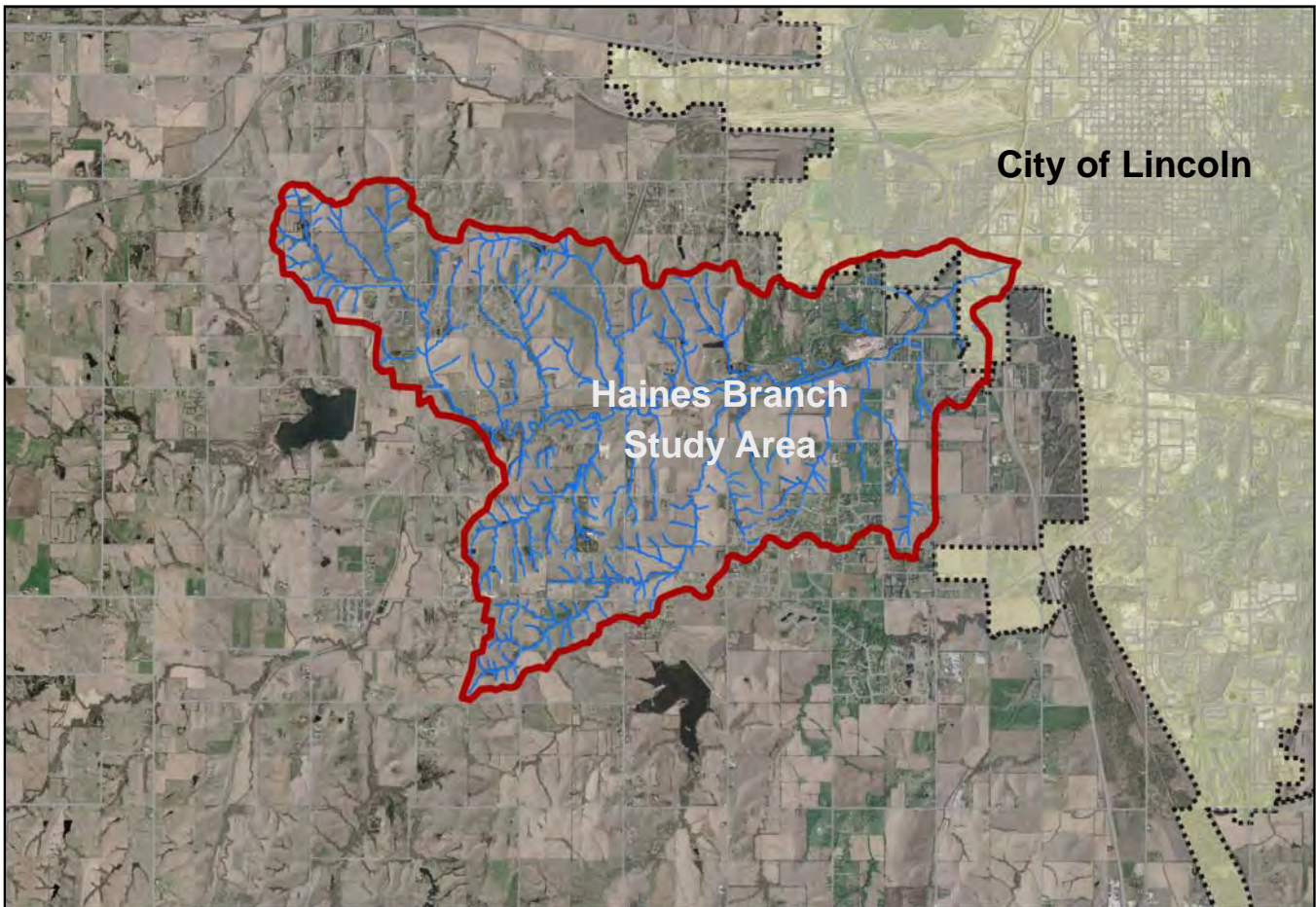




Haines Branch Watershed Master Plan Study





Haines Branch Watershed Master Plan



Lower Platte South
Natural Resources District

INTUITION &
LOGIC

In Association With:
United States Geological Survey
The Heartland Center for Leadership Development



Mark Edward Meyer E-11103

This page left intentionally blank



14R-297

Introduce: 11-24-14

Comprehensive Plan Amendment No. 14006

RESOLUTION NO. A- 88681

1 WHEREAS, the Planning Director has made application to amend the
 2 2040 Lincoln/Lancaster County Comprehensive Plan to add the Haines Branch
 3 Watershed Master Plan as a subarea plan and to the list of adopted watershed studies;
 4 and

5 WHEREAS, the Lincoln City-Lancaster County Planning Commission has
 6 recommended approval of said proposed amendment.

7 NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of
 8 Lincoln, Nebraska:

9 That the 2040 Lincoln/Lancaster County Comprehensive Plan be
 10 amended as follows:

11 1. Under Energy and Utilities on page 11.13 revise the first full paragraph to
 12 read as follows:

13 As part of the overall watershed management program, the City, in cooperation
 14 with the LPSNRD, is developing a unified master watershed management plan.
 15 This plan will provide information and computer models to aid in analyzing
 16 stormwater management alternatives. Individual watershed plans for ~~seven~~
 17 several watersheds in Lincoln and the surrounding area have already been
 18 completed and are adopted as subarea plans in this document (see "Plan
 19 Realization" chapter). These plans evaluate and propose projects to address a
 20 wide range of water resources and they are formulated in cooperation with other
 21 local, state and federal agencies. Ideally, additional watershed plans are
 22 completed and adopted prior to urban development occurring within a new basin.
 23 This allows projects and recommendations in the plan to be considered during
 24 the review of specific development proposals.

1 2. Under Plan Realization on page 12.16 add the Haines Branch Watershed
2 Master Plan, 2014 to the list of Watershed Master Plans.

3
4 BE IT FURTHER RESOLVED that any other references in said plan which
5 may be affected by the above-specified amendments be, and they hereby are amended
6 to conform to such specific amendments.

Introduced by:

Jonathan Cook
AYBS: Camp, Christensen, Cook,
Emery, Eskridge, Fellers, Gaylor
Baird; NAYS: None.

Approved as to Form & Legality:

Rich Lee
City Attorney

Approved this 16th day of Dec., 2014:
[Signature]
Mayor

ADOPTED
DEC 08 2014
BY CITY COUNCIL

Table of Contents

Executive Summary	ES-1
-------------------------	------

Section 1 – Introduction and Purpose

1.1	Introduction.....	1-1
1.2	Watershed Characteristics.....	1-1
1.3	Study Area Characteristics.....	1-2
1.4	Goals and Objectives	1-6
1.5	Public Participation Process.....	1-7
1.5.1	Open House Events.....	1-7
1.5.2	Website and Newsletter	1-8

Section 2 – Inventory and Methodology

2.1	Watershed Inventory.....	2-1
2.2	Study Methodology.....	2-3
2.2.1	Hydrologic Modeling.....	2-3
2.2.2	Water Quality Investigation.....	2-4
2.2.3	Geomorphic Field Investigation	2-6
2.2.4	Special Areas Consideration.....	2-8

Section 3 – Hydrologic Model Development

3.1	Introduction.....	3-1
3.2	Methodology.....	3-1
3.2.1	Sub-basin Delineation.....	3-1
3.2.2	Rainfall.....	3-3
3.2.3	Runoff Volume	3-3
3.2.4	Runoff Hydrographs	3-7
3.3	Modeling Results	3-7
3.4	Culvert Analysis.....	3-8
3.4.1	Flowrates.....	3-8
3.4.2	Culvert Identification.....	3-8
3.4.3	HY-8 Analysis	3-9
3.4.4	Results.....	3-9

Section 4 – Water Quality

4.1	Introduction.....	4-1
4.2	Methodology.....	4-1
4.2.1	Sampling Protocol	4-1
4.2.2	Analytical Procedures	4-3
4.3	Results	4-3
4.3.1	Applicability to Water-Quality Criteria	4-4

4.3.2	Naturally Elevated Specific Conductance and Sodium	4-5
4.3.3	Runoff Characteristics	4-7
4.3.3.1	Total Suspended Solids	4-8
4.3.3.2	Bacteria	4-8
4.3.3.3	Total Phosphorus	4-9
4.3.3.4	Atrazine	4-10
4.4	Managing Stormwater Quality.....	4-10
Section 5 – Geomorphic Evaluation		
5.1	Introduction.....	5-1
5.2	Methodology.....	5-3
5.3	Results.....	5-8
5.4	Stream Recommendations	5-14
Section 6 – Special Areas		
6.1	Introduction.....	6-1
6.2	Methodology	6-1
6.3	Evaluation Results	6-1
6.4	Special Area Recommendations	6-6
Section 7 – Capital Improvement Projects		
7.1	Introduction.....	7-1
7.2	Problem Identification	7-1
7.3	Evaluation Approach	7-2
7.3.1	Stream Erosion Evaluation	7-2
7.3.2	Water Quality Considerations.....	7-2
7.3.3	Special Areas Considerations	7-2
7.3.4	Capital Improvement Project Types	7-2
7.4	Capital Improvement Projects.....	7-4
7.4.1	Project HB-1	7-6
7.4.2	Project HB-2	7-7
7.4.3	Project HB-3	7-8
7.4.4	Project HB-4	7-9
7.4.5	Project HB-5	7-10
7.4.6	Project HB-6	7-11
7.4.7	Project HB-7	7-12
7.4.8	Project HB-8	7-13
7.4.9	Project HB-9	7-14
7.4.10	Project HB-10	7-15
7.5	Prioritization	7-16
7.6	Other Improvement Recommendations	7-17
7.6.1	Project HB Other-1	7-20
7.6.2	Project HB Other-2	7-21

7.6.3 Project HB Other-3 7-22
7.6.4 Project HB Other-4 7-23
7.6.5 Project HB Other-5 7-24
7.6.6 Project HB Private-1 7-25
7.6.7 Project HB Private-2 7-26
7.6.8 Project HB Private-3 7-27
7.6.9 Project HB Private-4 7-28
7.6.10 Project HB Private-5 7-29

Section 8 – Implementation

8.1 Introduction..... 8-1
8.2 Capital Improvement Project Implementation..... 8-1
8.3 Education Program..... 8-1
8.4 Project Funding..... 8-1
8.5 Coordination Efforts 8-1
8.6 Additional Studies 8-2

Section 9 – Glossary of Terms and References

9.1 Glossary of Terms..... 9-1
9.2 References..... 9-9

Appendices

Appendix A - Digital Deliverables

Appendix B - Public Participation Materials (Summary Documents, Attendance Lists, Minutes, Watershed News)

Appendix C - Hydrologic Model Input Data and Results

Appendix D - Water Quality Sampling Data

Appendix E - Fundamentals of Fluvial Geomorphology

Appendix F - Channel Condition Scoring Matrix and Channel Condition Data

Appendix G - Dominant Process Indicators and Reach Summary Data Sheets

Appendix H - Capital Improvement Project Prioritization Ranking Worksheets

Appendix I - Capital Improvement Project Cost Worksheets

Figures

ES-1	Status of Watershed Master Plans.....	ES-2
ES-2	Study Area Map	ES-3
ES-3	CIP Locations.....	ES-5
1-1	Status of Basin Plans Map	1-3
1-2	Watershed Map	1-4
1-3	Study Area Map	1-5
2-1	Hydrology Study Areas.....	2-4
2-2	Water Quality Sampling Sites.....	2-5
2-3	Haines Branch Study Reaches	2-6
3-1	Subbasin Boundaries.....	3-2
3-2	Existing Land Use.....	3-5
3-3	Hydrologic Soil Groups	3-6
3-4	Watershed Culvert Analysis	3-10
4-1	Water Quality Sampling Sites.....	4-2
4-2	Geometric Mean of Sodium-Adsorption Ratio.....	4-6
4-3	Total Suspended Solid Concentrations Increase.....	4-8
4-4	<i>E. coli</i> Concentrations Increase.....	4-9
4-5	Total Phosphorus Concentrations	4-9
4-6	Atrazine Concentrations Increase	4-10
5-1	Channel Evolution Stages	5-2
5-2	Study Reaches.....	5-6
5-3	Channel Condition Scores.....	5-10
5-4	Stream Channel Dominant Process.....	5-13
6-1	Special Areas Map 1	6-4
6-2	Special Areas Map 2	6-5
7-1	Rock Grade Control Structure Detail.....	7-3
7-2	Bank Stabilization Structure Detail	7-4
7-3	Stilling Basin Structure Detail	7-4
7-4	Watershed CIP Locations	7-5
7-5	Debris jam knickpoint.....	7-6
7-6	Conceptual Layout of HB-1	7-6
7-7	High Bank from erosion.....	7-7
7-8	Conceptual Layout of HB-2.....	7-7
7-9	Knickpoint at tributary.....	7-8
7-10	Conceptual Layout of HB-3.....	7-8
7-11	Knickpoint.....	7-9
7-12	Conceptual Layout of HB-4.....	7-9
7-13	Knickpoint.....	7-10
7-14	Conceptual Layout of HB-5.....	7-10
7-15	Knickpoint.....	7-11
7-16	Conceptual Layout of HB-6.....	7-11
7-17	Knickpoint.....	7-12

7-18 Conceptual Layout of HB-7 7-12

7-19 Knickpoint..... 7-13

7-20 Conceptual Layout of HB-8..... 7-13

7-21 Incising Channel 7-14

7-22 Conceptual Layout of HB-9..... 7-14

7-23 4 Foot Knickzone..... 7-15

7-24 Conceptual Layout of HB-10..... 7-15

7-25 Other & Private Projects 7-19

7-26 SW 84th St Bridge over Channel..... 7-20

7-27 HB Other-1 Project Location 7-20

7-28 Trail by Bank 7-21

7-29 HB Other-2 Project Location 7-21

7-30 W Claire Ave Culvert (O125)..... 7-22

7-31 HB Other-3 Project Location 7-22

7-32 W Denton Rd Culvert (N129)..... 7-23

7-33 HB Other-4 Project Location 7-23

7-34 HB Other-5 Project Location 7-24

7-35 Pipe in channel..... 7-25

7-36 HB Private-1 Project Location..... 7-25

7-37 Utility Pole 7-26

7-38 HB Private-2 Project Location..... 7-26

7-39 Structure on top of bank..... 7-27

7-40 HB Private-3 Project Location..... 7-27

7-41 Structure on top of bank..... 7-28

7-42 HB Private-4 Project Location..... 7-28

7-43 Utility Pole 7-29

7-44 HB Private-5 Project Location..... 7-29

Tables

ES-1	Project Priority, Rank and Cost	ES-6
1.1	Watershed Characteristics.....	1-2
1.2	Study Area Characteristics.....	1-2
3.1	Rainfall Depths	3-3
3.2	Lookup table	3-4
3.3	Peak Flow Rates.....	3-8
3.4	Culvert Overtopping Analysis	3-9
4.1	Analytes Evaluated For Each Sample.....	4-3
4.2	Geometric Means of Selected Analytes.....	4-5
5.1	Average Field Score Per Channel Condition Rating Category	5-8
5.2	Number of GOOD, FAIR and POOR Field Scores	5-9
7.1	Project Priority, Rank and Cost	7-17

This page left intentionally blank