



**STORMWATER**  
**Conveyance and Drainage Pond**

**OPERATIONS & MAINTENANCE MANUAL**

for

**Fraser Estates 2<sup>nd</sup> Addition**

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MCE No. 04-230

# STORMWATER CONVEYANCE AND DRAINAGE POND OPERATIONS & MAINTENANCE MANUAL

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## 1.00 PURPOSE

This document is intended to provide general operations and maintenance guidelines for the drainage ponds and drainage facilities located within Fraser Estates 2<sup>nd</sup> Addition (**Spokane County File No. P-1864**). Implementation of these guidelines will insure that the drainage facilities will function as designed and installed.

## 2.00 INTRODUCTION

Generally, the drainage system is intended to collect stormwater runoff and convey it to detention pond(s) for temporary storage, infiltration and possible surface discharge. The drainage facilities consist primarily of a series of drainage inlet structures, storm pipes, detention ponds and overflow structures. It is of the utmost importance to provide adequate operations and maintenance activities to insure that the drainage facilities remain silt or dirt free, as this silt or dirt loading will affect the performance of the storm pipes and ponds. If these facilities were to become completely clogged, the only remedy would be complete reconstruction of the drainage facilities. Therefore, periodic maintenance is necessary. A full set of engineering drawings is available for review at Spokane County Public Works, under the County file number listed above.

## 3.00 GENERAL OPERATIONAL CHARACTERISTICS

The drainage facilities for Fraser Estates 2<sup>nd</sup> Addition are generally very simple, functional, and have low maintenance requirements. A periodic visual inspection of the facilities will typically identify any required maintenance. Most maintenance will consist of keeping the drainage structures, pipes and ponds free of debris and sediment. A specific inspection schedule should be followed. See **Section 4.0 – Maintenance Requirements and Schedules**.

### 3.10 Drainage Structures and Storm Pipes

Concrete gutters, cast iron inlet grates and subsurface concrete inlets direct surface runoff into buried storm pipes for conveyance to the detention ponds.

### 3.20 Detention Ponds

A detention pond consists of earthen depressions constructed from native soils, enclosed within soil berms, which provide temporary storage for the stormwater runoff. The storage volume for each pond was based on the required treatment volume, in general accordance with the '208' water quality treatment requirements. For Fraser Estates 2<sup>nd</sup> Addition, the detention volume was sized to contain the stormwater runoff created during a 1/2" storm event, without reaching the outlet

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structure or overflowing to the downstream property. During the 50-year storm event (4.58"), overflow is anticipated.

The primary form of stormwater disposal is pond bottom infiltration. The soil located in the floor of the pond shall be a medium to well draining material, with a minimum infiltration rate of 0.5 inches per hour. Beyond the required storage depth for '208' treatment, additional infiltration is provided by the infiltration structures.

### **4.00 MAINTENANCE REQUIREMENTS AND SCHEDULES**

Below is a maintenance description for each of the drainage system elements contained within Fraser Estates 2<sup>nd</sup> Addition, including the drainage structures, storm pipes and detention ponds. The Homeowner's Association shall maintain all drainage facilities, except those serving Wellesley Avenue and Lehman Road. Should the Homeowner's Association be terminated for any reason, the maintenance responsibilities will become that of the individual landowners of Fraser Estates 2<sup>nd</sup> Addition.

The Homeowner's Association shall provide to the Spokane County Engineer the name, address, and 24-hour telephone number for the entity responsible for performing routine and emergency maintenance inspections and repairs. This information shall be confirmed on a yearly basis. The Homeowner's Association shall provide notice of any changes to the Spokane County Engineer within 15 days of said changes.

#### **General**

Proper maintenance procedures are necessary for the continued functioning of the drainage facilities. Improper maintenance, or lack of attentive maintenance measures, may result in negative drainage impacts. It is strongly recommended that the Homeowner's Association designate an individual who will be responsible for making sure the maintenance measures are implemented.

Generally, maintenance personnel are to conduct a visual inspection of the drainage facilities immediately following a substantial rainfall event or snowmelt event.

Substantial events include:

- Noticeably hard rain for a short period (30 minutes or more),
- Steady rain for a long period (6 hours or more), or
- Significant rainfall and/or snowmelt when the ground is frozen.

For long duration storms, longer than 24 hours, maintenance personnel are to inspect the drainage facilities during the storm event to identify any developing problems and correct them before they become major problems.

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1. Inspect all drainage structures (inlets, grates and curb drops) to ensure they are clear of debris and obstructions.
2. Inspect all pond berms for breaches. Immediately repair any breach with native sandy soil, compacted in place.

The above noted storm related visual inspections are in addition to the maintenance schedules noted below for each item.

### 4.10 Drainage Structures and Storm Pipes

Concrete Inlets and pipes should be inspected every 3 months, or after every significant storm event (1/2") and/or snowmelt event, whichever is more frequent. Visually inspect the pipes, inlets and outlets, making sure they are clear of debris and checking that the pipe is in good condition, without breaks or cracks. If there is an obstruction present, it should be removed immediately.

A flow test in the pipe can be used to readily detect major obstructions or breaks in the pipe. This test requires a water source (hydrant or water truck) and a person at the downstream end of the pipe observing the flow exiting out of the pipe section.

### 4.20 Detention Ponds

The detention ponds should be inspected every 3 months, or after every significant rainfall and/or snowmelt event, whichever is more frequent.

Routine maintenance and inspections of the pond will include removal of any accumulated debris, such as leaves, weeds and trash. Any obstructions that would not allow water to flow freely from the ponds via the outlet structures or overflow berms should be removed or repaired. Additionally, the pond berms should be inspected to insure that they are in good repair and structurally competent, and that no outflow has occurred other than through the outlet structure or overflow berm.

The Homeowner's Association shall be responsible for replacement of any grass turf and underlying 1-foot depth of soil in ponds whenever the vegetation appears to indicate a problem due to contamination. The turf and underlying soil shall meet Spokane County requirements for permeability in effect at the time of replacement.

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### 5.00 Recommended Set-Aside Funds for Maintenance & Future Replacement Costs

There will be annual maintenance costs, major renovation costs and future replacement costs of the drainage facilities. These costs are the responsibility of the Homeowner's Association or successors in interest. Major renovation and future replacement costs have been converted to annual costs, in the form of recommended set-aside funds. It is assumed that half of the storm pipe will need to be replaced within 20 years.

Table 5.00A - Pipe Replacement

Pipe Size (in)	½ Total Length (ft)	Present Value Per L.F.	Value Total	Future Value <sup>1</sup>
10	117	\$ 12	\$1,404	\$3,075
12	430	\$ 16	\$6,880	\$15,075
18	138	\$ 20	\$2,760	\$6,050
24	128	\$ 24	\$3,072	\$6,730
36	237	\$ 36	\$8,532	\$18,695
			<b>TOTAL</b>	<b>\$49,625</b>

The estimated annual maintenance costs and recommended annual set-aside costs are listed below in Table 5.00B. It is recommended the Homeowner's Association set-aside these amount of funds annually, to ensure that adequate maintenance and replacement measures of the drainage facilities will be implemented.

Table 5.00B - Maintenance and Future Replacement Costs

Drainage Facility	Annual Maintenance Costs	Annual Set-Aside Funds for Future Replacement or Major Renovation <sup>(1)</sup>
Drainage Structures, Pipes & Ponds	\$ 4,000	\$ 1,350

Note: (1) Assume replacement in 20 yrs, with 4% inflation and a 6% rate of return on investments for set-aside account. (F/P,4%,20)=2.1911, (A/F,6%,20)=0.0272.

**Grand Total/year = \$ 5,350**

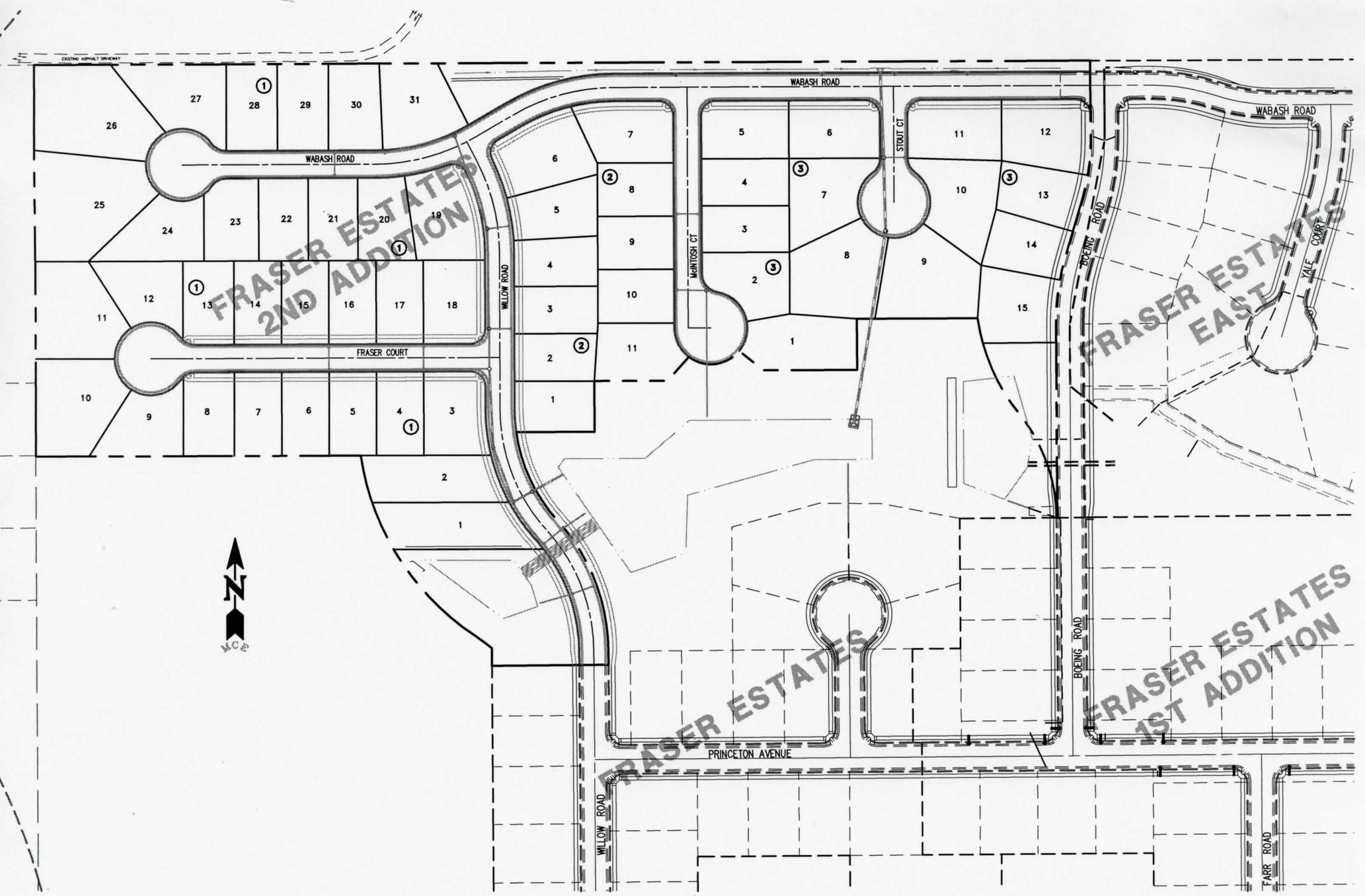
**Cost per lot/year = \$ 94 (57 lots)**

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**TECHNICAL APPENDIX**

**SITE MAP**



FRASER ESTATES  
2ND ADDITION

FRASER ESTATES  
EAST ADDITION

FRASER ESTATES

FRASER ESTATES  
1ST ADDITION