Pigeon Creek, the large lake acts as a backwater holding facility that is filled with backwater flowing through the ditches. Although Lot 8 bypasses the pond, it will result in no measurable impact for when the stormwater detention is needed, the entire storm sewer will be flowing backward into the lake (Shown on Appendix A-3).

D. The proposed design of the drainage control system;

E. The results of the analysis of the proposed drainage control system showing that it does solve the project's identified and anticipated drainage problems; **Need to address pipe sizing**

Response: See revised Storm Sewer Pipe Design Calculations (Appendix B) printout.

F. 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;

G. Maps showing individual drainage areas within the project subdivided for use in the analysis thereof.

13.04.180 Typical cross sections of the 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: **Provide x/y cross section of lake showing pool, existing and proposed side slopes and elevation at design storm (cross section of features below pool elevation are not required if unknown) .**

Response: This information has been added (See Appendix A-5 – Lake Cross Sections).

A. Must show the elevation of the existing land immediately adjacent to all drainage facilities;

B. Must show the high water elevations adjacent to all waterways and impoundments as expected from the one hundred (100) year storm in relationship to permanent structures

13.04.440 General detention/retention basin design requirements.
The following design principles shall be observed for detention and retention basins:

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. **Need to provide this calculation as well as show flood zone elevations**

Response: Per the FIRM Panel, the 100 year flood elevation = 384.00. The FPG for each lot is 386.00

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. **Basin to be graded to 4:1 on south and east sides. The request is to leave slopes on north side as they exist. Discussion should state what the final slopes will be and justification for this request should be included (existing vegetation at soccer complex). It will be recommended that regardless of slope, that these areas be dressed and seeded even if steeper slopes are allowed.**

Response: It is the Owner's desire to let the north bank of the lake revert back to a natural state. There is no development that will occur along this narrow strip of land, and, therefore, no reason to urbanize the lake bank. The Owner feels it is environmentally a wise choice to let it be natural. In order to speak to the requirement that the bank be regraded and seeded for maintenance reasons that should not apply here. They are offering to extend the fence that separates this land from the soccer complex to the edge of the lake and post signs that do not allow trespassing and designate the area as a natural preserve (See Appendix A-1- Lake Restoration Plan.

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 measurements to one vertical unit of measurement (2:1) at any point in the side slope. **See D above**

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 measurements from a point two vertical feet below permanent pool, thence downward. **Existing borrow pit**

H. Minimum Depth of Riprap Application. Riprap side slope armor shall be a minimum twelve (12) inches in depth at all points of application. **Not applicable**

I. Drain Recommended for Maintenance of Wet Basins. If possible, a drain should be installed to lower the pool of wet basins to a level sufficient to repair any wave action erosion along the waterline, and to perform other periodic maintenance. **Not provided nor is it required**

J. 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 board. **Basin is located south of soccer fields and east of baseball fields. Access to the basin can occur from the south or the east. The County Surveyor will make no recommendation to the board regarding the elimination of any safety feature. If the developer wishes to not fence the lake they should make a request to the Drainage Board along with a stipulation that the County will not have any liability as a result of not requiring fencing.**

Response: The Owner has agreed to the request to lower the lake and provide a marine safety ledge to all that portion of the lake accessible to the public (Appendix A-5). The Owner will install a fence extension from the soccer property fence to the lake edge to prohibit use of the north shore that will be set aside as the preserve area for water fowl and the like (Appendix A-1).

K. 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. **No controls**

L. 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. **Provided**

M. Emergency Spillway Requirements. **Spillway shown at 4 feet wide with 4:1 side slopes; what is the basis for this design?**

Response: In this situation spillway size is irrelevant. 100 year storm never exceeds the height of this spillway. Backwater will inundate the entire lake as defined. The spillway can be made wider if required.

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.

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.

N. 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. **Spillway is an open channel-See comment under M above**

Q. 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. **See comment D above**

R. 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. **Side slopes are to be seeded except for North side. See comment D above**

S. 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. **A majority of the lake will have sufficient access except for north side.**

T. 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. **Provided**

U. 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 report shall be attached to the restrictions for the property on which the basin and its parts are located.

3. Such restrictions shall be shown to exist prior to the board's final approval of the drainage plan for a project whose plans include a basin. ***Should be provided with revised maintenance agreement.***

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

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. **According to the report a revised maintenance agreement is being prepared; when will this be submitted?**

Response: This will be submitted by KDDK sometime within the next week.

AMENDED

FINAL STORM DRAINAGE ANALYSIS

HECKEL ROAD COMMERCIAL SUBIDIVISION

As Approved January 24, 2012

Located along North Green River Road
at the intersection of N. Green River Road and Heckel Road
Evansville, Indiana
BLA Project No.: 111.0117-APD

Prepared for:
J. J. Brodi, L.L.C.

By:

LOCHMUELLER GROUP

6200 Vogel Road, Evansville, Indiana 47715
PHONE: 812.479.6200 •TOLL FREE: 800.423.7411

June 17, 2016

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
6/20/16 CA

LOCHMUELLER GROUP

TRANSMITTAL

DATE: June 20, 2015

TO: Vanderburgh County Surveyor
Room 325 Civic Center Complex
Evansville, IN 47708

RE: Heckel Road Commercial Subdivision
Amended Final Storm Drainage Analysis

ATTENTION: Jeffrey Mueller

BLA PROJECT NO.: 111-0117-APD

We Transmit:

☒ Attached ☐ Under Separate Cover ☐ In Accordance With Your Request

Via:

☐ UPS Ground ☐ UPS Next Day Air ☐ First Class Mail ☐ Pick-Up ☒ Messenger

No. Copies	Dated	Description
2	6/17/2016	Amended Final Storm Drainage Analysis`
2		Full-size Sheets of Appendices A-1, A-2, A-3 & A-4

REMARKS: Please review and let us know your questions/comments.

Sincerely,

LOCHMUELLER GROUP

By: James A. Farny, P.E., L.S.
Senior Project Engineer

/tac

Copies to: John Stoll
File

S:\111-0117\PD\DRAINAGE REPORT\2016 Amended Report\trans_Mueller.docx

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
6/20/16 CA

6200 Vogel Road
Evansville, Indiana 47715
PHONE: 812.479.6200 •TOLL FREE: 800.423.741

Table of Contents

Cover Letter to Jeffrey Mueller ..... 1 - 2

Appendix

Appendix A-1 ..... Lake Restoration Plan

Appendix A-2 ..... Site Storm Plan – South Half

Appendix A-3 ..... Site Storm Plan – North Half

Appendix A-4 ..... Storm Details

Appendix B ..... Storm Sewer Pipe Design Calculations

Appendix C ..... Previously Approved Final Storm Drainage Analysis
Dated January 16, 2012

LOCHMUELLER GROUP

6200 Vogel Road, Evansville, Indiana 47715-4006

June 20, 2016

Mr. Jeffrey Mueller
Vanderburgh County Surveyor
Room 325 Civic Center Complex
Evansville, IN 47708

RE: Heckel Road Commercial Subdivision
Amended Final Storm Drainage Analysis
Project No. 111-0117-APD

Dear Jeff,

The drainage plan entitled *Storm Drainage analysis for Heck Road commercial Subdivision"* was received by the County Surveyor's office on December 15, 2011. The plan was submitted to the drainage board and approved on January 24, 2016.

Two 'Lake Maintenance and Storm Drainage Easements' were prepared by Kahn Dees Donovan and Kahn. These easements were recorded on July 21, 2014 in the office of the Recorder of Vanderburgh County in Instrument No. 2014R00016089 (for Evansville-Vanderburgh Convention and Visitors Bureau) and Instrument No. 2014R00016107 (for J. J. Brodi, L.L.C.).

A Maintenance Agreement is being amended to include all users by Kahn Dees Donovan & Kahn.

A letter of credit for the shoreline to meet drainage code requirements will be obtained by the Owner and filed with the Area Plan Commission.

Stormwater from Lots 5 through 8 is currently routed to the north through a 12 inch diameter sewer. Therefore, the runoff from these lots does not drain directly to the lake. As previously reported, lake storage is provided for all of the subdivision, including lots 5 through 8 with less than one foot of rise in the lake. The lake outflow was sized accordingly.

Because of the limited capacity in this storm sewer that drains Lots 5 through 8, we are showing the upstream end of this sewer indirectly routed to the lake as well. We can accomplish this without crossing the road and introducing a pavement cut, which is desirable by the county engineer. By providing this interconnection to the lake, outlet capacity of the storm water piping in this area is doubled and does not allow for direct entry of stormwater into the lake should the existing sewer reach capacity.

Because this project is a conversion, or fit, of an existing road and infrastructure to meet the objectives of the ordinance, the storm water routing is more sophisticated or complicated in order to avoid cutting the road, except where necessary.

Due to the nature of the overall watershed area that drains to Firlick Creek and into Pigeon Creek, which experiences flooding from Pigeon Creek backwater, all storm retention areas are often filled by water flowing backward through the system as Pigeon Creek rises. For this reason, the retention areas are filled from backwater and the detailed routing of all storm water directly into the designated basin, for it will backflow into the basin as the need arises. Because of the backwater condition that exists, the lakes are utilized for detention even though they are filled backwards through the storm water piping.

With the construction of this large borrow pit (now converted into a storm detention lake) and the interconnection of the surrounding retention facilities in both the Goebel Soccer Complex and the Deaconess Sports Park, a stormwater detention facility has been created that far exceeds the capacity required by the drainage ordinance.

At the south end of the subdivision, the road will be cut and a new storm and sanitary sewer will be installed. A 24 inch diameter sewer can be installed to handle the flow from all of the lots south of the lake and east of Vieth Lane.

Storm sewer runs 2 and 3 together can share the suggested loading from Lots 5 through 8 (see Appendix B – Storm Sewer Pipe Design Calculations for Runs 1, 2 and 3).

With the understanding of what causes the stormwater to accumulate and affect these areas, and with the introduction of these oversize stormwater holding areas, it should be noted that the goals set forth by the drainage ordinance have been met.

The Owner/Developer appreciates your consideration in this matter and asks that you place this request on the next Vanderburgh County Drainage Board agenda and recommend for approval.

Respectfully submitted,

James A. Farny, P.E., P.S.
Senior Project Engineer

jaf/tac

Attachments: Amended Final Storm Drainage Analysis

cc: J. J. Brodi, L.L.C.
File

APPENDICES INDEX

Appendix A-1	-	Lake Restoration plan
Appendix A-2	-	Site Storm Plan – South Half
Appendix A-3	-	Site Storm Plan – North Hal
Appendix A-4	-	Storm Details
Appendix B	-	Storm Sewer Pipe Design Calculations
Appendix C	-	Previously Approved Final Storm Drainage Analysis dated January 16, 2012

APPENDIX A-1

LAKE RESTORATION PLAN

APPENDIX A-2

SITE STORM PLAN – SOUTH HALF

APPENDIX A-3

SITE STORM PLAN – NORTH HALF

APPENDIX A-4

STORM DETAILS

APPENDIX B

STORM SEWER PIPE DESIGN CALCULATIONS

REVISED BY
8/15/2016
SUBMITTAL

APPENDIX B

STORM SEWER PIPE DESIGN CALCULATIONS

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
8/9/16 CA

YEAR : 25 Yr.
REGION : evll
(INDY,SBND,EVLL,FTWY)

ENGINEER LOCHMUELLER GROUP
FILENAME: S:\PROJECTS\111-0117-OPD

MANNINGS n= 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)		PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)	TRAVEL TIME(MIN)
1.00	179	377.50	109	375.90	230.00	0.70	0.96	0.67	0.67	20.00	20.00	4.43	3.0	12		0.70	3.0	3.79	1.01
2.00	107	377.50	108	376.20	150.00	0.70	0.95	0.67	0.67	20.00	20.00	4.43	2.9	12		0.87	3.3	4.23	0.59
2.01	108	376.20	109	376.00	10.00	0.70	1.07	0.75	1.41	20.00	20.59	4.35	6.2	15		2.00	9.2	7.46	0.02
1.03	109	376.70	110	376.00	340.00	0.70	0.00	0.00	2.09	20.00	20.61	4.35	9.1	24		0.21	10.3	3.28	1.73
1.04	0	0.00	0	0.00	0.00	0.00	0.00	0.00	2.09	0.00	22.34	4.12	8.6	12	###	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
1.05	0	0.00	0	0.00	0.00	0.00	0.00	0.00	2.09	0.00	#DIV/0!	#DIV/0!	#DIV/0!	12	###	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

REVISED BY
8/5/2016 SUBMITTAL

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
8/9/16 CA

YEAR : 25 Yr.
REGION : evll
(INDY,SBND,EVLL,FTWY)

ENGINEER LOCHMUELLER GROUP
FILENAME: S:\PROJECTS\111-0117-OPD

MANNINGS n= 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)	PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)	TRAVEL TIME(MIN)
1.00	181	380.25	182	379.25	226.00	0.70	0.89	0.62	0.62	20.00	20.00	4.43	2.8	15	0.44	4.3	3.51	1.07
1.01	182	379.25	101	378.68	80.00	0.70	1.82	1.27	1.90	20.00	21.07	4.29	8.1	18	0.71	8.9	5.03	0.27
1.02	101	378.68	102	377.90	330.00	0.70	0.91	0.64	2.53	20.00	21.34	4.25	10.8	24	0.24	11.0	3.51	1.57
1.03	102	377.90	103	377.00	275.00	0.70	1.11	0.78	3.31	25.00	25.00	3.80	12.6	24	0.33	13.0	4.13	1.11
1.04	103	377.00	104	376.14	348.00	0.70	2.87	2.01	5.32	25.00	26.11	3.69	19.6	30	0.25	20.4	4.17	1.39
1.05	105	376.14	106	376.00	16.00	0.70	1.45	1.02	6.34	25.00	27.50	3.54	22.4	30	0.87	38.5	7.84	0.03

REVISED BY
8/15/2016
SUBMITTAL

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VANDERBURGH COUNTY
SURVEYOR'S OFFICE
8/9/16 CA

10 YEAR STORM SEWER DESIGN-RATIONAL METHOD

NTENSITY CURVES
YEAR : 10 Yr.
REGION : evll
',SBND,EVLL,FTWY)

PROJECT: HECKEL ROAD COMMERCIAL SUB RUN 1
ENGINEER: LOCHMUELLER GROUP
FILENAME: S:\PROJECTS\111-0117-OPD

DATE: 06/17/16
MANNINGS 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)		PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)	TRAVEL TIME(MIN)
1.00	100	380.25	101	379.44	170.00	0.70	1.40	0.98	0.98	30.00	30.00	5.84	5.7	15	^	0.48	4.5	3.64	0.78
1.01	101	379.44	102	378.80	134.00	0.70	1.30	0.91	1.89	30.00	30.78	5.84	11.0	18	^	0.48	7.3	4.12	0.54
1.02	102	378.80	103	377.88	331.00	0.70	1.00	0.70	2.59	25.00	31.32	5.84	15.1	21	^	0.28	8.4	3.48	1.58
1.03	103	377.88	104	377.10	275.00	0.70	2.00	1.40	3.99	25.00	32.90	5.84	23.3	24	^	0.28	12.1	3.85	1.19
1.04	104	377.10	105	375.20	348.00	0.70	2.10	1.47	5.46	25.00	34.10	5.84	31.9	24	^	0.55	16.8	5.34	1.09
1.05	105	375.20	106	375.10	16.00	0.70	1.30	0.91	6.37	25.00	35.18	5.84	37.2	24	^	0.62	17.9	5.71	0.05

10 YEAR STORM SEWER DESIGN-RATIONAL METHOD

NTENSITY CURVES
YEAR : 10 Yr.
REGION : evll
',SBND,EVLL,FTWY)

PROJECT: HECKEL ROAD COMMERCIAL SUBD. RUN 2
ENGINEER: LOCHMUELLER GROUP
FILENAME: S:\PROJECTS\107-0 1110117OPD

DATE: 06/17/16
MANNINGS 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)		PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)	TRAVEL TIME(MIN)
1.00	107	377.50	108	377.25	70.00	0.70	1.40	0.98	0.98	30.00	30.00	6.37	6.2	12	^	0.36	2.1	2.72	0.43
1.01	108	377.25	109	376.33	160.00	0.70	1.30	0.91	1.89	30.00	30.43	6.37	12.0	12	^	0.58	2.7	3.45	0.77
1.02	109	376.33	110	375.00	233.00	0.70	1.00	0.70	2.59	25.00	31.20	6.37	16.5	15	^	0.57	4.9	3.99	0.97
1.03	110	375.00	111	374.95	2.00	0.70	2.00	1.40	3.99	25.00	32.18	6.37	25.4	15	^	2.50	10.2	8.35	0.00

10 YEAR STORM SEWER DESIGN-RATIONAL METHOD

AINFALL INTENSITY CURVES
YEAR : 10 Yr.
REGION : evll
(INDY,SBND,EVLL,FTWY)

PROJECT: HECKEL ROAD COMMERCIAL SUBD. RUN 3
ENGINEER LOCHMUELLER GROUP
FILENAME: S:\PROJEC T 1110117OPD

DATE: 06/17/16
MANNINGS n= 0.013

STORM SEWER DESIGN TEMPLATE-ENGLISH UNITS

LINE NUMBER	UPSTREAM MANHOLE	UPSTREAM INVERT	DOWNSTREAM MANHOLE	DOWNSTREAM INVERT	LENGTH (FT)	C	A (ACRES)	CxA	SUM CxA	Local Tc (MIN)	Tc(cum) (MIN)	I (IN/HR)	Q (CFS)	PIPE DIA. (INCHES)		PIPE SLOPE	PIPE CAPACITY	VELOCITY (FT/SEC)	TRAVEL TIME(MIN)
-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	---	-	-	-	-
1.00	111	380.00	112	379.66	26.00	0.70	0.50	0.35	0.35	25.00	25.00	6.37	2.2	12		1.31	4.1	5.20	0.08
1.01	112	379.66	113	378.91	51.00	0.70	1.00	0.70	1.05	25.00	25.08	6.37	6.7	12	^	1.47	4.3	5.52	0.15
1.02	113	378.91	114	375.93	224.00	0.70	1.00	0.70	1.75	25.00	25.24	6.37	11.1	15	^	1.33	7.5	6.09	0.61
1.03	114	375.93	0	0.00	0.00	0.70		0.00	1.75	25.00	25.85	6.37	11.1	15	###	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!

APPENDIX C

PREVIOUSLY APPROVED FINAL STORM DRAINAGE ANALYSIS

FINAL
STORM DRAINAGE ANALYSIS

HECKEL ROAD COMMERCIAL SUBDIVISION

Located along North Green River Road
at the Intersection of N. Green River Road and Heckel Road
Evansville, Indiana
BLA Project No.: 111-0117-0PD

Prepared for:

JJ Brodi, LLC
James R. Johnston, Partner
1555 122nd Street
Ocean Marathon, Florida 33050

By:

Bernardin • Lochmueller & Associates, Inc.
6200 Vogel Road, Evansville, Indiana 47715
812-479-6200

January 16, 2012

INTRODUCTION

The proposed commercial subdivision is to be constructed along the North Green River Road corridor at the northwest quadrant of the intersection of North Green River Road and Heckel Road in Evansville, Indiana. The easterly portion of this subject area is known as Heckel Road Commercial Subdivision. Much of the storm water storage will take place west of the proposed subdivision on additional land owned by the same entity that is developing the subdivision.

The site lies directly south of the City of Evansville's Goebel Soccer Complex within the Firlick Creek watershed. Firlick Creek is a tributary to Bluegrass Creek and Pigeon Creek that, combined, have a very large flood plain. The subdivision in particular lies in a Zone AE area that has an established 100 year Base Flood Elevation (BFE) of 384.00. Consequently, any structures built within this subdivision will need to have finish floor elevations in excess of 386.00.

This site lies adjacent to the recently reconstructed North Green River Road which was elevated using material from a borrow pit located on this site immediately west of the proposed subdivision. Borrow material for the pit construction was also placed on the lots within the subdivision in order to elevate them and make them more 'pad ready' in anticipation of development.

This pit/lake is large enough to serve as a retention basin for the surrounding area, including the proposed subdivision.

This drainage report will address the storm detention requirements for this proposed development in accordance with the current Vanderburgh County Drainage Ordinance. This ordinance states that a 10 year undeveloped condition should be compared to a 25 year developed condition and the quantitative difference in runoff experienced under these conditions shall be temporarily detained onsite in a retention or detention basin. We will also determine the necessary 50 year and 100 year developed condition storm to insure the lake also

has capacity to serve the general area.

The lake, because of its large surface area and relatively flat shore line, will accommodate a tremendous amount of water due to its ability to spread its surface area significantly with very little rise in the pond elevation.

To be conservative, we will assume that from the base pool surface elevation future bank slopes will be constructed at a 4:1 slope so as to increase the amount of developable area around the pond and to limit the horizontal spread versus vertical rise in the pond during a storm event. By making this assumption, the available pond storage area will produce a conservative value.

Several years ago the north/south road that runs through the subdivision was constructed along with the construction of storm drainage that drains the road today. This same storm sewers with some modifications and additions will serve to redirect the storm water from the development to the newly constructed pond.

METHOD

The Rational Method (Q = cia) will be used for the drainage area to compute the 10 year undeveloped flows. The undeveloped flow from the subdivision portion of the larger watershed will be used as the allowable outflow rates for the developed site, controlled through a low flow outlet pipe. A dual stage outlet will be constructed so that only minor modifications to the retention basin outlet structure will be necessary once additional area is developed.

"c" = Runoff Coefficient (undeveloped) - The existing land slopes from south to north. The soils are silt loams, silty clay loams and silty clays. The area is currently dormant but is sometimes cropped. Table 3.2.1 of the HERPICC Stormwater Drainage Manual suggests an undeveloped runoff coefficient of 0.50 be used for clay and silty loams on flat terrain.

"c" = Developed (runoff coefficient) - In addition, a developed runoff coefficient of 0.70 will

be used on the proposed land use. This value is taken from Table 3.2.2 HERPICC Stormwater Drainage Manual and is representative of a neighborhood business development or light industrial use.

"I" = Intensity - Kerby=s Formula will be used to determine the Time of Concentration for the undeveloped site and the corresponding 10 year intensity will be calculated. For the area flowing from the south to north a value of 24 minutes will be used. The resulting 10 year intensity is 3.30 (see Appendix "B").

"a" = Area - The contributory area flowing into each basin from the proposed subdivision is 18.58 acres.

To the product of the developed "c" value and the area "a", a range of intensity values for different duration storms having a 25 year and 100 year specified return rate will be multiplied to compute expected inflow rates.

The difference between the inflow rates and outflow rates for each interval will establish the required storage for that interval. From this data a curve can be generated and the peak or largest value attained will be used as the required storage basin capacity.

The existing basin (borrow pit) will provide for the necessary storm water storage. The outflow for each basin will be sized to limit the outflow from this increased runoff. A dual stage outlet will make this outlet control structure more flexible at such time additional development is undertaken. A summary of the allowable outflow rates are as follows:

- The allowable outflow rate calculated for the lake based on the planned contributory area of 18.58 acres is 31 CFS (refer to input/output data sheets in *Appendix C Storage Volume Data*. This release rate of 31 CFS yielded very little storage requirement. Downstream

from this lake is an access road with a 24 inch diameter culvert placed beneath the road to drain this entire area. This pipe will have limited flow capability that will be in the range of 20 to 25 CFS. In order to take advantage of the storage that could easily be accommodated in the lake, the inflow/outflow was rerun using reduced outflows of 12± CFS and 23± CFS, attainable by downsizing the outfall to 18 inch and 24 inch pipes, respectively.

- The resulting storage requirements for the 25 year storm based on various outflow rates was calculated as shown in *Appendix C Storage Volume Data*
- are listed as follows:

Outflow Release Rate	25 Year Storm	100 Year Storm
12 CFS	(1.30 ac/ft)(56,678 cu.ft.)	(2.07 ac/ft)(90,013 cu.ft.)
23 CFS	(0.96 ac/ft) (41,903 cu.ft.)	(1.41 ac/ft)(61,532 cu.ft.)
31 CFS	(0.77 ac/ft) (33,723 cu.ft.)	(1.18 ac/ft)(51,350 cu.ft.)

- The lake shall be constructed as shown in *Appendix E Basin Volumes* providing the storage listed thereon. The lake can provide the required storage with only a few inches rise in the lake.

- The lake should be fenced or the edge reworked such that there is the approved slope no more than 6:1 and a marine safety ledge having a minimum width of 4 feet, no deeper than 24 inch below the permanent pool. In addition, signs suggesting no trespassing should be posted around the lake.

RESULTS

A summary of the Results is as follows:

- The available storage in the basin from elevation 376.00 to 377.00 is 518,921 cubic feet (See Appendix E).

- The required 25 year storage based on the minimum 12 cfs, allowable outflow is 56,678 cubic feet and 100 year storage is 90,013 cubic feet. The available storage far exceeds these requirements less than one foot of rise. The allowable 10 year outflow rate used to arrive at the required storage rates is 31 cfs (much higher than the 12 cfs used as a minimum in this report. The allowable outflow rate and storage requirements were derived as shown in Appendix C. A dual stage outlet control structure is recommended with the primary 12 inch diameter outlet pipe set at 376.00 and the secondary outlet control being through a casting set in the top of the structure being set at the required height of 18" above the primary outlet pipe, which exceeds the head necessary to attain the maximum allowable outlet flow and is also far above the stormwater storage elevation necessary to achieve the required storage. Based on the basin geometry the required volume of 56,678 cubic feet will be reached when the ponding water elevation rises only several inches.

SUMMARY

The developer will assume maintenance of the proposed facilities. Proper implementation of the drainage plan outlined herein represents a workable plan for this site. The lake will serve as an effective way to reduce the release rate of storm water during times when the downstream confluence of this tributary to Pigeon Creek is not in a high flood/backwater condition. During these high backwater stages, much of the overall area is inundated and the fact that the lake, too, will be inundated should not matter for the stormwater generated from this site alone will not have any measurable effect on the overall rise in water level caused from the Pigeon Creek backwater.

APPENDICES INDEX

Appendix A	-	Drainage Plan
Appendix B	-	Time of Concentration/Intensity
Appendix C	-	Storage Volume Data
Appendix D	-	Outlet Control Structure Analysis
Appendix E	-	Basin Volumes

(Oversized pages included as the last pages of this document)

Appendix "A"

DRAINAGE PLAN

Appendix "B"

TIME OF CONCENTRATION / INTENSITY

TIME OF CONCENTRATION

FLAT SHEET FLOW (Kirby's Formula)

$$TC = .827 \left[\frac{(N)(L)}{\sqrt{S}} \right]^{.467}$$

N = 0.2 Coefficient Pasture/Grass (new crops or med. Rough bare surface)
L = Length = 700'
H = 382 – 375 = 7'
S = Slope = .01

$$TC = .827 \left[\frac{(0.2)(700)}{\sqrt{0.01}} \right]^{.467} = 24.36 \text{ minutes} \cong 24 \text{ minutes}$$

INTENSITY

$$i_{10} = \frac{C(T)^{\alpha}}{(Tc+d)^{\beta}}$$

Factors for Evansville / Newburgh Area

C = 1.9533 T = duration
α = 0.1747 Tc = Time of Concentration (10 yr. undeveloped)
d = 0.522
β = 1.6408

$$i_{10} = \frac{1.9533(10)^{0.1747}}{(24.36/60+0.522)^{1.6408}} = i_{10} = \frac{2.9206}{0.8846} = 3.30$$

Appendix "C"

STORAGE VOLUME DATA

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	67.35		
RAINFALL INTENSITY (INCHES/HR):	0.00	1.291221	1.4258021
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	12.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

25 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	7.88	102.51	12.00	90.52	0.603
0.17	6.27	81.56	12.00	69.57	0.986
0.25	5.24	68.16	12.00	56.16	1.170
0.33	4.46	57.98	12.00	45.98	1.265
0.42	3.78	49.17	12.00	37.18	1.301
0.50	3.31	43.02	12.00	31.02	1.293
0.58	2.92	38.01	12.00	26.02	1.257
0.67	2.57	33.42	12.00	21.42	1.196
0.75	2.31	30.04	12.00	18.04	1.128
0.83	2.09	27.18	12.00	15.18	1.050
0.92	1.88	24.45	12.00	12.46	0.955
1.00	1.72	22.38	13.25	9.13	0.761
1.25	1.88	24.50	13.25	11.26	1.173
1.50	1.67	21.69	13.25	8.44	1.055
1.75	1.50	19.51	13.25	6.26	0.913
2.00	1.37	17.76	13.25	4.51	0.752
2.50	1.16	15.13	13.25	1.88	0.392
3.00	1.02	13.23	13.25	-0.01	-0.004
4.00	0.82	10.66	13.25	-2.58	-0.861
6.00	0.60	7.81	13.25	-5.44	-2.718
10.00	0.40	5.23	13.25	-8.02	-6.679

STORAGE (ACRE/FT):	1.30	
STORAGE (CUBIC FT):	56,678.04	

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	67.35		
RAINFALL INTENSITY (INCHES/HR):	0.00	1.291221	1.4258021
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	12.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

100 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	10.04	130.60	12.00	118.61	0.791
0.17	7.99	103.91	12.00	91.92	1.302
0.25	6.68	86.84	12.00	74.84	1.559
0.33	5.68	73.87	12.00	61.87	1.701
0.42	4.82	62.65	12.00	50.65	1.773
0.50	4.21	54.80	12.00	42.81	1.784
0.58	3.72	48.43	12.00	36.43	1.761
0.67	3.27	42.58	12.00	30.58	1.707
0.75	2.94	38.27	12.00	26.28	1.642
0.83	2.66	34.63	12.00	22.63	1.565
0.92	2.40	31.15	12.00	19.16	1.469
1.00	2.19	28.51	13.25	15.26	1.272
1.25	2.54	33.08	13.25	19.84	2.066
1.50	2.25	29.29	13.25	16.04	2.005
1.75	2.03	26.34	13.25	13.09	1.909
2.00	1.84	23.98	13.25	10.73	1.789
2.50	1.57	20.43	13.25	7.18	1.496
3.00	1.37	17.87	13.25	4.62	1.155
4.00	1.11	14.40	13.25	1.15	0.384
6.00	0.81	10.54	13.25	-2.70	-1.351
10.00	0.54	7.06	13.25	-6.18	-5.153

STORAGE (ACRE/FT):	2.07
STORAGE (CUBIC FT):	90,012.97

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

RELEASE RATE PERIOD:	5\10\25\100		
	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	67.35		
RAINFALL INTENSITY (INCHES/HR):	0.00	1.291221	1.4258021
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	12.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

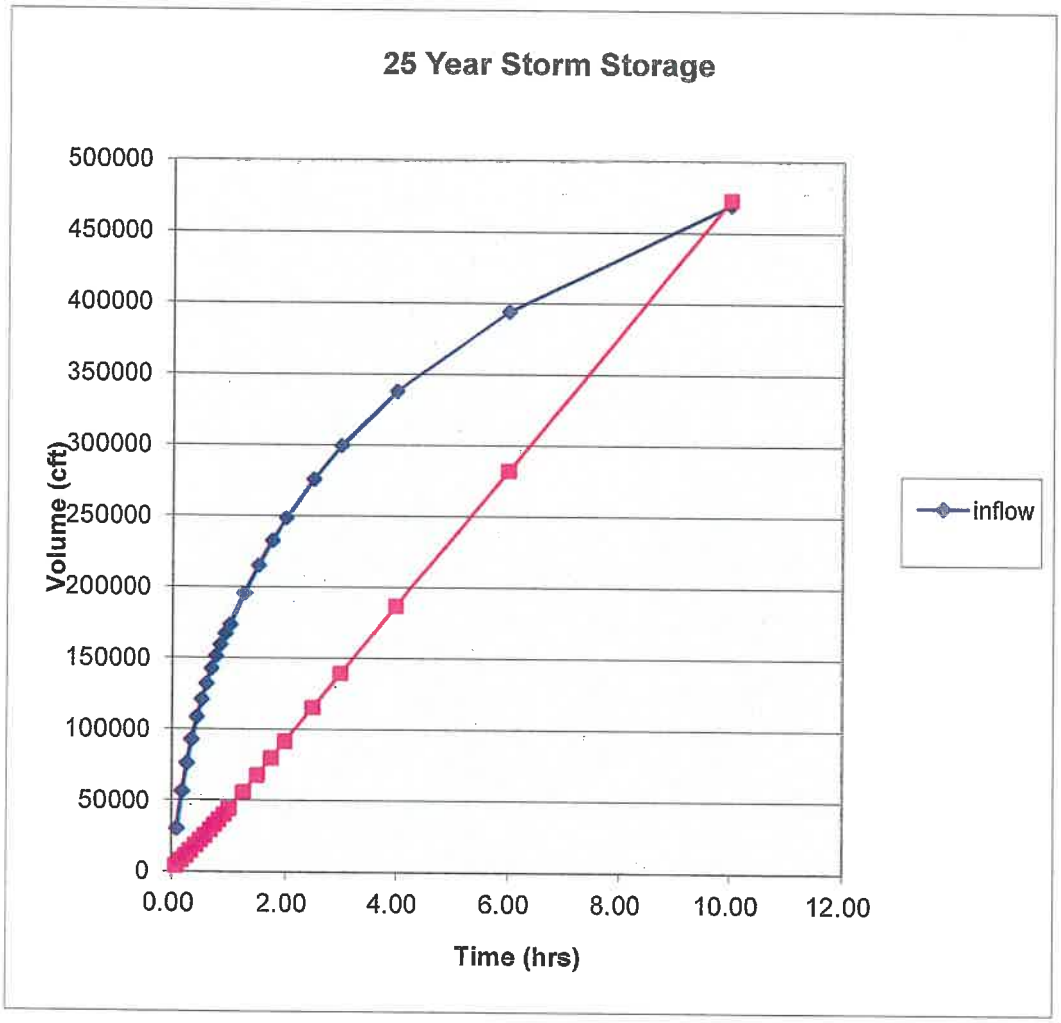
50 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.90	115.71	12.00	103.71	0.691
0.17	7.08	92.06	12.00	80.07	1.134
0.25	5.92	76.93	12.00	64.94	1.353
0.33	5.03	65.44	12.00	53.45	1.470
0.42	4.27	55.50	12.00	43.51	1.523
0.50	3.73	48.55	12.00	36.56	1.523
0.58	3.30	42.91	12.00	30.91	1.494
0.67	2.90	37.72	12.00	25.72	1.436
0.75	2.61	33.91	12.00	21.91	1.369
0.83	2.36	30.68	12.00	18.68	1.292
0.92	2.12	27.60	12.00	15.60	1.196
1.00	1.94	25.26	13.25	12.01	1.001
1.25	2.19	28.47	13.25	15.23	1.586
1.50	1.94	25.20	13.25	11.96	1.495
1.75	1.74	22.67	13.25	9.42	1.374
2.00	1.59	20.64	13.25	7.39	1.232
2.50	1.35	17.58	13.25	4.33	0.903
3.00	1.18	15.37	13.25	2.13	0.532
4.00	0.95	12.39	13.25	-0.86	-0.285
6.00	0.70	9.07	13.25	-4.17	-2.086
10.00	0.47	6.08	13.25	-7.17	-5.973

PEAK STORAGE (ACRE/FT):	1.59
PEAK STORAGE (CUBIC FT):	69,085.57

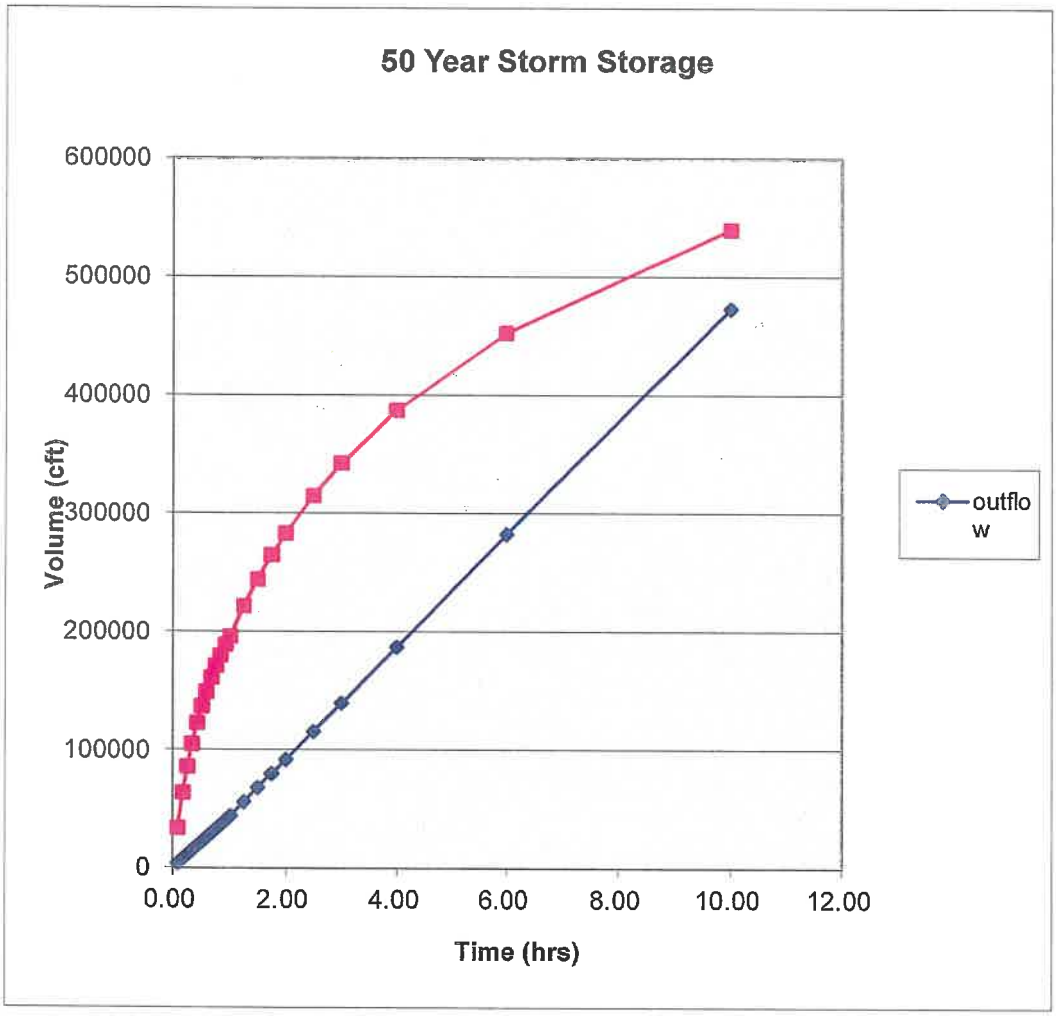
PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	67.35		
RAINFALL INTENSITY (INCHES/HR):	0.00	1.291221	1.4258021
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	12.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



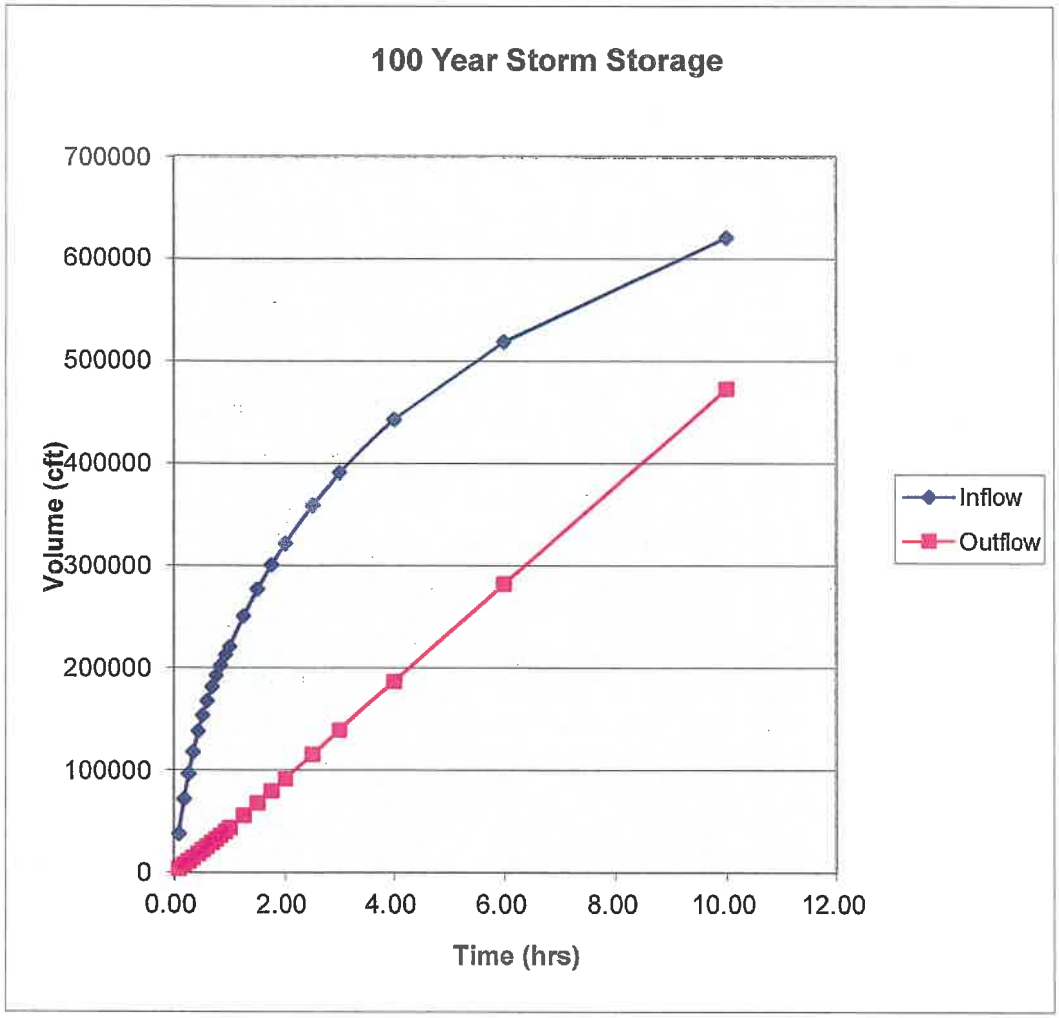
PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	67.35		
RAINFALL INTENSITY (INCHES/HR):	0.00	1.291221	1.4258021
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	12.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	67.35		
RAINFALL INTENSITY (INCHES/HR):	0.00	1.291221	1.4258021
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	12.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	35.04		
RAINFALL INTENSITY (INCHES/HR):	0.00	2.475572	2.1014588
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	23.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

25 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	7.88	102.51	23.00	79.51	0.530
0.17	6.27	81.56	23.00	58.56	0.830
0.25	5.24	68.16	23.00	45.16	0.941
0.33	4.46	57.98	23.00	34.98	0.962
0.42	3.78	49.17	23.00	26.17	0.916
0.50	3.31	43.02	23.00	20.02	0.834
0.58	2.92	38.01	23.00	15.01	0.726
0.67	2.57	33.42	23.00	10.42	0.582
0.75	2.31	30.04	23.00	7.04	0.440
0.83	2.09	27.18	23.00	4.18	0.289
0.92	1.88	24.45	23.00	1.45	0.111
1.00	1.72	22.38	19.52	2.86	0.238
1.25	1.88	24.50	19.52	4.98	0.519
1.50	1.67	21.69	19.52	2.17	0.271
1.75	1.50	19.51	19.52	-0.02	-0.002
2.00	1.37	17.76	19.52	-1.76	-0.294
2.50	1.16	15.13	19.52	-4.39	-0.915
3.00	1.02	13.23	19.52	-6.29	-1.573
4.00	0.82	10.66	19.52	-8.86	-2.953
6.00	0.60	7.81	19.52	-11.71	-5.857
10.00	0.40	5.23	19.52	-14.29	-11.910

STORAGE (ACRE/FT):	0.96
STORAGE (CUBIC FT):	41,903.16

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	35.04		
RAINFALL INTENSITY (INCHES/HR):	0.00	2.475572	2.1014588
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	23.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

100 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	10.04	130.60	23.00	107.60	0.717
0.17	7.99	103.91	23.00	80.91	1.146
0.25	6.68	86.84	23.00	63.84	1.330
0.33	5.68	73.87	23.00	50.87	1.399
0.42	4.82	62.65	23.00	39.65	1.388
0.50	4.21	54.80	23.00	31.81	1.325
0.58	3.72	48.43	23.00	25.43	1.229
0.67	3.27	42.58	23.00	19.58	1.093
0.75	2.94	38.27	23.00	15.27	0.955
0.83	2.66	34.63	23.00	11.63	0.804
0.92	2.40	31.15	23.00	8.15	0.625
1.00	2.19	28.51	19.52	8.99	0.749
1.25	2.54	33.08	19.52	13.56	1.413
1.50	2.25	29.29	19.52	9.76	1.220
1.75	2.03	26.34	19.52	6.82	0.994
2.00	1.84	23.98	19.52	4.46	0.743
2.50	1.57	20.43	19.52	0.90	0.188
3.00	1.37	17.87	19.52	-1.66	-0.414
4.00	1.11	14.40	19.52	-5.13	-1.708
6.00	0.81	10.54	19.52	-8.98	-4.489
10.00	0.54	7.06	19.52	-12.46	-10.384

STORAGE (ACRE/FT): 1.41
STORAGE (CUBIC FT): 61,531.76

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	35.04		
RAINFALL INTENSITY (INCHES/HR):	0.00	2.475572	2.1014588
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	23.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

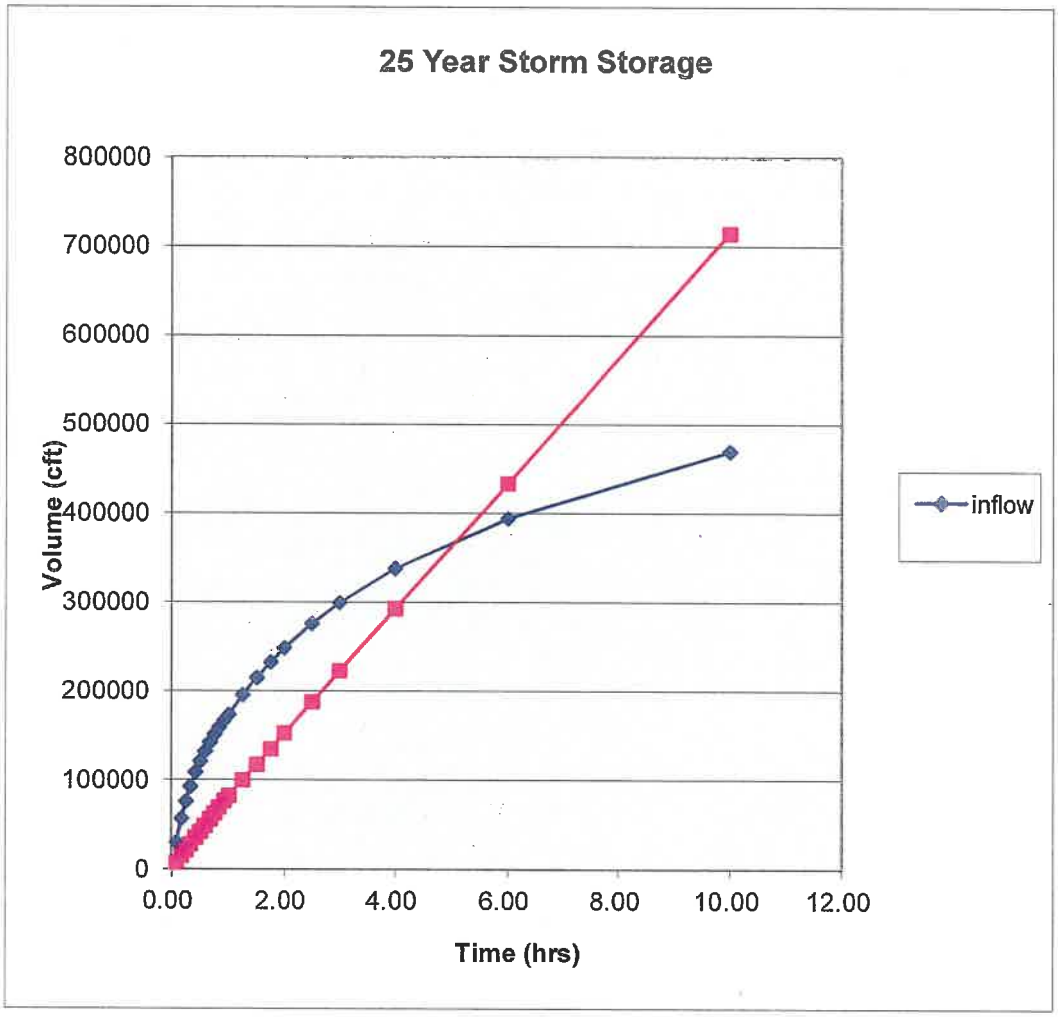
50 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.90	115.71	23.00	92.71	0.618
0.17	7.08	92.06	23.00	69.06	0.978
0.25	5.92	76.93	23.00	53.94	1.124
0.33	5.03	65.44	23.00	42.44	1.167
0.42	4.27	55.50	23.00	32.50	1.138
0.50	3.73	48.55	23.00	25.55	1.065
0.58	3.30	42.91	23.00	19.91	0.962
0.67	2.90	37.72	23.00	14.72	0.822
0.75	2.61	33.91	23.00	10.91	0.682
0.83	2.36	30.68	23.00	7.68	0.531
0.92	2.12	27.60	23.00	4.60	0.353
1.00	1.94	25.26	19.52	5.74	0.478
1.25	2.19	28.47	19.52	8.95	0.932
1.50	1.94	25.20	19.52	5.68	0.710
1.75	1.74	22.67	19.52	3.14	0.459
2.00	1.59	20.64	19.52	1.11	0.186
2.50	1.35	17.58	19.52	-1.94	-0.405
3.00	1.18	15.37	19.52	-4.15	-1.037
4.00	0.95	12.39	19.52	-7.13	-2.378
6.00	0.70	9.07	19.52	-10.45	-5.224
10.00	0.47	6.08	19.52	-13.44	-11.204

PEAK STORAGE (ACRE/FT):	1.17
PEAK STORAGE (CUBIC FT):	50,843.76

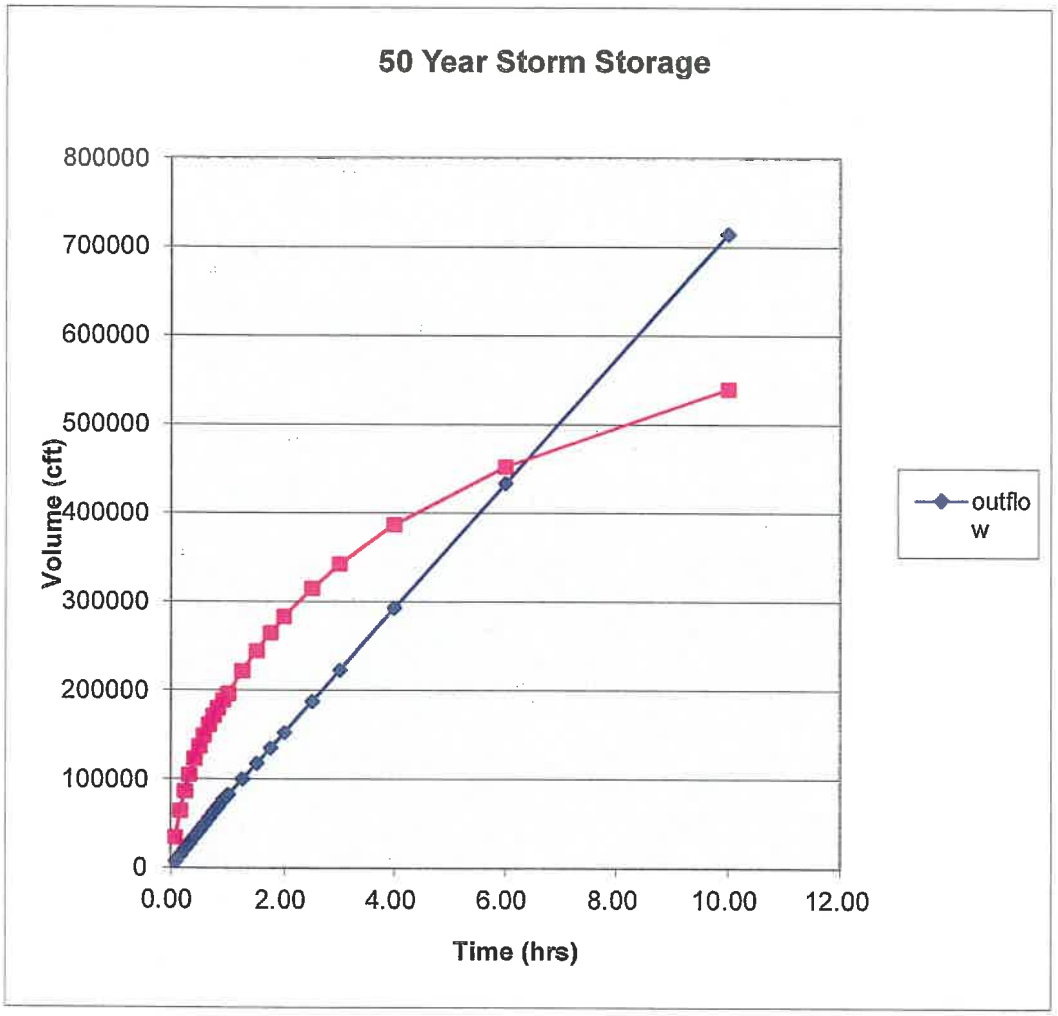
PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	35.04		
RAINFALL INTENSITY (INCHES/HR):	0.00	2.475572	2.1014588
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	23.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



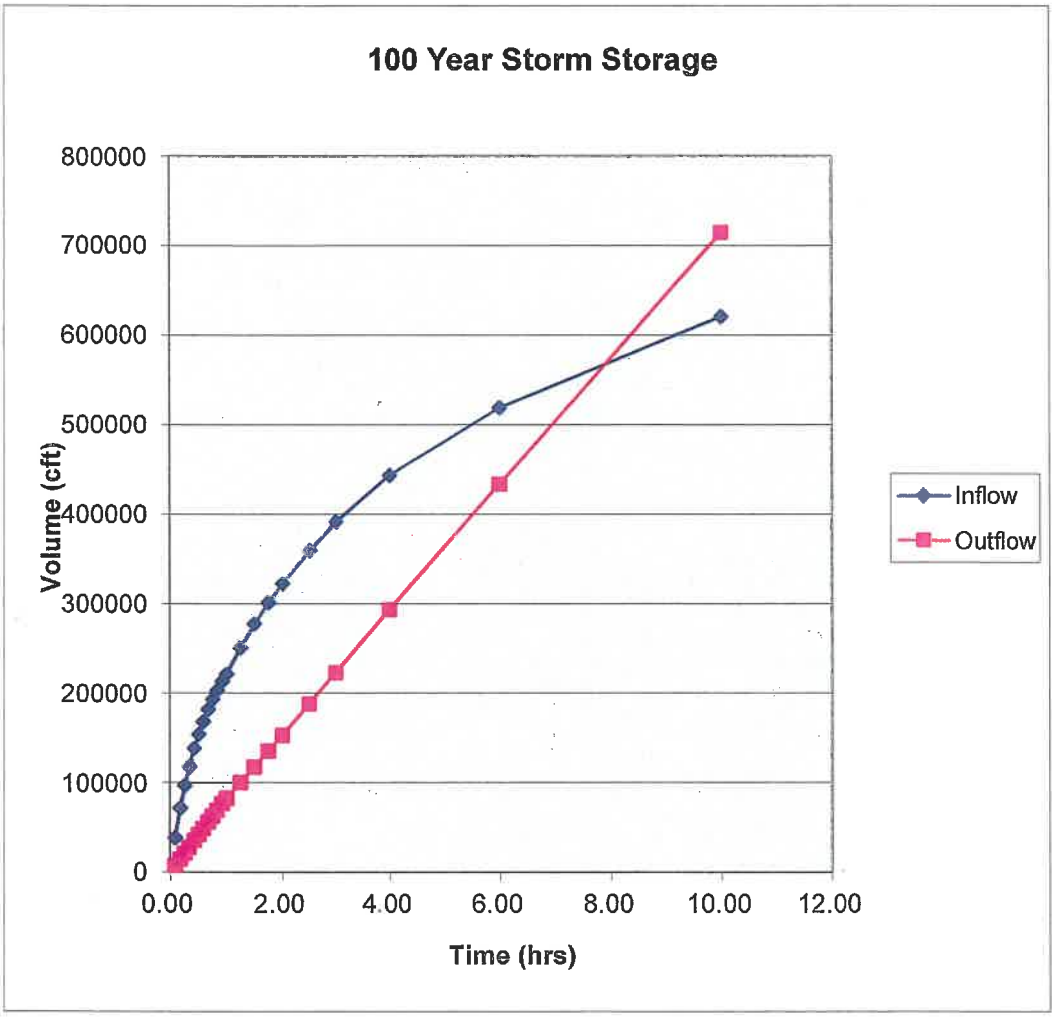
PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	35.04		
RAINFALL INTENSITY (INCHES/HR):	0.00	2.475572	2.1014588
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	23.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	35.04		
RAINFALL INTENSITY (INCHES/HR):	0.00	2.475572	2.1014588
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	23.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	24		
RAINFALL INTENSITY (INCHES/HR):	0.00	3.336864	2.541939
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	31.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

25 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	7.88	102.51	31.00	71.51	0.477
0.17	6.27	81.56	31.00	50.56	0.716
0.25	5.24	68.16	31.00	37.16	0.774
0.33	4.46	57.98	31.00	26.98	0.742
0.42	3.78	49.17	31.00	18.17	0.636
0.50	3.31	43.02	31.00	12.02	0.501
0.58	2.92	38.01	31.00	7.01	0.339
0.67	2.57	33.42	31.00	2.42	0.135
0.75	2.31	30.04	31.00	-0.96	-0.060
0.83	2.09	27.18	31.00	-3.82	-0.264
0.92	1.88	24.45	31.00	-6.55	-0.502
1.00	1.72	22.38	23.61	-1.24	-0.103
1.25	1.88	24.50	23.61	0.89	0.092
1.50	1.67	21.69	23.61	-1.93	-0.241
1.75	1.50	19.51	23.61	-4.11	-0.599
2.00	1.37	17.76	23.61	-5.85	-0.976
2.50	1.16	15.13	23.61	-8.49	-1.768
3.00	1.02	13.23	23.61	-10.38	-2.596
4.00	0.82	10.66	23.61	-12.95	-4.317
6.00	0.60	7.81	23.61	-15.81	-7.903
10.00	0.40	5.23	23.61	-18.38	-15.320

STORAGE (ACRE/FT):	0.77
STORAGE (CUBIC FT):	33,723.30

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	24		
RAINFALL INTENSITY (INCHES/HR):	0.00	3.336864	2.541939
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	31.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

100 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	10.04	130.60	31.00	99.60	0.664
0.17	7.99	103.91	31.00	72.91	1.033
0.25	6.68	86.84	31.00	55.84	1.163
0.33	5.68	73.87	31.00	42.87	1.179
0.42	4.82	62.65	31.00	31.65	1.108
0.50	4.21	54.80	31.00	23.80	0.992
0.58	3.72	48.43	31.00	17.43	0.842
0.67	3.27	42.58	31.00	11.58	0.646
0.75	2.94	38.27	31.00	7.27	0.454
0.83	2.66	34.63	31.00	3.63	0.251
0.92	2.40	31.15	31.00	0.15	0.012
1.00	2.19	28.51	23.61	4.90	0.408
1.25	2.54	33.08	23.61	9.47	0.986
1.50	2.25	29.29	23.61	5.67	0.709
1.75	2.03	26.34	23.61	2.72	0.397
2.00	1.84	23.98	23.61	0.37	0.061
2.50	1.57	20.43	23.61	-3.19	-0.664
3.00	1.37	17.87	23.61	-5.75	-1.437
4.00	1.11	14.40	23.61	-9.22	-3.073
6.00	0.81	10.54	23.61	-13.07	-6.535
10.00	0.54	7.06	23.61	-16.55	-13.794

STORAGE (ACRE/FT): 1.18
STORAGE (CUBIC FT): 51,350.40

PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	24		
RAINFALL INTENSITY (INCHES/HR):	0.00	3.336864	2.541939
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	31.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		

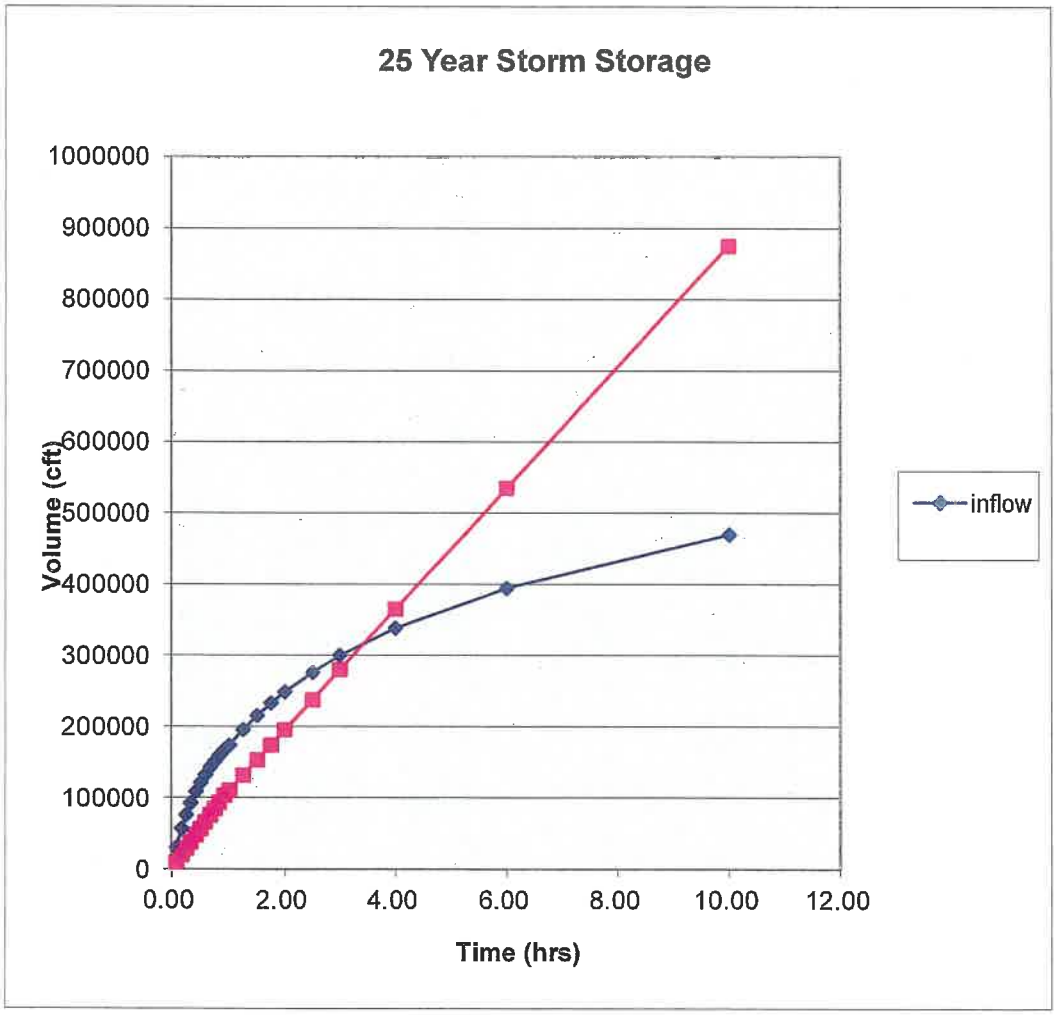
50 Year Storm

STORM DURATION (HRS)	RAINFALL INTENSITY (INCH/HR)	INFLOW RATE (CFS)	OUTFLOW RATE (CFS)	STORAGE RATE (CFS)	REQUIRED STORAGE (ACRE-FT)
0.08	8.90	115.71	31.00	84.71	0.565
0.17	7.08	92.06	31.00	61.06	0.865
0.25	5.92	76.93	31.00	45.93	0.957
0.33	5.03	65.44	31.00	34.44	0.947
0.42	4.27	55.50	31.00	24.50	0.858
0.50	3.73	48.55	31.00	17.55	0.731
0.58	3.30	42.91	31.00	11.91	0.575
0.67	2.90	37.72	31.00	6.72	0.375
0.75	2.61	33.91	31.00	2.91	0.182
0.83	2.36	30.68	31.00	-0.32	-0.022
0.92	2.12	27.60	31.00	-3.40	-0.261
1.00	1.94	25.26	23.61	1.64	0.137
1.25	2.19	28.47	23.61	4.86	0.506
1.50	1.94	25.20	23.61	1.59	0.199
1.75	1.74	22.67	23.61	-0.95	-0.138
2.00	1.59	20.64	23.61	-2.98	-0.496
2.50	1.35	17.58	23.61	-6.04	-1.257
3.00	1.18	15.37	23.61	-8.24	-2.060
4.00	0.95	12.39	23.61	-11.22	-3.742
6.00	0.70	9.07	23.61	-14.54	-7.270
10.00	0.47	6.08	23.61	-17.54	-14.614

PEAK STORAGE (ACRE/FT):	0.96
PEAK STORAGE (CUBIC FT):	41,685.91

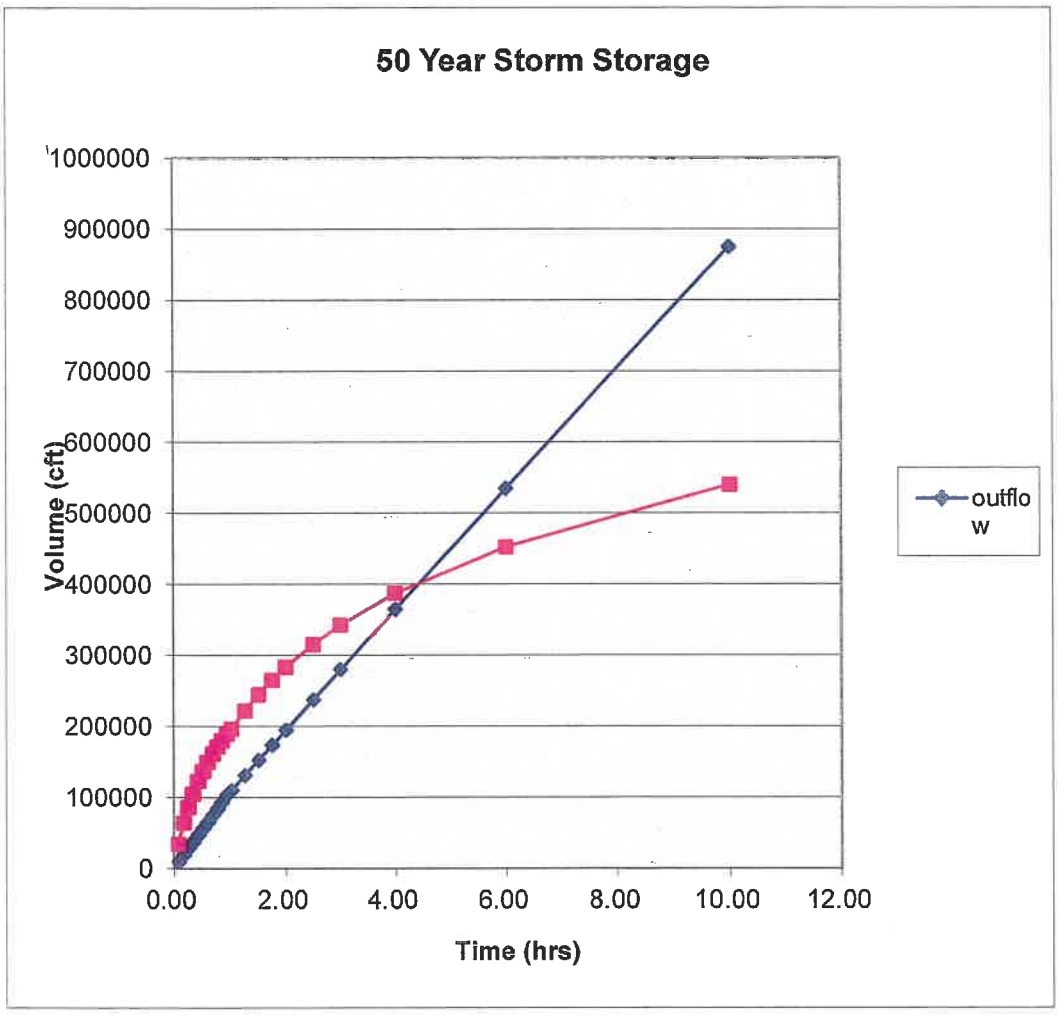
PROJECT:	Heckel Road Commercial Subdi	DATE:	12/07/11
ENGINEER:	BERNARDIN, LOCHMUELLER & ASSOCIATES		

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	24		
RAINFALL INTENSITY (INCHES/HR):	0.00	3.336864	2.541939
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	31.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



PROJECT: Heckel Road Commercial Subdi DATE: 12/07/11
ENGINEER: BERNARDIN, LOCHMUELLER & ASSOCIATES

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
TIME OF CONCENTRATION UNDEV. (min):	24		
RAINFALL INTENSITY (INCHES/HR):	0.00	3.336864	2.541939
UNDEVELOPED RUNOFF COEFFICIENT:	0.50		
UNDEVELOPED RUNOFF RATE (CFS):	31.00		
DEVELOPED RUNOFF COEFFICIENT:	0.7		



PROJECT:	Heckel Road Commercial Subdi		DATE:	12/07/11
ENGINEER:	BERNARDIN, LOCHMUELLER & ASSOCIATES			

	5\10\25\100		
RELEASE RATE PERIOD:	5\10\25\100		
WATERSHED AREA (ACRES):	18.58		
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UNDEVELOPED RUNOFF RATE (CFS):	31.00		
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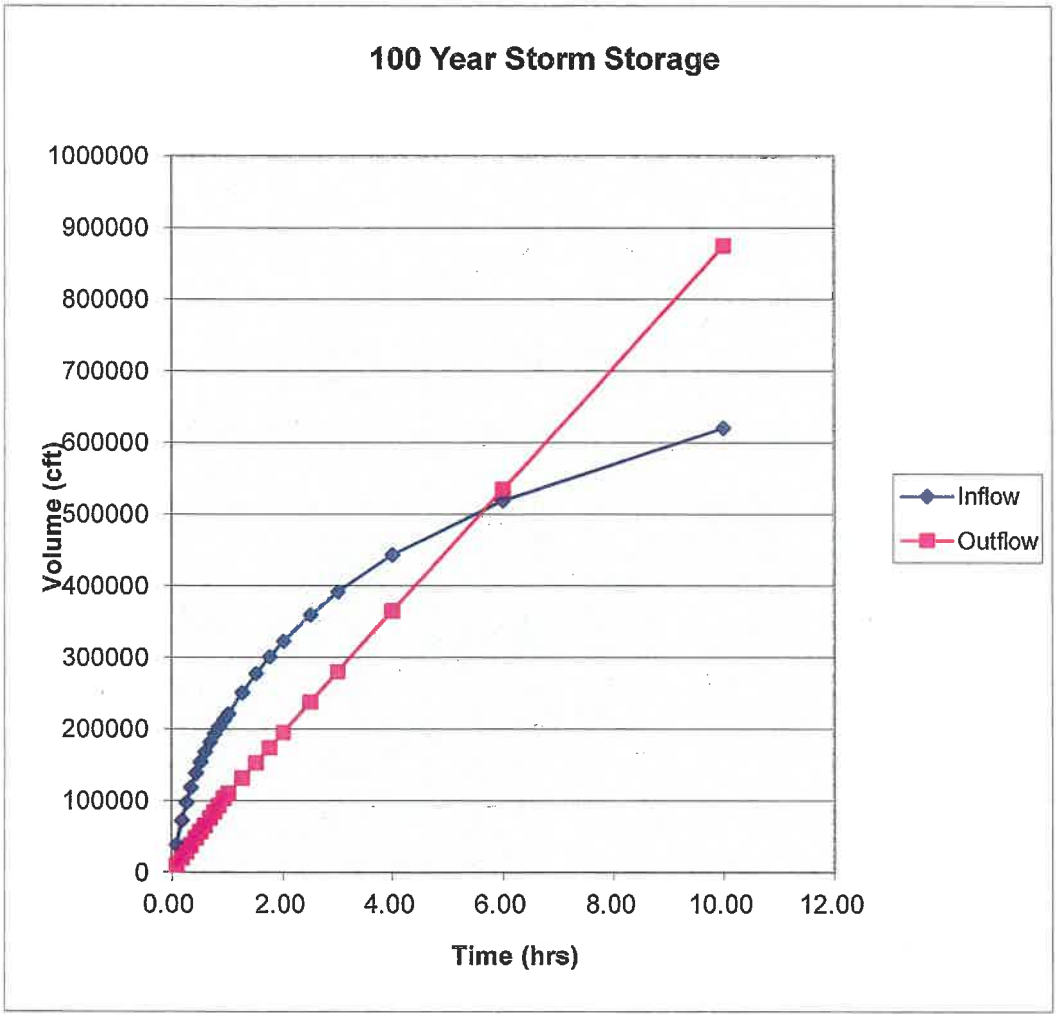


Appendix "D"

OUTLET CONTROL STRUCTURE ANALYSIS

APPENDIX "D"

OUTLET CONTROL STRUCTURE

ORIFICE EQUATION

Primary Outlet Sizing – East Basin

cd = Cc x Cv = (.62)(.97) = .60

$Q = cdA\ \sqrt{2gh}$

Allowable Outflow Q = cia = (0.36)(3.05)(9.80) = 10.76 cfs + (9 cfs pass through from north)

c = 0.50
I = 1.29
a = 18.58 acres

Allowable HW = Top Box to invert of Pipe – 375.00 – 379.00 = 4.0

$(12.00) = Q = (.60)(A)\ \sqrt{2(32.2)(4.0)}$ $\qquad$ $(.6)(A)(16.05) = 12$

$A = 0.80$

$A = \frac{9.63}{12} = \frac{\pi d^2}{4}$

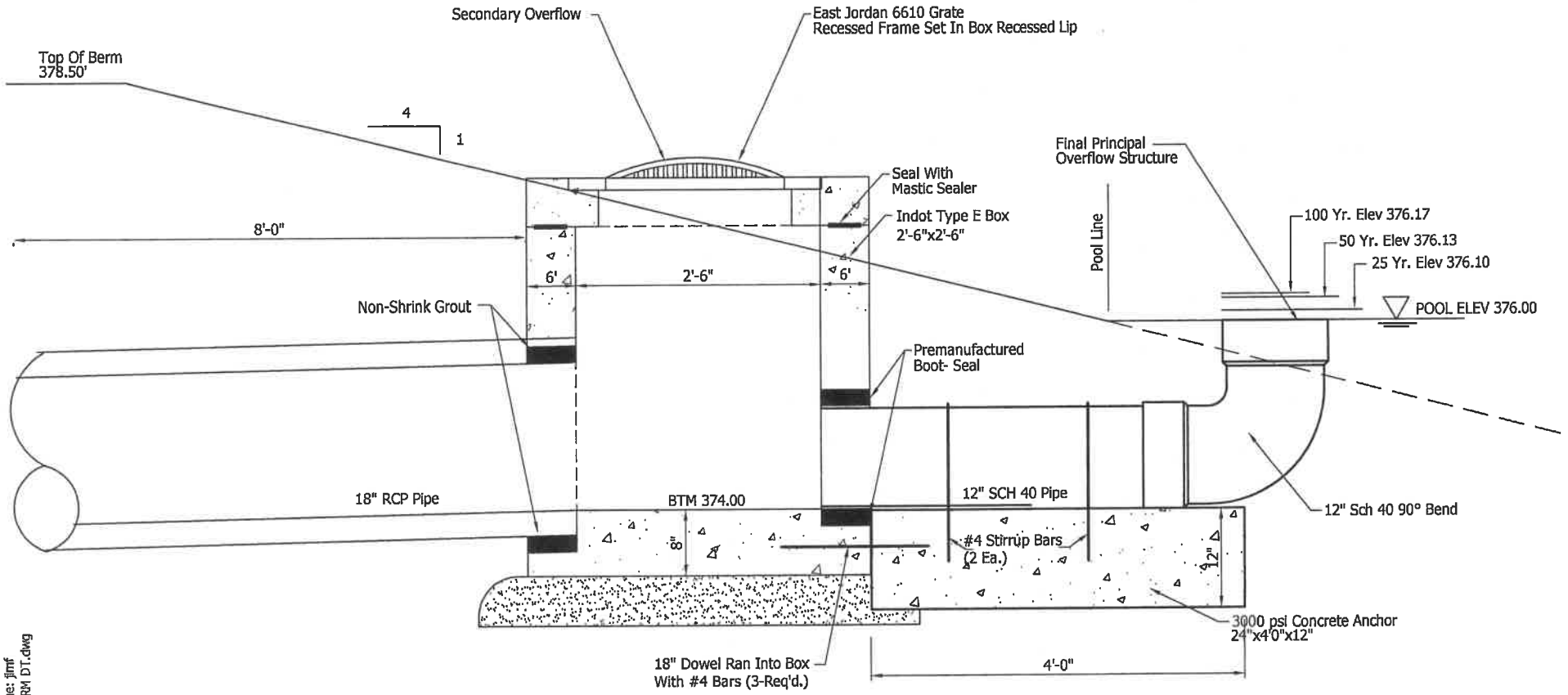
$d = 1.01'$

Use a 12 inch diameter outlet pipe $\qquad 12" = \pi\ (.5)^2 = 1.01$

The lake will have to rise 4 feet for 12" pipe to pass 12 cfs.
Therefore, primary outlet pipe restriction is more than required
or much more conservative than required.

Appendix "E"

BASIN VOLUMES



OUTLET CONTROL STRUCTURE

NTS

Date: Jun 26, 2014, 11:36am User Name: jimf
File: S:\111-0117\PD\CAD\DESIGN\STORM DT.dwg

HECKEL ROAD COMMERCIAL SUBD.

EVANSVILLE, INDIANA • VANDERBURGH COUNTY

OUTLET CONTROL STRUCTURE

BERNARDIN · LOCHMUELLER & ASSOC., INC.
8900 Vogel Road Evansville, Indiana 47715
(812)479-8200 / fax (812)479-8282

DRAWN BY	CHECKED BY	SCALE	DATE	JOB / PROJ. NO.
B.E.W.	J.A.F.	NTS	12/05/11	111-0117-0PD

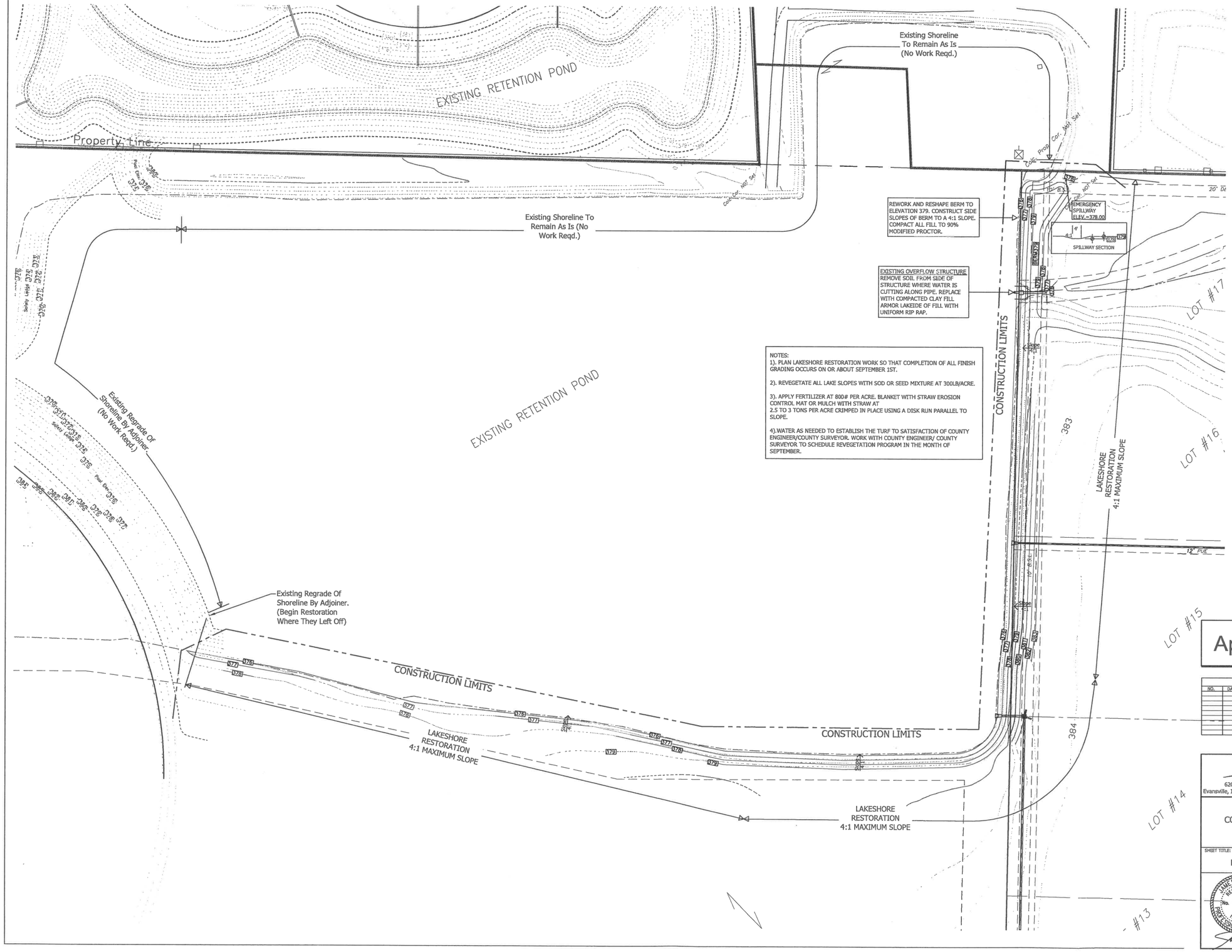
APPENDIX "E"

BASIN VOLUME

Project: HECKEL ROAD SUBDIVISION

Date: 12/13/2011

ELEVATION	SURFACE AREA (square feet)	Incremental Volume (cubic feet)	Accumulated Volume (cubic feet)	Accumulated Volume (acre/feet)
375.00	511,783	0	0	0
376.00	526,059	518,921	518,921	11.91
377.00	540,436	533,248	1,052,169	24.15
378.00	554,910	547,673	1,599,842	36.73
379.00	569,485	562,198	2,162,039	49.63
380.00	584,157	576,821	2,738,860	62.88



Appendix A-1

REVISIONS		
NO.	DATE	DESCRIPTION

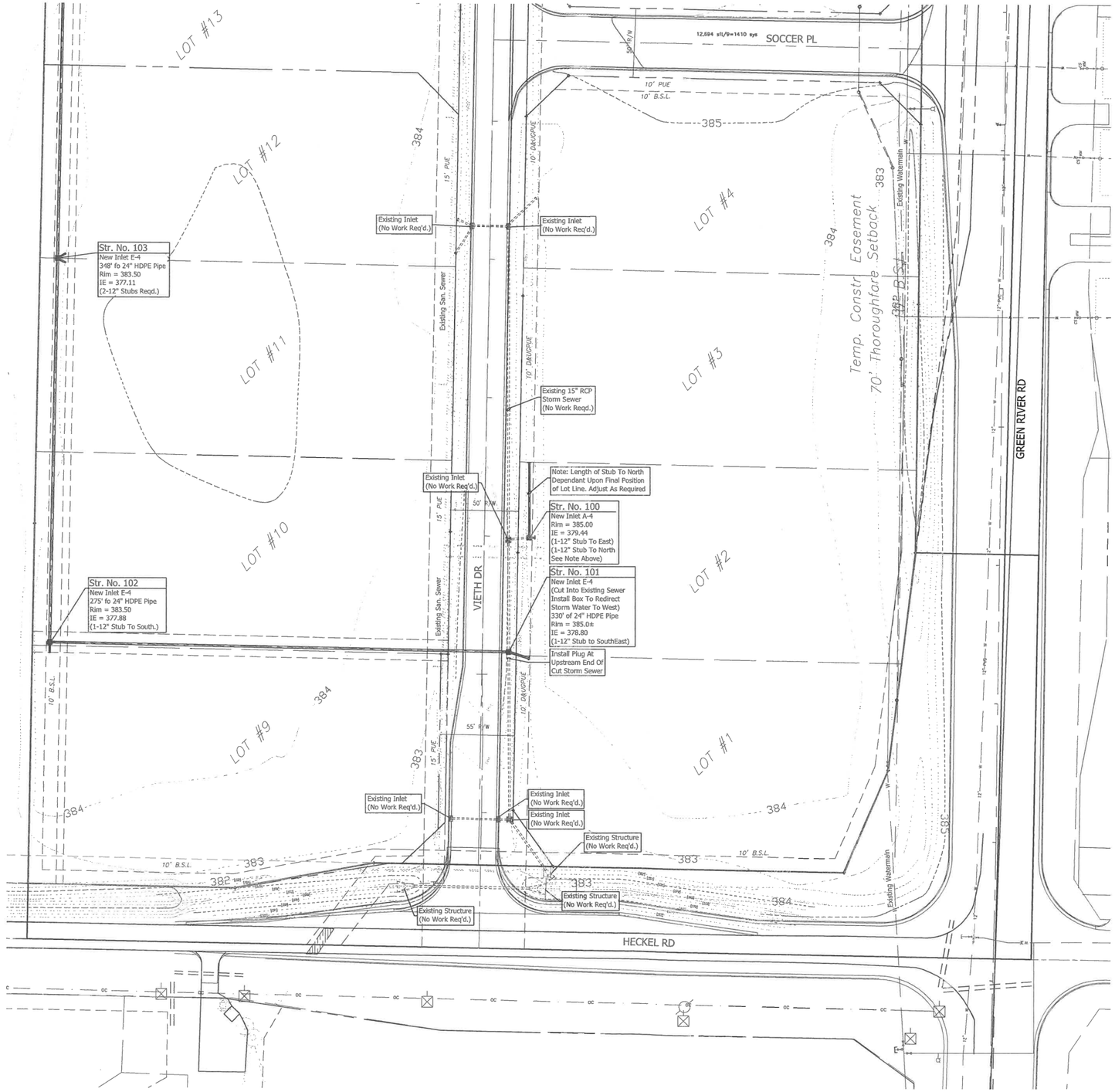
LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

SHEET TITLE:
LAKE RESTORATION PLAN

JAMES A. TADINI REGISTERED No. PE60020434 STATE OF INDIANA PROFESSIONAL ENGINEER

HORIZ. SCALE: 1"=30'	LOCH. GROUP PROJ. NO.: 111-0117
VERT. SCALE: --	PROJECT: --
DRAWN BY: DAG	DATE: 06/20/16
DESIGNED BY: JAF	ISSUED: ---
SHEET NO.: C1.0	



0 15 30 60
SCALE: 1"=30'

Appendix A-2

REVISIONS		
NO.	DATE	DESCRIPTION

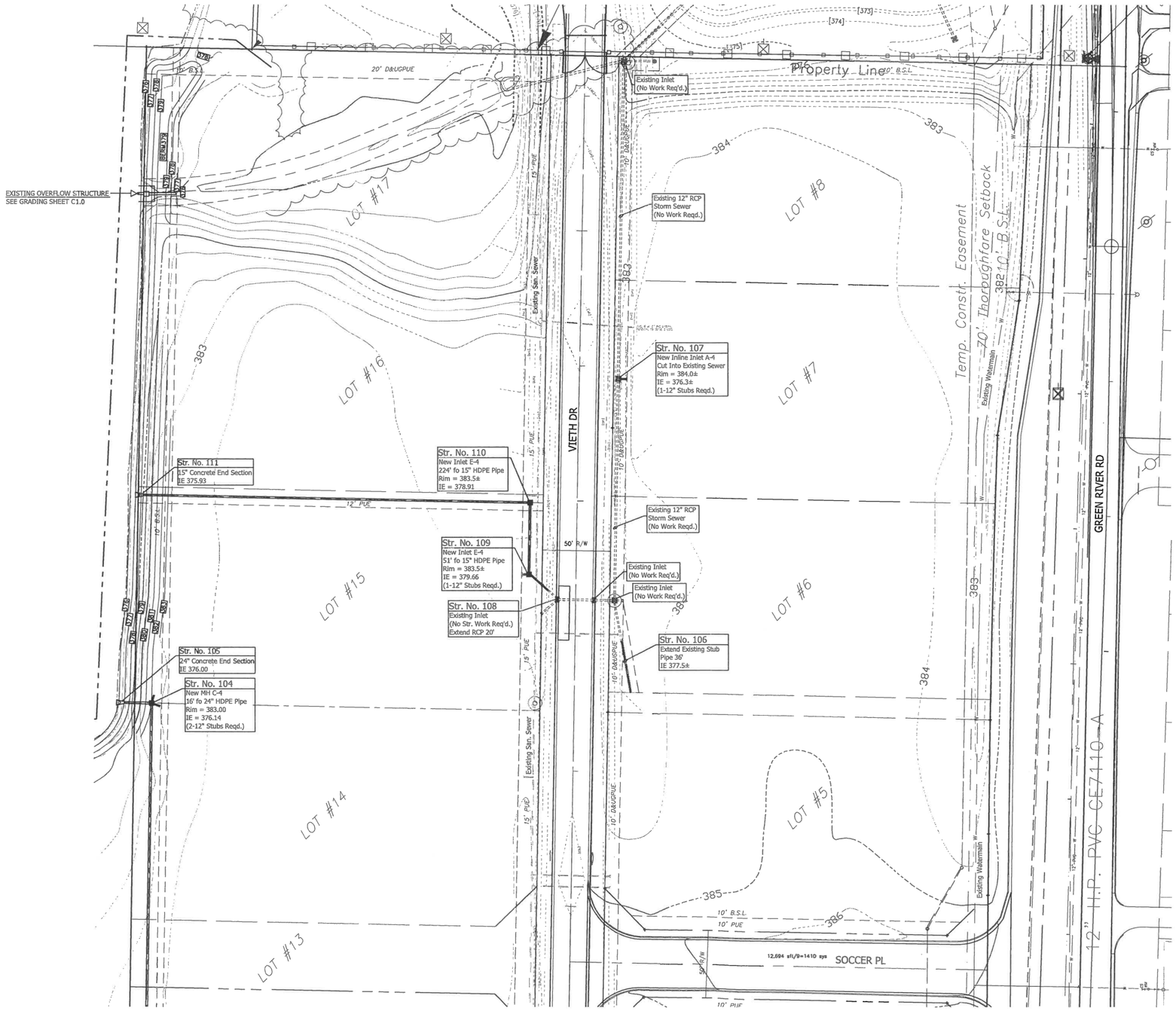
LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

SHEET TITLE:
SITE STORM PLAN
SOUTH HALF

JAMES A. FAHEY REGISTERED No. PE6002043 STATE OF INDIANA PROFESSIONAL ENGINEER

HORIZ. SCALE 1"=30'	LOCH. GROUP PROJ. 111-0117
VERT. SCALE —	PROJECT —
DRAWN BY DAG	DATE: 06/20/16
DESIGNED BY JAF	ISSUED: —
SHEET NO.: C2.0	



0 15 30 60
SCALE: 1"=30'

Appendix A-3

REVISIONS		
NO.	DATE	DESCRIPTION

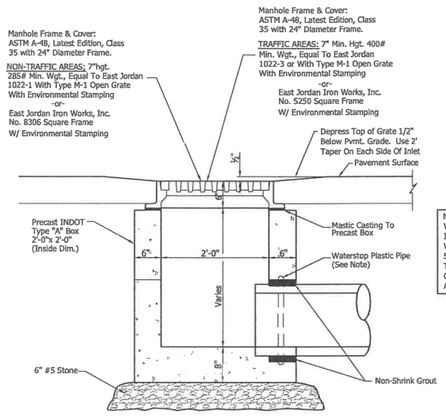
LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

SHEET TITLE:
SITE STORM PLAN
NORTH HALF

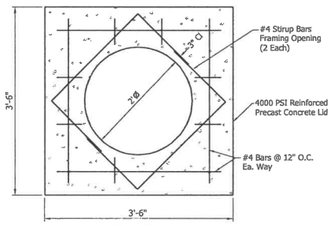
JAMES A. TAMM
REGISTERED
No. PE60020434
STATE OF INDIANA
PROFESSIONAL ENGINEER

HORIZ. SCALE: 1"=30'	LOCH. GROUP PROJ.: 111-0117
VERT. SCALE: --	PROJECT: --
DRAWN BY: DAG	DATE: 06/20/16
DESIGNED BY: JAF	ISSUED: ---
SHEET NO.: C3.0	

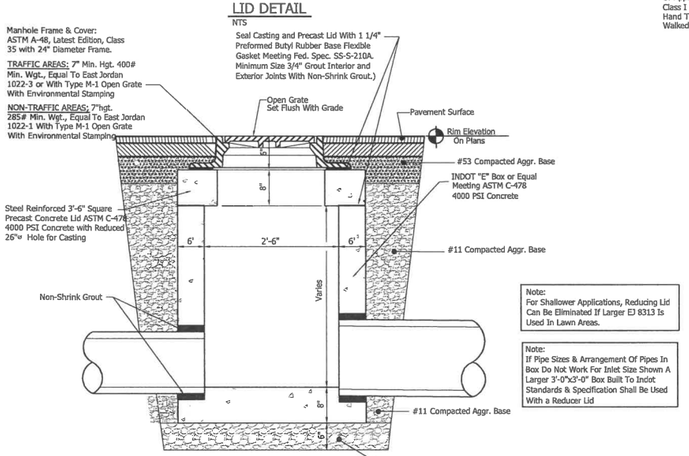


Note:
Where Plastic Pipe
Is Used A Ring Type
Water Stop Gasket
Shall Be Placed On
The Pipe Prior To
Grouting Pipe
At Box Interface.

INLET TYPE A-4
NTS



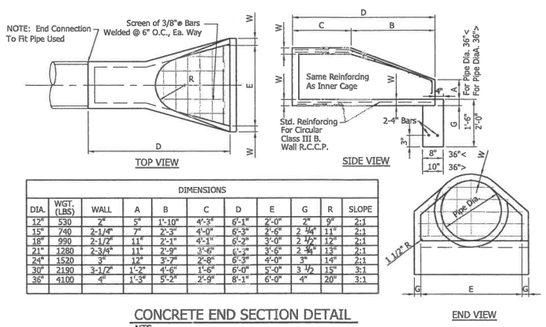
LID DETAIL
NTS



Note:
For Shallower Applications, Reducing Lid
Can Be Eliminated If Larger EJ 8313 Is
Used In Lawn Areas.

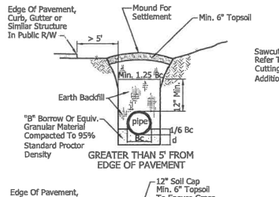
Note:
If Pipe Sizes & Arrangement Of Pipes In
Box Do Not Work For Inlet Size Shown A
Larger 3'-0"x3'-0" Box Built To Indot
Standards & Specification Shall Be Used
With a Reducer Lid

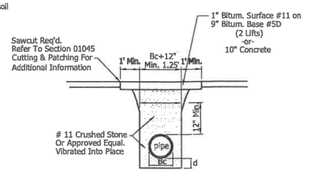
INLET TYPE E-4
NTS

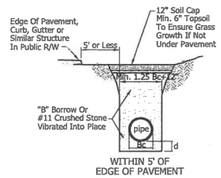


DIMENSIONS										
DIA.	WGT. (LBS)	WALL	A	B	C	D	E	G	R	SLOPE
12"	530	2"	5"	1'-10"	4'-3"	6'-1"	2'-0"	2"	9"	2:1
15"	740	2-1/4"	7"	2'-3"	4'-0"	6'-3"	2'-6"	2 1/4"	11"	2:1
18"	990	2-1/2"	11"	2'-1"	4'-1"	6'-3"	3'-0"	2 1/2"	12"	2:1
21"	1280	2-3/4"	11"	2'-9"	3'-6"	6'-3"	3'-6"	2 3/4"	15"	2:1
24"	1520	3"	12"	3'-7"	2'-8"	6'-3"	4'-0"	3"	14"	2:1
30"	2190	3-1/2"	1'-2"	4'-6"	1'-6"	6'-0"	5'-0"	3 1/2	15"	3:1
36"	4100	4"	1'-3"	5'-2"	2'-9"	8'-1"	6'-0"	4"	20"	3:1

CONCRETE END SECTION DETAIL
NTS







STORM SEWER TRENCH/PIPE BEDDING DETAIL FOR REINFORCED CONCRETE PIPE (RCP)
NTS

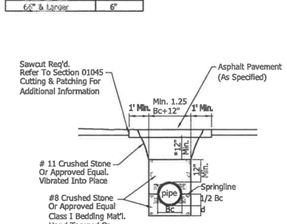
LEGEND
Bc Outside Diameter
D Inside Diameter
d Depth of Bedding Material Below Pipe

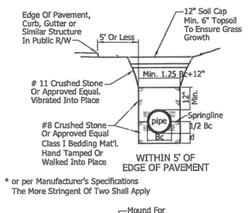
Depth of Bedding Material Below Pipe	
D	d
27" & Smaller	3"
30" to 66"	4"
66" & Larger	6"

All Bedding & Initial Shall Be Installed
In 6" To 12" Balanced Lifts
A Minimum 9" Of Clearance Shall Be
Provided On Each Side Of Installed Pipe
(Note: All bedding shown shall be incidental to pipe)

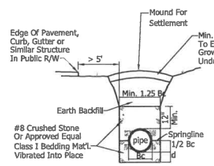
NOTE:
Contractor Shall Install Pipe Using More
Stringent Of Two Procedures
1.) That Depicted Hereon
2.) Manufacturer Recommendations

Note:
On Projects Where
Flowable Fill Is Specified.
Replace All Trench
Materials From Top To
Bottom With Flowable Fill.

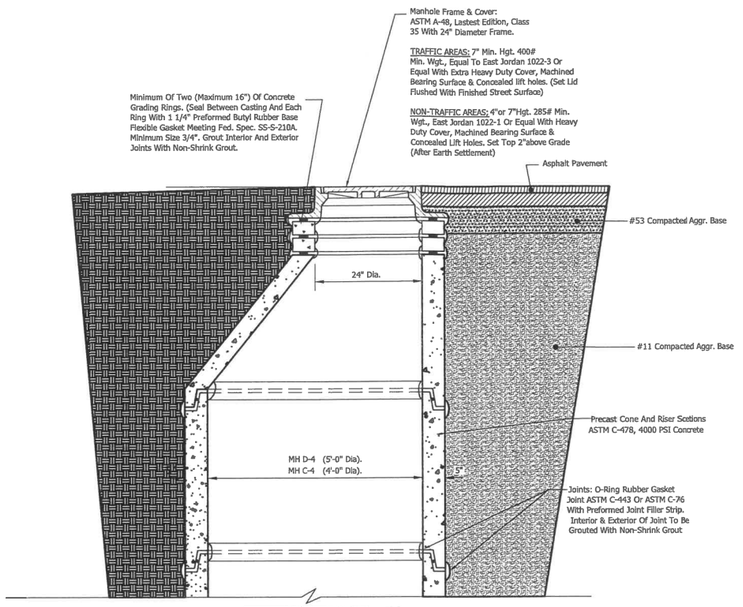




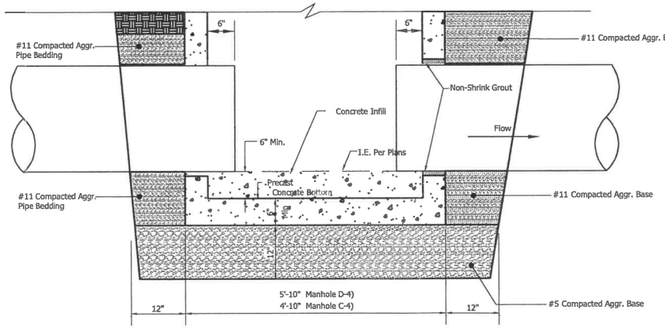
* or per Manufacturer's Specifications
The More Stringent Of Two Shall Apply



STORM SEWER TRENCH/PIPE BEDDING DETAIL FOR PLASTIC PIPE (PVC & HDPE)
NTS
(For PP Pipe Min. Cover can be reduced to 12")



Note:
4" Cast Base Section Shall Be
Tall Enough That All Piping
Is Contained With Base Section



MANHOLE TYPE C-4 (4'-0" Dia).
MANHOLE TYPE D-4 (5'-0" Dia).

STRUCTURE DATA									
STR. NO.	CONN. TO STR. NO.	DESCRIPTION	SIZE IN.	MATERIAL	LENGTH FT.	FLOW LINE UP STREAM ELEV.	FLOW LINE DOWN STREAM ELEV.	* RIM/ GUTTER ELEV	REMARKS
100	-	Inlet Type A-4	12	HDPE		379.44	-	385.00	1-12" Stub To East, 1-12" Stub to North **
101	**102**	Inlet Type E-4	24	HDPE	330	378.80	377.88	385.0±	Cut Into Existing Sewer, Provide 1-12" Stub To SE
102	**103**	Inlet Type E-4	24	HDPE	275	377.88	377.11	383.50	Provide 1-12" Stub To South
103	**104**	Inlet Type E-4	24	HDPE	348	377.11	376.14	383.50	Provide 1-12" Stub To South East, & 1 12" Stub To North East
104	**105**	MH Type C-4	24	HDPE	16	376.14	376.00	383.00	Provide 1-12" Stub To South East, & 1 12" Stub To North East
105	-	24" Concrete End Section				376.00	-	-	
106	-	Extend Existing Stub	12	RCP	36	377.5±	377.4±	-	Field Verify Inverts, Extend Pipe 36'
107	-	Inlet Type A-4				376.3±	-	384.0±	Cut Into Existing Sewer, Provide 1-12" Stub To East
108	**105**	Existing Inlet E-4	-	RCP		-	-	-	Extend Pipe 20'
109	**110**	Inlet Type E-4	15	HDPE	51	379.66	378.91	383.5±	
110	**111**	Inlet Type E-4	15	HDPE	224	378.91	375.93	383.5±	
111	-	15" Concrete End Section				375.93	-	-	

* No additional compensation will be given for upsizing of structures. Contractor shall review piping arrangements and price into base bid any larger structures if it is of the bidders opinion that the larger sizes are needed.

** Note: Length of Stub To North Dependant Upon Final Position of Lot Line. Adjust As Required

Appendix A-4

REVISIONS		
NO.	DATE	DESCRIPTION

LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

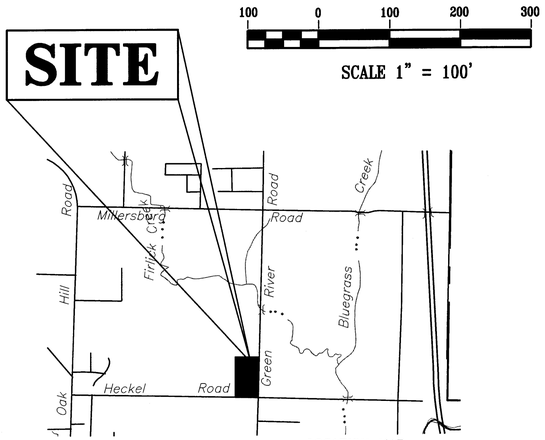
HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

SHEET TITLE:
STORM DETAILS

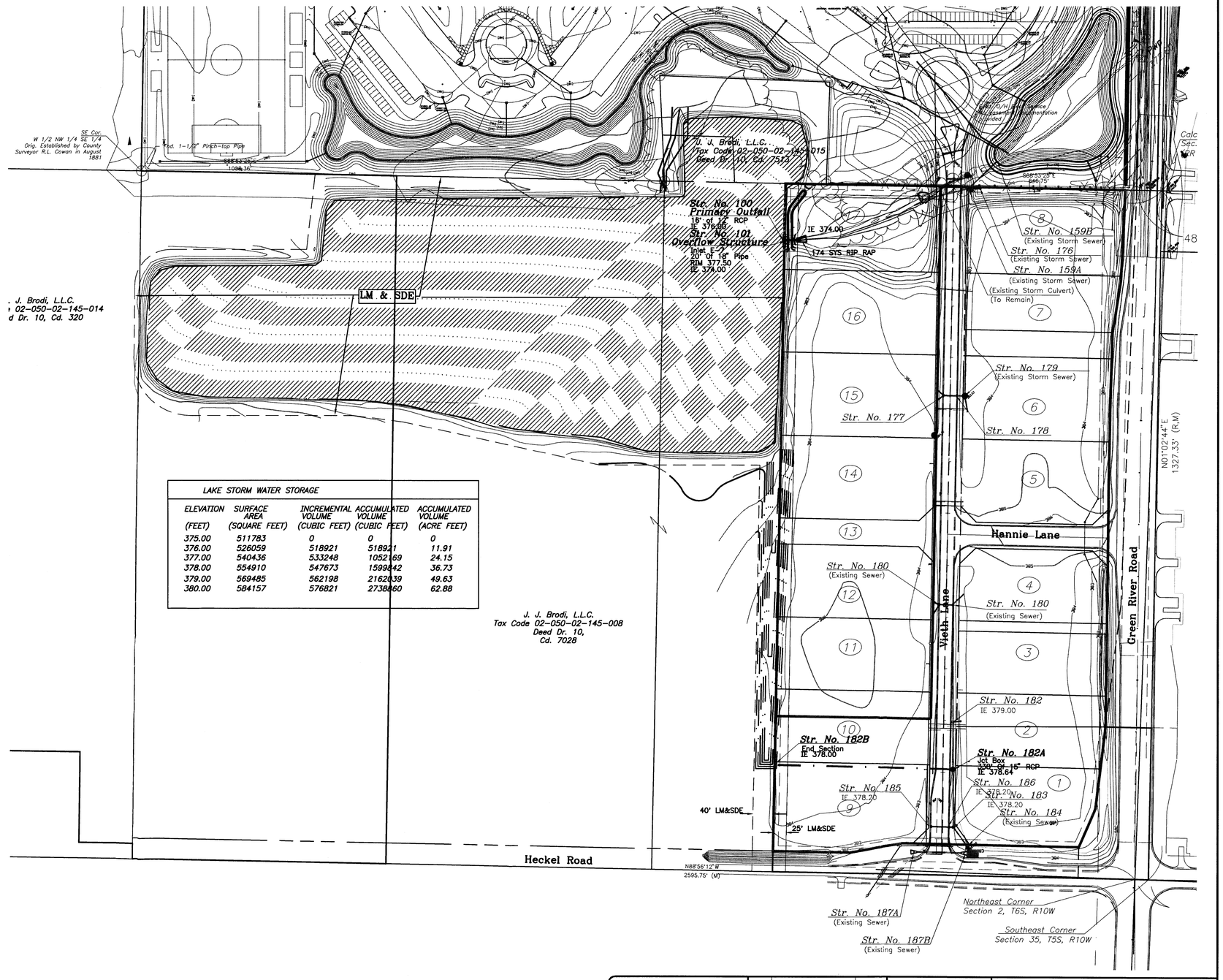
JAMES A. FAHEY REGISTERED No. PE60020436 STATE OF INDIANA PROFESSIONAL ENGINEER

HORIZ. SCALE 1"=30'	LOCH. GROUP PROJ. 111-0117
VERT. SCALE –	PROJECT –
DRAWN BY DAG	DATE: 06/20/16
DESIGNED BY JAF	ISSUED: ----
SHEET NO.: C5.0	

HECKEL ROAD COMMERCIAL SUBDIVISION
Drainage Plan



LOCATION MAP
CENTER TWP.
VANDERBURGH CO.
SE 1/4 SEC. 35, T 5 S – R 10 W



LAKE STORM WATER STORAGE				
ELEVATION (FEET)	SURFACE AREA (SQUARE FEET)	INCREMENTAL VOLUME (CUBIC FEET)	ACCUMULATED VOLUME (CUBIC FEET)	ACCUMULATED VOLUME (ACRE FEET)
375.00	511783	0	0	0
376.00	526059	518921	518921	11.91
377.00	540436	533248	1052169	24.15
378.00	554910	547673	1599842	36.73
379.00	569485	562198	2162039	49.63
380.00	584157	576821	2738860	62.88

GENERAL NOTES:

NOTES:

The detention basin shown at right is entirely contained within a drainage easement more particularly described as follows:

A part of the Southeast Quarter of the Southeast Quarter of Section 35, Township 5 South, Range 10 West of the Second Principal Meridian, in Vanderburgh County, Indiana, more particularly described as follows:

Commencing at the southeast corner of said quarter section; thence North 88 degrees 56 minutes 12 seconds West 765.00 along the south line of said quarter section; thence North 01 degree 02 minutes 44 seconds East 40.00 feet to a point on the north right–of–way of Heckel Road and the true POINT OF BEGINNING; thence continue North 01 degree 02 minutes 44 seconds East 743.84 along a line 40.00 feet west of and parallel with the west line of the proposed plat of Heckel Road Commercial Subdivision; thence North 90 degrees 00 minutes 00 seconds West 308.79 feet; thence North 77 degrees 46 minutes 11 seconds West 387.37 feet; thence North 82 degrees 38 minutes 34 seconds West 96.31 feet; thence North 90 degrees 00 minutes 00 seconds West 314.37 feet; thence 174.55 feet along a curve to the right, concave to the northeast, said curve having a radius of 110.00 feet and a chord of 156.81 feet bearing North 44 degrees 32 minutes 24 seconds West; thence North 00 degrees 55 minutes 13 seconds East 140.44 feet; thence 108.83 feet along a curve to the right, concave to the southeast, said curve having a radius of 70.00 feet and a chord of 98.20 feet bearing North 45 degrees 27 minutes 36 seconds East; thence North 90 degrees 00 minutes 00 seconds East 261.54 feet; thence North 06 degrees 36 minutes 09 seconds East 146.27 feet to a point on the north line of the South Half of the Southesat Quarter of said section; thence South 88 degrees 53 minutes 25 seconds East 673.49 feet along said north line; thence North 02 degrees 29 minutes 38 seconds West 204.39 feet; thence South 87 degrees 47 minutes 47 seconds East 328.15 feet; thence South 02 degrees 11 minutes 52 seconds West 197.75 feet; thence North 88 degrees 53 minutes 24 seconds West 53.25 feet to a point South 88 degrees 53 minutes 24 seconds East 25.00 feet from the northwest corner of the proposed plat of Heckel Road Commercial Subdivision; thence South 01 degrees 02 minutes 44 seconds West 1287.85 feet, being 25.00 feet east of and parallel with the west line of said subdivision, to a point on the north right–of–way of Heckel Road; thence North 88 degrees 56 minutes 12 seconds West 65.00 feet to the POINT OF BEGINNING.

The recorded easement document includes language assigning ownership of the easement to an entity which has heirs and assigned successors so that the drainage board at all times has the ability to enforce maintenance and repair of the facilities housed within the easement.

Owners of lots 1 through 17 shall be responsible for their proportion of the maintenance of the drainage facility located within the easement described above.

All post construction pollution control measures implemented as part of the subdivision shall be maintained by a designated third party, constracted by the Owners of Lots 1 through '7 as the entity who shall keep the facilities in working order in accordance with the approved SWP3 post construction pollution control measures.

STRUCTURE DATA

STR. NO.	DESCRIPTION	SIZE	MATERIAL	LENGTH	FLOW LINE UP STREAM	FLOW LINE DOWN STREAM	RIM/ GUTTER	"B" BORROW FOR STR. BACKFILL	PIPE END SECTION	REMARKS
		IN.		FT.	ELEV.	ELEV.	ELEV	CU.YDS	EA./SIZE	
182A	JCT. BOX	15	RCP	338	378.64	378.00	383.5±			
182B	Pipe Outlet	15	RCP	(–)	378.00	(–)	(–)		1/15"	
100	Pipe Inlet	12	RCP	16	375.00	374.80	(–)		1/12"	
101	Inlet Type E–4	18	RCP	240	374.50	373.50	379.00			
102	Pipe Outlet	18	RCP	(–)	373.50	(–)	(–)		1/18"	

This drawing is the property of Bernardin Lochmueller & Associates. All layouts and designs were created for use on a specific project. No part of this design or drawing shall be disclosed to any person or organization without the express written permission of Bernardin Lochmueller & Associates. Contractors shall verify and be responsible for all dimensions and conditions on the site. Contractor shall notify Bernardin, Lochmueller & Associates of any variations from the design shown hereon.

Num.		
1	Ch. S. Access Rd. To Type "A" Ch. Brk. Curb to Curb & Gutter	5/12/03
	Ch. Add. Curb to Curb & Gutter	08/12/03

JAMES A. FARNY REGISTERED No. PE60020434 STATE OF INDIANA PROFESSIONAL ENGINEER

Drainage Plan

Prepared By
BERNARDIN LOCHMUELLER & ASSOC., INC.
Planners · Engineers · Surveyors
6200 Vogel Road
Evansville, IN 47715 (812)479-6200

DATE:
PROJECT NO.: 111-0117
ISSUED: 12-15-11
SHT. 1

Appendix "A" Drainage Plan

0 15 30 60
SCALE: 1"=30'

LAKESHORE RESTORATION 4:1 MAXIMUM SLOPE

Slope 4:1

EXISTING RETENTION POND

Property Line

1 Install "Preserve Area/No Trespassing Sign" At End Of Existing Fence

EXISTING CHAIN LINK FENCE

Preserve Area (Leave Exist. Vegetation Intact)

Preserve Area (Leave Exist. Vegetation Intact)

Existing Shoreline To Remain As Is (No Work Reqd.)

1 Perserve Area (Install 6' Chain Link Fence To Waters Edge w/ No Trespassing Sign)

REWORK AND RESHAPE BERM TO ELEVATION 379. CONSTRUCT SIDE SLOPES OF BERM TO A 4:1 SLOPE. COMPACT ALL FILL TO 90% MODIFIED PROCTOR.

EMERGENCY SPILLWAY ELEV=378.00

SPILLWAY SECTION

EXISTING OVERFLOW STRUCTURE
REMOVE SOIL FROM SIDE OF STRUCTURE WHERE WATER IS CUTTING ALONG PIPE. REPLACE WITH COMPACTED CLAY FILL ARMOR LAKEIDE OF FILL WITH UNIFORM RIP RAP.

Existing Regrade Of Shoreline By Adjoiner. (Begin Restoration Where They Left Off)

CONSTRUCTION LIMITS

SOFTBALL COMPLEX PROPERTY LINE

Existing Regrade Of Shoreline By Adjoiner (No Work Reqd.)

LAKE SECTION B-B

LAKE SECTION A-A

Lake Maintenance & SDE Instr. # 2014R00016107

25' Drainage Easement Instr.# 2014R00016107

20' DE

12' PUE

LOT #17

LOT #16

LOT #15

LOT #14

LOT #13

LAKESHORE RESTORATION 4:1 MAXIMUM SLOPE

CONSTRUCTION LIMITS

LAKESHORE RESTORATION 4:1 MAXIMUM SLOPE

LAKESHORE RESTORATION 4:1 MAXIMUM SLOPE

NOTES:
1). PLAN LAKESHORE RESTORATION WORK SO THAT COMPLETION OF ALL FINISH GRADING OCCURS ON OR ABOUT SEPTEMBER 1ST.

2). REVEGETATE ALL LAKE SLOPES WITH SOD OR SEED MIXTURE AT 300LB/ACRE.

3). APPLY FERTILIZER AT 800# PER ACRE. BLANKET WITH STRAW EROSION CONTROL MAT OR MULCH WITH STRAW AT 2.5 TO 3 TONS PER ACRE CRIMPED IN PLACE USING A DISK RUN PARALLEL TO SLOPE.

4).WATER AS NEEDED TO ESTABLISH THE TURF TO SATISFACTION OF COUNTY ENGINEER/COUNTY SURVEYOR. WORK WITH COUNTY ENGINEER/ COUNTY SURVEYOR TO SCHEDULE REVEGETATION PROGRAM IN THE MONTH OF SEPTEMBER.

REVISIONS		
NO.	DATE	DESCRIPTION
1	08/08/16	Added Lake Section Lines, CLTF and Sign

LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

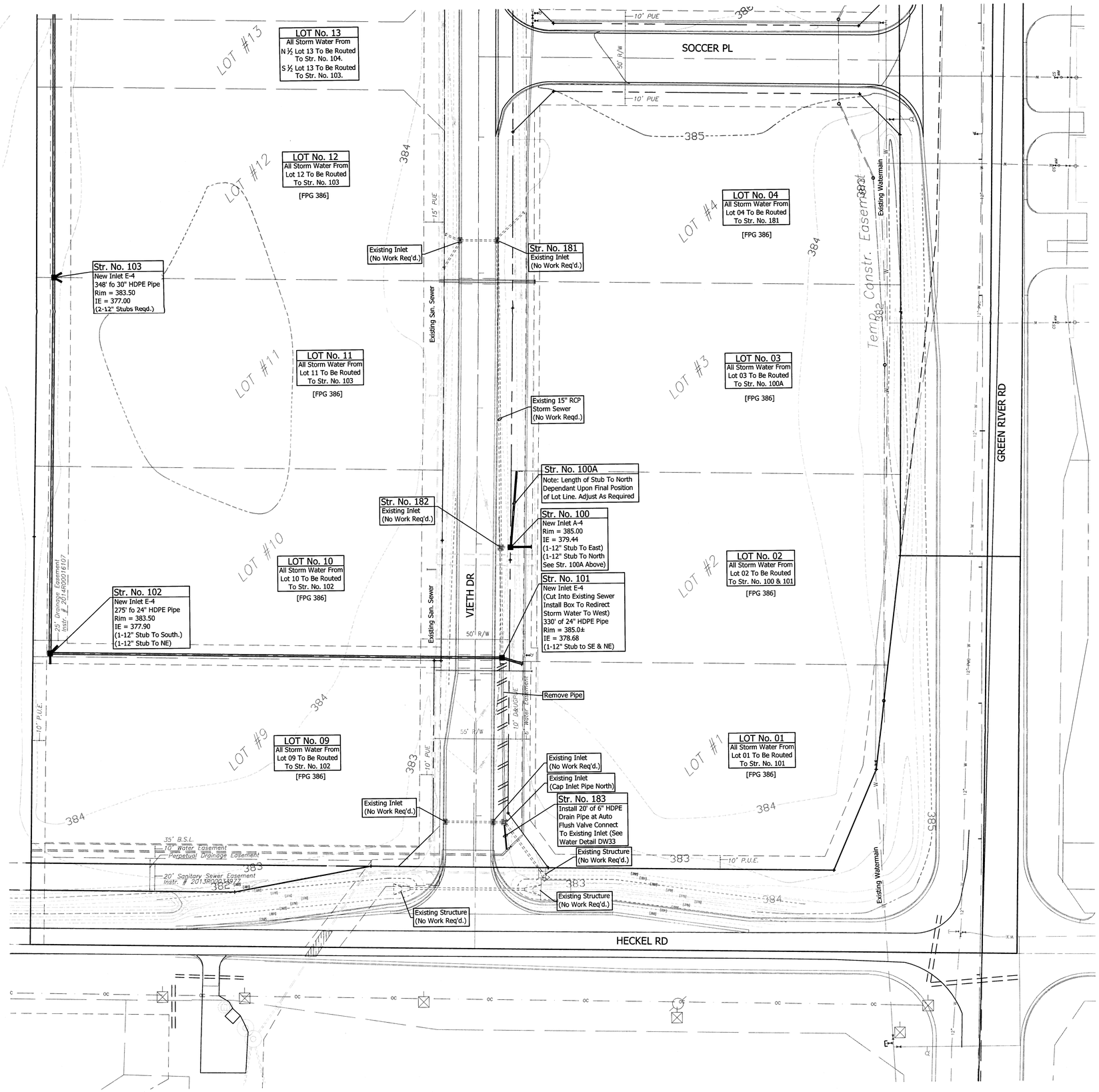
HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

APPROVED
AUG 2 3 2016
VANDERBURGH COUNTY BOARD

SHEET TITLE: LAKE RESTORATION PLAN

JAMES A. TAHNI REGISTERED No. PE60020434 STATE OF INDIANA PROFESSIONAL ENGINEER

HORIZ. SCALE 1"=30'	LOCH. GROUP PROJ. 111-0117
VERT. SCALE --	PROJECT --
DRAWN BY DAG	DATE: 06/29/16
DESIGNED BY JAF	ISSUED: ----
SHEET NO.: C1.0	



0 15 30 60
SCALE: 1"=30'

Appendix A-2

REVISIONS		
NO.	DATE	DESCRIPTION

LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

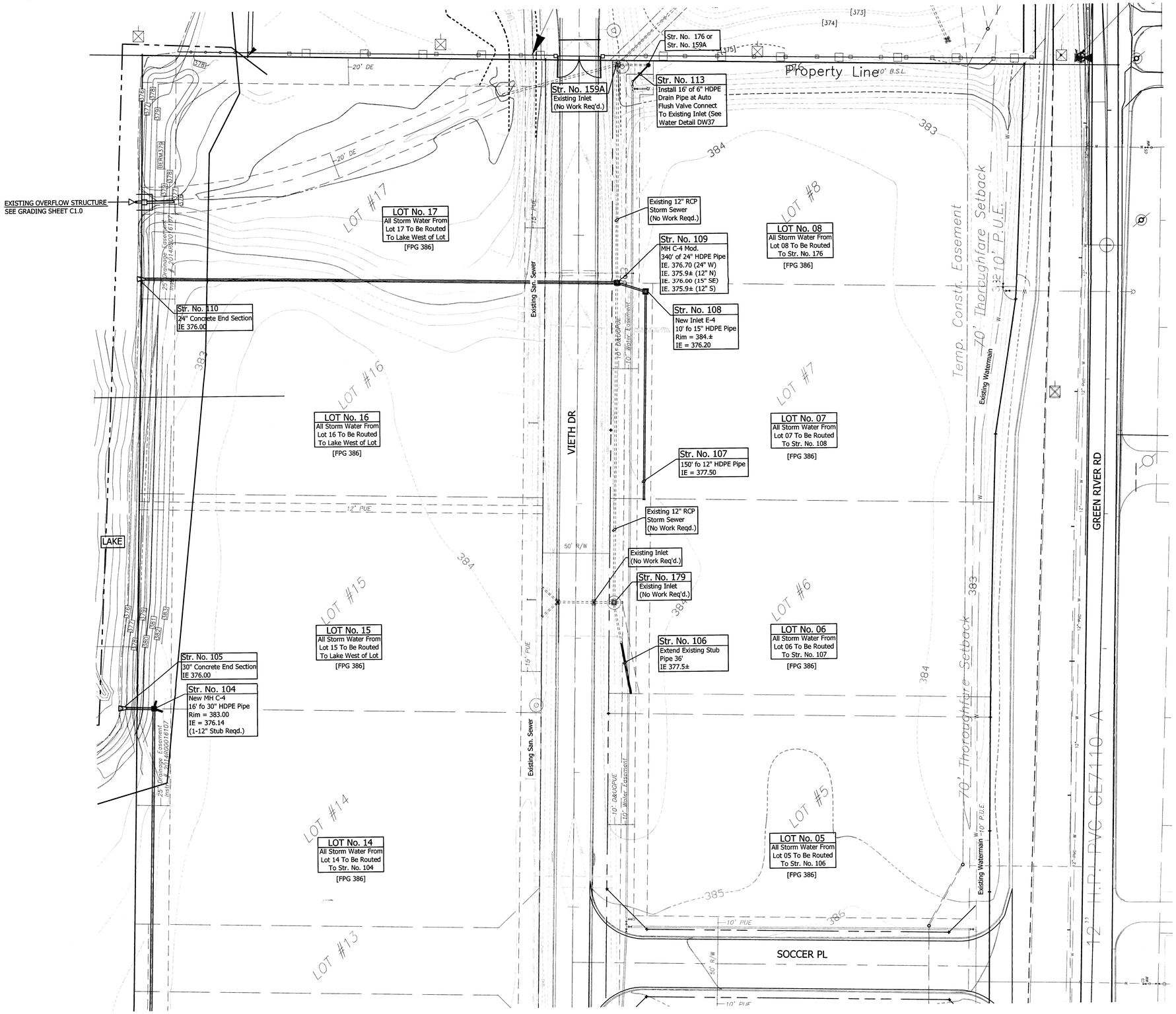
SHEET TITLE:
SITE STORM PLAN
SOUTH HALF

APPROVED
AUG 23 2016
VANDERBURGH COUNTY
AREA PLAN COMMISSION

JAMES A. FARNY REGISTERED No. PE60020434 STATE OF INDIANA PROFESSIONAL ENGINEER

HORIZ. SCALE: 1"=30'	JOB NO.: 111-0113
VERT. SCALE --	PROJECT --
DRAWN BY DAG	DATE: 06/29/16
DESIGNED BY JAF	ISSUED: ----
SHEET NO.: C3.0	

8/15/2016



Appendix A-3

REVISIONS		
NO.	DATE	DESCRIPTION

LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

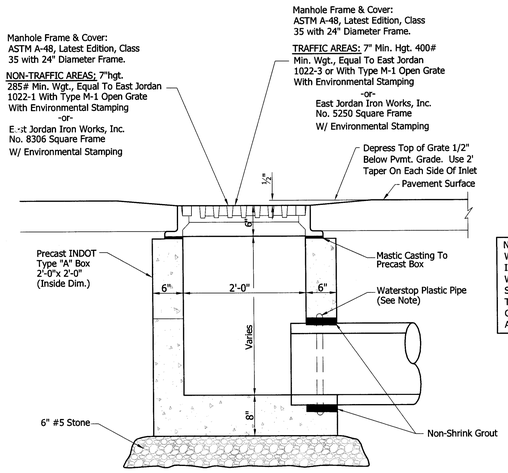
APPROVED
AUG 23 2016
VANDERBURGH COUNTY
AREA PLAN COMMISSION

SHEET TITLE:
SITE STORM PLAN
NORTH HALF

JAMES A. FARNY
REGISTERED
No. PE60020434
STATE OF
INDIANA
PROFESSIONAL ENGINEER

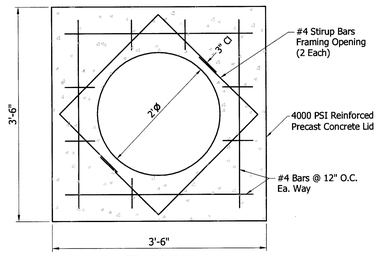
HORIZ. SCALE 1"=30'	LOCH. GROUP PROJ. 111-0117
VERT. SCALE --	PROJECT --
DRAWN BY DAG	DATE: 06/29/16
DESIGNED BY JAF	ISSUED: ----
SHEET NO.: C4.0	

8-15-2016

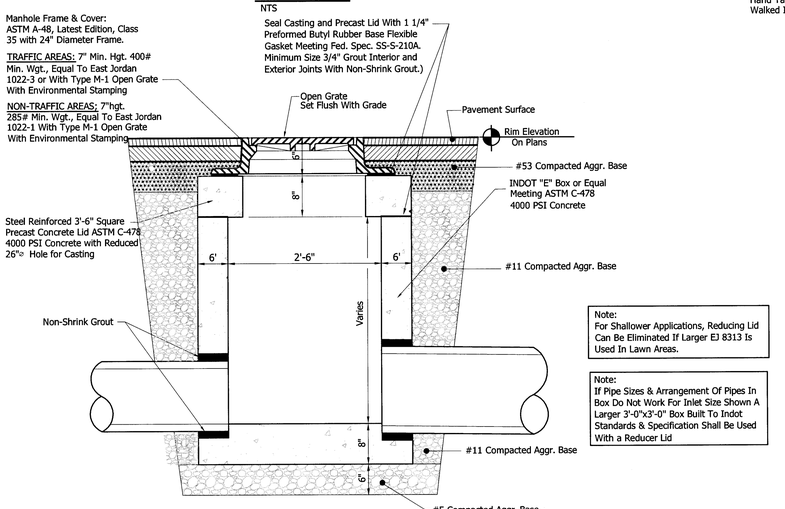


Note:
Where Plastic Pipe
Is Used A Ring Type
Water Stop Gasket
Shall Be Placed On
The Pipe Prior To
Grouting Pipe
At Box Interface.

INLET TYPE A-4
NTS



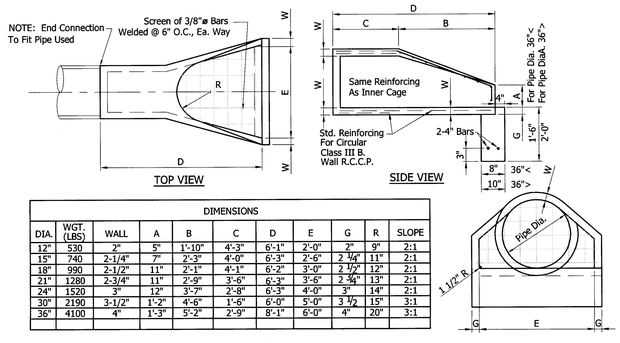
LID DETAIL
NTS



Note:
For Shallower Applications, Reducing Lid
Can Be Eliminated If Larger EJ 8313 Is
Used In Lawn Areas.

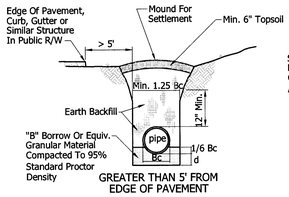
Note:
If Pipe Sizes & Arrangement Of Pipes In
Box Do Not Work For Inlet Size Shown A
Larger 3'-0"x3'-0" Box Built To Indot
Standards & Specification Shall Be Used
With a Reducer Lid

INLET TYPE E-4
NTS

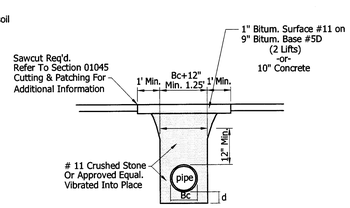


DIMENSIONS										
DIA.	WGT. (LBS)	WALL	A	B	C	D	E	G	R	SLOPE
12"	530	2"	5"	1'-10"	4'-3"	6'-1"	2'-0"	2"	9"	2:1
15"	740	2-1/4"	7"	2'-3"	4'-0"	6'-3"	2'-6"	2 1/4"	11"	2:1
18"	990	2-1/2"	11"	2'-1"	4'-1"	6'-2"	3'-0"	2 1/2"	12"	2:1
21"	1280	2-3/4"	11"	2'-9"	3'-6"	6'-3"	3'-6"	2 3/4"	13"	2:1
24"	1520	3"	12"	3'-7"	2'-8"	6'-3"	4'-0"	3"	14"	2:1
30"	2190	3-1/2"	1'-2"	4'-6"	1'-6"	6'-0"	5'-0"	3 1/2	15"	3:1
36"	4100	4"	1'-3"	5'-2"	2'-9"	8'-1"	6'-0"	4"	20"	3:1

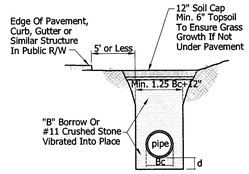
CONCRETE END SECTION DETAIL
NTS



GREATER THAN 5' FROM
EDGE OF PAVEMENT



BENEATH PAVEMENT



WITHIN 5' OF
EDGE OF PAVEMENT

STORM SEWER TRENCH/PIPE BEDDING DETAIL FOR
REINFORCED CONCRETE PIPE (RCP)
NTS

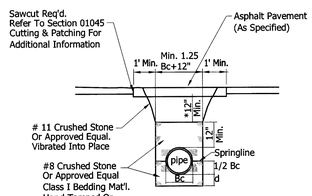
LEGEND
Bc Outside Diameter
D Inside Diameter
d Depth of Bedding Material
Below Pipe

Depth of Bedding Material Below Pipe	
D	d
27" & Smaller	3"
30" to 60"	4"
66" & Larger	6"

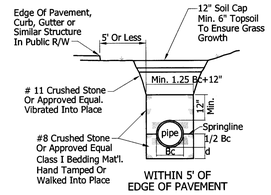
All Bedding & Initial Shall Be Installed
In 6" To 12" Balanced Lifts
A Minimum 9" Of Clearance Shall Be
Provided On Each Side Of Installed Pipe
(Note: All bedding shown shall be incidental to pipe)

NOTE:
Contractor Shall Install Pipe Using More
Stringent Of Two Procedures
1.) That Depicted Hereon
2.) Manufacturer Recommendations

Note:
On Projects Where
Flowable Fill Is Specified.
Replace All Trench
Materials From Top To
Bottom With Flowable Fill.

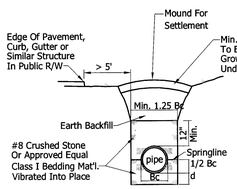


BENEATH PAVEMENT



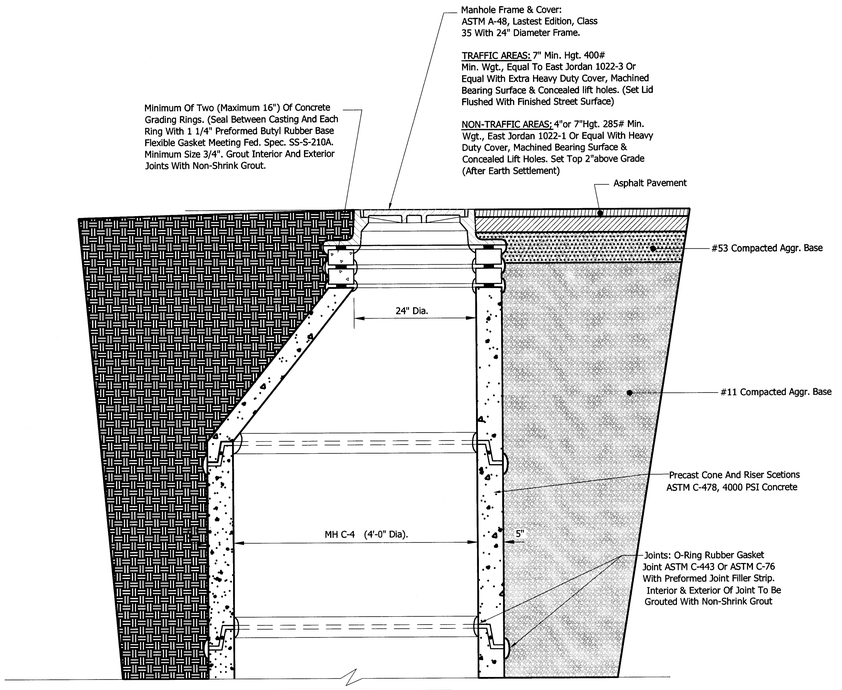
WITHIN 5' OF
EDGE OF PAVEMENT

* or per Manufacturer's Specifications
The More Stringent Of Two Shall Apply



GREATER THAN 5' FROM
EDGE OF PAVEMENT

STORM SEWER TRENCH/PIPE BEDDING DETAIL FOR
NTS
PLASTIC PIPE (PVC & HDPE)
(For PP Pipe Min. Cover can be reduced to 12")



Note:
4' Cast Base Section Shall Be
Tall Enough That All Piping
Is Contained With Base Section

STR. 109 DIVERSION MANHOLE TYPE C-4 (4'-0" Dia).

STRUCTURE DATA									
STR. NO.	CONN. TO STR. NO.	DESCRIPTION	SIZE	MATERIAL	LENGTH	FLOW LINE		* RIM/ GUTTER	REMARKS
						UP STREAM	DOWN STREAM		
			IN.		FT.	ELEV.	ELEV.	ELEV	
100	-	Inlet Type A-4	12	HDPE		379.44	-	385.00	1-12" Stub To East, 1-12" Stub to North **
101	102	Inlet Type E-4	24	HDPE	330	378.68	377.90	385.0±	Cut Into Existing Sewer, Provide 1-12" Stub To SE
102	103	Inlet Type E-4	24	HDPE	275	377.90	377.00	383.50	Provide 1-12" Stub To South
103	104	Inlet Type E-4	24	HDPE	348	377.00	376.14	383.50	Provide 1-12" Stub To South East, & 1 12" Stub To North East
104	105	MH Type C-4	24	HDPE	16	376.14	376.00	383.00	Provide 1-12" Stub To South East, & 1 12" Stub To North East
105	-	30" Concrete End Section				376.00	-	-	
106	-	Extend Existing Stub	12	RCP	36	377.5±	377.4±	-	Field Verify Inverts, Extend Pipe 36'
107	108	Pipe Extension	12	HDPE	150	377.50	376.20	-	
108	109	Inlet Type E-4	15	HDPE	10	376.20	376.00	384.±	
109	110	MH C-4	24	HDPE	340	376.70	376.00	384.±	Diversion Wall See Detail on C6.0
110	-	24 Concrete End Section				376.00	-	-	
113	-	Pipe Run To Existing Inlet	6	HDPE	16	-	-	-	Drain Pipe at Auto Flush Valve, Connect To Existing Inlet
183	-	Pipe Run To Existing Inlet	6	HDPE	20	-	-	-	Drain Pipe at Auto Flush Valve, Connect To Existing Inlet

* No additional compensation will be given for upsizing of structures. Contractor shall review piping arrangements and price into base bid any larger structures if it is of the bidders opinion that the larger sizes are needed.

** Note: Length of Stub To North Dependant Upon Final Position of Lot Line. Adjust As Required

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE
8/9/16 CA

Appendix A-4

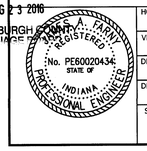
REVISIONS		
NO.	DATE	DESCRIPTION

LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

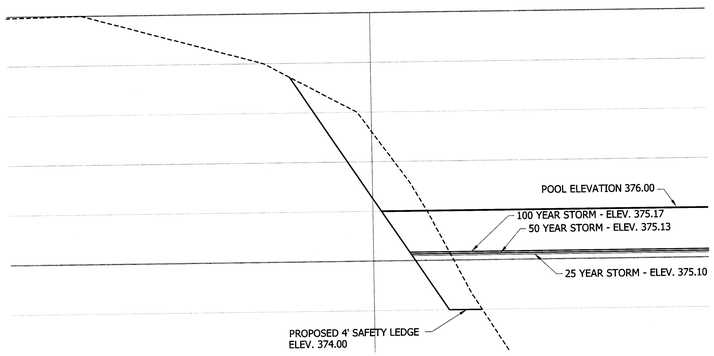
HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

SHEET TITLE:
STORM DETAILS

APPROVED
AUG 23 2016
VANDERBURGH COUNTY DRAINAGE BOARD

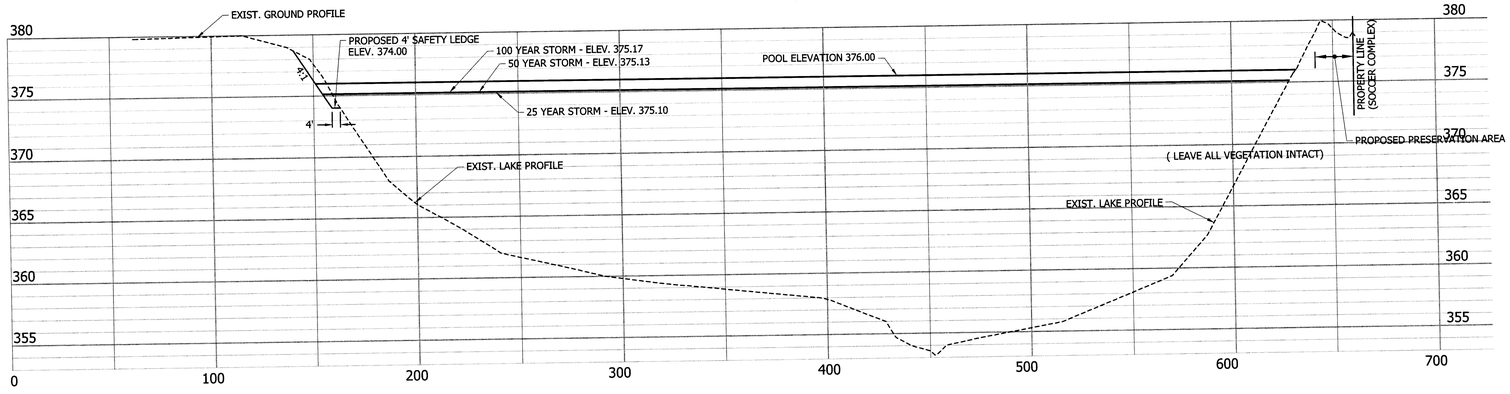


HORIZ. SCALE: VARIES	LOCH. GROUP PROJ. 111-0117
VERT. SCALE: --	PROJECT: --
DRAWN BY: DAG	DATE: 06/29/16
DESIGNED BY: JAF	ISSUED: ----
SHEET NO.: C6.0	



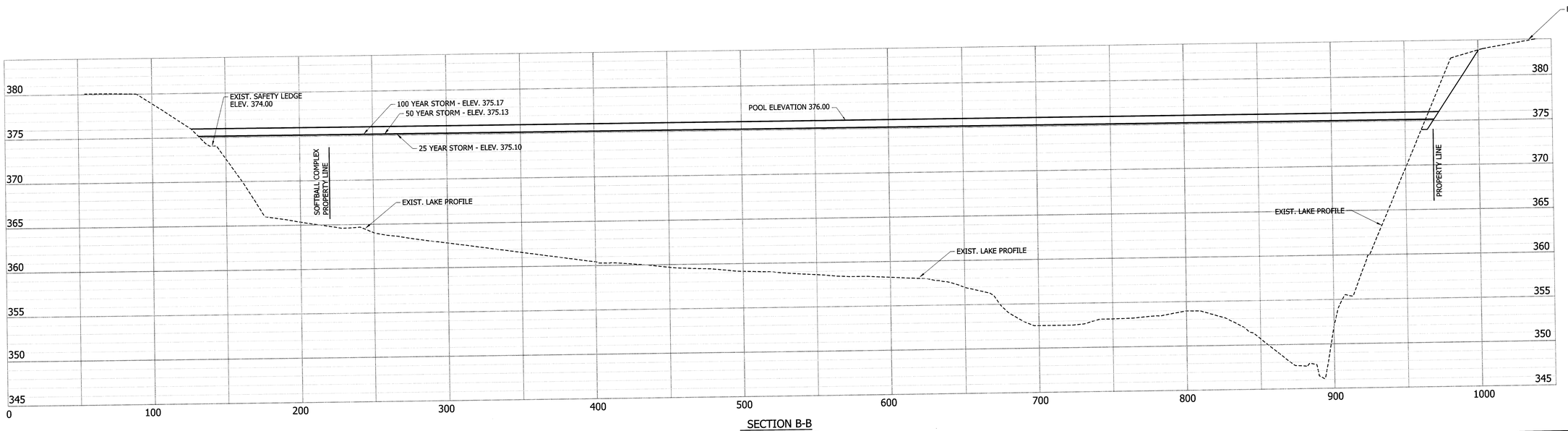
ELEVATION DETAIL

NOT TO SCALE



SECTION A-A

SCALE: HORIZ.: 1"=30'
VERT.: 1"=5'



SECTION B-B

SCALE: HORIZ.: 1"=30'
VERT.: 1"=5'

Appendix A-5

REVISIONS		
NO.	DATE	DESCRIPTION
1	08/08/16	Added Lake Section Lines, CLTF and Sign

LOCHMUELLER GROUP
6200 Vogel Road
Evansville, Indiana 47715
Phone: 812.479.6200
Toll Free: 800.423.7411

HECKEL ROAD
COMMERCIAL SUBDIVISION
EVANSVILLE, INDIANA

APPROVED
AUG 23 2016
VANDERBURGH COUNTY
DRAINAGE BOARD

LAKE CROSS SECTIONS

HORIZ. SCALE 1"=30'	LOCH. GROUP PROJ. 111-0117
VERT. SCALE --	PROJECT --
DRAWN BY DAG	DATE: 08/08/16
DESIGNED BY JAF	ISSUED: ----
SHEET NO.: C1.1	

JAMES A. FARNY REGISTERED No. PE60020434 STATE OF INDIANA PROFESSIONAL ENGINEER

RECEIVED BY THE
VANDERBURGH COUNTY
SURVEYOR'S OFFICE

Aug 08, 2016, 5:28pm User Name: mp
J:\111-0117\PD\CAD\DESIGN\2016 WORK\LAKE CROSS SECTION.dwg