

MEMORANDUM

Date: January 27, 2017 Project Number:
To: Brian Lee P.E. Project Manager - City of Half Moon Bay
From: Jason Drew CPECS - Project Manager and Ryan Shafer P.E. - Principal
Subject: Seymour Ditch – Preliminary Field Observations

On January 22, 2017 NCE conducted a preliminary field investigation of Seymour Ditch and its contributing drainage area to assess erosion features, factors causing the erosion and to field verify the Seymour Ditch drainage area and patterns. The preliminary field observations were conducted during an ongoing precipitation event within an unusually wet January with above average rainfall. Precipitation totals from the rain gage located at the Montara Water and Sanitary District's Water Treatment Facility show that 1.12 inches of rain fell on January 22, 2017 (<http://www.balancehydrologics.com/mwsd/>). Flows were present in the channel but flow rates were not available or estimated.

Existing information and data

NCE obtained and reviewed the following information prior to visiting the site and performing the preliminary field observations.

- March 8, 2016 Planning Commission Staff Report for the Seymour Bridge Replacement Project
- January 12, 2007 and January 17, 2017 videos and photos captured by City Staff of the site
- May 18, 2016 Seymour Pedestrian Bridge design plans
- Historic photos of the County landfill site provided by City Staff on January 17, 2017
- County landfill site map provided by City staff on January 20, 2017

Erosion types

There are three types of erosion occurring at the site including bluff erosion, a channel head cut and channel down cutting. Bluff erosion, predominantly from ongoing coastal wave and tidal action, is occurring throughout the region and is likely to accelerate with sea level rise. Although active at the western edge of the project area, bluff erosion currently does not appear to significantly influence erosion within the Seymour Ditch channel. As shown in **Photo 1A**, a significant head cut has formed at the location of the former Coastal Trail pedestrian bridge (abutments still visible). The head cut is active and evidence of active bed and bank erosion was identified by NCE staff while on site. The feature was formally dominated by a large vertical drop (approximately 25-30 feet in height) at this location (**Photo 1B**). It appears that over time the underlying soils were eroded and a large portion of the bed and banks sloughed creating the cascade feature which was evident when NCE performed our field observations. Finally, the Seymour Ditch channel is actively down cutting throughout its length (**Photo 2**). The temporal relationship of this down cutting is unknown. What is clear is the channel has down cut through the fat clay dominated

A horizon in the western half of the channel and is very close to the bottom of the A horizon in the eastern half of the channel. A more thorough soils analysis will need to be conducted prior to developing any erosion control solutions for the site.

NCE made additional general observations while on site:

- The A horizon or clay soil material (approximately 3.5-4.5 feet in depth) is very expansive (that is it tends to shrink and swell with changes in moisture content) and its cohesive nature and its stiffer consistency affords it a greater ability to resist erosion
- Once flow in the ditch works through the clay the underlying unconsolidated granular soils are highly erodible
- The only vegetation associated with the main ditch are trees (predominately Cypress)
- The root system of trees on both the left and right banks has assisted in holding the bed and bank together
- Channel down cutting has lowered the channel grade below the top root systems and many of the trees are being undermined and collapsing into the channel

Erosion causes

Surface flows in the channel are the primary vector for both the head cut and down cutting. What is not well understood, at this time, are the flow characteristics in the channel and their relationship with localized erosion features. A key question which needs to be answered prior to selecting stabilization measures is "what are the channel forming or erosion causing flows in Seymour Ditch?" Has most of the erosion in Seymour Ditch occurred during large high energy storm events? Or during small, frequent storm events and base flow? Or both? The answer to these questions will drive the appropriate long term stabilization approach. As mentioned above, tidal/wave action and surface runoff do not appear to be significantly connected at this location, so the energy associated with storm surges and high tide are not substantially influencing the head cut or channel down cutting.

Drainage

Surface flows associated with the ditch and in the contributing drainage area appear to have been significantly altered over the past 40 years with landfill grading and filling of drainage features as well as land development with new streets and homes. As a result the ditch likely receives more flow than historical drainage regimes. The current contributing drainage area is large at 577 acres and includes agricultural fields, residential development, local roads and Highway 1 (**Figure 1**). The northern portion of the drainage area is dominated by residential development with residential runoff delivered to the ditch from the end of both Seymour Street and Magnolia Street (**Photos 3 and 4**) where the southern portion is dominated by agricultural fields. There are two wetland/stormwater basin features at the west end of Seymour Street (Photo 5). The size, purpose and treatment capacities of these features is unknown at this time. NCE is currently in the process of obtaining flow and velocity information from the Storm Drain Master Plan for the Seymour Ditch.

Preliminary considerations and recommendations

Based on review of readily available information and preliminary field observations, NCE considered both temporary erosion control measures and permanent stabilization of the site. NCE's general observation and overall recommendation is for the City to focus efforts and resources on a permanent solution to the existing drainage and erosion issues rather than expand resources on identifying and deploying temporary erosion control measures that could be compromised by further erosion and/or deterioration of the head cut and steep bluffs. The site should be monitored closely for the remainder of this raining season in case site conditions change or erosion at the head cut significantly accelerates. The City should also take the necessary safety precautions to keep trail users away from active erosion areas and slopes with appropriate barricades and/or fencing. We make this recommendation understanding the site is actively eroding and concerns exist about the potential for the erosion to impact local infrastructure. Based on NCE's preliminary field observations we concur the site is actively eroding but there does not appear to be an immediate threat to any existing infrastructure or the County's historic landfill site. Also an important consideration is the disturbance associated with the construction of any temporary measures given the saturated conditions at the site and likely precipitation events in February, March and April. For discussion purposes the following are temporary stabilization measures preliminarily considered by NCE:

- Placing a temporary headwall in the channel and then constructing surface piping to convey flows to the elevation of the beach
- Keying in a geotextile or visqueen type product at the upper end of the channel for surface protection and running the product all the way to the elevation of the beach
- Diverting flows away from the ditch to a new discharge locations (new discharge locations would have to be identified)

All three options are viable but have significant limitations, constraints, costs and construction considerations associated with them. One of the most important is the amount of disturbance and earth moving activity required to construct each improvement. NCE's concern is performing this disturbance during the raining season has the potential to exacerbate erosion. For these reasons and the current site conditions, NCE does not recommend the City move forward with deploying temporary erosion control measures at this time.

With this said, NCE recommends the City expeditiously initiate development of permanent solutions to facilitate construction prior to the start of the raining season in late 2017. The timing of these permanent solutions is critical to prevent further erosion and deterioration of the ditch and protect local infrastructure including the landfill and recently moved bridge. Permanent solutions discussed with City staff on January 24, 2017 include stabilizing the head cut with structural controls like rip rap, gabions or bioengineered designs; addressing channel down cutting by revegetating or armoring the channel; placing the entire system in a storm drain and capturing and routing flows to the elevation of the beach; or diverting surface flows away from the channel permanently and constructing new stabilized outfalls at appropriate locations. NCE recommends the City perform a more formal review of existing conditions and alternatives evaluation process for the site in order to identify the most cost effective permanent solution.



Photo 1A



Photo 1B



Photo 2



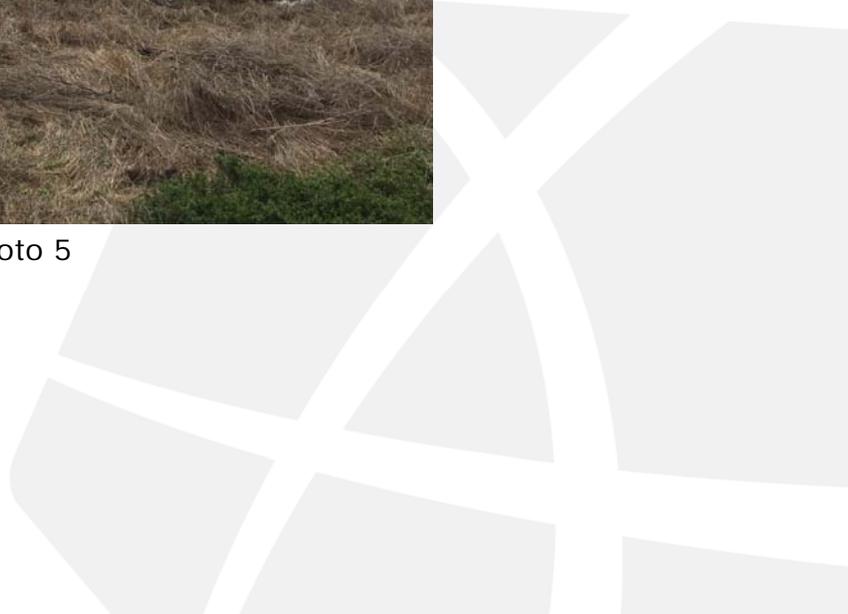
Photo 3



Photo 4



Photo 5





File: P:\Katie\Projects\Half Moon Bay - 561.05.55 - Seymour Ditch Erosion Control\CAD\Cabrillo Field Map 2017.dwg | Layout: Figure 1 | Printed: Jan 27, 2017 @ 4:59pm | 10.48x20.00 (US, Tech)

- LEGEND**
- - - - - = APPROXIMATE FLOWLINE / DITCH
 - = APPROXIMATE STORMWATER IMPOUNDMENT AREA
 - = CULVERT
 - = SCHEMATIC STORMWATER SOURCE FROM FIELD AREAS

NOTE

IT SHOULD BE NOTED THAT DURING OUR SITE VISIT ON JANUARY 22, 2017, FIELD AREAS IN THE VICINITY OF SEYMOUR DITCH WERE SATURATED WITH SURFACE STORMWATER.



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Field Map of Observed Stormwater Sources
SEYMOUR DITCH EROSION CONTROL
HALF MOON BAY, CA

FIGURE
1

DRAWN J.B.	JOB NUMBER 561.05.55	APPROVED	DATE 01-26-2017	REVISED DATE
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