KERR WOOD LEIDAL
consulting engineers

Appendix E

Survey

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E. Introduction

Kerr Wood Leidal Associates Ltd. (KWL) undertook survey of a number of storm sewers, storm manholes, culverts and storm detention ponds/facilities in the City of Courtenay (City) as part of the Integrated Rainwater Management Plan (IRMP) Phase 3 process to fill gaps in available data provided by the City. In particular, the survey targeted storm sewers, storm manholes, culverts, and storm detention ponds/facilities where missing information would make modelling of these infrastructure elements difficult or the results unreliable.

Data received from the City was checked for any missing elements and for quality as noted in Appendix A. The City filled nearly all the data gaps following the previous IRMP Phase 1 and 2 work. Therefore, there was very little missing data for the storm system network. Missing data was compiled and given to the KWL survey team who filled in as much of the missing data as they could in the field within the confines of the project budget.

All surveyed storm sewers, storm manholes, culverts and storm detention ponds/facilities can be seen on Figure E-1. Locations of interest were traversed on foot and data was identified and recorded with the GIS collector application on an iPad. Measurements, photographs, and additional observations were recorded as attributes associated with the GPS positions to create a comprehensive GIS database.

The surveys were carried out between November 30th and December 3rd, 2021, allowing measurement of invert elevations, storm sewer and culvert opening sizes, lengths, material types, and general arrangement of the various infrastructure. A total of 12 individual culverts, 8 storm sewer pipes, and 6 storm manholes were surveyed. In addition, 6 stormwater ponds were surveyed within the Crown Isle Resort and Golf Community development. Additionally, 1 other storm detention pond was surveyed located on the North Island College site. At each detention pond, inlet/outlet culverts and weir structures were surveyed along with further topographic data to ascertain an approximate volume.

E.1 Survey Equipment, Methodology and Coordinate System

Survey data including culvert, storm sewer and manhole invert elevations were established using a high accuracy Trimble R8 receiver. It operated on Can-Net's Virtual Reference Station Network 3.0. Horizontal coordinates are UTM Zone 10 NAD83(CSRS). The vertical datum of CGVD28 was accessed by GNSS using GeoID model HTv2.0(1997). Survey control monuments as published by MASCOT BC were located to confirm 3D positional accuracy of the GNSS unit.

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E.2 Culvert, Storm Sewer, and Storm Manhole Invert Elevations

GIS Data

The culvert, storm sewer and storm manhole information collected was entered into a GIS database which included the fields as shown in the tables below. This will allow integration of surveyed information into the City's GIS by City staff. The GIS data is available digitally. The location of the culvert and storm sewer end points is contained in the GIS spatial data and the tabular GIS data for each culvert and storm sewer and includes attributes as listed in Table E-1 and Table E-2.

Table E-1: Culvert Attributes

Attribute	Example Culvert
Type (shape)	Circular
CulvertTyp (shape code)	3
Material	Concrete
Height (mm)	750
Width (mm)	750
ID_Pipe	1334
As-built (length m)	15.8
US_Elev (invert m Geodetic)	81.49
DS_Elev (invert m Geodetic)	81.34
StatusLife	As-built
Owner	City of Courtenay

Table E-2: Storm Sewer Attributes

Attribute	Example Storm Sewer
Type (shape)	Circular
StormTyp (shape code)	2
Material	Concrete
Diameter (mm)	750
Height (mm)	750
Width (mm)	750

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Attribute	Example Storm Sewer
ID_Pipe	1332
As-built (length m)	15.8
US_Elev (invert m Geodetic)	81.49
DS_Elev (invert m Geodetic)	81.34
StatusLife	As-built
Owner	City of Courtenay

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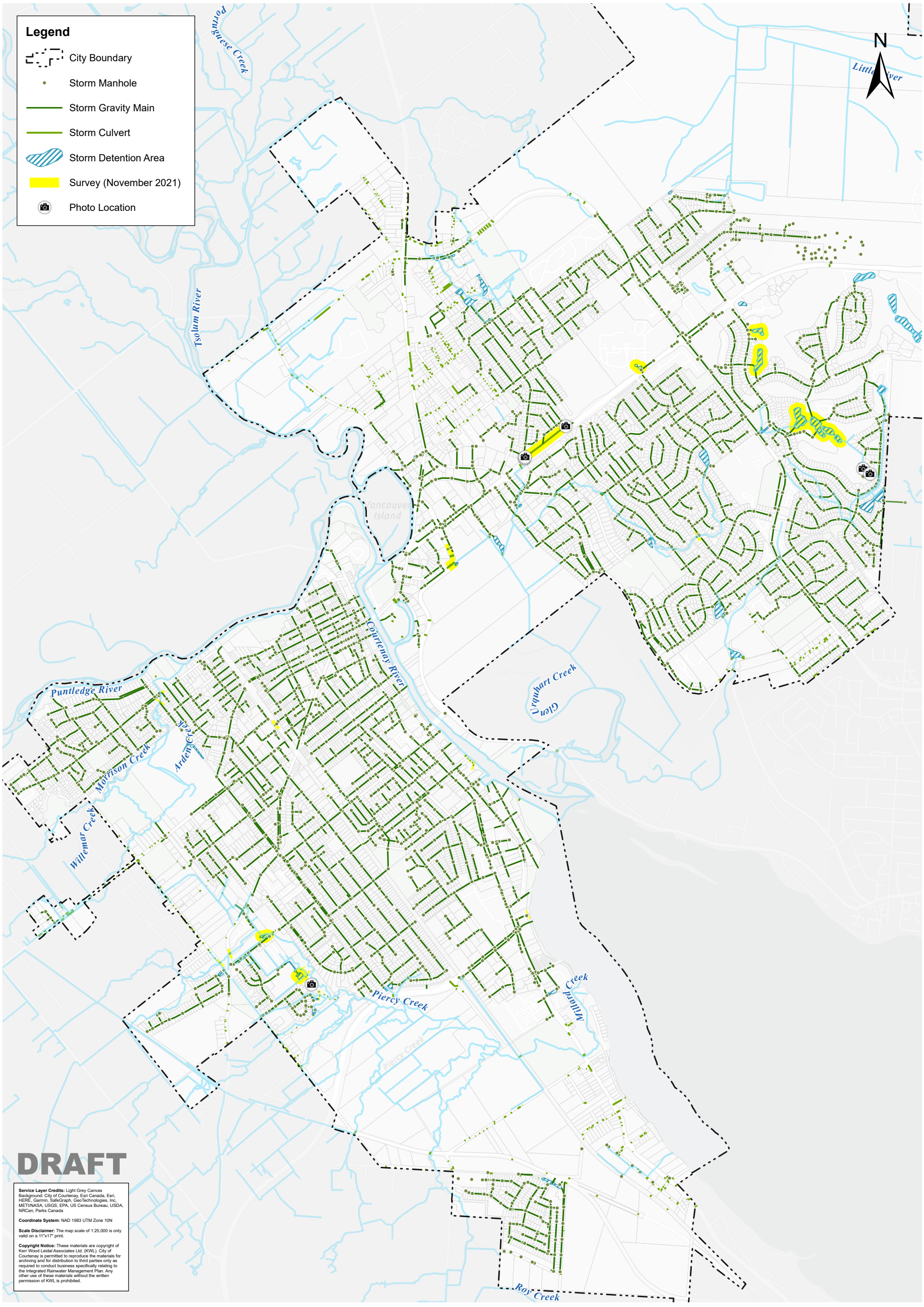
City of Courtenay

Integrated Rainwater Management Plan - Phase 3

KERR WOOD LEIDAL consulting engineers



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Service Layer Credits: Light Grey Canvas Background: City of Courtenay, Esri Canada, Esri, HERE, Garmin, SafeGraph, GeoTechnologies, Inc, METI/NASA, USGS, EPA, US Census Bureau, USDA, NRCan, Parks Canada

Coordinate System: NAD 1983 UTM Zone 10N

Scale Disclaimer: The map scale of 1:25,000 is only valid on a 11"x17" print.

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Project No. 2980-014

Date November 2022

Scale 1:25,000

0 100 200 400 m

Survey - November 2021

Figure E-1