PRELIMINARY ALTERNATIVES

This chapter provides a detailed description of the alternatives developed under Step 2.1 of Phase 2 (as described in Section 5.3). Development of alternatives began with identification of preliminary sites suitable for CSO facilities. These preliminary alternatives were developed between July and September 2009. Based on this information and design criteria resulting from flow monitoring and modeling, preliminary alternatives were developed using the identified viable CSO control approaches.

6.1 NO ACTION ALTERNATIVES

The No Action Alternatives for the Barton and Murray CSO basins entail no changes to the sewer systems in the two basins. These alternatives would result in CSOs in the basins in excess of one per year on a long-term average based on historical data. The basins would not comply with RCW 90.48.480 and WAC 173-245-020 (22) or the West Point Treatment Plant NPDES Permit, all of which require CSOs to be limited to an average of no more than one untreated discharge per year per outfall on a long-term average. The Barton CSO basin has experienced an average of four CSO events per year, averaging 4 MG per year, and the Murray CSO basin has experienced an average of five CSO events per year, averaging 5 MG per year.

The risk to Puget Sound water quality (e.g., bacteria, nutrients, and metals) would remain at present levels. Decreased water quality could adversely affect biological resources and could result in decreased availability of the beach and/or public exposure.

6.2 IDENTIFICATION OF PRELIMINARY SITES

Initial candidate sites for facilities were identified using GIS data from King County (*CSO Beach Project GIS Analysis*, King County, Revised June 2010) and the City of Seattle, based on the following criteria:

- Ground surface slope of less than 10 percent.
- Outside public right of way.
- Publicly owned or vacant.
- Minimum area of 1 acre.

After initial identification of candidate sites meeting these criteria, each site was further evaluated for suitability of placing a CSO control facility. Sites in upper portions of the basins would be less effective in controlling CSOs than sites near the bottom of the basin because each individual sub-basin generates only a small portion of the total peak flow that needs to be controlled. Preliminary siting criteria required that at least 50 percent of the peak flow would need to pass by a site in order for it to serve as an effective location for a CSO facility. Figures 4.3 and 4.5 show the peak flow distribution in the Barton and Murray CSO basins. Based on the results of this analysis, only parcels close to the bottom of the basin were

retained for the Murray CSO basin. Candidate parcels were retained in Barton at the bottom of the basin and along upper Fauntleroy Way SW, SW Director Street and SW Barton Street.

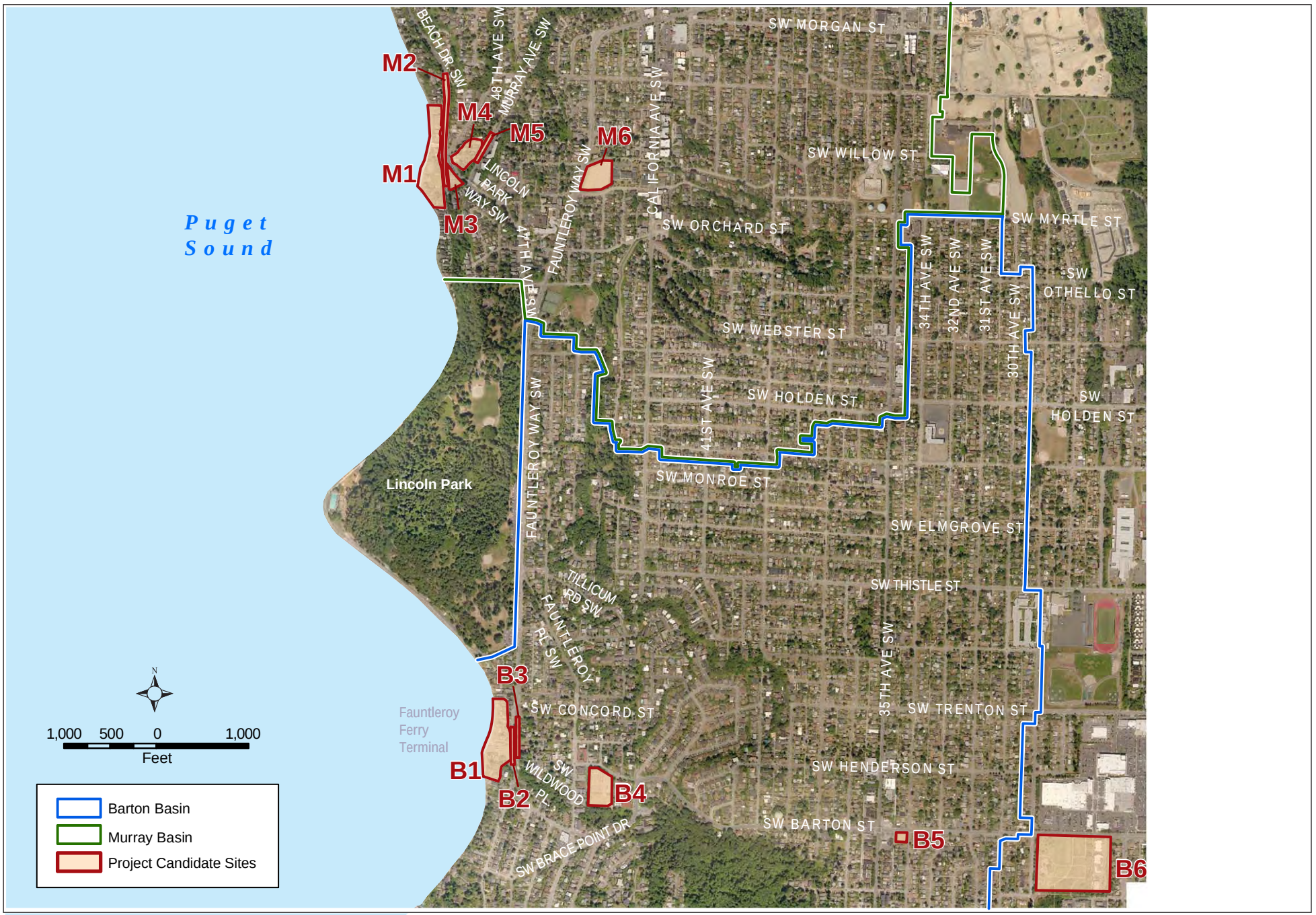
A survey and review of the site characteristics were then performed to further refine the list of remaining sites. Because very few sites remained after these analyses, the criteria were modified to allow developed parcels and sites within the public right-of-way for siting storage facilities (such as large diameter pipe storage). The final set of candidate sites used for development of preliminary alternatives is shown on Figure 6.1 and summarized in Tables 6.1 and 6.2.

Table 6.1 Barton CSO Basin Preliminary Sites

Site	Description
B1	Area surrounding existing Barton Pump Station and Fauntleroy Ferry Terminal, west of Fauntleroy Way SW
B2	Fauntleroy Way SW right-of-way, adjacent to Fauntleroy Ferry Terminal
B3	Upper Fauntleroy Way SW right-of-way
B4	Property west of Fauntleroy School
B5	Vacant parcels at southwest corner of SW Barton Street and 34th Avenue SW
B6	Roxhill Playground, just outside Barton CSO basin

Table 6.2 Murray CSO Basin Preliminary Sites

Site	Description
M1	Area surrounding existing Murray Pump Station and Lowman Beach Park, west of Beach Drive SW
M2	Beach Drive SW right-of-way, adjacent to Lowman Beach Park
M3	Private parcels bounded by Beach Drive SW, Lincoln Park Way SW and Murray Avenue SW
M4	Parcels north of intersection of Lincoln Park Way SW and Murray Avenue SW
M5	Murray Avenue SW right-of-way, north of Lincoln Park Way SW
M6	Property on west side of Gatewood Elementary School



3630023/Fig6-01_InitialSites.ai

BARTON AND MURRAY COMBINED SEWER OVERFLOW CONTROL FACILITIES PLAN

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Figure 6.1.
CANDIDATE SITES

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6.3 PRELIMINARY ALTERNATIVES OVERVIEW

The viable control approaches were matched with the remaining candidate sites based on the results of flow monitoring and modeling and basin reconnaissance. Potential areas were defined roughly by the ability to route flow to the CSO facility location, topography, and distance from the existing CSO control facility. An important project assumption is that existing CSO outfalls would not be modified, due to environmental and permitting impacts on the implementation schedule. Therefore, no new control points were created by the alternatives.

The following alternatives were developed for the Barton CSO basin:

- Control Approach 1 – Storage:
  - Alternative 1A – Rectangular Storage at Bottom of Basin
  - Alternative 1B – Circular Storage at Bottom of Basin
  - Alternative 1C – Pipe Storage at Bottom of Basin
  - Alternative 1D – Pipe Storage in Right-of-Way at Bottom of Basin
  - Alternative 1E – Pipe Storage in Upper Fauntleroy Way SW
  - Alternative 1F – Rectangular Storage in Vicinity of Fauntleroy School
  - Alternative 1G – Rectangular Storage in Upper Basin
- Control Approach 2 – Convey-and-Treat:
  - No alternative was developed for this approach because planning is already underway for improvements to increase the capacity of the Barton Pump Station (see Chapter 3).
- Control Approach 3 – End-of-Pipe Treatment:
  - Alternative 3A – End-of-Pipe Treatment at Bottom of Basin
- Control Approach 4 – Peak Flow Reduction:
  - Alternative 4A – Peak Flow Reduction by Roof Drain Disconnection.
- Control Approach 5 – Combined Approach:
  - No alternatives combining approaches were developed for the Barton CSO basin.

The following alternatives were developed for the Murray CSO basin:

- Control Approach 1 - Storage:
  - Alternative 1A – Rectangular Storage at Bottom of Basin
  - Alternative 1B – Circular Storage in Vicinity of Murray Avenue and Lincoln Park Way
  - Alternative 1C – Distributed Storage Along Beach Drive and Murray Avenue SW
  - Alternative 1D – Pipe Storage at Bottom of Basin by Tunneling
  - Alternative 1E – Upper Basin Storage

  - Alternative 1F – Combined Pipe and Rectangular Storage at Bottom of Basin

- Control Approach 2 - Convey and Treat:
  - Alternative 2A – Convey and Treat at Alki
- Control Approach 3 – End-of-Pipe Treatment:
  - Alternative 3A – End-of-Pipe Treatment at the Bottom of the Basin
- Control Approach 4 – Peak Flow Reduction:
  - No alternatives using only peak flow reduction were developed for the Murray Basin.
- Control Approach 5 - Combined Approach:
  - Alternative 5A - Peak Flow Reduction by Roof Drain Disconnection, Combined with Storage.

Conceptual layouts for improvement facilities were developed and drawn at candidate sites within the alternative locations. Preliminary alternatives are summarized in Tables 6.3 and 6.4 and described in the following sections.

Table 6.3 Barton CSO Basin Preliminary Alternatives

Approach	Alternative	Description	Site (Figure 6.1)
Centralized storage	1A	One 0.11-MG rectangular tank; construction footprint = 65’ x 55’ x 15’	B1
	1B	One 0.11-MG circular tank, 52’ diameter, 14’ deep	B1
	1C	One 0.11-MG storage pipe, 12’ diameter, 150’ long	B1
	1D	One 0.11-MG storage pipe, 12’ diameter, 150’ long	B2
	1E(1)	One 0.11-MG storage pipe, 12’ diameter, 150 long	B3
	1F(1)	One 0.11-MG rectangular tank; construction footprint = 65’ x 55’ x 15’	B4
	1G(1)	One 0.11-MG rectangular tank; construction footprint = 65’ x 55’ x 15’	B5 or B6
End-of-Pipe Treatment	3A	12-mgd Actiflo treatment plant; construction footprint = 120’ x 60’ x 15	B1
Peak Flow Reduction	4A	26 acres of impervious roof and street right-of-way area disconnected from combined sewers	n/a

1. Alternatives 1E, 1F and 1G are at locations in the mid or upper basin and require more storage than the bottom-of-basin alternatives; however, the mid/upper-basin storage requirement was not calculated prior to development of the preliminary alternatives, so sizing for the preliminary alternatives assumed storage volume equal to that of the bottom-of-basin alternatives.

Table 6.4 Murray CSO Basin Preliminary Alternatives

Approach	Alternative	Description	Site (Figure 6.1)
Centralized storage	1A	One 1-MG rectangular tank; construction footprint = 175' x 90' x 17'	M1
	1B	One 1-MG circular tank, 110' diameter, 20' deep	M4
	1D	One 1-MG storage pipe, 12' diameter, 1,250' long	M2
	1E	One 28.5-mgd pump station and one 1-MG rectangular tank; tank construction footprint = 175' x 90' x 17'	M1 and M6
Distributed Storage	1C	One 0.28-MG storage pipe, 12' diameter, 350' long; One 0.72-MG storage pipe, 12' diameter, 900' long	M2 and M5
	1F	One rectangular tank (0.6 to 1.0 MG) and one storage pipe (0 to 0.4 MG)	M2 and M3
Convey & Treat	2A	One 28.5-mgd pump station and 13,350' of new 42" force main	M1
End-of-Pipe Treatment	3A	28.5-mgd Actiflo treatment plant; construction footprint = 160' x 80' x 20	M1
Combination	5A	10 acres of impervious roof and street right-of-way area disconnected from combined sewers; one storage pipe, 12' diameter, 1,075' long (0.86 MG)	M2

6.4 PRELIMINARY BARTON CSO BASIN ALTERNATIVES

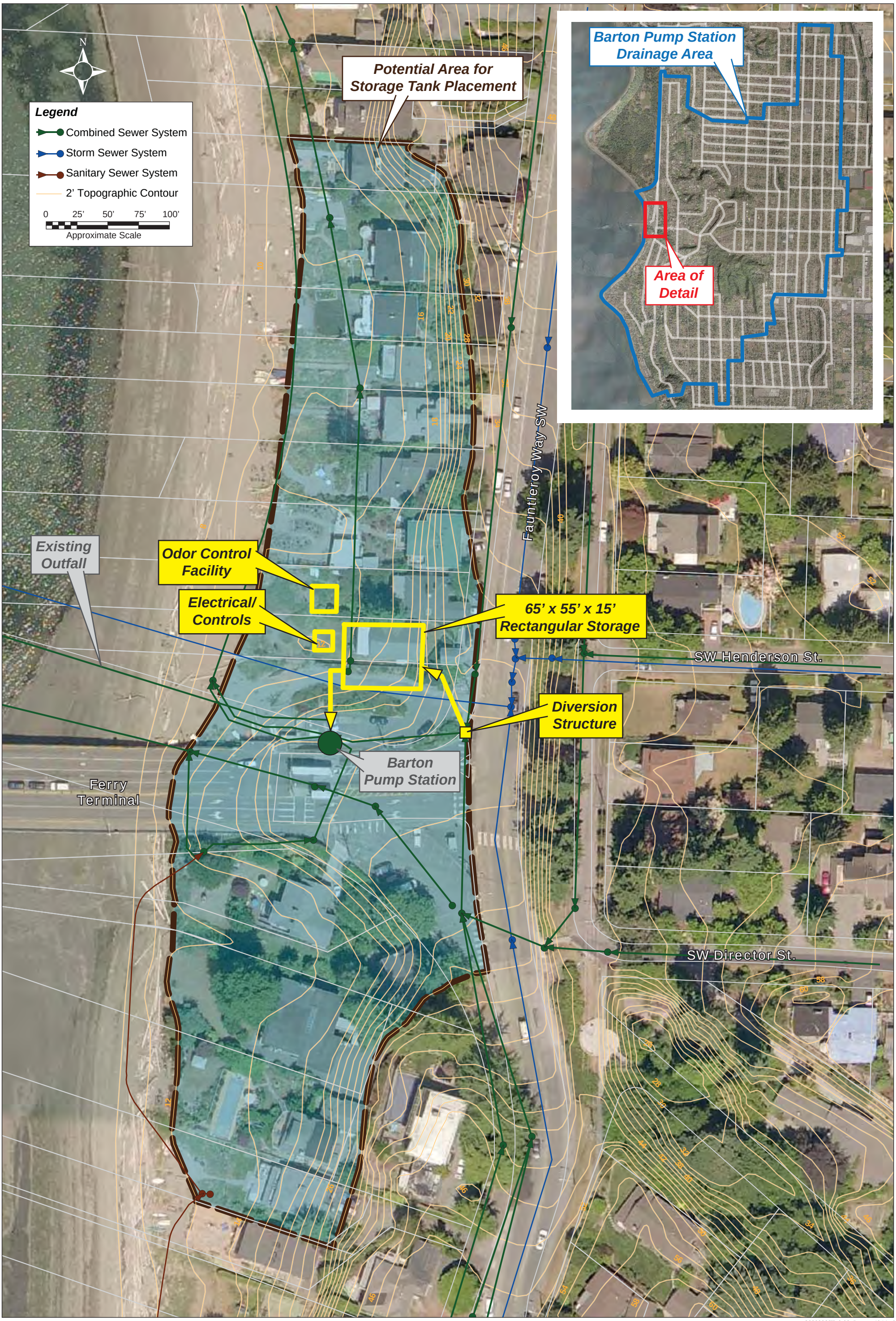
6.4.1 Alternatives Using Control Approach 1 – Peak-Flow Storage

Preliminary peak-flow storage alternatives for the Barton CSO basin were developed before the required storage volume for a mid-basin storage facility was calculated, as described in Section 4.2.1.1. Therefore, all storage facilities described below have the required bottom-of-basin storage of 0.11 MG, regardless of the facility's location in the basin. Mid-basin storage alternatives for the Barton CSO basin that were advanced beyond the preliminary stage were refined to account for the correct mid-basin storage volume requirement, as described in Chapter 7.

6.4.1.1 Alternative 1A – Rectangular Storage at Bottom of Basin

This alternative features a 0.11-MG rectangular storage tank at the bottom of the basin, near the Barton Pump Station and the Fauntleroy Ferry Terminal. Figure 6.2 illustrates the alternative. It includes the following elements:

- A buried storage tank approximately 65 feet by 55 feet in area and 15 feet deep on property near the ferry terminal.
- A new diversion structure in the City of Seattle trunk sewer upstream of the tank site to divert peak flows into the tank.



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BARTON AND MURRAY COMBINED SEWER OVERFLOW CONTROL FACILITIES PLAN DRAFT – February 2011	**Figure 6.2.** BARTON CSO BASIN ALTERNATIVE 1A: RECTANGULAR STORAGE AT BOTTOM OF BASIN

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- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

6.4.1.2 Alternative 1B – Circular Storage at Bottom of Basin

This alternative features a 0.11-MG circular storage tank at the bottom of the basin, near the Barton Pump Station and the Fauntleroy Ferry Terminal. Figure 6.3 illustrates the alternative. It includes the following elements:

- A buried storage tank approximately 52 feet in diameter and 14 feet deep on property near the ferry terminal.
- A new diversion structure in the City of Seattle trunk sewer upstream of the tank site to divert peak flows into the tank.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

6.4.1.3 Alternative 1C – Pipe Storage at Bottom of Basin

This alternative features a 0.11-MG large-diameter storage pipe at the bottom of the basin, near the Barton Pump Station and the Fauntleroy Ferry Terminal. Figure 6.4 illustrates the alternative. It includes the following elements:

- A buried storage pipe 12 feet in diameter and approximately 150 feet long on property near the ferry terminal.
- A new diversion structure in the City of Seattle trunk sewer upstream of the storage pipe site to divert peak flows into the storage pipe.
- Drain pumps to empty the storage pipe contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

6.4.1.4 Alternative 1D – Pipe Storage in Right-of-Way at Bottom of Basin

This alternative features a 0.11-MG large-diameter storage pipe in Fauntleroy Way SW at the bottom of the basin, adjacent to the Barton Pump Station and the Fauntleroy Ferry Terminal. Figure 6.5 illustrates the alternative. It includes the following elements:

- A buried storage pipe 12 feet in diameter and approximately 150 feet long in Fauntleroy Way SW east of the ferry terminal.
- A new diversion structure in the City of Seattle trunk sewer upstream of the storage pipe site to divert peak flows into the storage pipe.
- Drain pumps to empty the storage pipe contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities
- Standby power.
- Site surface access, fencing, and parking off street.

6.4.1.5 Alternative 1E – Pipe Storage in Upper Fauntleroy Way SW

This alternative features a 0.11-MG large-diameter storage pipe in Upper Fauntleroy Way SW near the bottom of the basin, east of the Fauntleroy Ferry Terminal. Figure 6.6 illustrates the alternative. It includes the following elements:

- A buried storage pipe 12 feet in diameter and approximately 150 feet long in Upper Fauntleroy Way SW east of the ferry terminal.
- A new diversion structure in the City of Seattle trunk sewer upstream of the storage pipe site to divert peak flows into the storage pipe.
- Drain pumps to empty the storage pipe contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

6.4.1.6 Alternative 1F – Rectangular Storage in Vicinity of Fauntleroy School

This alternative features a 0.11-MG rectangular storage tank in the middle of the basin, adjacent to Fauntleroy School, off SW Director Street. Figure 6.7 illustrates the alternative. It includes the following elements:

- A buried storage tank approximately 65 feet by 55 feet in area and 15 feet deep on the west parking lot of Fauntleroy School, off SW Director Street.
- A new diversion structure in the City of Seattle trunk sewer upstream of the tank site to divert peak flows into the tank.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

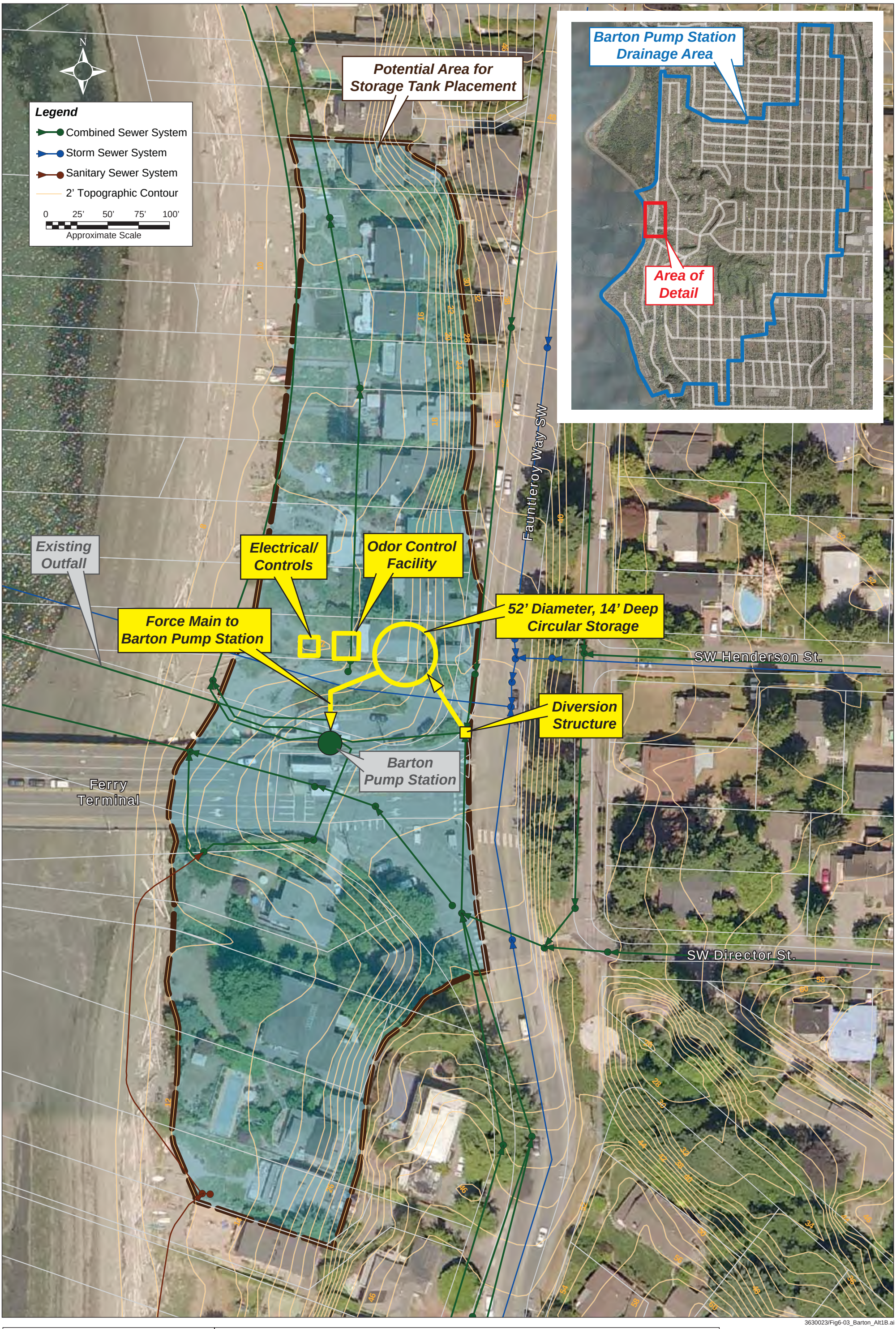

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Figure 6.3.
BARTON CSO BASIN ALTERNATIVE 1B: CIRCULAR STORAGE AT BOTTOM OF BASIN

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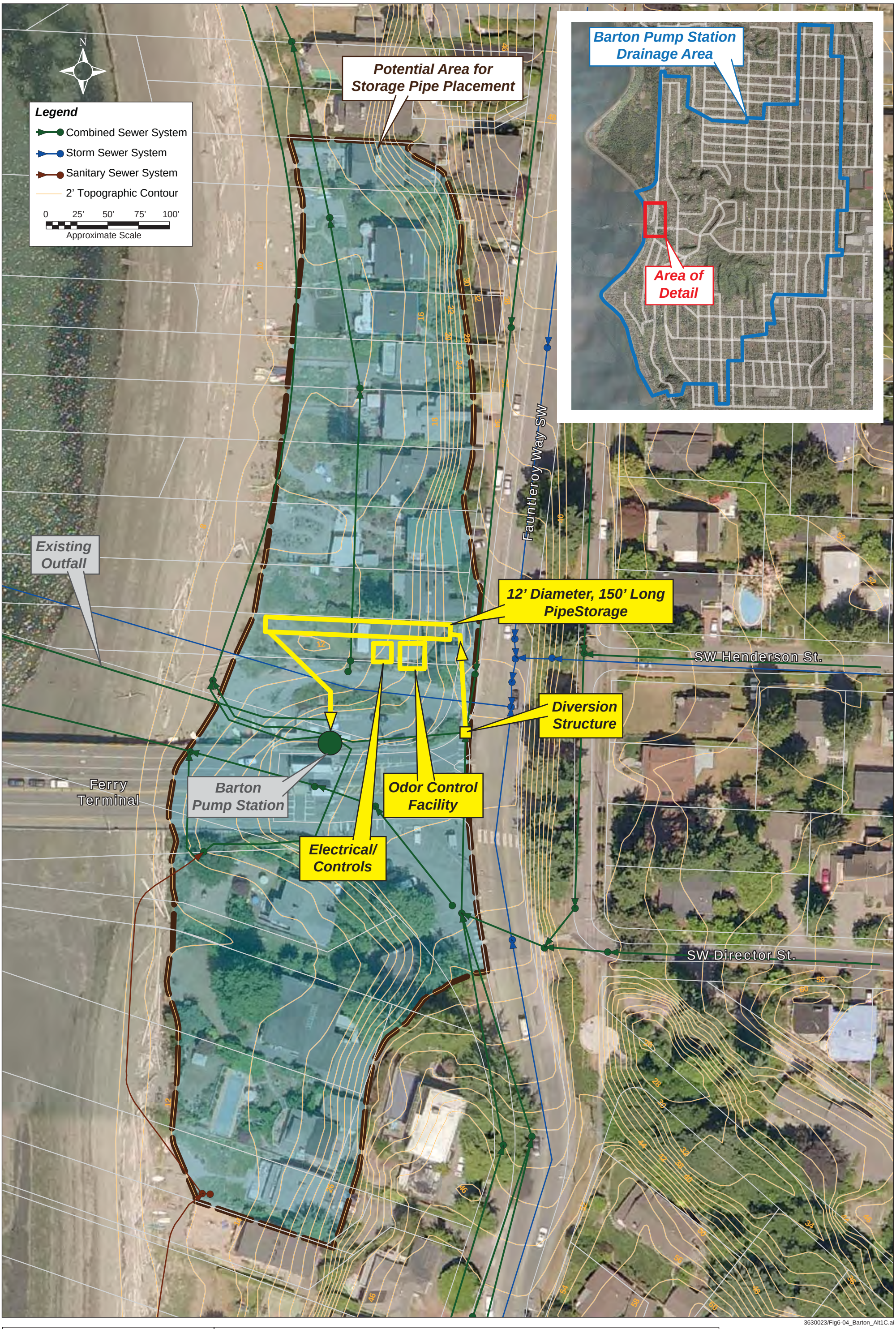

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Figure 6.4.
BARTON CSO BASIN ALTERNATIVE 1C: PIPE STORAGE AT BOTTOM OF BASIN

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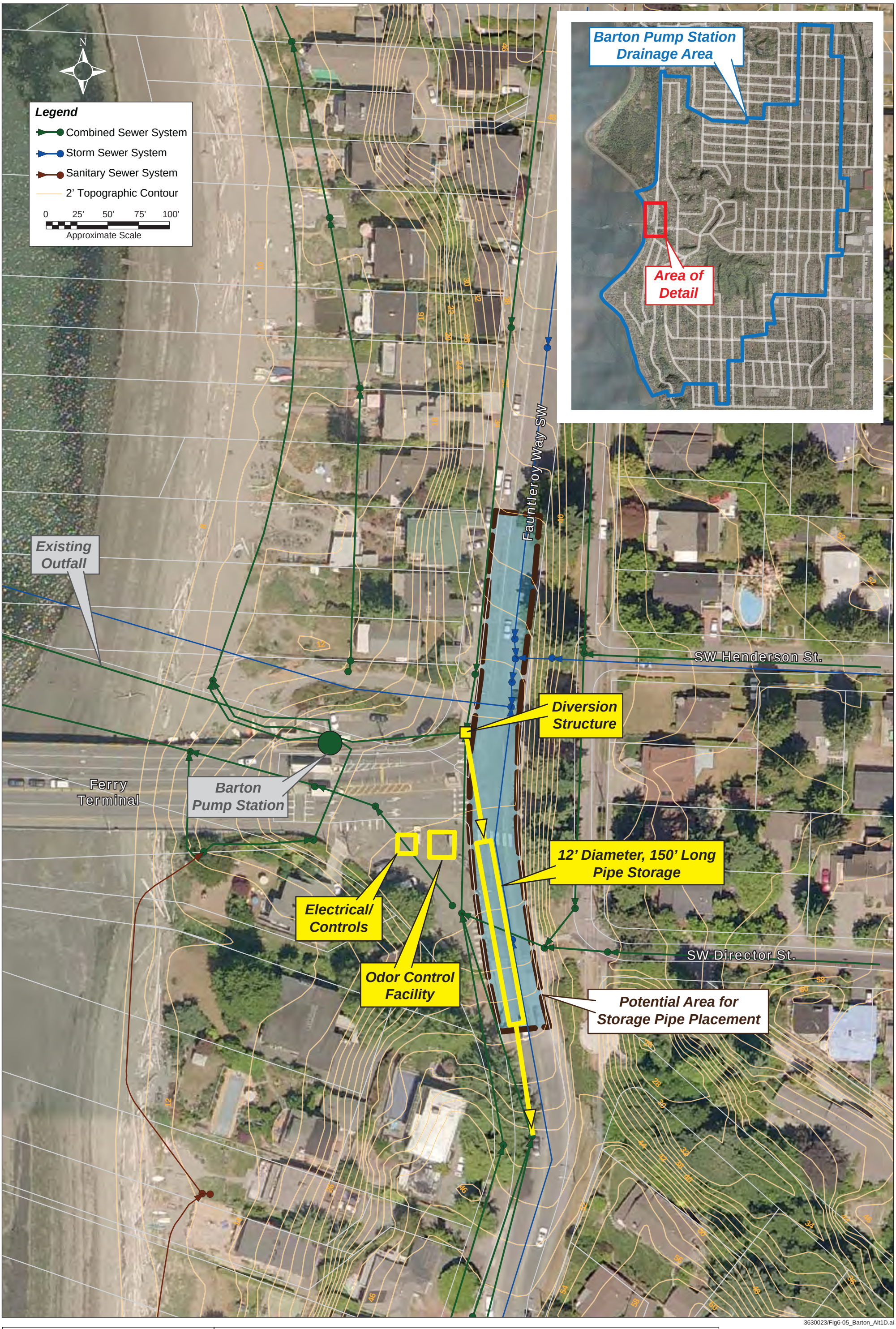

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BARTON AND MURRAY COMBINED SEWER OVERFLOW CONTROL FACILITIES PLAN DRAFT – February 2011	**Figure 6.5.** BARTON CSO BASIN ALTERNATIVE 1D: PIPE STORAGE IN RIGHT-OF-WAY AT BOTTOM OF BASIN

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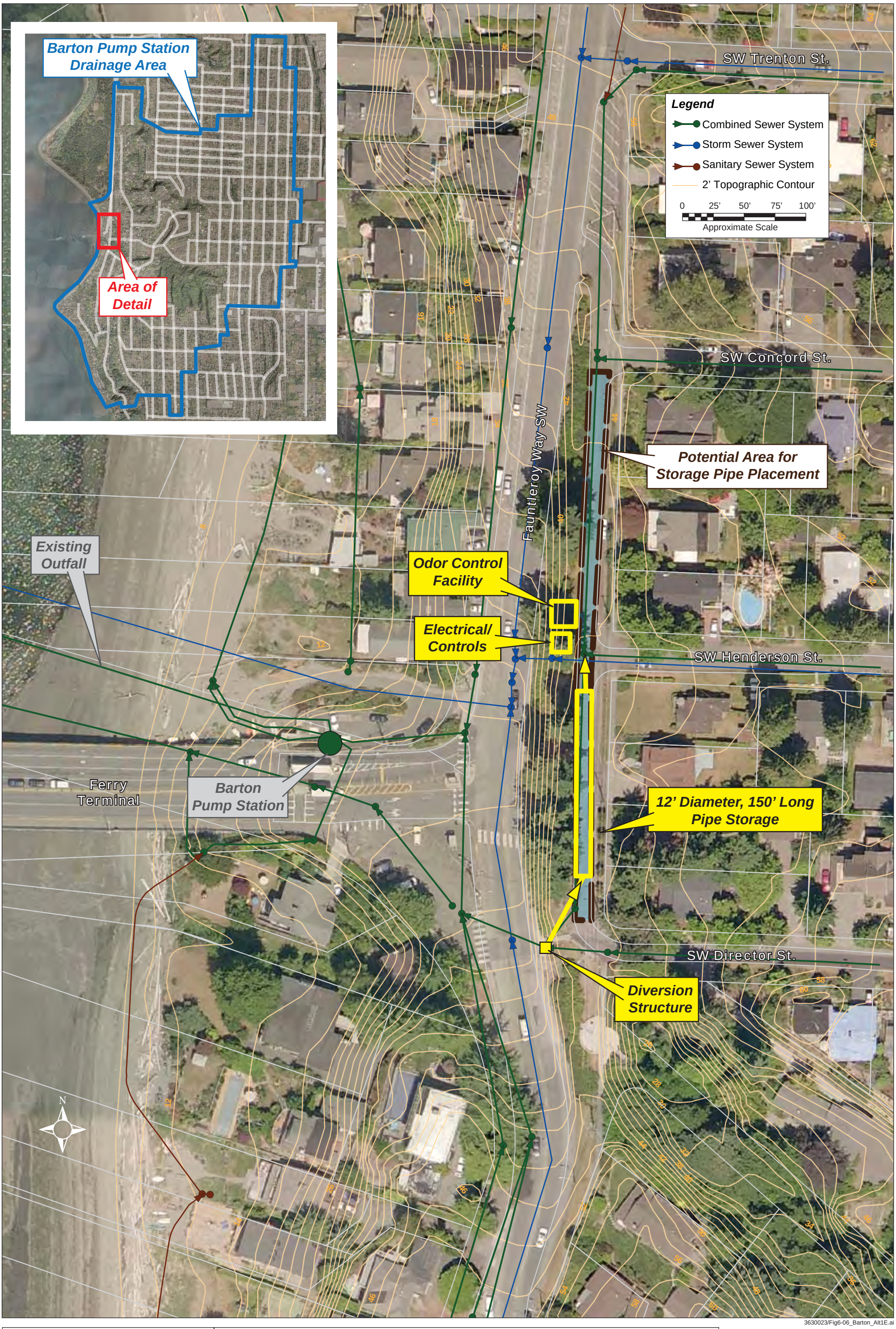

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Figure 6.6.
BARTON CSO BASIN ALTERNATIVE 1E: PIPE STORAGE IN UPPER FAUNTLEROY WAY SW

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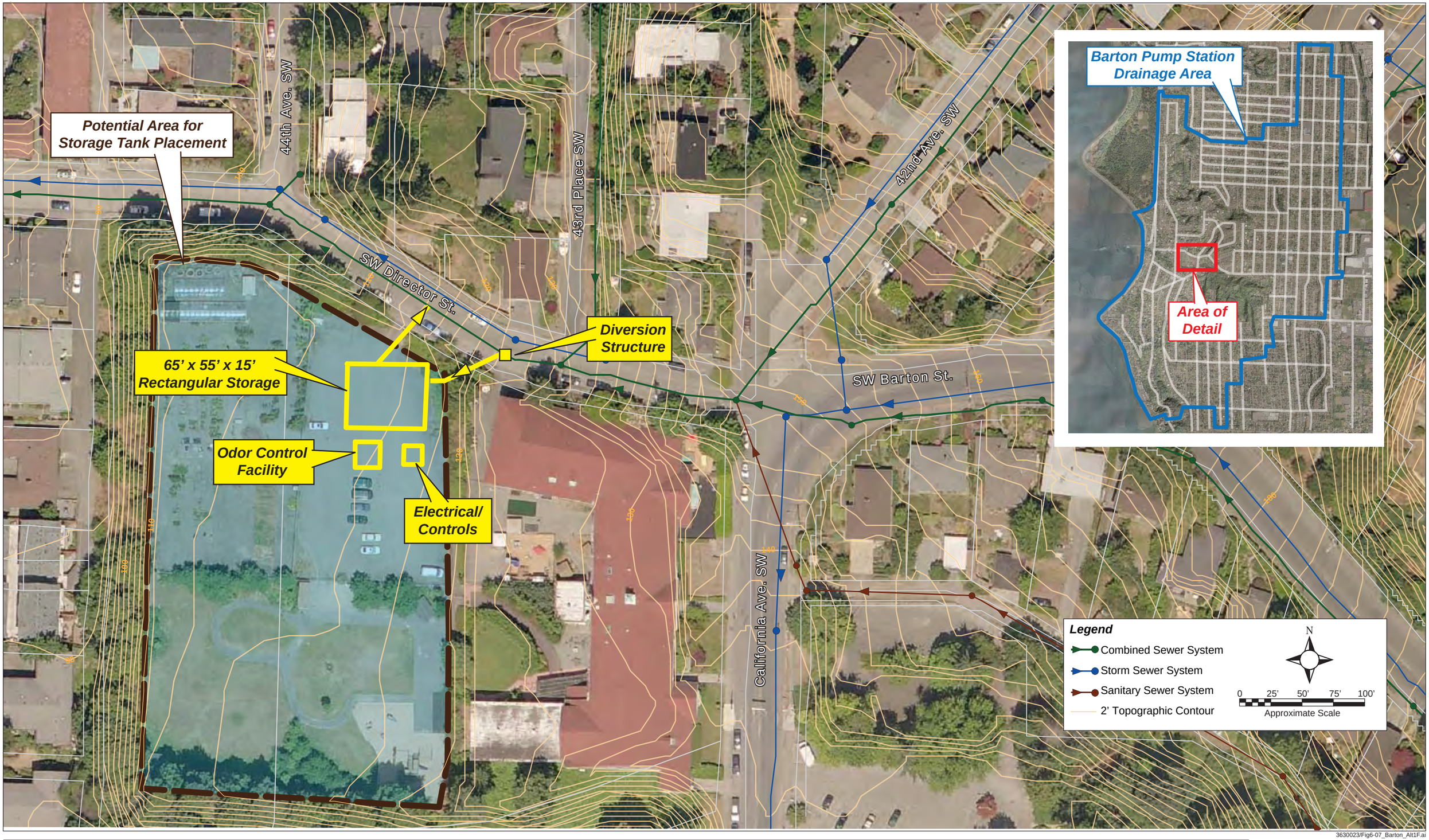

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Figure 6.7.
BARTON CSO BASIN ALTERNATIVE 1F: STORAGE IN VICINITY OF FAUNTLEROY SCHOOL

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6.4.1.7 Alternative 1G – Rectangular Storage in Upper Basin

This alternative features a 0.11-MG rectangular storage tank in the upper basin, off SW Barton Street. Figure 6.8 illustrates the alternative. It includes the following elements:

- A buried storage tank 66 feet by 55 feet in area and 15 feet deep on property south of SW Barton Street, in Roxhill Playground (outside the Barton CSO basin) or west of 34th Avenue SW (inside the basin).
- A new diversion structure in the City of Seattle trunk sewer upstream of the tank site to divert peak flows into the tank.
- A pump station and force main to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

6.4.2 Alternative Using Control Approach 3 - End of Pipe Treatment

6.4.2.1 Alternative 3A – End-of-Pipe Treatment at Bottom of Basin

This alternative features a 12-mgd high-rate clarification treatment plant at the bottom of the basin, near the Barton Pump Station and the Fauntleroy Ferry Terminal. Figure 6.9 illustrates the alternative. It includes the following elements:

- A buried high-rate clarification treatment plant approximately 120 feet by 60 feet in area and 15 feet deep on property near the Fauntleroy Ferry Terminal.
- A new diversion structure in the City of Seattle trunk sewer upstream of the treatment facility site to divert peak flows into the treatment facility.
- A pumped discharge from the treatment plant connecting to the CSO outfall.
- Odor control using carbon scrubbers (within treatment plant footprint).
- Electrical and control facilities (within treatment plant footprint).
- Standby power (within treatment plant footprint).
- Site surface access, fencing, and parking off street.

6.4.3 Alternative Using Control Approach 4 – Peak-Flow Reduction

6.4.3.1 Alternative 4A – Peak-Flow Reduction by Roof Drain Disconnection.

This alternative would disconnect roof-drains and street right-of-way from the combined sewer system over a 26-acre area in Subbasin 416. Figure 6.10 illustrates the alternative. It includes the following elements:

- Disconnection of all roof-drains in the target area from the combined sewer system.
- Disconnection of all street right-of-way in the target area from the combined sewer system.

- Construction of 13,750 feet of new storm sewers in Subbasin 416 to receive the storm flows disconnected from the combined system.

6.5 PRELIMINARY MURRAY CSO BASIN ALTERNATIVES

6.5.1 Alternatives Using Control Approach 1 – Peak-Flow Storage

6.5.1.1 Alternative 1A – Rectangular Storage at Bottom of Basin

This alternative features a 1.0-MG rectangular storage tank at the bottom of the basin, in or near Lowman Beach Park. Figure 6.11 illustrates the alternative. It includes the following elements:

- A buried storage tank approximately 175 feet by 90 feet in area and 16.5 feet deep on property west of Beach Drive SW in or near Lowman Beach Park.
- A new diversion structure in the City of Seattle trunk sewer upstream of the tank site to divert peak flows into the tank.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and control facilities.
- Standby power.
- Site surface access, fencing, and parking off street.

6.5.1.2 Alternative 1B – Circular Storage in Vicinity of Murray Avenue and Lincoln Park Way

This alternative features a 1.0-MG circular storage tank near the bottom of the basin, at the corner of Murray Avenue SW and Lincoln Park Way SW. Figure 6.12 illustrates the alternative. It includes the following elements:

- A buried storage tank approximately 110 feet in diameter and 20 feet deep on property north of the intersection of Lincoln Park Way SW and Murray Avenue SW.
- A new diversion structure in the City of Seattle trunk sewer to divert excess Murray CSO basin peak flows to the new tank.
- A 1.5-mgd pump station in Beach Drive SW to pump excess peak flows from the Barton Pump Station to the new tank.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and controls.
- Standby power.
- Site surface access, fencing, and parking off street.

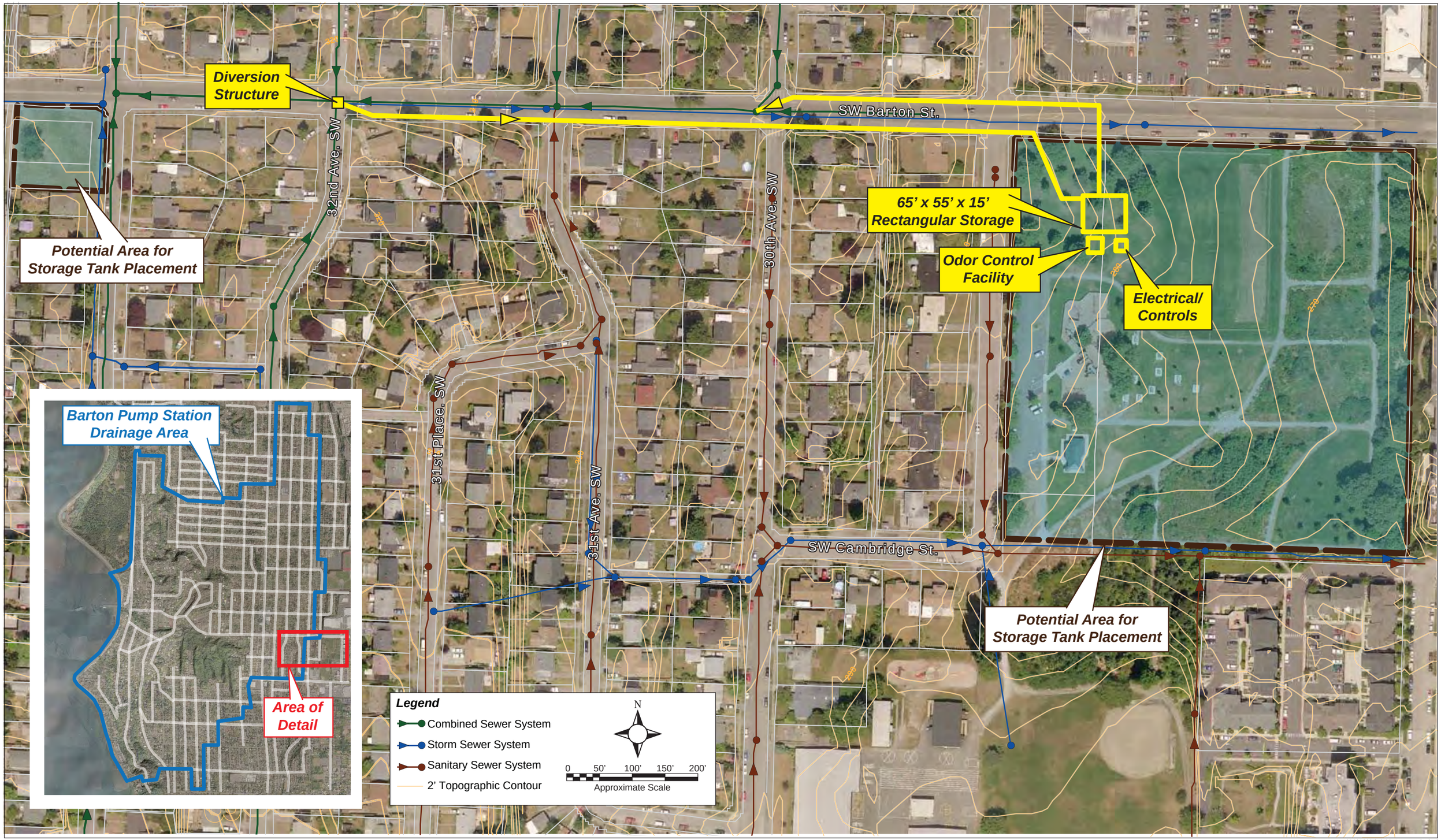

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Figure 6.8.
BARTON CSO BASIN ALTERNATIVE 1G: RECTANGULAR STORAGE IN UPPER BASIN

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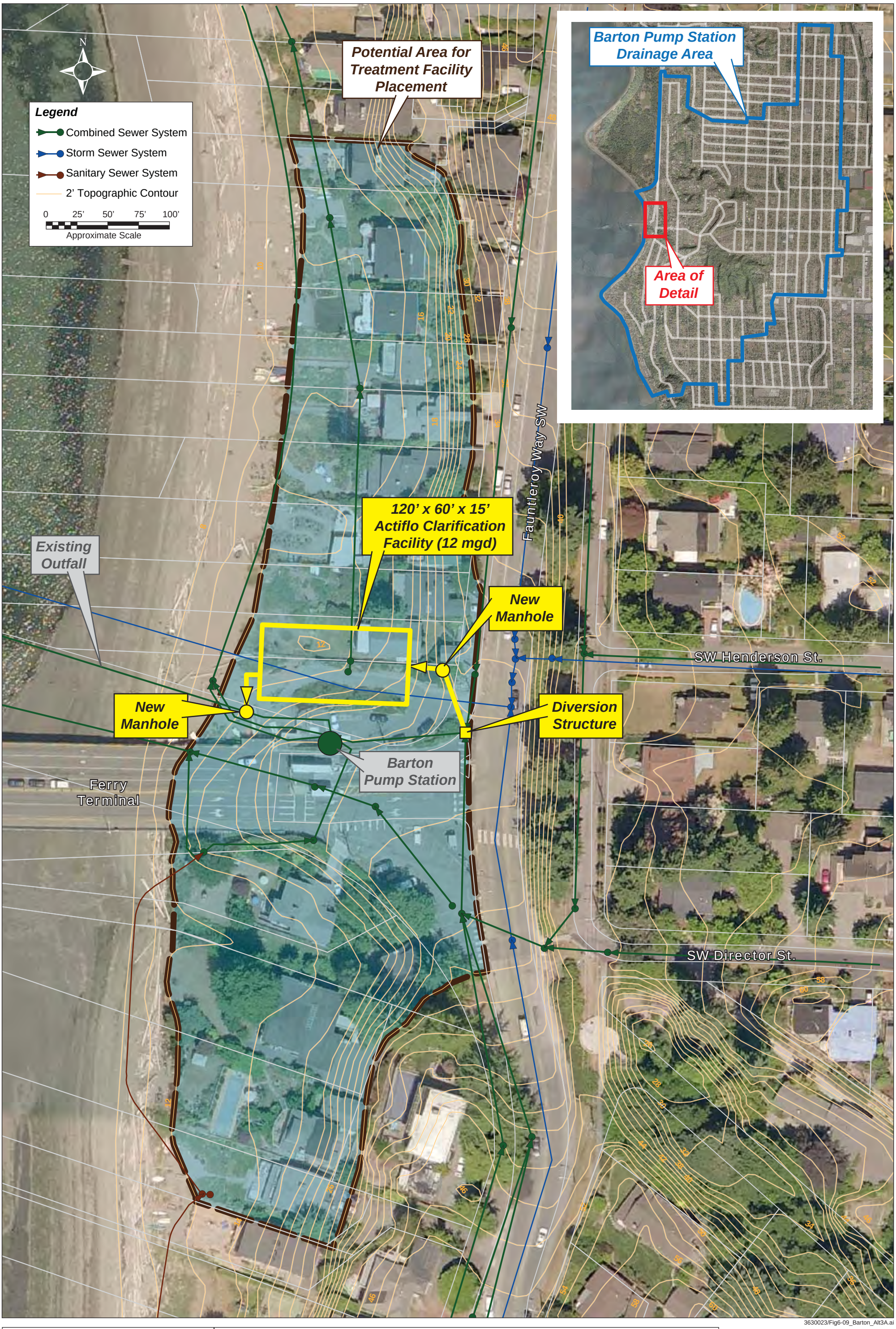

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Figure 6.9.
BARTON CSO BASIN ALTERNATIVE 3A: END-OF-PIPE TREATMENT AT BOTTOM OF BASIN

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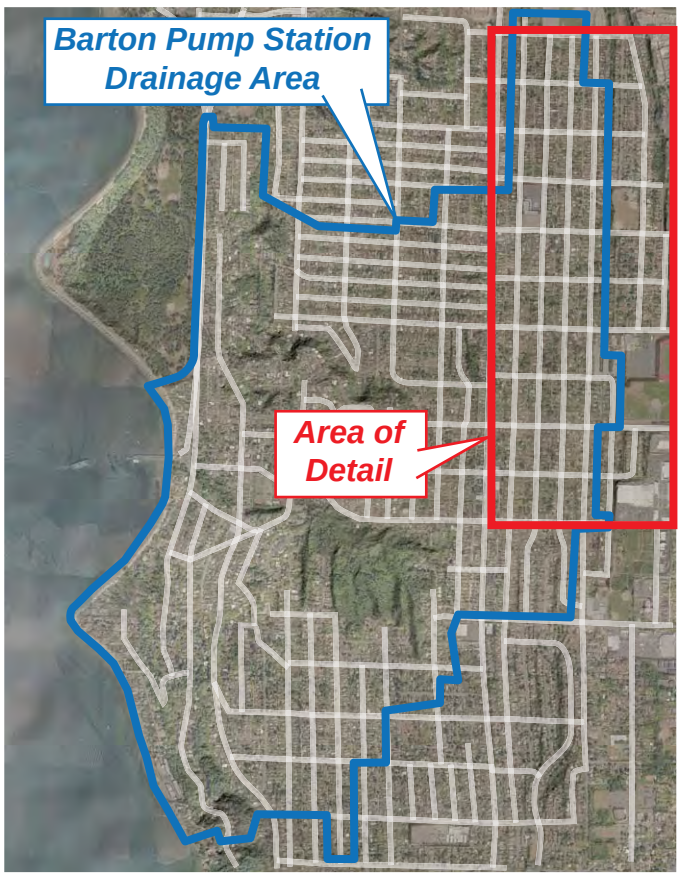
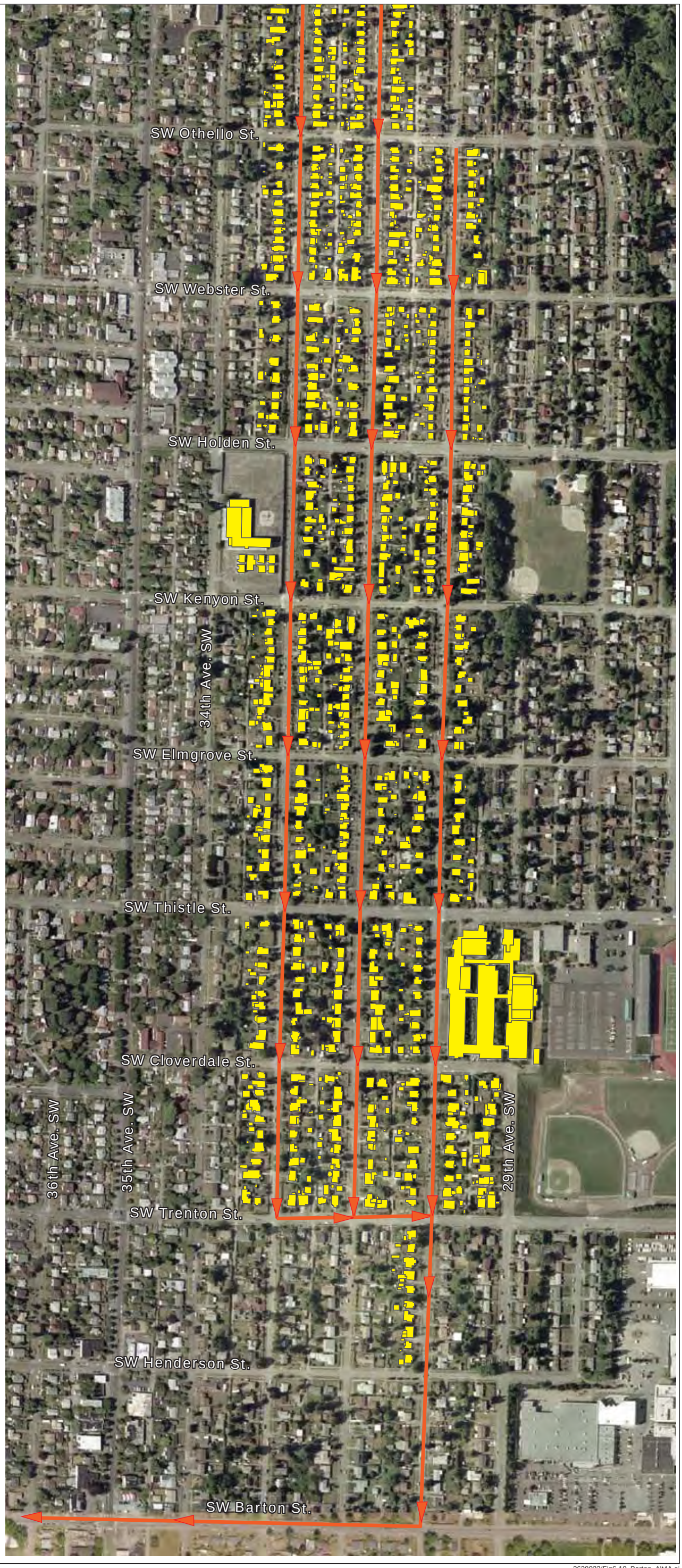


Legend

- Roof to Be Disconnected from Combined Sewer System
- New Storm Drain

26 acres of impervious roof and street right-of-way area disconnected from combined sewer system. No storage required.



N

0 125’ 250’ 375’ 500’

Approximate Scale

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Figure 6.10.
BARTON CSO BASIN ALTERNATIVE 4A:
PEAK-FLOW REDUCTION BY ROOF DRAIN DISCONNECTION

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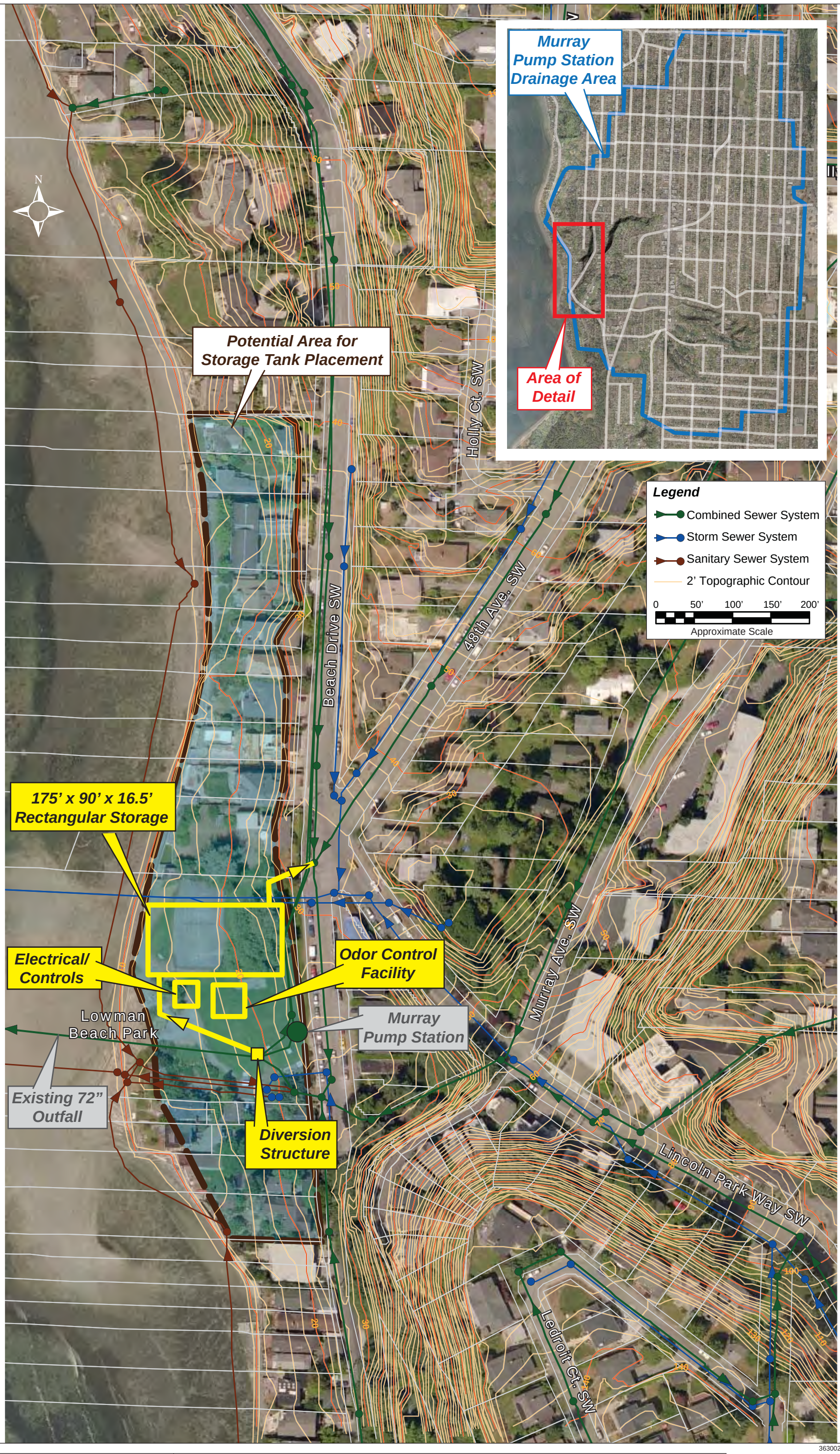

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Figure 6.11.
MURRAY CSO BASIN ALTERNATIVE 1A: RECTANGULAR STORAGE AT BOTTOM OF BASIN

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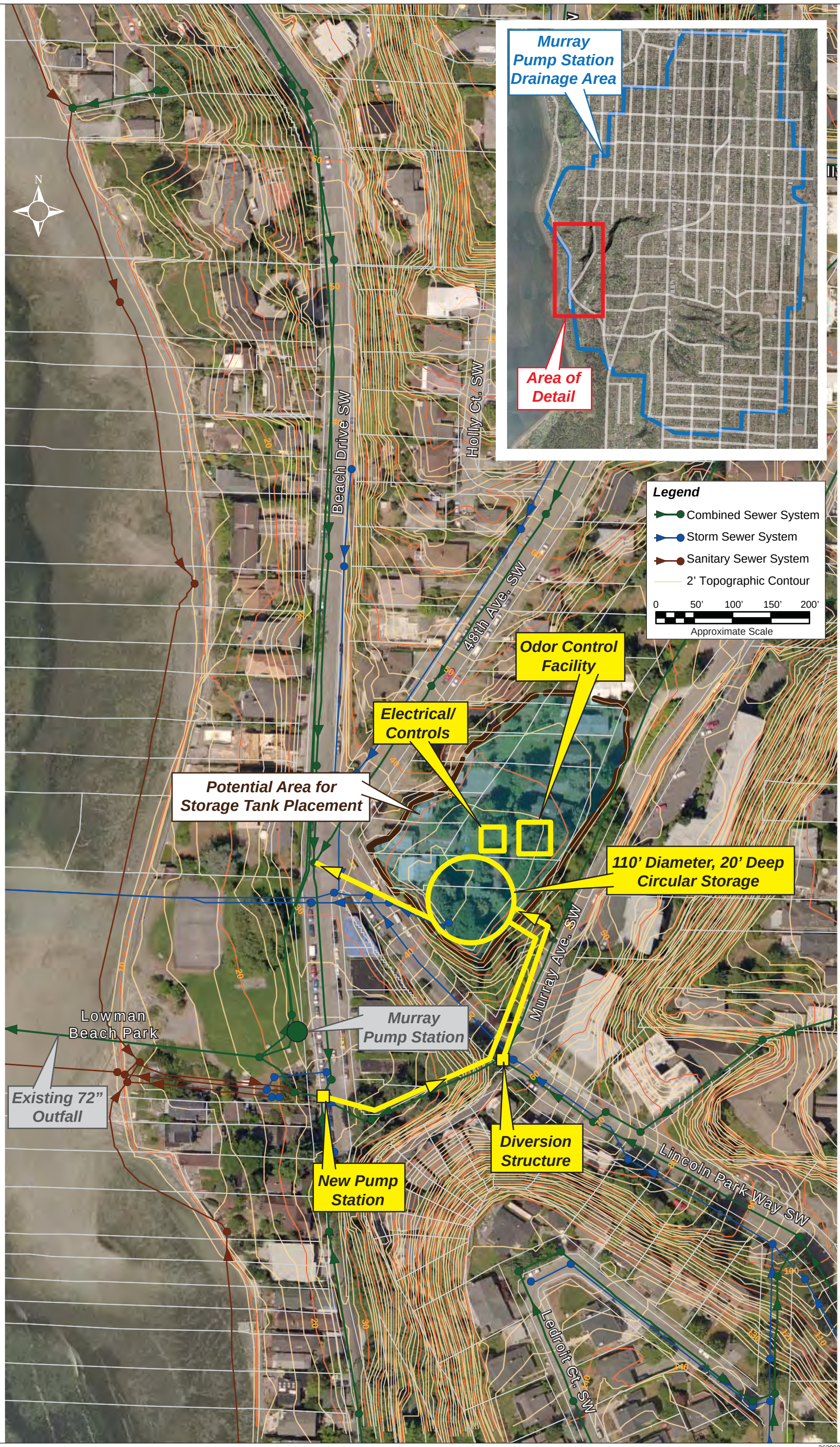

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BARTON AND MURRAY COMBINED SEWER OVERFLOW CONTROL FACILITIES PLAN

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Figure 6.12.
MURRAY CSO BASIN ALTERNATIVE 1B:
CIRCULAR STORAGE IN VICINITY OF MURRAY AVENUE AND LINCOLN PARK WAY

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6.5.1.3 Alternative 1C – Distributed Storage Along Beach Drive and Murray Avenue SW

This alternative features two large-diameter storage pipes near the bottom of the basin, in the rights-of-way of Beach Drive SW and Murray Avenue SW, with combined storage capacity of 1.0 MG. Figure 6.13 illustrates the alternative. It includes the following elements:

- A buried storage pipe 12 feet in diameter and approximately 900 feet long in Beach Drive SW, with a capacity of 0.72 MG.
- A buried storage pipe 12 feet in diameter and approximately 350 feet long in Murray Avenue SW, with a capacity of 0.28 MG.
- Two new diversion structures in the City of Seattle trunk sewer upstream of the storage pipe sites to divert peak flows into the storage pipes.
- Drain pumps to empty the storage pipe contents over a 12-hour period after a storm.
- Odor control facilities using carbon scrubbers at the site of each storage pipe.
- Electrical and controls.
- Standby power at the site of each storage pipe.
- Site surface access, fencing, and parking off street.

6.5.1.4 Alternative 1D – Pipe Storage at Bottom of Basin by Tunneling

This alternative features a large-diameter storage pipe near the bottom of the basin in the Beach Drive SW right-of-way, with a capacity of 1.0 MG. Figure 6.14 illustrates the alternative. It includes the following elements:

- An underground storage pipe 12 feet in diameter and approximately 1,250 feet long in Beach Drive SW, with a capacity of 1.0 MG.
- Tunneled construction of the storage pipe over the majority of its lengths, using two 50-foot-diameter portals in Beach Drive SW.
- A new diversion structure in the City of Seattle trunk sewer upstream of the storage pipe site to divert peak flows into the pipe.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and controls.
- Standby power.
- Site surface access, fencing, and parking off street.

6.5.1.5 Alternative 1E – Upper Basin Storage

This alternative features a 1.0-MG rectangular storage tank somewhere in the upper Murray CSO basin, with a pump station at or near Lowman Beach Park to divert peak flows to the tank. Figure 6.15 illustrates the alternative. It includes the following elements:

- A buried storage tank approximately 175 feet by 90 feet in area and 16.5 feet deep on property somewhere upstream of the current CSO control location (Figure 6.15 shows an example location next to Gatewood Elementary School).
- A 28.5-mgd peak flow pump station in or near Lowman Beach Park to pump excess flows to the new tank.
- A large-diameter force main; length and diameter dependent upon tank location. (36- to 42-inch diameter, depending upon the elevation of the storage tank).
- A new diversion structure in the City of Seattle trunk sewer near Lowman Beach Park to divert peak flows to the new pump station.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers at the new peak flow pump station and the new storage tank.
- Electrical and controls.
- Standby power at the new peak flow pump station and the new storage tank.
- Site surface access, fencing, and parking off street.

6.5.1.6 Alternative 1F – Combined Pipe and Rectangular Storage at Bottom of Basin

This alternative features a rectangular storage tank east of Beach Drive SW and a large-diameter storage pipe in the Beach Drive SW right-of-way, with a combined capacity of 1.0 MG. Figure 6.16 illustrates the alternative. It includes the following elements:

- A buried storage tank at the bottom of the Murray basin on properties east of Beach Drive SW with a capacity between 0.6 MG and 1.0 MG (dependent upon area available for tank construction).
- A buried storage pipe in the Beach Drive SW right-of-way with a capacity up to 0.4 MG (assumes open cut construction).
- A new diversion structure in the City of Seattle trunk sewer upstream of the storage site to divert peak flows into the storage tank and storage pipe.
- Drain pumps to empty the tank and pipe contents over a 12-hour period after a storm.
- A single odor-control facility using carbon scrubbers for both storage facilities.
- A single electrical and controls facility for both storage facilities.
- A single standby power facility for both storage facilities.
- Site surface access, fencing, and parking off street.

6.5.2 Alternative Using Control Approach 2 – Convey and Treat

6.5.2.1 Alternative 2A – Convey and Treat at Alki

This alternative features a new pump station and force main to convey peak flows from the bottom of the Murray CSO basin to the 63rd Avenue Pump Station at Alki. Figure 6.17 illustrates the alternative. It includes the following elements:

- A 28.5-mgd peak flow pump station in or near Lowman Beach Park to pump excess flows to the 63rd Avenue Pump Station.

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Figure 6.13.
MURRAY CSO BASIN ALTERNATIVE 1C:
DISTRIBUTED STORAGE ALONG BEACH DRIVE AND MURRAY AVENUE SW

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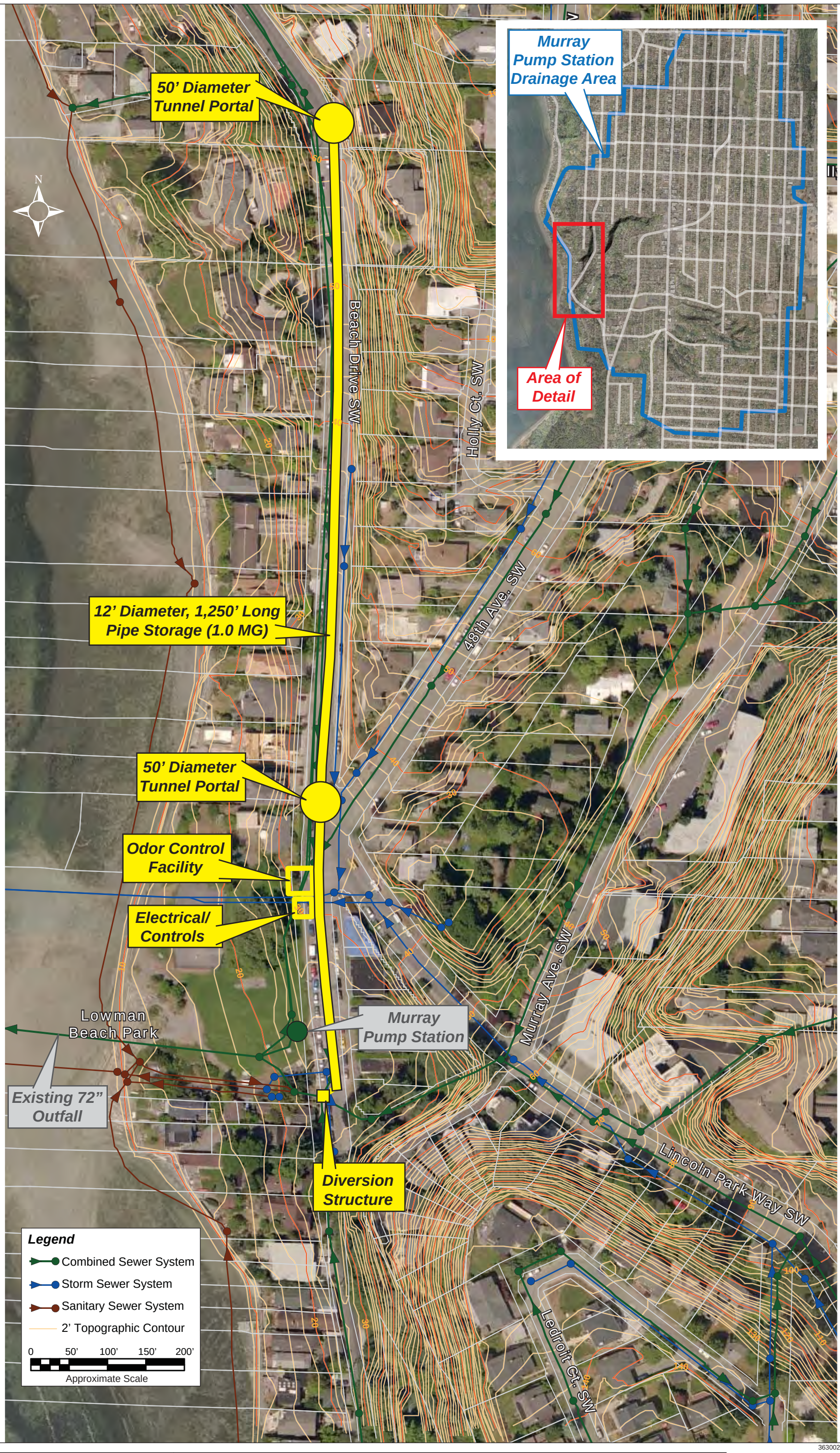

3630023/Fig6-14_Murray_Alt1D.ai

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Figure 6.14.
MURRAY CSO BASIN ALTERNATIVE 1D: PIPE STORAGE AT BOTTOM OF BASIN BY TUNNELING

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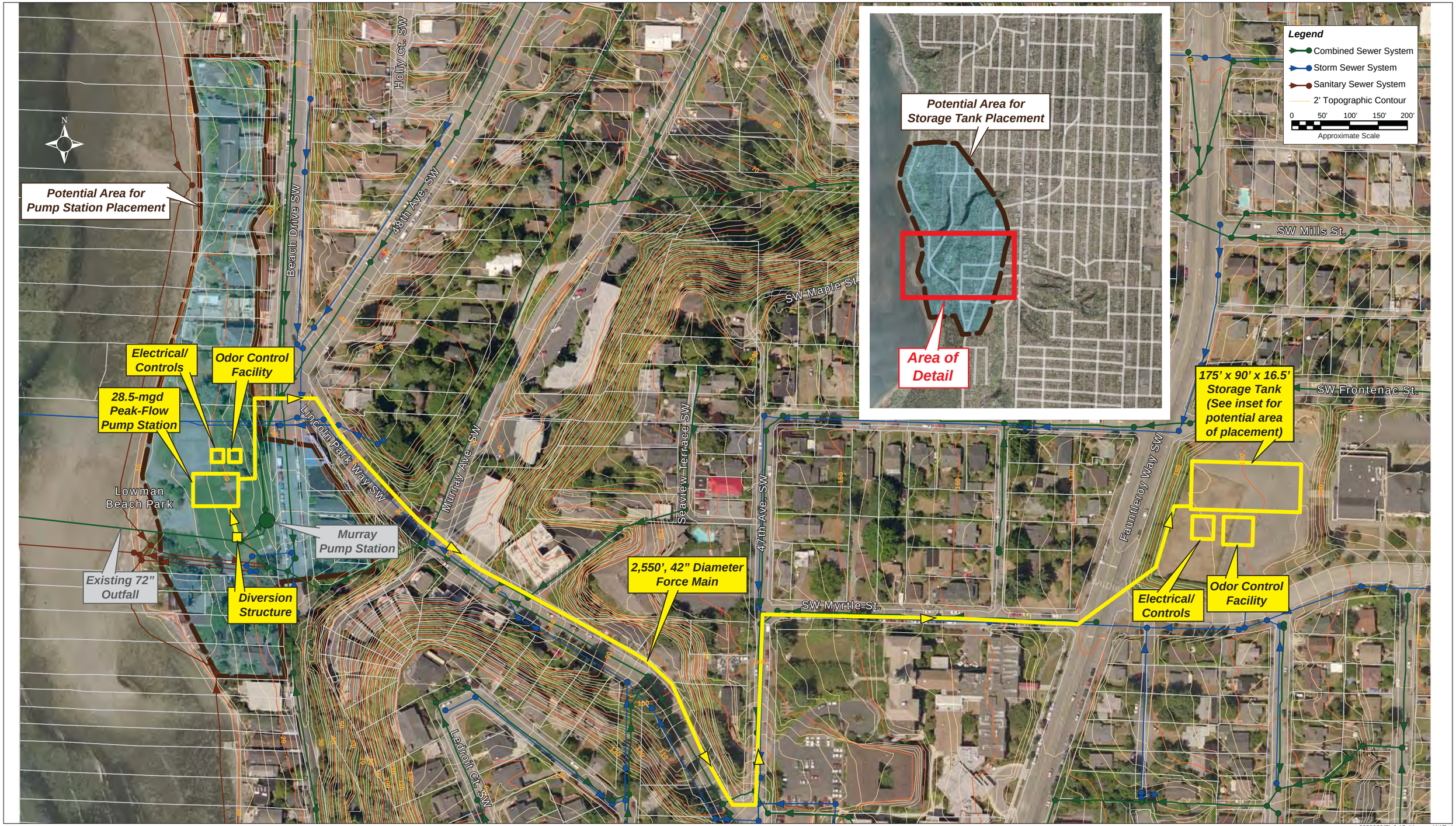

3630023/Fig6-15_Murray_Alt1E.ai

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Figure 6.15.
MURRAY CSO BASIN ALTERNATIVE 1E: UPPER BASIN STORAGE

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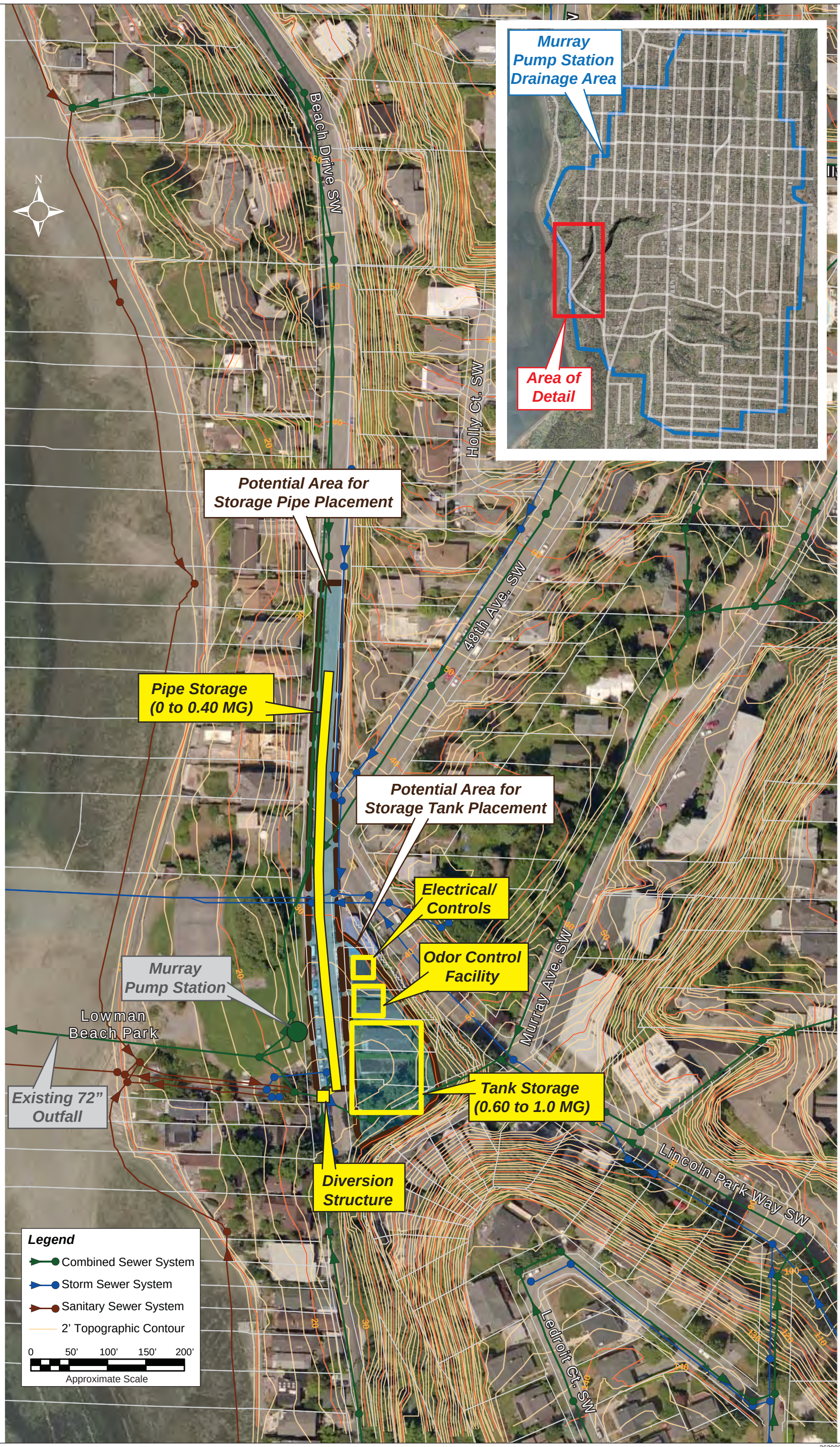

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Figure 6.16.
MURRAY CSO BASIN ALTERNATIVE 1F:
COMBINED PIPE AND RECTANGULAR STORAGE AT BOTTOM OF BASIN

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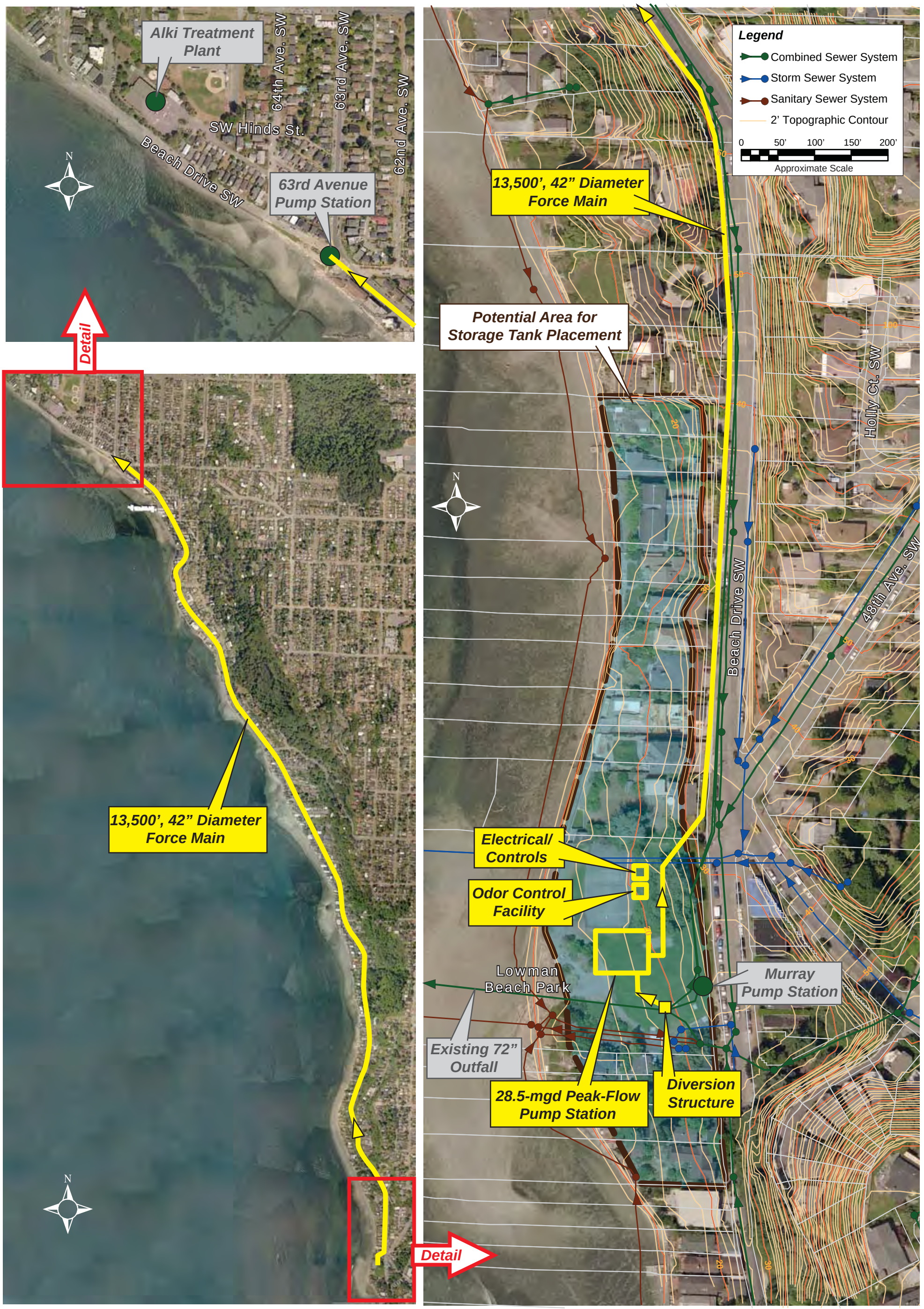

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BARTON AND MURRAY COMBINED SEWER OVERFLOW CONTROL FACILITIES PLAN DRAFT – February 2011	**Figure 6.17.** MURRAY CSO BASIN ALTERNATIVE 2A: CONVEY AND TREAT AT ALKI

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- A new diversion structure in the City of Seattle trunk sewer upstream of the pump station site to divert peak flows to the new pump station.
- 13,500 feet of new 42-inch force main installed along Beach Drive.
- Capacity upgrades at the Alki wet-weather treatment facility.
- Odor control using carbon scrubbers.
- Electrical and controls.
- Standby power.
- Site surface access, fencing, and parking off street.

6.5.3 Alternative Using Control Approach 3 - End of Pipe Treatment

6.5.3.1 Alternative 3A – End-of-Pipe Treatment at Bottom of Basin

This alternative features a 28.5-mgd high-rate clarification treatment plant at the bottom of the basin, in or near Lowman Beach Park. Figure 6.18 illustrates the alternative. It includes the following elements:

- A buried high-rate clarification treatment plant approximately 160 feet by 80 feet in area and 20 feet deep in or near Lowman Beach Park.
- A new diversion structure in the City of Seattle trunk sewer upstream of the treatment facility site to divert peak flows into the treatment facility.
- A pumped discharge from the treatment plant connecting to the CSO outfall.
- Odor control using carbon scrubbers (within treatment plant footprint).
- Electrical and control facilities (within treatment plant footprint).
- Standby power (within treatment plant footprint).
- Site surface access, fencing, and parking off street.

6.5.4 Alternative Using Control Approach 5 – Combined Approaches

6.5.4.1 Alternative 5A – Peak-Flow Reduction by Roof Drain Disconnection, Combined with Storage

This alternative would disconnect roof-drains and street right-of-way from the combined sewer system over a 10-acre area in Subbasin 419 and provide new pipe storage in Beach Drive SW. Figure 6.19 shows the alternative. It includes the following elements:

- Disconnection of all roof-drains in the target area from the combined sewer system.
- Disconnection of all street right-of-way in the target area from the combined sewer system.
- Construction of 6,800 feet of new storm sewers in Subbasin 419 to receive the storm flows disconnected from the combined system.
- A buried storage pipe 12 feet in diameter and approximately 1,075 feet long in Beach Drive SW, with a capacity of 0.86 MG.

- A new diversion structure in the City of Seattle trunk sewer upstream of the storage pipe site to divert peak flows into the storage pipe.
- Drain pumps to empty the tank contents over a 12-hour period after a storm.
- Odor control using carbon scrubbers.
- Electrical and controls.
- Standby power.
- Site surface access, fencing, and parking off street.

6.6 REFINED PRELIMINARY ALTERNATIVES

The refined preliminary alternatives were further developed and evaluated between August and December 2009. Team workshops held each month focused on technical and nontechnical aspects of the alternatives. Engineering schematics of each CSO control approach were developed in order to refine costs as a result of county operations and maintenance input. The schematics were used to develop a basis of costs for the alternatives. A planning level cost estimate for each of the alternatives was developed and included in the evaluation.

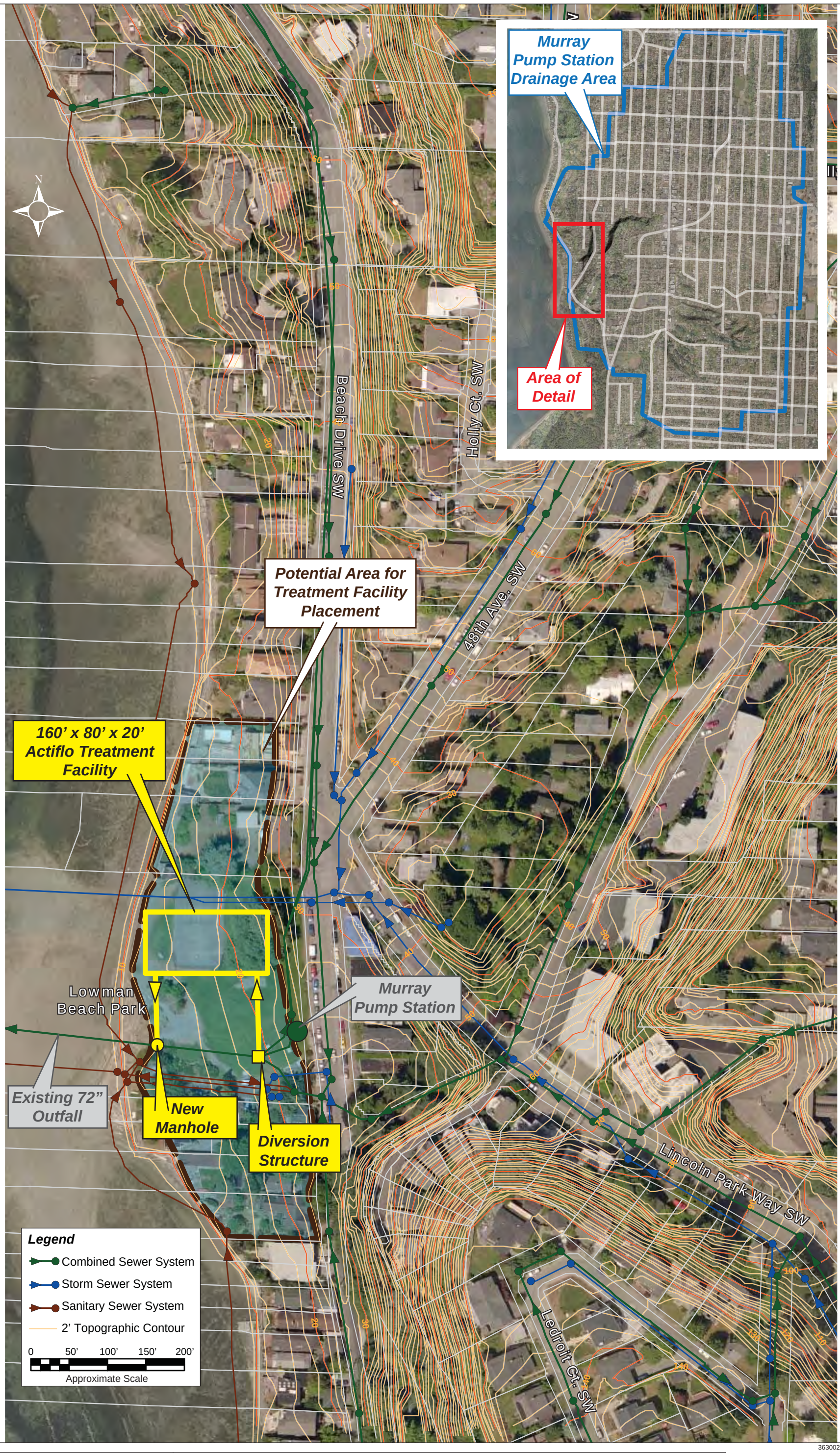

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Figure 6.18.
MURRAY CSO BASIN ALTERNATIVE 3A: END-OF-PIPE TREATMENT AT BOTTOM OF BASIN

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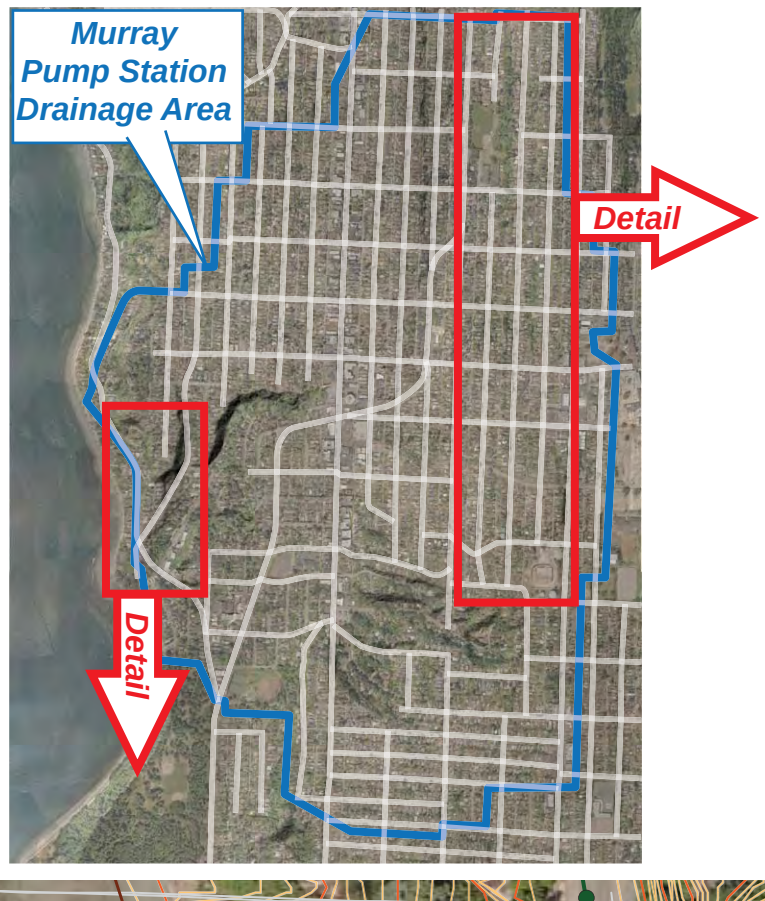

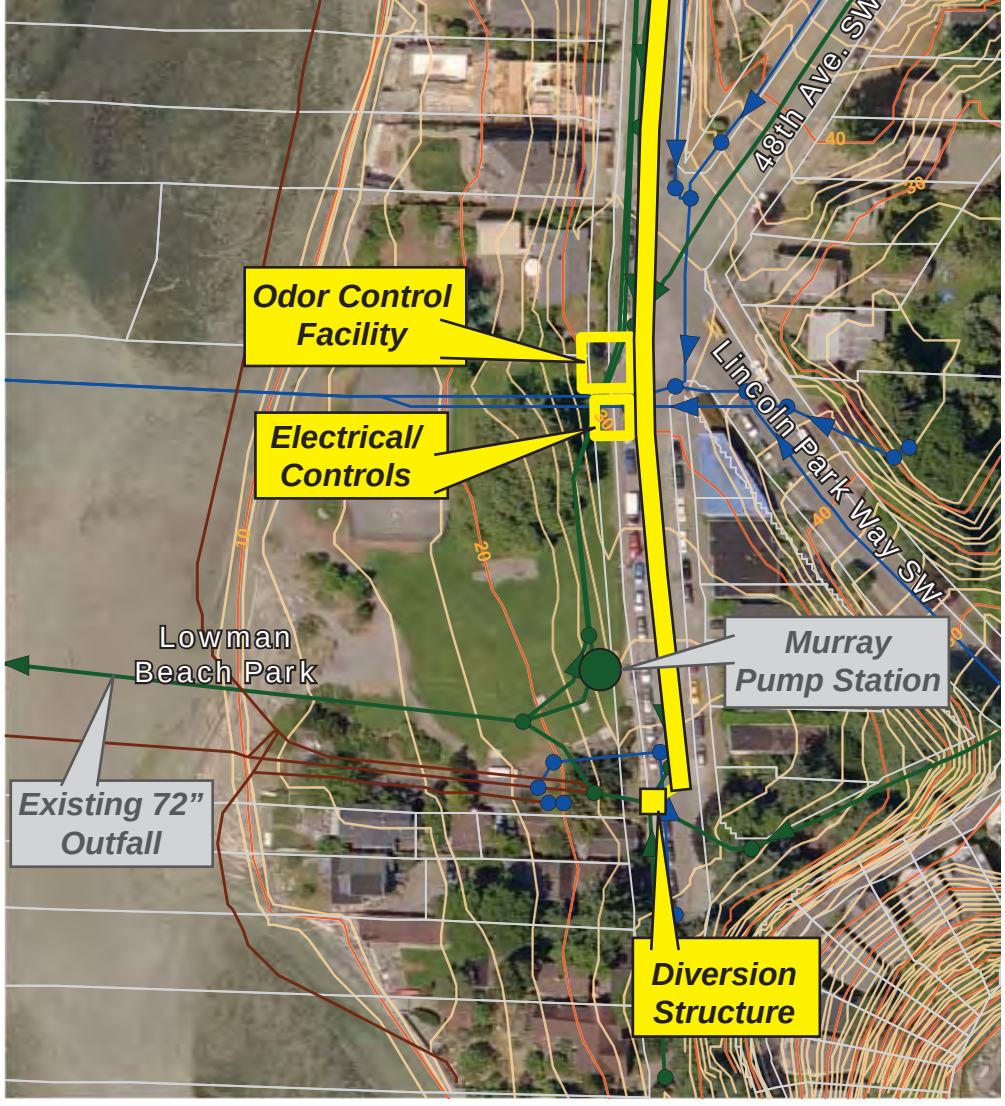

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Figure 6.19.
MURRAY CSO BASIN ALTERNATIVE 5A:
PEAK-FLOW REDUCTION BY ROOF DRAIN DISCONNECTION, COMBINED WITH STORAGE

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