PAPILLION CREEK WATERSHED MANAGEMENT PLAN

MARCH 2014 UPDATE

Papillion Creek Watershed Partnership

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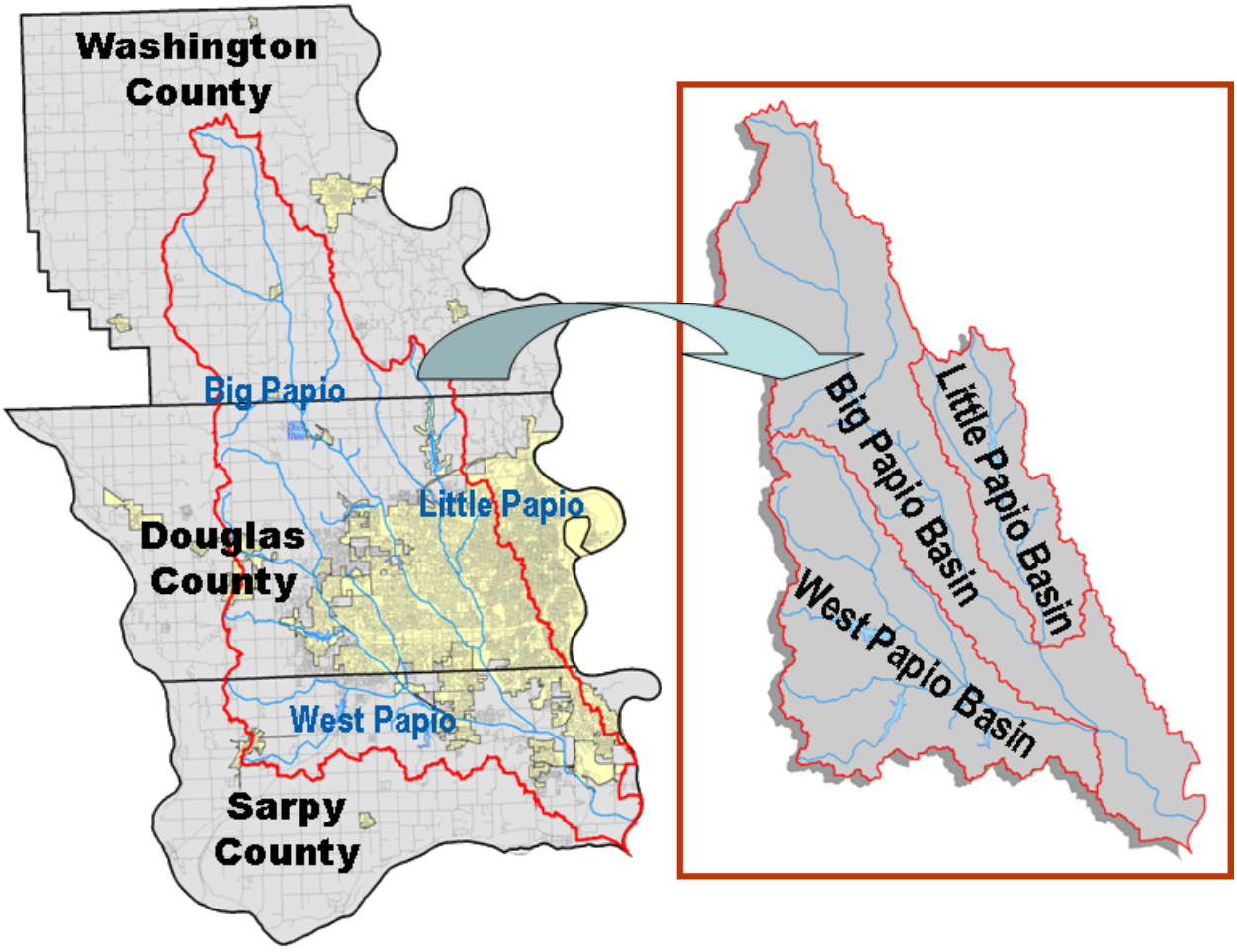
Executive Summary

E.1 Background and Purpose

Improved stormwater management within the Papillion Creek Watershed (Watershed) has been the on-going objective of the Papillion Creek Watershed Partnership (PCWP) since its formation in August 2001. The Watershed covers approximately 402 square miles of drainage area extending from northern Washington Country southward through Douglas and Sarpy Counties and ultimately discharges to the Missouri River south of Bellevue – see Figure E-1. PCWP members presently consist of the cities of Bellevue, Boys Town, Gretna, La Vista, Omaha, Papillion, and Ralston; Sarpy County; and the Papio-Missouri River Natural Resources District (P-MRNRD).

Figure E-1 Papillion Creek Watershed



It is the desire of the PCWP to review and update the Watershed Fees framework and rates, the Watershed Management Plan, and the Implementation Plan with respect to availability of needed funds and rate of development within the Watershed every 3 to 5 years. This 2014 Update represents the first effort to update the implementation plan. The 2014 Update is intended to provide interim progress updates for the various management practices. Specifically, the financial needs for the entire list of remaining structural projects were evaluated so that the PCWP could reach consensus for the necessary long-term and near-term strategies, including defining the Program structural projects for the next 2014 to 2018 planning period.

E.2 2014 Review and Update

The following text summarizes the general efforts and findings from the 2014 Update:

Water Quality Evaluation: The Nebraska Department of Environmental Quality (NDEQ) updated its various water quality impairment listings in 2012 for area lakes and stream segments. There are a number of new water body impairment listings, including nutrients (Total Nitrogen and Total Phosphorus) and Chlorophyll "a" in four of the existing area lakes. Additional details are covered in this 2014 Update and in Appendix A.

Peak Flow Reduction Evaluation: No additional technical analyses were conducted for the 2014 Update; however, a summary of interim activities within the Watershed was provided:

- The U.S. Army Corps of Engineers (USACE) updated the hydrologic analyses for the Papillion Creek Watershed.
- The National Oceanic and Atmospheric Administration (NOAA) derived new precipitation data that included some statistical increases. In particular, the 100-year, 24-hour precipitation increased from 6.7 inches to 7.0 inches

Status of 2009-2013 Watershed Implementation Plan: Projects identified in the 2009 Watershed Management Plan as Program Projects are listed in Table E-1. The Papio-Missouri River NRD (P-MRNRD) constructs the projects on behalf of the PCWP. Table E-1 provides an updated current completion status and cost obligations of the 2009-2013 Program Projects. The currently estimated completion costs of the structures are nearly $40 million which is less than estimated in the 2009 Plan. This was primarily due to reconfiguration of the water quality basins upstream of WP-5 and DS 15A.

Proposed Watershed Management Plan: The Watershed Management Plan Update deals primarily with the continuation of how to implement the remaining water quality and structural flood control projects. Table E-2 shows the proposed list of remaining structural projects, along with updated estimated capital costs. The project sequencing for some water quality basins has changed to reflect recent changes in development interest, management priorities, and financial constraints. Figure E-2 shows the locations of the remaining structural projects.

Financial modeling was conducted for eight project funding scenarios. Each modeling scenario identified the number of remaining structural projects that could likely be completed within the next 35-year planning period from 2014 to 2049. The following components provided inputs to the financial modeling scenarios:

- Updated land use maps to help establish spatial relationships of existing and future development relative to the approximate timing of remaining structural projects.
- Updated population and land use projections. Progressive land consumption from development forms the basis for Watershed Management Fee (Watershed Fee) revenue

Table E- 1 Status of 2009 Program Projects for Years 2011 to 2013

Structure Name	Approx. Location & Planning Jurisdiction	Drainage Area (acres)	Estimated Project Funding Sources (Millions of $)				Current Status
			Bonding	General Fund	Watershed Fees	Total Est, Project Cost	
WP-5 and Associated Water Quality Basins [1]	126th & Cornhusker Road; Papillion	3,310	$18.5	$17.4	$0	$35.9	Under Construction; Est. June 2014 Completion
DS 15A and Associated Water Quality Basin [2]	168th & Fort Streets; Omaha	7,100	$42.6	$1.2	$0	$43.8	Design In Progress; Est. Fall 2014 Construction Start and 2015 Completion.
WQ-Zorinsky 1	Upstream of Zorinsky Lake; Omaha	1,660	$1.5	$1.3	$1.4	$4.2	Design Complete; Est. Spring 2014 Construction Start and Completion in 2014
WQ-CL-6	Upstream of Cunningham Lake; Omaha	510					Deferred.
		Totals:	$62.6	$19.9	$1.4	$83.9	

Notes:

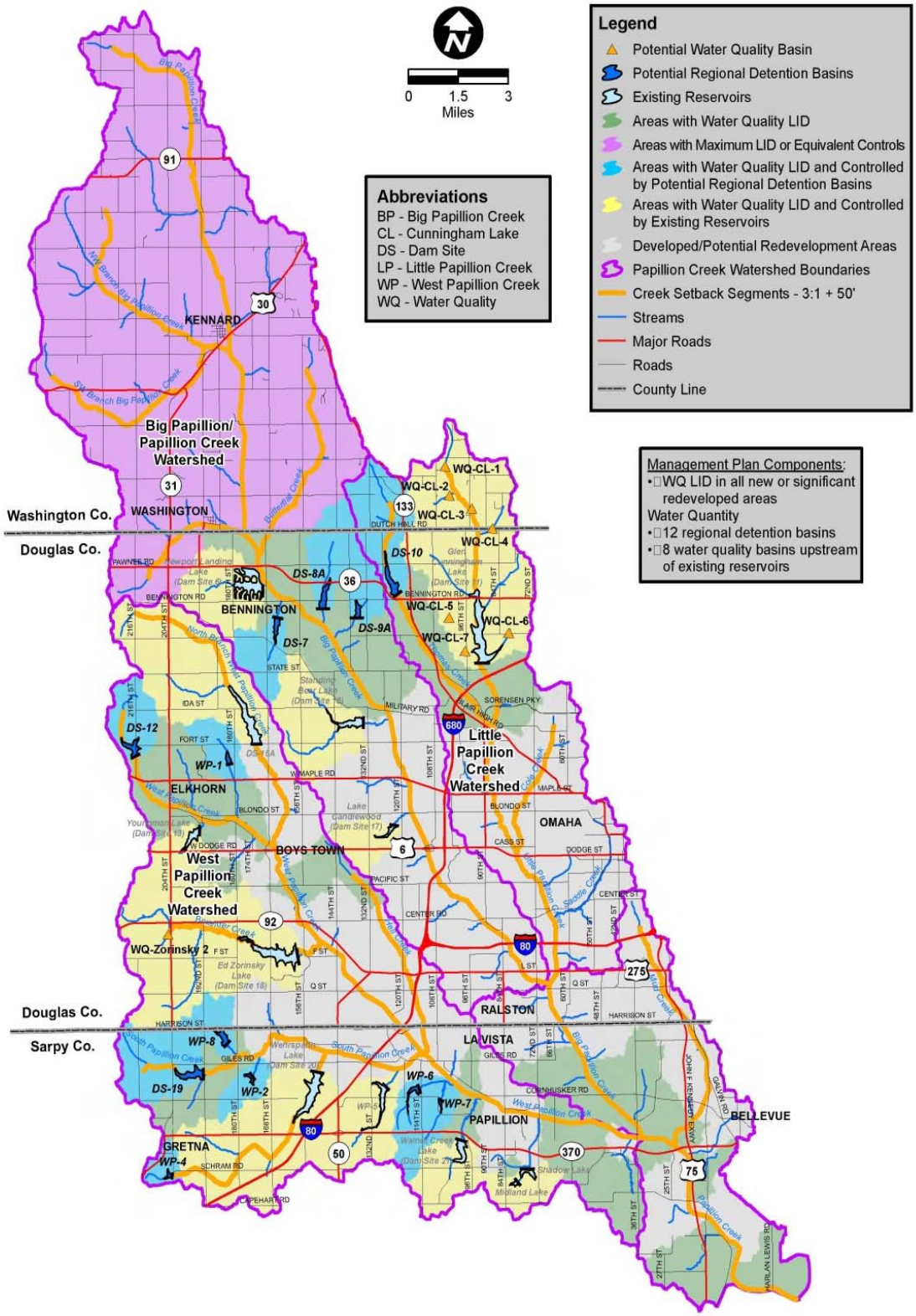
[1] Original single basin concept revised to two basins.

[2] Original two basin concept revised to form a single basin.

Table E- 2 Summary of Estimated Capital Costs for Remaining Projects

Structure Name	Stream Reach	Approx. Location/Jurisdiction	Drainage Area (Acres)	Est. Project Costs, 2013 Basis	
				Est. Normal Pool Area (Acres)	Total Est. Project Capital Costs, $ Millions
WP-6	Trib. to Unnamed West Papillion Trib.	114th & Cornhusker Road; Sarpy Co.	1,260	32	$11.6
WP-7	Trib. to Unnamed West Papillion Trib.	108th & Cornhusker Road; Sarpy Co.	450	12	$6.4
WP-4	Trib. to South Papillion	204th & Schram Road; Gretna	563	16	$9.9
DS 19	South Papillion Creek	192nd & Giles Road; Sarpy Co.	2,750	100	$23.7
WP-8	Trib. to South Papillion	180th & Harrison St.; Douglas & Sarpy Co.	1,470	45	$11.0
WP-2	Trib. to South Papillion	180th & Giles Road; Sarpy Co.	679	21	$9.9
WP-1	Trib. to West Papillion	180th & Fort St., Omaha	864	24	$13.7
DS 12	West Papillion Creek	216th & Fort Streets; Douglas Co. & Omaha	1,670	70	$20.7
DS 10	Thomas Creek	120th & Bennington Road; Omaha	2,950	97	$23.2
DS 7	Trib to Big Papillion	168th & Bennington Road, Bennington & Omaha	1,600	47	$13.8
DS 9A	Trib to Big Papillion	132nd & Bennington Road, Omaha	1,280	38	$10.5
DS 8A	Trib to Big Papillion	144th St. & Bennington Road, Bennington	1,850	75	$15.6
				Regional Detention Subtotal	$169.9
WQ-CL-6	Upstr. Existing Cunningham Lake	Omaha	510		$9.5
WQ-Zorinsky 2	Upstr. Existing Zorinsky Lake	Omaha	1,000		$9.9
WQ-CL-5	Upstr. Existing Cunningham Lake	Omaha	470		$9.1
WQ-CL-7	Upstr. Existing Cunningham Lake	Omaha	200		$7.0
WQ-CL-4	Upstr. Existing Cunningham Lake	Omaha & Washington Co.	915		$14.2
WQ-CL-2	Upstr. Existing Cunningham Lake	Washington Co.	845		$13.7
WQ-CL-3	Upstr. Existing Cunningham Lake	Washington Co.	790		$13.3
WQ-CL-1	Upstr. Existing Cunningham Lake	Washington Co.	740		$13.3
				Water Quality Basins Subtotal	$ 89.9
				Total Regional Detention and Water Quality Basins	$ 259.8

Figure E- 2 2014 Watershed Management Plan Update for Full Build-Out Conditions



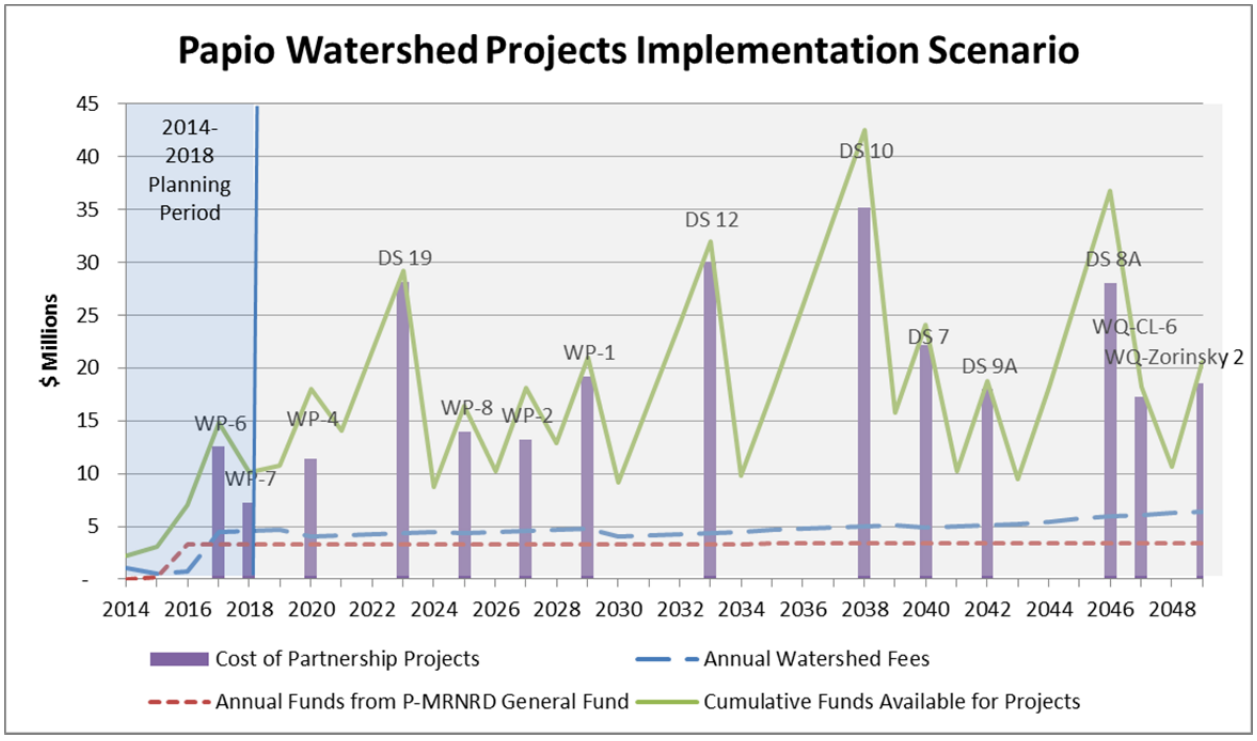
stream projections. Watershed Fees are assessed to developers and home builders based on projected capital costs for structural projects, projected land consumption, and the underlying intent to maintain a ratio of 1/3 private to 2/3 public financing for the overall structural program projects as per Root Policy Group #6 in Appendix C.

- The Papio-Missouri River Natural Resources District (P-MRNRD) Long-Range Implementation Plan (LRIP). This document formed the basis for probable available General Fund allocations for structural projects.
- Annual bond repayment obligations. Current P-MRNRD bond obligations are approximately $5 million per year for three existing bonds totaling approximately $71.5 million that will expire in 2032, 2033, and 2034 respectively. Approximately $10 million in remaining bonding capacity exists and was also considered.
- The Program Project planning period was changed by the PCWP from 3 years to 5 years; the latter of which will now result in a 2014 to 2018 time frame.

2014-2018 Implementation Plan: The Implementation Plan addresses proposed Program Projects and funding needs for the 2014 to 2018 planning period as follows:

- Financial and administrative needs to implement the proposed Program Projects were identified.
- A number of scenarios were studied to help identify a reasonable revenue generation strategy to fund the Program Projects. Figure E-3 depicts Project Funding Scenario 1A as a reasonable baseline means for project financing using pay-as-you-go (P-A-Y-G) General Fund allocations at the existing P-MRNRD mill levy, along with the proposed Watershed Fee Schedule. Under this funding strategy, all twelve (12) of the remaining regional detention basin projects could potentially be implemented, along with two (2) of the eight (8) remaining water quality basin projects.

Figure E- 3 Scenario 1A: P-A-Y-G with Existing Mill Levy and Dedicated General Fund Allocation per LRIP, Begin 2016



- Table E-3 identifies the two structural projects that were selected by the PCWP for the 2014 to 2018 Implementation Plan and their projected costs.

Table E- 3 Watershed Management Plan Program Projects for Years 2014 to 2018

Structure	Approx. Location & Planning Jurisdiction	Drainage Area (acres)	Est. Project Capital Costs, 2014 Basis, $ Millions
WP- 6	114th & Cornhusker Road; Sarpy County	1,260	$11.6
WP- 7	108th & Cornhusker Road; Sarpy County	450	$6.4
		Total	**$18.0**

Note: The abbreviation "WP" = West Papillion Creek Watershed.

- Table E-4 contains the schedule of Watershed Fees selected by PCWP for the 2014 to 2018 planning period.

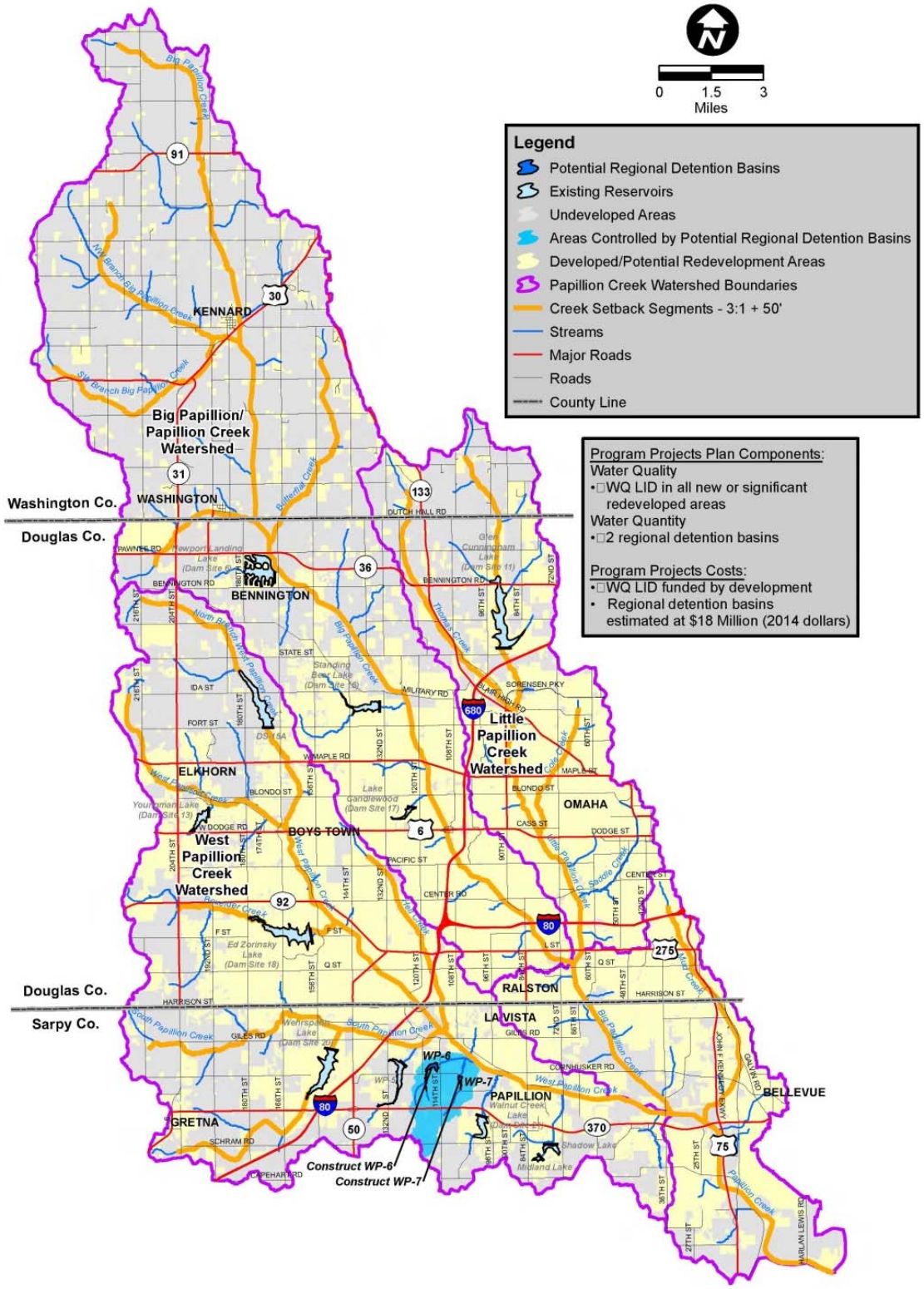
Table E- 4 Schedule of Watershed Fees for Years 2014 to 2018

Fee Category	Current Developer Fee Amounts	2014	2015	2016	2017	2018
Single Family Residential (also includes low-density multi-family up to 4-plexes)	$750 per lot (same as per Housing Unit or per Dwelling Unit)	$823	$843	$864	$886	$908
High-Density Multi-Family Residential (beyond 4-plexes)	$3,300 per Gross Developable Acre	$3,619	$3,710	$3,803	$3,898	$3,995
Commercial/Industrial	$4,000 per Gross Developable Acre	$4,387	$4,497	$4,609	$4,724	$4,842

Note: The annual increase for 2015 to 2018 is 2.5 percent per year.

- Figure E-4 represents the Implementation Plan that depicting the locations for the proposed two Program Projects for the 2014 to 2018 planning period.

Figure E-4 Papillion Creek Watershed Implementation Plan (Years 2014 to 2018)



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1.0 Update Purpose

This Papillion Creek 2014 Watershed Management Plan Update (2014 Update) is intended to provide interim progress updates from the 2009 Watershed Management Plan (2009 Report) for the various Watershed management practices. Therefore, this 2014 Update includes:

- A summary of the current water quality impairment situation within the Watershed,
- Update on the Watershed hydrology.
- As required in the Papillion Creek Watershed Partnership (PCWP) interlocal agreement, at approximately three (3) year intervals, the PCWP and the development community are to review the Watershed Management Fees (Watershed Fees) framework and rates, the Watershed Management Plan for remaining structural projects, and the Implementation Plan for the structural Program Projects selected for potential funding and construction for the next planning period. For this 2014 Update, the next Program Project planning period has been established by the PCWP as a 5-year period extending from 2014 to 2018.

2.0 Watershed Description

The Watershed is depicted in Figure 1 and drains an area of approximately 402 square miles (mi^2). Approximately one-half of the Watershed is located within Douglas County, and the other half is divided nearly equally between Washington and Sarpy Counties. Primary streams in the Watershed include Big Papillion, Little Papillion, West Papillion, and Papillion Creeks. Little Papillion Creek drains approximately 60 mi^2 and flows into the Big Papillion Creek near 66th and Q Streets in Omaha. Big Papillion Creek has a drainage area of approximately 233 mi^2 and extends northward into Washington County and includes the tributary drainage area of Little Papillion Creek. The drainage area of West Papillion Creek is approximately 135 mi^2. The Big Papillion and West Papillion Creeks form Papillion Creek at their confluence near 36th Street and Gilmore Road in Bellevue.

3.0 Water Quality Impairments

Nebraska Department of Environmental Quality (NDEQ) publishes key pollutants of concern (POCs) for Nebraska water bodies. The Papillion Creek Watershed lies within NDEQ's Missouri River Tributaries, Sub-basin MT1, which extends from approximately the middle of Dakota County southward through Sarpy County. The latest NDEQ report listing water quality impairments is documented in *2012 Water Quality Integrated Report, April 01, 2012.* The locations of the 2012 impairments are shown in Figure 2, and the impairments are summarized in Table 1, along with the water quality impairments that were previously listed in the 2009 Report, based on NDEQ's *2008 Water Quality Integrated Report*.

Figure 1 Papillion Creek Watershed

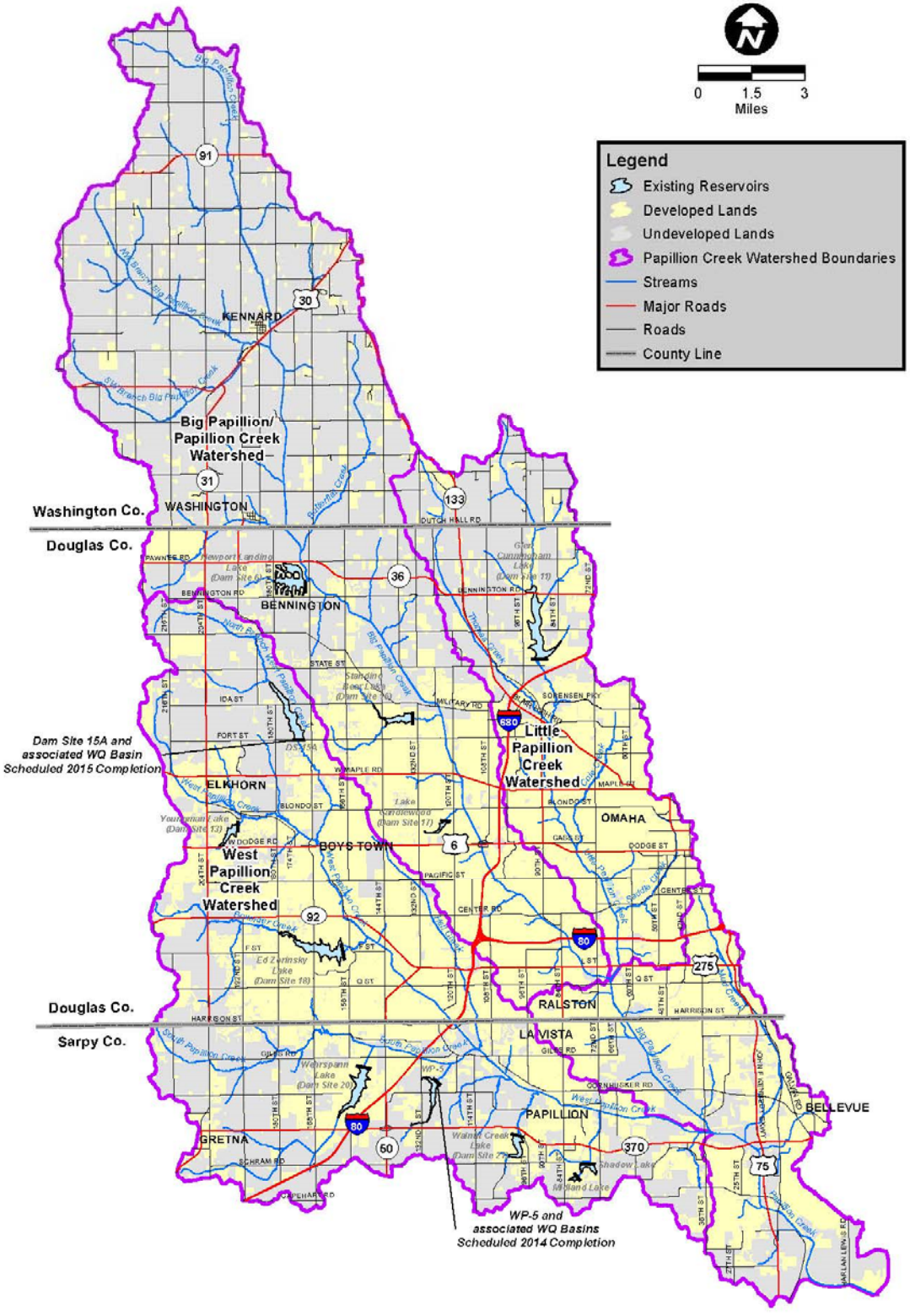


Figure 2 Locations of NDEQ 2012 Water Quality Impairments within Watershed

(Use in Conjunction with Table 1)

Table 1 April 2012 NDEQ Water Quality Impairments in the Watershed

(Use in Conjunction with Figure 2)

Figure 2 Map Pt.	NDEQ Waterbody ID	Waterbody	2008 WQ Impairments								2012 WQ Impairments									
			Sediment	Diss. Oxygen	Nutrients (TN and TP)	*E. coli* Bacteria	PCBs [2]	Dieldrin [2]	Selenium [2]	Mercury [2]	Sediment	Diss. Oxygen	Nutrients (TN and TP)	Chlorophyll a	*E. coli* Bacteria	pH	Cancer Risk Compounds [3]	Hazard Index Compounds [4]	Selenium	Mercury
Lakes																				
1	MT1-L0023	Halleck Park Lake (Papillion)																X		
2	MT1-L0025	Walnut Creek Lake			[1]									X				X		X
3	MT1-L0030	Wehrspann Lake			[1]					X			X					X		X
4	MT1-L0040	Hitchcock Park Lake														X				
5	MT1-L0050	Ed Zorinsky Lake			[1]					X			X	X				X		X
6	MT1-L0100	Standing Bear Lake									X		X	X				X		X
7	MT1-L0120	Glenn Cunningham Lake		X	X								X	X						
8	MT1-ND	Candlewood Lake	X								X									
Streams																				
9	MT1-10100	Papillion Creek (Mo River to W. Papio Confluence)				X	X	X	X						X		X	X	X	
10	MT1-10110	Big Papillion Creek (W. Papio Confluence to Little Papio Confluence)				X									X					
11	MT1-10120	Big Papillion Creek (Little Papio Confluence to Butter Flat Creek Confluence)				X									X					
12	MT1-10111	Little Papillion Creek (Big Papio Confluence to Thomas Creek Confluence)				X									X					
13	MT1-10111.1	Cole Creek		X		X						X			X					
14	MT1-10111.2	Thomas Creek									**Aquatic Life Impaired but Parameters Unknown**									
15	MT1-10200	West Papillion Creek (Big Papio Confluence to South Papio Confluence)				X									X					
16	MT1-10210	Walnut Creek									**Aquatic Life Impaired but Parameters Unknown**									
17	MT1-10240	South Papillion Creek									**Aquatic Life Impaired but Parameters Unknown**									
18	MT1-10250	West Papillion Creek (South Papio Confluence to North Branch Confluence)					X	X									X	X		
19	MT1-10252	West Papillion Creek, North Branch									**Aquatic Life Impaired but Parameters Unknown**									

Notes

[1] Delisted from 2006 assessment

[2] These parameters have resulted in fish consumption advisories. PCBs and Dieldrin are banned chemicals that are apparently still persistent, and at the time, EPA had not decided if NDEQ can designate these segments as Category 4B, which recognizes impairment, but would have assumed that these chemicals would cease to be of concern "within a reasonable period of time." However, Selenium and Mercury are considered bio-accumulative heavy metals that may persist indefinitely and it has been speculated that they may be primarily from air-borne contamination.

[3] Cancer Risk Compounds include Aroclor-1248 (PCB-1248),Arochlor-1260 (PCB-1260), cis-chlordane, Chlordane, trans-chlordane, DDD, DDE, DDT, Dieldrin, Helptachlor, Heptachlor Epoxide, Hexachlorobenzene, cis-nonachlor, trans-nonachlor, Oxychlordane, Pentachloranisole, and Tifluralin.

[4] Hazard Risk Compounds include Aroclor-1254 (PCB-1254), Lindane (g-BHC), cis-chlordane, Chlordane, trans-chlordane, DDT, Dieldrin, Heptachlor, Heptachlor Epoxide, Hexachlorobenzene, cis-nonachlor, trans-nonachlor, Oxychlordane, Pentachloranisole, Mercury, Cadmium, and Selenium.

The key comparative results of the 2009 and 2012 impairment listings for pollutants of concern (POCs) are generally as follows:

- Four area lakes (Walnut Creek Lake, Wehrspann Lake, Ed Zorinsky Lake, and Standing Bear Lake have been newly listed for impairments due to nutrients (Total Nitrogen and Total Phosphorus) and/or Chlorophyll "a".
- Five area lakes have been newly listed as impaired for Hazard Index Compounds. Refer to Footnote 3 for a listing of the POCs involved. The organic POCs are EPA banned chemicals that are considered to be persistent "legacy" compounds. Note that four of the same five lakes have separate listings for Mercury (additional two lakes from 2009), which is a bio-accumulative heavy metal. The presence of these POCs is why fish consumption advisories have been posted for these lakes.
- Four stream segments have been newly listed as being impaired for aquatic life, but current water quality and habitat testing is insufficient to define the causative parameters.

NDEQ has been working very cooperatively with the Papillion Creek Watershed Partnership (PCWP), and NDEQ may elect to gather more data within the Watershed with respect to on-going water quality improvement projects sponsored by the PCWP. As a proactive goal of the PCWP, the PCWP plans to work with NDEQ to monitor water quality performance evaluations of various Water Quality Low Impact Development (WQ LID) post-construction sites in preparation for the next planning period.

Appendix A contains additional details for the current water quality impairment listings, potential causative factors, and possible regulatory implications.

4.0 Watershed Hydrology

No new modeling was conducted as part of the 2014 Update. This chapter summarizes hydrologic modeling conducted since the issuance of the *Multi-Reservoir Analysis, Papillion Creek Watershed*, dated September 2004 (2004 Study); updated precipitation values; and provides an update on projects completed and projects currently under development.

4.1 Hydrologic Modeling

In an effort to update the flood hazard data for the Big and Little Papillion creeks, the U.S. Army Corps of Engineers (USACE), Omaha District has been assisting the P-MRNRD in updating the hydrology and hydraulics. In 2010, USACE completed a hydrologic analysis of the Papillion Creek Watershed providing flows for the 10-, 25-, 50-, 100-, and 500-year return interval storms to be used to update floodplain mapping. Hydrology was updated using the USACE's Hydrologic Engineering Center (HEC) Hydrologic Modeling System (HEC-HMS, Version 3.3). The study also included an analysis of the impacts of future development and land use changes on the flood flow frequency relationships.

4.2 Precipitation Depth

Hydrologists throughout the years have been using two technical documents to define precipitation depths: Weather Bureau's Technical Paper No. 40, *Rainfall Frequency Atlas of the United States for Durations from 30 Minutes to 24 Hours and Return Periods from 1 to 100*

Years (1961) and NOAA Technical Memorandum NWS HYDRO-35, *Five- to 60-Minute Precipitation Frequency for the Eastern and Central United States* (Frederick et al., 1977).

In 2013, NOAA published Precipitation-Frequency Atlas of the United States, Midwestern States (NOAA Atlas 14, Volume 8. Precipitation frequency estimates were computed for a range of frequencies and durations using a regional frequency analysis approach. Table 2 shows the 10- and 100-year precipitation depths for storm durations between 5-minutes to 24-hour using TP-40/HDYRO 35 and NOAA Atlas 14, Volume 8.

Table 2 Papillion Creek Watershed Rainfall Intensity

Duration	10-Yr (TP-40/ HYDRO-35)	10-Yr (NOAA Atlas 14) [1]	Percent Change	100-Yr (TP-40/ HYDRO-35)	100-Yr (NOAA Atlas 14) [1]	Percent Change
	Precipitation Depth (inches)			Precipitation Depth (inches)		
5-min	0.60	0.63	+5%	0.85	0.98	+15%
15-min	1.30	1.13	-13%	1.85	1.75	-5%
1-hr	2.50	2.26	-10%	3.75	3.63	-3%
2-hr	2.80	2.84	+1%	4.15	4.68	+13%
3-hr	3.10	3.19	+3%	4.48	5.37	+20%
6-hr	3.55	3.66	+3%	5.20	6.28	+21%
12-hr	4.10	3.98	-3%	5.95	6.68	+12%
24-hr	4.60	4.27	-7%	6.70	7.03	+5%

[1] Papillion Creek Watershed near 132nd and Maple Streets in Omaha, NE.

5.0 Watershed Management Plan

The 2009 Watershed Management Plan integrated water quality and peak flow reduction needs through a series of detailed evaluations of various strategies throughout the Watershed. These strategies had variations in the placements of WQ LID measures[1]; flood protection regional detention basin structures; water quality basins upstream of the regional detention basins; and a strategy termed Maximum Low Impact Development (Max LID)[2], which was intended to provide an alternate means of both peak flow reduction and water quality protection in lieu of regional detention basins and water quality basins.

This section provides a summary of the Watershed Management Plan refinements as follows:

- Current status of structural Program Projects that were originally scheduled for the 2011 to 2013 time frame.

[1] WQ LID represents engineered control measures to improve overall water quality and decrease stream bank erosion. WQ LID measures are to be implemented for all new development and significant redevelopment throughout the Douglas-Sarpy County portion of the Watershed. WQ LID provisions must capture the first 0.5 inches of net runoff ("first flush" of pollutants) from all storms, as well as providing "no net increase" in peak flows from a 2-year storm relative to pre-development baseline conditions.

[2] Max LID includes the basic features of WQ LID, plus provides sufficient additional on-site detention to provide protection for 100-year storm event.

- Reference to the current Watershed management policies (Appendix C). The policies were finalized after the release of the 2009 Report.
- Updated 2010 and future land use maps (reference Appendix B).
- Updated population and land use projections (reference Appendix B) that were derived from 2010 baseline Census data and a new MAPA 2040 housing and land use model called Community Visionalization™. Reference Appendix B for the 2040 model land use mapping output.
- Estimated capital cost and cash-flow requirements to fund the remaining structural projects (regional detention basins and water quality basins).

5.1 Structural Components: 2011-2013 Program Project Status

During development of the 2009 Plan, a suite of regional detention basins were screened for relative flood protection performance effectiveness and implementation priority/scheduling. In the 2009 Plan, fourteen (14) regional detention basins ranking 2 to 5 for their peak flow reduction potential were selected as candidate structures. A ranking of 5 represents the highest potential flood protection performance.

Table 3 summarizes the current status of the Program Projects for the 2011 to 2013 Implementation Plan identified in the 2009 Report. Note that some of the targeted water quality basins have been reconfigured in their design. Water quality basin WQ-CL-6 has been necessarily re-assigned to a much lower priority due to the present lack of development interest in the Cunningham Lake area. Therefore, WQ-CL-6 has been deferred. Projects under construction or under development include the following:

- In October 2012, construction began on regional detention basin WP-5 located west of 132nd Street and between 126th Street Circle and Nebraska State Highway 370 in Sarpy County. The project provides both flood control along West Papillion Creek and recreational opportunities for surrounding areas. The main dam creates a 135 surface acre lake. Major components of the project include a 1,200-foot long, 50-foot high earthen dam, two water quality basins, relocation of a major sanitary sewer, extension of Lincoln Road accompanied by a bridge crossing, pedestrian trail, recreational areas along Cornhusker Road and Lincoln Road, and in-reservoir fishery enhancements. Construction completion is scheduled for June 2014.
- In May 2013, the P-MRNRD Board of Directors voted to fund the construction of Flood Control Papio Dam Site 15A to be located northwest of 168th and Fort Streets in Douglas County. This reservoir will provide significant flood protection to downstream areas along the West Branch Papillion Creek. The project will contain stormwater runoff from an upstream area of approximately 11 square miles and provide a 225-acre lake for public water-based recreation. The total parkland area, to be operated by the City of Omaha, will be approximately 600 acres with hiking/biking trails, boating and fishing, picnicking, and other outdoor recreation and wildlife viewing opportunities for metro area residents. Final design is underway and construction is scheduled to begin in the summer of 2014 with completion in 2015.

Table 3 Status of 2009 Implementation Plan for Years 2011 to 2013

Original Structure Name	Changes from 2009 Report	Estimated Project Funding Sources (Millions of $)				Current Status
		Bonding	General Fund	Watershed Fees	Total Est, Project Cost	
WP- RB5	Renamed to WP-5	$18.5	$17.4	$0	$35.9	Under Construction; Est. June 2014 Completion
WQ-RB5-1	Revised to Two Basins: WQ-WP-5N and WQ-WP-5S					Under Construction; Est. June 2014 Completion
DS-15A	None	$42.6	$1.2	$0	$43.8	Under Design; Est. Fall 2014 Construction Start and 2015 Completion.
WQ-15A-1	Revised to One Basin: WQ-15A					
WQ-15A-2						
WQ-Zorinsky 1	None	$1.5	$1.3	$1.4	$4.2	Design Complete; Est. 2014 Construction Start and Completion
WQ-CL-6	No Longer a Program Project Due to Lack of Development Interest					Deferred
	Totals:	$62.6	$19.9	$1.4	$83.9	

- Construction on WQ-ZB-1, a water quality basin located upstream of Zorinsky Lake and northwest of the Highways 6/31 and 275/92 intersection will begin in the spring of 2014 and be completed by fall. This water quality basin consists of excavation of earthen material and the construction of a weir structure. No public access is planned for this 19 acre water surface basin.

5.2 Watershed Management Plan Map Update

5.2.1 Overview of Retained Features

The updated long-term Watershed Management Plan map for full platting build-out conditions is depicted in Figure 3. There are twelve (12) regional detention basin and eight (8) water quality basin projects remaining. Existing regional detention basins are shown under different color coding.

5.3 Updated Population and Land Use Projections

Updated land use maps were acquired to help explain the spatial allocations among various types of existing and future development. Land use designations and estimated rates of land consumption for new development are important considerations for the timing and capital costs associated with future regional detention basins and water quality basins. HDR obtained the 2010 Land Use Map and Future Land Map for full platting build-out within the Watershed and the recent 2013 aerial photography for Douglas and Sarpy Counties. Land use categories were combined with similar categories to create general land use maps. The 2010 and Future Land Use maps are included in Appendix B.

Projections for the 2009 Report were based on an independent study that included population projections that was prepared by the University of Nebraska-Lincoln's Bureau of Business Research (BBR). Population-based land use consumptions were then derived from housing and land use statistics prepared by the City of Omaha Planning Department.

As an alternative approach, the necessary projections for the 2014 Update first involved deriving land use projected increases from a MAPA 2040 transportation model called Community Visualization™. The projected land use increases within the model were in reference to the 2010 baseline Census data that was available on "block level" polygons within the Watershed. The resultant 2040 modeling assumptions and data outputs provided the basis for incremental land use consumption and population within occupied housing units via a series of non-linear interpolations and extrapolations in relation to MAPA's assumed trends for the metropolitan planning area. Appendix B contains the basic modeling, mapping, and subsequent calculation procedures used to adapt the 2040 MAPA model for the purpose of this 2014 Update. It was necessary to consolidate the applicable land use categories and resultant land consumption data into Single Family Housing Units (SFHUs), Multi-Family Housing Units (MFHUs), and Commercial/Industrial Development in order to be consistent with the Watershed Fee categories and to provide the basis for estimated Watershed Fee revenue streams for subsequent cash flow analyses for proportionate funding of the remaining structural projects.

Figure 4 graphically represents the outcome of the MAPA 2040 model adaptation process. Note that in the upper graph, red dashed-line and data markers represent the former BBR population projections used in the 2009 Report as a comparison to the updated projected populations within Douglas and Sarpy Counties. The updated populations are numerically listed adjacent to the blue and green markers. The projected 5-year increases in SFHUs, MF Gross.

Figure 3 2014 Watershed Management Plan Update for Full Build-Out Conditions

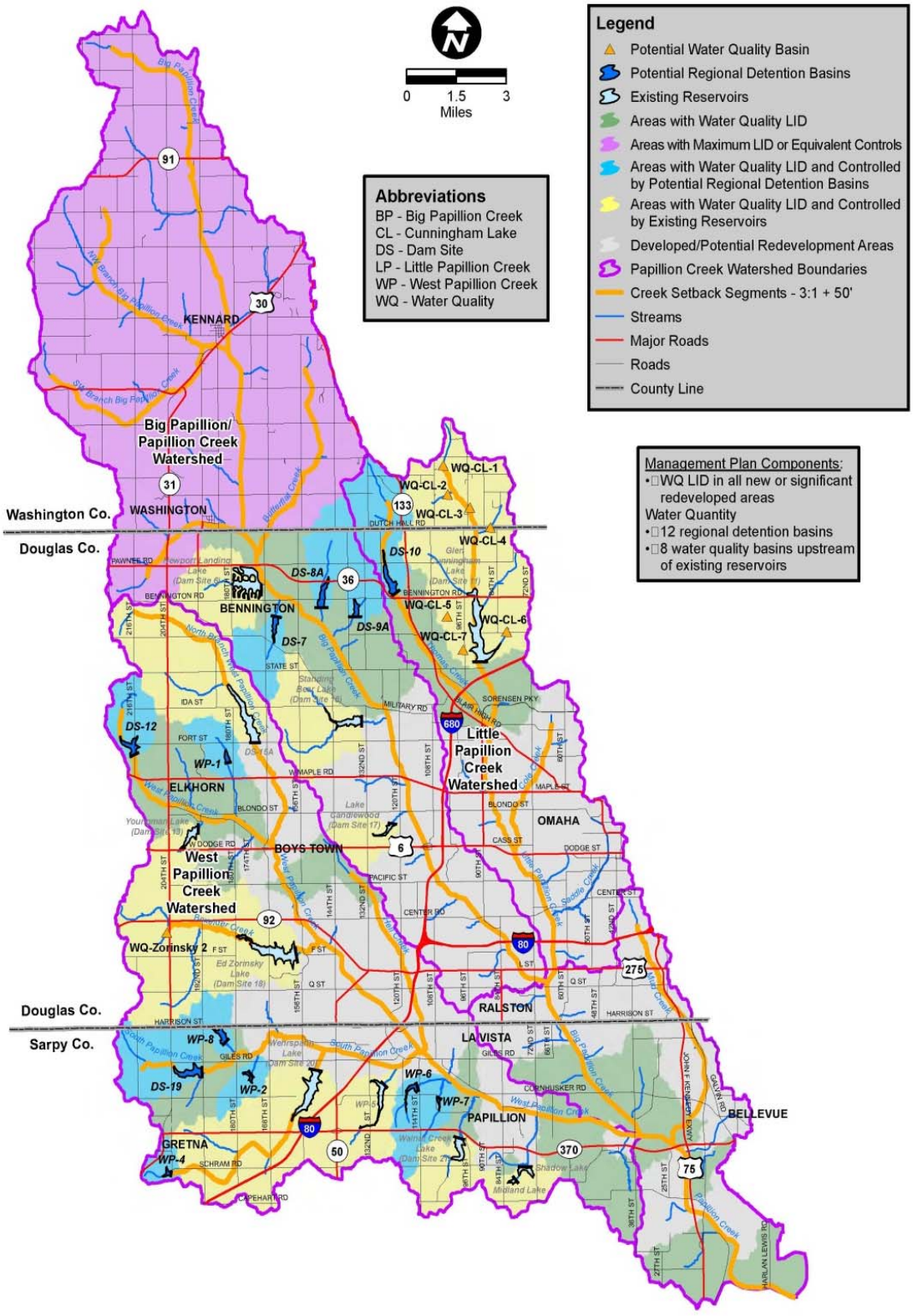
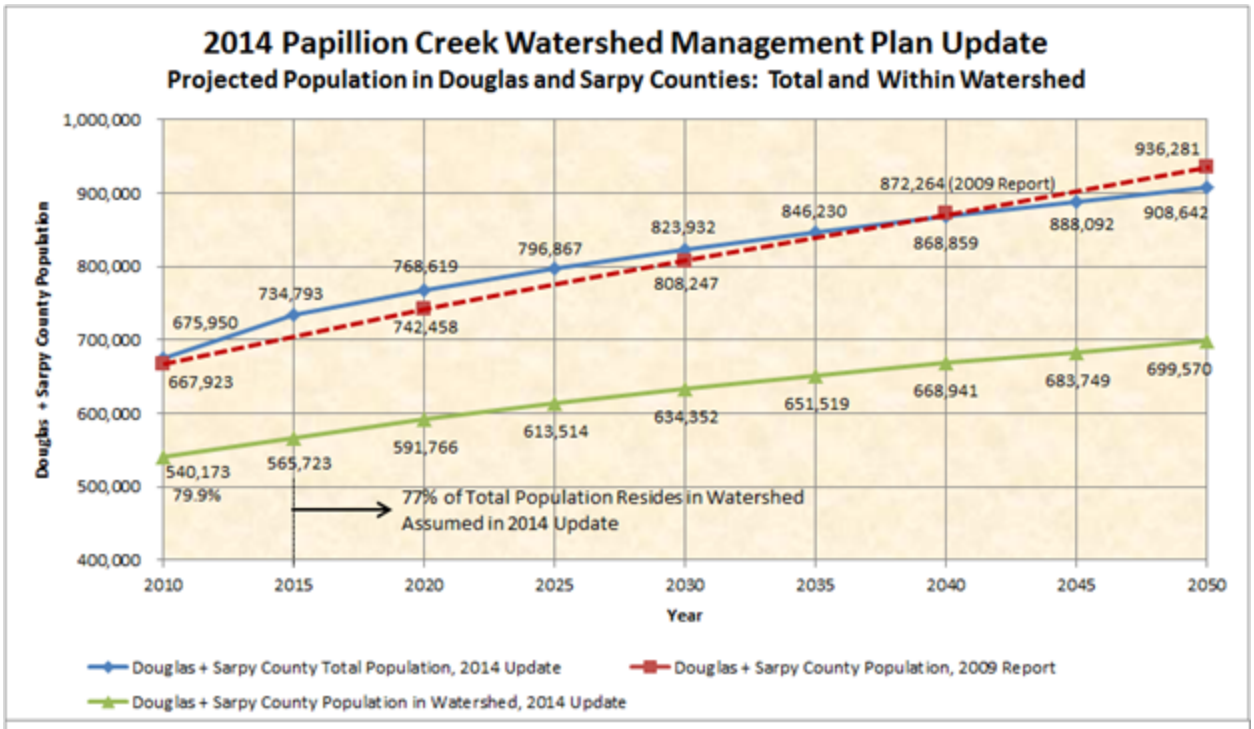
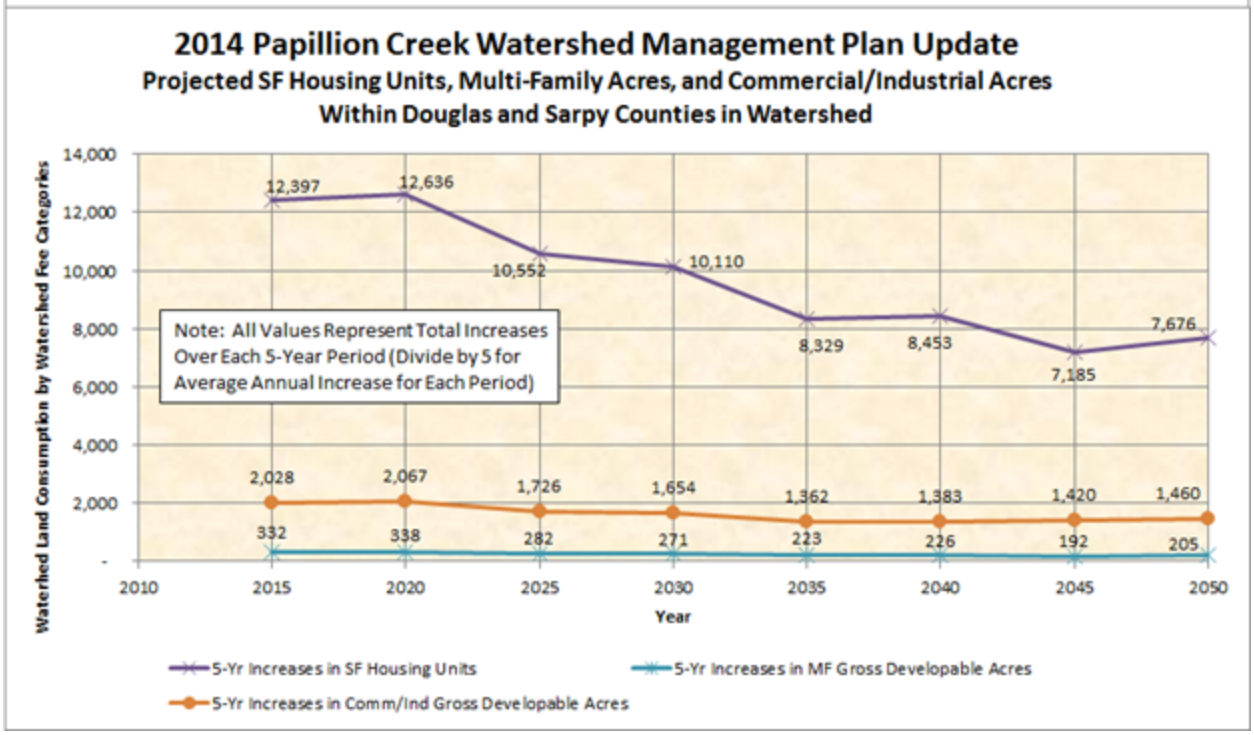


Figure 4 Updated Population and Land Use Projections





Developable Acres, and Commercial/Industrial Gross Developable Acres are shown in the lower graph

In general, the MAPA modeling assumption is that the rates of growth increases will decline over time as the Watershed approaches platting build-out. As mentioned above, the supporting tabular population and land use projections were extracted from a detailed spreadsheet and are included in Appendix B.

5.4 Financial Requirements

5.4.1 Previous Program Projects Financial Approach

As shown in Table 3 above, Program Projects identified for the previous 2011 to 2013 planning period were constructed with bond proceeds, General Fund allocations, and Watershed Fees as follows:

- The P-MRNRD obtained bonding authority from the Nebraska Legislature in 2009. Bonding authority sunsets in 2019.
- Three bonds have been issued totaling $71.5 million. Seventy five percent of the bond proceeds have been used to construct the 2011-2013 Program Projects. Bond repayment is for a 20-year period with an approximate average interest rate of 3 percent. Bond repayments are approximately $5 million per year and will progressively expire in 2031, 2033, and 2034.
- Watershed Fees are collected by PCWP members through subdivision agreements at the time building permits are secured.

5.4.2 Estimated 2014 Update Structural Project Capital Costs

Table 4 summarizes the estimated capital costs for the remaining regional detention basins and water quality basins. Appendix B contains some additional cost breakdown details. The structural projects in Table 4 are listed in preferred sequence, beginning with the WP-6 regional detention basin and ending with the WQ-CL-1 water quality basin. The project sequences listed are based on several general factors:

- A need to provide the most performance-effective flood protection as early as possible in the overall program. Selected projects for the next planning period of 2014 to 2018 are to be designated as “Program Projects.”
- Estimated population and land consumption trends provide the basic guidance for project timing as to when development platting may subsequently encroach on the structures in question. Related factors include the probable “lead time” that is needed for land appraisals and land acquisition, engineering design time, permitting, and the time it takes to resolve various public utilities and other infrastructure conflicts.
- Balancing project costs over time to the extent practical must be the primary driver for affordability and overall project timing for implementation, deferral, or elimination. There may also be future opportunities for public-private partnerships to help make projects more viable.
- Completing or at least initiating all affordable projects in Douglas and Sarpy Counties prior to platting build-out within respective subbasins is highly desirable from both a cost and timely performance standpoint. Full platting build-out for the entire Watershed within Douglas County may occur by 2050 or slightly beyond, according to previous land consumption estimates and comments from the Omaha Planning Department. Similarly, full platting build-out within the Sarpy County portion of the Watershed has been.

Table 4 Summary of Estimated Capital Costs for Remaining Projects

Structure Name	Stream Reach	Approx. Location/Jurisdiction	Drainage Area (Acres)	Est. Project Costs, 2013 Basis	
				Est. Normal Pool Area (Acres)	Total Est. Project Capital Costs, $ Millions
WP-6	Trib. to Unnamed West Papillion Trib.	114th & Cornhusker Road; Sarpy Co.	1,260	32	$11.6
WP-7	Trib. to Unnamed West Papillion Trib.	108th & Cornhusker Road; Sarpy Co.	450	12	$6.4
WP-4	Trib. to South Papillion	204th & Schram Road; Gretna	563	16	$9.9
DS 19	South Papillion Creek	192nd & Giles Road; Sarpy Co.	2,750	100	$23.7
WP-8	Trib. to South Papillion	180th & Harrison St.; Douglas & Sarpy Co.	1,470	45	$11.0
WP-2	Trib. to South Papillion	180th & Giles Road; Sarpy Co.	679	21	$9.9
WP-1	Trib. to West Papillion	180th & Fort St., Omaha	864	24	$13.7
DS 12	West Papillion Creek	216th & Fort Streets; Douglas Co. & Omaha	1,670	70	$20.7
DS 10	Thomas Creek	120th & Bennington Road; Omaha	2,950	97	$23.2
DS 7	Trib to Big Papillion	168th & Bennington Road, Bennington & Omaha	1,600	47	$13.8
DS 9A	Trib to Big Papillion	132nd & Bennington Road, Omaha	1,280	38	$10.5
DS 8A	Trib to Big Papillion	144th St. & Bennington Road, Bennington	1,850	75	$15.6
				Regional Detention Subtotal	$169.9
WQ-CL-6	Upstr. Existing Cunningham Lake	Omaha	510		$9.5
WQ-Zorinsky 2	Upstr. Existing Zorinsky Lake	Omaha	1,000		$9.9
WQ-CL-5	Upstr. Existing Cunningham Lake	Omaha	470		$9.1
WQ-CL-7	Upstr. Existing Cunningham Lake	Omaha	200		$7.0
WQ-CL-4	Upstr. Existing Cunningham Lake	Omaha & Washington Co.	915		$14.2
WQ-CL-2	Upstr. Existing Cunningham Lake	Washington Co.	845		$13.7
WQ-CL-3	Upstr. Existing Cunningham Lake	Washington Co.	790		$13.3
WQ-CL-1	Upstr. Existing Cunningham Lake	Washington Co.	740		$13.3
				Water Quality Basins Subtotal	$89.9
				Total Regional Detention and Water Quality Basins	$259.8

previously estimated to occur between 2040 to 2050 due a recognized trend for a more rapid rate of growth

5.4.3 Cash Flow Requirements

A cash flow model was developed to evaluate possible impact of various financing strategies within in P-MRNRD's budget on the implementation of the Papillion Creek Watershed Management Plan. The cash flow model tracks sources of funds (revenues) and uses of funds (expenditures) over a 35-year planning horizon, beginning in 2014. Based on total revenues and expenditures following their historical trends, the model annually estimates the level of funds available for implementing the projects in their desired sequence. The available funds are assumed to be kept in a reserve or sinking fund until its balance is sufficient to fund the next upcoming project in the implementation plan. At the time of implementation, the fund is temporarily depleted and reserves must again build-up until the subsequent project can be constructed. A similar revenue accrual and expenditure pattern must continue until all of the projects in the Management Plan are constructed. Furthermore, a bond issue allows for immediate funding of projects but imposes a long-term debt service requirement.

The model development included four steps:

1. The development of model structure and logic.
2. Development of key model assumptions or inputs.
3. Identification of funding mechanisms.
4. Development of funding scenarios.

The model structure and logic follows straightforward sources and uses of funds analysis. Model assumptions were developed for critical inputs such as: project implementation schedule, regional growth rates, inflation rates, property tax rates (mill levy), Watershed Fees, and bond decisions. These inputs were linked to two funding mechanisms: pay-as-you-go (P-A-Y-G); or bonding with P-A-Y-G. The model assumes two funding mechanisms were then combined to evaluate a combination of funding scenarios. The model development is described in more detail below.

The funding goal for capital projects has been approximately 2/3 from public funding and 1/3 from private funding. This funding goal is commensurate with Policy Group #6: Stormwater Management Financing, included in Appendix C. Public funding is from the P-MRNRD and is based on an assumed allocation of General Funds as described in the P-MRNRD's Long Range Implementation Plan (LRIP). Private funding is generated by Watershed Fees paid by home builders or developers.

5.4.4 Sources of Funds

Sources of funds include reserve balances carried over from a previous year, P-MRNRD allocations of General Fund revenues, Watershed Fees, and bond proceeds.

5.4.5 Uses of Funds

Uses of funds in the model include expenditures for the implementation of projects and payments to debt service in bonding scenarios.

5.4.6 Key Model Assumptions or Inputs

Critical inputs, or assumptions, needed to evaluate the alternatives in the cash flow model include:

1. Desired Sequence of Project Implementation. The sequence used in this analysis is based on current and projected development patterns in the Watershed, anticipated funding availability, flood damage reduction performance, and deferral of the water quality basins.

2. Mill Levy. Two mill levies were considered: The existing levy of $0.032753 per $100 of valuation, or $0.045 per $100 of valuation. These represent the plausible range of General Fund revenues which could be allocated with the maximum mill levy based on Nebraska Statutes for the Natural Resources District.

3. Regional Growth. It was assumed that population in the Papillion Creek Watershed would increase based on projections derived from the MAPA 2040 Community Visualization™ Model. Property values in the Watershed were assumed to increase at a rate of 1.5 percent per year based on D.A. Davidson Co. (P-MRNRD's bonding company) projections for assessed valuations for property in the P-MRNRD's jurisdictional boundary.

4. Inflation Rate. Price levels for the P-MRNRD's existing and planned operation and maintenance expenditures are assumed to increase 2 percent per year based on a long-run average of the Consumer Price Index.

5. Watershed Fees. Watershed Fees were reassessed based on total Program costs (updated remaining structural project costs plus previous Program Projects costs), land use/population projections, and a credit for 1/3 public Watershed Fees collected to date. Funding needs were rebalanced to achieve a 2/3 public and 1/3 private funding goal cost share in conjunction with an inflation index. Reassessed Watershed Fees were then estimated using the multipliers from the 2009 Watershed plan for Single Family residential, High-Density Multi-Family residential and commercial/industrial Fee Categories.

6. Annual Watershed Fee Increases. Watershed Fees are linked to inflation with an assumed long-run average of 2.5 percent over time based on an average of construction cost indices.

7. P-MRNRD Decision to Bond. The P-MRNRD has a remaining authority to issue up to approximately $10 million in bonds. In scenarios where bonding is used, it assumed that all remaining bonding authority will be used in the next planning period (2014-2018).

8. Financing Terms for Bonding. It was assumed that bond payments would be the principal amortized over 20 years at 4.5 percent interest, based on a review of similar municipal bonds in 2012-13.

5.4.7 Funding Mechanisms

The cash flow model considers two (2) funding mechanisms in the range of the modeling scenarios:

1. P-A-Y-G. The first funding mechanism is a continuance of the strategy developed in the 2009 Plan, whereby implementation continues on a P-A-Y-G basis. Under this mechanism the projects are implemented utilizing a combination of General Fund revenue allocations from the P-MRNRD and Watershed Fees. Additional revenues may be gained from some combination of P-MRNRD levy increases or Watershed Fee increases.

2. Bonding with P-A-Y-G. The second funding mechanism adds P-MRNRD bonding authority to the P-A-Y-G. The P-MRNRD has capacity to issue additional bonds of $10 million. When bonding is used in a scenario, the P-MRNRD would reduce its allocation of funds to the project implementation to cover the costs of bond issuance (annual debt service). Additional revenues may be gained from some combination of P-MRNRD levy increases or Watershed Fee increases.

These funding mechanisms were combined to form eight (8) financing scenarios described below.

5.4.8 Funding Scenarios

An entire suite of funding options is available, given the model assumptions and funding mechanisms described above. The two funding mechanisms were combined with the model assumptions to form financing scenarios described below in Table 5. These financing scenarios represent the range of the financial picture for the project implementation. Scenarios 1A and 3A were evaluated for further consideration, since they have the most similarity to previous funding mechanisms and rates. See Appendix B for additional information on the other scenarios evaluated.

Table 5 Funding Scenarios Evaluated

Scenario	Funding Mechanism	Mill Levy per $100 Valuation	Watershed Fees	P-MRNRD General Fund Allocation
1A Baseline	P-A-Y-G	$0.03275	Current Rates with Inflation	Dedicated General Fund Allocation per LRIP, Begin 2016
1B	P-A-Y-G	$0.03275	Increase to 50% of program costs, linked to inflation	Dedicated General Fund Allocation per LRIP, Begin 2016
2A	P-A-Y-G	$0.03275	Current Rates with Inflation	No Dedicated Allocation of Funds
2B	P-A-Y-G	$0.03275	Increase to 50% of program costs, linked to inflation	No Dedicated Allocation of Funds
3A	Bonding with P-A-Y-G	$0.03275	Current Rates with Inflation	Same as 1A + Bond Proceeds - Debt Service
3B	Bonding with P-A-Y-G	$0.03275	Increase to 50% of program costs, linked to inflation	Same as 1B + Bond Proceeds - Debt Service
4A	Bonding with P-A-Y-G	$0.045	Current Rates with Inflation	Dedicated General Fund Allocation per LRIP, Begin 2016
4B	Bonding with P-A-Y-G	$0.045	Increase to 50% of program costs, linked to inflation	Dedicated General Fund Allocation per LRIP, Begin 2016

5.4.9 Cash Flow Model Results

Cash flow projections from the model are presented graphically for each funding scenario. Scenarios 1A and 3A have been tentatively selected as perhaps the most reasonable funding strategies at this time, and are shown below in Figures 5 and 6, respectively. The figures for the remaining six scenarios are included in Appendix B. The figures include revenue streams (annual General Funds from the P-MRNRD, annual Watershed Fees, and cumulative fund balances) and expenditures on projects. From these figures, as well as calculations within the model, key model outputs that were derived include:

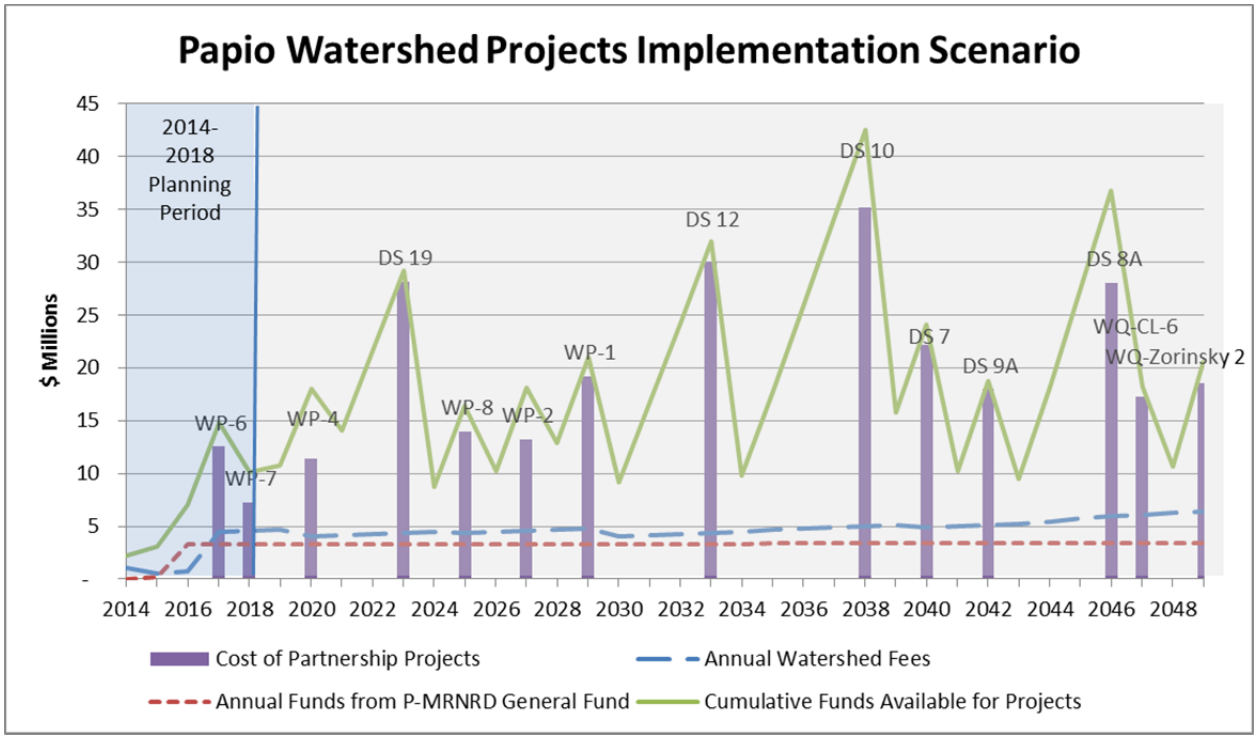
1. Number of projects completed in the next implementation (Program Projects) period of 2014 to 2018.
2. Total number of projects completed in the long-term planning horizon.
3. If all projects were to be completed, the years needed to complete the desired sequence of projects.
4. Impact from assumed inflation on future construction costs.
5. Financing costs for bonding scenarios.

A general description of figure components is summarized below:

- The long-term planning horizon utilized was 35 years (2014 to 2049).
- The next Program Projects cycle is shown in light blue from 2014 to 2018.
- Projects were sequenced based on estimated proximity to urbanization.

- The red short dash line represents the contribution of annual funds from the P-MRNRD's General Fund. In accordance with the LRIP, a dedicated $3 million dollars is to be set aside for future Watershed projects.
- The blue long dash line represents the annual contribution of Watershed Fees.
- The green solid line represents the cumulative funds available (e.g. annual funds, Watershed Fees, or bonds proceeds).
- The purple bars represent the estimated cost of the project.

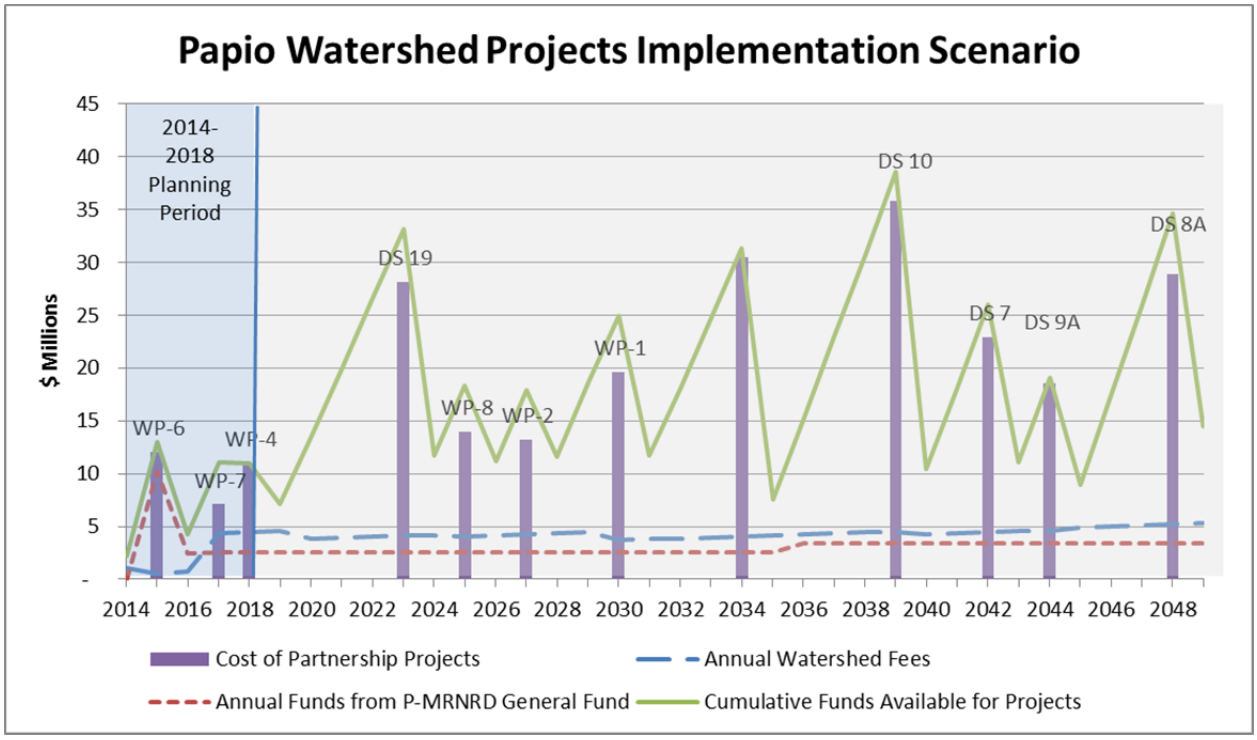
Figure 5 Scenario 1A: P-A-Y-G with Existing Mill Levy and Dedicated General Fund Allocation per LRIP, Begin 2016



Results from Figure 5:

- All 12 of the regional detention basins can be potentially constructed.
- Only the first 2 of 8 water quality basins can be constructed within the planning horizon.
- Only 2 projects can be constructed in the next Program Project cycle from 2014 to 2018.

Figure 6 Scenario 3A: Bonding with P-A-Y-G Existing Mill Levy and Dedicated General Fund Allocation per LRIP, Begin 2016



Results from Figure 6:

- If the P-MRNRD uses bonding in the next planning period, all 12 of the regional basins but none of the water quality basins can be constructed within the planning horizon.
- With the additional immediate funds from bond proceeds, 3 of the regional basin projects can be constructed in the next Program Project cycle from 2014 to 2018.
- With the additional debt service payments (approximately $1 million per year) the dedicated allocation of P-MRNRD funds is reduced accordingly, which would delay implementation of future projects in the subsequent planning periods.

5.4.10 Cash Flow Model Findings

Table 6 summarizes the total number of projects that could be potentially completed in the 35-year planning horizon and the number of projects that could be completed in the next Program Project cycle from 2014 to 2018 using Scenario 1A and 3A funding strategies. For these strategies, the existing mill levy of $0.03275 per $100 of valuation and the current watershed fees increased with inflation was assumed.

Table 6 Summary of Projects Implemented for Scenarios 1A and 3A

Scenario	Total Number of Projects Completed in 35-Year Planning Horizon	Program Projects Completed 2014 to 2018
1A P-A-Y-G	14	2
3A Bonding with P-A-Y-G	12	2 or 3

In overall summary for Scenario 1A and 3A under the current authority of the P-MRNRD:

- Two (2) projects can be implemented within the next planning period with or without bonding. If sufficient allocated General Funds remain available, 3 projects could potentially be implemented with bonding.
- With bonding, there would potentially be two fewer projects that could be completed over the 35-year planning period due to residual debt service.

6.0 Implementation Plan

6.1 Overview

The Implementation Plan in the 2009 Report primarily dealt with the administrative and financial requirements necessary to initiate the Watershed Management Plan. Since the basic administrative framework (policies) are already in place, the Implementation Plan within this 2014 Update is primarily intended to provide updated capital cost estimates and recommended Program Projects that can be considered for the upcoming 2014 to 2018 time frame in accordance with the following provisions:

- Watershed Management Fees (also called “Watershed Fees”) and public funding (the P-MRNRD’s mill levy) are the two revenue streams to be used for the construction of regional detention basin and water quality basin projects called for in the Papillion Creek Watershed Management Plan. The goal for funding the capital projects as a whole has been approximately 2/3 from public funding and 1/3 from Watershed Fees.

- Current Developer Fee classifications are as follows:
  - o Single Family (SF) Residential. Fees are assessed per lot. This classification includes low-density multi-family units up to 4-plexes and provides the baseline assumption for stormwater surface runoff potential in comparison to the other fee classifications. Therefore, Single Family Residential has a Surface Runoff Multiplier of 1.0. Typical lot densities range from approximately 3 to 3.5 dwelling units per Gross Developable Acre[3].
  - o High-Density Multi-Family (MF) Residential (beyond 4-plexes). Fees are assessed per Gross Developable Acre, and this classification has an assumed Surface Runoff Multiplier of 1.25 because of increased impervious areas.
  - o Commercial/Industrial. Fees are assessed per Gross Developable Acre, and this classification has an assumed Surface Runoff Multiplier of 1.5 because of further increased impervious areas.
- Watershed Fees only apply to new development or significant redevelopment (as defined).
- Watershed Fees have not been generally applied to continued development within S&IDs that have developer agreements that have been in place prior to the time that Watershed Fee provisions were created within the respective PCWP jurisdictions through inter-local agreements and enabling ordinances and resolutions.
- Watershed Fees (private) are intended to account for approximately one-third (1/3) of required capital funds and shall be paid to the applicable local zoning jurisdiction with building permit applications.
- Watershed Fees collected by PCWP members are transferred to a special Watershed Management Fund that is managed by the P-MRNRD. The P-MRNRD serves as the administrative agent for the PCWP as a public agency having inter-jurisdictional authority. The P-MRNRD has the capability for carrying out the construction of structural projects, as authorized by inter-local agreements within the PCWP.
- The P-MRNRD was able to acquire general obligation bonding authority from the Nebraska Legislature to provide necessary construction scheduling flexibility.

The P-MRNRD furnished HDR with the following background financial information that was used to update the financial cash-flow model:

- Bonding summaries prepared by the P-MRNRD's bonding company, D. A. Davidson & Company, for three outstanding bond issuances that are being used to finance the current Program Projects that were identified in the 2009 Plan for

[3] Gross Developable Acres means the total interior area within the boundaries of an S&ID that is considered developable. As such, the area occupied by interior streets is included but not the exterior arterials. Also not included are interior areas involving creeks and their development set-back areas; dedicated recreational park or nature preservation areas; existing dedicated wetlands areas that are to remain; areas having exceptionally steep terrain and heavily forested areas not conducive to development; and any interior existing buildings, outlots, and easements that are intended to remain as is. The typical ratio of Gross Developable Acres to Total Gross Acres ranges from 68% to 75% for SF Residential and MF Residential and 75% to 100% for Commercial/Industrial developments.

the 2011 to 2013 planning period.

- The current design and construction status of these projects. This was previously presented in Table 3.
- The bonding summaries and a bond payment schedule that keys into the June 30th end of fiscal years from 2014 through the 2034 retirement of the last bond issued.
- The estimated P-MRNRD mill levy requirements are based on an assumed 1.5 percent annual increase in assessed valuations of property within the District.
- The construction bid tabulation from Dixon Construction for the new Pigeon/Jones Creek Dam Site 15, located near the Village of Hubbard in Dakota County, NE. This was used to help prepare updated structural capital cost estimates.
- Proposed P-MRNRD Board budget for "Projected Expenditures by Program or Project - Fiscal Years 2014-2019".
- Proposed P-MRNRD Board "Projected Revenues Fiscal Years 2014-2019".
- An itemization of Developer Fee revenues via building permits received by PCWP participants from 2010 through 2014.

The Implementation Plan includes structural and non-structural elements. The structural portion of the Implementation Plan consists of Program Projects whose construction would be initiated in the next immediate planning period (assumed to be 2014 to 2018).

6.2 Structural Components: Program Projects

The structural portion of the Implementation Plan Update consists of Program Projects whose construction would be initiated in the next 5-year planning period (2014 to 2018). Proposed Program Projects recommended by the PCWP consist of two (2) regional detention basins, as listed in Table 7 and shown in Figure 7, which is the Implementation Plan Map.

Table 7 Watershed Management Plan Program Projects for Years 2014 to 2018

Structure	Approx. Location & Planning Jurisdiction	Drainage Area (acres)	Est. Project Capital Costs, 2014 Basis, $ Millions
WP- 6	114th & Cornhusker Road; Sarpy County	1,260	$11.6
WP-7	108th & Cornhusker Road; Sarpy County	450	$ 6.4
		Total	**$18.0**

Note: The abbreviation "WP" = West Papillion Creek Watershed.

6.3 Project Funding Framework

Project funding considerations every 3 to 5 years need to include a re-examination of financial resources, responsibilities, and constraints that may be needed to better support the Watershed Management Plan and the Implementation Plan.

Every 3 to 5 years when the Watershed Management Plan and Implementation Plan are reviewed and updated, Watershed Fees are reassessed based on total Program costs (updated remaining structural projects plus previous Program Projects), land use/population projections, and a credit for Watershed Fees collected to date. Funding needs will be cost shared with the goal of 2/3 public (tax dollars) and 1/3 private (Watershed Fees) for overall Program Project costs. The Watershed Fees will be increased by an annual inflation factor.

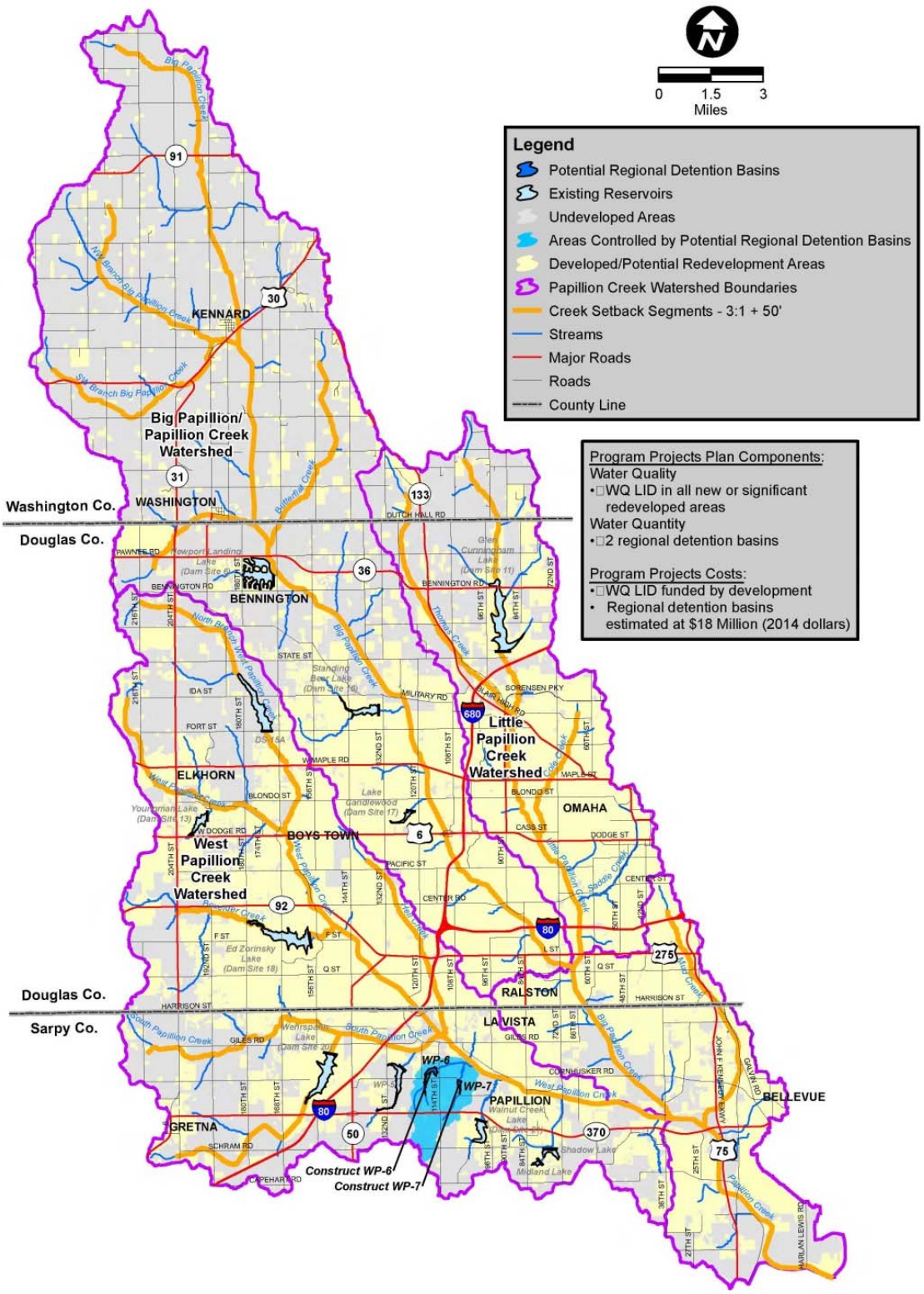
Table 8 below summarizes the annual Watershed Fee rate adjustments selected by the PCWP for the Program Project years 2014 to 2018.

Table 8 Schedule of Watershed Fees for Years 2014 to 2018

Fee Category	Current Developer Fee Amounts	2014	2015	2016	2017	2018
Single Family Residential (also includes low-density multi-family up to 4-plexes)	$750 per lot (same as per Housing Unit or per Dwelling Unit)	$823	$843	$864	$886	$908
High-Density Multi-Family Residential (beyond 4-plexes)	$3,300 per Gross Developable Acre	$3,619	$3,710	$3,803	$3,898	$3,995
Commercial/Industrial	$4,000 per Gross Developable Acre	$4,387	$4,497	$4,609	$4,724	$4,842

Note: The assumed inflation rate for 2015 to 2018 is 2.5 percent per year.

Figure 7 Papillion Creek Watershed Implementation Plan (Years 2014 to 2018)



List of Appendices

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Supplemental Water Quality Impairment Commentary

Purpose

The purpose of this supplemental commentary is to provide additional information for the reader about the various existing water quality impairments listed by Nebraska Department of Environmental Quality (NDEQ) for key pollutants of concern (POCs) within the Watershed, and to comment on changes from the listings contained in the 2009 Report. The water quality impairment comparisons will include brief discussion on anticipated future water quality regulations that may affect future Watershed planning obligations and strategies. No additional water quality technical analyses were provided by HDR for this 2014 Update.

Basis for Water Quality Impairments

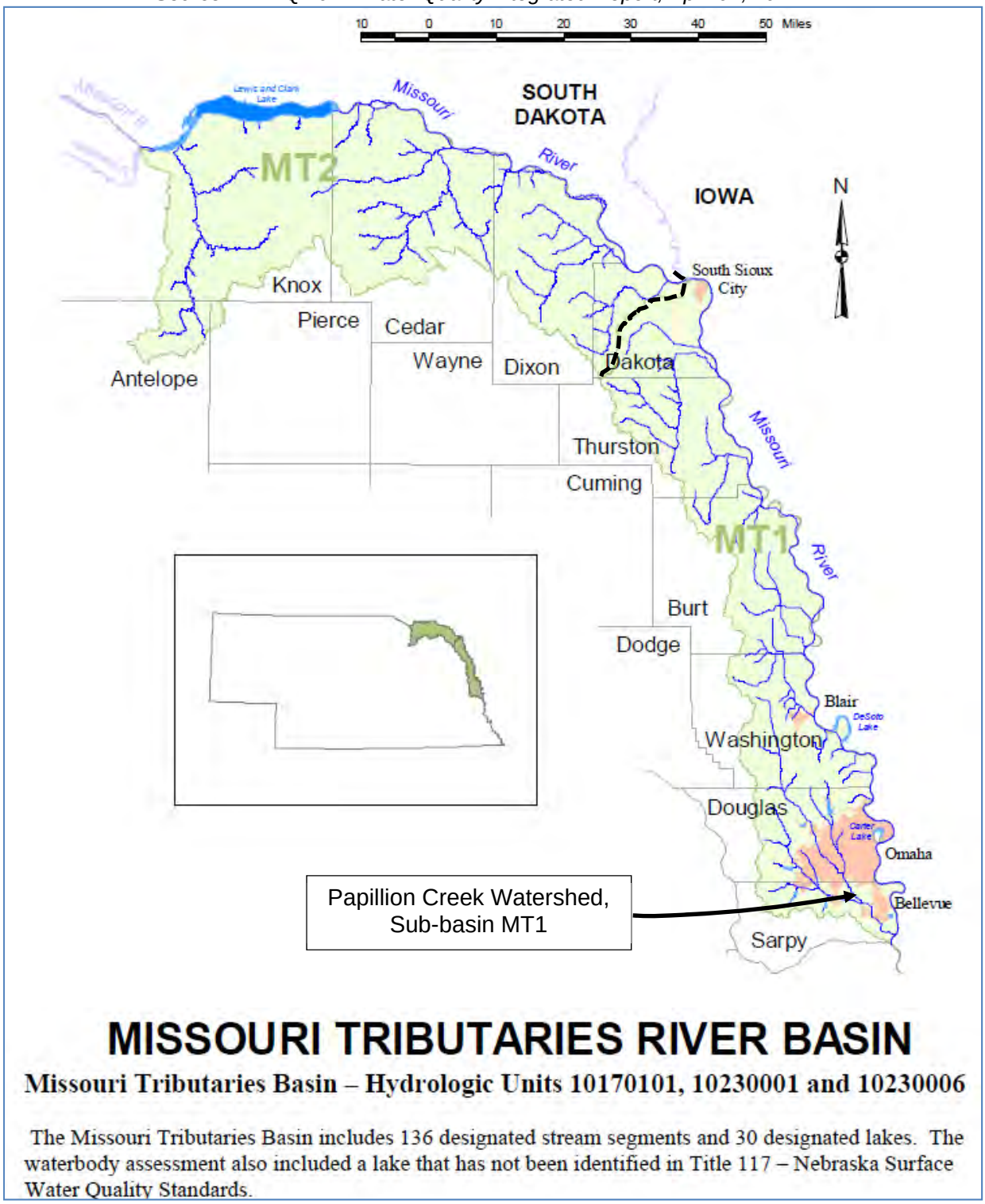
Surface water in Nebraska is primarily regulated by NDEQ's *Title 117 - Nebraska Surface Water Quality Standards*. Water quality criteria are based on the designated beneficial use classifications of the various lake and stream water bodies. Designated beneficial uses within the Watershed include:

- Primary Contact Recreation: Human exposure to pathogens, as indicated by Escherichia coliform (E. coli) bacteria that are commonly found in the lower intestines of warm-blooded animals and humans. E. coli bacteria are a subset of fecal coliform bacteria, and human exposure in protected water bodies is typically due to swimming and wading.
- Aquatic Life: Potential toxicity to aquatic community and suitability of habitat.
- Fish Consumption Advisories: Triggered by POCs, such as carcinogens, which exceed established criteria and, therefore, may pose a human health risk.
- Water Supply: Public Drinking Water Supply and/or Agricultural Water Supply.
- Aesthetics: Degradation of water clarity and overall visual appearance of a water body due to discoloration, sedimentation, Chlorophyll "a" content (algae production), and nutrient enrichment.

The Papillion Creek Watershed lies within NDEQ's Missouri River Tributaries, Sub-basin MT1. See Figure A-1, which has been extracted from NDEQ's *2012 Water Quality Integrated Report, April 01, 2012.* The only beneficial use that will not apply within the Papillion Creek Watershed will be that for Public Drinking Water Supply. Under the Aquatic Life beneficial use, the various tributary segments are classified as Warmwater "A", which is the most protective warmwater classification, due to their proximity to urban development.

Figure A-1 Papillion Creek Watershed within NDEQ's Missouri River Tributaries Sub-Basin MT1

Source: NDEQ *2012 Water Quality Integrated Report, April 01, 2012*



Currently, Sub-basin MT1 has several water bodies (both lakes and stream segments) that are listed as impaired for water quality by NDEQ in the most recent *2012 Water Quality Integrated Report.* These impairments within the Papillion Creek Watershed were summarized in the Main Body of the Report in Table 1, with locations of the impairments shown in Figure 2. There are other stream segments within the Watershed that were not listed in Table 1. The segments that are unlisted are due to either water quality assessments that have not yet been completed (such as for Hell Creek and South Papillion Creek) or a determination that the unlisted segments have been ranked as "supporting" of designated beneficial uses (such as is the case for Boxelder Creek that lies west of Ed Zorinsky Lake). Therefore, such unlisted stream segments may or may not be of future regulatory concern. It is at NDEQ's discretion as to whether or not to pursue regulatory enforcement actions for the various listed impairments. There are many factors which affect such discretionary decisions, including:

- Whether or not impairments are due to natural, uncontrollable conditions.
- The extent that current data and supplemental future data will likely be able to adequately describe probable sources of POCs.
- Impairments involving the presence of EPA previously banned chemicals (commonly called "legacy" chemicals) that are expected to slowly dissipate over time.
- The judged practicality and affordability of impairment correction.
- Limits of EPA/NDEQ jurisdictional authority. Numeric water quality standards cannot currently be legally enforced unless they are included in EPA's National Pollution Discharge Elimination System (NPDES) for issuance of discharge permits. Historically, numeric water quality criteria and NPDES permitting have not been applied to non-point source pollution. Therefore, non-point source water quality issues have to be presently addressed through voluntary compliance actions and/or best management practices (BMPs) that establish water quality performance goals rather than enforceable numeric water quality criteria.
- There is current pressure against EPA to find a way to include non-point source pollution under the umbrella of the NPDES Program, but one can expect a great deal of resistance in that regard.

Commentary on Current Water Quality Impairments

Lake Impairments

- Nutrient and Chlorophyll "a" Impairments.
    - Affected Lakes. For regulatory purposes, nutrient enrichment generally equates to high levels of Total Nitrogen and Total Phosphorus. Walnut Creek Lake, Wehrspann Lake, and Ed Zorinsky Lake had been previously "de-listed" for nutrients by NDEQ in the March 2008 Integrated Report, based on NDEQ's assumption at that time that upstream water quality basin controls would likely eliminate the nutrient enrichment problems. However, for NDEQ's 2012 Integrated Report, nutrient impairment listings have been added for Wehrspann Lake, Ed Zorinsky Lake, and Standing Bear Lake. Nutrient impairment was retained for Glenn Cunningham Lake. Walnut Creek Lake is now listed for Chlorophyll "a" impairment, which indicates a high amount of algal growth. High Chlorophyll "a" concentration is considered to be an indication of increasing nutrient loading. NDEQ has noted in Table 8-1 within the 2012 NDEQ Integrated

Report that the lower portion of Papillion Creek at Segment MT1-10100 (from the Missouri River confluence to the West Papillion Creek confluence) appears to have statistically increasingly higher levels of ammonia, which is a component of Total Nitrogen.

- o Potential Reasons for Impairment.
  - Nutrient water quality standards for lakes are typically much lower than those established for streams. Lakes typically have long hydraulic storage times that allow accumulation of nutrients over time. Elevated nutrient levels in lakes may persist even with the implementation of best management practices, including upstream water quality LID measures, vegetative buffers around the lakes, and upstream water quality basin controls. Such control measures are primarily designed for erosion and sediment control for low to moderate surface runoff events and are mostly geared for POCs associated with solids. However, the majority of nutrients in urban areas are typically in soluble form from the application of inorganic fertilizer and from nitrogen content within rainfall; thereby being very mobile. Under higher surface runoff events, a significant portion of the Total Nitrogen (TN) and Total Phosphorus (TP) nutrient loadings can simply bypass physical and vegetative control measures and contribute to lake enrichment.
  - Nutrients from wildlife fecal matter and from atmospheric deposition are difficult to control. General observations of the nutrient impaired lakes in the Watershed have indicated a large presence of waterfowl. The observed waterfowl vary between year-round and seasonal species. Literature review indicates that Canada geese and ducks can significantly contribute to nutrient loadings.
  - The Watershed lakes have limited dry weather flow-through and will naturally retain some nutrient concentration. Aquatic vegetation will result in the uptake of nitrogen and to a lesser extent phosphorus. Shore-line vegetation and algae will eventually release some nutrients back to the Watershed upon decay. With all the variables involved, the predictability of nutrient enrichment is complex, but to date the general trend being suggested by NDEQ's reports is a progressive degree of nutrient enrichment.
  - Implications. It is not likely that the lakes listed for nutrient impairment will be "de-listed" by NDEQ in the near term. Upstream LID and water quality basin controls may eventually decrease nutrient concentrations under limited rainfall conditions. Such controls overall may still not be able to sufficiently compensate for the nutrient contributions induced by larger rainfalls, additive nutrients from uncontrollable sources, and for pre-existing large portions of the Watershed that have no water quality control measures. It is not anticipated that any near-term regulatory repercussions for nutrient enrichment within the listed lakes will be initiated by NDEQ because they recognize all of the causative factors stated above and the good Watershed management measures being promoted by the PCWP. However, it is suggested that the PCWP work with NDEQ proactively to further evaluate the impairment situation.

- Sediment Impairment. Candlewood Lake continues to be listed for sediment impairment. This impairment is most likely due to several storm sewers that discharge directly into the lake without pretreatment. Upstream control measures will be required to resolve this impairment, which is not likely to occur as retrofits.

- pH Impairment. Hitchcock Park Lake is the only water body listed for pH impairment. High pH typically originates in lakes for two reasons: water exposure to highly alkaline soils or bedrock outcrops or from an excessive amount of algae. There are no known practical solutions for addressing pH impairment due to alkaline soils or bedrock outcrops. If excessive algae exists, the lake may also eventually become listed as impaired for nutrients and/or Chlorophyll "a". Excessive algal growth during hot, bright, sunny days will often consume large amounts of dissolved carbon dioxide. This can easily cause a rise in the pH above the water quality standard maximum of 9.5. It is reasonably common for high algae-laden lakes and ponds to have this type of problem. One of the most common remedial measures for algae induced pH problems includes dredging of the lake in order to remove excessive vegetative-based sediment and installing surface aeration type mixing. However, Hitchcock Park Lake is not currently listed as impaired for nutrients. Therefore, in order to determine appropriate treatment protocols, the cause of high pH in Hitchcock Park Lake will need to be investigated.
- Hazard Index Compounds. NDEQ has partially regrouped/reclassified such impairments since their 2008 assessment. The organic compounds involved comprise a standard "watch" list. The consistent exceedance of any one or more of the POC components will trigger an impairment listing. The organic compounds have been banned by the EPA and have therefore been considered "legacy" compounds. It is assumed that these legacy compounds are buried in bottom sediments or will otherwise dissipate over time. There are typically no regulatory remedial actions ordered other than to issue fish consumption advisories for such compounds. The exception would be if the impairment situation would seriously jeopardize the public in other ways, which is not the present case.
- Heavy Metal Impairments. EPA and NDEQ have long suspected that mercury contamination in the listed lakes and others elsewhere is most likely due to atmospheric deposition of particulates. There is currently no agreement among the scientific community as to the exact sources of such contamination; whether it is presumed to be from coal-fired power plant air emissions and/or from naturally occurring geothermal emission sources. There have been no known local studies to attempt to identify probable sources, simply because the study efforts would be extremely difficult and still subject to controversy. Therefore, it is unlikely that any further regulatory actions will be taken concerning mercury contamination within the lakes in the Watershed.

Stream Impairments

- Bacterial Impairments.
  - *E. coli* bacteria (a sub-set of fecal coliform bacteria) are EPA's standard indicators of potential pathogenic (disease-causing) bacteria that originate from the intestinal tracts of warm-blooded animals and humans and are used to judge water quality with respect to the Primary Contact Recreation designated beneficial use. Bacterial exceedances to NDEQ Title 117 water quality standards have continued to be the most prevalent form of stream impairment in the Watershed where sampling has been conducted. Non-point sources such as agricultural practices along with wildlife can also contribute significant amounts of non-point source bacteria.
  - Within the Omaha urbanized area, Cole Creek, Saddle Creek (which discharges to the Little Papillion Creek), and the lower portion of Big Papillion Creek currently have combined sewer overflow (CSO) discharges without disinfection, which periodically contribute to bacterial contamination. The Elkhorn (City of Omaha) wastewater

treatment plant (WWTP) discharges to the Papillion Creek system, but the WWTP effluent is being disinfected and should not significantly contribute to bacterial counts. With planned CSO improvements, disinfection of wet weather overflows will be implemented, but past Watershed modeling work has suggested that even if the Watershed CSOs were to be totally eliminated, the various tributaries would still remain impaired for bacteria. Urbanized area can contribute significant additional non-point source bacteria from pets and wildlife.

- Overall compliance with current bacterial water quality standards within the Watershed is not expected to be met, even with added water quality LID and new CSO measures. Uncontrollable wildlife contributions can be a significant contributor to bacteria in rural and suburban watersheds. Eventual compliance could only be expected if EPA is willing to change the current rules for Primary (full-body) and Secondary (partial-body) Contact Recreation.
- There are three major regulatory issues that have remained highly controversial over the years and will likely continue for at least the near term planning period:
  - The types and locations of various stream settings with respect to the probable frequency and likely degree of human exposure that actually exists, and the water quality standards that should legitimately apply under low exposure risk situations have been contested. Warning sign and colored flag postings and City website water quality announcements have been used as a means of regulatory response for bacterial impairment where non-point source dominated bacterial problem cannot be practically eliminated. The PCWP may eventually wish to pursue a similar public notification approach for the affected stream segments in the Watershed.
  - The recognized lack of epidemiological study work for stream settings to link the level of actual human health risk from bacterial exposure versus the extremely low number of reported clinical incidents from such exposure continues to be mentioned as a reason to change the rules. EPA has not responded to this basic argument.
  - The continued use of *E. coli* indicator bacteria (as a subset to fecal coliform bacteria) has been demonstrated to not adequately differentiate between human and animal sources nor does it necessarily indicate recent pollution. *E. coli* bacteria can reside in clay-silt stream sediments and wetted stream banks for extended periods of time and can easily become mobilized when scouring surface runoff events occur.

- Dissolved Oxygen Impairment. The CSOs in Cole Creek have most likely caused the impairment for low dissolved oxygen levels due to the periodic discharges of oxygen-consuming organics in the wastewater portion of the CSOs. The Omaha CSO Program is intended to minimize wet weather overflows to the receiving streams, including Cole Creek. The dissolved oxygen levels should continue to be monitored, as the proposed improvements should eliminate the impairment.
- Hazard Index Compounds and Heavy Metals Impairments. See discussion above for lakes. Similar issues and causative factors may exist for the streams. There may be some contributions from CSO discharges, but the extent of such sources is not known at this time. Fish consumption advisories have been issued by NDEQ, but since banned organic chemicals are involved, it has been assumed by NDEQ and EPA that these impairments will dissipate over time. The source(s) of high selenium in the lower segment of Papillion Creek continues to remain unknown. No additional regulatory action is anticipated in the near term.

- Nutrients. EPA has been urging states to impose nutrient (TN and TP) limits for streams and rivers in the Mississippi River Watershed because of the Gulf of Mexico hypoxia (dissolved oxygen deficiency) situation. There are currently no nutrient-based stream impairments within the State of Nebraska, simply because water quality standards for nutrients for streams have not yet been established by NDEQ. It has been noted by NDEQ that most of the Nebraska streams cannot be considered locally impaired from nutrients other than ammonia due to the "flushing" action and bottom scouring nature of the streams that typically have clay/sand substrates. The prospect of nutrient standards for streams will definitely remain on the regulatory "watch" list for Nebraska, because the other EPA Region 7 States (Iowa, Kansas, and Missouri) are in the process of developing or have already begun pre-emptive actions to regulate nutrients in the streams from both point and non-point sources. Their actions have been endorsed by EPA Region 7, so pressure will eventually come from EPA for NDEQ to invoke similar nutrient control strategies.

  Non-point sources of nutrients within the EPA Region 7 (Nebraska, Iowa, Kansas, and Missouri) major streams typically exceed 90% of the total loadings leaving the Region. EPA's stated goal is to reduce the nutrient loads to the Mississippi River Watershed by at least 25 percent. EPA has acknowledged during the most recent 4-State Governmental Affairs meeting (November 13, 2013) that overall reduction goals may not be met for at least 30 to 40 years, which also heavily depends on the availability of cost-share funding for non-point source reduction. What is pushing the nutrient control issue is the persistence of 3rd party lawsuits against EPA to take appropriate corrective actions.

  It has also been acknowledged by EPA that over 80% of the annual nutrient loadings within the Mississippi River Watershed are caused by a few large annual storms that are well beyond typical design storms currently used to construct stormwater best management practices. Therefore, serious discussions will continue as to how to implement and cost-effectively sustain the necessary nutrient control measures.

- Aquatic Life Impairments but Parameters Unknown. These listings will eventually be addressed by NDEQ with new stream sampling work. No speculative narrative as to the upcoming water quality sampling schedule and possible impairment causes can be offered at this time.

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Financial Model Development

Updated Land Use Maps

HDR obtained the 2010 Land Use Map and Future Land Map for full platting build-out within the Watershed and the recent 2013 aerial photography for Douglas and Sarpy Counties. The 2010 and Future Land Use maps are included hereinafter in this Appendix B, including the 2040 MAPA modeling output map further discussed below.

Updated Population and Land Use Projections

This portion of Appendix B is intended to provide supplemental information concerning the rationale used to derive new population and land use projections. A summary of the process is noted below:

- 2010 Census Tract population and housing unit information was extracted via GIS meta data and mapping methods on a "block level" for Douglas and Sarpy Counties as a whole.
- The 2040 MAPA model used algorithms for "spatial attractiveness" for placement of new development and "capacity attribute" values within GIS generated polygons within Douglas and Sarpy Counties to define land consumption.
- HDR furnished GIS shape files to MAPA that define the various subbasin boundaries in the Watershed. This allowed MAPA to parse out the portions of these counties that reside within the Watershed. This, in turn, allowed the 2040 modeling output to be spatially applied to new development within the Watershed.
- It was necessary to regroup the MAPA modeling outputs into three land use categories and perform the necessary calculations to be commensurate with the Watershed Fee system as previously mentioned in the Main Body of the 2014 Update, bur further explained as follows:
    - Single Family Housing Units (SFHUs). This housing classification includes both occupied and vacant units. The 2040 MAPA model provided an aggregate total increase in SFHUs for the entire period from 2010 to 2040. One of the complexities for predicting Watershed Fee revenue streams is the inherent time lag from when any given existing or new development parcel was platted to the time when Watershed Fees are collected. Watershed Fees are currently assessed at the time building permits are issued in Omaha/Douglas County and in Sarpy County. There is no revenue dependency on whether or not a particular SFHU will soon be occupied or may remain vacant during a particular planning period or beyond. There was no attempt made to reflect future changes in housing demands in response to economic forecasts. The incremental interpolations and extrapolations in SFHUs assumed uniform growth patterns for each planning period. An assumption for percent occupancy is only important for the purpose of estimated population, but not for the Watershed Fee revenue stream.

Another difficulty for making near-term SFHU revenue projections is that there is no convenient way to extract to what extent existing S&IDs pre-date the requirements for such Watershed Fees. That time lag problem should largely dissipate within roughly ten years from the time the S&ID came into existence, and it has already been four years since the 2009 Plan was adopted. In other words, the absence of Watershed Fee revenue from the older S&IDs was given some time lag safety factor consideration for the initial 2014 to 2018 Program Project period.

- o Multi-Family Housing Units (MFHUs). Considerations are similar to those used for SFHU development; except that Watershed Fees are based on Gross Developable Acres projected land consumption, rather than individual housing units. MFHUs are often associated with "Mixed Use" commercial type development, so there had to be an assumed percentage of separation in the land uses between MF and commercial land uses.
- o Commercial/Industrial Development. The MAPA modeling outputs included several separate commercial and industrial land use sub-categories. These land uses were consolidated into a single category of Commercial/Industrial Development on a Gross Developable Acre basis to match up with the current Watershed Fee system.

- The 2040 MAPA model provided the basis for the net total increases in housing units and Gross Developable Acres of the above land use categories from 2010 to 2040 by applying the projected "capacity attribute" values in order to determine the approximate total land consumption and remaining developable areas within the established GIS polygons.
- The 2040 modeling outputs were spatially parsed into GIS land use polygons among individual and adjacent (over-lapping) subbasin boundaries.
- Projected housing occupancy/vacancy rates were used to generate the estimated 2040 population individually for Douglas and Sarpy County as a whole and also for the portions of these counties within the Watershed for each incremental planning period.
- The "Papillion Creek Watershed Community Visualization™ 2040 Output" land use map from the MAPA is included in this Appendix B.
- Finally, a weighted average proration methodology was derived based on the 2010 and 2040 end points and MAPA's assumed growth percentages for the entire MAPA planning area to estimate incremental population growth and Gross Developable Acres growth for 5-year increments from 2010 through 2050.

Figure 4 in the Main Body of the 2014 Update graphically represents the outcome of the MAPA 2040 model adaptation process. The supporting tabular population and land use projections have been extracted from a rather complex calculation spreadsheet and are included as Table B-1.

Papillion Creek Watershed
Base Land Use 2010

0 1.5 3
Miles

Washington County
Douglas County
Douglas County
Sarpy County

Dam Site 9A
Dam Site 10
Newport Landing Lake (Dam Site 6)
Glenn Cunningham Lake (Dam Site 11)
Dam Site 8A
Dam Site 7
Dam Site 15A
WP - 1
Dam Site 12
Standing Bear Lake (Dam Site 16)
Lake Candlewood (Dam Site 17)
Dam Site 13
Ed Zorinsky Lake (Dam Site 18)
WP - 8
WP - 2
WP - 6
WP - 6
Dam Site 19
Wehrspann Lake (Dam Site 20)
WP - 7
WP - 5
Walnut Creek Lake (Dam Site 21)
Midland Lake
Shadow Lake
WP - 4

Legend

- Streams
- Existing Reservoirs
- Proposed Reservoirs
- Big Papillion Creek Watershed
- County Boundary

Land Use 2010

- Agriculture
- Commercial / Industrial
- Highway
- Multi-Family Residential
- Open Space
- Other-NA
- Public
- Quasi-Public
- Single Family Residential
- Transportation Corridor
- Vacant

Papillion Creek Watershed
Future Land Use

0 1.5 3
Miles

Washington County
Douglas County
Douglas County
Sarpy County

Dam Site 9A
Dam Site 10
Newport Landing Lake (Dam Site 6)
Glenn Cunningham Lake (Dam Site 11)
Dam Site 8A
Dam Site 7
Dam Site 15A
WP - 1
Dam Site 12
Standing Bear Lake (Dam Site 16)
Lake Candlewood (Dam Site 17)
Dam Site 13
Ed Zorinsky Lake (Dam Site 18)
WP - 8
WP - 6
WP - 2
WP - 6
Dam Site 19
Wehrspann Lake (Dam Site 20)
WP - 7
WP - 5
Walnut Creek Lake (Dam Site 21)
Midland Lake
Shadow Lake
WP - 4

Legend

- Streams
- Existing Reservoirs
- Proposed Reservoirs
- Big Papillion Creek Watershed
- County Boundary

Future Land Use

- Agriculture
- Commercial / Industrial
- Greenspace
- Multi-Family Residential
- Park - Quasi Public
- Rural Estates
- Single Family Residential

Papillion Creek Watershed
Community Visualization 2040 Output

0 1.5 3
Miles

Washington County
Douglas County
Douglas County
Sarpy County

Dam Site 9A
Dam Site 10
Newport Landing Lake (Dam Site 6)
Glenn Cunningham Lake (Dam Site 11)
Dam Site 8A
Dam Site 7
Dam Site 15A
WP - 1
Dam Site 12
Standing Bear Lake (Dam Site 16)
Dam Site 13
Lake Candlewood (Dam Site 17)
Ed Zorinsky Lake (Dam Site 18)
WP - 8
WP - 2
WP - 6
WP - 6
Dam Site 19
Wehrspann Lake (Dam Site 20)
WP - 5
WP - 7
WP - 4
Walnut Creek Lake (Dam Site 21)
Midland Lake
Shadow Lake

29
680
480
80

Legend

- Interstates
- Streams
- Existing Reservoirs
- Proposed Reservoirs
- Big Papillion Creek Watershed
- County Boundary
- Multi-Family Residential - 2040
- Single Family Residential - 2040
- Retail - 2040
- Office Space - 2040
- Industrial - 2040
- Future Development Zone
- Present Development Zone

Table B-1 Spreadsheet Extraction of Population and Land Use Projections Utilizing MAPA 2040 Model

2014 Papillion Creek Watershed Management Plan Update

Population, Housing, and Gross Developable Acres Estimates

Selected Population Determination Methodology:

- 2040 Watershed Population was Back-Calculated from 2040 MAPA Housing Unit Estimates
- Remaining Population Projections were Prorated to MAPA Total Planning Area Growth Projections to Maintain General Trending Instead of Using Linear Interpolations

	Baseline Census	Projections							
	2010	2015	2020	2025	2030	2035	2040	2045	2050
Summary of Total County Population Projections									
Updated Total County Population [1]									
Douglas County, Total	517,110	533,639	550,486	564,556	578,036	589,142	600,413	609,993	620,228
Sarpy County, Total	158,840	201,155	218,132	232,311	245,896	257,088	268,446	278,099	288,414
Total	**675,950**	**734,793**	**768,619**	**796,867**	**823,932**	**846,230**	**868,859**	**888,092**	**908,642**
Comparison Population from 2009 Watershed Management Plan [2]									
Douglas County, Total	511,227		550,918		583,538		618,713		653,888
Sarpy County, Total	156,696		191,540		224,709		253,551		282,393
Total	**667,923**		**742,458**		**808,247**		**872,264**		**936,281**
Summary of Papio Watershed Population[3]									
Updated Papio Watershed Population									
Douglas County Portion of Papio Watershed	398,127	410,853	423,824	434,656	445,035	453,585	462,263	469,638	477,518
Sarpy County Portion of Papio Watershed	142,046	154,870	167,942	178,858	189,317	197,934	206,678	214,111	222,052
Total Watershed Population	**540,173**	**565,723**	**591,766**	**613,514**	**634,352**	**651,519**	**668,941**	**683,749**	**699,570**
Total Watershed Percentage Increases		4.73%	4.60%	3.68%	3.40%	2.71%	2.67%	2.21%	2.31%
Comparison Population from 2009 Watershed Management Plan [2]									
Douglas County Portion of Papio Watershed	367,566		405,787		437,120		481,351		504,630
Sarpy County Portion of Papio Watershed	130,763		161,441		192,114		219,307		246,743
Total	**498,329**		**567,228**		**629,234**		**700,658**		**751,373**
Details of Papio Watershed Population and Housing Unit Projections [4]									
Single Family Residential in Watershed									
2010 to 2040 MAPA "Allocated SF HU" Total Increase in Watershed							**62,477**		
Total Watershed SF HU (Occupied + Vacant)	**162,169**	174,565	187,201	197,753	207,863	216,193	**224,646**	231,830	239,507
Total Watershed SF HU (Occupied + Vacant) Increases		12,397	12,636	10,552	10,110	8,329	8,453	7,185	7,676
Total Watershed SF Occupied Housing Units (SF OHU) [5]	**157,141**	169,154	181,398	191,623	201,419	209,491	**217,682**	224,644	232,082
Total Watershed SF Population	**432,139**	454,374	477,039	495,966	514,101	529,042	**544,204**	557,091	570,860
Total Watershed SF Percentage Increases		5.15%	4.99%	3.97%	3.66%	2.91%	2.87%	2.37%	2.47%
Douglas County 2010 to 2040 MAPA "Allocated SF HU" Increase							**35,389**		
Douglas County SF HU (Occupied + Vacant)	**119,524**	126,546	133,703	139,680	145,407	150,125	**154,913**	158,982	163,330
Douglas County SF HU (Occupied + Vacant) Increases		7,022	7,157	5,977	5,727	4,718	4,788	4,070	4,348
Douglas County Portion of Watershed SF OHU by Ratio of Total SF OHU to HU	**115,819**	122,623	129,558	135,350	140,899	145,471	**150,110**	154,054	158,267
Douglas County Est. SF Population	**318,502**	329,767	341,249	350,838	360,025	367,595	**375,276**	381,805	388,780
Sarpy Co. Portion of Watershed SF HU (Occupied + Vacant) by Subtraction	42,644	48,019	53,498	58,073	62,457	66,068	69,733	72,848	76,176
Sarpy County SF HU (Occupied + Vacant) Increases		5,375	5,478	4,575	4,384	3,611	3,665	3,115	3,328
Sarpy Co. Portion of Watershed SF OHU by Subtraction	41,323	46,531	51,839	56,273	60,520	64,020	67,571	70,590	73,815
Sarpy County Est. SF Population by Subtraction	113,637	124,608	135,790	145,129	154,076	161,447	168,928	175,286	182,080
Multi-Family Residential in Watershed									
2040 MAPA "Allocated MF HU" Total Increase in Watershed							**23,982**		
Total Watershed MF HU (Occupied + Vacant)	**62,704**	67,463	72,313	76,363	80,244	83,442	**86,686**	89,444	92,391
Total Watershed MF HU (Occupied + Vacant) Increases		4,758	4,850	4,050	3,881	3,197	3,245	2,758	2,947
Total Watershed MF Occupied Housing Units (MF OHU) [5]	**54,372**	59,150	64,019	68,086	71,983	75,193	**78,451**	81,220	84,179
Total Watershed MF Population	**108,035**	111,349	114,727	117,548	120,251	122,477	**124,737**	126,658	128,710
Total Watershed MF Percentage Increases		3.07%	3.03%	2.46%	2.30%	1.85%	1.85%	1.54%	1.62%
Douglas County 2010 to 2040 MAPA "Allocated MF HU" Increase							**14,236**		
Douglas County MF HU (Occupied + Vacant)	**46,215**	49,040	51,919	54,324	56,627	58,525	**60,452**	62,089	63,838
Douglas County MF HU (Occupied + Vacant) Increases		2,825	2,879	2,404	2,304	1,898	1,926	1,637	1,749
Douglas County Portion of Watershed MF OHU by Ratio of Total MF OHU to HU	**40,074**						**54,709**		
Douglas County Est. MF Population	**79,625**	81,086	82,575	83,818	85,009	85,991	**86,987**	87,833	88,738
Sarpy Co. Portion of Watershed MF HU (Occupied + Vacant) by Subtraction	16,489	18,423	20,394	22,040	23,617	24,916	26,235	27,355	28,553
Sarpy County MF HU (Occupied + Vacant) Increases		1,934	1,971	1,646	1,577	1,299	1,319	1,121	1,197
Sarpy Co. Portion of Watershed MF OHU by Subtraction	14,298	59,150	64,019	68,086	71,983	75,193	23,742	81,220	84,179
Sarpy County Est. MF Population by Subtraction	28,409	30,263	32,152	33,730	35,241	36,487	37,750	38,825	39,972
Total Housing Units in Watershed									
Total HU (Occupied + Vacant)	224,873	242,028	259,514	274,116	288,108	299,634	311,332	321,274	331,897
Total Occupied HU (2010 Value Based on 2010 Census Extraction into Watershed	211,513	228,303	245,417	259,709	273,402	284,684	296,133	305,864	316,260
Vacant Housing Units (VHU)	13,360	13,725	14,097	14,408	14,705	14,950	15,199	15,411	15,637
Overall Percent Vacancy	5.94%	5.67%	5.43%	5.26%	5.10%	4.99%	4.88%	4.80%	4.71%
Papio Watershed Allocated Increases in Gross Developable Acres Derived from MAPA Modeling Outputs [6]									
Single Family Residential Gross Developable Acre Increases in Watershed									
Douglas County SF Gross Developable Acre Increases									
2010 to 2040 MAPA Allocated Total Increase							**13,243**		
Incremental Increases Prorated by SFHUs		2,628	2,678	2,237	2,143	1,766	1,792	1,523	1,627
Sarpy County SF Gross Developable Acre Increases									
2010 to 2040 MAPA Allocated Total Increase							**8,083**		
Incremental Increases Prorated by SFHUs		1,604	1,635	1,365	1,308	1,078	1,094	930	993
Douglas + Sarpy County SF Gross Developable Acre Increases in Watershed		4,231	4,313	3,602	3,451	2,843	2,885	2,452	2,620
Multi-Family Residential Gross Developable Acre Increases in Watershed									
Douglas County MF Gross Developable Acre Increases									
2010 to 2040 MAPA Allocated Total Increase							**946**		
Incremental Increases Prorated by MFHUs		188	191	160	153	126	128	109	116
Sarpy County MF Gross Developable Acre Increases									
2010 to 2040 MAPA Allocated Total Increase							**726**		
Incremental Increases Prorated by MFHUs		144	147	123	117	97	98	83	89
Douglas + Sarpy County MF Gross Developable Acre Increases in Watershed		332	338	282	271	223	226	192	205
Commercial/Industrial (C/I) Gross Developable Acre Increases in Watershed									
Douglas County C/I Gross Developable Acre Increases									
2010 to 2040 MAPA Allocated Total Increase							**4,577**		
Incremental Increases Prorated by Population		908	926	773	741	610	619	629	640
Sarpy County C/I Gross Developable Acre Increases									
2010 to 2040 MAPA Allocated Total Increase							**5,643**		
Incremental Increases Prorated by Population		1,120	1,141	953	913	752	763	791	820
Douglas + Sarpy County C/I Gross Developable Acre Increases in Watershed		2,028	2,067	1,726	1,654	1,362	1,383	1,420	1,460
Total Increases in Gross Developable Acres in Watershed		6,591	6,718	5,610	5,375	4,429	4,494	4,065	4,286
Average Annual Increases in Total Gross Developable Acres in Watershed		1,318	1,344	1,122	1,075	886	899	813	857

MAPA Reference Data for Total Planning Area Modeling Assumptions [7]	2010	2015	2020	2025	2030	2035	2040	2045	2050
% Population Growth		6.01%	6.12%	5.11%	4.90%	4.04%	4.10%	3.48%	3.72%
Overall People per Occupied Housing Unit (OHU) [8]	2.58	2.54	2.50	2.46	2.42	2.38	2.35	2.35	2.35
% SF Population	80%	80%	80%	80%	80%	80%	80%	80%	80%
% MF Population	20%	20%	20%	20%	20%	20%	20%	20%	20%
SF Population per OHU	2.75	2.70	2.65	2.60	2.55	2.50	2.50	2.50	2.50
MF Population per OHU	1.77	1.74	1.71	1.68	1.65	1.62	1.59	1.57	1.57
SF Vacancy Rates	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%	3.1%
MF Vacancy Rates	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%	9.5%

Notes:

[1] Based on MAPA's assumed growth percentages for total planning area (Douglas County, Sarpy County, and Council Bluffs portion of Pottawattamie County.

[2] 2009 Report values were based on Bureau of Business Research (BBR) projections.

[3] Based on GIS partitionining of 2010 Census data and MAPA 2040 model outputs for SF and MF Housing Unit (SFHU and MFHU) growth in Watershed and assumped people per SF and MF OHU.

[4] Bold values are "pivot" values that form the basis for interpolated values for 2015 - 2035 and for 2045 and 2050.

[5] Interpolations between the 2010 and 2040 "pivot" points and for 2045 and 2050 were made by using weighted average ratios of the assumed population growth percentages in the MAPA Total Planning Area rather than by linear interpolation in order to provide better overall trending estimates.

[6] 2040 bold values are cumulative allocated increases (not total acres) relative to 2010 and were derived from GIS-based computations applied to MAPA model land use allocation outputs. These increases were prorated for all other years by ratios of SF and MF housing units. This was necessary because total Gross Developable Acres for 2010 have not been determined.

[7] Values apply to Douglas County, Sarpy County, and the Council Bluffs portion of Pottawattomie County.

[8] The 2010 Census data for the Watershed indicated that the overall average people per Occupied Housing Unit (OHU) was 2.554. By comparison, this value is 1% lower than the 2.58 people per OHU value in the MAPA reference table above for the total planning area.

2013 Updated Papillion Creek Watershed Management Plan
Cost Estimates for Regional Detention and Water Quality Basins

Regional Detention Summary Table

Regional Detention Site[1]	Reach Name	Approx. Location	Drainage Area (acres)	Normal Pool Area (acres)	Top of Dam Area Plus 20%[2]	Dam Construction Cost ($ million) (2013 $)	Real Estate Cost3[3] ($ million) (2013$)	Utilities/ Infrastructure Cost[4] ($ million) (2013 $)	Estimated Recreation Cost ($) 25% ($ million) (2013 $)	Total Estimated Cost ($million) (2013 $)
WP-6	Unnamed West Papillion Creek Trib.	114th & Cornhusker Road	1,260	32	120	$3.60	$6.90	$0.20	$0.90	$11.6
WP-7	Trib to Unnamed West Papillion Trib.	108th & Cornhusker Road	450	12	40	$3.11	$2.30	$0.25	$0.78	$6.4
WP-4	Trib. to South Papillion	204th & Schram Road	563	16	113	$3.20	$5.65	$0.25	$0.80	$9.9
DS 19	South Papillion Creek	192nd & Giles Road	2,750	100	300	$4.44	$18.16	$0.00	$1.11	$23.7
WP-8	Trib. to South Papillion	180th & Harrison St.	1,470	45	125	$3.70	$6.25	$0.10	$0.93	$11.0
WP-2	Trib. to South Papillion Creek	180th & Giles Road	679	21	103	$3.80	$5.15	$0.00	$0.95	$9.9
WP-1	Trib. to West Papillion Creek	180th & Fort St.	864	24	120	$3.90	$6.00	$2.80	$0.98	$13.7
DS 12	West Papillion Creek	216th & Fort Streets	1,670	70	215	$3.94	$12.91	$2.84	$0.99	$20.7
DS 10	Thomas Creek	120th & Bennington Road	2,950	97	295	$3.78	$17.89	$0.56	$0.95	$23.2
DS 7	Trib to Big Papillion Creek	168th & Bennington Road	1,600	47	145	$3.67	$9.06	$0.11	$0.92	$13.8
DS 9A	Trib to Big Papillion Creek	132nd & Bennington Road	1,280	38	100	$3.76	$5.79	$0.00	$0.94	$10.5
DS 8A	Trib to Big Papillion Creek	144th St & Bennington Road	1,850	75	160	$4.00	$9.22	$1.34	$1.00	$15.6
					Subtotals	$44.90	$105.28	$8.46	$11.23	$169.9

Notes:

[1] Potential regional structure located on tributary to Big Papillion Creek (BP) or West Papillion Creek (WP).

[2] Top of Dam (TOD) area includes 20% for squaring off of properties.

[3] Real estate costs $50,000 per acre. Real estate costs include costs for building acquisition.

[4] Utilities/Infrastructure (power, roadway) based on potential impacts.

Water Quality Basin Summary Table

Water Quality Basin No.	Approx. Location	Drainage Area (acres)	Total Estimated Cost ($million) (2013$)
WQ- CL-6	Upstream of Cunningham Lake	510	$9.47
WQ-Zorinsky 2	Upstream of Zorinsky Lake	1000	$9.92
WQ- CL-5	Upstream of Cunningham Lake	470	$9.14
WQ- CL-7	Upstream of Cunningham Lake	200	$7.02
WQ- CL-4	Upstream of Cunningham Lake	915	$14.15
WQ- CL-2	Upstream of Cunningham Lake	845	$13.71
WQ- CL-3	Upstream of Cunningham Lake	790	$13.26
WQ- CL-1	Upstream of Cunningham Lake	740	$13.26
		Subtotals	$89.9

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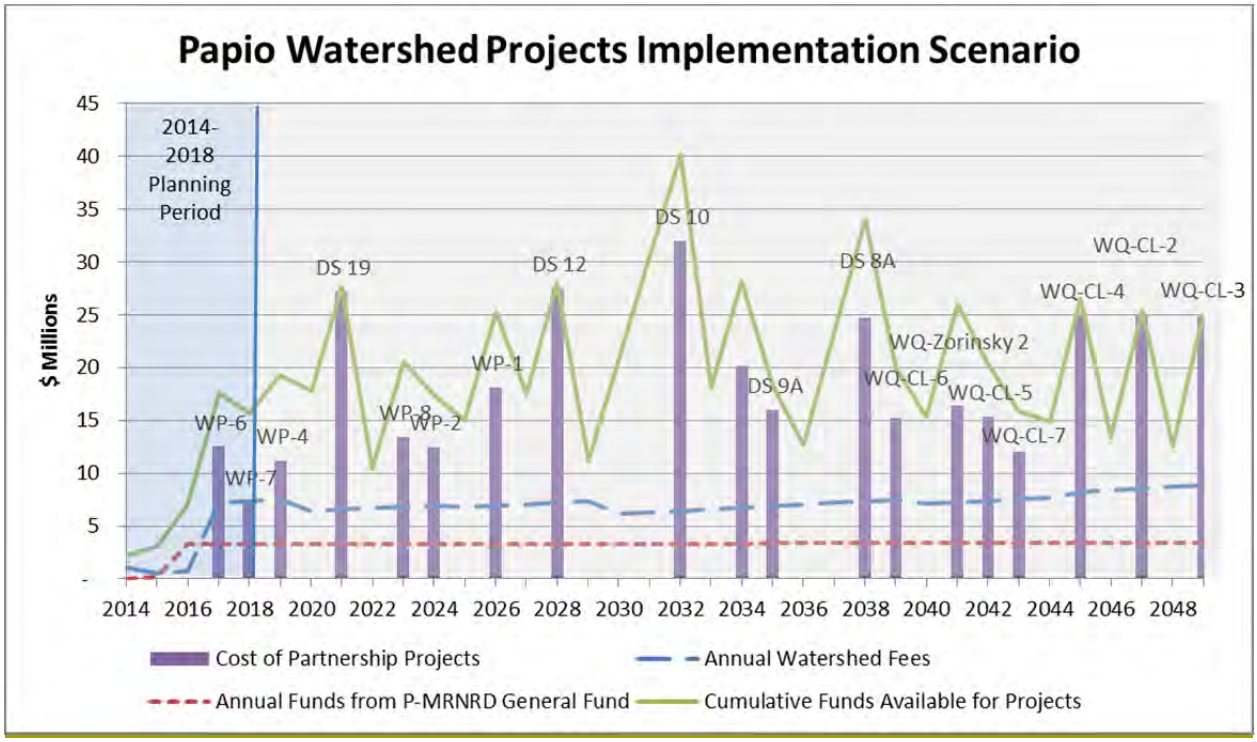
Remaining Financial Cash-Flow Model Scenarios

A range of funding scenarios was evaluated for project implementation. Provided in this appendix are the results of six (6) scenarios: 1B, 2A, 2B, 3B, 4A, and 4B. Key model outputs and a general description of the figures are summarized in the Main Body of the 2014 Update. Scenarios 1A and 3A were selected as the most reasonable funding strategies and are showed in the Main Body of the 2014 Update.

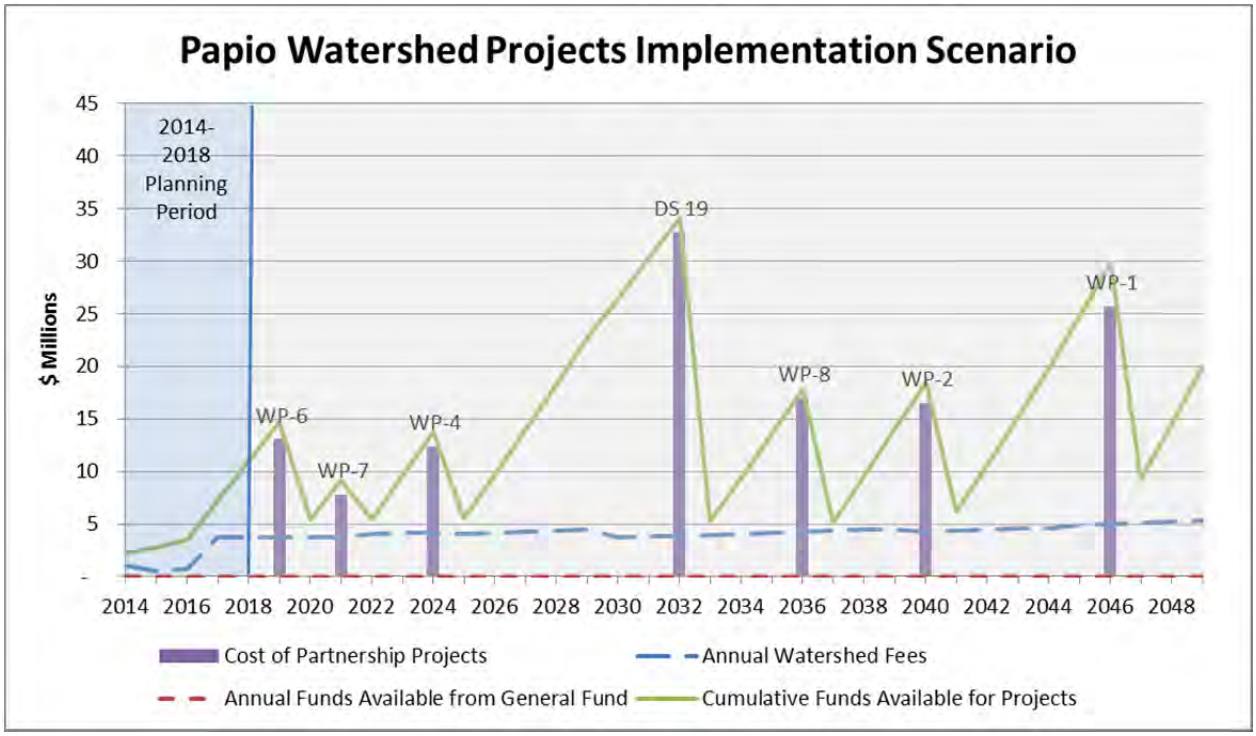
Figure B-1 Scenario 1B: P-A-Y-G with Existing Mill Levy, Dedicated General Fund Allocation, and Watershed Fee Increase to 50% of Total Program Costs



Results from Figure B-1:

- Due to the assumed time lag, increasing the Watershed Fees does not result in increased revenues until late in the next planning period (2017).
- The increase in Watershed Fee revenues helps to fund additional long-term projects from that of Scenario 1A. All 12 of the regional basins and 7 of the 8 candidate water quality basins can be constructed within the planning horizon.
- Only 2 projects are constructed in the next Program Project cycle from 2014 to 2018.

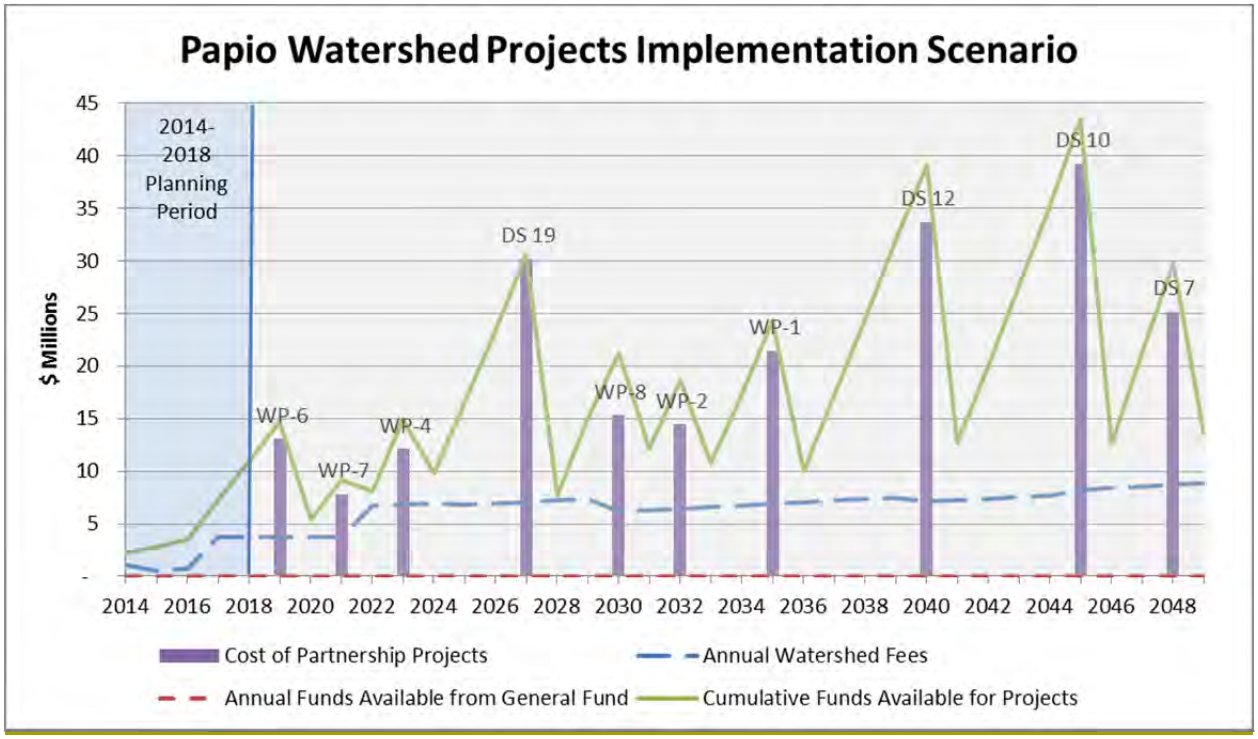
Figure B-2 Scenario 2A: P-A-Y-G with Existing Mill Levy and No Dedicated General Fund Allocation



Results from Figure B-2:

- Scenario 2A examines the possibility that the P-MRNRD would need to modify its priorities under the existing LRIP or is otherwise unable to follow its plan as currently set forth. As such, the dedicated allocation of General Funds does not occur annually and the P-MRNRD only allocates funds when there would be funds available after completing other priorities and debt service payments.
- With this scenario only 7 of the 12 candidate regional basins and none of the water quality basins can be constructed within the planning horizon.
- No projects can be constructed in the next Program Project cycle from 2014 to 2018 due to the limited funds available.

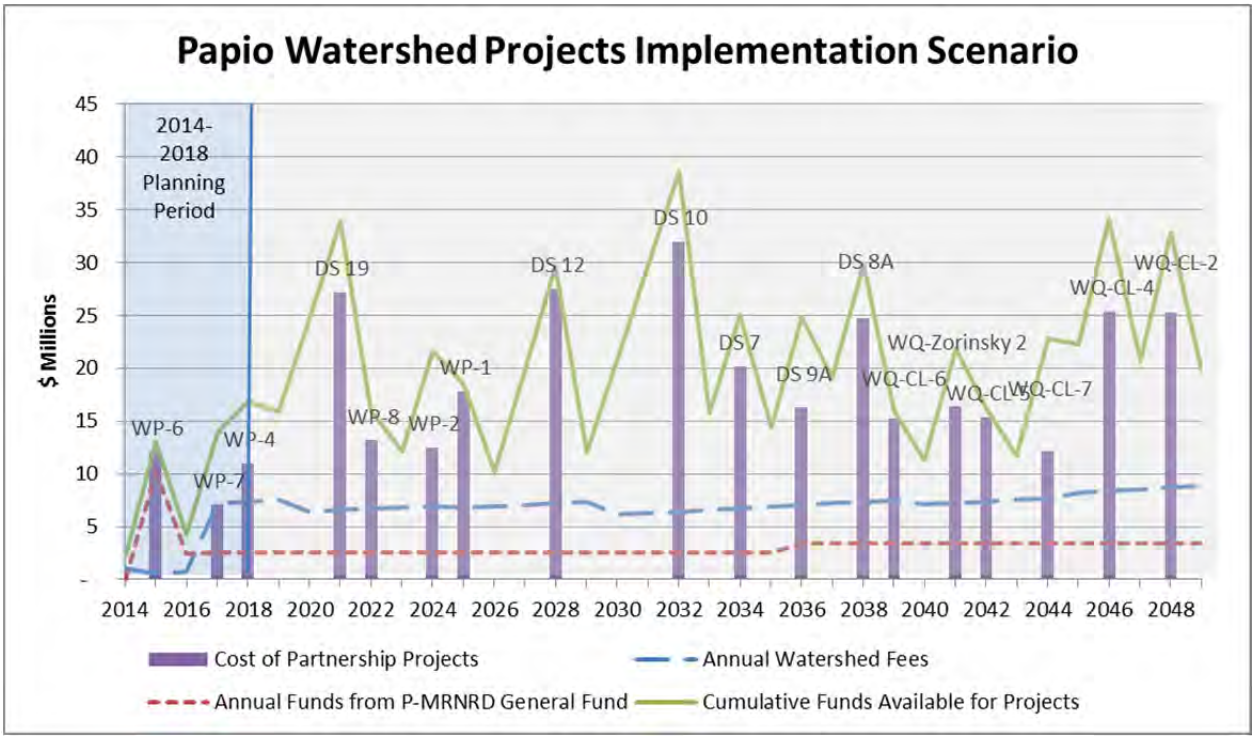
Figure B-3 Scenario 2B: P-A-Y-G with Existing Mill Levy, No Dedicated General Fund Allocation and Watershed Fee Increase to 50% of Total Program Costs



Results from Figure B-3:

- With Scenario 2B, the financial assumptions for the P-MRNRD allocation remain the same as Scenario 2A. However, the Watershed Fee rates are increased to cover 50% of the program costs. Due to the lag in the collection of these fees, the financial picture remains similar to Scenario 2A, with 10 of the 12 candidate regional basins able to be constructed but none of the water quality basins constructed within the planning horizon.
- No projects can be constructed in the next Program Project cycle from 2014 to 2018 due to the limited funds available.

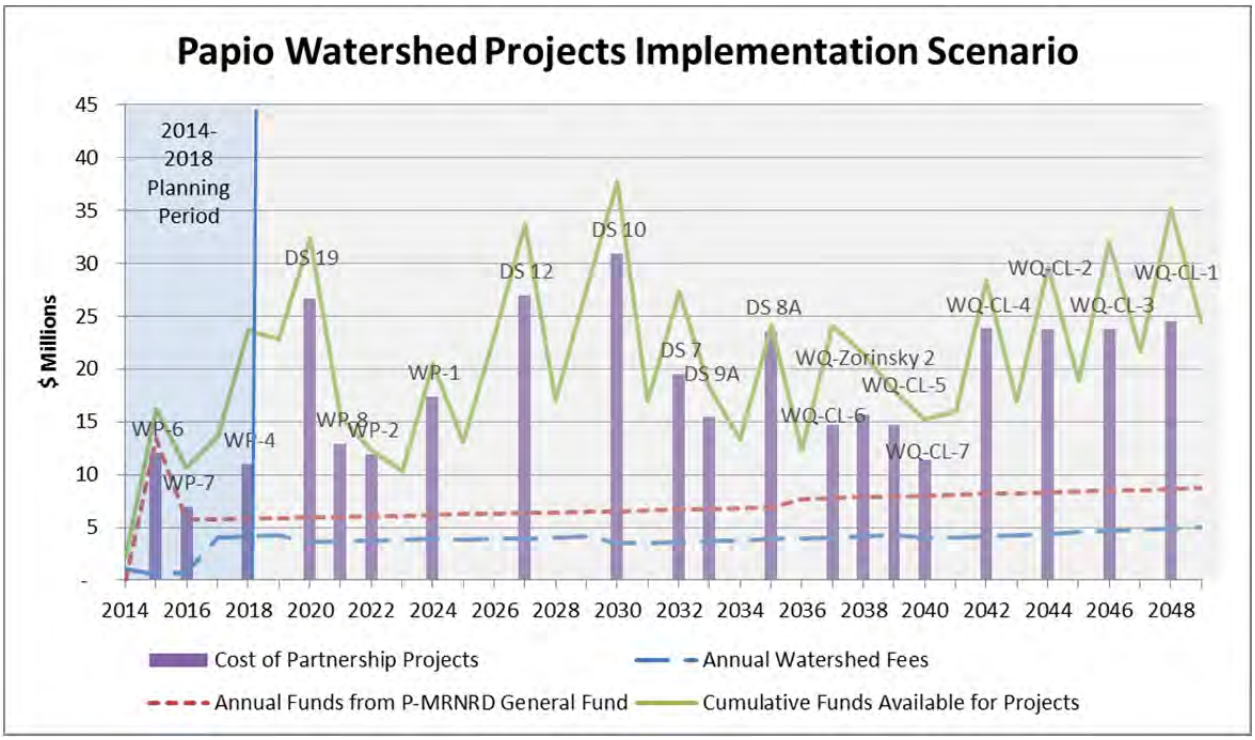
Figure B-4 Scenario 3B: Bonding with P-A-Y-G Existing Mill Levy and Current Watershed Fee Increase to 50% of Total Program costs



Results from Figure B-4:

- The Watershed Fee increase to 50% of program costs while using bonding results in the implementation of all 12 of the regional basins and 6 of the 8 candidate water quality basins within the planning horizon.
- With the additional immediate funds from bond proceeds, 3 projects can be constructed in the next Program Project cycle from 2014 to 2018.

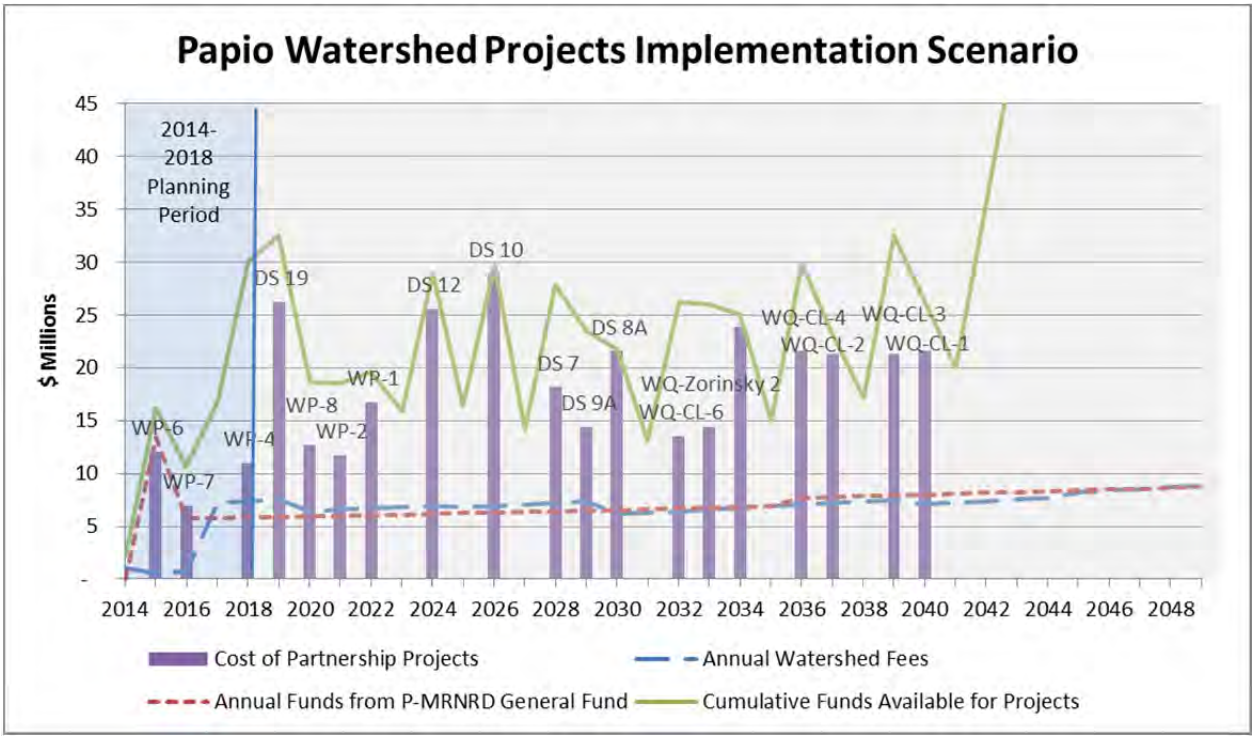
Figure B-5 Scenario 4A: Bonding with P-A-Y-G Utilizing Mill Levy Increase to $0.045, Dedicated General Fund Allocation per LRIP



Results from Figure B-5:

- If the P-MRNRD was able to increase its mill levy to its maximum capacity ($0.045) and allocate up to 50% of that increase to the Watershed Plan, while also issuing bonds in the next planning period, all 12 of the regional detention basins and all 8 of the candidate water quality basins could be constructed.
- With the additional immediate funds from bond proceeds, 3 projects can be constructed in the next Program Project cycle from 2014 to 2018.

Figure B-6 Scenario 4B: Bonding with P-A-Y-G, Mill Levy Increase to $0.045, Dedicated General Fund Allocation per LRIP in 2016, and Watershed Fee Increase to 50% of Total Program Costs



Results from Figure B-6:

- Increasing the P-MRNRD mill levy to its maximum capacity ($0.045), utilizing bonding and increasing the Watershed Fees greatly accelerates the program implementation, with 3 projects that can be constructed in the next Program Project cycle from 2014 to 2018.
- All candidate projects can be completed by 2040.

Table B-2 summarizes the total number of projects that could be potentially completed in the 35-year planning horizon and the number of projects that could be completed in the next Program Project cycle from 2014 to 2018 for the funding scenarios evaluated.

Table B-2 Summary of Candidate Projects Implemented for Each Scenario

P-A-Y-G				
Scenario	Mill Levy per $100 Valuation	Watershed Fees	Total Number of Program Projects Completed in 35-Year Planning Horizon (Regional Basins/WQ Basins)	Program Projects Completed 2014 to 2018
1A Baseline	$0.03275	Current Rates with Inflation	14 (All 12/2)	2
1B	$0.03275	Increase to 50% of program costs, linked to inflation	19 (All 12/7)	2
2A	$0.03275	Current Rates with Inflation	7 (7/0)	0
2B	$0.03275	Increase to 50% of program costs, linked to inflation	8 (8/0)	0
Bonding with P-A-Y-G				
Scenario	Mill Levy per $100 Valuation	Watershed Fees	Total Number of Program Projects Completed in 35-Year Planning Horizon (Regional Basins/WQ Basins)	Program Projects Completed 2014 to 2018
3A	$0.03275	Current Rates with Inflation	12 (All 12/0)	2 or 3
3B	$0.03275	Increase to 50% of program costs, linked to inflation	18 (All 12/6)	2
4A	$0.045	Current Rates with Inflation	20 (All 12/ All 8)	3
4B	$0.045	Increase to 50% of program costs, linked to inflation	20 (All 12/ All 8) and 8 years sooner than Scenario 4A	3

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Current Watershed Management Policies

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PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

POLICY GROUP #1: WATER QUALITY IMPROVEMENT

ISSUE: Waters of the Papillion Creek Watershed are impaired.

"ROOT" POLICY: Improve water quality from all contributing sources, including but not limited to, agricultural activities, urban stormwater, and combined sewer overflows, such that waters of the Papillion Creek Watershed and other local watersheds can meet applicable water quality standards and community-based goals, where feasible.

SUB-POLICIES:

1) Water Quality LID shall be required on all new developments and significant redevelopments.
2) Protect surface and groundwater resources from soil erosion (sheet and rill, wind erosion, gully and stream bank erosion), sedimentation, nutrient and chemical contamination. Buffer strips and riparian corridors should be established along all stream segments.
3) Preserve and protect wetland areas to the fullest extent possible to maintain natural hydrology and improve water quality by minimizing the downstream transport of sediment, nutrients, bacteria, etc. borne by surface water runoff. Reestablishment of previously existing wetlands and the creation of new wetlands should be promoted. Any impacted wetlands shall be mitigated at a 3:1 ratio.
4) Support NDEQ in an accelerated TMDL development process that addresses potential pollutant sources in a fair and reasonable manner based on sound technical data and scientific approach.
5) Implement Best Management Practices (BMPs) that reduce both urban and rural pollution sources, maintain or restore designated beneficial uses of streams and surface water impoundments, minimize soil loss, and provide sustainable production levels. Water quality basins shall be located in general conformance with an adopted Papillion Creek Watershed Management Plan.

REFERENCE INFORMATION

DEFINITIONS:

1) Low-Impact Development (LID). A land development and management approach whereby stormwater runoff is managed using design techniques that promote infiltration, filtration, storage, evaporation, and temporary detention close to its source. Management of such stormwater runoff sources may include open space, rooftops, streetscapes, parking lots, sidewalks, medians, etc.
2) Water Quality LID. A level of LID using strategies designed to provide for water quality control of the first ½ inch of stormwater runoff generated from each new development or significant redevelopment and to maintain the peak discharge rates during the 2-year storm event to baseline land use conditions, measured at every drainage (stormwater discharge) outlet from the new development or significant redevelopment.
3) Best Management Practice (BMP). "A technique, measure or structural control that is used for a given set of conditions to manage the quantity and improve the quality of

stormwater runoff in the most cost-effective manner." *[Source: U.S. Environmental Protection Agency (EPA)]*

4) Total Maximum Daily Load (TMDL). A calculation of the maximum amount of a pollutant that a waterbody can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. Water quality standards are set by States, Territories, and Tribes. They identify the uses for each waterbody, for example, drinking water supply, contact recreation (swimming), and aquatic life support (fishing), and the scientific criteria to support that use. A TMDL is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the State has designated. The calculation must also account for seasonal variation in water quality. The Clean Water Act, Section 303, establishes the water quality standards and TMDL programs, and for Nebraska such standards and programs are administered by the Nebraska Department of Environmental Quality. *[Source: EPA and Nebraska Surface Water Quality Standards, Title 117].*

PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

POLICY GROUP #2: PEAK FLOW REDUCTION

ISSUE
Urbanization within the Papillion Creek Watershed has and will continue to increase runoff leading to more flooding problems and diminished water quality.

ROOT POLICY
Maintain or reduce stormwater peak discharge during development and after full build-out land use conditions from that which existed under baseline land use conditions.

SUB-POLICY

1) Regional stormwater detention facilities and other structural and non-structural BMPs shall be located in general conformance with an adopted Papillion Creek Watershed Management Plan and shall be coordinated with other related master planning efforts for parks, streets, water, sewer, etc.
2) Maximum LID shall be required to reduce peak discharge rates on all new developments and significant redevelopments as identified in the Papillion Creek Watershed Management Plan.
3) All significant redevelopment shall maintain peak discharge rates during the 2, 10, and 100-year storm event under baseline land use conditions.

REFERENCE INFORMATION

DEFINITIONS

1) Low-Impact Development (LID). A land development and management approach whereby stormwater runoff is managed using design techniques that promote infiltration, filtration, storage, evaporation, and temporary detention close to its source. Management of such stormwater runoff sources may include open space, rooftops, streetscapes, parking lots, sidewalks, medians, etc.
2) Water Quality LID. A level of LID using strategies designed to provide for water quality control of the first ½ inch of stormwater runoff generated from each new development or significant redevelopment and to maintain the peak discharge rates during the 2-year storm event to baseline land use condition, measured at every drainage (stormwater discharge) outlet from the new development or significant redevelopment.
3) Maximum LID. A level of LID using strategies, including water quality LID and on-site detention, designed not to exceed peak discharge rates of more than 0.2 cfs/acre during the 2-year storm event or 0.5 cfs/acre during the 100-year storm event based on the contributing drainage from each site, measured at every drainage (stormwater discharge) outlet from the new development or significant redevelopment.
4) Peak Discharge or Peak Flow. The maximum instantaneous surface water discharge rate resulting from a design storm frequency event for a particular hydrologic and hydraulic analysis, as defined in the Omaha Regional Stormwater Design Manual. The measurement of the peak discharge shall be at the lower-most drainage outlet(s) from a new development or significant redevelopment.

5) Regional Stormwater Detention Facilities. Those facilities generally serving a drainage catchment area of 500 acres or more in size.
6) Baseline Land Use Conditions. That which existed for Year 2001 for Big and Little Papillion Creeks and its tributaries (excluding West Papillion Creek) and for Year 2004 for West Papillion Creek and its tributaries.
7) Full Build-Out Land Use Conditions. Fully platted developable land use conditions for the combined portions of the Papillion Creek Watershed that lie in Douglas and Sarpy Counties that are assumed to occur by the Year 2040, plus the projected 2040 land uses within the Watershed in Washington County; or as may be redefined through periodic updates to the respective County comprehensive plans.

PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

POLICY GROUP #3: LANDSCAPE PRESERVATION, RESTORATION, AND CONSERVATION

ISSUE: Natural areas are diminishing, and there is a need to be proactive and integrate efforts directed toward providing additional landscape and green space areas with enhanced stormwater management through restoration and conservation of stream corridors, wetlands, and other natural vegetation.

"ROOT" POLICY: Utilize landscape preservation, restoration, and conservation techniques to meet the multi-purpose objectives of enhanced aesthetics, quality of life, recreational and educational opportunities, pollutant reduction, and overall stormwater management.

SUB-POLICIES:

1) Incorporate stormwater management strategies as a part of landscape preservation, restoration, and conservation efforts where technically feasible.
2) Define natural resources for the purpose of preservation, restoration, mitigation, and/or enhancement.
3) For new development or significant redevelopment, provide a creek setback of 3:1 plus 50 feet along all streams as identified in the Papillion Creek Watershed Management Plan and a creek setback of 3:1 plus 20 feet for all other watercourses.
4) All landscape preservation features as required in this policy or other policies, including all stormwater and LID strategies, creek setbacks, existing or mitigated wetlands, etc., identified in new or significant redevelopment shall be placed into an out lot or within public right of way or otherwise approved easement.

REFERENCE INFORMATION

DEFINITIONS

1) Creek Setback. See Figure 1 below and related definitions in Policy Group #5. A setback area equal to three (3) times the channel depth plus fifty (50) feet (3:1 plus 50 feet) from the edge of low water on both sides of channel shall be required for any above or below ground structure exclusive of bank stabilization structures, poles or sign structures adjacent to any watercourse defined within the watershed drainage plan. Grading, stockpiling, and other construction activities are not allowed within the setback area and the setback area must be protected with adequate erosion controls or other Best Management Practices, (BMPs). The outer 30 feet adjacent to the creek setback limits may be credited toward meeting the landscaping buffer and pervious coverage requirements.

   A property can be exempt from the creek setback requirement upon a showing by a licensed professional engineer or licensed landscape architect that adequate bank stabilization structures or slope protection will be installed in the construction of said structure, having an estimated useful life equal to that of the structure, which will provide adequate erosion control conditions coupled with adequate lateral support so that no portion of said structure adjacent to the stream will be endangered by erosion

or lack of lateral support. In the event that the structure is adjacent to any stream which has been channelized or otherwise improved by any agency of government, then such certificate providing an exception to the creek setback requirement may take the form of a certification as to the adequacy and protection of the improvements installed by such governmental agency. If such exemption is granted, applicable rights-of-way must be provided and a minimum 20 foot corridor adjacent thereto.

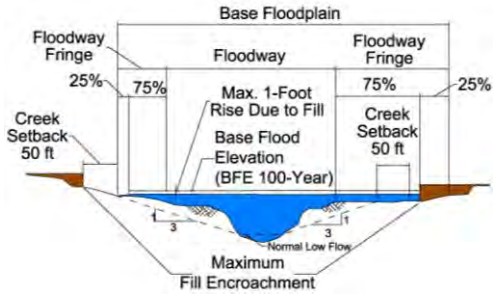

Figure 1 – Floodway Fringe Encroachment and Creek Setback Schematic

DEFINITIONS

1) Base Flood. The flood having a one percent chance of being equaled or exceeded in magnitude in any given year (commonly called a 100-year flood). *[Adapted from Chapter 31 of Nebraska Statutes]*
2) Floodway. The channel of a watercourse and the adjacent land areas that are necessary to be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot. *[Adapted from Chapter 31 of Nebraska Statutes].* The Federal Emergency Management Agency (FEMA) provides further clarification that a floodway is the central portion of a riverine floodplain needed to carry the deeper, faster moving water.
3) Floodway Fringe. That portion of the floodplain of the base flood, which is outside of the floodway. *[Adapted from Chapter 31 of Nebraska Statutes]*
4) Floodplain. The area adjoining a watercourse, which has been or may be covered by flood waters. *[Adapted from Chapter 31 of Nebraska Statutes]*
5) Watercourse. Any depression two feet or more below the surrounding land which serves to give direction to a current of water at least nine months of the year and which has a bed and well-defined banks. *[Adapted from Chapter 31 of Nebraska Statutes]*
6) Low Chord Elevation. The bottom-most face elevation of horizontal support girders or similar superstructure that supports a bridge deck.
7) Updated Flood Hazard Maps. The remapping of flooding sources within the Papillion Creek Watershed where Digital Flood Insurance Rate Maps (DFIRMs) are based on 2004 or more recent conditions hydrology and full-build out conditions hydrology. West Papillion Creek and its tributaries are currently under remapping and will become regulatory in 2009. Updating flood hazard maps for Big Papillion Creek and Little Papillion Creek are planned to be completed in the future.
8) New Development. New development shall be defined as that which is undertaken to any undeveloped parcel that existed at the time of implementation of this policy.

PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

POLICY GROUP #4: EROSION AND SEDIMENT CONTROL AND OTHER BMPs

ISSUE: Sound erosion and sediment control design and enforcement practices are needed in order to protect valuable land resources, stream and other drainage corridors, and surface water impoundments and for the parallel purpose of meeting applicable Nebraska Department of Environmental Quality regulatory requirements for construction activities that disturb greater than one acre.

"ROOT" POLICY: Promote uniform erosion and sediment control measures by implementing consistent rules for regulatory compliance pursuant to State and Federal requirements, including the adoption of the Omaha Regional Stormwater Design Manual.

SUB-POLICIES:

1) Construction site stormwater management controls shall include both erosion and sediment control measures.

2) The design and implementation of post-construction, permanent erosion and sediment controls shall be considered in conjunction with meeting the intent of other Stormwater Management Policies.

3) Sediment storage shall be incorporated with all regional detention facilities where technically feasible.

REFERENCE INFORMATION

DEFINITIONS

1) Erosion Control. Land and stormwater management practices that minimize soil loss caused by surface water movement.
2) Sediment Control. Land and stormwater management practices that minimize the transport and deposition of sediment onto adjacent properties and into receiving streams and surface water impoundments.

PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

POLICY GROUP #5: FLOODPLAIN MANAGEMENT

ISSUE: Continued and anticipated development within the Papillion Creek Watershed mandates that holistic floodplain management be implemented and maintained in order to protect its citizens, property, and natural resources.

"ROOT" POLICY: Participate in the FEMA National Flood Insurance Program, update FEMA floodplain mapping throughout the Papillion Creek Watershed, and enforce floodplain regulations to full build-out, base flood elevations.

SUB-POLICIES:

1) Floodplain management coordination among all jurisdictions within the Papillion Creek Watershed and the Papio-Missouri River Natural Resources District (P-MRNRD) is required.
2) Flood Insurance studies and mapping throughout the Papillion Creek Watershed shall be updated using current and full-build out conditions hydrology.
3) Encroachments for new developments or significant redevelopments within floodway fringes shall not cause any increase greater than one (1.00) foot in the height of the full build-out base flood elevation using best available data.
4) Filling of the floodway fringe associated with new development within the Papillion Creek System shall be limited to 25% of the floodway fringe in the floodplain development application project area, unless approved mitigation measures are implemented. The remaining 75% of floodway fringe within the project area shall be designated as a floodway overlay zone. For redevelopment, these provisions may be modified or waived in whole or in part by the local jurisdiction.
5) The low chord elevation for bridges crossing all watercourses within FEMA designated floodplains shall be a minimum of one (1) foot above the base flood elevation for full-build out conditions hydrology using best available data.
6) The lowest first floor elevation of buildings associated with new development or significant redevelopment that are upstream of and contiguous to regional dams within the Papillion Creek Watershed shall be a minimum of one (1) foot above the 500-year flood pool elevation.

REFERENCE INFORMATION

DEFINITIONS (See Figure 1 below and related definitions in Policy Group #3: Landscape Preservation, Restoration, and Conservation).

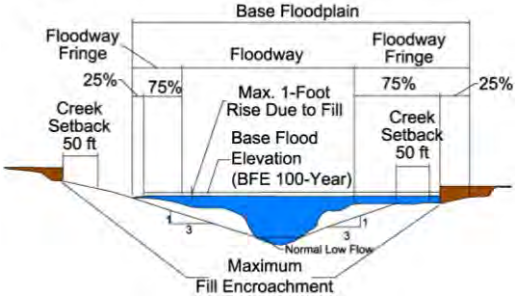

Figure 1 – Floodway Fringe Encroachment and Creek Setback Schematic

1) Base Flood. The flood having a one percent chance of being equaled or exceeded in magnitude in any given year (commonly called a 100-year flood). *[Adapted from Chapter 31 of Nebraska Statutes]*
2) Floodway. The channel of a watercourse and the adjacent land areas that are necessary to be reserved in order to discharge the base flood without cumulatively increasing the water surface elevation more than one foot*. [Adapted from Chapter 31 of Nebraska Statutes].* The Federal Emergency Management Agency (FEMA) provides further clarification that a floodway is the central portion of a riverine floodplain needed to carry the deeper, faster moving water.
3) Floodway Fringe. That portion of the floodplain of the base flood, which is outside of the floodway*. [Adapted from Chapter 31 of Nebraska Statutes]*
4) Floodplain. The area adjoining a watercourse, which has been or may be covered by flood waters*. [Adapted from Chapter 31 of Nebraska Statutes]*
5) Watercourse. Any depression two feet or more below the surrounding land which serves to give direction to a current of water at least nine months of the year and which has a bed and well-defined banks. *[Adapted from Chapter 31 of Nebraska Statutes]*
6) Low Chord Elevation. The bottom-most face elevation of horizontal support girders or similar superstructure that supports a bridge deck.
7) Updated Flood Hazard Maps. The remapping of flooding sources within the Papillion Creek Watershed where Digital Flood Insurance Rate Maps (DFIRMs) are based on 2004 or more recent conditions hydrology and full-build out conditions hydrology. West Papillion Creek and its tributaries are currently under remapping and will become regulatory in 2009. Updating flood hazard maps for Big Papillion Creek and Little Papillion Creek are planned to be completed in the future.
8) New Development. New development shall be defined as that which is undertaken to any undeveloped parcel that existed at the time of implementation of this policy.

BASIC FEMA REQUIREMENTS

On March 1, 2003, FEMA became part of the U.S. Department of Homeland Security (DHS). In order for a community to participate in the FEMA National Flood Insurance Program, it must first define base flood elevations and adopt a floodway for all its major streams and tributaries. Once a community adopts its floodway, the requirements of *44 CFR 60.3(d)* must be fulfilled. The key concern is that each project in the floodway must receive an encroachment review; i.e., an analysis to determine if the project will increase flood heights or cause increased flooding downstream. Note that the FEMA regulations call for preventing any increase in flood heights. Projects, such as filling, grading or construction of a new building, must be reviewed to determine whether they will obstruct flood flows and cause an increase in flood heights upstream or adjacent to the project site. Further, projects, such as grading, large excavations, channel improvements, and bridge and culvert replacements should also be reviewed to determine whether they will remove an existing obstruction, resulting in increases in flood flows downstream. *[Adapted from Federal Emergency Management Agency guidance]*

PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

POLICY GROUP #6: STORMWATER MANAGEMENT FINANCING

ISSUE: Regulatory requirements for stormwater management and implementation of Stormwater Management Policies intended to accommodate new development and significant redevelopment will impose large financial demands for capital and operation and maintenance beyond existing funding resources.

"ROOT" POLICY: Dedicated, sustainable funding mechanisms shall be developed and implemented to meet capital and operation and maintenance obligations needed to implement NPDES Stormwater Management Plans, Stormwater Management Policies, and the Papillion Creek Watershed Management Plan.

SUB-POLICIES:

1) All new development and significant redevelopment will be required to fund the planning, implementation, and operation and maintenance of water quality LID.
2) A Watershed Management Fee system shall be established to equitably distribute the capital cost of implementing the Papillion Creek Watershed Management Plan among new development or significant redevelopment. Such Watershed Management Fee shall only apply to new development or significant redevelopment within the Papillion Creek Watershed and the initial framework shall consist of the following provisions:
    a. Collection of fees and public funding shall be earmarked specifically for the construction of projects called for in the Papillion Creek Watershed Management Plan, including Maximum LID costs such as on site detention, regional detention basins, and water quality basins.
    b. Multiple fee classifications shall be established which fairly and equitably distribute the cost of these projects among all undeveloped areas within the Papillion Creek Watershed.
    c. Watershed Management Fees (private) are intended to account for approximately one-third (1/3) of required capital funds and shall be paid to the applicable local zoning jurisdiction with building permit applications.
    d. Watershed Management Fee revenues shall be transferred from the applicable local zoning jurisdiction to a special P-MRNRD construction account via inter-local agreements.
    e. The P-MRNRD (public) costs are intended to account for approximately two-thirds (2/3) of required capital funds, including the cost of obtaining necessary land rights, except as further provided below; and the P-MRNRD shall be responsible for constructing regional detention structures and water quality basins using pooled accumulated funds.
    f. The P-MRNRD will seek general obligation bonding authority from the Nebraska Legislature to provide necessary construction scheduling flexibility.
    g. Financing for Papillion Creek Watershed Management Plan projects may require public-private partnership agreements between the P-MRNRD and developers/S&IDs on a case-by-case basis.
    h. On approximately three (3)-year intervals, the Papillion Creek Watershed Management Plan and Watershed Management Fee framework, rates, and construction priority schedule shall be reviewed with respect to availability of

needed funds and rate of development within the Papillion Creek Watershed by the parties involved (local zoning jurisdictions, P-MRNRD, and the development community). Subsequent changes thereto shall be formally approved by the respective local zoning jurisdictions and the P-MRNRD.

3) A Stormwater Utility Fee System shall be established to equitably distribute the costs for ongoing operation and maintenance of all stormwater BMPs and infrastructure among all existing property owners within NPDES Phase I or II municipal jurisdictions.
    a. NPDES Phase I and II cities and counties should actively seek legislation from the Nebraska Legislature to allow for the establishment of an equitable stormwater utility fee.
    b. The initial framework for the Stormwater Utility Fee System should consist of the following provisions provided Nebraska statutes allow for such a fee:
        i. A county or city shall establish by resolution user charges to be assessed against all real property within its zoning jurisdiction and may issue revenue bonds or refunding bonds payable from the proceeds of such charges, all upon terms as the county board or city council determines are reasonable.
        ii. Such charges shall be designed to be proportionate to the stormwater runoff contributed from such real property and based on sound engineering principles.
        iii. Such charges should provide credits or adjustments for stormwater quantity and quality BMPs utilized in order to encourage wise conservation and management of stormwater on each property.
        iv. Such charges shall be collected in a manner that the county or city determines as appropriate and shall not be determined to be special benefit assessments.
        v. A county or city shall establish a system for exemption from the charges for the property of the state and its governmental subdivisions to the extent that it is being used for a public purpose. The local elected body shall also provide an appeals process for aggrieved parties.
        vi. A county shall not impose these charges against real property that is being charges user charges by a city.
        vii. Any funds raised from a Stormwater Utility Fee shall be placed in a separate fund and shall not be used for any purpose other than those specified.

REFERENCE INFORMATION

DEFINITIONS

1) Stormwater Management Policies. Stormwater management policies developed by the Technical Workgroup and Policy Workgroup that were commissioned by the Papillion Creek Watershed Partnership (PCWP) subsequent to the “Green, Clean, and Safe” initiatives developed through the “Watershed by Design” public forums conducted in 2004 and 2005 and subsequently revised by the PCWP in 2009. The

following policy groups contain "root" policies and sub-policies for stormwater management that have been developed in addition to the Stormwater Management Financing Policy Group herein:

- Policy Group #1 – Water Quality Improvement
- Policy Group #2 – Peak Flow Reduction
- Policy Group #3 – Landscape Preservation, Restoration, and Conservation
- Policy Group #4 – Erosion and Sediment Control and Other BMPs
- Policy Group #5 – Floodplain Management

2) Stormwater Management Plan (SWMP). A SWMP is a required part of the NPDES Phase II Stormwater Permits issued to many of the Omaha metropolitan area Papillion Creek Watershed Partnership (PCWP) members. Development of Stormwater Management Policies is an integral part of the SWMP, and such policies are to be adopted by respective PCWP partners.
3) Comprehensive Development Plans. Existing plans developed by local jurisdictions that serve as the basis for zoning and other land use regulations and ordinances. The Stormwater Management Policies are to be incorporated into the respective Comprehensive Development Plans.
4) Policy Implementation. The implementation of the policies will be through the development of ordinances and regulations, in years 3 through 5 of the NPDES permit cycle; that is, by the year 2009. Ordinances and regulations are intended to be consistent for, and adopted by, the respective PCWP members. Such ordinances and regulations shall need to be consistent with the Comprehensive Development Plans of the respective PCWP members.
5) Low-Impact Development (LID). A land development and management approach whereby stormwater runoff is managed using design techniques that promote infiltration, filtration, storage, evaporation, and temporary detention close to its source. Management of such stormwater runoff sources may include open space, rooftops, streetscapes, parking lots, sidewalks, medians, etc.
6) Water Quality LID. A level of LID using strategies designed to provide for water quality control of the first ½ inch of stormwater runoff generated from each new development or significant redevelopment and to maintain the peak discharge rates during the 2-year storm event to baseline land use conditions, measured at every drainage (stormwater discharge) outlet from the new development or significant redevelopment.
7) Maximum LID. A level of LID using strategies, including water quality LID and on-site detention, designed not to exceed peak discharge rates of more than 0.2 cfs/acre during the 2-year storm event or 0.5 cfs/acre during the 100-year storm event based on the contributing drainage from each site, measured at every drainage (stormwater discharge) outlet from the new development or significant redevelopment.
8) Baseline Land Use Conditions. That which existed for Year 2001 for Big and Little Papillion Creeks and its tributaries (excluding West Papillion Creek) and for Year 2004 for West Papillion Creek and its tributaries. That which existed in 2007 for all areas not within the Papillion Creek Watershed.

PAPILLION CREEK WATERSHED
STORMWATER MANAGEMENT POLICIES

BASIS FOR STORMWATER MANAGEMENT FINANCING ISSUE

1) Time is of the essence for policy development and implementation:
   a) Under the existing Phase II Stormwater Permits issued by the Nebraska Department of Environmental Quality, permitees must develop strategies, which include a combination of structural and/or non-structural best management practices and incorporate them into existing Comprehensive Development Plans by the end of 2009.
   b) The S&ID platting process is typically several years ahead of full occupation of an S&ID. Therefore, careful pre-emptive planning and program implementation is necessary in order to construct regional stormwater detention and water quality basin improvements in a timely manner to meet the purposes intended and to avoid conflicts from land use encroachments from advancing development.
2) Financing to meet capital and O&M obligations for stormwater management projects requires a comprehensive, uniformly applied approach and not a project-by-project approach.

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