EF-A 02

Daybreak Pits Avulsion Risk Assessment – Conceptual Design

Reach: EF Lewis 6A, 6B, 6C, 7, 8A
River mile: 7.3 - 9.5
Reference page in main document: 74

Assessment Project Description

The Daybreak Pits are previously-mined floodplain gravel pits located to the north and east of the mainstem East Fork Lewis River between river miles 7.5 and 9.0. The pits pose a potential risk of stream channel avulsion into the pits (i.e. "pit capture") which could result in significant loss of important habitat in both the short and long-term. An avulsion risk assessment at this site was identified as the highest priority action in the lower river by the East Fork Lewis Working Group. Past work to evaluate the risk of pit capture and to identify mitigation alternatives has been conducted by WEST Consultants (2001); however, a more up-to-date and comprehensive analysis is warranted in order to fully characterize avulsion risks and to identify treatment alternatives to address risk. This project will be impacted by work conducted as part of the Storedahl Daybreak Mine Expansion Habitat Conservation Plan. It will be necessary to coordinate this project with these efforts.

The objectives of the Daybreak Pits Avulsion Risk Assessment are the following:

1) Describe potential pit capture scenarios and the levels of risk associated with each scenario.
2) Describe measures to protect against pit capture while also enhancing habitat and river processes.
3) Conduct field data collection and technical analyses that are necessary to support the above investigations.

This project was moved to the top of the ranked project list, above other higher scoring projects, because of its importance to preserving the integrity of the entire lower river. This decision was made by the East Fork Lewis Working Group.

Data Collection and Analysis

The following data collection and analysis activities will be necessary to support this assessment. These activities have some overlap with data collection and analysis tasks outlined as part of the Ridgefield Pits Alternatives Assessment (project #EF-A 01). Conducting these assessments in tandem would reduce the total time and costs.

Site Topographic Survey

- Conduct a topographic survey of the key features of the site. The analysis area encompasses over 700 acres if you consider the entire valley floor throughout this reach; but the entire area does not need a detailed topographic survey. The survey should focus on the channel and any hydraulic flow paths (potential avulsion paths) through the site, as well as the dimensions of levees, roadways, and the existing Daybreak Pits. Cross sections and channel profiles will be needed to support hydraulic analysis. Water surface elevations and the elevation of surface expressions of groundwater should be surveyed in order to calibrate the hydraulic model and to support the analysis. Data from past topographic surveys and available LiDAR data should be incorporated into the survey if these data sources are deemed accurate, up-to-date, and useful for the study.

Hydrology and Hydraulics

- Determine river flow volumes for a range of flood recurrence intervals to be used in the risk assessment. Develop flow duration relationships to be used in hydraulic analysis. Much of this information has been compiled as part of past investigations but should be updated with recent flow data.
- A hydraulic model should be developed in order to evaluate flow velocities, energy gradients, and shear stress along banks. Hydraulic modeling should build off of existing hydraulics analysis to the extent possible. It is assumed that existing hydraulic models available for the site will require significant revision due to recent channel changes and may therefore have limited utility in this analysis; however, they may be useful for obtaining model parameters.
- Flood inundation extents at a range of flow levels should be mapped throughout the project area and depicted on aerial photo maps.

Sediment Transport and Geomorphic Analysis

- Substrate and sediment sampling will be required at multiple locations throughout the site to characterize erodibility of riverbed, riverbank and floodplain materials. These data will support incipient motion calculations used to characterize bed and bank mobility conditions in the mainstem as well as avulsion risk potential in floodplain/overbank areas.
- Characterize equilibrium sediment conditions in the reach to determine trends in sediment aggradation or incision. This will require estimating potential sediment volumes contributed from upstream sources. It is assumed that the volume of upstream-derived sediment needed for the analysis can be estimated without completing a detailed sediment budget for the basin.
- Identify the location of historic flow paths and the past and current channel migration zone. Characterize past and expected future rates of channel migration.

- Evaluate the rate of filling of the Ridgefield Pits and identify how pit filling will affect channel dynamics and erosion/avulsion potential within the reach.
- Evaluate the effects of a potential future pit capture on local, upstream, and downstream beneficial uses. This will require an analysis of the potential extent of upstream headcut progression in the main channel if a pit capture were to occur and the length of time it would take for the pits to naturally fill with riverbed material. This analysis should build off of existing assessment work conducted by WEST (2001).
- Build off of existing analyses (e.g. WEST 2001). Include a review of past assumptions and data sources and incorporate newer data.

Aquatic Species Surveys

- Conduct presence/absence surveys within abandoned ponds for salmon and trout and other important aquatic species, such as western pond turtles and red-legged frogs, to support project planning and impacts analysis.

Identification of Risk of Pit Capture

The data and site analyses will be used to identify potential pit capture scenarios and their associated levels of risk. Potential erosion sites and avulsion paths will be described and identified on aerial photo maps. Cross-sections and profiles will be included that portray site topography, elevation of flood flow paths, and significant landscape features. Risk of pit capture scenarios will be based on the hydraulics, sediment, and geomorphology analyses and will be framed in terms of flood recurrence and duration potential, with considerations for changes in the level of risk given potential future channel adjustment.

Evaluation of Treatment Alternatives

Treatment alternatives will be determined as part of the analysis and in consideration of stakeholder objectives. A few of the potential treatment alternatives that might be considered are included below:

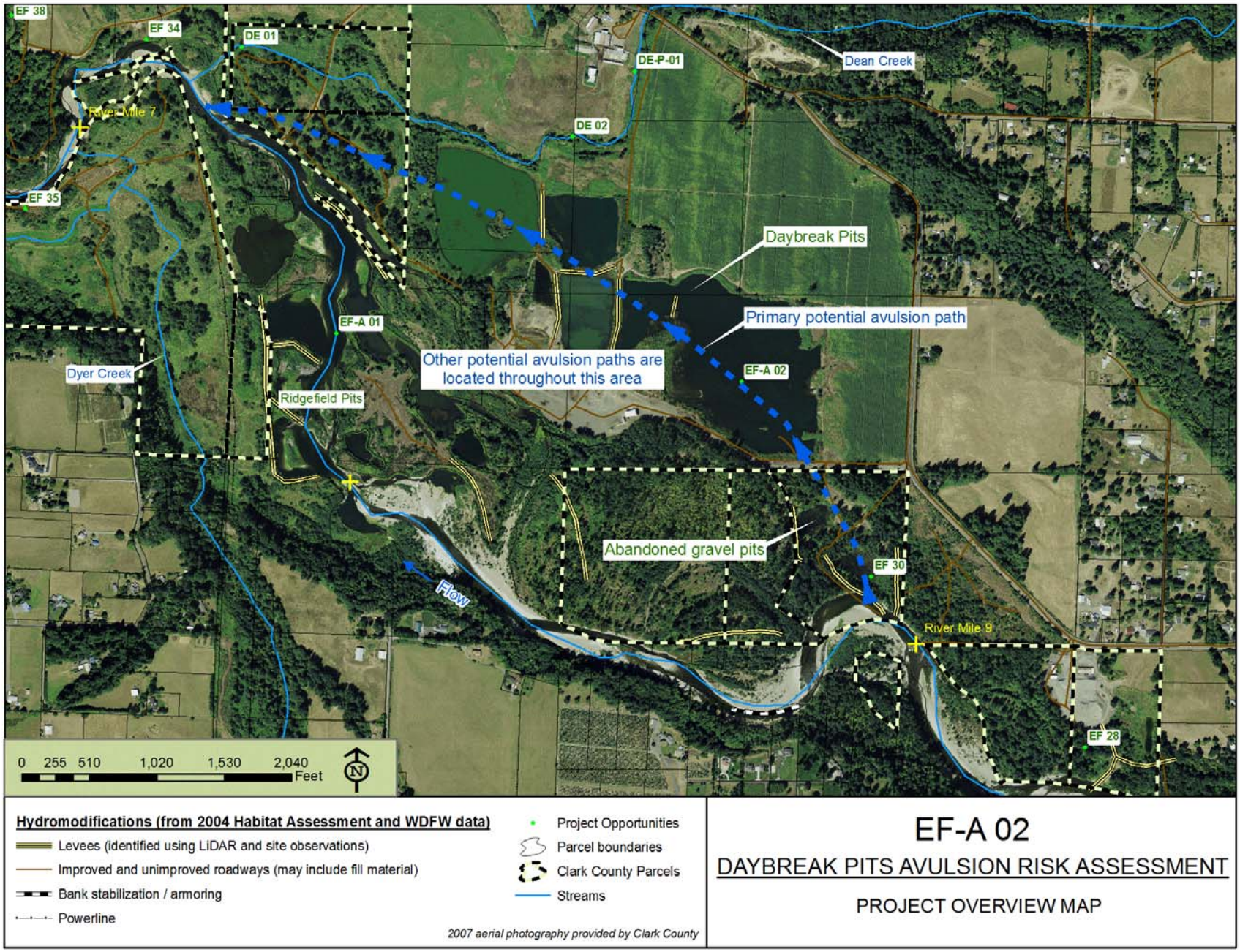
- No action: This alternative should be considered in the analysis. A no action alternative should only be recommended if the risk analysis shows very little risk of pit avulsion.
- Defined CMZ: This alternative includes establishing a channel migration zone with a northeast boundary defined by levees and other features that will ensure the prevention of pit capture but will allow the river to migrate and flood within a defined CMZ.
- Channel avulsion control: This alternative would include techniques for increasing floodplain roughness along overbank flow paths in order to reduce shear stresses and to reduce the risk of headcutting that would initiate an avulsion. Techniques might also include the containment and control of overbank flows into well-defined and stabilized flow paths that are resistant to erosion/avulsion.
- Control of lateral migration: This alternative would be considered if lateral channel migration potential shows a risk of erosion into the pits. Lateral erosion can be controlled by a number of different channel and bank treatments using natural and artificial materials.
- Other: There are other sub-treatments that may be combined with the strategies listed above or utilized on their own to control risk of pit capture, reduce impacts in the case of pit capture, and/or to improve habitat conditions. These include removal of remnant levees in the floodplain and filling of the pits to reduce the impacts of an avulsion if it were to occur. It is anticipated that there will be other treatments that are identified and evaluated as part of the assessment.

Treatment alternatives will need to consider any actions that are taken to restore the Ridgefield Pits reach. Treatment alternatives are likely to impact lower Dean Creek. The impact on the lower Dean Creek channel and habitat conditions needs to be considered as part of the assessment.

A recommended treatment alternative should be developed as part of this evaluation and carried forward to the 30% design level.

Access and Landownership

Access can be obtained at multiple locations throughout the site. Boat access will be required for bathymetric surveys of the mainstem East Fork Lewis River channel and the Daybreak Pits. This site spans private and Clark County lands. No work will occur without the consent of willing landowners.


EF 38
EF 34
DE 01
DE-P-01
Dean Creek
River Mile 7
DE 02
EF 35
Daybreak Pits
Primary potential avulsion path
EF-A 01
Other potential avulsion paths are located throughout this area
EF-A 02
Dyer Creek
Ridgefield Pits
Abandoned gravel pits
EF 30
Flow
River Mile 9
EF 28
0 255 510 1,020 1,530 2,040 Feet
N
Hydromodifications (from 2004 Habitat Assessment and WDFW data)
Levees (identified using LiDAR and site observations)
Improved and unimproved roadways (may include fill material)
Bank stabilization / armoring
Powerline
Project Opportunities
Parcel boundaries
Clark County Parcels
Streams
2007 aerial photography provided by Clark County
EF-A 02
DAYBREAK PITS AVULSION RISK ASSESSMENT
PROJECT OVERVIEW MAP

Planning-level cost estimate for EF-A 02

Note: This is a preliminary cost estimate for planning purposes. Actual costs may vary substantially from these estimates. This estimate is based on assumptions for time requirements and material quantities. Additional information obtained during site investigations will be needed to determine actual quantities and costs. Estimates are based on 2009 costs.

Description	Unit	Quantity	Unit Cost	Total Cost	Comment
Site Topographic Survey	LS	1	$36,000	$36,000	Includes a crew of 3 for 2 weeks of surveying. Assumes existing survey data can be used for portions of the site where channel (or other) changes have not occurred.
Data reduction and analysis	LS	1	$5,000	$5,000	Includes CAD time and data QA/QC
Hydrology and Hydraulics	LS	1	$20,000	$20,000	Assumes 4 weeks for a hydrologist / engineer. Includes development of a hydraulic model.
Sediment Transport Analysis	LS	1	$20,000	$20,000	Assumes 1 week field work for two staff and 2 weeks analysis from an engineer/geomorphologist
Geomorphology Analysis	LS	1	$10,000	$10,000	Assumes 2 weeks for a professional fluvial geomorphologist
Aquatic Species Surveys	LS	1	$7,000	$7,000	Assumes 1 week and two staff for field work and data processing
Identification of Risk of Pit Capture	LS	1	$10,000	$10,000	Includes synthesis of data to characterize risk of pit capture scenarios. Assume 2 weeks for a professional engineer / geomorphologist
Development and Evaluation of Treatment Alternatives	LS	1	$20,000	$20,000	Includes selection of a preferred alternative. Assumes 2 weeks for 2 professional engineers / fluvial geomorphologists
30% Level Design for Preferred Alternative	LS	1	$30,000	$30,000	Assumes CAD and engineering time for 15 design sheets
Implementation Sub-Total				**$158,000**	
Concept Level Implementation Contingency (20%)				$31,600	
Implementation Total				**$189,600**	
Project Delivery					Items below are calculated as a percent of the construction sub-total
Development of final report (15%)				$23,700	
Contract Administation (5%)				$7,900	
Project Delivery Sub-Total				**$31,600**	
TOTAL ESTIMATE				**$221,000**	rounded to nearest $1,000

General Notes:

Cost includes a 20% implementation contingency

All costs are figured on hourly rates of contracted workers. Entities conducting these activities in-house may be able to realize cost savings depending on hourly rates.

Costs do not include meetings with stakeholders, presentations, or multiple revisions of materials

Costs do not include wetland inventory and impacts analysis

Costs do not include any permitting

Time and resource efficiencies can be gained by conducting this project in conjunction with EF-A 01

Key

LS = Lump sum