

***Draft Chimes Creek Bank
Stabilization and Channel
Restoration
Feasibility Study***

Prepared for:

City of Oakland, CA
*Community Economic Development Agency
Watershed and Stormwater Management
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Oakland, CA 94612-2034*

Submitted by:

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PREFACE

A bank stabilization and channel restoration feasibility study was prepared for Chimes Creek between Delmont Ave and the Alameda County Flood Control District culvert entrance near Nairobi Place in the City of Oakland, CA. Questa Engineering Corporation prepared this feasibility study under contract with the City of Oakland's (City) Watershed and Stormwater Management Department as part of a consent decree reached between the Millsmont Homeowners Association (MHA) and the City of Oakland (MHA, 2008). The primary goal of the report is to investigate and provide restoration alternatives to limit accelerated bank erosion and channel instability that currently threatens private property along Chimes Creek.

Specific *Project Goals* include:

- Execute topographical, biological, and geomorphic mapping in support of project design and alternative development;
- Review and analyze existing hydraulic and geomorphic conditions/constraints;
- Communicate with MHA regarding various bank stabilization and channel restoration techniques and urban geomorphology;
- Develop and design conceptual restoration alternatives to meet hydraulic, geomorphic, biological (habitat), regulatory (permitting), and community constraints;
- Recommend restoration alternatives to the City and MHA;
- Prepare feasibility level design of recommended bank stabilization/restoration alternatives; and,
- Propose a project schedule and feasibility level cost estimate for the recommended conceptual alternatives that includes final design, bidding, and acquisition of required permits.

This feasibility report is a conceptual plan that has been developed through a technical planning process which included the completion of detailed biological, geomorphic, and hydrologic analyses, and the development and screening of restoration alternatives, through a series of meetings with City staff and local residents. This feasibility report provides detailed hydrogeomorphic information and potential restoration alternatives to thwart further private property loss along Chimes Creek and restore a natural riparian community. This study should guide the subsequent development of more detailed engineering drawings which will be necessary for project construction.

EXECUTIVE SUMMARY

This report presents a feasibility analysis of bank stabilization and channel restoration along Chimes Creek in the City of Oakland, CA (**Figure 1**). The first part of the report investigates existing conditions with a hydrologic review, geomorphic assessment, and hydraulic modeling of 1,150 lineal feet of channel along Chimes Creek in the Millsmont neighborhood between Delmont Ave and the Alameda County Flood Control District culvert entrance near Nairobi Place (**Figure 2**). The second component of the feasibility analysis provides three restoration design concepts and a permitting/construction schedule for project implementation.

Preparation of this feasibility report and conceptual designs were based on detailed topographic surveying, and subsequent geomorphic, hydrologic, and biological investigations. Geomorphic analyses suggest Chimes Creek has incised some 8 to 12 feet over the last 50 years, creating over-steepened and unstable banks that are susceptible to slumping and failure. Overall, erosion problems in Chimes Creek are directly related to land use changes in the watershed that have decreased coarse sediment input and increased flood discharges. Chimes Creek is adjusting to a lower sediment supply and increased peak flows by eroding the channel bed throughout the unculverted sections of the project reach. Without action, continued vertical degradation ranging from 4 (downstream) to 22 ft (upstream) is possible.

An inventory of the study reach found two major sections that differ by the magnitude and type of erosion conditions. The lower section of Chimes Creek (STA 0+00 – 7+00) is dominated by vertical incision, toe undermining, and shallow geotechnical slump failures that lead to channel widening and property loss. The upper section of Chimes Creek (STA 7+00 – 11+50) is not dominated by vertical incision and bank failure zones and instead contains a well connected floodplain and only minor erosional features. Therefore, the prime focus of all bank stabilization alternatives was to stop vertical incision and stabilize bank slopes in the lower section.

In **Alternative 1** the channel profile and cross sectional shape will be re-graded to an equilibrium slope and form using elevated grade controls of large immobile boulders keyed into channel banks to minimize further incision. In addition, adjacent channel banks will be re-graded and slopes engineered and protected with a combination of seeding, erosion control blankets, native riparian plantings, and coir fiber roll toe protection. Channel bed fill material will be imported as necessary. Cost of this alternative is estimated to range from \$550,000-\$670,000. Although in the short term Alternative 1 is more expensive and requires property owners accept channel grading into portions of their yards, in the long term this alternative will likely have less (reactionary) maintenance problems, and will provide superior private property protection.

Alternative 2 includes strategically placing grade controls at current stream profile elevations along the channel and re-grading adjacent slopes only where necessary for construction access. Fill will not be used to increase channel elevations. Grade controls installed at current knick-points will prohibit further vertical incision. Additional bio-technical bank stabilization measures like brush mattresses, erosion control blankets, biodegradable toe protection, and riparian vegetation plantings will be installed to stabilize existing banks and failure zones. Cost of this alternative is estimated to range from \$400,000-\$490,000.

Alternative 3 will not contain grade controls or additional bank stabilization measures along channel banks. Instead, a roughened channel, composed of rock calculated to be immobile during the 25-yr event will be laid on top of the existing channel bed throughout the lower section of Chimes Creek. The roughened channel will mitigate vertical incision, and coir fiber rolls with willow stakes installed along bank toes will mitigate toe scour and lateral movement of the channel. Minor grading and stabilization will be performed only where construction access necessitates widening of the channel. Cost of this alternative is estimated to range from \$257,000-\$315,000.