



MEMORANDUM

To: Black Diamond Hearing Examiner

From: Colin Lund, Chief Entitlement Officer, YarrowBay *CL*

cc: Nancy Rogers, Legal Counsel for YarrowBay
Megan Nelson, Director of Legal Affairs, YarrowBay

Re: YarrowBay's Reply and Rebuttal to Wetland Comments Regarding The Villages MPD Preliminary Plat Phase 2 Plat C (PLN13-0027)

Date: January 9, 2015

BD Village Partners, LP ("YarrowBay") submits this reply and rebuttal to public comments submitted regarding wetlands on The Villages MPD Preliminary Plat Phase 2 Plat C (PLN13-0027) ("Plat 2C"). Specifically, this reply and rebuttal responds to the following documents:

- A memo by Lider Engineering, dated December 15, 2014, titled Villages MPD Phase 2 Plat Hearing Additional Document Review;
- A memo by Lider Engineering, dated December 17, 2014, titled Villages MPD Phase 2 Plat Hearing Review for Rebuttal to new Exhibits;
- A memo by Touchstone EcoServices, dated December 19, 2014, titled Wetland E1 Buffer Issues of Concern;
- A memo by Touchstone EcoServices, dated December 19, 2014, titled Wetland E1 Division and Land Use Intensity – Issues of Concern; and
- A memo by Touchstone EcoServices, dated December 19, 2014, titled Wetland Hydrology and Stormwater Design Issues of Concern.

Wetland E1's Buffer

The attached responsive documents demonstrate that, among other things, Wetland E1's buffer was properly established based on the presence of an existing improved gravel road in compliance with the Black Diamond Municipal Code. *See* Declaration of Scott Brainard and attached technical memorandum. Ms. Brewster's assertions in the Touchstone EcoServices' memoranda that such road has been abandoned are unsubstantiated by fact. There is no evidence that Ms. Brewster ever conducted a Plat 2C site visit (nor was a request ever made by Ms. Brewster to the applicant for permission to enter the property). Such conjecture should not be given greater weight than the expert opinions of YarrowBay's wetland biologist, Scott Brainard from Wetland Resources, Inc., and the City's wetland biologist, Jason Walker from Perteet, both of whom have in fact visited the Plat 2C site, studied this wetland extensively, and concur that the buffer is properly placed. *See also* City's response to comments, Perteet attachment.

Moreover, as part of the proposed Villages Plat 2C subdivision, this gravel road will be abandoned, converted to a trail, and utilized as additional buffer for buffer averaging. This small portion of addition buffer is part of the overall increase of 26,222 square feet of protected buffer associated with Plat 2C's approved buffer averaging plan.

Wetland E1's Division

The attached responsive documents also demonstrate that the break between Wetland E1 and the Core Wetland Complex was appropriately established pursuant to The Villages Preliminary Plat 1A Condition of Approval No. 87. *See* Declaration of Scott Brainard and attached technical memorandum. Such a sensitive areas determination decision cannot be revisited now in the context of the Plat 2C hearing. *See* discussion in YarrowBay memorandum dated December 29, 2014 regarding collateral attacks. As noted in the documents, the State of Washington Department of Ecology requires a clear break in the direction of flow to establish a division in wetlands. This clear break was established via a detailed topographic and sub-basin analysis and readily discernable field observations. *See* Declaration of Scott Brainard; *see also* City's response to comments, Perteet attachment. Again, there is no evidence that Ms. Brewster ever conducted a Plat 2C site visit to see the break in directional flow. Accordingly, her commentary should be given little weight.

Wetland TOS's Buffer

The attached declaration and technical memorandum of Scott Brainard, Wetland Resources, Inc., demonstrate that the 225-foot buffer for Wetland TOS shown in the Plat 2C document complies with the City's SAO and any requested increases to such a large buffer are unnecessary to mitigate for Plat 2C development impacts.

Wetlands and Land Use Intensity

The attached responsive documents further demonstrate that the wetland buffer widths approved for Wetlands E1 and TOS are appropriate and reasonably mitigate for development impacts associated with Plat 2C. *See* Declaration of Scott Brainard; *see also* City's response to comments, Perteet attachment. Ms. Brewster's assertions that the Hearing Examiner should consider increases to wetland buffer widths to meet a chart published in an Ecology Guidance document, because the development density is greater than 1 unit per acre, are based on theoretical impacts unsubstantiated by facts in the record. Further, as discussed on page 9 of YarrowBay's memorandum dated December 29, 2014, the City of Black Diamond did not adopt this portion of the referenced Ecology Guidance document into its SAO. The argument that buffer widths need to be increased is another impermissible collateral attack on the adopted regulations of the City of Black Diamond.

Tetra Tech Letter dated December 5, 2014

The attached documents also respond to the misrepresentation, in the December 15, 2014 memorandum from Lider Engineering, that Tetra Tech was prescribing which temporary erosion and sediment control ("TESC") best management practices ("BMPs") YarrowBay should use, or that Tetra Tech was attempting to prepare a Stormwater Pollution Prevention Plan. *See* Declaration of Rob Plonikoff and attached memorandum. Instead, as noted in the attached documents, Tetra Tech was merely stating that BMPs will be used and that the site will utilize

physical barriers (drawing an analogy to curtain barriers) to prevent phosphorous transport to bodies of water.

Wetland Hydrology

Finally, the attached documents demonstrate: (i) during final plat design, a continuous hydrologic model will be used in the design of Plat 2c storm drainage facilities; and (ii) baseline wetland hydrology study is neither required for Plat 2C nor necessary to estimate flows given use of a continuous hydrologic model. *See* Declaration of Alan Fure and attached technical memorandum. The water balance calculations performed for Plat 2C to date by Triad for the applicant were used to inform general layout of the plat utilities, tracts, and easements. The stormwater analysis performed to date, as well as the use of a continuous hydrologic model during final plat design, are consistent with the City of Black Diamond Municipal Code and the Plat 2C Staff Report conditions. As noted in the attached Triad technical memorandum, the applicant is also offering the following condition to further affirm the use of continuous modeling in the final design: “Storm drainage design for Plat 2C shall utilize an HSPF based continuous runoff model (such as WWHM). For drainage facility design receiving runoff from drainage basins 320 acres and larger in total area, a calibrated model should be considered.”

As YarrowBay and the City of Black Diamond have shown in this memorandum and our responses to other public comments, Plat 2C, as conditioned, appropriately mitigates for impacts to wetlands consistent with the City’s SAO and its adopted buffers. YarrowBay respectfully requests that the Hearing Examiner approve The Villages Plat 2C with the modified conditions discussed in Exhibit 72 and YarrowBay’s memorandum dated December 29, 2014.

DECLARATION OF SCOTT BRAINARD

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BEFORE THE CITY OF BLACK DIAMOND HEARING EXAMINER

IN RE: THE MATTER OF THE VILLAGES
MPD - PRELIMINARY PLAT 2C (PLN13-
0027)

DECLARATION OF SCOTT BRAINARD

I, Scott Brainard, am a citizen of the United States and a resident of the State of Washington, am over the age of 18 years, have firsthand knowledge of the matters to which I attest below, am fully competent to testify as a witness, and have sworn and do certify and declare, under penalty of perjury, that the following declaration is true and correct.

1. I am a Certified Professional Wetland Scientist, and a true and correct copy of my curriculum vitae was submitted as an exhibit during the public hearing on Preliminary Plat 2C (Exhibit 63).

2. I was asked to respond to the following comments: 1) a memo by Touchstone EcoServices, dated December 19, 2014, titled Wetland E1 Buffer Issues of Concern (TES Comments 1); 2) a memo by Touchstone EcoServices, dated December 19, 2014, titled Wetland E1 Division and Land Use Intensity – Issues of Concern (TES Comments 2); 3) a memo by Touchstone EcoServices, dated December 19, 2014, titled Wetland Hydrology and Stormwater Design Issues of Concern (TES Comments 3), 4) a memo by Lider Engineering, dated December 15, 2014, titled Villages MPD Phase 2 Plat Hearing Additional Document Review (Lider Comments 1); and 5) a memo by Lider Engineering, dated December 17, 2014, titled Villages

1 MPD Phase 2 Plat Hearing Review for Rebuttal to new Exhibits (Lider Comments 2).

2 3. Attached is a true and correct copy of the response I prepared to such comments.

3 4. In my professional opinion, nothing in the TES Comments 1 through 3 or Lider
4 Comments 1 and 2 raises issues of concern that should prevent The Villages MPD Preliminary
5 Plat 2C, as conditioned, from being approved.

6 Dated this 5TH day of January, 2015 at Everett, Washington.

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9 _____
10 SCOTT BRAINARD

WETLAND RESOURCES, INC. TECHNICAL MEMORANDUM



January 6, 2015

City of Black Diamond
Attn: Andy Williamson, Economic Development Director
PO Box 599
Black Diamond, WA 98010

Re: Response to Three Touchstone Ecoservices (TES) December 19, 2014 letters and Lider Engineering December 15 and 17, 2014 letters

Dear Mr. Williamson,

Please find below responses to the above-identified comment letters. Specific comment letters are identified in bold with the Wetland Resources, Inc. (WRI) response following. Only comments specific to WRI reports are discussed.

TES 12/19/14 - Letter regarding Wetland E1 Buffer Issues of Concern Public Hearing on Yarrow Bay Plat 2C

Pursuant to BDMC §19.10.230(E), the designated 110-foot protective buffer stops at the existing logging road that runs near the northern end of Wetland E1. This gravel road provides a functional and ecological barrier that effectively separates the potential buffer from the ecological function of the resource. Specifically, this hardened surface is slightly elevated above the adjacent natural contour, creating a barrier to the natural stormwater storage and water quality function that would ordinarily be provided by a buffer. This hydrologic discontinuity prevents any potential buffer located on the northern portion of the gravel road from providing these functions to Wetland E1. As part of the proposed Villages Plat 2C subdivision, this gravel road will be abandoned, converted to a trail, and utilized as additional buffer for buffer averaging. This small portion of addition buffer is part of the overall increase of 26,222 square feet of protected buffer associated with buffer averaging (12.3:1 - addition:reduction ratio).

In addition, and as noted in the approved Villages Phase 1A subdivision, and by City of Black Diamond staff, the gravel roads throughout The Villages MPD site, including the road on the northern end of Wetland E1, are regularly used, thus creating a persistent and ongoing disturbance in Wetland E1's buffer area. WRI's direct observations of this specific Wetland E1 section of the on-site gravel roads is that it is devoid of fallen trees, branches and growing vegetation, which is not typical of the less frequently used roads also on The Villages MPD site. WRI has also observed off-road vehicle use of The Villages MPD existing roads and heard gunshots during site visits, indicating use of the area and gravel access roads. In addition, in an

email from the City of Black Diamond to Colin Lund dated July 12, 2012 (attached), Steve Pilcher stated that “on a typical workday, City staff observes private vehicles parked at the primary entrance to the site along the Auburn-Black Diamond Road... On most days, even in inclement weather, it is not unusual to find vehicles parked at this location. We have observed some individuals departing from this point to walk their dogs on the site, presumably using the existing road system. Individuals may also be using the site for other purposes, as there have been reports of firearms discharge, noise from ATVs, etc.”

The Washington State Department of Ecology Publication no. 10-06-011 Calculating Credits and Debits for Compensatory Mitigation in Wetlands of Western Washington, p. 102, defines *relatively undisturbed* as a “general term used to describe areas that are almost completely free of human impacts and activities. This includes uplands, other wetlands, lakes and other bodies of water. It means that the area is free of regular disturbances such as ... Paved Roads or frequently used gravel roads... Note 4: A rarely used gravel path or gravel road can be considered *relatively undisturbed* if it is used less than once or twice per week. Daily usage of a road or area is considered disturbed.” Based on these observations and the existing condition of the Wetland E1 gravel road, it is my conclusion that this section of The Villages MPD existing road is frequently used and does not meet Ecology’s definition of *relatively undisturbed*. Moreover, contrary to the unsubstantiated assertions of Ms. Brewster, the segment of logging road adjacent to Wetland E1 is not abandoned.

TES 12/19/14 - Letter regarding Wetland E1 Division and Land Use Intensity – Issues of Concern

Wetland E1 Division

A detailed topographic and sub-basin analysis was conducted by Triad and Associates to determine contributing basins of Wetland E1 and the directions of flow within the Wetland. This analysis was submitted to the City’s MDRT in compliance with The Villages Preliminary Plat 1A Condition of Approval #87, which provides:

As discussed in Finding of Fact No. III(M)(3), the City’s MDRT team shall re-evaluate the Class II designation for Wetland E1 on the basis of whether Wetland E1 was properly segregated under the guidelines of the City’s adopted and applicable wetland classification manual. The re-evaluation shall be completed prior to conducting any activities within Wetland E1 or its buffers that would be prohibited in a Class I wetland and no later than issuance of the first certificate of occupancy for a PP1A dwelling unit.

See Triad analysis at pages 188-189 of Exhibit 28 to Staff Report. This analysis led to the clear conclusion that the hydrology in Wetland E1 flows to the northwest, away from the Core Wetland Complex associated with Rock Creek (see attached Wetland Drainage Basin Exhibit prepared by Triad and Associates). This flow pattern is readily discernable in the field and was observed during one of the multiple site visits conducted by Wetland Resources, Inc. and Perteet, the City’s wetland consultant. Given this distinct basin divide, monitoring of hydrology over a period of a year would provide no salient data related to the separation of the Wetland E1 Unit to Wetland TOS, nor does the Washington State Department of Ecology Wetland Rating

System for Western Washington, Ecology Publication #04-06-025 (August 2004) require such monitoring to be conducted given such facts. Indeed, this flow pattern constitutes the “abrupt change” criteria referenced in TES’s 12/19 letter. Pursuant to The Villages Preliminary Plat 1A Condition of Approval #87, this drainage basin divide was verified and approved by Perteeet in their March 31, 2014 memo. See page 3 of Exhibit 28c to Staff Report.

Buffers and Land Use Intensity

The Applicant has provided the full 110-foot buffer along the majority of Wetland E1 with the exceptions of minor buffer averaging intrusions as allowed and approved per BDMC §19.10.230(H) and the location where the buffer stops at the existing gravel road per the provisions of BDMC §19.10.230(E). The result of this activity is a net increase in buffer area of 25,833 square feet adjacent to the existing buffer of Wetland E1 that would not be protected under the City’s SAO provisions without the Applicant’s approved buffer averaging plan.

In addition BDMC §19.10.220(B)(3) states “Trails may be permitted within a category II, III, or IV wetlands or their buffers and may be permitted only within the buffer of a category I wetland, the buffer of a wetland in the core complex or the buffer of a headwaters wetland...” The proposed trails within Plat 2C are all located within the outer portion of the wetland buffer, do not impact any wetlands, and are less than four feet wide. The proposed trail system for Plat 2C meets the design parameters identified within the City’s code.

An increased buffer per the provisions of BDMC 19.10.230(G) is not necessary and/or appropriate for Wetland E1 or Wetland TOS. While the Wetland E1 Unit is adjacent to Wetland TOS (Core complex), it is separate and distinct. In addition, the non-wetland area surrounding Wetland E1 is managed forest with a history of logging activities, gravels roads, and ORV use. Providing an additional 115-foot buffer (totaling 225 feet) would not afford any additional protection to the functions and values of the Core Wetland Complex due to this disconnect and the historical land-use surrounding Wetland E1.

Wetland TOS has been identified as part of the Core Complex and has already been afforded a significantly larger buffer (225 feet) due to that designation. Additional buffers from Core Complex wetlands are only required per BDMC 19.10.230.B as follows:

- a. If land within and adjacent to the buffer has a slope in excess of thirty percent (30%) the buffer shall extend at least 25 feet beyond the top of slope, and
- b. If land within and adjacent to the buffer is designated a landslide hazard, the buffer shall extend at least to the extent of the buffer designated in Section 19.10.410.B.

Since the land within and adjacent to the Wetland TOS buffers does not fall into either of these categories, no additional buffer area is required.

In conclusion, as a qualified professional wetland scientist, I do not believe a buffer increase for Wetland E1 or Wetland TOS is necessary.

Buffer widths associated with all the on-site wetlands are driven by requirements established in BDMC 19.10.230, which designates buffers based on Category and Habitat Score rather than the density of adjacent development. Therefore, under BDMC 19.10, the density of adjacent

development is not germane to the application of the standard buffer width established in BDMC 19.10.230. Moreover, in my professional opinion, density of 5.81 units/acre, as proposed adjacent to wetlands in Plat 2C, is mitigated by the buffer widths adopted by the City of Black Diamond.

TES 12/19/14 - Letter regarding Wetland Hydrology and Stormwater Design Issues of Concern

I have reviewed both the above referenced letter from Touchstone EcoServices as well as Triad's response to such letter entitled "Plat 2C Response to Comments". Based on my review of these documents, it remains my professional opinion, as set forth in my prior memorandum dated December 5, 2014 and included within Exhibit 71 at page 32, "that based on the preliminary drainage calculations, there will not be a significant adverse impact to the hydrology of the on-site wetlands from the development of the Villages Phase 2 Plat C project."

Lider Engineering 12/15/2014 letter

This memo references the WRI letter dated December 5, 2014, Exhibit 71, Page 30 of 112, Kristen Bryant comments, Item 2 which states "*...In the situation of Wetland E1 an abrupt change in the water regime is readily apparent, identifiable, and defendable due to natural topographic change. At this surveyed topographic location, a drainage basin break occurs within a portion of the water flowing south and east into the Core complex and a portion flowing north and west into the body of Wetland E1.*" Mr. Lider takes this WRI statement out of its appropriate context. The statement only relates to defining the boundary between wetland units and is not an attempt by WRI to delineate or describe Threshold Discharge Areas (TDA's).

Lider Engineering 12/17/2014 letter

As summarized in my above response to the TES letter dated 12/19/14 regarding wetland hydrology and stormwater design issues of concern, it remains my professional opinion that, based on the preliminary drainage designs, there will not be a significant adverse impact to the hydrology of the on-site wetlands from the development of the Villages Phase 2 Plat C project.

After careful review of all the public comments and written comments from the expert witnesses for The Villages Plat 2C, I stand by my professional opinion that the boundary of the Wetland E1 unit has been appropriately and scientifically established, the buffers depicted on the Villages Plat 2C preliminary plat map provide protection to Wetlands E1 and TOS such that no significant impacts to such critical areas are reasonably anticipated, and that the materials prepared by Triad Associates to date establish that no significant impacts to wetland hydrology will result from the development of Plat 2C. It is my further opinion that the critical area portions of the Villages Plat 2C application meet the requirements established in BDMC §19.10.

Thank you for the opportunity to respond to comments brought up as part of the public hearing. If you have any questions or need further information regarding this project, please feel free to contact me at 425.337.3174.

Sincerely

Wetland Resources, Inc.

A handwritten signature in blue ink, appearing to read 'S. Brainard', with a long horizontal flourish extending to the right.

Scott Brainard, PWS
Principal Wetland Ecologist

EXHIBIT 1

EMAIL FROM STEVE PILCHER TO COLIN LUND

Justin Wortman

Subject: Use of The Villages property by area residents

From: Steve Pilcher [<mailto:SPilcher@ci.blackdiamond.wa.us>]

Sent: Thursday, July 12, 2012 11:31 AM

To: Colin Lund

Subject: Use of The Villages property by area residents

Colin:

Per our discussions yesterday, this is to confirm that on a typical workday, City staff observes private vehicles parked at the primary entrance to the site along Auburn-Black Diamond Road (i.e., at the gate). Both myself and Natural Resources Director Aaron Nix commute to communities located to the west of Black Diamond, so we use this route on a daily basis. On most days, even in inclement weather, it is not unusual to find vehicles parked at this location.

We have observed some individuals departing from this point to walk their dogs on the site, presumably using the existing road system. Individuals may also be using the site for other purposes, as there have been reports of firearms discharge, noise from ATVs, etc.

Steve Pilcher
Community Development Director
City of Black Diamond
360-886-5700

Scott Brainard
scott@wetlandresources.com

EXHIBIT 2

WETLAND E1 DRAINAGE BASIN EXHIBIT



1711 17th Ave. NE
Atlanta, GA 30329
404.525.1111
www.triadassociates.com

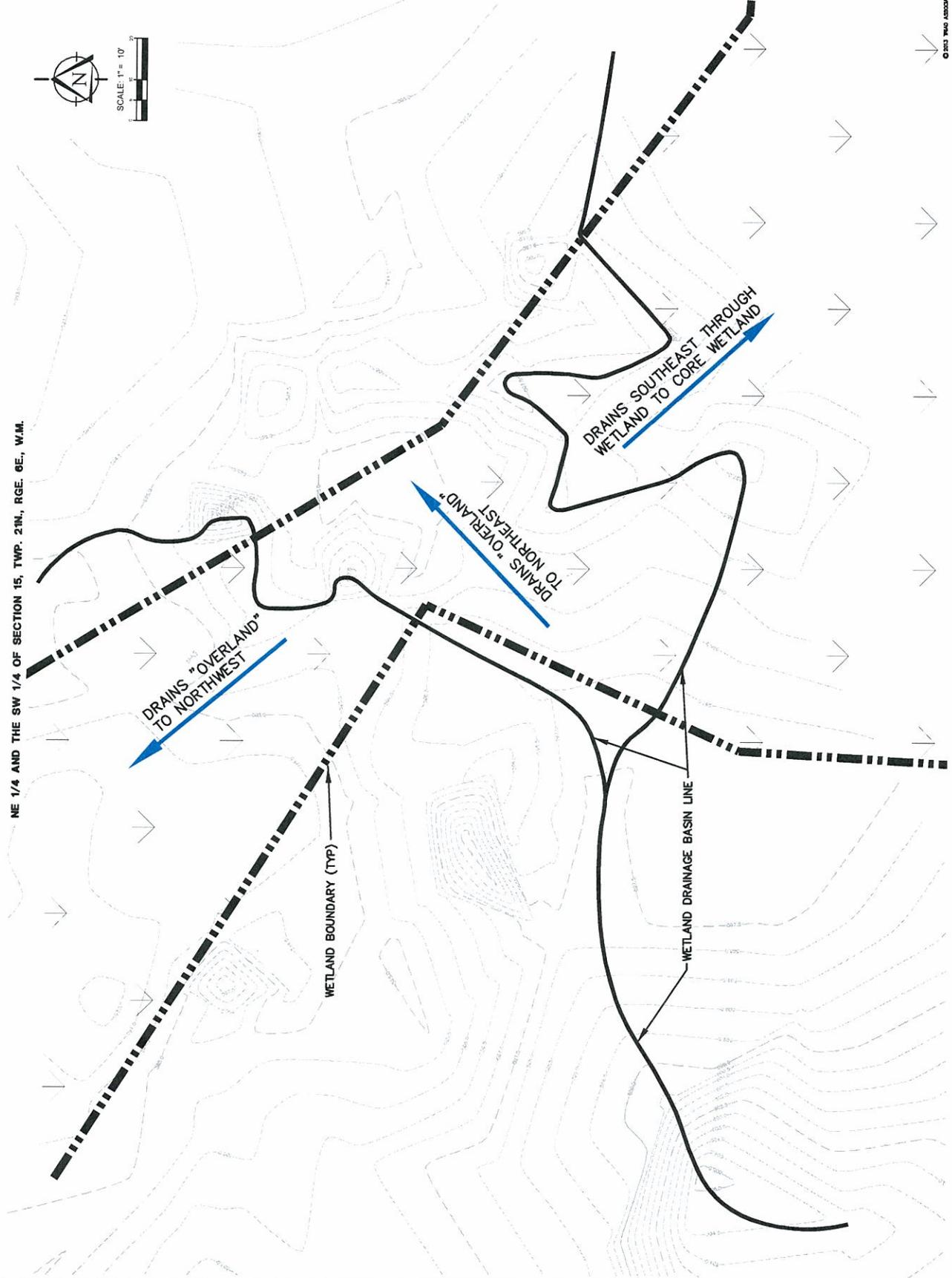
WASHINGTON

THE VILLAGES

WETLAND DRAINAGE BASIN EXHIBIT

DATE	10/13/10
PROJECT	THE VILLAGES
LOCATION	1711 17th Ave. NE, Atlanta, GA
SCALE	1" = 10'
PROJECT NUMBER	10-001
DATE	10/13/10
BY	[Signature]
CHECKED	[Signature]
APPROVED	[Signature]

DATE PLOTTED: 10/13/10
 PLOT NUMBER: 10-001
 SHEET NO.: 2 of 2



DECLARATION OF ROBERT W. PLOTNIKOFF

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BEFORE THE CITY OF BLACK DIAMOND HEARING EXAMINER

IN RE: THE MATTER OF THE VILLAGES
MPD - PRELIMINARY PLAT 2C (PLN13-
0027)

**DECLARATION OF ROBERT W.
PLOTNIKOFF**

I, Robert W. Plotnikoff, am a Permanent Resident of the United States and a resident of the State of Washington, am over the age of 18 years, have firsthand knowledge of the matters to which I attest below, am fully competent to testify as a witness, and have sworn and do certify and declare, under penalty of perjury, that the following declaration is true and correct.

1. I am a Senior Aquatic Ecologist & Principal Scientist/Project Manager at Tetra Tech, Inc., and a true and correct copy of my curriculum vitae was submitted as an exhibit during the public hearing on Preliminary Plat 2C (Exhibit 66).

2. I was asked to respond to a memo by Lider Engineering, dated December 15, 2014, titled Villages MPD Phase 2 Plat Hearing Additional Document Review (Lider Comments 1).

3. Attached is a true and correct copy of the letter I prepared in response.

4. The 12/5/2014 Tetra Tech response directly addressed the statement made in a public comment regarding potential release of phosphorous in the Lake Sawyer Basin from certain soil disturbing activities. The Lider Comments 1 makes several incorrect assertions regarding this 12/5/2014 Tetra Tech response that includes misinterpreting the nature of the

1 original public comment. In my professional opinion, nothing in the LIDER Comments 1 suggests
2 even the possibility for phosphorous release as a result of The Villages Plat 2C development
3 activity especially having ignored the fact that applicable BMPs will be implemented to meet the
4 environmental goals as stated in the Tetra Tech response dated December 5, 2014.

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Dated this ___5th___ day of __January__, 2015 at ___Seattle___, Washington.



ROBERT W. PLOTNIKOFF

TETRA TECH, INC. MEMORANDUM



TETRA TECH, INC.

January 5, 2015

Colin Lund
Oakpointe YarrowBay Holdings
10220 NE Points Drive, Suite 310
Kirkland, WA 98033

Reference: Response to Mr. Lider Comments (December 15, 2014) on Tetra Tech Letter Dated December 5, 2014 Pursuant to Preliminary Plat 2C Public Comments

Dear Mr. Lund:

Tetra Tech provided a response to public comments based on our role and expertise in water quality monitoring in the Lake Sawyer drainage on August 13, 2014 and provided a finalized copy on Tetra Tech letterhead to YarrowBay December 5, 2014 (original letter attached). Comments on the original letter (Tetra Tech, December 5, 2014) by Lider Engineering made several incorrect assertions that have misinterpreted the nature of the original public comment and the Tetra Tech response. In addition, the reference by Lider Engineering to several typographical errors in the Tetra Tech letter are simply due to electronic scanning of the original document into PDF format where the letter "c" appeared as the letter "e".

The original public comment was a statement describing potential release of phosphorous in the Lake Sawyer Basin with soil disturbing activities that may require mitigation measures to address and correct the impact. Tetra Tech's response was solely focused on the mechanisms by which phosphorous can be mobilized and reach streams, lakes, or wetlands in the Lake Sawyer drainage. Any reference to a mitigation measure was solely used in layman's terms and did not attempt to prescribe specific Best Management Practices (BMPs) for Plat 2C. Tetra Tech provided clarity on pathways for phosphorous transfer. Our role has been to provide expert advice on dynamics of nutrients and potential responses measured in water resources in the Lake Sawyer drainage.

Sincerely,

Senior Aquatic Ecologist/Water Quality Specialist

1420 5th Avenue, Suite 550, Seattle, WA 98101
Tel 206.728.9655 Fax 206.728.9670
www.tetrattech.com

DECLARATION OF ALAN D. FURE

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BEFORE THE CITY OF BLACK DIAMOND HEARING EXAMINER

IN RE: THE MATTER OF THE VILLAGES
MPD - PRELIMINARY PLAT 2C (PLN13-
0027)

DECLARATION OF ALAN D. FURE

I, Alan D. Fure, PE, am a citizen of the United States and a resident of the State of Washington, am over the age of 18 years, have firsthand knowledge of the matters to which I attest below, am fully competent to testify as a witness, and have sworn and do certify and declare, under penalty of perjury, that the following declaration is true and correct.

1. I am a licensed civil engineer, and a true and correct copy of my curriculum vitae was submitted as an exhibit during the public hearing on Preliminary Plat 2C (Exhibit 59).

2. I was asked to respond to the following comments: 1) a memo by Touchstone Echoservices, dated December 19, 2014, titled Wetland E1 Buffer Issues of Concern (TES Comments 1); 2) a memo by Touchstone Echoservices, dated December 19, 2014, titled Wetland E1 Division and Land Use Intensity – Issues of Concern (TES Comments 2); 3) a memo by Touchstone Echoservices, dated December 19, 2014, titled Wetland Hydrology and Stormwater Design Issues of Concern (TES Comments 3), 4) a memo by Lider Engineering, dated December 15, 2014, titled Villages MPD Phase 2 Plat Hearing Additional Document Review (Lider Comments 1); 5) a memo by Lider Engineering, dated December 17, 2014, titled Villages MPD Phase 2 Plat Hearing Review for Rebuttal to new Exhibits (Lider Comments 2); and 6) a memo

1 by Silver Tip Solutions, dated December 11, 2014, titled Stormwater issues of concern for Public
2 Hearing on Yarrow Bay's Plat 2C (Silver Tip Comments 1).

3 3. Attached is a true and correct copy of the memorandum I prepared in response.

4 4. In my professional opinion, nothing in the TES Comments 1-3, Lider Comments
5 1 and 2, or Silver Tip Comments 1 raises issues of concern that should prevent The Villages
6 MPD Preliminary Plat 2C, as conditioned, from being approved.

7 Dated this 31st day of December, 2014 at Woodinville, Washington.

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ALAN D. FURE, PE

TRIAD ASSOCIATES TECHNICAL MEMORANDUM

Date: December 31, 2014
To: Colin Lund, Yarrow Bay Development
From: Alan D. Fure, PE 
Re: Plat 2C Response to Comments
Triad Job No.: 10-001

The Use of a Continuous Hydrologic Model

We are mostly in agreement with Mr. Lider and the comments from Silver Tip Solutions. During FINAL design, a continuous hydrologic model will be used in the design of the storm drainage facilities. We differ on what is needed at the preliminary plat stage. Because of the *preliminary* nature of a Preliminary Plat and some specific code requirements unique to Black Diamond, a preliminary calculation was made using SBUH (Santa Barbara Urban Hydrograph) to determine peak discharge rates (as required by the *City of Black Diamond Engineering Design and Construction Standards, 4.2.01*). This was done to assess the approximate number of dispersal systems needed to meet the City's 0.5 cfs peak flow limit to each facility (*City of Black Diamond Engineering Design and Construction Standards, Standard DWG SD-15*). A water balance calculation was used to do a preliminary estimate of the number of roof tops needed to approximately match pre-development hydrology (Mr. Lider was correct in his observation that we placed a high priority on only directing clean rooftop water towards Wetland TOS since it drains to Lake Sawyer and one of our highest priorities is to protect Lake Sawyer from phosphorous inputs). These preliminary calculations provided the information needed to inform the general layout of the plat utilities, tracts and easements. There are a variety of final design strategies available to mimic wetland hydrology and those will be evaluated and implemented during final design. The Phase 1A pond also serves this plat and affords a tremendous LID opportunity through the infiltration of runoff while affording us the flexibility of fine-tuning the amount of water delivered to the wetlands to match the predevelopment wetland hydrology (the existence of this pond seems to have been missed by some or all of the commenters).

The City of Black Diamond Preliminary Plat requirements are clear that only preliminary calculations are needed to allow for planning of facility locations and tract sizes:

"Storm drainage design analysis at a level of detail to allow for accurate sizing of storm drainage facilities and tracts." BDMC 17.12.010.F.

"Generalized plans of proposed water distribution systems, storm sewers, sewerage systems and shoreline modifications, if any, indicating locations and sizing." BDMC 17.12.020(J).

During final design, more detailed work will be conducted. The detailed work will include the use of a continuous hydrologic model, and will include the water balance criteria generated as a part of the Environmental Impact Statement process. As noted in the email attached to the Rebuttal dated December 17 from Carrier, Bryant and Bortleson, Amanda Heye, Stormwater Engineer for the State Department of Ecology confirms that “the modeling criteria (in both the 2005 and 2012 [manuals]) simulate inputs that are designed to preserve the wetland.” The proposed Conditions in the Staff Report are consistent with these recommendations (See Conditions 6 and 8). The applicant is offering the following condition to further affirm the use of continuous modeling in the final design: “Storm drainage design for Plat 2C shall utilize an HSPF based continuous runoff model (such as WWHM). For drainage facility design receiving runoff from drainage basins 320 acres and larger in total area, a calibrated model should be considered.”

Groundwater and Hydrologic Monitoring

Ms. Brewster’s December 19 memo titled “Wetland Hydrology and Stormwater Design Issues of Concern, at p. 3 asserts that “a baseline wetland hydrology study would need to be done for at least one year during a year where precipitation falls without the 30-year norm, in accordance [with] the Guidelines in Appendix 1-D of the SWMMWW.” Ms. Brewster is citing the 2005 version of that document. But, as noted in the Golder Memo (Exhibit 71), the City of Black Diamond did not adopt Volume 1 of the 2005 SWMMWW, but instead adopted Appendix 1 of the Western Washington Phase II Municipal Stormwater Permit. Thus, the Guidelines cited by Ms. Brewster do not apply. In addition, the Development Agreement Section 15.1 reiterates that vesting as to stormwater regulations is on a phase-by-phase as described in Section 7 of the Development Agreement. See, *especially*, Section 7.4.4.A.

Appendix 1 of the Western Washington Phase II Municipal Stormwater Permit, cross references the 2012 version of the cited guideline document, which itself also makes clear that there is no requirement for a year of monitoring. The 2012 Appendix 1-D (copy attached) includes “Guidelines” and expressly states that the Guidelines do not fulfill requirements for permitting. See p. D-2. Guide Sheet 3B addresses “Protecting wetlands from impacts of changes in water flows.” See pp. D-5 to D-8. Nothing in Guidesheet 3B mandates any sort of baseline wetland hydrology study. Instead, the Guidesheet explains: “Use the Western Washington Hydrology Model (WWHM), or other models approved by Ecology, for estimating the increases or decreases in total flows (volume) into a wetland that can result from the development project. See p. D-6. The list of “data needed” for Guidesheet 3B does not include baseline monitoring, but does again explain that the WWHM modeling procedure estimates flows to the wetland. See p. D-14. Independent of these guidelines for protecting wetland hydrology on a project-specific basis, Guidesheet 4, addresses “Jurisdictional planning for wetlands and stormwater management.” See pp. D-9 to D-13. Guidesheet 4 applies to a City or County that is planning and adopting jurisdiction-wide regulations. See p. D-9. It is only in this context that Appendix 1-D calls for at least one year of baseline wetland monitoring, and even then it is not a requirement, it is a suggestion: “the monitoring program should include the following tasks...” See p. D-13.

The baseline monitoring raised by Ms. Brewster is not required to be performed. Even though baseline hydrologic monitoring is not required, YarrowBay has been performing monitoring of baseline water quality along the buffer edge of Wetland TOS. Subsurface groundwater monitoring (interflow) was conducted over the 2013/2014 water year through 5 piezometers installed at the western edge of Wetland TOS. These monitoring points were accurately surveyed in the field along with a detailed survey asbuilt of the elevations which determine the wetland basin split. This monitoring provides information on pre-development water quality conditions of interflow which will be used during final design, to assure maintenance of water quality in the Lake Sawyer basin.

ATTACHMENT

APPENDIX 1-D

Appendix I-D Guidelines for Wetlands when Managing Stormwater

This Appendix provides guidelines on the management of stormwater, from development and redevelopment projects, to avoid or minimize changes to wetland functions and values.

This appendix consists of seven sections:

Scope and Principles

Guide Sheet 1: Criteria for Excluding Wetlands from Serving as a Treatment or Flow Control BMP/Facility

Guide Sheet 2: Criteria for Including Wetlands as a Treatment or Flow Control BMP/Facility

Guide Sheet 3: Wetland Protection Guidelines

Guide Sheet 4: Jurisdictional Planning for Wetlands and Stormwater Management

Information Needed to Apply the Guidelines—This section contains a list of basic data needed for each of the guide sheets to perform basic analyses.

Definitions— Refer to this section for the meaning of terms throughout this appendix.

Scope and Principles

Purpose

Wetlands are important features in the landscape that provide numerous beneficial functions and values for people, fish, and wildlife. Some of these include protecting and improving water quality, providing fish and wildlife habitats, storing floodwaters, and maintaining surface water flow during dry periods.

Development, redevelopment, and stormwater management projects may decrease the functions and values of wetlands by:

- Increasing the amount of water flow discharged to wetlands.
- Decreasing the amount of water flow discharged to wetland.
- Increasing the amount of pollutants discharged to wetland.

This can happen even if the wetland is not formally used for stormwater management purposes.

These guidelines intend to prevent decreasing the functions and values of wetlands by avoiding alterations to the structural, hydrologic, and water

quality characteristics of existing wetlands to the extent possible during development, redevelopment and stormwater management projects.

Regulatory Requirements

Following these guidelines does not fulfill requirements for assessment and permitting. Every development and redevelopment project should follow the stipulations of the State Environmental Policy Act and contact the local permitting authority. Other state and federal agencies may also have jurisdiction over projects affecting wetlands such as the Washington State Departments of Ecology, Fisheries, and Wildlife; the U.S. Environmental Protection Agency; and the U.S. Army Corps of Engineers.

These guidelines do not address actions needed to enhance or restore degraded wetlands.

Guideline Basis

These guidelines were principally from the results of the Puget Sound Wetlands and Stormwater Management Research Program, as set forth in Sections 2 and 3 of the program's summary publication, *Wetlands and Urbanization, Implications for the Future* (Horner et al. 1997).

Washington State Wetland Rating System

The wetlands in Washington State differ widely in their functions and values. Washington State's wetland rating systems categorizes wetlands into four categories based on their sensitivity to disturbance, their rarity, our ability to replace them, and the functions they provide.

The rating system, however, does not replace a full assessment of wetland functions that may be necessary to plan and monitor a project of compensatory mitigation.

For more information on the wetlands rating system go to:

<http://www.ecy.wa.gov/programs/sea/wetlands/ratingsystems/index.html>.

Guide Sheet 1: Criteria that excludes wetlands from serving as a treatment or flow control BMP/facility

The following types of wetlands are not suitable as a treatment or flow control BMPs/facilities. Engineering structural or hydrologic changes within the wetland itself to improve stormwater flows and water quality are not allowed. Do not increase or decrease the water regime in these wetlands beyond the limits set in Guide Sheet 3. Provide these wetlands with the maximum protection from urban impacts (see [Guide Sheet 3](#), Wetland Protection Guidelines):

1. The wetland is currently a Category I wetland because of special conditions (forested, bog, estuarine, Natural Heritage, coastal lagoon).

2. The wetland provides a high level of many functions. These are Category I and II wetlands as determined by the Washington State Wetland Rating System of Western Washington.
3. The wetland provides habitat for threatened or endangered species. Determining whether or not the conserved species will be affected by the proposed project requires a careful analysis in relation to the anticipated habitat changes. Consult with the appropriate agencies with jurisdiction over the specific threatened or endangered species on the site.

If a wetland type listed above needs to be included in a stormwater system then this activity is considered an impact. It will be treated as any other impact, and will need to be mitigated according to the rules for wetland mitigation. Project proponents will have to demonstrate that they have done everything to avoid and minimize impacts before proceeding to compensatory mitigation.

The wetlands listed above cannot receive flows from a stormwater system unless the criteria in Guide Sheets 3B and 3C are met.

Guide Sheet 2: Criteria for including wetlands as a treatment or flow control BMP/facility

A wetland can be physically or hydrologically altered to meet the requirements of a treatment or flow control BMP/facility if ALL of the following criteria are met:

Modifications that alter the structure of a wetland or its soils will require permits. Existing functions and values that are lost would have to be compensated/replaced.

1. It is classified in Category IV in the “Washington State Wetland Rating System of Western Washington,” or a Category III wetland with a habitat score of 19 points or less.
2. You can demonstrate that there will be “no net loss” of functions and values of the wetland as a result of the structural or hydrologic modifications done to provide control of runoff and water quality. This includes the impacts from the machinery used for the construction. Heavy equipment can often damage the soil structure of a wetland. However, the functions and values of degraded wetlands may sometimes be increased by such alterations and thus would be self-mitigating. Functions and values that are not replaced on site will have to be mitigated elsewhere.
 - a. Modifications that alter the structure of a wetland or its soils will require permits. Check with the agency(ies) issuing the permits for the modification(s) to determine which method to use to establish “no net loss.”

- b. A wetland will usually sustain fewer impacts if the required storage capacity can be met through a modification of the outlet rather than through raising the existing overflow.
3. The wetland does not contain a breeding population of any native amphibian species.
4. The hydrologic functions of the wetland can be improved as outlined in questions 3,4,5 of Chart 4 and questions 2,3,4 of Chart 5 in the "Guide for Selecting Mitigation Sites Using a Watershed Approach," (available here: <http://www.ecy.wa.gov/biblio/0906032.html>); or the wetland is part of a priority restoration plan that achieves restoration goals identified in a Shoreline Master Program or other local or regional watershed plan.
5. The wetland lies in the natural routing of the runoff, and the discharge follows the natural routing.

Guide Sheet 3: Wetland protection guidelines

This guide sheet provides information on ways to protect wetlands from changes to their ecological structure and functions that result from human alterations of the landscape. It also recommends management actions that can avoid or minimize deleterious changes to wetlands.

Although, this guide sheet is intended primarily for the protection of the wetlands listed in Guide Sheet 1; this guidance still should be applied, as practical, for wetlands listed in Guide Sheet 2 when they are modified to meet stormwater requirements.

Guide Sheet 3A: General guidelines for protecting functions and values of wetlands

1. Consult regulations issued under federal and state laws that govern the discharge of pollutants. Wetlands are classified as "Waters of the United States" and "Waters of the State" in Washington.
2. Maintain the wetland buffer required by local regulations.
3. Retain areas of native vegetation connecting the wetland and its buffer with nearby wetlands and other contiguous areas of native vegetation.
4. Avoid compaction of soil and introduction of exotic plant species during any work in a wetland.
5. Take measures to avoid general urban impacts (e.g., littering and vegetation destruction). Examples are protecting existing buffer zones; discouraging access, especially by vehicles, by plantings outside the wetland; and encouragement of stewardship by a homeowners' association.
6. Fences can be useful to restrict dogs and pedestrian access, but they also interfere with wildlife movements. Their use should be very

carefully evaluated on the basis of the relative importance of intrusive impacts versus wildlife presence. Fences should generally not be installed when wildlife would be restricted and intrusion is relatively minor. They generally should be used when wildlife passage is not a major issue and the potential for intrusive impacts is high. When wildlife movements and intrusion are both issues, the circumstances will have to be weighed to make a decision about fencing.

7. If the wetland inlet will be modified for the stormwater management project, use a diffuse flow method, (eg. BMPC206 Level Spreader Swale, Volume II, and BMP T5.10B Downspout Dispersion Systems, Volume III) to discharge water into the wetland in order to prevent flow channelization.

Guide Sheet 3B: Protecting wetlands from impacts of changes in water flows

Protecting wetland plant and animal communities depends on maintaining the existing wetland's hydroperiod. This means maintaining the annual fluctuations in water depth and its timing as closely as possible. The risk of impacts to functions and values increases as the changes in water regime deviate more from the existing conditions. These changes often result from development.

Hydrologic modeling is useful to measure or estimate the aspects of the hydroperiod under existing pre-project and anticipated post-project conditions. Post-project estimates of the water regime in a watershed and wetland hydroperiod must include the cumulative effect of all anticipated watershed and wetland modifications. Perform this assessment with the aid of a qualified hydrologist.

Provisions in these guidelines pertain to the full anticipated build-out of the wetland's watershed as well as changes resulting from an individual development.

Unfortunately, attempts to modify and use the standard hydrologic models for describing the flow and fluctuations of water in a stormwater pond have failed to adequately model the hydrodynamics in wetlands. It is difficult, to estimate if stormwater discharges to a wetland will meet the criteria for protection developed by the Puget Sound Wetland and Stormwater Research Program. The criteria developed by that program apply only to depression wetlands. They are not applicable to riverine, slope, or lake-fringe wetlands. Ecology does not have any hydrologic models available to characterize the hydrodynamics in these types of wetlands.

As a result, it is difficult to predict the direct impacts of changes in water flows resulting from a development. In the absence of hydrologic models that characterize all types of wetlands, criteria have to be set using

information that is readily available. These criteria are based on risk to the resource rather than an actual understanding of impacts.

The following criteria will provide some protection for the valuable wetland types listed in Guide Sheet 1, but we cannot determine if they result in the complete protection of a wetland's functions and values. The risk to wetland functions will increase as the water volumes into the wetland diverge from the pre-project conditions. The risk will be decreased if the divergence is smaller.

Use the Western Washington Hydrology Model (WWHM), or other models approved by Ecology, for estimating the increases or decreases in total flows (volume) into a wetland that can result from the development project. These total flows can be modeled for individual days or on a monthly basis. Compare the results from this modeling to the criterion below. WWHM 2012 will have the capability to compare these results with the criterion.

Criterion 1: total volume of water into a wetland during a single precipitation event should not be more than 20% higher or lower than the pre-project volumes.

Modeling algorithm for Criterion 1

1. Daily Volumes can be calculated for each day over 50 years for Pre- and Post-project scenarios. Volumes are to be calculated at the inflow to the wetland or the upslope edge where surface runoff, interflow, and ground water are assumed to enter.
2. Calculate the average of Daily Volume for each day for Pre- and Post-project scenarios. There will be 365 values for the Pre-project scenario and 365 for the Post-project.

Example calc for each day in a year (e.g., April 1):

- If you use 50 years of precipitation data, there will be 50 values for April 1. Calculate the average of the 50, April 1, Daily Volumes for Pre- and Post-project scenarios.
 - Compare the average Daily Volumes for Pre- versus Post-project scenarios for each day. The average Post-project Daily Volume for April 1 must be within +/- 20% of the Pre-project Daily Volume for April 1.
3. Check compliance with the 20% criterion for each day of year. Criterion 1 is met/passed if none of the 365 post-project daily volumes varies by more than 20% from the pre-project daily volume for that day.

Criterion 2: Total volume of water into a wetland on a monthly basis should not be more than 15% higher or lower than the pre-project volumes.

This needs to be calculated based on the average precipitation for each month of the year. This criterion is especially important for the summer months when a development may reduce the monthly flows rather than increase them because of reduced infiltration and recharging of ground water.

Modeling algorithm for Criterion 2

1. Monthly Volumes can be calculated for each calendar month over 50 years for Pre- and Post-project scenarios. Volumes are to be calculated at the inflow to the wetland or the upslope edge where surface runoff, interflow, and ground water are assumed to enter.
2. Calculate the average of Monthly Volume for each calendar month for Pre- and Post-project scenarios.

Example calc for each calendar month in a year (e.g., April):

- If you use 50 years of precipitation data, there will be 50 values for the month of April. Calculate the average of the 50, April, Monthly Volumes for Pre- and Post-project scenarios.
 - Compare the Monthly Volumes for Pre- versus Post-project scenarios. Post- project Monthly Volume for April must be within +/- 15% of the Pre- project Monthly Volume for April.
3. Check compliance with the 15% criterion for each calendar month of year. Criterion 2 is met/passed if none of the post- project Monthly Volume varies by more than 15% from the pre- project Monthly Volume for every month.

WWHM Modeling Assumption and Approach

Assumption - Flow components feeding the wetland under both Pre- and Post-project scenarios are assumed to be the sum of the surface, interflow, and ground water flows from the project site.

Approach - Assign the wetland a point of compliance #1 (POC) number such as POC1 downstream of the project area.

- Pre-project scenario - Connect all flow components to the wetland/POC1
 - **Pre-project Total Flows to POC1 = Surface + Interflow + Ground water**
- Post-project scenario - Identify flows to the wetland/POC1.
 - a) Impervious surfaces send flows to wetland via (1)- surface flow.

- ✓ WWHM sub-flows to POC1 = Surface flow (+ Interflow default set in WWHM)
 - b) Pervious surfaces send flows to wetland via (1)- surface, (2)- interflow, and (3)- ground.
 - ✓ WWHM sub-flows to POC1 = Surface + Interflow + Ground water
 - c) Infiltrating facilities send flows to wetland via ground water, and surface overflows.
 - (1) Ground water - Connect infiltrated water (Outlet 2) to ground water component of the area between facility and wetland. Use Lateral Basin downstream of the infiltrating facility and connect Outlet 2 to the ground water component of the Lateral Basin. If this area is the same area modeled in Step (b) above, use the Lateral Basin element in Step (b).
 - ✓ WWHM sub-flows to POC1 = infiltrated flows
 - (2) Surface Overflow – Connect the surface flow (Outlet 1) to wetland/POC1
 - ✓ WWHM sub-flows to POC1 = facility surface flows (Outlet 1)
- **Post-project Total Flows to POC1 = Sum of flows in (a), (b), and (c).**

If it is expected that the limits stated above could be exceeded, consider the following strategies to reduce the volume of surface flows:

- Reducing of the level of development by reducing the amount of impervious surface and/or increasing the retention of natural forest cover.
- Increasing infiltration through the use of LID BMPs and LID principles.
- Increasing storage capacity for surface runoff.
- Using selective runoff bypass around the wetland. Bypassed flow must still comply with other applicable stormwater requirements.

Monitoring – Modifications that alter the structure of a wetland or its soils will require permits. Conduct monitoring as required by local, state, or federal permits.

Guide Sheet 3C: Guidelines for protecting wetlands from pollutants

Protecting a wetland from pollutants generated by a development should include the following measures:

1. Use effective erosion control at construction sites in the wetland's drainage catchment. Refer to Volume II this manual and local jurisdiction requirements.
2. Institute a program of source control BMPs and minimize the pollutants that will enter storm runoff that drains to the wetland.
3. For wetlands that meet the criteria in Guide Sheet 1, provide a water quality control facility consisting of one or more treatment BMPs to treat runoff entering the wetland.

If the wetland is a Category I wetland because of special conditions (forested, bog, estuarine, Natural Heritage, coastal lagoon), the facility should include a BMP with the most advanced ability to control nutrients.

Guide Sheet 4: Jurisdictional planning for wetlands and stormwater management

Local jurisdictions should plan and manage their resources to protect the overall function and values of wetlands, including their role in storm drainage systems.

Advanced planning can help local jurisdictions to take advantage of the most options for managing stormwater in newly developing areas.

The comprehensive planning steps, below, are based on two principles for effective environmental management:

1. The best management policies for the protection of wetlands are those that prevent or minimize impacts at their point of origin.
2. The best management strategies are self-perpetuating, that is they do not require periodic infusions of capital and labor.

The Department of Ecology, the Puget Sound Partnership, and other groups are actively developing new tools for watershed planning that will address many of the steps outlined below. We suggest you review information that has already been developed in the region of your concern. This may significantly reduce your efforts. A good place to start is:

<http://www.ecy.wa.gov/watershed/index.html>

Comprehensive Planning Steps

1. Define the landscape unit you will be using for your planning effort. See the definition of landscape unit in the Definitions section.
2. Begin the plan for the landscape unit with attention to the following general principles:
 - a. Formulate the plan based on clearly articulated community goals. Carefully identify conflicts and choices between retaining and protecting desired resources and community growth.

- b. Map and assess the suitability of different areas for urban uses.
 - c. There are several tools available for identifying such areas. For more information visit <http://www.ecy.wa.gov/mitigation/landscapeplan.html>. When appropriate, the assessment can also highlight outstanding local or regional resources that the community determines should be protected. For example, a fish run, scenic area, recreational area, threatened species habitat, farmland.
3. Maximize natural water storage and infiltration opportunities within the landscape unit and outside of existing wetlands, especially:
 - a. Promote the conservation of forest cover. Develop on deforested land. This affects the water flows in a basin less than building on land that requires removing forest cover. Loss of forest cover increases peak runoff requiring expensive structural solutions.
 - b. Maintain natural storage reservoirs and drainage corridors, including depressions, areas of permeable soils, swales, and intermittent streams. Implement policies and regulations to discourage the clearing, filling, and channelization of these features. Use existing drainage networks in preference to pipes, culverts, and engineered ditches as long as the flows and volumes of water in them are not increased.
 4. Establish and maintain buffers surrounding wetlands and in riparian zones. Also, maintain interconnections among wetlands and other natural habitats to allow for wildlife movements.
 5. Implement measures to avoid general impacts on wetlands and other water bodies (e.g., littering, vegetation destruction, human and pet intrusion harmful to wildlife).

In wetlands that are relatively unaffected by human activities, plan so the quantity or stormwater flows match the pre-project hydroperiod and hydrodynamics. In wetlands whose water flows have been disturbed, consider ways of reducing the existing changes to flows. This involves not only management of high volumes and rates of flow during the wet season, but also preventing water supply depletion during the dry season. The latter may require augmenting flows if urbanization reduces existing surface or ground water inflows. Refer to [*Guide Sheet 3: Wetland Protection Guidelines*](#), for details on implementing these guidelines.

6. Assess alternatives for controlling the quantities of runoff as follows:
 - a. Analyze proposed development actions in terms of changes to quantity of runoff.
 - b. For existing development or redevelopment, assess possible alternative solutions to adding flow controls by:

- (1) Protecting health, safety, and property from flooding by removing buildings from the flood plain.
 - (2) Preventing stream channel erosion by stabilizing the eroding bed and/or bank area with bioengineering techniques, preferably, by using structural reinforcements that are consistent with the protection of aquatic habitats and beneficial uses of the stream (refer to Chapter 173-201A of the Washington Administrative Code (WAC) for the definition of beneficial uses).
- c. For new development or redevelopment, assess different regulatory alternatives or incentives for changing common practices in land use including: density controls, clearing limits, impervious surface limits, transfer of development rights, purchase of conservation areas, etc.
- d. If the alternatives considered in Step 6 above cannot solve an existing or potential problem, perform an analysis of the contributing drainage catchment to assess possible alternative solutions that can be applied on-site or on a regional scale. The most appropriate solution or combination of alternatives should be selected with regard to the specific opportunities and constraints existing in the drainage catchment. For new development or redevelopment, on-site facilities that should be assessed include, in approximate order of preference:
- (1) LID BMPs and LID principles
 - (2) Infiltration basins or trenches.
 - (3) Detention ponds.
 - (4) Below-ground vault or tank storage.
 - (5) Parking lot detention.

Regional facilities that should be assessed for solving problems associated with new development, redevelopment, or existing development include:

- (1) LID BMPs and LID principles
- (2) Infiltration basins or trenches.
- (3) Detention ponds.
- (4) Constructed wetlands.
- (5) Bypassing a portion of the flow to an acceptable receiving water body, with treatment as required to protect water quality and other special precautions as necessary to prevent downstream impacts.

- e. Consider physically altering an existing wetland for controlling water quantities only if upland alternatives are inadequate to solve the existing or potential problem. Refer to the criteria in Guide Sheet 1 and 2 to evaluate if wetlands can be altered.
7. Place strong emphasis on water resource protection during construction of new development. Establish effective erosion control programs to reduce the sediment loadings to receiving waters to the maximum extent possible. No preexisting wetland or other water body should ever be used for the sedimentation of solids in construction-phase runoff.
 8. Characterize alternatives for the control of runoff water quality as follows:
 - a. Analyze the contributing drainage catchment basin to assess possible alternative solutions that can be applied on-site or on a regional scale. The best alternatives are those that minimize changes to water quality resulting from development. Consider both source control BMPs, treatment BMPs, and LID BMPs as alternative solutions before considering use of existing wetlands.
 - b. Consider altering an existing wetland for water quality control only if upland alternatives are inadequate to solve the existing or potential problem.

Using wetlands for polishing is subject to analysis on a case-by-case basis and may be allowed only if the following conditions are met:

- (1) The restoration or enhancement of a previously degraded wetland is required.
- (2) Both improving water quality and the upgrading of other wetland functions need to be accomplished.
- (3) All legally adopted water quality standards for wetlands are observed.
- (4) Appropriate source control and treatment BMPs are applied in the contributing catchment on the basis of the analysis in Step 9a.

If these circumstances apply, refer to *Guide Sheet 2: Criteria for Including Wetlands as a Treatment or Flow Control BMP/Facility*

9. Stimulate public awareness of and interest in wetlands and other water resources in order to encourage protective attitudes in the community. This program should include:
 - a. Education regarding the use of fertilizers and pesticides, automobile maintenance, the care of animals and the importance of retaining buffers to prevent water pollution.

- b. Descriptive signboards adjacent to wetlands informing residents of the wetland type, its functions, the protective measures taken, etc.
- c. If beavers are present in a wetland, educate residents about their ecological role and value and take steps to avoid human interference with beavers.

Monitoring

Design and carry out a program to monitor water quality if bogs and other Category I wetlands will be subject to pollutant loadings from new developments. Such wetlands are at risk if they have contributing catchments with either of the following characteristics:

1. More than 20 percent of the catchment area is committed to commercial, industrial, and/or multiple family residential land uses.
2. The combination of all urban land uses (including single family residential) exceeds 30 percent of the catchment area.

The monitoring program should include the following tasks:

1. Perform pre-project baseline sampling by collecting water quality grab samples in an open water pool of the wetland for at least one year, allocated through the year as follows:
 - November 1-March 31--4 samples
 - April 1- May 31--1 sample
 - June 1- August 31--2 samples
 - September 1- October 31--1 sample

If the wetland is dry during any period, reallocate the sample(s) scheduled then to another time when the wetland is no longer dry.

Analyze samples for pH; dissolved oxygen (DO); conductivity (Cond); total suspended solids (TSS); total phosphorus (TP); nitrate + nitrite-nitrogen (N); fecal coliforms (FC); and total copper (Cu), lead (Pb), and zinc (Zn). Find the median and range of each water quality variable.

2. Considering the baseline results, set water quality goals to be maintained in the post-project period. Example goals are:
 - pH--no more than "x" percent (e.g., 10%) increase (relative to baseline) in annual median and maximum or decrease in annual minimum.;
 - Do--no more than "x" percent decrease in annual median and minimum concentrations.
 - Other variables--no more than "x" percent increase in annual median and maximum concentrations.
 - No increase in violations of the Washington Administrative Code (WAC) water quality criteria.

Repeat the sampling on the same schedule for at least one year after all development is complete. Compare the results to the set goals.

Information Needed to Apply the Guidelines

Each guide sheet requires collecting specific information. The following sections list the basic data needed for applying the Guide Sheets. As a start, obtain the relevant soil survey; the National Wetland Inventory for the watershed, topographic and land use maps, and the results of any local wetland inventory.

Data Needed for Guide Sheet 1: Criteria for Excluding Wetlands as Part of a Stormwater System

1. Wetland category Ecology's "Washington State Wetland Rating System for Western Washington," available on-line at <http://www.ecy.wa.gov/biblio/sea.html>.
2. Rare, threatened, or endangered species inhabiting the wetland.
3. Presence or absence of a breeding population of native amphibians. If amphibians are found in the wetland assume they are native unless you can demonstrate the only species present are non-native.

Data Needed for Guide Sheet 2: Criteria for Including Wetlands as Part of a Stormwater System

1. Hydrologic modeling of the existing flows and predicted flows into the wetland.
2. A characterization of the changes to water quality coming into the wetland from the development.
3. Presence of breeding populations of native amphibian species.
4. Presence of fish species.

Data Needed for Guide Sheet 3B: Protecting wetlands from impacts of changes in water flows

The WWHM user manual will have a modeling procedure for estimating water flows to wetlands. Follow the modeling procedure in WWHM user manual to estimate flows and determine compliance with the wetland Criteria 1 and 2. The information needed to model water flows to a wetland in WWHM includes the following:

1. Location of the development project
2. Land use characteristics before and after development.
 - a) Soil Type
 - b) Surface Vegetation
 - c) Land slope
 - d) Land area (acres)
3. Land use characteristics between the development project area and the wetland.

Data Needed for Guide Sheet 4: Jurisdictional Planning for Wetlands and Stormwater Management

1. Wetland boundary delineated using the latest Federal Manuals
<http://www.ecy.wa.gov/programs/sea/wetlands/delineation.html>
2. A map of the contributing watershed to the wetland or other landscape unit, and an estimate of its area.
3. A definition of environmental and development goals for the landscape unit subject to planning and management.
4. Existing management and monitoring plans.
5. Existing and projected land use in the landscape unit in the categories commercial, industrial, multi-family residential, single-family residential, agricultural, various categories of undeveloped, and areas subject to active logging or construction (expressed as percentages of the total watershed area).
6. Surface drainage network throughout the landscape unit.
7. Soil conditions, including soil types, infiltration rates, and elevation of water table as it changes seasonally, and the presence of any restrictive layers,
8. Ground water recharge and discharge points.

Definitions

The following terms are applicable only to this appendix (Appendix I-D).

Baseline sampling	Sampling performed to define the existing environmental and biological conditions present before any modification occurs.
Bioengineering	Bioengineering for streams and wetlands --The use of living and nonliving plant materials in combination with natura and synthetic support materials for slope stabilization, erosion reduction, and vegetative establishment.
Buffer	The area (either upland, open water, or another wetland) that surrounds a wetland and that reduces adverse impacts to it from adjacent development.
Constructed wetland	A wetland intentionally created from a non-wetland site.
Degraded wetland	A wetland whose functions and values have been reduced as a result of human activities
Enhancement	The manipulation of the physical, chemical, or biological characteristics of a wetland site to heighten, intensify or improve specific function(s) or to change

the growth stage or composition of the vegetation present. Enhancement is undertaken for specified purposes such as water quality improvement, flood water retention or wildlife habitat. Activities typically consist of planting vegetation, controlling non-native or invasive species, modifying site elevations or the proportion of open water to influence hydroperiods, or some combination of these. Enhancement results in a change in some wetland functions and can lead to a decline in other wetland functions, but does not result in a gain in wetland acres.

Estuarine wetland

Generally, a vegetated wetland where the salinity of the surface or port waters is greater than 0.5 parts per thousand.

Functions

The ecological (physical, chemical, and biological) processes or attributes of a wetland. Functions are often defined in terms of the processes that provide value to society, but they can be defined on processes that are not value based. Wetland functions include food chain support, provision of ecosystem diversity and fish and wildlife habitat, flood flow alteration, ground water recharge and discharge, water quality improvement, and soil stabilization.

Hydrodynamics

The science involving the energy and forces acting on water or other liquids and the resulting impact on the motion of the liquid.

Hydroperiod

The seasonal occurrence of flooding and/or soil saturation; encompasses the depth, frequency, duration, and seasonal pattern of inundation.

Invasive plant species

Opportunistic plant species (either native or non-native) that colonize disturbed ecosystems and come to dominate the plant community in ways that are seen by us as reducing the values provided by the previous plant community. Most often, opportunistic plants are considered invasive if they reduce the value of an area as habitat for valuable species.

Landscape unit

An area of land that has a specified boundary used for planning purposes that defines an area of interrelated physical, chemical, and biological processes. A watershed or drainage basin is a common type of landscape unit. A ground water aquifer is another type of landscape unit.

Modification, Modified (wetland)	A wetland whose physical, hydrological, or water quality characteristics have been purposefully altered for a management purpose, such as by dredging, filling, forebay construction, and inlet or outlet control.
On-site	An action (here, for stormwater management purposes) taken within the property boundaries of the site to which the action applies.
Polishing	Additional treatment of a waste stream that has already received one or more stages of treatment by other means. This is also called advance treatment. The conditions present across a landscape after a specific stormwater management project (e.g., raising the outlet, building and outlet control structure) are placed in the wetland or a land use change that occurs in the landscape unit that will potentially affect the wetland.
Post-project	The conditions present across a landscape after a specific stormwater management project (e.g., raising the outlet, building an outlet control structure) are placed in the wetland or a land use change that occurs in the landscape unit that will potentially affect the wetland.
Pre-project	The conditions present across a landscape before a specific stormwater management project (e.g., raising the outlet, building an outlet control structure) are placed in the wetland or a land use change occurs in the landscape unit that will potentially affect the wetland.
Rare, threatened, or endangered species	Plant or animal species that are regional relatively uncommon, are nearing endangered status, or whose existence is in immediate jeopardy and is usually restricted to highly specific habitats. Threatened and endangered species are officially listed by federal and state authorities, whereas rare species are unofficial species of concern that fit the above definitions.
Redevelopment	Conversion of an existing development to another land use, or addition of a material improvement to an existing development.
Regional	An action (here, for stormwater management purposes) that involves more than one discrete property.
Re-establishment	Actions performed to reestablish wetland functional characteristics and processes that have been lost by alterations, activities, or catastrophic events in an area that no longer meets the definition of a wetland.

Structure	The physical components of an ecosystem, both the abiotic (physical and chemical) and biotic (living).
Values	Wetland processes or attributes that are valuable or beneficial to society (also see <u>Functions</u>). Wetland values include support of commercial and sport fish and wildlife species, protection of life and property from flooding, recreation, education, and aesthetic enhancement of human communities.
Wetlands	Those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas. Wetlands do not include those artificial wetlands intentionally created from nonwetland sites, including, but not limited to, irrigation and drainage ditches, grass-lined swales, canals, detention facilities, wastewater treatment facilities, farm ponds, and landscape amenities, or those wetlands created after July 1, 1990, that were unintentionally created as a result of the construction of a road, street, or highway. Wetlands may include those artificial wetlands intentionally created from nonwetland areas to mitigate the conversion of wetlands. (Waterbodies not included in the definition of wetlands as well as those mentioned in the definition are still waters of the state.)