Technical Memorandum

November 08, 2024

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From	Brett Vivyan PE, Zane Cook	**Project No.**	12638533
Project Name	City of Ferndale Water Quality and Drainage Improvement Project		
Subject	City of Ferndale Detention Basin Capacity, Runoff, and Effects on Wetlands		

1. Introduction

The City of Ferndale experiences frequent flooding during rain events near the Humboldt County Fairgrounds. Upgrades to the stormwater drainage system are needed to mitigate these flooding issues. The proposed Project involves replacement and new stormwater drainage infrastructure near the Fairgrounds, specifically along Arlington Avenue, 5th Street, Van Ness Avenue, and in the agricultural pasture north of Van Ness Avenue. The Project includes the replacement of existing storm drain inlets and piping along Arlington Avenue, new piping and swales along 5th Street, enlargement of the drainage swale in the pasture, and creation of a stormwater detention basin in the northern extent of the pasture. A schematic of existing and proposed flow paths and components is shown in Figure 1.

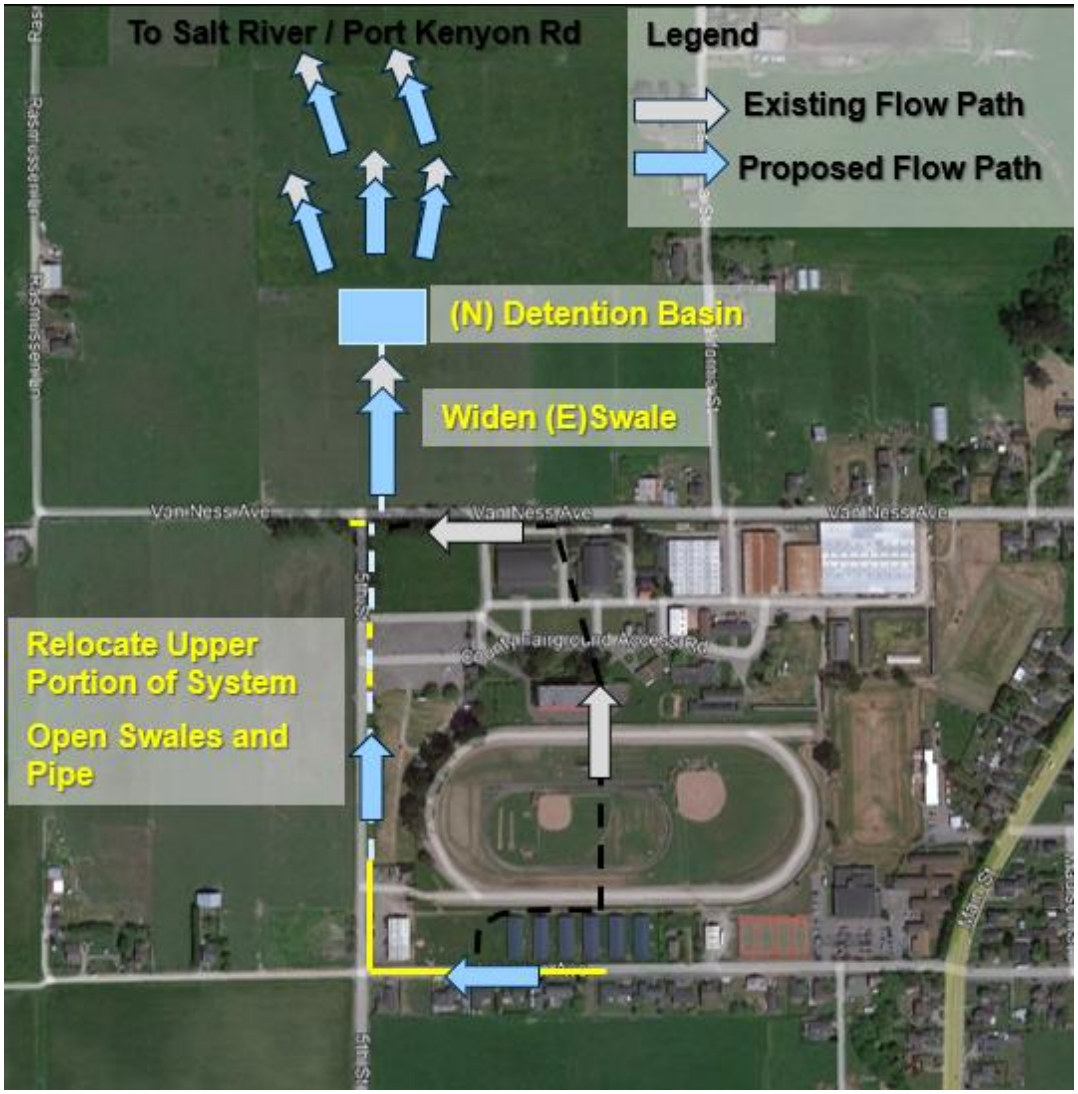

Figure 1 *Schematic concept of existing and proposed flow paths and features.*

1.1 Purpose of this Memorandum

The proposed 0.45-acre detention basin is located within an existing agricultural wetland at the downstream end of an existing drainage swale. Under existing conditions, runoff through the existing drainage swale flows north, leaving the shallow swale and discharges overland across agricultural pastures to the north. Overland flow has been observed to accumulate in shallow pools on the pastures, between the northern extent of the Project Area and Port Kenyon Road / Salt River between Rasmussen Lane to the west and California Street to the east (see Figure 2). These pastures are presumed to also exhibit wetland characteristics, because

vegetation appears similar to the documented agricultural wetland, wet weather observations, property owner descriptions of shallow pooled water, and no known obstruction to the groundwater aquifer.

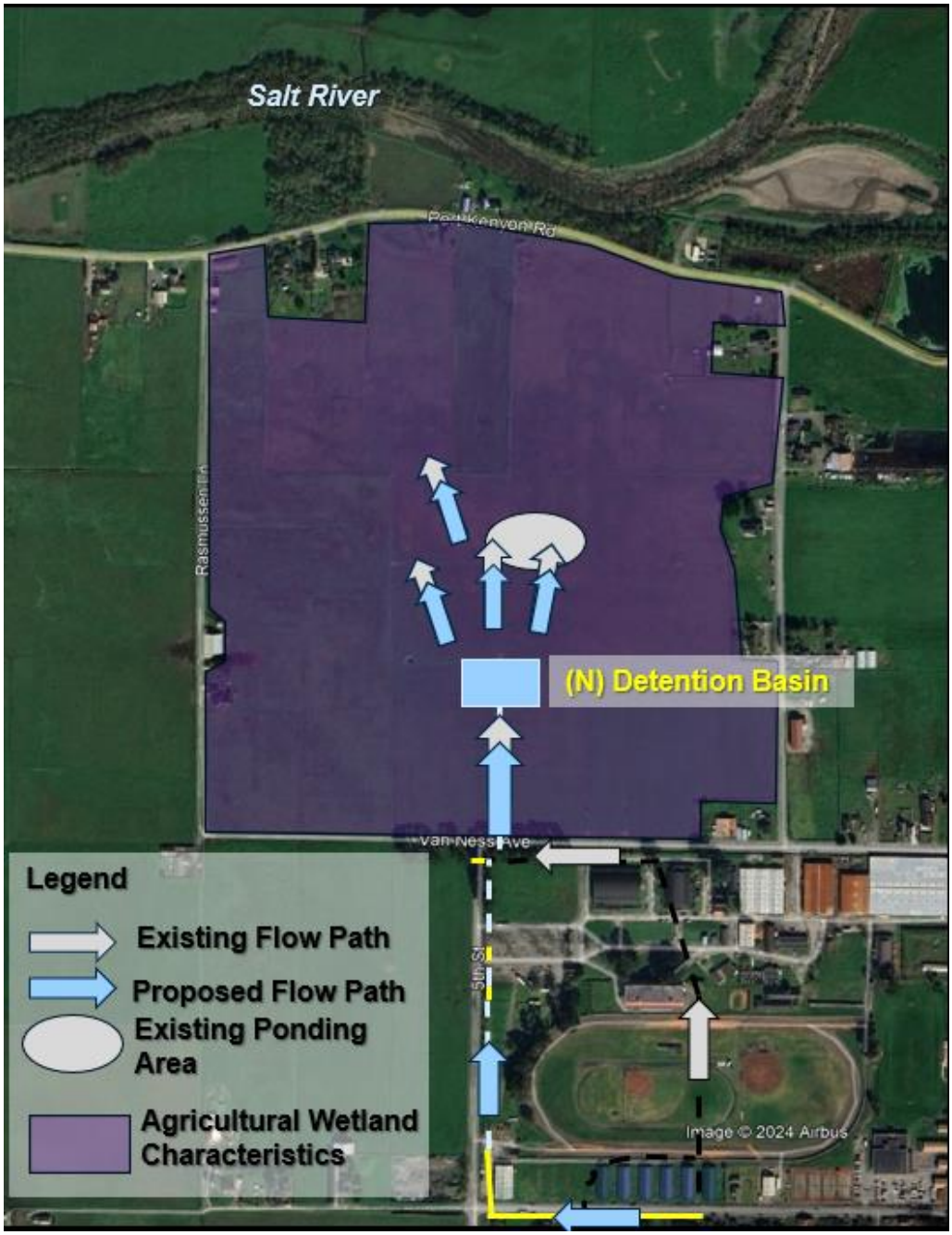

Figure 2 ***Overland flow and observed ponding areas***

Following a site visit with Coastal Commission staff, additional detention basin storage capacity information was requested to evaluate whether the proposed detention basin could affect the assumed wetlands to the north. The purpose of this memo is to provide the volume of rainfall runoff detained within the proposed detention basin, and the amount of overland flow that will continue north of the proposed detention basin to the agricultural pastures under a variety of rainfall events.

2. Detention Basin Capacity and Runoff Volumes

The proposed 0.45-acre detention basin is approximately 1.2 feet deep with a volume capacity of 26,463 ft^3. Design dimensions are shown in Table 1.

Table 1: Dimensions of proposed detention pond used to calculate storage volume.

Pond Dimensions	
Shape	Trapezoidal
Bottom Length	204 ft
Bottom Width	104 ft
Top Length	211 ft
Top Width	111 ft
Height	1.17 ft
Side Slope	3H:1V
Volume	26,463 ft^3

The contributing drainage area to the existing drainage swale, proposed detention basin, and agricultural fields to the north, is comprised of seven drainage management areas (DMA) which are located in the vicinity of the Project. The DMAs total 107.6 acres and consist of developed and undeveloped land (Table 2). To calculate runoff volume, each DMA was assigned a runoff coefficient based on a composite runoff value identified in the City's Storm Drain Master Plan and based on land use type.

Table 2: Subbasin characteristics used to calculate runoff volume.

Label	Area (acres)	Runoff Coefficient (Composite)
DMA 1A	15.6	0.75
DMA 1B	27.4	0.40
DMA 2A	11.6	0.55
DMA 2B	3.9	0.40
DMA 3	1.3	0.60
DMA 4	29.1	0.25
DMA 5	2.5	0.40
DMA 6	11.5	0.75
DMA 7	4.6	0.25

Using the area and runoff coefficients in Table 2 for each DMA, the detention basin has capacity to store and infiltrate a rainfall event of up to 0.15 inches (Table 3). Based on 24-hr rainfall data from National Weather Service Station CW7137 in Eureka at Woodley Island for a period of record 2008 to current, this 0.15-inch rainfall amount represents the 60th percentile 24-hour event (Figure 3). This means that approximately 60% of 24-hour rainfall totals will be stored and infiltrated within the detention basin, assuming no precipitation occurred within 72 hours prior. Based on soil infiltration rates, approximately 72 hours is required for the total capacity of the basin to infiltrate. Events exceeding 24-hours and 0.15 inch accumulation, or consecutive rain events with less than 72 hours between them, will overflow the detention basin and flow overland to the north, as under existing conditions.

Table 3: Stormwater runoff volume contributions for each subcatchment.

DMA	Runoff Volume for 0.15 inch rainfall (cubic feet)
DMA 1A	6,252
DMA 1B	5,871
DMA 2A	3,424
DMA 2B	842
DMA 3	406
DMA 4	3,885
DMA 5	542
DMA 6	4,621
DMA 7	620
Total Rainfall Runoff (ft^3)	**26,463**

DMA	Runoff Volume for 0.15 inch rainfall (cubic feet)
Total Detention Basin Storage Capacity (ft^3)	26,463

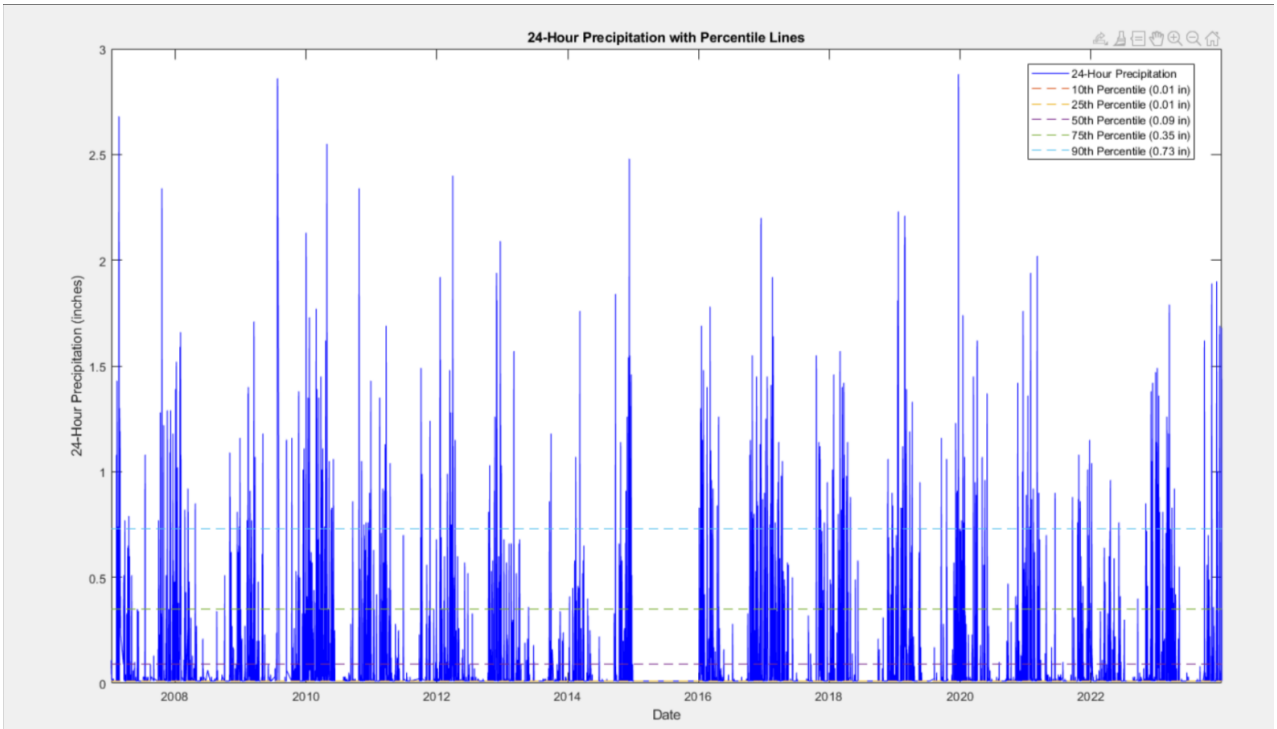

Figure 3 24-hour Precipitation Depth for National Weather Service Station CW7137 in Eureka at Woodley Island for a period of record 2008 to current.

Precipitation within the detention basin will infiltrate into the relatively shallow groundwater aquifer that contributes to the wetland conditions within the vicinity (including the agricultural pastures to the north of the proposed basin). Given the surrounding agricultural areas shown in Figure 2 exhibit similar observed characteristics of the agricultural wetlands in the Project Area, the location of infiltration within this area is not anticipated to result in changes to the overall groundwater depth elevation, or change wetland characteristics within this area. Groundwater gradients flow toward waterways, which is the Salt River to the north.

In summary, overland flow to adjacent agricultural lands is anticipated to persist when rainfall accumulation is above 0.15 inches in a 24-hour event, or when consecutive rainfall events occur over a 72-hour period. It is expected that the volume of this overflow to the north in addition to infiltration at the detention basin location, approximately 450 feet south of the current area where ponding on the agricultural pastures has been observed, will not likely have a significant effect on groundwater levels and therefore not result in changes to wetland characteristics in the areas to the north of the detention basin.