

APPENDIX B

B-1 Minimum Requirements #1 -#9 – Responses for Section B TIR

B-2 Flow Control Discussion

B-3 Direct Connection to Lake

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Section B (REPORT) - MINIMUM REQUIREMENTS #1-#9 - RESPONSES

Section B – Minimum Requirements

The “**Parklands Executive Residential Subdivision and Parklands Business Park**” proposal contains three threshold discharge areas (TDAs) which are subject to minimum requirements 1 – 10.

1. Preparation of Stormwater Site Plans

To be finalized.

2. Construction Stormwater Pollution Prevention

A SWPP will be prepared for implementation. An erosion control plan will be part of the construction plan set.

3. Source Control of Pollution

Preliminary TIR

Section D – Source Control

There are not any prohibited discharges planned for this site. A SWPP will be developed for the Final TIR that will further identify and list BMPs for Source Control and will include BMPS to prohibit sediment laden runoff from leaving the site and impacting any local or State waters. In addition, BMPs will be implemented as necessary to prevent pollutants from coming in contact with stormwater.

The proposed site is being developed with activities that are pollution generating. The following BMP categories have some degree of applicability, in particular, BMPs for Landscaping and Lawn/ Vegetation Management and Maintenance of Stormwater Drainage and Treatment Systems.

All source control BMPs in the public right-of-way will be the responsibility of Camas City forces per their established maintenance procedures. The stormwater facilities will be publicly owned and maintained in a manner consistent with the Stormwater Facility Maintenance Manual and BMPs for Landscaping and Lawn/Vegetation Management.

Individual lot owners will be responsible for source control BMPs related to installing and maintaining landscaping and roof downspout systems on their respective lots. This responsibility includes the prevention of introduction of

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pollutants into their system(s). Application of appropriate maintenance measures will also provide source control.

4. Preservation of Natural Drainage Systems and Outfalls

There are no existing onsite drainage systems of significance for the overland flow to the wetland areas. See continued discussion under next Minimum Requirement.

5. Onsite Stormwater Management

Preliminary TIR

Section E – Onsite Stormwater Management BMPs

An Erosion Control Plan(s) will be developed for implementation of BMPs to manage stormwater during grading activities will be shown on the erosion control plan.

Individual lot owners will be responsible for installing and maintaining roof downspout systems on their respective lots consistent with Downspout Dispersion Systems (BMP T5.10B) Volume III, Chapter 3.1.2 of the SMMWW (2012).

6. Runoff Treatment

Preliminary TIR

Section F – Runoff Treatment and Design

The following treatment elements pertain to this project:

1. Basic stormwater treatment is required for the private streets within this project.
2. Enhanced stormwater treatment is required for the business portion of this project.
3. Phosphorous removal is also required.

Design approaches:

- a) Roof and drive runoff will be re-introduced as sheet flow (dispersion) to the specific lot source. The soils for these lots will be amended or augmented with HSG B soils as a surface and fill layer.
- b) The management of flows from the lots will be to sheet flow dispersion at the respective wetland buffer.

Onsite:

- 1) Business Park Roof runoff – directed to storm system that is receiving treated runoff
- 2) Business Park parking and landscape areas that drain onto parking pavement- treatment in Filtera® system(s)
- 3) Private Streets - treatment in Filtera® system(s)

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Offsite:

- 4) Larkspur and a future development west of Larkspur (future) – a bypass by is provided for direct flow Storm Line ‘C’ for release to Wetland A – assume that this (these) areas will be treated (future) prior to entering bypass system in Camas Meadows Drive.
 - 5) Camas Meadows Drive and landscape areas – paved areas treated in Filtera® system(s) – sidewalk and landscape areas collected and directed to storm system as bypass flow after the Filtera® system(s)
 - 6) The Village site will develop three storm system lines for conveyance - one ‘clean’ and two ‘dirty’. The two ‘dirty’ lines will be directed Filtera® system(s) or as an option to a bioretention facility(ies) along Camas Meadows Drive prior to further conveyance.
- c) The existing site release is from Wetland A to the north toward Lacamas Lake. Wetland A receives flow from Wetland B via two existing culverts at a field road crossing. A small portion of the offsite and onsite drainage basin area flows to Wetland C which extends east and has an east to northeast release path.
 - d) Wetland B provides an opportunity to provide added water quality mitigation as well as stormwater management. A further description of Wetland B and the inherent suitability for this design approach is presented under 8. Wetlands Protection.

7. Flow Control

Preliminary TIR

Section G – Flow Control Analysis and Design

Control-Exempt Surface Waters) of the Stormwater Manual and all of the following criteria are exempt from Minimum Requirement 7 (Flow Control):

- a. *Project meets the exemption requirements (described in Volume I, Section 2.5.7 of the Stormwater Manual) for discharges to one of the following water bodies:*
 - Columbia River
 - Lacamas Lake
 - Round Lake
- b. *Runoff is treated in accordance with Minimum Requirement 6 (Runoff Treatment).*

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c. The discharge structure is designed to avoid erosion during all storms up to the 100-year storm.

d. If an existing discharge structure is used the discharge structure and conveyance system leading to the discharge must have adequate capacity to meet the requirements of Chapter 7 (Conveyance Systems) of this manual.

Flow control facilities are not required for this project. The noted criteria will be applied to meet the exemption. Specifically, in relation to water quality.

However, as previously mentioned, design features are proposed that will slightly 'reduce' peak flow.

- a) Soil amendment or replacement to replicate HSG B soil characteristics.
- b) An option – may not be accepted for phosphorous treatment. Employ bioretention systems with media for phosphorous control – the filter media depth and infiltration rate will 'delay' these flows by as much as 4.5 hours.

8. Wetlands Protection

Camas Stormwater Manual

For projects with stormwater discharges to a wetland, either directly or indirectly through a conveyance system, the preliminary TIR shall describe wetland protection measures to be implemented in accordance with Minimum Requirement 8. The narrative shall describe the measures that will maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support existing and designated uses.

- 1) The TIR will demonstrate that the proposed development will manage stormwater runoff in a manner that will provide wetland protection measures as noted. These wetlands are separated by existing culverts and are somewhat non-typical in that there is a significant gradient for flow through.

➤ *Several resources have been reviewed related to wetlands and wetland protection*

Regarding *“measures that will maintain the hydrologic conditions, hydrophytic vegetation, and substrate characteristics necessary to support*

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existing and designated uses", the second reference seemed to provide some data that is helpful in making this assessment.

It provides the following definitions regarding processes that were evaluated.

Hydroperiod

Refers to the depth, duration, frequency and pattern of wetland inundation has been determined to be a key factor in determining biological responses

Water Level Fluctuation

WLF is measured as the average difference between the maximum depth and average instantaneous or base depth in a time period (Taylor 1993, Taylor, Ludwa and Horner 1995).

Excursion

The frequency of storm events was measured in a hydroperiod by defining an event a water level increase above the monthly average depth of more than 0.5 ft.

Duration

defined as the time period of an excursion

- If the option for bioretention facilities allowed for phosphorous control the following approach for design will be applied:
 - 2) The Simple Method will be applied to ascertain pre and post Phosphorous loading.
 - 3) Phosphorous soil mix will be applied at the bioretention facilities to reduce levels to satisfactory levels. Any portion being further routed through the Wetland A and B will also potentially receive further removal through settling and plant biological processes.
 - 4) Wetland B has a low area near the outlet to Wetland A. One of the two culverts is about six feet lower than the elevations along some of the south, north, and east buffer delineation. By retrofitting the two culverts, a ponding area that covers about 43% of Wetland B could be established. This ponded water along with the ponded water in the SWTF system – aside from water quality benefits - would provide wetness to the surrounding soils and be especially beneficial during extended dry periods in the summer months.

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- 5) This approach also provides opportunity for wetland diversity aspects through additional plantings that would be similar to plantings in a Stormwater Wetland Treatment Facility (SWTF) BMP 10.30.

Basin/Watershed Planning

Not applicable per Camas Stormwater Manual.

9. Operation and Maintenance

An Operation and Maintenance procedure document will be developed and include City of Camas procedures and processes. The Clark County Stormwater Facility Maintenance Manual and DOE references will also be referred to for additional or appropriate material for inclusion.

B-2 FLOW CONTROL DISCUSSION

Parklands Executive Residential and Parklands Business Park at Camas Meadows Golf Course – Flow Control Discussion

This project discharges to a Flow Control - exempt receiving water – Lacamas Lake. Responses are included for this section on flow control, but section 2.5.8 *Minimum Requirement #8: Wetlands Protection seems more applicable. The wetlands are within the 100 yr flood plain.*

2.5.7 Minimum Requirement #7: FlowControl Applicability

Projects must provide flow control to reduce the impacts of stormwater runoff from impervious surfaces and land cover conversions. The requirement below applies to projects that discharge stormwater directly, or indirectly through a conveyance system, into a fresh water - except for projects that discharge to a water in Appendix I-E – Flow Control-Exempt Receiving Waters in accordance with the following restrictions:

- *Direct discharge to the exempt receiving water does not result in the diversion of drainage from any perennial stream classified as Types 1, 2, 3, or 4 in the State of Washington Interim Water Typing System, or Types “S”, “F”, or “Np” in the Permanent Water Typing System, or from any category I, II, or III wetland; and*
 - **The stormwater runoff from this development does not result in the diversion of drainage from any perennial stream .. or from any category I, II, or III wetland;**
- *Flow splitting devices or drainage BMP’s are applied to route natural runoff volumes from the project site to any downstream Type 5 stream or category IV wetland:*
 - **Separate storm systems and BMPs are applied to route from the project site to a category III wetland: The separate systems allow the development to discharge runoff volumes close enough to natural runoff volumes that the wetland hydroperiod and downstream erosion aspects are not negatively impacted. The discharges are to two interconnected category III wetland segments that continue offsite as part of a larger wetland complex.**
- *Design of flow splitting devices or drainage BMP’s will be based on continuous hydrologic modeling analysis. The design will assure that flows delivered to Type 5 stream reaches will approximate, but in no case exceed, durations ranging from 50% of the 2-year to the 50-year peak flow.*
 - **The discharge is to large wetland complex. See next comment.**

B-2 FLOW CONTROL DISCUSSION

- *Flow splitting devices or drainage BMP's that deliver flow to category IV wetlands will also be designed using continuous hydrologic modeling to preserve pre-project wetland hydrologic conditions unless specifically waived or exempted by regulatory agencies with permitting jurisdiction; and*

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Parklands Executive Residential and Parklands Business Park at Camas Meadows Golf Course – Flow Control Discussion

- **The discharge is to large wetland complex. The available continuous model software is not suited for the complex stormwater management controls being applied for this project. We propose that this requirement should be waived for this project.**
 - **The TIR contains an analysis for a direct area input analysis and provides historic and post-development runoff hydrographs related to the inflow and outflow condition of the discharge from Wetland A. This comparison shows that the wetland hydroperiod elements of concern are not negatively impacted. See C-2d.**
- *The project site must be drained by a conveyance system that is comprised entirely of manmade conveyance elements (e.g., pipes, ditches, outfall protection, etc.) and extends to the ordinary high water line of the exempt receiving water; and*
 - **Some of this project is drained by several stormwater piping systems. However, lots directly bordering the wetland buffer areas will sheet flow directly to and through the buffers. The piping system outfalls will be protected against erosive forces before being released to the wetland buffer area.**
 - **The wetland area discharges northerly through the continuation of the wetland complex to the ordinary high water line of the exempt receiving water.**
 - *The conveyance system between the project site and the exempt receiving water shall have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected*
; and
 - **This offsite area is being accounted for in the piping system design to have sufficient hydraulic capacity to convey discharges from future build-out conditions (under current zoning) of the site, and the existing condition from non-project areas from which runoff is or will be collected .**
 - **The conveyance system between the project site and the exempt receiving water has sufficient hydraulic capacity for this project and upstream projects in a fully developed condition.**

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B-2 FLOW CONTROL DISCUSSION

- *Any erodible elements of the manmade conveyance system must be adequately stabilized to prevent erosion under the conditions noted above.*

If the discharge is to a stream that leads to a wetland, or to a wetland that has an outflow to a stream, both this requirement and Minimum Requirement #8 apply.

- **There are no elements in the proposed stormwater management design that will introduce erodible elements onsite or to the wetland complex and outfall conveyance as a whole.**

Local governments may petition Ecology to exempt projects in additional areas. A petition must justify the proposed exemption based upon a hydrologic analysis that demonstrates that the potential stormwater runoff from the exempted area will not significantly increase the erosion forces on the stream channel nor have near field impacts.



Contours - Flow to north



- Legend**
- Contour Lines - 2 ft
 - Contour Lines - 10 ft
 - Contour Lines - 200 ft
 - Building Footprints
 - Taxlots
 - Cities Boundaries
 - Urban Growth Boundaries



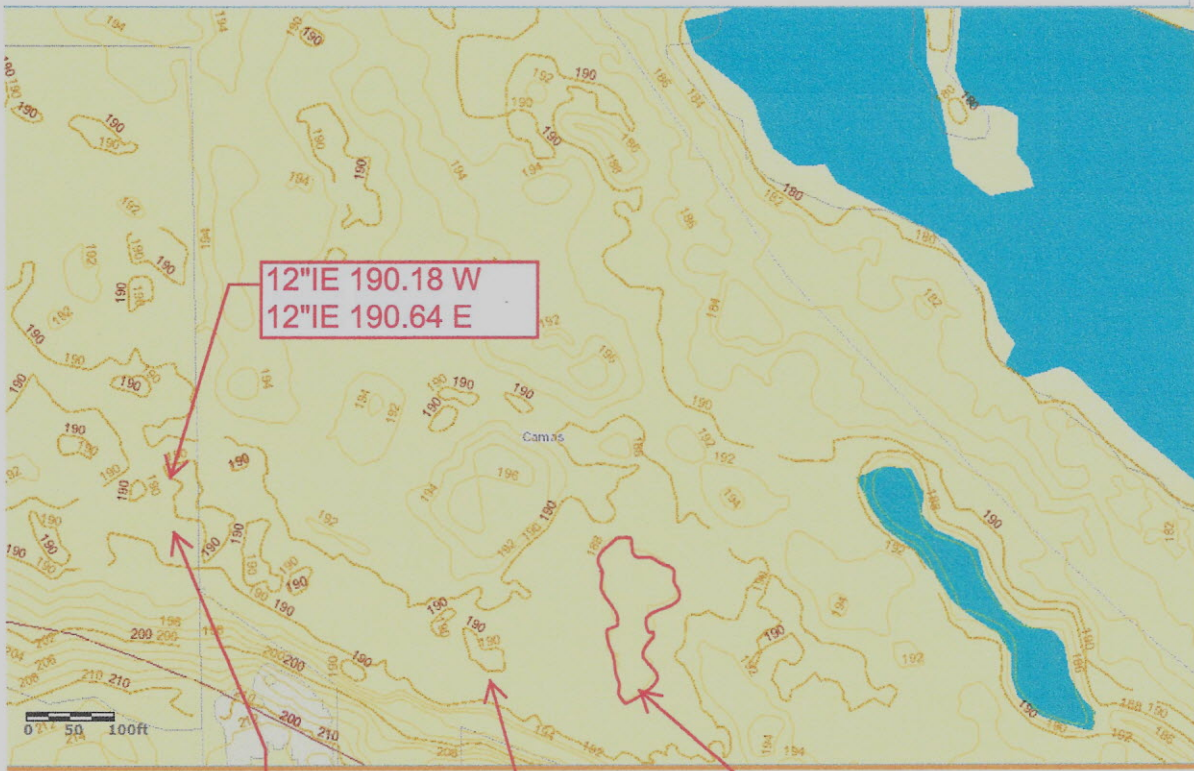
Notes:

0.1 0 0.03 0.1 Miles

WGS_1984_Web_Mercator_Auxiliary_Sphere
Clark County, WA. GIS - <http://gis.clark.wa.gov>

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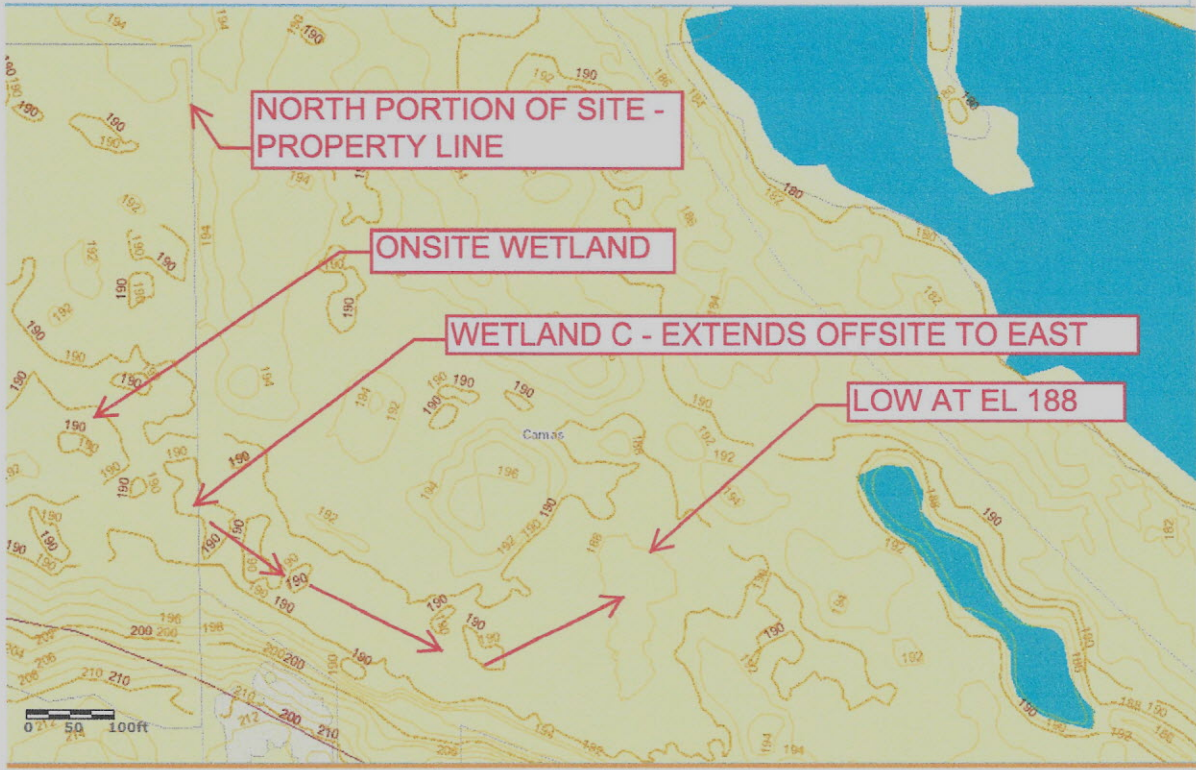


12"IE 190.18 W
12"IE 190.64 E

12"IE 190.30 W
12"IE 190.73 E

contour 188

path crossing -
culvert(s)?



NORTH PORTION OF SITE -
PROPERTY LINE

ONSITE WETLAND

WETLAND C - EXTENDS OFFSITE TO EAST

LOW AT EL 188

OFFSITE TO EAST OF SITE