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CITY of NOVI CITY COUNCIL

Agenda Item 6
August 13, 2007

SUBJECT: Consideration of Ordinance No. 07-124.18, an amendment to the Novi Code of Ordinances, Chapter 11 (Design and Construction Standards) and Ordinance Nos. 07-106.04 and 07-168.01, Chapter 12 (Drainage and Flood Damage Prevention), to add low impact development requirements for stormwater management systems; and consideration of resolution authorizing the City Engineer to prepare, approve and maintain the contents of an Engineering Design Manual that will contain detailed specifications regarding stormwater management systems. **First Reading**

SUBMITTING DEPARTMENT: Engineering

CITY MANAGER APPROVAL:

BACKGROUND INFORMATION:

Since early this year, Engineering staff have been working toward making revisions to the Novi Code of Ordinances to allow low impact development options for stormwater management systems (Rob Hayes' May 30, 2007 memorandum, attached). Recently, Engineering staff members have worked with ECT, Inc. (the City's environmental consultant), to develop a series of proposed revisions to relevant chapters of the Ordinance to make it possible for low impact development technologies to be implemented at development sites in Novi. The proposed changes also update several portions of Chapters 11 and 12 to eliminate redundancy and make them consistent with present day standards.

Finally, the proposed amendment establishes an *Engineering Design Manual*, which would allow the transition of technical details and specifications from the Ordinance to a document that the City Engineer would be responsible for keeping current (especially in light of the evolving nature of technologies and equipment in the construction industry). The manual is a more accessible and contemporary reference that would be routinely updated by Administration, as opposed to bringing numerous changes to Council for approval when updates are required (Rob Hayes' July 12, 2007 memorandum, attached). The attached draft resolution would effect this change should Council deem it appropriate.

Specific voluntary low impact development technologies that have been included in the Engineering Design Manual include bioretention basins and rain gardens. Subsequent additions to the manual will include vegetated swales and pervious pavement options for developers to consider.

Comments regarding the text amendment were solicited from Novi's development community and no objections were received (e-mail responses from Mozart Homes, Amson Dembs, and Northern Equities are attached).

The City Attorney has reviewed the proposed text amendment and recommends that following its first reading, Council should direct staff to finalize the Engineering Design Manual and bring it back to Council at a future meeting concurrent with the second reading of the text amendment (Kristin Kolb's August 7, 2007 letter, attached). Doing so would allow the manual to be considered at a public meeting before the concept is formally adopted.

RECOMMENDED ACTION: Consideration of Ordinance No. 07-124.18, an amendment to the Novi Code of Ordinances, Chapter 11 (Design and Construction Standards) and Ordinance Nos. 07-106.04 and 07-168.01, Chapter 12 (Drainage and Flood Damage Prevention), to add low impact development requirements for stormwater management systems; and consideration of resolution authorizing the City Engineer to prepare, approve and maintain the contents of an Engineering Design Manual that will contain detailed specifications regarding stormwater management systems. **First Reading**

	1	2	Y	N
Mayor Landry				
Mayor Pro Tem Capello				
Council Member Gatt				
Council Member Margolis				

	1	2	Y	N
Council Member Mutch				
Council Member Nagy				
Council Member Paul				

Hayes, Rob

From: Mike Fellows [mlf@mozarthomes.com]
Sent: Tuesday, August 07, 2007 2:37 PM
To: Hayes, Rob
Subject: RE: Draft Stormwater Ordinance Revisions

Hi Rob,

I have to apologize --- We moved our offices about 2 weeks ago and in the process I lost any emails that had not been saved. So I was not able to even read the proposed changes. From this forwarded email I see that the proposed changes include consolidation of the relevant ordinance requirements, which sounds good. Any time there are less places to look up the rules we have to follow it helps.

If there is any thought to revisions of the financial guarantee requirements, I would like to point out that a financial guarantee of 150% of the completion costs always seems unnecessarily excessive. I know that there are circumstances where even 200% of completion costs are required. For a large development the cost of obtaining these guarantees is substantial. I would like to know if in the history of requiring financial guarantees has the City ever had to seize and spend 150% of the estimated cost of any improvement. A financial guarantee need only be in place to restore an uncompleted site to a safe and non-environmentally-threatening condition. For example, if a development gets mass graded and then the developer skips town, there is no need to have money in place to install all the utilities and roads; the City only would need to stabilize the site for soil erosion concerns, and remove any dangerous conditions.

Also, if the new requirements are less performance oriented and more of "design guidelines" – meaning a new limiting of the options offered developers, of course I would disagree in principal with that. Almost invariably, new municipal design guidelines end up increasing the cost of new developments, not reducing them.

Anyway, I do appreciate your contacting me to request our comments. Normally I would have been happy to provide them. I've been quite distracted lately trying to stay in business, and plumb forgot that you sent me that email. I will not have any time this evening to read the proposed changes; my friend, I'm afraid I'm not much help to you on this one.

Mike

From: Hayes, Rob [mailto:rhayes@cityofnovi.org]
Sent: Monday, August 06, 2007 5:43 PM
To: Ryan Dembs; mlf@mozarthomes.com
Subject: RE: Draft Stormwater Ordinance Revisions

Ryan and Mike:

Any comments on what I sent you previously in regards to adding low impact development options to our ordinance? We have until Wednesday to collect any comments (pro/con/otherwise) from the development community. These changes will now be considered at the August 13th meeting.

- Rob

From: Hayes, Rob
Sent: Thursday, July 12, 2007 3:43 PM
To: 'Ryan Dembs'; 'mlf@mozarthomes.com'; 'mssosin@noreq.com'
Subject: Draft Stormwater Ordinance Revisions

Gentlemen:

We are beginning to open the door to Low Impact Development/Green Development techniques in the City of Novi and have prepared the attached draft Ordinance revisions to reflect proposed changes for stormwater management in Novi. These revisions also provide a lot of consolidation and updating to make the stormwater-related portions of the Ordinance a lot easier to follow.

This is your opportunity to review and comment on the changes we propose. We plan on presenting these to Council for consideration at the July 23rd meeting.

Regards,

Rob Hayes, P.E.
City Engineer, City of Novi
45175 W. Ten Mile Road
Novi, Michigan 48375
Phone: 248-347-0454
Fax: 248-735-5683

Hayes, Rob

From: Ryan Dembs [ryan@amsondembs.net]
Sent: Tuesday, August 07, 2007 11:20 AM
To: Hayes, Rob
Subject: RE: Draft Stormwater Ordinance Revisions

Rob- I think it is great that the city tries to head in this direction...I dont know a ton about it, but I think that it is definitely worth while to explore these options....Thanks for considering us in your decision.....Talk soon.....Ryan

---

From: Hayes, Rob [mailto:rhayes@cityofnovi.org]
Sent: Monday, August 06, 2007 5:43 PM
To: Ryan Dembs; mlf@mozarthomes.com
Subject: RE: Draft Stormwater Ordinance Revisions

Ryan and Mike:

Any comments on what I sent you previously in regards to adding low impact development options to our ordinance? We have until Wednesday to collect any comments (pro/con/otherwise) from the development community. These changes will now be considered at the August 13th meeting.

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To: 'Ryan Dembs'; 'mlf@mozarthomes.com'; 'mssosin@noreq.com'
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Regards,

Rob Hayes, P.E.
City Engineer, City of Novi
45175 W. Ten Mile Road
Novi, Michigan 48375
Phone: 248-347-0454
Fax: 248-735-5683

Hayes, Rob

From: Matthew S. Sosin [mssosin@noreq.com]
Sent: Wednesday, August 08, 2007 12:25 PM
To: Hayes, Rob
Subject: stormwater

My only comment is that if there are technologies that accomplish the goals of the ordinance, but they happen to be underground structures, they should not be discouraged. At least the minimum site limitation should be raised.

Also, I am not sure if this is the right place, but I would like the ordinance to allow for plastic pipe to be used for stormwater conveyance.

Matthew S. Sosin
President
Northern Equities Group
39000 Country Club Drive
Farmington Hills, MI 48331
P - (248) 848-6400
F - (248) 848-6700
http://www.noreq.com

Draft
8/8/2007

STATE OF MICHIGAN

COUNTY OF OAKLAND

CITY OF NOVI

ORDINANCE NO. 07-124.18

AN ORDINANCE TO AMEND THE CITY OF NOVI CODE OF ORDINANCES, AS AMENDED, CHAPTER 11, "DESIGN AND CONSTRUCTIONS STANDARDS," ARTICLE IV, "STORM SEWERS IN ORDER TO…

THE CITY OF NOVI ORDAINS:

PART I

That Chapter 11, Design and Construction Standards, Article IV, Storm Sewers, of the City of Novi Code of Ordinances is hereby amended to read as follows:

ARTICLE IV. STORM SEWERS.

Sec. 11-91. [Unchanged.]

Sec. 11-92. [Unchanged.]

Sec. 11-93. General design.

(a) All storm sewer designs shall conform to the City of Novi Stormwater Management Master Plan (SWMMP) *and the Engineering Design Manual*. The master plan describes the city stormwater system. Underground drainage facilities will generally be required for the minor stormwater disposal system (ten-year storm event). Continuous overland flood routing will generally be required for the major stormwater disposal system (one-hundred-year storm event).

(b) [Unchanged.]

Sec. 11-94. [Unchanged.]

Sec. 11-95. [Unchanged.]

Sec. 11-96 is hereby deleted in its entirety.

Sec. 11-~~97~~ *96*. [Unchanged.]

Sec. 11-~~98~~ *97*. [Unchanged.]

Sec. 11-~~99~~ *98*. [Unchanged.]

Sec. 11-~~100~~ *99*. [Unchanged.]

Sec. 11-~~101~~ *100*. [Unchanged.]

Sec. 11-~~102~~ *101*. [Unchanged.]

PART II

That Chapter 11, Design and Construction Standards, Article V, Stormwater Holding Facilities, of the City of Novi Code of Ordinances is hereby amended as follows:

Article V, "Stormwater Holding Facilities," Sections 11-121 – 11-128,
is hereby deleted in its entirety

PART III

Savings Clause. The amendment of the Novi Code of Ordinances set forth in this Ordinance does not affect or impair any act done, offense committed, or right accruing, accrued, or acquired or liability, penalty, forfeiture or punishment, pending or incurred prior to the amendment of the Novi Code of Ordinances set forth in this Ordinance.

PART IV

Severability. Should any section, subdivision, clause, or phrase of this Ordinance be declared by the courts to be invalid, the validity of the Ordinance as a whole, or in part, shall not be affected other than the part invalidated.

PART V

Effective Date: Publication. The provisions of this Ordinance shall become effective fifteen (15) days after its adoption and shall be published within 15 days of its adoption by publication of a brief notice in a newspaper circulated in the City, stating the date of enactment and the effective date of the ordinance, a brief statement as to the subject matter of this Ordinance and such other facts as the Clerk shall deem pertinent, and that a copy of the Ordinance is available for public use and inspection at the office of the City Clerk.

MADE, PASSED, AND ADOPTED BY THE CITY COUNCIL OF THE CITY OF NOVI, OAKLAND COUNTY, MICHIGAN, ON THE ___ DAY OF _____, 2007.

_____
DAVID LANDRY, MAYOR

_____
MARYANNE CORNELIUS, CITY CLERK

Ayes:
Nays:
Abstentions:
Absent:

CERTIFICATION OF ADOPTION

I hereby certify that the foregoing is a true and complete copy of an Ordinance passed at a _____ meeting of the Novi City Council, held on the _____ day of _____, 2007.

_____
MARYANNE CORNELIUS, CITY CLERK

Adopted:
Published:
Effective:

956562_1

Draft
8/8/2007

STATE OF MICHIGAN

COUNTY OF OAKLAND

CITY OF NOVI

ORDINANCE NO. 07-106.04

AN ORDINANCE TO AMEND THE CITY OF NOVI CODE OF ORDINANCES, AS AMENDED, CHAPTER 12, "DRAINAGE AND FLOOD DAMAGE PROTECTIONS" ARTICLE III, "STORMWATER DETENTION" IN ORDER TO ADD LOW IMPACT DEVELOPMENT REQUIREMENTS FOR STORMWATER MANAGEMENT SYSTEMS

THE CITY OF NOVI ORDAINS:

PART I.

That Chapter 12, Drainage and Flood Damage Protections, Article III, Stormwater Detention, of the City of Novi Code of Ordinances is hereby amended to read as follows:

Sec. 12-66. [Unchanged.]

Sec. 12-67. [Unchanged.]

Sec. 12-68. [Unchanged.]

Sec. 12-69. [Unchanged.]

Sec. 12-70. Determination of need for on-site detention or retention facilities.

(a) [Unchanged.]

(b) ~~Where a receiving drainage course does not possess sufficient flow capacities to protect downstream properties from damage resulting from developed stormwater flows, the~~ *All* new development*s and redevelopments* shall provide an on-site stormwater detention or retention facility or facilities in accordance with ~~chapter 11, "Design and Construction Standards."~~ *Article VI, "Stormwater Management" and the Engineering Design Manual.*

(c) Where a receiving drainage course possesses sufficient flow capacities to protect downstream properties from damage resulting from developed stormwater flows, the new development shall:

(1) Pay a stormwater detention fee, as provided in section 12-71, if utilizing a regional stormwater detention facility~~;~~, *and provide facilities for stormwater quality enhancements* or

(2) Elect to provide an on-site stormwater ~~detention or retention~~ *management* facility or facilities in accordance with ~~chapter 11, "Design and Construction Standards."~~ *the Engineering Design Manual.*

(d) [Unchanged.]

(e) [Unchanged.]

Sec. 12-71. [Unchanged.]

Sec. 12-72. [Unchanged.]

Sec. 12-73. [Unchanged.]

Sec. 12-74. [Unchanged.]

Sec. 12-75. [Unchanged.]

PART II.

Savings Clause. The amendment of the Novi Code of Ordinances set forth in this Ordinance does not affect or impair any act done, offense committed, or right accruing, accrued, or acquired or liability, penalty, forfeiture or punishment, pending or incurred prior to the amendment of the Novi Code of Ordinances set forth in this Ordinance.

PART III.

Severability. Should any section, subdivision, clause, or phrase of this Ordinance be declared by the courts to be invalid, the validity of the Ordinance as a whole, or in part, shall not be affected other than the part invalidated.

PART IV.

Effective Date: Publication. The provisions of this Ordinance shall become effective fifteen (15) days after its adoption and shall be published within 15 days of its adoption by publication of a brief notice in a newspaper circulated in the City, stating the date of enactment and the effective date of the ordinance, a brief statement as to the subject matter of this Ordinance and such other facts as the Clerk shall deem pertinent, and that a copy of the Ordinance is available for public use and inspection at the office of the City Clerk.

Draft
8/8/2007

MADE, PASSED, AND ADOPTED BY THE CITY COUNCIL OF THE CITY OF NOVI, OAKLAND COUNTY, MICHIGAN, ON THE ___ DAY OF _____, 2007.

_____
DAVID LANDRY, MAYOR

_____
MARYANNE CORNELIUS, CITY CLERK

Ayes:
Nays:
Abstentions:
Absent:

CERTIFICATION OF ADOPTION

I hereby certify that the foregoing is a true and complete copy of an Ordinance passed at a _____ meeting of the Novi City Council, held on the _____ day of _____, 2007.

_____
MARYANNE CORNELIUS, CITY CLERK

Adopted:
Published:
Effective:

956628_1

STATE OF MICHIGAN

COUNTY OF OAKLAND

CITY OF NOVI

ORDINANCE NO. 07-168.01

AN ORDINANCE TO AMEND THE CITY OF NOVI CODE OF ORDINANCES, AS AMENDED, CHAPTER 12, "DRAINAGE AND FLOOD DAMAGE PROTECTIONS," ARTICLE VI, "STORMWATER MANAGEMENT," AND THE APPENDIX IN ORDER TO ADD LOW IMPACT DEVELOPMENT REQUIREMENTS FOR STORMWATER MANAGEMENT SYSTEMS

THE CITY OF NOVI ORDAINS:

PART I.

That Chapter 12, Drainage and Flood Damage Protections, Article VI, Stormwater Management, of the City of Novi Code of Ordinances is hereby amended to read as follows:

ARTICLE VI. STORMWATER MANAGEMENT

DIVISION 1. PURPOSES AND INTERPRETATION

Sec. 12-181. Purposes.

The purposes of this article shall be:

(1) To protect public health, safety and welfare by requiring stormwater management whenever new, expanded or modified developments are proposed.

(2) To facilitate achievement of the goals outlined in the Rouge River and Huron River Watershed Master Plans.

(3) To minimize the increased volume of stormwater generated from a development.

(4) To protect natural infiltration and groundwater recharge rates in order to sustain ground water supplies and stream base flows.

~~(2)~~ *(5)* To assure that stormwater runoff from development is controlled so that the water quality in watercourses, ground water recharged by stormwater and habitat situated in areas impacted by stormwater are protected, and that siltation and pollution are minimized.

(6) To maintain natural drainage patterns and encourage the use of natural drainage systems and LID techniques.

~~(3)~~ *(7)* To provide for cost-effective and functionally-effective stormwater management, and to reduce the need for future remedial projects.

(8) To treat and release stormwater as close to the source of runoff as possible using minimal structures and maximizing reliance on natural processes.

~~(4)~~ *(9)* To prevent soil erosion and sedimentation.

(10) To protect in-stream channels and geomorphologic conditions of receiving streams; protect their flood carrying capacity and aquatic habitats and reduce in-stream erosion and sedimentation.

~~(5)~~ *(11)* To ensure that, if wetlands are to be used for stormwater detention, the natural functions and quality of wetlands throughout the city are protected to the maximum extent particularly with regard to the effects of stormwater elevation increases on existing woodlands.

~~(6)~~ *(12)* To recognize private responsibility to incorporate stormwater management systems into the early stages of site planning and design.

~~(7)~~ *(13)* To ensure that all stormwater conveyance and detention facilities will be properly maintained.

~~(8)~~ *(14)* To promote the avoidance of degradation of water resources by reducing and/or avoiding impacts on the hydrology of stormwater runoff.

~~(9)~~ *(15)* To establish regulations to prevent harmful effects of changes in the quantity and quality of surface water discharge into water bodies that are in the city, in whole or part.

~~(10)~~ *(16)* Recognizing that significant adverse surface and/or groundwater impacts may result from development, it is the intent of this article to require development design and control mechanisms to ensure that stormwater runoff does not result in a short-term and/or long-term threat to the public health, safety and welfare in the city, and in downstream areas.

~~(11)~~ *(17)* To achieve compliance with state and federal law and regulations relating to water quality*, including the City's Stormwater Pollution Prevention Initiative*.

Sec. 12-182. [Unchanged.]

Sec. 12-183. [Unchanged.]

DIVISION 2. DEFINITIONS

Sec. 12-190. Definition of terms.

The following terms, phrases, words and derivatives shall have the meaning defined below:

* * *

Bankfull flood. *The stormwater generated by a storm event with a 1.5-year return level.*

BMP or best management practice. *BMPs are any structural, vegetative or managerial practice used to treat, prevent or reduce water pollution. Such practices include temporary seeding on exposed soils, detention and retention basins for stormwater control, and scheduling the implementation of all BMPs to ensure their effectiveness.*

Bioretention facility. *A stormwater management system that consists of a shallow, landscaped depressed land area that receives runoff and is designed to use soil and plant material to mimic the natural water cycle by storing, filtering and infiltrating stormwater into the ground. Rain gardens, bioretention basins and bioswales are examples of bioretention facilities.*

Buffer strip. *A zone that is used for filtering stormwater runoff into a stormwater management system.*

* * *

Design Storm. *A rainfall event of a specified size and return interval used to calculate the peak stormwater flow and volume that a stormwater management facility must be designed to handle.*

* * *

~~*BMP or best management practice.* BMPs are any structural, vegetative or managerial practice used to treat, prevent or reduce water pollution. Such practices include temporary seeding on exposed soils, detention and retention basins for stormwater control, and scheduling the implementation of all BMPs to ensure their effectiveness.~~

* * *

First flush. *The volume of stormwater associated with ½-inch of runoff over the tributary area.*

* * *

Low impact development (LID). *A comprehensive land planning and engineering design approach with a goal of maintaining and enhancing the pre-development hydrologic regime of urban and developing watersheds. LID's goal is to mimic a site's predevelopment hydrology by using design techniques that infiltrate, filter, store, evaporate, and detain runoff close to its source.*

* * *

Manufactured treatment system. *A manmade device or structure that is used to remove oil and grease, debris, sediment and/or other particulate contaminants from stormwater.*

* * *

Underdrain. *One or more underground pipes installed beneath stormwater management facilities or structures to facilitate conveyance of stormwater runoff from beneath the facility or structure to another part of the stormwater management system.*

Underground Detention System. *One or more underground pipes and/or other structures that are used to provide storage of stormwater.*

* * *

DIVISION 3. GENERAL PROVISIONS

[Unchanged.]

DIVISION 4. PLAN REQUIREMENTS

Sec. 12-211. [Unchanged.]

Sec. 12-212. [Unchanged.]

Sec. 12-213. [Unchanged.]

Sec. 12-214. [Unchanged.]

Sec. 12-215. [Unchanged.]

Sec. 12-216. [Unchanged.]

Sec. 12-217. Standards for stormwater management plan approval.

All developments requiring a stormwater management plan shall be designed, constructed, and maintained to prevent flooding and protect water quality. The particular facilities and measures required on-site shall take into consideration the natural features, wetlands, and watercourses on the site; the potential for on-site and off-site adverse stormwater

impacts, water pollution, and erosion; and the size of the site. *The City strongly encourages the use of low impact development techniques for reducing and managing stormwater runoff.*

(1) *General standards for on-site and off-site stormwater management.*

a. Stormwater management conveyance, storage and infiltration measures and facilities shall be designed to prevent flood hazards and water pollution related to stormwater runoff, to prevent accelerated soil erosion from the proposed development, and shall conform with the requirements ~~as~~ specified ~~in part two of the appendix following this article~~ *in the Engineering Design Manual*.

b. [Unchanged.]

c. Unless otherwise approved, stormwater runoff shall be conveyed through swales and vegetated buffer strips so as to decrease runoff velocity, allow for natural infiltration, allow suspended sediment particles to settle, and to remove pollutants. *To the fullest extent possible, impervious surfaces should be disconnected from other impervious surfaces.*

d. Runoff rates from detention basins shall conform ~~with~~ *to* the requirements specified in ~~part two of the appendix~~ *the Engineering Design Manual* for the first flush, bankfull, and one-hundred-year storm.

e. [Unchanged.]

f. [Unchanged.]

g. [Unchanged.]

(2) *Soil erosion control.*

a. Cutting, filling and grading shall conform with the requirements specified in ~~part two of the appendix~~ *the Engineering Design Manual*.

b. - k. [Unchanged.]

(3) *Stormwater storage, ~~and~~ infiltration* and treatment *facilities.* Stormwater storage, ~~and/or~~ infiltration *and treatment* facilities required pursuant to this article shall comply with the requirements specified in ~~part two of the appendix (following this article)~~ *the Engineering Design Manual*.

(4) [Unchanged.]

Sec. 12-218. Off-site stormwater management.

(a) *Requirements.*

(1) In lieu of on-site stormwater detention, the use of off-site stormwater conveyance, infiltration, and/or detention areas may be proposed. Off-site stormwater management facilities shall be designed to comply with the requirements specified in *the Engineering Design Manual* ~~part two of the appendix (following this article)~~ and all other standards provided by this article that are applicable to on-site facilities.

(2) [Unchanged.]

(3) [Unchanged.]

(4) [Unchanged.]

(b) *Performance guarantees, inspections, maintenance, and enforcement.* All provisions of divisions 7 and 9 of this article, and of chapter 26.5 shall apply to off-site stormwater conveyance and detention. *Additional requirements for maintenance of stormwater management facilities provided in the Engineering Design Manual shall also apply.*

PART II.

That the Appendix to Chapter 12, Drainage and Flood Damage Protections, of the City of Novi Code of Ordinances is hereby amended to read as follows:

APPENDIX

PART ONE. PROCEDURES FOR SUBMISSION AND REVIEW OF DEVELOPMENT PLANS

Sec. I. [Unchanged.]

Sec. II. Submission of preliminary plan.

A. *Submission and general information requirements for approval of stormwater management plans.*

1. - 2. [Unchanged.]

3. The plan will include:

a. - j. [Unchanged.]

k. Soil borings may be required at various locations including the sites of proposed retention/detention *or infiltration* facilities, and as needed in areas where high ground water tables exist. *Additional guidance for soil boring requirements is provided in the Engineering Design Manual.*

4. - 8. [Unchanged.]

Sec. III. Final construction approval.

A. The applicant will submit final stormwater management facility construction plans with a letter of transmittal. Plans will be prepared under the direction of, and sealed by, a registered professional engineer and will be in accordance with part two of these procedures and standards. The city engineer will review final construction plans to assure that adequate storm drainage will be provided and that the proposed stormwater management system provides adequately for water quantity and quality management to ensure protection of property owners and watercourses both within the proposed development and downstream. Submission requirements include, but will not be limited to the following:

1. - 3. [Unchanged.]

4. A stormwater facility maintenance plan, schedule, and budget estimating the costs that will be associated with system maintenance ~~(see part two, subsection X.D.)~~ *as outlined in the Engineering Design Manual. Where applicable, a draft stormwater facility maintenance agreement shall be submitted.*

5. [Unchanged.]

B. - F. [Unchanged.]

Part Two is hereby deleted in its entirety.

Part III.

Savings Clause. The amendment of the Novi Code of Ordinances set forth in this Ordinance does not affect or impair any act done, offense committed, or right accruing, accrued, or acquired or liability, penalty, forfeiture or punishment, pending or incurred prior to the amendment of the Novi Code of Ordinances set forth in this Ordinance.

PART IV.

Severability. Should any section, subdivision, clause, or phrase of this Ordinance be declared by the courts to be invalid, the validity of the Ordinance as a whole, or in part, shall not be affected other than the part invalidated.

PART V.

Effective Date: Publication. The provisions of this Ordinance shall become effective fifteen (15) days after its adoption and shall be published within 15 days of its adoption by publication of a brief notice in a newspaper circulated in the City, stating the date of enactment and the effective date of the ordinance, a brief statement as to the subject matter of this Ordinance and

such other facts as the Clerk shall deem pertinent, and that a copy of the Ordinance is available for public use and inspection at the office of the City Clerk.

MADE, PASSED, AND ADOPTED BY THE CITY COUNCIL OF THE CITY OF NOVI, OAKLAND COUNTY, MICHIGAN, ON THE ___ DAY OF _____, 2007.

_____
DAVID LANDRY, MAYOR

_____
MARYANNE CORNELIUS, CITY CLERK

Ayes:
Nays:
Abstentions:
Absent:

CERTIFICATION OF ADOPTION

I hereby certify that the foregoing is a true and complete copy of an Ordinance passed at a _____ meeting of the Novi City Council, held on the _____ day of _____, 2007.

_____
MARYANNE CORNELIUS, CITY CLERK

Adopted:
Published:
Effective:

964556_1

CITY COUNCIL

Mayor
David B. Landry

Mayor Pro Tem
Kim Capello

Bob Gatt

Terry K. Margolis

Andrew Mutch

Toni Nagy

Lynne Paul

City Manager
Clay J. Pearson

City Clerk
Maryanne Cornelius

[DRAFT]

RESOLUTION OF AUTHORITY

ENGINEERING DESIGN MANUAL

WHEREAS, the City of Novi's Code of Ordinances contains numerous technical details and specifications relating to construction; and,

WHEREAS, standards in the construction industry change frequently as technologies, materials and equipment improve; and,

WHEREAS, the City and its development community would benefit from a streamlined, single document that contains construction details and specifications.

NOW, THEREFORE, BE IT RESOLVED that the Mayor and Council of the City of Novi authorize the City Engineer to prepare, maintain and approve the contents of an Engineering Design Manual for purposes of clearly conveying technical details and specifications related to construction within the City of Novi.

CERTIFICATION

I, Maryanne Cornelius, duly appointed Clerk of the City of Novi, do hereby certify that the foregoing is a true and complete copy of a resolution adopted by the City Council of the City of Novi at a Regular meeting held this ___ day of _____, 2007.

_____

Maryanne Cornelius
City Clerk

45175 W. Ten Mile
Novi, MI 48375
(248) 347-0460
(248) 347-0577 Fax
www.cityofnovi.org

Proposed Engineering Design Manual for City of Novi
Oakland County, Michigan

DRAFT – July 11, 2007
Submitted by:

Environmental Consulting & Technology, Inc.

2200 Commonwealth Blvd., Suite 300
Ann Arbor, MI 48105
Ph: 734-769-3004
Fax: 734-769-3164

TABLE OF CONTENTS

CHAPTER 1 – STORMWATER MANAGEMENT

This ~~part two~~document sets forth specific performance, design, ~~and~~ construction and maintenance standards that will be used by the city in review of proposed stormwater management systems in accordance with the objectives of managing both the quantity and quality of stormwater runoff.

It is difficult or impossible to develop one (1) set of uniform standards that can accommodate all variables and unique site circumstances. In particular, it is recognized that these standards may be difficult to realize on small sites. Waivers or variances from specific provisions of these standards may be requested, and alternatives consistent with the overall intent of stormwater quantity and quality management may be proposed, subject to the approval of the city in accordance with the procedure and standards in the ~~stormwater management ordinance [article VI, preceding this appendix~~City's Code of Ordinances~~].~~.

PART ONE

PERFORMANCE CRITERIA FOR STORMWATER MANAGEMENT SYSTEMS

This Part One sets forth performance standards that the City has adopted to meet the objectives of managing the quantity and quality of stormwater runoff. Designers may select any combination of stormwater management elements which meet the performance standards provided the selections: (1) comply with the requirements identified in this document and the City's Code of Ordinances; (2) comply with other local, county, state or federal requirements; and (3) do not conflict with the existing local stormwater management and watershed plans.

The performance standards described in this Section pertain to permanent stormwater management systems.

SECTION 1.0 Low-Impact Development

There are several additional methods of controlling the quantity of and improving the quality of stormwater runoff from the site. The designer should consider incorporating low impact design principles into the site design as a method of improving the stormwater quality and reducing peak flows. The goal of low impact design is to more closely mimic the watershed's natural hydrologic functions and include:

A. Prevent stormwater impacts rather than having to mitigate for them.

B. Manage stormwater quantity and quality as close to the source as possible and minimize the use of large or regional collection and conveyance.

C. Preserve natural areas, native vegetation and reduce the impact on the watershed hydrology.

D. Use natural drainage pathways as a frame work for site design.

E. Utilize simple, non-structural methods for stormwater management that are lower cost and lower maintenance than structural controls.

F. Create a multifunctional landscape.

Low impact design practices and techniques for site design include the following:

A. Preservation of Natural Features and Conservation Design
   1. Preservation of undisturbed areas
   2. Preservation of buffers
   3. Reduction of clearing and grading
   4. Locating sites in less sensitive areas
   5. Open space design

B. Reduction of Impervious Cover
   1. Roadway reduction
   2. Sidewalk reduction
   3. Driveway reduction
   4. Cul-de-sac reduction
   5. Building footprint reduction
   6. Parking reduction

C. Utilization of Natural Features and Source Control for Stormwater Management
   1. Vegetated buffer/filter strips
   2. Open vegetated channels
   3. Bioretention, rain gardens and bioswales
   4. Infiltration
   5. Rooftop runoff mitigation
   6. Stream daylighting for redevelopment projects
   7. Tree planting

Additionally, the following techniques can improve the stormwater management plan for a site:

A. Disconnection of impervious surfaces.
B. Reduced slopes and increased roughness of flow paths.
C. Avoid channelizing of stormwater flow.

SECTION 2.0 Stormwater Quantity Control

The design of a stormwater management system must incorporate elements for protecting against the effects of flooding. To control flooding, the City has adopted the following minimum performance standards for controlling the volume of stormwater runoff from development projects:

A. Stormwater quantity control facilities must accommodate the 100-year storm event and provide additional protection for the bankfull flood and first flush events. Acceptable methods for determining the volume of runoff from the 100-year storm and bankfull flood and are in Part Two, Section 1.02.

B. Stormwater management facilities should, in every way feasible, conform to the natural drainage patterns within the site and the watershed in which it is located.

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C. Where a positive outlet (detention systems) is provided, the flow shall be restricted to provide protection for the 100-year storm event and bankfull flood as defined in Part One, Section 2.01.

D. Stormwater management facilities may not be constructed within the 100-year floodplain unless specifically approved by the Michigan Department of Environmental Quality, Oakland County and the Township.

The designer may consider the following stormwater management technologies for meeting these performance standards:

A. Detention Basins
B. Retention Basins
C. Infiltration Trenches or Ponds
D. Underground Detention Systems are typically discouraged unless the criteria outlined in Part Two, Section 3.0 have been met.
E. Use of Existing Wetlands for stormwater management is typically discouraged unless the criteria outlined in Part One, Section 2.05 have been met.

Additional design requirements for the above mentioned technologies are detailed in Part Two.

2.01 Allowable Discharge Rate

In no event will the maximum design rate or volume of discharge exceed the maximum capacity of the downstream land, channel, pipe or watercourse to accommodate the flow and conform with all public and private rights. It is the applicant's obligation to meet this standard. Should a stormwater system, as built, fail to comply, it is the applicant's responsibility to design and construct, or to have constructed at his/her expense, any necessary additional and/or alternative stormwater management facilities. Such additional facilities shall be subject to the city's review and approval.

The stormwater discharge from the site shall be directed to a defined watercourse, channel or storm sewer. The stormwater discharge from the site shall not exceed 0.15 cfs per acre, provided sufficient capacity exists within the downstream watercourse, channel or storm sewer. The applicant is required to identify the ultimate stormwater outlet for the site (surface water body, established country drain, etc.) and provide documentation that sufficient conveyance capacity exists within the downstream watercourse between the site and the ultimate outlet for the discharge from the site.

If ~~no adequate watercourse exists~~sufficent capacity does not exist within the downstream watercourse, channel or storm sewer to effectively handle a concentrated flow of water from the proposed development, allowable discharge rates will be further reduced. ~~reduced to the agricultural rate prior to exiting the site, and cannot exceed fifteen hundredths (0.15) cfs/acre. Additional volume controls may be required in such cases and/or acquisition of rights-of-way from downstream property owners receiving the stormwater flow~~.

Discharge should outlet within the drainage basin where flows originate, and generally may not be diverted to another basin.

2.02 Determination of Required Detention Storage Volume

Stormwater detention facilities must provide enough storage volume so as not to exceed the maximum allowable runoff rate for the site during a 100-year, 24-hour design storm event. Detention volume must be provided for all on-site and off-site acreage contributing to the detention basin. The method for determining required detention volume is provided in Part Two, Section 1.02. Additional requirements for detention facilities are identified in Part Two, Section 2.0.

2.03 Determination of Required Retention Storage Volume

Retention of stormwater within a "no outlet" retention basin is discouraged and will only be considered when the designer can demonstrate that no possible stormwater outlet exists for the site. A retention basin is permissible only under specific site conditions that are outlined in Part Two, Section 4.01.

Stormwater retention facilities must provide sufficient storage capacity for two consecutive 100-year storm events from the entire contributing tributary area including any off-site drainage. The method for determining required retention volume is provided in Part Two, Section 1.03. Additional requirements for retention facilities are identified in Part Two, Section 4.0.

2.04 Determination of Required Infiltration Storage Volume

Where infiltration facilities are installed to meet the performance standards for quantity control, the minimum design volume shall be calculated in a manner similar to the method used for determining required detention volume outlined above. The infiltration facility shall be sized to accommodate the runoff from a 100-year, 24-hour design storm. The "outlet" rate may be determined based on the infiltration rate of the in-situ soils. Additional requirements for infiltration facilities are identified in Part Two, Section 5.0.

2.05 Use of Existing Wetlands

The City discourages the use of existing wetlands for the purposes of providing stormwater quantity control. The City will only consider approval of use of an existing wetland for stormwater quantity control if all of the following are requirements are satisfied:

A. The wetland must already be highly altered by watershed development and meet certain benchmarks for isolation, high water level fluctuation, low wetland plant richness, dominance of invasive or aggressive plants and altered hydrology.

B. It must be shown that the wetland site does not contain any unique wetland features.

C. The wetland must be characterized as an emergent, submergent aquatic, or open water wetland. In some cases, scrub-shrub or forested wetlands may be considered if it is clearly demonstrated that the additional storage would not jeopardize the health of the wetland community.

D. An analysis of the pre-developed and post developed water balance for the wetland shows no negative impacts to the existing wetland or adjacent properties. The designer is required to provide the water balance documentation for review. The water balance should include runoff from irrigation.

E. A stormwater management easement shall be provided for the entire wetland. Where portions of the wetland are located on adjacent properties, the developer shall secure all of the required easements.

F. Sufficient pretreatment of the stormwater is provided prior to its discharge to the wetland. Pretreatment shall be designed in accordance with the requirements of Part One, Section 3.0 and Part Two, Section 2.05.

G. A wetland enhancement plan shall be provided for all wetlands that are dominated by invasive species. The enhancement plan may include some or all of the following: removal of all or some of the invasive and restoration with native species; planting of additional trees and shrubs; and creation of open water areas.

H. For wetlands regulated by the Michigan Department of Environmental Quality, a permit from the MDEQ has been obtained all proposed stormwater discharges and use of the existing wetland for stormwater quantity control.

I. For wetlands regulated by the City, a permit from the City has been obtained for all proposed stormwater discharges and use of the existing wetland for stormwater quantity control.

SECTION 3.0 Stormwater Quality Control

The design of a stormwater management system must incorporate elements for providing stormwater quality improvements. To protect water resources from stormwater pollutants, the City has adopted the following minimum performance standards for controlling the quality of stormwater runoff from development projects.

A. Volume based stormwater quantity control facilities (sediment forebay, bioretention, etc.) must provide treatment for the first flush volume. The first flush volume is defined as the first ½ -inch of stormwater runoff and can be determined using the following relationship:

V_{ff} = 1815 x drainage area (acres) x the relative imperviousness factor C

B. Flow based stormwater quality control facilities (manufactured treatment systems) must provide treatment for the peak flow associated with a 1-year storm event. The procedure for determining the peak flow rate associated with a 1-year storm event is provided in Part Two, Section 1.0.

The designer may consider the following stormwater management technologies for meeting these performance standards:

A. Sediment Forebays

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B. Bioretention/Rain Gardens
C. Manufactured Treatment Systems are typically discouraged unless the criteria outlined in Part Two, Section 7.0 have been met.

Additional design requirements for the above mentioned technologies are detailed in Part Two.

SECTION 4.0 Stormwater Conveyance

The design of the site should include sufficient provisions for stormwater conveyance. Stormwater management facilities may use open channels or closed conduits or both for means of conveying stormwater runoff provided. To ensure adequate stormwater conveyance, the City has adopted the following minimum performance standards.

A. Stormwater conveyance facilities shall have capacity to convey stormwater runoff from the 10-year storm event. Increased capacity requirements may be required by other governing agencies. Acceptable methods for determining the runoff associated with a 10-year storm event are included in Part Two, Section 1.0.

B. Open channels are generally preferred to closed conduits as a method for stormwater conveyance. Specifically, natural water courses, vegetated swales and channels and bioswales are preferred.

Additional design requirements for stormwater conveyance technologies are detailed in Part Two, Section 9.0.

PART TWO

DESIGN CRITERIA FOR STORMWATER MANAGEMENT SYSTEMS

This Part Two sets forth specific design and construction standards that will be used by the City in review of proposed stormwater management systems in accordance with the objectives of meeting the performance standards.

The standards and design criteria set forth herein are intended to guide designers to develop a stormwater management system that controls the quantity and quality of stormwater discharge from a site. The internal drainage for a site as well as the downstream conditions will be reviewed. Every site is part of an overall watershed and the system should be designed with this in mind. The system should conform to natural drainage patterns both on and off-site. These standards are the minimum requirements of the City and should not be construed as all-inclusive. The design engineer should consider many factors when planning the stormwater management system. In particular, Federal, State and Local standards may be stricter than these standards. In the case where conflicting standards arise, the more stringent requirements will govern. Exceptions will be considered when conformance with a local community master plan, stormwater management plan or watershed plan is required.

SECTION 1.0 Determination of Surface Runoff

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The Rational Method of calculating stormwater runoff is generally acceptable for calculating peak flow rates at any particular location within a stormwater management system for sites less than 150 acres in size. More precise methodologies for predicting runoff such as runoff hydrographs are widely available, and may be required by the City for sizing drainage systems on large sites and/or smaller sites that are deemed potentially problematic. Acceptable alternative methods will include:

A. Corps of Engineers HEC-1
B. Soil Conservation Service UD-21, TR-20 and TR-55
C. U.S. EPA's SWMM
D. Continuous simulation (e.g. HSPF)

Unless a contiguous simulation approach to drainage system hydrology is used, all design rainfall events will be based on the SCS Type II distribution.

Computations of runoff hydrographs that do not rely on a continuous accounting of antecedent moisture conditions will assume a conservative wet antecedent moisture condition.

1.01 The Rational Method

For all stormwater management systems that are designed using the Rational Method, the following formula must be used for calculating peak flow rate:

$$Q = c \times i \times A$$

Where: Q = peak runoff (cfs)
C = composite runoff coefficient
I = design rainfall intensity (inches/hour),
A = drainage area in acres

Runoff Coefficient
A realistic runoff coefficient will be used based upon the imperviousness of the tributary area. The range of this coefficient may vary from 0.15 for completely grassed areas to 0.95 for impervious areas and 1.0 for open water.

Certain calculations require use of a composite runoff coefficient value. The composite runoff coefficient is calculated as follows:

$$c = \frac{\sum_{i=1}^{n} c_i A_i}{\sum_{i=1}^{n} A_i}$$

Where: c = composite runoff coefficient
c_i = runoff coefficient for each sub-area
n = total number of sub-areas
A_i = drainage area in acres for each sub-area

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Minimum runoff coefficients for various surface types are provided in the table below:

Type of Surface		Runoff Coefficient (c)		
Water surfaces		1.0		
Roofs		0.95		
Asphalt or concrete pavements		0.95		
Gravel or brick		0.85		
Semi-pervious[1]:				
		Slope <4%	Slope 4-8%	Slope >4%
	Hydrologic Soil Group A	0.15	0.20	0.25
	Hydrologic Soil Group B	0.25	0.30	0.35
	Hydrologic Soil Group C	0.30	0.35	0.40
	Hydrologic Soil Group D	0.45	0.50	0.55

Notes:
1. Turf grass lawns shall have a minimum runoff coefficient of 0.35.

The runoff coefficient calculation must be included with plan submittal.

Design Rainfall Intensity
Formulas for determining rainfall intensities for various storm events are as follows:

Design Storm	Intensity (in/hr)
1-year	$XX/(t_c+25)$
10-year	$175/(t_c+25)$
100-year	$275/(t_c+25)$

Where: t_c = Time of Concentration (min)

Time of Concentration
An initial time of concentration of 20 minutes will be used on residential subdivisions. The time of concentration must be calculated for commercial and industrial subdivisions.

The design engineer may also use a calculated time of concentration if desired. The methodology and computations must be submitted for review.

When more than one type of flow exists, the individual flows should be summed up to find the total time of concentration.

Determination of Runoff from Green Roofs, Porous Pavers, Cisterns and other LID Techniques
The design of green roofs, porous pavers, cisterns and other LID techniques varies greatly from site to site. The City recognizes that these technologies will provide a reduction in the peak flow rate and volume of runoff. The design engineer should work with the City to identify how use of these technologies fit into the overall stormwater management plan for a site. In general, the following information should be considered when these LID techniques are proposed:

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A. The storage capacity (volume) of the system.
   1. For green roofs and porous pavers: a porous material is often provided for the base materials and the capacity within the void space should be identified.
   2. For cisterns: the total volume of the vessel.

B. The anticipated time for complete drainage of the system.
   1. For green roofs: a summary of how long it takes for the base material and underdrain system to drain following a rain event.
   2. For porous pavements: if infiltration is the only mechanism for drainage from the base material, the time for complete drainage will be based on the infiltration rate of the in-situ soil. Sufficient documentation (similar to the requirements outlined in Part Two, Section 5.0) should be provided to support the assumed infiltration rate. If an underdrain is proposed, the time to drain will be a function of the base material and pipe capacity.
   3. For cisterns: if water is to be used as grey water for a building or for irrigation purposes, an annual water balance calculation should be provided.

C. An analysis of the overflow, including prediction of when overflow will occur (i.e. storm events larger than 1-year, etc.) and identification of where water will be directed.

1.02 Determination of Required Detention Storage Volume

The following equations can be used to determine the required storage volume for a 100-year, 24-hour storm event:

Include calculations here or refer to OCDC standards.

1.03 Determination of Required Retention Storage Volume

Retention of stormwater within a "no outlet" retention basin is discouraged and will only be considered when the designer can demonstrate that no possible stormwater outlet exists for the site. A retention basin is permissible only under specific site conditions that are outlined in Part Two, Section 4.01.

Stormwater retention facilities must provide sufficient storage capacity for two consecutive 100-year storm events from the entire contributing tributary area including any off-site drainage. The following formula can be used to determine the required retention volume.

$$V_r = 33{,}000 \times A \times c$$

Where: V_r = required retention storage volume (cf)
A = Tributary area (ac)
c = runoff coefficient

SECTION 2.0 Detention Basins

Stormwater detention may be provided as part of a stormwater management system in order to satisfy the quantity control performance standards described in Part One, Section 2.0. Stormwater detention basins are generally acceptable for most sites. The following standards shall be adhered to when designing stormwater detention basins.

A. Pretreatment shall be provided for the stormwater prior to discharge into the detention basin. Acceptable methods and performance standards for pretreatment of stormwater are outlined in Part One, Section 3.0.

B. The volume of detention provided must be equal to or in excess of the volume of stormwater runoff generated from a 100-year storm event. The method for determining this volume is outlined in Part Two, Section 1.02.

C. Detention basins must have a positive method for draining. If a permanent pool is proposed, the basin must completely dewater to the elevation of the permanent pool. The outlet shall restrict the flow so that the flow does not exceed the maximum allowed outflow defined in Part One, Section 2.01.

D. In general, wet ponds and stormwater marsh systems will be preferred to dry ponds. Dry ponds providing extended storage will be accepted when the development site's physical characteristics or other local circumstances make the use of a wet pond infeasible.

E. When discharge is within a watershed where thermal impacts are a primary concern, dry ponds will be preferred to wet ponds, and extended detention (first flush and bankfull) requirements may be reduced to 12 hours. Shade plantings on the west and south sides of facilities are encouraged unless such plantings would not thrive or are not otherwise in the public interest.

F. Public safety will be a paramount consideration in stormwater system and pond design. Providing safe detention is the applicant's responsibility. Pond designs will incorporate gradual side slopes, vegetative and barrier plantings, and safety shelves. Where further safety measures are required, the applicant is expected to include them within the proposed development plans.

2.01 Detention Basin Types

Detention basins may be designed in a number of ways. The following are examples of types of ponds:

A. Wet detention basins

A wet detention basin is a small man-made surface water designed to treat stormwater runoff. Incoming stormwater runoff displaces "old water" out of the basin and is then stored until the next storm. By retaining the water for long periods of time, pollutants are effectively removed. The basin also deters re-suspension of deposited materials. Wetland vegetation should be used around the banks to help removed dissolved contaminants and algae. In addition to the

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general requirements for all detention basins outlined in this Ordinance, wet detention basins should meet the following requirements:

1. A minimum permanent pool depth of 3 feet should be provided.

2. Plant vegetation should be used to control erosion and enhance sediment entrapment. A shelf of fringe wetland (minimum 4-foot wide and 1-foot deep) should be provided along the perimeter of the pond to establish aquatic vegetation. The total area of the shelf should be 25-50% of the water surface area.

B. Constructed wetlands

Constructed wetlands are characterized as a man-made basin with over 50% of its surface area covered by wetland vegetation. Permanent wetland pool depths should vary between 0.5 and 3.0 feet depending on vegetation type. Wetlands should be constructed to mitigate stormwater quality and quantity impacts associated with development projects and should not serve to mitigate the loss of natural wetlands or encroach on natural delineated wetland areas. Wet ponds and constructed marsh/wetland systems are an effective BMP for controlling both stormwater quantity and quality. In addition to the general requirements for all detention basins outlined in this Ordinance, constructed wetlands should meet the following requirements:

1. Basins should be designed to maximize sheet flow across the wetland. In general, a rectangular configuration should be used with a length to width ratio of 3 to 1 placing the inlet and outlet pipes at the opposite ends. Baffles may be used to increase the flow path and maintain the topography.

2. A diversity of depth zones throughout the basin should be used to meet the unique growing requirements of divergent wetland plants.

C. Dry detention basins

Dry detention basins are designed so to drain completely following a storm event. Dry ponds are generally not preferred except where thermal impacts to the receiving waters are a concern.

2.02 Pond Geometry

Insert Pond Geometry guidelines here

2.03 Determination of Storage Volume Provided

Insert requirements for calculating storage provided, or refer to OCDC standards

2.04 Basin Inlets & Outlets

Insert requirements for inlets & outlets. Include requirement for double walled outlet structure.

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2.05 Additional Requirements

Insert additional requirements here (landscaping, maintenance, etc.) and/or refer to other applicable ordinance documents

SECTION 3.0 Underground Detention

Underground detention systems are the least preferred method of detention and will only be allowed for sites that meet at least one of the following criteria:

A. The site is an existing developed site that is proposed to be redeveloped.

B. The site has topographical constraints that would limit the effectiveness of a traditional basin

C. The site has size constraints (typically two acres or smaller).

The following will be required for underground detention facilities:

Insert design and construction criteria here. Include requirement for ground water elevation to be below bottom of basin (3' minimum, or other).

3.01 Restricted Outlet

Insert restricted outlet design guidelines & standards here

SECTION 4.0 Retention Basins

4.01 Minimum Site Requirements

Stormwater retention may be approved on sites where the following can be documented. Soil borings must be obtained within the location of the proposed basin and extend to a depth of 20 feet below the proposed retention basin bottom elevation. Additional boring depth may be appropriate for large basins. A minimum of one soil boring should be obtained for every 50 square feet of basin area, with a minimum of two borings for any basin. The soil borings shall be provided for review.

A. No stormwater outlet exists for the site.

B. Soil types in the area of the proposed retention basin are hydrological soil group classifications of A or B.

C. The permeability of the existing soils must be such that percolation of the retained stormwater is possible. Calculations performed by a professional geotechnical engineer should be submitted to support this. The calculations should be based on the percolation rates for the soils encountered in the soil borings.

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D. The ground water elevation is a minimum of 3 feet below the bottom of the retention basin.

4.02 Additional Requirements

Insert additional retention basin requirements here

SECTION 5.0 Infiltration Facilities

Stormwater infiltration systems are generally described as natural or constructed depressions located in permeable soils that capture, store and infiltrate stormwater runoff with a certain period of time. Stormwater infiltration may be provided through the use of infiltration trenches, infiltration basins or other mechanisms. While infiltration practices may not be practical as a sole method for meeting the performance standard of this ordinance, they can be incorporated as one component of an overall stormwater management system.

5.01 Minimum Site Requirements

Stormwater infiltration may be approved on sites where the following can be documented. Soil borings must be obtained within the location of the proposed infiltration facility and extend to a depth of 20 feet below the proposed bottom elevation. Additional boring depth may be appropriate for large basins. A minimum of one soil boring should be obtained for every 50 square feet of basin area, with a minimum of two borings for any basin. The soil borings shall be provided for review.

A. Infiltration facilities will be permitted only on sites with undrained hydrologic soil group classifications of A or B. Where infiltration facilities are proposed, a sufficient number of soil borings will be provided in each location to evaluate the soil suitability.

B. The infiltration rate of the existing soils must be such that percolation of the retained stormwater is possible within a reasonable time. Calculations performed by a professional geotechnical engineer should be submitted to support this. The calculations should be based on the percolation rates for the soils encountered in the soil borings. Pre and post construction percolation tests shall be performed to confirm the actual infiltration rate of the soil.

C. The seasonal high ground water elevation must be a minimum of 4 feet below the bottom of the infiltration facility.

D. Infiltration facilities are not suitable for land uses or activities with potential for high sediment or pollutant loads.

E. It is recommended that drainage areas for infiltration trenches not exceed 5 acres and drainage areas for infiltration basins be between 5 and 50 acres.

F. Slopes in the tributary area should not exceed 6% unless proper energy dissipation devices are installed.

5.02 Design Requirements

Insert design requirements here

5.03 Additional Requirements

Insert design requirements here

SECTION 6.0 Sediment Forebays

A sediment forebay is generally very compatible with an above ground detention or retention basin. However, it could also be used in combination with an underground detention system or infiltration system. Sediment forebays shall meet the following requirements:

A. The sediment forebay shall be sized to accommodate the first flush volume. The first flush volume is generally considered to be the first ½ inch of runoff from the site and can be determined by the following equation:

$$V_{ff} = 1850 \times \text{acreage} \times \text{the relative imperviousness factor C}$$

The volume of storage provided in the forebay may not be included as a part of the total provided storage volume required for storm water quantity control, above any permanent pool of water

B. When used in combination with an above ground detention or retention basin, the sediment forebay shall be a separate cell, which can be formed by gabions or an earthen berm. For small sites, where the size of the forebay would not provide sufficient settling time, alternative methods of providing quality control should be considered.

SECTION 7.0 Manufactured Treatment Systems

Manufactured treatment systems include underground swirl concentrators, which are "treatment systems" used to remove sediment and other particulate matter from stormwater runoff. Manufactured treatment systems are the least preferred method for meeting the stormwater quality performance standard and will only be allowed when other stormwater quality control facilities are not feasible for a given site. Future developments that may be permitted to install a swirl concentrator pretreatment structure would include redevelopment sites or sites involving relatively small drainage areas (generally two acres or smaller). For sites where a forebay would be relatively small, a swirl concentrator device may an acceptable substitute because of the reduced effectiveness and inadequate detention time of small forebays.

7.01 General Performance and Design Specifications

A. The system may be used to meet the storm water quality performance standards outlined in Part One, Section 3.0 as approved by the City Engineer.

B. The treatment system must include a "swirl chamber" with a tangential inlet that facilitates a swirling flow pattern to allow settlement of solids and prevent re-suspension of settled particulates.

C. Systems that have demonstrated 80% removal of the annual total suspended solids load based on third party independent testing are required.

D. The system must treat 100% of the runoff from the 1-year, 24-hour storm event and remove a minimum of 80% of the Total Suspended Solids (TSS) load based on a 110-micron particle size. The peak runoff from a 1-year, 24-hour storm event can be calculated as provided in Part Two, Section 1.01.

Include additional performance and design specifications here...

SECTION 8.0 Bioretention/Rain Gardens

Bioretention basins (sometimes referred to as Rain Gardens) can generally be described as shallow, landscaped depressions that receive runoff and are deigned to use soil and plant material to mimic the natural water cycle by storing, filtering and infiltrating stormwater into the ground. Bioretention areas may be used anywhere to meet the stormwater quality performance standards. Bioretention areas are the preferred method of meeting the stormwater quality performance standards of this Ordinance.

8.01 Site Suitability

Bioretention basins are generally suitable for all land uses, provided the tributary area is appropriate for the size of the facility. Common bioretention opportunities include landscaping islands, cul-de-sacs, parking lot setback areas, open spaces and streetscapes.

8.02 Design Guidelines

A. The bioretention basin shall be sized to accommodate the first flush volume. The first flush volume is generally considered to be the first ½ inch of runoff from the site and can be determined by the following equation:

V_{ff} = 1815 x acreage x the relative imperviousness factor C

Storage provided within the bioretention facility (including above-grade ponding and storage within the subsurface porous medium) and/or calculation infiltration will count toward the detention/retention storage requirements.

B. Bioretention basin shall be sized based on the principle's of Darcy's Law, as follows:

$$A_f = \frac{V_{ff} d_f}{k(h_f + d_f)t_f}$$

Where: A_f = Surface area of facility (sf)
d_f = Depth of filter bed (ft)
k = Coefficient of permeability of filter media (ft/day)
h_f = Average height of water above filter bed (ft)
t_f = design filter bed drain time (days)

Include additional guidance on sizing bioretention. Specifically, designer must demonstrate the volume provided in the basin. For consideration of water stored within the planting media and stone base, documentation needs to be provided to support the assumed void space. Consider a factor of safety and field test..

C. *Include additional design guidelines here.*

8.03 Additional Requirements

A. In residential properties, bioretention facilities provided to meet the stormwater management performance standards must be located within common areas and be protected from changes to grading and landscaping by the Master Deed or other appropriate document.

Include additional requirements (landscaping, maintenance, etc.)

SECTION 9.0 Stormwater Conveyance

Stormwater management facilities may use open channels or closed conduits or both for means of conveying stormwater runoff provided. Sufficient stormwater conveyance of a 10-year storm event is required. Methods for determining the 10-year design flow for a tributary area is outlined in Part Two, Section 1.01. Generally, open channels are preferred to closed conduits and naturally vegetated of grassed lined channels or swales are preferred.

9.01 Storm Sewer

9.02 Open Channels

9.03 Vegetated Swales

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5-31-07
To: Mayor and City Council Members
Work in progress

MEMORANDUM

To: Clay Pearson, City Manager
Pam Antil, Assistant City Manager

From: Rob Hayes, City Engineer

Re: **Green Site Development Revisions to the Storm Water Ordinance**

Date: May 30, 2007

****

Background

Earlier this year, City Council established a goal of being a community that values natural areas and features, and identified the following strategy and short-term goal to help achieve it:

5.3 Strategy – to allow and encourage green building and development

Short term goal – review ordinances to determine where changes are need to become more environmentally friendly

The Engineering Department has been evaluating ways in which green site development concepts (as opposed to *green building* concepts) may be allowed and encouraged, and we are continuing to review applicable portions of the Code of Ordinances to further this strategy. Since January's goal-setting session, Engineering staff members have completed the following actions in support of Council's goal:

- Revised Chapter 11 of the Ordinance to allow the use of porous turf pavers for emergency access in the public rights-of-way and on private development sites. Porous turf pavers minimize run-off to storm sewers by providing a means for storm water to infiltrate to and be treated by underlying soils.
- Participated in the formation of a "Green Working Group" with staff from Community Development (Planning and Building Divisions) and ECT, Inc. that will develop and recommend policy and ordinance modifications relative to green development.
- Attended local workshops on sustainable storm water management and pervious pavement technology.
- Worked with engineering consultants on the Police Gun Range project to evaluate potential green site development infrastructure improvements.

Attached is a recent memorandum from Brian Coburn and Ben Croy, who have been familiarizing themselves with green site development (also known as low impact development, or LID) concepts, and are concurrently working on incorporating aspects of green development in the City's storm water ordinance, as recommended in the 2005 Storm Water Master Plan Update report. As Ben and Brian point-out, the State of Michigan is currently developing a LID manual; in fact, several states have such a manual in place and municipalities simply incorporate the Best Management Practices cited in the manual by reference in their ordinances, thus eliminating a lot of duplication of effort. The revisions we'll make will be general in nature so that we can eventually cite the Michigan manual for detailed specifications once it is published in 2008.

Bioswales

Ordinance text amendments are under development that will address the relatively new concept of low impact development. The next revision to the ordinance will incorporate bioswales, which is slated to be presented to City Council at the July 23, 2007 meeting.

The term bioswale describes a shallow, vegetated drainageway designed to trap pollutants and slowly convey storm water run-off above ground, so that it may subsequently be treated by underlying soils that will filter-out contaminants in the water. Types of bioswales include: bioretention basins, bioretention islands, linear vegetated swales, and rain gardens. Bioswales are often used as an alternative to, or an enhancement of, traditional storm sewer systems. If designed correctly, bioswales do not pond water for a long period of time and induce infiltration. They are typically vegetated with native plants and wetland vegetation, and generally have a trapezoidal or parabolic shape with relatively flat side slopes. Individual bioswales generally treat small drainage areas (five acres or less), and could potentially be used in Novi to handle and treat run-off from roadways, parking lots and buildings.

Future ordinance revisions will address other LID concepts such as pervious pavement. In order to comprehensively revise relevant sections of the ordinance, we will retain the services of one of the City's engineering consultants and continue to work with our Landscape Architect and Planning Division to ensure the appropriate level of expertise is committed to this effort.

Please let me know if you have any questions, comments or concerns regarding our proposed approach to the "greening" of the City's ordinance.

cc: Brian Coburn, Civil Engineer
Ben Croy, Civil Engineer
Steve Rumple, Community Development Director
Barb McBeth, Planning Director
David Beschke, Landscape Architect

MEMORANDUM

To: Rob Hayes, P.E.; City Engineer

From: Brian Coburn, P.E. BTC
Ben Croy, P.E. BCG

Re: "Green" Revisions to Storm Water Ordinance

Date: May 25, 2007

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One of the goals of City Council is to allow and encourage green building and development. The purpose of this memo is to present our ideas for revisions to the Storm Water Ordinance to encourage "green" storm water techniques. Our current storm water ordinance was adopted in 2002 and included detention and sedimentation requirements that were more stringent than other communities at that time. Today, there is a movement by many communities to go the next step by encouraging developers to go "green."

What does it mean to go "green?" Several communities and some states, including Michigan, have or are developing guidelines and specifications for the green storm water. Michigan's low-impact development manual is being developed in cooperation with Southeast Michigan Council of Governments (SEMCOG) and is anticipated to be available in 2008. Generally, green storm water practices encourage infiltration, plant uptake of storm water, and other methods to decrease the amount of storm water runoff that will leave a site and improve the quality of the storm water runoff that is discharged into storm sewers and streams.

We have collected a substantial amount of information and have attended seminars addressing these various types of green storm water techniques. As a first step towards revising the ordinance to include green storm water techniques, we are working on amendments to the storm water ordinance that will allow bioretention swales and basins as well as rain gardens. While most of Novi is comprised of poorly drained clayey soils that are not conducive to infiltration, the above measures may have the potential to improve the quality of the storm water that is discharged from the site.

With the Michigan manual being developed, it is our intent to amend the ordinance to define the various technologies that exist such as those described above, permit their use, streamline the process for incorporating into a site plan to encourage the use of green storm water techniques but leaving the detailed specifications for review by the City Engineer until the Michigan manual can be referenced in the ordinance.

cc: Clay Pearson, City Manager

7-11-07
To: Mayor and Council Members
Clay m

MEMORANDUM

To: Clay Pearson, City Manager
Pam Antil, Assistant City Manager

From: Rob Hayes, City Engineer RH

Re: **Low Impact Development (Green) Revisions to the Stormwater Ordinance**

Date: July 12, 2007

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The Engineering Department has developed the attached draft Ordinance text amendments to Chapter 11 (Design and Construction Standards) and Chapter 12 (Drainage and Flood Damage Prevention) to add low impact development requirements for stormwater management systems. Also, as part of the revision process we are recommending that all detailed technical specifications be moved from the Ordinance to an *Engineering Design Manual* to better streamline those portions of the Ordinance that are related to stormwater management. Each of these two proposed Ordinance revision items is discussed in detail in the sections below.

The proposed revisions would not make stormwater management more (or less) restrictive for private site developers, and instead would provide developers the option of implementing low impact development techniques should they so choose. We have transmitted these draft Ordinance text amendments to a group of three Novi developers (Northern Equities, Amson Dembs Development and Mozart Homes) to solicit their feedback.

Low Impact Development Requirements

Chapters 11 and 12 require significant revision to allow implementation of low impact development technologies, and to bring these portions of the Ordinance to current stormwater management standards. Accordingly, text changes are proposed for Chapter 11, Article IV (Storm Sewers), Chapter 12, Article III (Stormwater Detention), and Chapter 12, Article VI (Stormwater Management). Some significant portions of both chapters have been revised to bring them current with present-day standards. In particular, we are recommending that Chapter 11, Article V (Holding Facilities) be repealed in its entirety because these requirements are already comprehensively covered in Chapter 12, Article III (Stormwater Detention) and Article VI (Stormwater Management). Also, it is recommended that Chapter 12, Article VI, Appendix, Part Two (Design Criteria for Stormwater Management Facilities) – which contains detailed technical specifications for stormwater system design - be repealed because it is proposed to be included in the Engineering Design Manual, as discussed in the next section. As shown in the attached draft text amendments, references to cite the Engineering Design Manual are provided throughout the revised text of Chapters 11 and 12.

Engineering Design Manual

The proposed approach of using a design manual to spell-out detailed requirements - separate from the Ordinance - is similar to the approach used by several municipalities in Michigan, including Farmington Hills, Troy and Oakland County. This concept would allow the City Engineer to prepare and approve the contents of an Engineering Design Manual, and keep it current as different technologies and equipment evolve. You may recall that Council approved a similar approach earlier this year when the detailed technical procedures for record drawing preparation were removed from

the Ordinance. Our intent is to expand the Engineering Design Manual to add other engineering areas, including roads and utilities, as future Ordinance revisions to these areas are proposed.

The attached draft Engineering Design Manual was prepared by moving relevant portions of Chapters 11 and 12 that contain detailed specifications, and by adding sections for stormwater management performance and design criteria. The performance criteria provide general requirements to manage stormwater quality and quantity. The design criteria spell-out several detailed technologies for implementing stormwater management. These include traditional methods, such as detention basins and infiltration facilities, as well as relatively new low impact development technologies such as bioretention facilities and rain gardens.

Please note that the Engineering Design Manual is a work in progress: we will continue to add sections to Part Two as they relate to detailed design criteria and specifications. As mentioned in a previous update, the State of Michigan is developing a low impact development manual for stormwater management systems. Once it is published (scheduled for 2008), our plan is to cite the Michigan manual in our Engineering Design Manual to include other detailed stormwater management specifications.

We will be presenting the proposed changes at the July 23rd City Council meeting. In the meantime, please let me know if you have any questions, comments or concerns in regards to these draft Ordinance text amendments.

cc: Brian Coburn, Civil Engineer
Ben Croy, Civil Engineer
Steve Rumple, Community Development Director
Barb McBeth, Planning Director
Tom Schultz, City Attorney