Framework for NPDES Phase I Bear Creek Watershed-Scale Stormwater Plan

Watershed Plan Overview

1. Establish Partnerships
2. Develop tools for watershed analyses
3. Project future conditions
4. Develop Monitoring QAPP
5. Characterize Existing Conditions
6. Design Implementation plan
7. Submit Collaboration and Dispute Resolution Document to Ecology August 13, 2015
9. Submit Watershed Plan to Ecology April 4, 2018

Needs Ecology Approval
Framework for NPDES Phase I Bear Creek Watershed-Scale Stormwater Plan

STAGE 1a: Assessment of Existing Conditions

Assemble Existing Data and Studies and Evaluate
Objective: assemble existing data in watershed study area and identify gaps
- Data collected by Partners
- Previous Studies
- Water Quantity
- Water Quality
- Aquatic Use (chinook)
- Riparian Habitat
- Wetlands
- Channel stability
- Macroturbulents
- Sediments

Collection of New Data
Objective: develop monitoring QA/QC that will augment existing data sufficient enough for characterization of watershed and development of watershed models
- Characterize:
  - Stream flows (13 gauges)
  - Rainfall (4 gauges)
  - Macroinvertebrates (15 sites + 13)
  - Storm events: 12 sites (6 events, 3 grabs)
  - Base flow: 12 sites (6 events, 2 grabs)
  - Fish Preference (mainstream night surveys)
  - Sediment PSS (suspended, benthic)

Mapping
Objective: Inventory existing stormwater infrastructure, assemble landscape conditions needed for watershed characterization and model development
- Integrate MSI mapping from all partners
- Identify OSS and sewered areas
- Identify infiltration capacities
- Identify high water tables
- Identify GW flow directions
- Identify resumptions for protection and restoration
- Wetlands, Riparian Habitat

Goals
- NPDES Permit Compliance
- Developed a retrospective assessment of study area looking at historical conditions, implementation plans from previous studies, how much has been implemented and if it’s effectiveness, and what is remaining
- Support development of watershed models

Public Involvement
Objective: Leverage existing knowledge in the basin with participation and collaboration of stakeholders in development of shared strategies
- Inventory of known places of interest in study area
- Inventory previously established recommended CIP project lists
- Inventory of objectives and goals

Partner Collaboration
Objective: Manage expectations with clear communication and achieve consensus as much as possible
- Conduct monthly/ish meetings
- Document meetings and highlight decisions made, decisions needed, action items, and due dates
- Assimilate the partners goals as much as possible

Stage 1b: Development of Analytical Tools (Watershed models)

HSFP Model Development
Objective: Build HSFP models that will be designed to efficiently answer likely questions in the planning process.
- Segment delineations to allow for analyses at targeted areas of interest/concern
- Consolidate land use/cover
- Develop channel hydraulics of existing system
- Integrate existing stormwater facilities into model framework
- Design model to allow for likely scenarios to be evaluated (e.g., water conservations, septic failure rates, etc)

HSFP Model Calibration
Objective: Calibrate models to adequately simulate stream flows and water quality when comparing to observed conditions.
- Development databases with available atmospheric, flow rates, and water quality – when data become available.
- Calibrate to stream flows
- Calibrate to water chemistry
- Verify projections of BIBI using regressions (TBD)
- Generate Report

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SUSTAIN Model Development
Objective: Build SUSTAIN models that will evaluate stormwater management cost effectiveness of strategies
- Define subareas for detailed hydraulic routing (Monticello Creek, others TBD)
- Build conveyance network
- Develop types of BMP

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SUSTAIN Model Calibration
Objective: Calibrate models to adequately simulate stream flows and compare results of suspended sediment.
- Integrate HRU unit time series from HSFP
- Calibrate to stream flows by adjusting simplification of hydraulic routings.
- Generate Report

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Metrics/Targets
Objectives: Establish metrics to be used to evaluate existing conditions, and proposed responses based on defined strategies.
- An assessment of proposed habitat conditions using a qualitative rating system of low, medium, and high, (EMAP?)
- Flashiness (HPC, all 87, other?)
- Substrate mobilization
- BIBI (DeGasper, WRAP, specific to study area, EPA/ECY)

Targets:
- Annual freq of mobile spawning gravel
- Flashiness metrics
- BIBI (best estimate, 90% CI)
- WAC criteria
- Loading Reductions

Identify/Define numerical relationship between metrics and B-IIBI
Objective: Use/develop regression equations to project B-IIBI scores for scenarios
Sources:
- DeGasper
- WRAP
- Stratified within the study area
- EPA / ECY

In Development: Refine BIBI Relationships
Objective: Reduce uncertainty in defined relationships between BIBI and Flashiness,
- Group BIBI data into 3 categories based on local habitat conditions, revises flashiness relationships to BIBI

Historic, Existing, and Future Conditions
Objectives: Characterize past, present, and future conditions in the landscape.
- Benchmarks:
  - Historical: forested with existing wetlands, lakes, channel hydraulics (not necessary historical wetlands)
  - Existing: existing land use with existing stormwater infrastructure.
  - Future: land cover/use based on current comp plans, adjust potential full build out based on environmental constraints (e.g., CAO).

Public Involvement
Objective: Update public on project status, solicit concerns about conditions in the study area.
- Workshops
- Open House Public Meetings

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Stage 2a: Stormwater Management Strategies

**Evaluate Current Stormwater Guidelines**
Objective: Evaluate stormwater guideline effectiveness using defined metrics in this project and how they compare to established targets.
- Design BMP strategies
- Compare to targets
- Project BIBI scores

**Evaluate potential Future Stormwater Guidelines**
Objective: Identify how much more mitigation strategies are needed to meet identified targets intended to achieve established goals.
What does it take using:
- Current Stormwater Guidelines
- Enhanced Gray Guidelines
- Enhanced GSI Guidelines
- E.Gray + E.GSI
- Land Use management (TDR, GMA, Retrofit, etc)
- How is the flood frequency curve modified designing to stream habitat metrics?
- Cost-effectiveness

**Develop Scenarios**
Objectives: Develop scenarios to inform policy makers of potential stream conditions based on land use and stormwater management strategies.
- Size retrofits to (100%) of existing conditions to forested regime using:
  - R/D ponds
  - EIA Reductions (porous pvm, green roofs, etc)
  - Infiltration Ponds
  - Site-specific feasibility of retrofit projects
  - Climate change (?)

**Characterize Effects to Hydrology**
Objective: Characterize study area using projections of BIBI
- Do results meet design targets?
- How is the flood frequency curve modified designing to stream habitat metrics?
- How much divergence from forested conditions stormwater mitigation strategies are acceptable given proposed channel designs?
- Compare to KC/ECY Design Manual Standards?
- Stakeholders in agreement

**Characterize Effects to Geomorphology**
Objective: Using generalized channel conditions, evaluate impacts on stream energy from mitigation strategies.
- With proposed strategies in place, confirm that fines are still mobilized with acceptable frequency to prevent embedded gravel while maintaining an acceptable level of spawning gravel transport.

**Characterize Effects to BIBI Scores**
Objective: Characterize study area using BIBI scorings for all modeling scenarios.
- Using the defined relationships between Hydrologic flow metrics and Benthic characterization, forecast B-IIBI scorings for all modeling scenarios.

**Characterize Effects to Water Quality Conditions**
Objective: Characterize study area using Simulated Water Quality
- Concentrations below Chronic & Acute criteria
- Loading reductions

**No**
Targets Achieved?

One Time
In Development: Evaluate Riparian Conditions
Objective: Using existing information, catalog and characterize riparian vegetation.
- Catalog riparian conditions over past few decades
- Analyze where improvements can be made
- Recommend improvements with resiliency to climate change

In Development: Evaluate Aquatic Fish
Objective: Using existing information, catalog and characterize presence and abundance of aquatic fish.
- Catalog presence and abundance of aquatic fish (target Chinook salmon)
- Characterize fishery operations conducted in the watershed

In Development: Evaluate Wetlands
Objective: Using existing information, catalog and characterize wetlands.
- Catalog wetlands over past few decades
- Characterize basin areas draining to wetlands
- Evaluate effectiveness of past/present protection guidelines and restoration efforts

In Development: Evaluate Channel Habitat
Objective: Integrate assemblage of existing information, summarize channel habitat conditions.
- Characterize channel habitat conditions over past few decades
- Analyze where improvements can be made
- Recommend improvements with resiliency to climate change
- Where feasible, include opportunity costs (in Today’s dollars)
- Evaluate effectiveness of (historical?) regulatory protections

In Development: Evaluate Aquatic Fish Use
Objective: Identify habitat preferences of juvenile Chinook.
- Define habitat metrics to be measured
- Select reaches for Chinook parr survey

In Development: Evaluate Channel Habitat / Riparian Conditions
Objective: Characterize localized channel habitat conditions at a limited number of reaches
- Define habitat metrics to be measured
- Select locations coincident with BIBI monitoring stations
- Generalize habitat quality into 3 broad categories: poor, fair, good.
Implementation Plan
Objective: Develop an implementation plan and schedule that identifies potential future actions to implement stormwater management strategies.

Stage 3: Develop Watershed Plan

High Priority Areas
Objective: Identify areas in need of restoration, or protection.
- Develop metrics/criteria:
  - Effectiveness
  - Cost
  - Engineered vs non-engineered
  - Distributed vs regional
  - Stream length treated
  - Drainage area treated
  - Public vs Private
  - Other Organizations’ Priorities

Near-term Project Lists
Objective: Develop list of either site-specific facilities and/or distributed programmatic mitigation strategies:
- Watershed-wide generalized mitigation strategy of facilities (or other) is narrowed down to a list of specific engineered and/or non-engineered capital projects and/or programs
- Top 5 (?) are in greater detail

Estimated Costs
Objective: Characterize costs associated with each scenario (only being considered for recommendation?).
- With proposed strategies in place, confirm that fines are still mobilized with acceptable frequency to prevent embedded gravel while maintaining an acceptable level of spawning gravel transport.

Implementation Schedule
Objective: Develop an implementation schedule that reflects partnership priorities.
- Establish a reasonable and realistic time horizon to achieve objectives
- Near-term (5-10 years)
- Medium-term (10-50 years)
- Long-term (> 50 years)

Implementation Plan
Objective: Develop an implementation plan and schedule that identifies potential future actions to implement stormwater management strategies.

Funding Sources
Objective: Identify possible funding sources.
- Identify funding sources
- Map types of mitigation to funding sources with similar priorities

Near-term Project Lists
- Finalize Watershed Plan among partners

Submit to Ecology

Stage I
Objective: Incorporate deliverables from Stage I activities into Watershed Plan.

Stage II
Objective: Incorporate deliverables from Stage II activities into Watershed Plan.

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Example Outputs and Analyses

Mitigation Cost for Projected Basin Average B-IBI Scores using NFP metrics 1 through 9

Cost ($ millions)

B-IBI Score

Mitigation Cost for Projected Basin Average B-IBI Scores using NFP metrics 3, 5, and 9

Cost ($ millions)

B-IBI Score

Storm #3 (May 4, 2009)

Mitigation Cost for Projected Basin Average B-IBI Scores using NFP metrics 3, 5, and 9

Cost ($ millions)

B-IBI Score