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Meeting Agenda

Barton, Murray, Magnolia, North Beach CSO Facilities Project

E00022E06

King County Department of Natural Resources and Parks
Wastewater Treatment Division

Date of Meeting: August 5, 2009 **Work Order No.:** 7562A.10

Time: 1 pm

Location: KSC 8th Floor Conference Center

Purpose: CSO Control Alternatives Development
Barton/Murray Basin CSO Control Alternatives

Meeting # 100-49

Anticipated Attendees

County		Consultants
John Cameron	Shaun O'Neil	Kevin Dour
Betsy Cooper	Sekhar Palepu	Bob Eimstad
Hien Dung	John Phillips	Karl Hadler
Pam Erstad	Kevin Sandquist	Jeff Lykken
Mary Beth Gilbrough	Mike Sand	Brian Matson
Karen Huber	Kevin Schock	Allen de Steiguer
Ron Kohler	Bob Swarner	
Kathy Mathena	Martha Tuttle	**SPU**
Sue Meyer	Mary Wohleb	Sahba Mohandessi
Lee Miller	Monica Van Der Vieren	
Ukwenga Oleru	Karl Zimmer	

Meeting Purpose:

1. Summarize input from July 21 CSO team meeting and July 29 meeting with Seattle Parks.
2. Review alternatives development and evaluation strategy and overall process.
3. Review alternatives developed for Barton/Murray basins.
4. Obtain additional feedback from CSO team.

Topic	Time	By
Introduction	10 min	S. Namini
Alternatives Development Process Review • Summary of input from CSO team and Seattle Parks • Strategy considerations for CSO alternatives development • CSO alternatives development and evaluation process • Schedule moving forward	35 min	B. Matson B. Eimstad

Barton Basin • Basis of design (technical requirements) • Technically viable CSO control Approaches • Configurations impacting potential sites • Minimum site requirements • Matching CSO control approaches and configurations to potential sites • Questions	45 min	K. Dour J. Lykken
Murray Basin • Basis of design (technical requirements) • Technically viable CSO control Approaches • Configurations impacting potential sites • Minimum site requirements • Matching CSO control approaches and configurations to potential sites • Questions	45 min	K. Dour J. Lykken
Summary/Action Items	10 min	S. Namini B. Matson

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Meeting Notes

Barton, Murray, Magnolia, North Beach CSO Facilities Project

E00022E06

King County Department of Natural Resources and Parks
Wastewater Treatment Division

Date of Meeting:	August 5, 2009	**Date of Notes:**	August 6, 2009	**Work Order No:**	7562A.10

Time: 1:00 pm

Location: King Street Center 8th Floor Conference Room

Purpose:
1. Summarize input from July 21 CSO team meeting and July 29 meeting with Seattle Parks.
2. Review alternatives development and evaluation strategy and overall process.
3. Review alternatives developed for Barton/Murray basins.
4. Obtain additional feedback from CSO team.

Meeting # 207-1 - CSO Control Alternatives Development
Barton/Murray Basin CSO Control Alternatives

Attendees:

County		Consultant
Shahrzad Namini	Shaun O'Neil	Kevin Dour
Betsy Cooper	Sekhar Palepu	Bob Eimstad
Chris Okuda	John Phillips	Karl Hadler
Bill Wilbert	Kevin Sandquist	Jeff Lykken
Wes Sprague	Kevin Schock	Brian Matson
Kathy Mathena	Bob Swarner	Bob Wheeler
Sue Meyer	Martha Tuttle	Ellen Blair
Lee Miller	Mary Wohleb	Lisa Adolfson
Ukwenga Oleru	Monica Van Der Vieren	Regina Raichart
Josho	Karl Zimmer	

SPU
Sahba Mohandessi

Distribution: Attendees, Allen de Steiguer, Hien Dung, Pam Erstad, Ron Kohler, Mary Beth Gilbrough

ACTION ITEMS

Item #	Action	Action By	Due By
1	Review the schedule and determine where input from the advisory board is required. Include this work in the schedule so that input is received at the appropriate time.	Matson	9/2/09
2	Look at revising the process schematic or providing more definition to prevent revisiting criteria and alternatives at a set point.	Matson	8/19/09

3	Update schedule information to reflect facility plan deadline and new dates for Workshop No. 1 and 2.	Matson	8/19/09
4	Document how you determined the sites and the flexibility with siting options. Site technical reasons such as topography and show areas that meet the minimum requirements rather than a single site.	Kevin Dour/ Allen de Steiguer/ Karl Hadler	8/11/09
5	Illustrate the focus area for alternative development on graphics and summaries and document why.	Kevin Dour/ Allen de Steiguer/ Karl Hadler	8/11/09
6	Determine if there are any feasible alternatives with storage in Subbasin B_8.	Kevin Dour	8/19/09
7	Determine whether the storage volume required assumes that flows go to West Point or if a portion of the flow pumped out of storage goes to wet weather facilities such as Alki.	Kevin Schock/ Ed Wicklein	9/2/09
8	Document the O&M requirements for approaches including frequency of use and duration of use.	Kevin Dour/ Allen de Steiguer/ Karl Hadler	8/11/09
9	Confirm the diameter of the existing outfall at Barton.	Kevin Dour	8/11/09
10	Provide comments on Barton Basin alternatives to Shahrzad.	Team	8/10/09

DISCUSSION

1. Alternative Development Process Review
    a. Public Participation
        i. Need to define the problem and present approaches (e.g. storage, peak flow reduction, etc.) for the public before we present the alternatives so they have an understanding of what we are trying to solve and the infrastructure options available to address the problem.
        ii. The public participation process needs to account for the political sensitivity of the work within these basins.
        iii. Public participation will occur throughout the alternative development and evaluation process.
    b. Advisory Board
        i. An advisory board will be assembled within King County to provide recommendations and guidance on big picture policy and political issues.
        ii. The project will require input from the advisory board at key milestones throughout the project. The technical schedule will be looked at with respect to the advisory board and public participation efforts to see where we need input and when so that information is not received too late.

c. The Brightwater siting process did not include a process with feedback loops to adjust criteria. The project needs to reach a point where criteria and alternatives are fixed so the evaluation does not enter into a constant "do loop". The team will look at revising the process or providing more definition to prevent revisiting criteria and alternatives at a set point.

d. King County Review

   i. The next meeting (scheduled for August 11) will allow the team to provide additional feedback on the alternative development process as well as the initial Barton alternatives.

   ii. Provide comments focusing on:

      1. Is the range of alternatives complete?

      2. Are there additional alternatives we are missing?

      3. Are there alternatives that should be eliminated because of a fatal flaw?

e. Schedule Updates

   i. Update presentation graphic to reflect facility plan deadline of December 31, 2010.

   ii. Workshop No. 1 and 2 will be scheduled in December 2009 to provide more time for public participation and detailed evaluation of the final three alternatives.

f. Storage Volume Calculations

   i. Determine whether storage volume required assumes that flows go to West Point or if a portion of the flow pumped out of storage goes to wet weather facilities such as Alki.

   ii. Alki is permitted to treat and discharge more total volume (longer duration) than it sees today, however, there is no more capacity at peak times.

2. Barton Basin Control Alternatives

   a. See attached handout showing the initial alternatives matrix and summaries.

   b. Alternative Development Phase

      i. Flow monitoring centered attention around the trunk sewer that runs along Director Street in the Barton Basin since this carries a significant portion of the basin flow. Murray flows are spread throughout the basin so that the focus for alternatives really becomes the bottom of the basin to capture enough flow. Consultant to illustrate the focus area on graphics and summaries and document why.

      ii. Document how the sites were determined and the flexibility with siting options. Note technical reasons such as topography and show areas that meet the minimum requirements.

   c. Barton Alternative Summaries

      i. Determine if there are any feasible alternatives with storage in Subbasin B_8.

      ii. The technical summaries provided for each alternative are an initial starting point for the evaluation process and provide basic information to the team. The team should provide comments and clarifications on the summaries, however, these will continue to be developed as the team evaluates the nine alternatives in the next step of the process.

iii. Alternative 1B would provide management of overflows for the entire basin, however, modeling may show that slightly more than 110,000 gallons of storage is required to relieve the peak flows from other locations to the Barton Pump Station.

iv. There will be disruption to the ferry terminal for bottom of the basin options. Potential issues include staging, trenching, etc. One lane of traffic will be closed for the Barton Pump Station improvements. The community has not had too many issues with improvements to the Barton Pump Station.

v. There are cultural resource issues associated with the site shown in Alternative 1E.

vi. Consultant will document the O&M requirements for alternatives including frequency of use and duration of use.

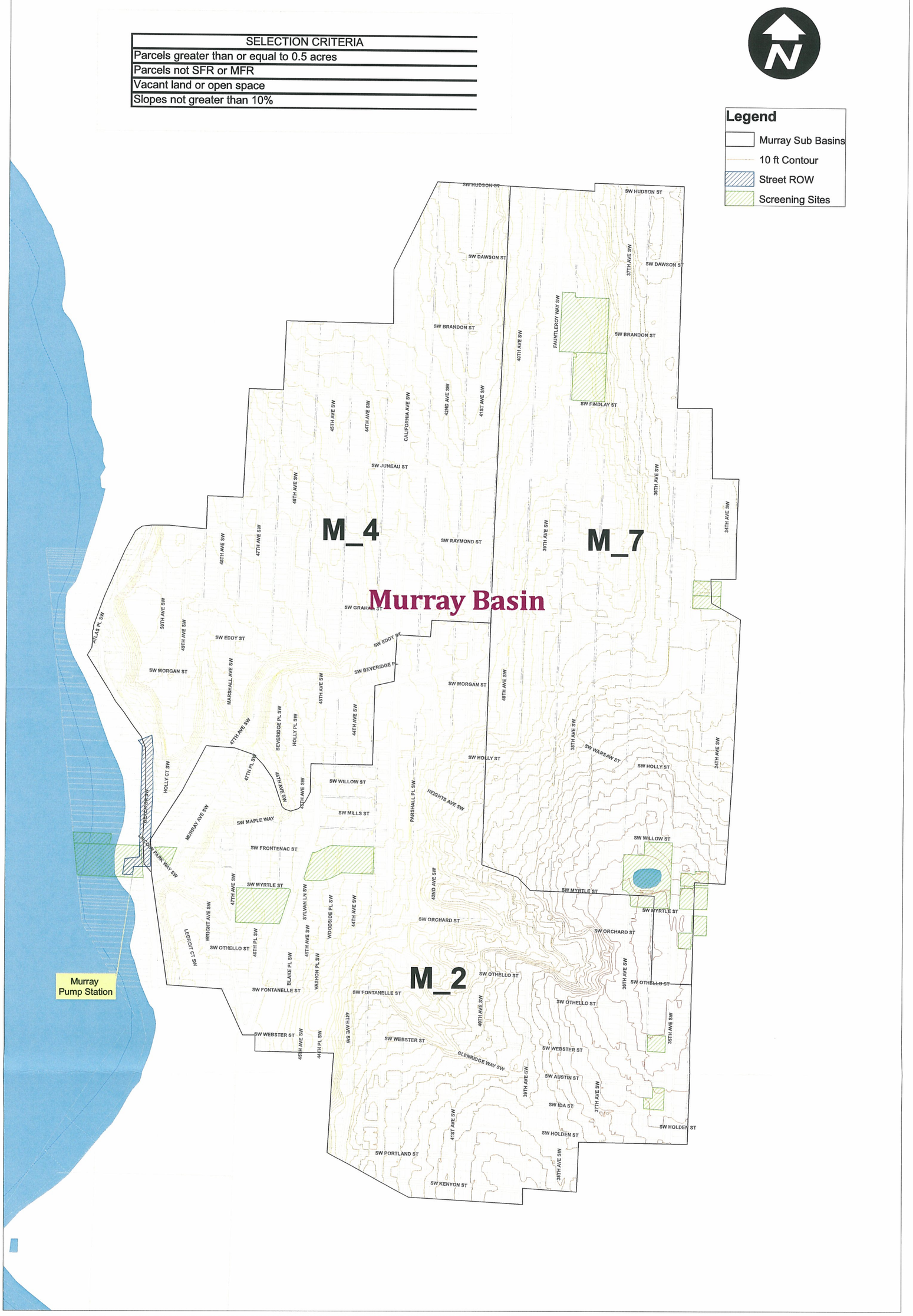
vii. No new outfalls are anticipated. The existing outfalls are assumed for end of pipe treatment approaches. Confirm the diameter of the existing outfall at Barton.

viii. Peak Flow Reduction Alternative

1. Pipes in alleys are not desirable. SPU prefers utilities in streets for a number of reasons. Peak flow reduction options would also be trying to capture flows on the streets. Therefore, MS4 development is assumed to be within the streets and not in alleys.
2. MS4s are assumed to connect to the existing system in an adjacent basin. The evaluation process will need to look at the capacity of those systems, outfall locations and impacts, etc. to determine the feasibility of this approach.
3. No treatment is assumed for disconnected area flows. This assumption would need to be confirmed during detailed evaluation.
4. Approximately 665 rooftops and associated right of way would need to be disconnected in the Barton Basin to eliminate the need for storage. The evaluation process needs to consider the disruption to homeowners and streets during construction.

END OF NOTES
CSO Control Alternatives Development
Barton/Murray Basin CSO Control Alternatives
8/06/09

SELECTION CRITERIA
Parcels greater than or equal to 0.5 acres
Parcels not SFR or MFR
Vacant land or open space
Slopes not greater than 10%

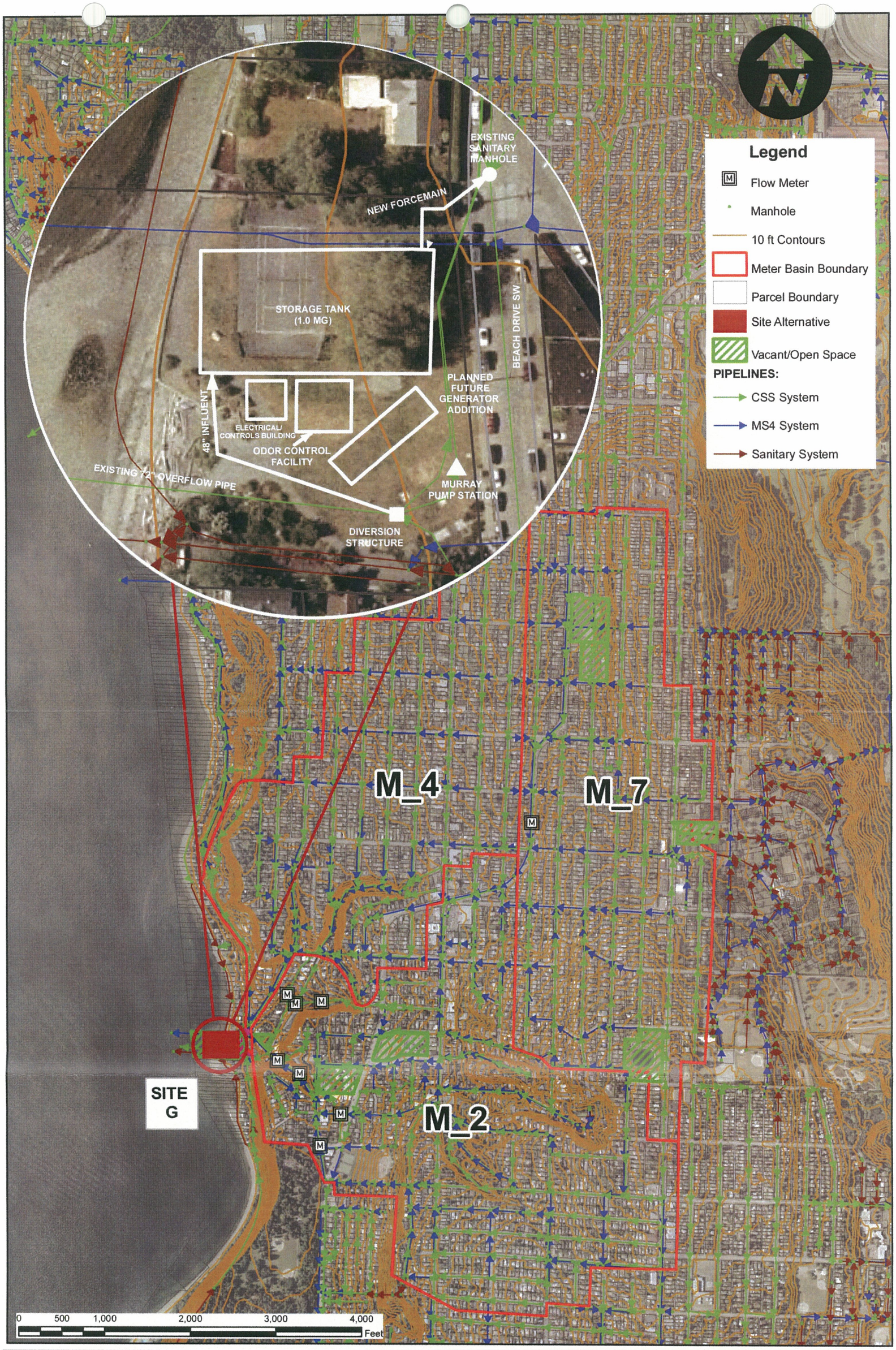


Murray Basin Final Results

ALTERNATIVE DEVELOPMENT PHASE				
			Barton Basin	**Murray Basin**
CSO Control Approach	**Configuration**	**Minimum Requirements for Potential Sites**	**Design Requirements:** • 110,000 gallon storage or • 26 acres effective disconnection	**Design Requirements:** • 1.0 mg storage or • 28.5 mgd conveyance or • Up to 10 acres effective disconnection to reduce 300,000 gallons of storage
1. Convey & Treat	Peak flow pump station, pipeline to existing treatment facility	• Flat (< 5%) open space near existing CSO • Outside public Right-of-Way • Sized for peak flow pump station	Cannot increase conveyance capacity out to Murray Basin	Alternative 2-K Convey and Treat
2. Centralized/Distributed Storage				
A. Bottom of Basin	Rectangular/Circular Tank	• Flat (< 5%) open space near existing CSO • Outside public Right-of-Way • Size dependent on storage volume	Alternative 1-A Rectangular Storage Alternative 1-A Circular Storage Alternative 1-C Circular Storage	Alternative 1-G Rectangular Storage
	Linear (in-line) Pipe	• Linear, flat (< 5%) open space near existing CSO • Inside or outside public Right-of-Way • Minimum 12-feet wide • Length dependent on storage volume	Alternative 1-A Pipe Storage Alternative 1-D Pipe Storage Alternative 1-E Pipe Storage	
	Deep Tunnel	• Flat (< 5%) open space near existing CSO • Flat (<5%) open space at access shaft (location dependent on storage volume) • Both sites outside public Right-of-Way		Alternative 1-J Pipe Storage
B. "Up-Basin"	Rectangular/Circular Tank	• Flat (< 5%) open space • Outside public Right-of-Way • Size dependent on storage volume	Alternative 1-B Rectangular Storage	Alternative 1-H Circular Storage
	Linear (in-line) Pipe	• Linear, flat (< 5%) open space • Inside or outside public Right-of-Way • Minimum 12-feet wide • Length dependent on storage volume		
3. End of Pipe Treatment				
A. Bottom of Basin	New high rate treatment facility	• Flat (< 5%) open space near existing CSO • Outside public Right-of-Way • Sized for treatment plant facilities and access	Alternative 3-A – End of Pipe Treatment	Alternative 3-G – End of Pipe Treatment
B. "Up-Basin"	Peak flow pump station, pipeline to new high rate treatment facility	• Flat (< 5%) open space near existing CSO, sized for peak flow pump station • Flat (<5%) open space at treatment plant location, sized for treatment plant facilities and access • Both sites outside public Right-of-Way		
4. Peak Flow Reduction				
A. Stormwater Disconnection	Disconnection of impervious areas (roof drains and catch basins) with stormwater re-routed to new or existing MS4.	• Available impervious area for disconnection • Inside or outside public Right-of-Way	Alternative 4-F – Stormwater Disconnection	Cannot achieve CSO control through disconnection alone in available CSO subbasins.
B. Green Stormwater Infrastructure (GSI)	Implementation of GSI techniques to limit stormwater response to rainfall	• See GSI analysis for constraints	TBD	TBD
5. Combined Approach				
A. Storage and Stormwater Disconnection	Disconnection of impervious areas to achieve reduction in required storage volume.	• See Approach 2 and Approach 4 above.	Can eliminate need for storage through disconnection in CSO sub-basin.	Alternative 5-J/L Combined Storage with Disconnection
NOTES:				

MURRAY BASIN
INITIAL ALTERNATIVES MATRIX

Control Approach		Site Locations					Notes
		G	H	J	K	L	
	Location	7005Beach Dr. SW	Intersection of Murray Ave SW and Lincoln Park SW	Beach Drive ROW	Beach Drive SW	Sub Basin M_7	
	Current Use	Public / Park	Residential / Vacant	Street ROW	63rd Street Pump Station	Residential	
1. Peak Flow Storage							
	"Rectangular Storage"	X					175' long x 90' wide x 16.5' deep buried, rectangular, multi-channel, self cleaning, cast-in-place concrete tank. Modification of existing effluent CSO diversion structure and diversion of flows to the new storage tank.
	"Circular Storage"		X				110-foot diameter, 20' deep circular Caisson storage tank. As the Murray Pump Station has only 31.5 MGD and the peak flow coming from the Barton pump station is 33 MGD, a new 1.5 mgd ancillary pump station would be required to pump excess flows coming from Barton basin to the new storage tank. Requires modification of existing diversion structure.
	"Pipe Storage"			X			12-foot diameter, 1350 LF of reinforced concrete pipe for storage. Requires 60' of shoring on beach drive at the north end of pipe.
2. Convey and Treat							
	Peak Flow PS at Lowman Beach Park and FM to 63rd Street Pump Station				X		75' long x 60' wide, 28.5 MGD peak flow pump station at Lowman Beach Park and 13,350 LF of 42" forcemain to 63rd Street pump station. Upgrades would be required to the 63rd Street pump station and the existing Alki CSO treatment facility to handle the increased flows. Also, existing Alki CSO outfall capacity should be evaluated to discharge the increased flows to the Puget sound.
3. End of Pipe Treatment							
	Bottom of Basin Treatment	X					160' long x 80' wide x 20' deep, 28.5 MGD Actiflo high rate clarification facility. Requires modification of existing effluent CSO diversion structure. May require pumping of the effluent to the Puget Sound depending on the hydraulic profile of the units.
4. Stormwater Flow Reduction							
	Roof Top Separation						10 acres of effective roof area and impervious ROW area separation from existing CSS system in Murray sub basin M_7 (sub basin 419 in GIS Report). Impervious area separation would be difficult to achieve in other sub basins as most of the basins are separated. Approximately 300,000 gallons of storage volume reduction would be achieved. Impervious area disconnection alone cannot meet the full control volume requirements.
5. Combined Approach							
	Impervious Area disconnection (300, 000 gallons) combined with Storage (700, 000 gallons)			X		X	300,000 gallons of reduction could be achieved from disconnecting 10 acres of effective roof area and impervious ROW area from existing CSS system in sub basin M_7. The remaining 700,000 gallons could be controlled either by a 950 LF of 12-foot diameter RCP pipe on Beach Drive road or by a 165' long x 70' wide x 16.5' deep buried, rectangular, multi-channel, self cleaning, cast-in-place concrete tank at the Lowman Beach Park.



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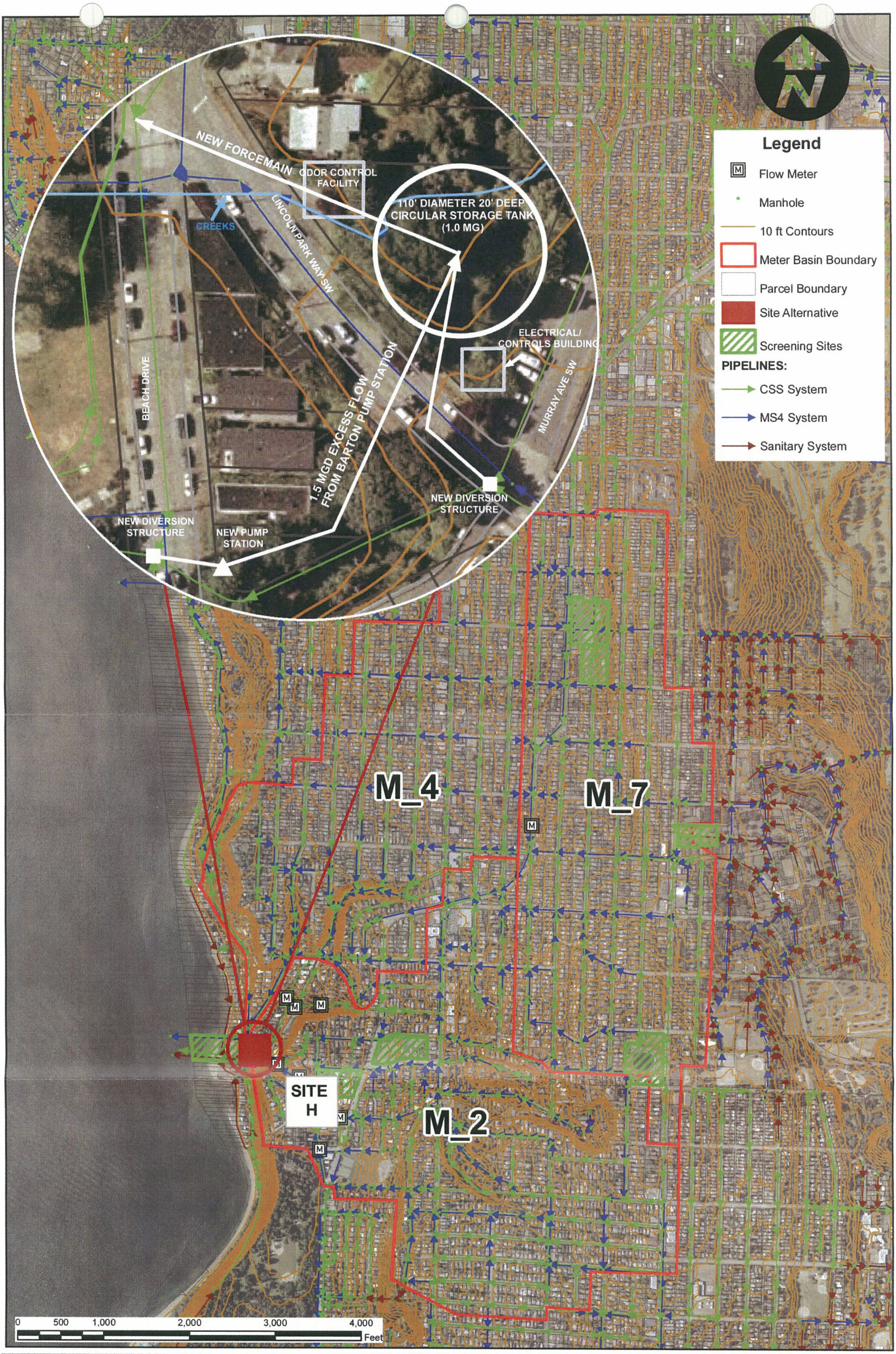
MURRAY CSO BASIN ALTERNATIVE 1G - RECTANGULAR STORAGE

CSO PLANNING/PREDESIGN SERVICES
KING COUNTY DNRP, WASTERWATER TREATMENT DIVISION

ALTERNATIVE TITLE		1- G - RECTANGULAR STORAGE
		TECHNICAL SUMMARY
LOCATION		7005 BEACH DR SW
CSO BASIN		MURRAY
DESCRIPTION		1.0 MG, 175 x 90 x 16.5 feet, buried, rectangular, multi-channel, self cleaning, cast-in-place concrete tank. Flushing chamber with automated flushing gates and drain chambers with submersible pumps. New diversion structure and control gates.
ANCILLARY FACILITIES		40' x 40' carbon scrubber type Odor Control Facility, 30' x30' Electrical/Controls Building with electrical equipment and controls. Access hatches and above grade structures.
OPERATIONAL FEATURES		Gravity flow into tank, pumped flow out of tank. Tank would be self cleaning using flushing gates. Flow would be pumped to an existing combined sewer manhole located on the Beach Drive.
		SELECTION CRITERIA FACTORS
LAND USE	Zoning	Commercial - Park use. Conditional use permit required.
	Ownership/acquisition	4.08 Ac. Acquire easement from Seattle Parks Department.
	Critical Areas	Yes, near to shore line. Requires shoreline permit and park permit.
ENVIRONMENT	Shorelines Zone	Yes
	Endangered Species	TBD
TECHNICAL	Complexity and Startup	Routing of flows using overflow weirs, automatic gates, and drain pumps. Facility would be within a single site located adjacent to the Barton Pump Station. The weir would be used for flow measurement and pump would be single speed "on/off". All controls and infrastructure would be located within the site.
	Compatibility w/WW system	A new diversion structure would be needed near the existing CSO outfall to divert flow to the new storage tank. Flow would be pumped from storage tank back to an existing sanitary sewer manhole upstream of Murray Pump Station.
	Flexibility	Minimal opportunity to expand. The County has planned a 96.5' x23.5' future generator upgrade project near the site.
	Constructability	Geotechnical and construction constraints due to close proximity of shore line. Special shoring and dewatering measures would likely be required. Contractor Staging Issues likely because of space constraints, off site staging would be required. Special construction and permanent measures would be required to stabilize the site such as slurry walls, tiebacks, and permanent dewatering.
O&M	Staffing	Facility can be automatically started and remotely monitored/operated. Drain pump start and shut down would be through county telemetry and control system. Periodic access would be required for equipment exercising and cleaning. The facility requires operator attention during design conditions (e.g. monitoring, sampling, chemical control, etc.). An operator may need to be present periodically for sampling, carbon delivery or other discrete tasks. Peak staff times require 1-2 operators. The facility can be shut down with minimal staff time. Cleanup work is generally automated; however, 1-2 personnel may be required. Some procedures of shutdown may need to be conducted immediately; however, most work can be scheduled to be integrated with other staff duties.
	Training	Routine training would be required in accordance with County's standards.
	Access	Inside the park through access hatches.
	Process Effects	None anticipated.
COST	Project Cost Factors	Mitigation for local traffic disruption during construction.
	Operation Cost Factors	Carbon for odor control.
	O&M	Carbon replacement, site checks, electricity, equipment and pump replacements and regular maintenance and cleaning.
	External Agency	Seattle Parks
	External Costs	Easement acquisition, site mitigation. Replacement of existing improvements required.
COMMUNITY	Location	Site located in a park surrounded by residences.
	Long Term Risk	Minimal impacts to residents from ongoing O & M: staff would be present infrequently (intermittent or only during/after storms).
	Construction	Reduction of usable park space due to proposed structures
		Construction would be located near residences and it will be difficult to mitigate impacts such as noise, after hours work, light, vibration, and access.
		Traffic Disruption from Construction
		Disruption from park use



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MURRAY CSO BASIN ALTERNATIVE 1H - CIRCULAR STORAGE

CSO PLANNING/PREDESIGN SERVICES
KING COUNTY DNRP, WASTERWATER TREATMENT DIVISION

ALTERNATIVE TITLE		1 - H - CIRCULAR STORAGE
TECHNICAL SUMMARY		
LOCATION		INTERSECTION OF MURRAY AVE SW AND LINCLON PARKWAY SW
CSO BASIN		MURRAY
DESCRIPTION		The proposed storage tank would be located in an undeveloped residential lot at the intersection of the Murray Ave SW and Lincoln Parkway SW. The property has a triangular boundary and therefore a 110' diameter, 20 feet deep circular caisson storage tank would provide the required 1.0 MG storage volume. A new diversion structure would be required at the intersection of Murray Ave SW and Lincoln Parkway SW to divert flows to the new storage tank. A new ancillary pump station would be required to pump some of the peak flow from the Barton Pump Station to the new storage facility.
ANCILLARY FACILITIES		When Barton Pump Station would be pumping 33 MGD during peak flows, Murray Pump Station can only pump 31.5 MGD. Therefore, a new 1.5 mgd pump station would be required near Murray Pump Station to pump excess flows to the new storage tank during peak flow events. 40' x 40' carbon scrubber type Odor Control Facility, 30' x30' Electrical/Controls Building with electrical equipment and controls. Access roads, fencing around surface structures.
OPERATIONAL FEATURES		Gravity flow and pumped flow into storage tank, pumped flow out of tank.
SELECTION CRITERIA FACTORS		
LAND USE	Zoning	Vacant residential lot.
	Ownership/acquisition	0.51 Acres. Acquire from City of Seattle.
	Critical Areas	The Site has steep slopes.
ENVIRONMENT	Shorelines Zone	TBD-Possible creek crossing.
	Endangered Species	TBD
TECHNICAL	Complexity and Startup	Routing of flows using overflow weirs, automatic gates, and drain pumps. Facility would be within a single site located approximately 300 ft upstream of the Barton Pump Station. The weir in the diversion structure and a flow meter in the ancillary pump station would be used for flow measurement. Drain pumps would be single speed "on/off". Ancillary pump station may be variable speed. Controls and infrastructure would be located at storage facility and in the ancillary pump station. Site has steep slopes. Special construction and permanent measures are needed to stabilize the site using caissons, slurry walls, tiebacks, etc.
	Compatibility w/WW system	A new diversion structure at the intersection of Murray Ave SW and Lincoln Parkway SW to divert flows by gravity to the new storage tank. New 1.5 mgd ancillary pump station near Murray Pump Station to pump excess flows to the new storage tank.
	Flexibility	Minimum opportunity for expansion.
	Constructability	Geotechnical and construction constraints due to steep slopes in the lot. Special measures required. Contractor Staging Issues. Possible creek crossing in the site and requires relocation.
O&M	Staffing	Facility can be automatically started and remotely monitored/operated. Drain pump start and shut down would be through county telemetry and control system. Periodic access would be required for equipment exercising and cleaning. The facility requires operator attention during design conditions (e.g. monitoring, sampling, chemical control, etc.). An operator may need to be present periodically for sampling, carbon delivery or other discrete tasks. Peak staff times require 1-2 operators. The facility can be shut down with minimal staff time. Cleanup work is generally automated; however, 1-2 personnel may be required. Some procedures of shutdown may need to be conducted immediately; however, most work can be scheduled to be integrated with other staff duties.
	Training	Routine training would be required in accordance with County's standards.
	Access	Within the site.
	Process Effects	TBD
COST	Project Cost Factors	Mitigation for local traffic disruption during construction.
	Operation Cost Factors	Carbon for odor control.
	O&M	Carbon replacement, site checks, electricity, equipment and pump replacements and regular maintenance and cleaning.
	External Agency	TBD
	External Costs	Land acquisition, mitigation.
COMMUNITY	Location	Site located in residential neighborhood.
	Long Term Risk	Minimal impacts to community from ongoing O & M: staff would be present infrequently (intermittent or only during/after storms).
	Construction	Construction would be located near residences and it would be difficult to mitigate impacts such as noise, after hours work, light, vibration, and access.
		Traffic Disruption from Construction.

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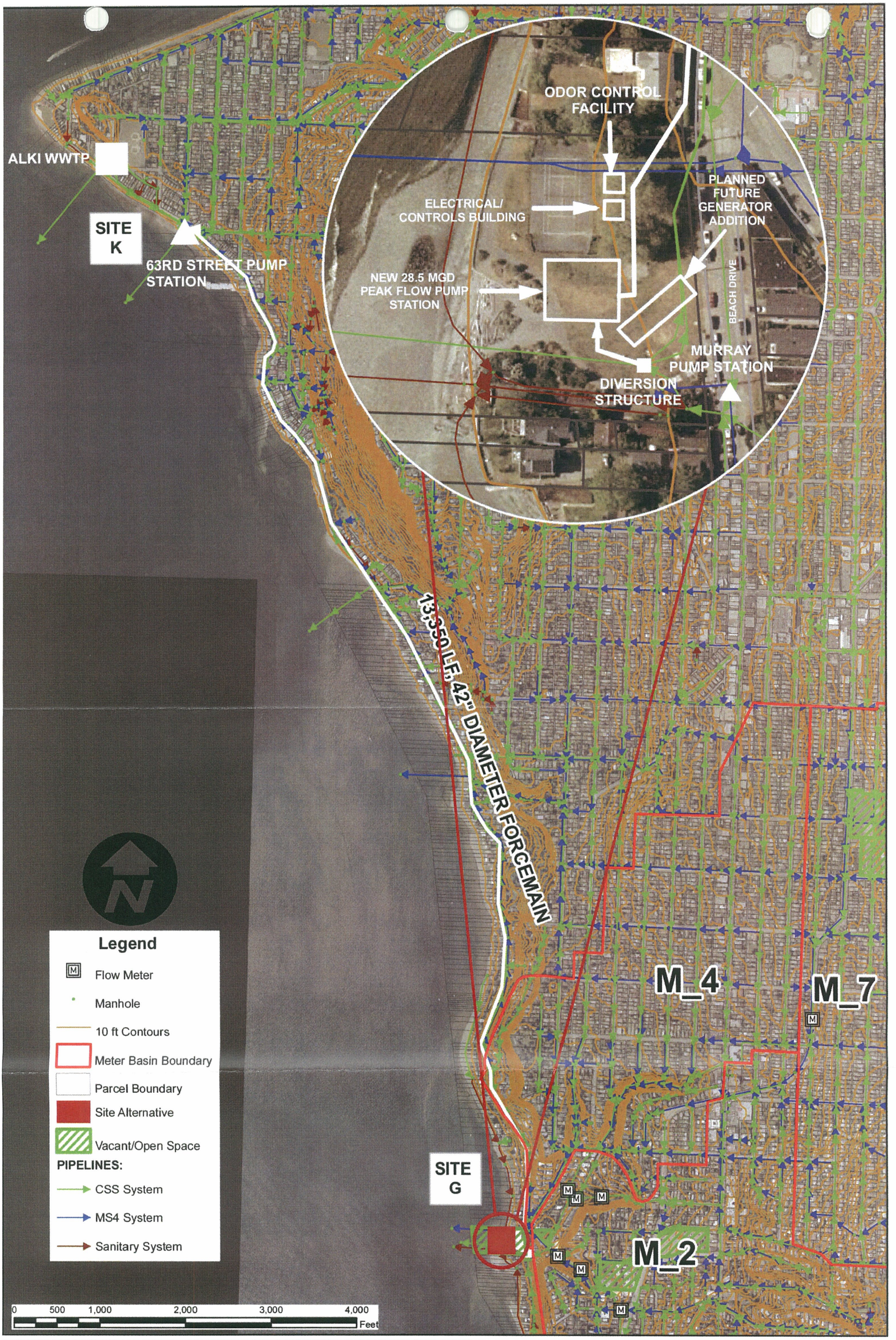
MURRAY CSO BASIN ALTERNATIVE 1J - PIPE STORAGE

CSO PLANNING/PREDESIGN SERVICES
KING COUNTY DNRP, WASTERWATER TREATMENT DIVISION

ALTERNATIVE TITLE		1- J - PIPE STORAGE
TECHNICAL SUMMARY		
LOCATION	BEACH DRIVE ROAD SW	
CSO BASIN	MURRAY	
DESCRIPTION	Requires approximately 1,350 LF of 144" (12-foot) diameter reinforced concrete pipe for storage of 1.0 MG. Major components include: a flushing chamber with flushing gates and drain chamber with submersible pumps. Flow control sensors and instrumentation. A new diversion structure with control gates near the existing CSO outfall to divert flow to the new storage pipe.	
ANCILLARY FACILITIES	40' x 40' carbon scrubber type Odor Control Facility, 30' x30' Electrical/Controls Building with electrical equipment and controls. Surface access structures or manholes on the Beach Drive along the length of the pipe line for regular operation and maintenance. Drain pumps.	
OPERATIONAL FEATURES	Gravity flow into tank, pumped flow out of tank.	
SELECTION CRITERIA FACTORS		
LAND USE	Zoning	Zoning would be commercial use where the pump station would be located in the park and road right-of-way for force main. Requires conditional use permit and permit from Seattle DOT.
	Ownership/acquisition	Easement required.
	Critical Areas	Located on Road right-of-way.
ENVIRONMENT	Shorelines Zone	No
	Endangered Species	TBD
TECHNICAL	Complexity and Startup	Similar to other County storage tanks.
	Compatibility w/WW system	A new diversion structure would be required near the existing CSO outfall to divert peak flow to the new storage pipe. The alternative may also require modifications to the operational methods for existing infrastructure.
	Flexibility	Minimum opportunity for expansion.
	Constructability	The north end of the pipe would be approximately 60' deep due to existing elevation. Special measures would be required for tunneling. Geotechnical and construction constraints due to location of the pipe on the Right-of-Way. Tunneling portals would block street requiring temporary access and detour measures for local residents along beach drive. Site is constrained, requiring careful construction sequencing, with several move-in, move-out stages to accommodate specialty contractors as well as conventional construction. Contractor would require provide offsite staging and operations. Relocation of sanitary sewer, water and other underground utilities may be required along Beach Drive.
O&M	Staffing	Facility can be automatically started and remotely monitored/operated. Drain pump start and shut down would be through county telemetry and control system. Periodic access would be required for equipment exercising and cleaning. The facility requires operator attention during design conditions (e.g. monitoring and control, etc.). An operator may need to be present periodically for sampling, carbon delivery or other discrete tasks. Peak staff times require 1-2 operators. The facility can be shut down with minimal staff time. Cleanup work is generally automated; however, 1-2 personnel may be required. Some procedures of shutdown may need to be conducted immediately; however, most work can be scheduled to be integrated with other staff duties.
	Training	Routine training would be required in accordance with County's standards.
	Access	Surface access, or from structure located outside of travelled roadway.
	Process Effects	None anticipated.
COST	Project Cost Factors	Mitigation for local traffic disruption and temporary access during construction.
	Operation Cost Factors	Carbon for odor control unit.
	O&M	Carbon replacement, site checks, electricity, equipment and pump replacements and regular maintenance and cleaning.
	External Agency	SDOT, SPU
	External Costs	Land / Easement Acquisition, mitigation.
COMMUNITY	Location	Site located on Beach Drive Right-of-Way. Visible to surrounding residences.
	Long Term Risk	Minimal impacts to community from ongoing O & M: staff would be present infrequently (intermittent or only during/after storms).
	Construction	Construction would be located on Beach Drive right-of-way. Access along the pipe alignment would be blocked by tunnel portals. Temporary access would need to be developed for those residents along Beach Drive located between the portals. It would be difficult to mitigate impacts such as noise, after hours work, light, vibration, and access.
		Traffic Disruption from Construction



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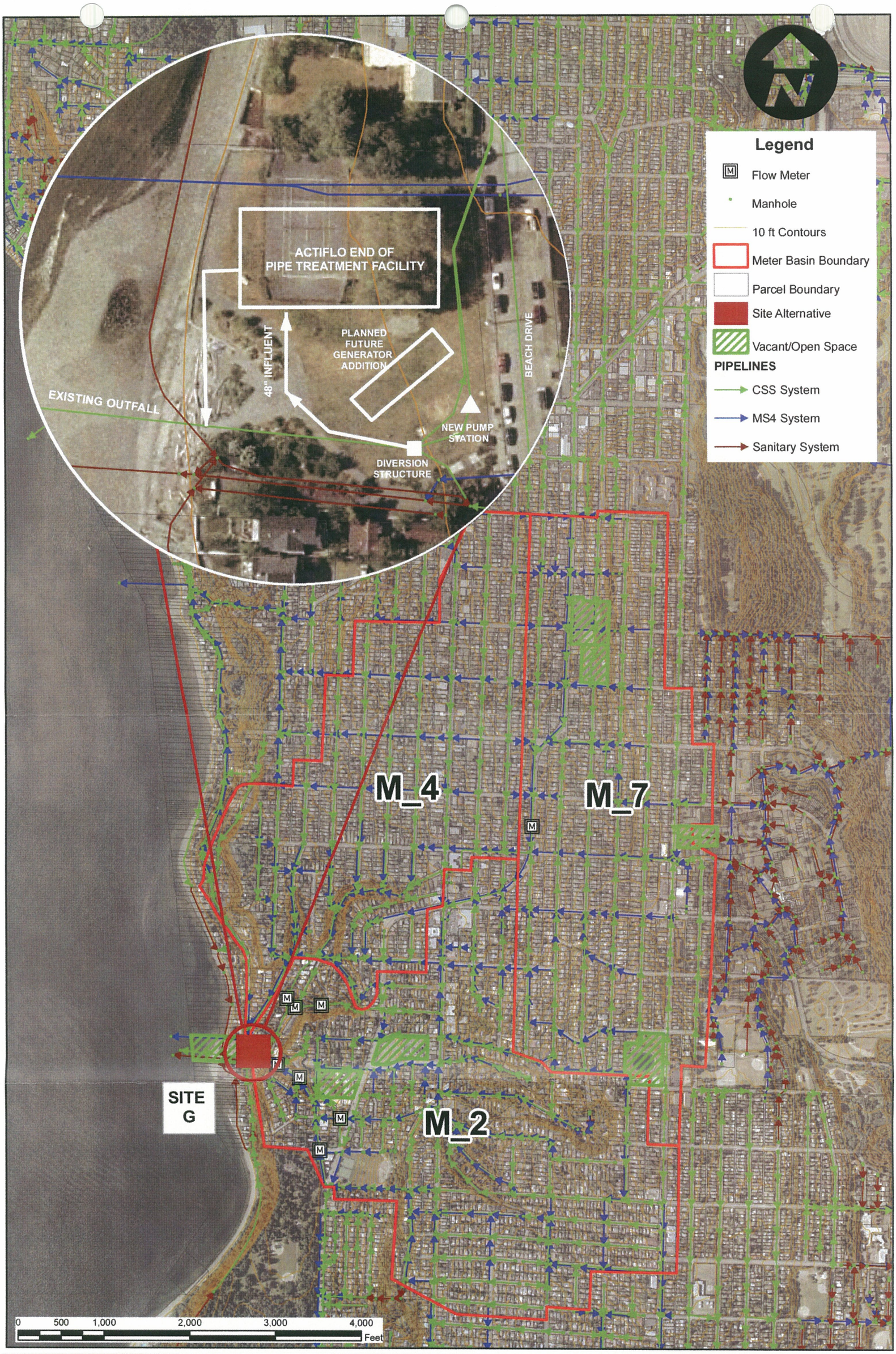
MURRAY CSO BASIN ALTERNATIVE 2K - CONVEY AND TREAT

CSO PLANNING/PREDESIGN SERVICES
KING COUNTY DNRP, WASTERWATER TREATMENT DIVISION

ALTERNATIVE TITLE		2- K - CONVEY AND TREAT
		TECHNICAL SUMMARY
LOCATION	BEACH DRIVE ROAD SW	
CSO BASIN	MURRAY	
DESCRIPTION	Peak flows from the Murray basin would be conveyed to the 63rd Street pump station and treated at the Alki CSO Treatment Facility. This would require a 60 x 75 feet, 28.5 MGD peak flow pump station near existing Murray pump station on Lowman Beach Park. Approximately 13,350 LF of 42" diameter forcemain along the beach drive road would be needed to convey the flows to the existing 63rd street pump station. This would also require upgrades to the existing 63rd Street pump station and the Alki treatment facility to handle the additional flows. Also, capacity of the Alki CSO outfall needs to be evaluated for discharging additional flows to the Puget Sound.	
ANCILLARY FACILITIES	20' x 20' carbon scrubber type Odor Control Facility, 20' x20' Electrical/Controls Building with electrical equipment and controls. Surface access structures or air release manholes on the Beach Drive along the length of the pipe line alignment for operation and maintenance. Upgrades to existing Alki CSO Treatment Facility.	
OPERATIONAL FEATURES	Peak flow diversion structure, peak flow wet weather pump station to convey flows to the Alki CSO Facility.	
		SELECTION CRITERIA FACTORS
LAND USE	Zoning	Park - Commercial use where the pump station would be located and road right-of-way for force main. Requires conditional use permit and permit from Seattle DOT.
	Ownership/acquisition	Easement for new pump station at Lowman Park
	Critical Areas	Located on Road Right of Way/Lowman Park
ENVIRONMENT	Shorelines Zone	Yes
	Endangered Species	TBD
TECHNICAL	Complexity and Startup	Similar to other County Pump Stations.
	Compatibility w/WW system	A new diversion structure shall be constructed near the existing CSO outfall to divert flow to the new wet weather pump station.
	Flexibility	Minimum opportunity to expand (limited space in the park)
	Constructability	Approximately 2.5 miles of forcemain construction along the Beach Drive. Traffic disruptions during construction, existing utility relocations due to new forcemain alignment. Disruption of Lowman Beach Park during construction of pump station.
O&M	Staffing	Remotely monitored, started, and shut down using county telemetry and control system. Periodic access for equipment exercising and cleaning.
	Training	Routine training would be required in accordance with County's standards.
	Access	Inside the Park (pump station), Along the road (forcemain)
	Process Effects	Treatment plant/outfall capacity will need to be increased at the Alki CSO facility.
COST	Project Cost Factors	Mitigation for local traffic disruption during construction.
	Operation Cost Factors	Additional O & M at Alki, New pump station /forcemain O & M.
	O&M	Electricity, pump station checks and forcemain maintenance.
	External Agency	Seattle Parks, SDOT, SPU
	External Costs	Easement acquisition, mitigation
COMMUNITY	Location	Visible to surrounding residences.
	Long Term Risk	O & M Risk: Accessing park site for regular pump station checks and maintenance.
	Construction	Construction would be located on Beach Drive Right-of-Way and it would be difficult to mitigate impacts such as noise, after hours work, light, vibration, and access.
		Traffic Disruption from Construction
		Disruption from park use
		Reduction of usable area of park due to proposed above grade structures



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MURRAY CSO BASIN ALTERNATIVE 3G - END OF PIPE TREATMENT

CSO PLANNING/PREDESIGN SERVICES
KING COUNTY DNRP, WASTERWATER TREATMENT DIVISION

ALTERNATIVE TITLE		3-G - END OF PIPE TREATMENT
TECHNICAL SUMMARY		
LOCATION	7005 BEACH DR SW	
CSO BASIN	MURRAY	
DESCRIPTION	28.5 MGD capacity, 160 x 80 x 20 feet, buried, rectangular Actiflo High Rate Clarification (HRC) system in cast-in-place concrete tank. HRC facilities include an Actiflo HRC unit, 10mm prescreening, odor control, electrical and chemical buildings and UV treatment.	
ANCILLARY FACILITIES	Surface access structures such as hatches for regular operation and maintenance. Access roads and fencing around surface structures.	
OPERATIONAL FEATURES	Gravity flow into to treatment unit. May require pumping of treated effluent depending upon hydraulic profile of treatment units.	
SELECTION CRITERIA FACTORS		
LAND USE	Zoning	Commercial – Park use. Conditional use permit required.
	Ownership/acquisition	4.08 Ac. Acquire easement from Seattle Parks Dept.
	Critical Areas	Yes, near to shore line. Requires shoreline permit and park permit.
ENVIRONMENT	Shorelines Zone	Yes
	Endangered Species	TBD
TECHNICAL	Complexity and Startup	More complex than typical county facilities.
	Compatibility w/WW system	A new diversion structure would be required near the existing CSO outfall to divert flows to the new Treatment Facility.
	Flexibility	Minimum. The County has a 96.5' x23.5' future generator upgrade project near the site.
	Constructability	Geotechnical and construction constraints due to close proximity of shore line. Special measures required. Contractor Staging Issues. Site has low to medium slopes and requires dewatering if disturbed because excavation would be near to the shore line. Special construction and permanent measures would be required to stabilize the site such as slurry walls, tiebacks, and permanent dewatering.
O&M	Staffing	Remotely monitored, started, and shut down using county telemetry and control system. May require staff monitoring during operation. Periodic access for equipment exercising, solids removal and cleaning.
	Training	Training would be required for operation and maintenance of facility.
	Access	On Site
	Process Effects	TBD
COST	Project Cost Factors	Mitigation for local traffic disruption during construction.
	Operation Cost Factors	Carbon for odor control unit, polymer for high rate clarification and operational cost associated with disinfection.
	O&M	Carbon replacement, site checks, electricity, equipment and pump replacements and regular maintenance and cleaning.
	External Agency	TBD
	External Costs	Easement acquisition, site mitigation.
COMMUNITY		Traffic Disruption from Construction and Construction noise.
		Disruption from park use.
		Reduce of usable park area due to proposed structures, residential neighbors to the South.
COMMUNITY	Location	Visible to surrounding residences.
	Long Term Risk	O & M impacts on surrounding community: moderate maintenance would be needed by staff and staff would be onsite to check during large storms.
	Construction	Construction would be located near residences and it would be difficult to mitigate impacts such as noise, after hours work, light, vibration, and access.
		Traffic Disruption from Construction.
		Disruption from park use.

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Murray CSO Basin Alternative 5L
Impervious Area Disconnection
CSO PLANNING/PREDESIGN SERVICES
KING COUNTY DNRP, WASTERWATER TREATMENT DIVISION

ALTERNATIVE TITLE		5- L - DISCONNECTION AND 5- J - PIPE STORAGE
TECHNICAL SUMMARY		
LOCATION	SOUTHEAST AREA OF SUBBASIN M_7 (SUBBASIN 419 FROM GIS REPORT) AND PIPE STORAGE ON BEACH DRIVE SW	
CSO BASIN	MURRAY	
DESCRIPTION	Disconnect approximately 10 acres of roof and street storm water connections from combined sewer system (CSS). This would reduce the control volume by 300,000 MG. The remaining 700,000 MG can be controlled either using a 950 foot long 144 inch diameter RCP pipe on Beach Drive SW or 165' x 70' x 16.5' deep buried, rectangular, multi-channel, self cleaning, cast-in-place concrete tank at the bottom of the basin in Lowman Beach Park. Compared to Alternative-1-J, by disconnecting impervious area in sub basin 419, approximately 400 LF of pipe storage could be reduced. (Refer to Alternative figures 1-J and 1-G for pipe and rectangular storage site locations)	
ANCILLARY FACILITIES	Construction of approximately 6,800 LF of 12-inch diameter storm sewer pipe along 34th, 35th and 36th AVE SW streets (refer to map for storm sewer location) 40' x 40' carbon scrubber type Odor Control Facility, 30' x30' Electrical/Controls Building with electrical equipment and controls. Surface access structures or manholes on the beach drive along the length of the pipe for regular operation and maintenance.	
OPERATIONAL FEATURES	Impervious area disconnections and diversion of flows from roof drains and catch basins into new storm sewers. The existing CSS will be used as the sanitary sewer system. For storage, operational features similar to rectangular and pipe storage alternatives.	
SELECTION CRITERIA FACTORS FOR DEMAND MANAGEMENT		
LAND USE	Zoning	Residential (SFR). Conditional use permit required.
ENVIRONMENT	Shorelines Zone	No
	Endangered Species	TBD
CAPACIY	**Storm System:** Pipeline Diameter Tie-in MS4 Diameter Capacity	 12-inch diameter and greater (estimate only, TBD) Varies TBD
	Sanitary System: Pipeline Diameter Downstream SS Capacity	(Reuse existing CSS) Varies 18 inches TBD
CONTROL VOLUME REDUCTION	Total Effective Impervious Area Disconnected	10.0 acres
	Total Control Volume Reduction	300,000 gallons
CONSTRUCTION IMPACTS	Lineal feet of pipe, ft	6,800 LF
O&M	Staffing	Not required.
	Training	Not required.
	Access	N/A
	Process Effects	TBD
COST	Project Cost Factors	Mitigation for local traffic disruption during construction. Concrete pavement panel replacement, side walk repairs, storm lateral connections.
	Operation Cost Factors	Minimum
	O&M	Minimum
	External Agency	Seattle Public Utilities
	External Costs	TBD
COMMUNITY	Location	Highly visible to residences.
	Long Term Risk	Minimum
	Construction	Traffic Disruption on streets during construction.
SELECTION CRITERIA FACTORS FOR STORAGE		
Refer to Alternative 1-G for rectangular storage and Alternative 1-J for pipe storage.		