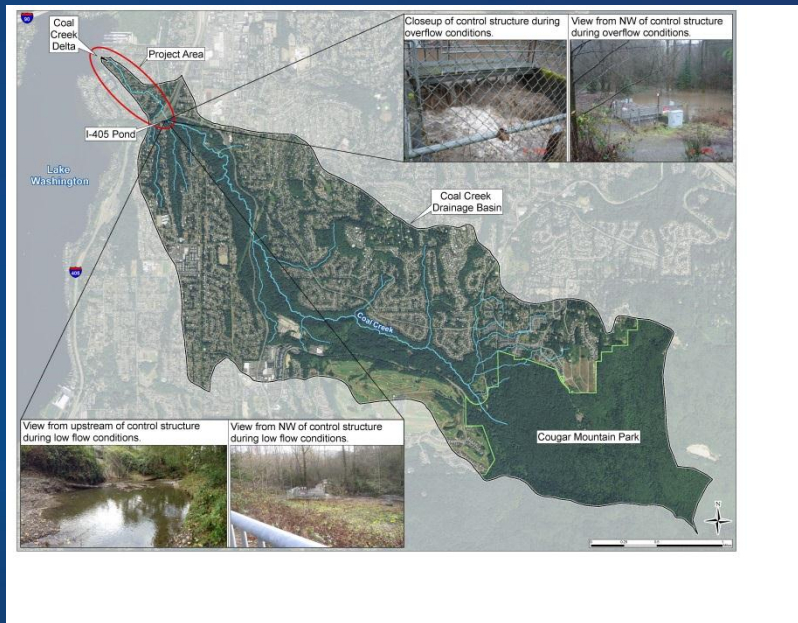


Lower Coal Creek Flood Risk Reduction Alternatives Analysis- Briefing for the Newport Shores HOA



March 12, 2014

Analysis

- Hydrology – How much water and how often?
- Hydraulics – How high does it get and where does it go?
- Sediment – Is the channel capacity changing?
- Drainage – How does the local drainage system interact with Coal Creek?

Findings: Hydrology

- I-405 pond provides 15%-20% reduction in peak flows
- Up to 30% reduction is possible with re-engineering



Culvert Capacities

- Culverts are undersized by today's standards
 - Back up water upstream
 - Largest backwater at Cascade Key
 - Increased risk of road, yard and home flooding
 - Effects extend over most of Newport Shores reach
 - Dependent on sediment flushing
 - Glacier Key & Downstream



Culvert Debris Blockage Risk

- Culverts are undersized
- Sediment in Culverts
- Utility pipes in and at mouth of culvert
- Upstream Wood Sources

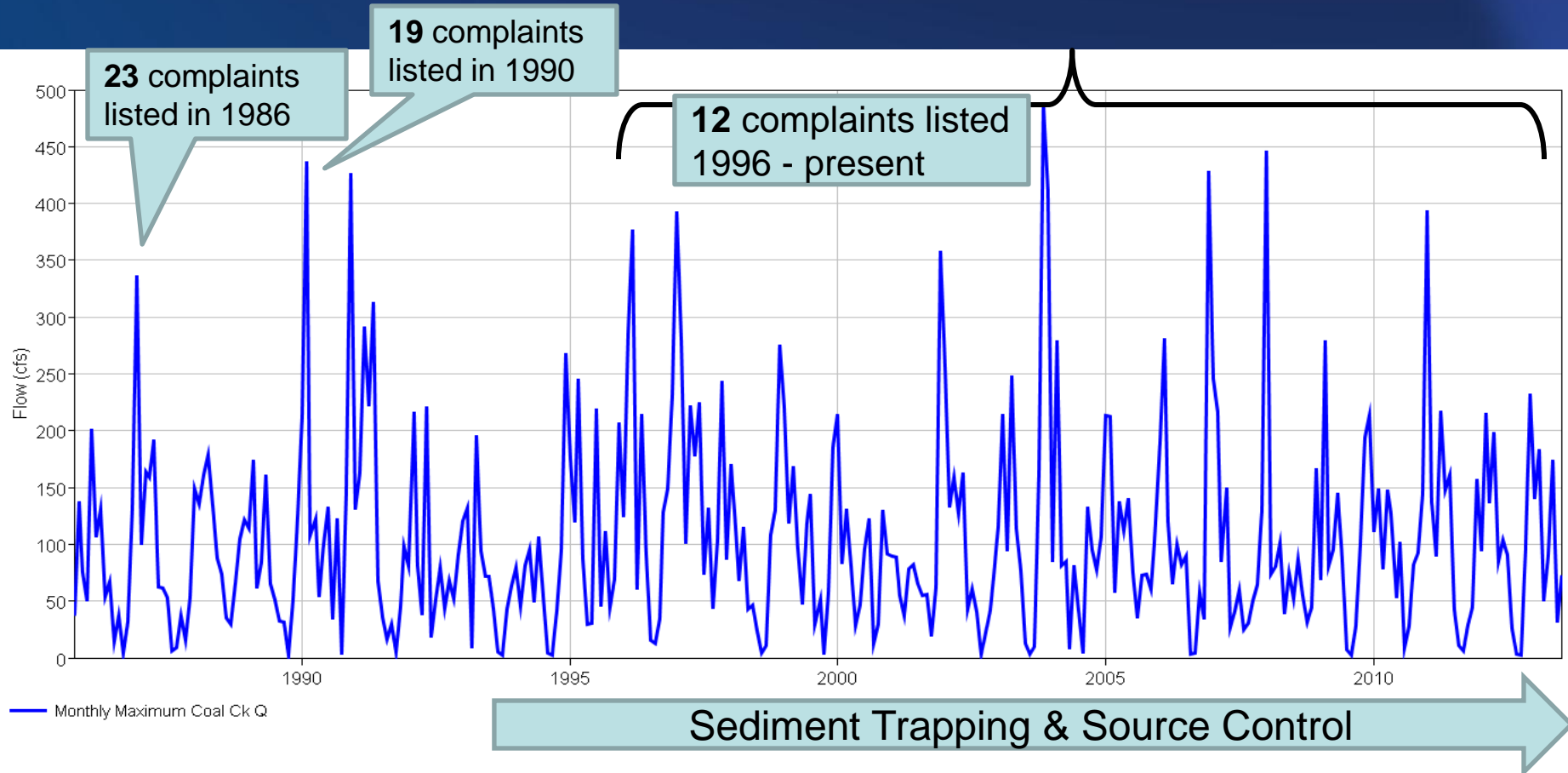


Existing Culverts in Newport Shores Increase Flood Risk

- Replacement of all culverts justifiable
- Recommended priority based on capacity, flood level, sediment, debris & condition
 - Cascade Key
 - Glacier Key
 - Newport Key
 - Upper Skagit Key
 - Lower Skagit Key



Flood Record & City Call Log of Stream Flooding Related Complaints



Findings – Stream Flooding

- Around 50-100 year capacity at road crossings if culverts are clear
- Culverts prone to blockage
 - Undersized by current standards
 - Backwater
 - Utilities
 - Sediment
- Vegetation
 - Local blockages and local effects
 - No reach wide effect on flood levels.
- Stream related complaints reduced in number and extent
 - Upstream Sediment Removal
 - City and Private projects



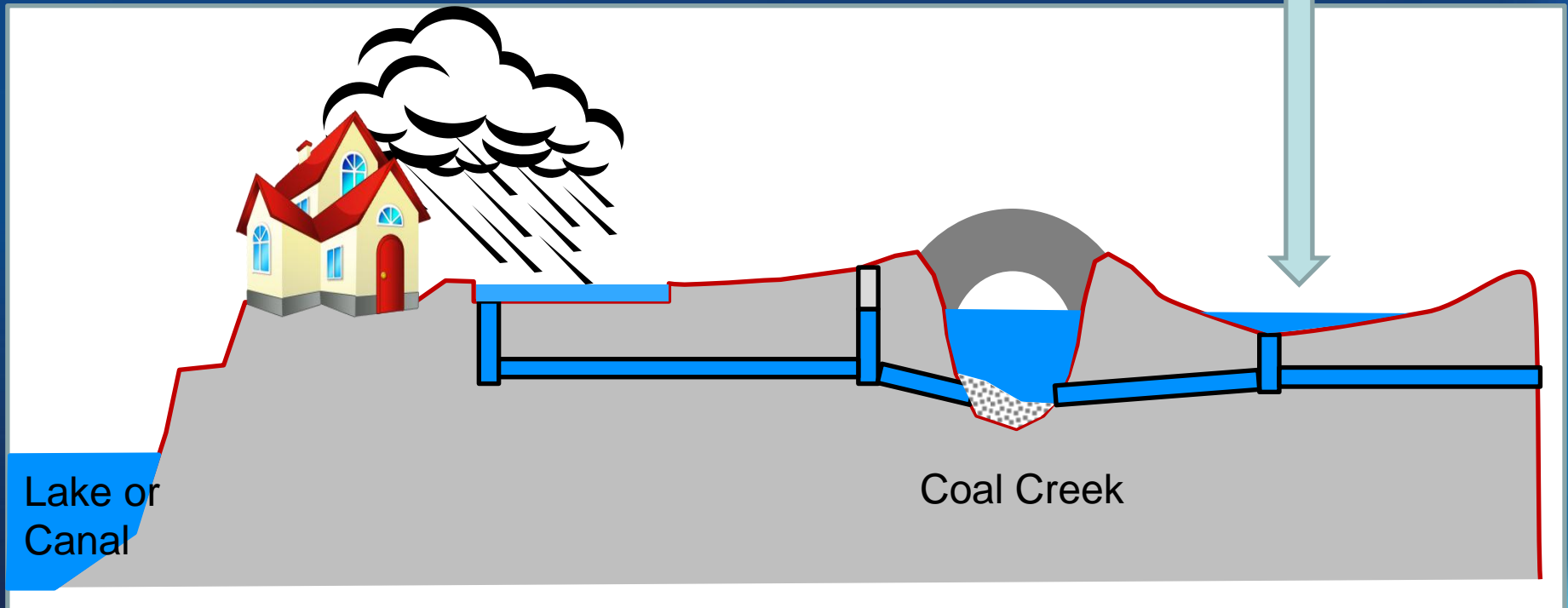
Findings: Stream Sediment

- **Since Upstream Sediment Removal Began in 1994**
 - Channel has lowered throughout Newport Shores
 - Streambed stabilizing



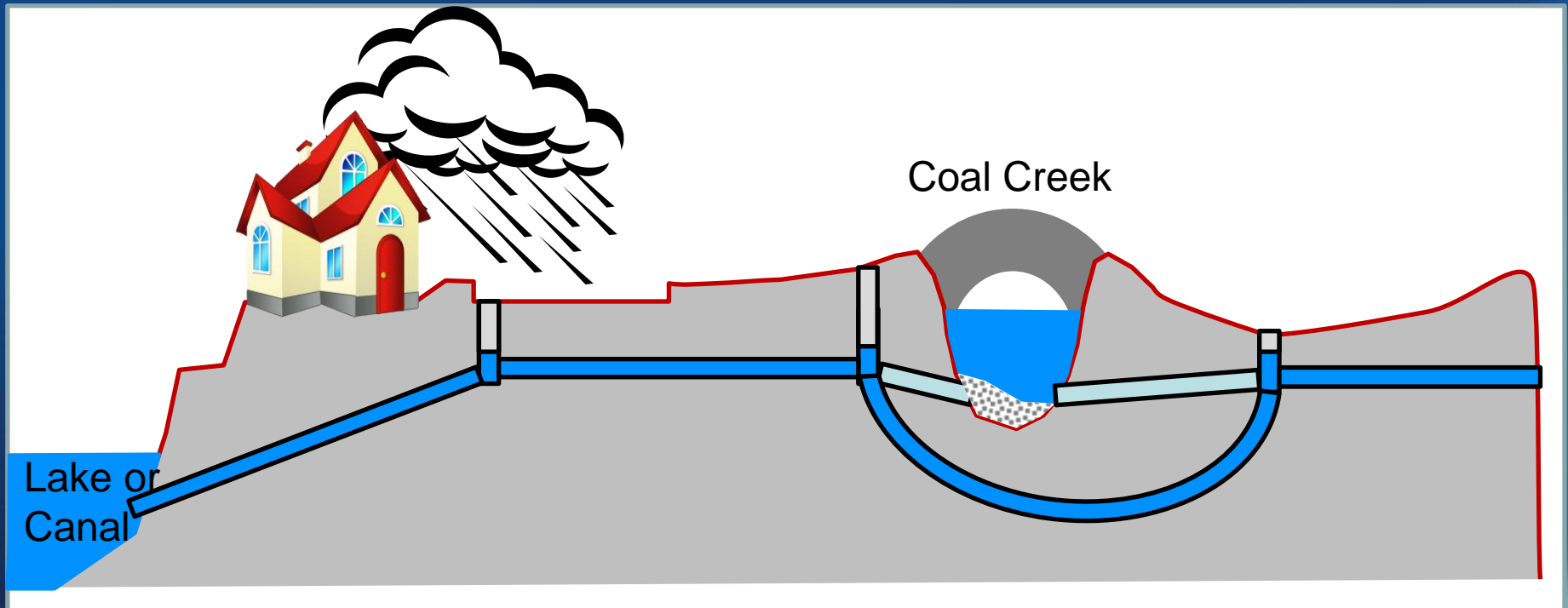
Findings: Drainage System

- High water in Coal Creek backs-up storm drains
 - Most frequent at Lummi-Skagit intersection
- Difficult to engineer solutions using existing system layout



Potential Drainage Solutions

- Additional outfall(s) from street directly to lake or canal
- Connect east-west storm drain systems, bypass creek
- Increase size of selected storm drain segments



Summary of Existing Conditions

- I-405 Pond provide 15-20% Flood Flow Reduction
- Frequency of creek flooding
 - 50- to 100-yr flood capacity (assuming clear culverts)
- Culverts are undersized by current standards
- Culvert blockage risk
 - Highest risk at Cascade Key, then Glacier Key
- Sediment is not accumulating in Coal Creek in Newport Shores
- Stream vegetation is a local concern but is not causing flood increases throughout Newport Shores
- Local drainage is affected by high water levels in Coal Creek

Most Promising Opportunities for Flood Risk Reduction

- Newport Shores Culvert Replacements
 - Cascade, Glacier, Newport, Upper Skagit and Lower Skagit
- I-405 Control Structure Redesign for More Flood Storage
- Storm Drain Relief Via Additional Outfalls