# Broadview Sewer and Drainage Improvement Project

Dayton Avenue N Basin Leading Sewer Alternatives



# Bitter Lake Community Center June 18, 2014

Seattle Dublic Utilities

#### Why are improvements needed in Broadview?

- Sewer backups in homes, streets, yards and creeks
- Stormwater flooding into homes, yards, streets and creeks
- Caused by:
  - Stormwater and groundwater flowing into sewer pipes during significant storms
  - Insufficient drainage
    infrastructure in some places



#### Where are sewer improvements needed?



#### CAUSES OF SEWER BACK UPS

During heavy rains, more than sewage flows into sewer pipes. Groundwater leaks through cracked sewer pipes. Tree roots take up additional space. And in some cases where homeowners have connected downspouts, foundation drains or sump pumps to the sewer, this takes up even more capacity. The result of too much water is sewer backups. Rain from roof drains to sewer when connected Sewage may overflow into creeks Sewage Sewage backs up X THAT backs up Foundation drain or sump Cracked or pump connected broken pipe Side sewer with Sanitary sewer pipe to treatment plant to sewer pipe cracks and roots 5011 SATURATED

# **Project goals**

- Reduce frequency and quantity of sewer backups into homes, properties, streets, and creeks
- Reduce risk of stormwater flooding to areas most impacted, especially building structures (homes)



# Work that has been completed

- Measured direction and amount of sewer and stormwater flows
- Measured direction of groundwater flows and depths in 12<sup>th</sup> Ave NW basin (summer 2013) and doing the same now for Dayton Ave N basin
- Created sewer and stormwater computer models of water flow
- Hosted public meetings, briefed Broadview Community Council, and held meetings with Broadview Sewer Task Force
- ✓ Conducted a *Flood Grouting Pilot Project* to seal mainline sewer pipes and side sewer lines (*late 2011 and early 2012*)
- Installed backflow valves to reduce likelihood of sewer backups into homes (2012)
- ✓ Now we are in the options analysis phase of the project

#### **Community involvement opportunities**



#### Sewer alternative evaluation criteria

 Performance — complexity and certainty of improvements, as well as future adaptability and impact during extreme events

Stakeholders — support from internal and external stakeholders

Construction Impacts — impacts to streets & private property

Environmental — impacts to creeks and other natural resources

✓ Operations and Maintenance — need for specialized or frequent operations & maintenance; accessibility

Schedule — length of time to build and permitting complexity

#### Leading Dayton Ave N basin sewer alternatives

- Reduce flows into sewer pipes and provide storage
- Upsize sewer pipes and build storage
- Upsize sewer pipes and build storage (centralized location)

#### Reduce Flows into Sewer Pipes and Provide Storage Preliminary cost estimate = \$41 million



#### **Reduce Flows into Sewer Pipes and Provide Storage**



- Addresses excess flows that are running from north to south Dayton basin during large storms
- Includes both sewer and drainage issues
- Private properties where flow reduction would be needed :
  - North Dayton: 330 homes
  - South Dayton: 280 homes

#### Reduce Flows into Sewer Pipes and Provide Storage

#### Sewer components

- Seal 25,000 feet of sewer mains
- Seal 60,000 feet of side sewers
- Build underground sewer storage



#### **Reduce Flows into Sewer Pipes and Provide Storage**

#### Related Drainage Components



Example of stormwater pond in Midvale (Northwest Seattle)

Example of bio-retention in High Point

# **Reduce Flows into Sewer Pipes and Provide Storage**

#### Benefits

- Addresses problem at its source
- Refurbishes large area of public sewer system and private side sewers
- Smaller sewer storage tank
- Less property needed for sewer solutions

#### Challenges

- Will require approximately 600 private homeowners participate
- Requires more drainage improvements to accommodate flows disconnected from the sewer
- Phased approach

#### Upsize Sewer Pipes and Build Storage in Dayton Basin Preliminary cost estimate = \$52 million

#### Components

- Increase size of 2,200 feet of sewer lines
- Build underground sewer storage



# Upsize Sewer Pipes and Build Storage in Dayton

#### Benefits

• Minimal involvement of private property owners

Challenges

- Substantial amount of space needed for underground sewer storage facilities
- Improves only a small portion of leaky sewer system
- Does not separate out stormwater/groundwater from sewer

#### Upsize Sewer Pipes and Build Storage in Centralized Location Preliminary cost estimate = \$55 million + \$\$\$ for 12<sup>th</sup> Ave basin

#### Components

- Increase size of 7,400 feet of sewer lines including lines through Carkeek Park to sewer storage tank
- Build underground sewer storage tank in Carkeek Park



#### Upsize Sewer Pipes and Build Storage in Centralized Location

#### Benefits

- Minimal involvement of private property owners
- Minimal space needs within currently held private property
- May be able to address excess sewer flows from 12th Ave basin by expanding facility

#### Challenges

- Construction on steep slopes and in park space
- Environmental and permitting challenges
- Limited space in park to accommodate sewer storage tank
- Improves only part of leaky sewers in basin

#### Broadview Sewer and Drainage

Broadview Sewer and Drainage Improvement Project



Dayton Ave Sewer		Components						
		Sewer Pipes	Sewer Storage	Natural Drainage Component	Property Acquisition			
Alternatives	Reduce Flows into Sewer Pipes and Provide Storage	Seal 25,000 linear feet (~38 blocks) of sewer mains, seal 60,000 linear feet (~91 blocks) of side sewers and increase size of 1,000 linear feet of sewer lines (~ 2 blocks)	Less than 100,000 gallon underground sewer storage	400,000 gallons in stormwater ponds or in storage pipes under right-of-way 6,000 feet of drainage improvements 2,000 linear feet of Bioretention (~3 blocks)	24,000 square feet (8,000 square feet for sewer and 16,000 square feet for stormwater)			
	Upsize Sewer Pipes and Build Storage in Dayton Basin	Increase size of 2,200 linear feet of sewer lines (~3 blocks)	1,500,000 gallon (~1.5 Olympic size pools) underground sewer storage near 115th and 100,000 gallon underground sewer storage near 105th	2,200 linear feet of Bioretention (~3 blocks)	32,000 square feet			
	Upsize Sewer Pipes and Build Storage (Centralized location)	Increase size of 7,400 linear feet of sewer lines (~11 blocks)	1,600,000 gallon underground sewer storage (~1.5 Olympic size pools)	3,300 linear feet of Bioretention (~5 blocks)	32,000 square feet			

# **Comments and Questions**

- Are there any clarifications you would like on the alternatives?
- What comments do you have on the sewer alternatives?

# Broadview Sewer and Drainage Improvement Project

12<sup>th</sup> Avenue NW Basin Leading Drainage Alternatives



# Bitter Lake Community Center June 18, 2014

Seattle Dublic Utilities

#### Why are drainage improvements needed?

- Address drainage impacts of sewer alternatives presented at March 2014 public meeting
  - Convey flows disconnected from sewer (e.g., roof drains, sump pumps)
  - Collect and convey interflow
- Reduce peak flows to creek
- Meet stormwater code (city requirements) for sewer project
- Goal to reduce high priority stormwater flooding (to homes)



# **Drainage Alternative Considerations**

- 12th Avenue NW Basin
- Sewer basin intersects multiple drainage basins
- Bluff to west
- High groundwater
- Plan to take measures to protect bluff
- Not proposing infiltration practices
- Proposing to offset potential rise in groundwater due to sewer alternatives



# **Drainage Tools Evaluated**

- French Drains
- Upsize Priority Pipes, Ditches, Culverts
- Detention Cisterns
- Stormwater Cascades (some E/W Streets)
- Stormwater Storage Pond
- Stormwater Storage Pipes (under right-of-way)
- New Stormwater Outfall
- Infiltration Practices in Upper Basin

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Eliminated

Infiltration Practices in Upper Basin

#### **French Drain**

 Collect interflow and prevent rise in groundwater levels



#### **Upsize Priority Drainage Pipes, Ditches, Culverts**

- Convey collected interflow and water disconnected from sewer
- Reduce flooding risk to homes



#### **Detention Cisterns**

• Stores and slows flow from roofs



Single Family Detention Cistern

#### **Stormwater Cascades**

 Stores and slows flow along roadway



Broadview Cascade on NW 107<sup>th</sup> Street

# **Stormwater Storage Pond**

- Pond "centralized" near bottom of basin
- Stores and slows flow before discharge to creeks



Midvale Stormwater Pond (10735 Stone Ave N)

#### **Stormwater Storage Pipe**

- Pipes in right-of-way (under street)
- Stores and slows flow





### **Combined Tools to Develop Alternatives**

- All alternative include these tools:
  - French Drains
  - Upsized Priority Pipes, Ditches, Culverts
  - Detention Cisterns
  - Stormwater Cascades
- Alts vary based on whether they include:
  - "Centralized" Stormwater Storage Pond
  - "Decentralized" Stormwater Storage Pipes

#### **Drainage Alternative Evaluation Criteria**

- Performance complexity and certainty of improvements, as well as future adaptability and impact during extreme events
- Stakeholders support from internal and external stakeholders
- Construction Impacts impacts to streets & private property
- Environmental impacts to creeks and other natural resources
- ✓ Operations and Maintenance need for specialized or frequent operations & maintenance; accessibility
- Schedule length of time to build and permitting complexity

# Leading 12th Ave NW Drainage Alternatives

- Centralized Storage (Pond)
- Decentralized Storage (Underground Pipes)

<u>French Drain</u>



- French Drain
- <u>Priority Pipe/Ditch/ Culvert</u> <u>Upsizing</u>



- French Drain
- Priority Pipe/Ditch/ Culvert Upsizing
- <u>Detention Cisterns</u>



- French Drain
- Priority Pipe/Ditch/ Culvert Upsizing
- Detention Cisterns
- <u>Stormwater Cascades</u>



- French Drain
- Priority Pipe/Ditch/ Culvert Upsizing
- Detention Cisterns
- Stormwater Cascades
- <u>Storage Pond</u>



- Key Advantages
  - Fewer uncertainties with aboveground storage
  - Construction disturbance for storage component confined to smaller area
- Key Disadvantages
  - Requires 24,000 square feet property acquisition
- Cost: Approx. \$17 million
  - Note: assumes pairing with representative sewer alternative



French Drain



- French Drain
- <u>Priority Pipe/Ditch/ Culvert</u> <u>Upsizing</u>



- French Drain
- Priority Pipe/Ditch/ Culvert Upsizing
- <u>Detention Cisterns</u>



- French Drain
- Priority Pipe/Ditch/ Culvert Upsizing
- Detention Cisterns
- <u>Stormwater Cascades</u>



- French Drain
- Priority Pipe/Ditch/ Culvert Upsizing
- Detention Cisterns
- Stormwater Cascades
- <u>Underground Detention</u>
  <u>Pipes</u>



- Key Advantages
  - Does not require property acquisition
  - Distributed detention helps to alleviate some drainage problems across basin
- Key Disadvantages
  - Construction disturbance for storage component is broader than for centralized
- Cost: Approx. \$19 million
  - Note: assumes pairing with representative sewer alternative



#### **Broadview Sewer** and Drainage Broadview Sewer and Drainage Improvement Project



12th Ave Drainage		Components							
		French Drains	Improved Drainage System	Stormwater Cascades	Detention Cisterns	Storage Pipe or Pond	Property Acquisition		
Alternatives	Centralized Storage (Pond)	9,000 linear feet (~14 blocks)	12,400 linear feet (~19 blocks)	1,500 linear feet (~8 blocks)	~30 homes (Voluntary participation)	600,000 gallon storage pond	24,000 square feet		
	Decentralized Storage (Underground pipes)	9,000 linear feet (~14 blocks)	7,400 linear feet (~11 blocks)	1,500 linear feet (~8 blocks)	~30 homes (Voluntary participation)	600,000 gallon storage pipes under the right-of-way	None		

# **Comments and Questions**

- Are there any clarifications you would like on the alternatives?
- What comments do you have on the drainage alternatives?

# For more information

- Website: www.seattle.gov/util/broadviewprojects
- Project information line: (206) 409-3651
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