8.0 OVERVIEW OF CONTROL TECHNOLOGY AND SITE SCREENING

Executive Summary: Balancing the need for a logical and consistent process against the need for basin planner flexibility, ALCOSAN developed a multi-tiered process for the development of site alternatives. This process, illustrated below in Figure 8-1, was followed by each of the basin planners, who made appropriate modifications to it in response to basin-specific issues, and it resulted in a series of reports for each planning basin: *Screening of Controls and Sites Report (SCSR); Feasibility Report and Present Worth Analysis (FRPW);* and *Basin Facilities Plan.* This Section of the Wet Weather Plan summarizes the findings first put forth in the SCSRs and modified in the subsequent reports.

Each basin planner identified the control technologies applicable to their basin by carefully assessing which of the "core" control technologies best suited their needs based upon the constraints and limitations they encountered. While the list of technology options was broader for CSOs versus SSOs, the basin planners found that site limitations played a significant factor in technology selection, as did the desire to reduce the number of site alternatives by consolidating overflows. Summaries of the control technologies carried forward into each planning basin's site alternative development phase can be found in the *Summary of Control Technology Screening Process* subsections of Sections 8.3 through 8.9.

The basin planners also faced significant challenges in identifying potential control sites. The site evaluation and screening process proved to be dynamic due to the many factors that come into play when assessing the potential use of a site. In many cases, sites initially deemed to be potential control sites were later eliminated due to local objections, environmental issues, access concerns, competing development plans or a myriad of other reasons. Similarly, it was not uncommon for the basin planners to add to their list of preferred control sites as the process progressed and additional information was obtained. Summaries of the control sites carried forward into each planning basin's site alternative development phase can be found in the *Summary of Site Screening Process* subsections of Sections 8.3 through 8.9.

Each planning basin presented unique challenges. Capacity limitations in existing interceptors such that they appeared unable to adequately accommodate future dry weather flows caused some of the basin planners to focus on conveyance enhancements along with their site alternatives. Most basin planners, particularly those addressing large numbers of individual overflows, focused on minimizing the number of individual site alternatives required through the use of consolidated flow (CF) conduits or pipes. In some cases, the evaluation and routing of the CF pipes was equally as challenging as identifying the control sites. For those basins having secondary or tertiary treatment requirements, such as those with significant numbers of SSOs or Total Maximum Daily Loads (TMDLs), sites capable of hosting satellite sewage treatment, satellite advanced treatment or storage facilities were favored. The basin planners also identified which control technologies were more suited to CSO versus SSO outfalls and which were more suited to implementation by ALCOSAN versus the customer municipalities.

Finally, in developing and evaluating their site alternatives, the basin planners also explored potential inter-basin opportunities, factoring in both basin specific and regional considerations. Each planning basin developed and evaluated a large number of diverse site alternatives

over a wide range of control levels resulting in suites of site alternatives that could be implemented as-is or adapted for use in larger scale basin alternatives or system-wide alternatives. Summaries of the site alternatives and control technologies carried forward into the basin alternative development phase can be found in the *Evaluation and Ranking of Site Alternatives* and *Control Technologies Carried Forward* subsections, respectively, of Sections 8.3 through 8.9.

Sections 8.1 and 8.2 describe the overall process used to identify, develop and evaluate control technologies, control sites and site alternatives, and defines the standard terminology and nomenclature specific to this process. Basin-specific results, including which site alternatives and control technologies were carried forward into the Basin and system-wide alternative development and evaluation process, are contained in Sections 8.3 through 8.9.

8.1 Introduction

The following key definitions are listed below in order to guide the reader through this and subsequent sections:

- **Control Technology**: A technology specifically designed to be utilized for controlling wet weather flows.
- **Control Site**: The physical location, denoted by block/lot number(s), of a proposed control alternative.
- **Hydrologic and Hydraulic (H&H) Conditions**: Those conditions that have an effect upon the rate, volume and frequency of overflows to be controlled. Specific conditions include: precipitation events, performance levels, applicable boundary conditions and sources of contributing flows.
- **Control Alternative**: A unique combination of a control technology, a control site and a specific set of H&H conditions.

The vast range of potential control alternatives is simplified somewhat by grouping them into the following three categories:

- **Site Alternative**: A control alternative that is site-specific or basin-segment specific serving as one component of a larger control alternative (i.e., part of a basin alternative).
- **Basin Alternative**: A control alternative made up of an array of one or more site alternatives intended to provide a level of flow control applicable to an entire planning basin.
- **System-Wide (Regional) Alternative**: A control alternative made up of an array of one or more basin alternatives intended to provide an inter-basin level of control.

Figure 8-1 illustrates the overall processes, based upon guidance from both the Program Manager and Basin Coordinator, which were used by the basin planners for arriving at the control alternatives at the site, basin and system-wide alternative levels. The first track was used to develop and evaluate control technologies that could then be evaluated for compatibility with selected control sites under specific H&H conditions. The second track, which runs parallel with the technologies track, was used to identify and screen potential sites within the basins. As with the control technologies, the sites were screened and then evaluated for compatibility with the selected technologies under specific H&H parameters. The third track utilized output from the planning basin H&H models to identify those hydraulic conditions, such as the overflow rate /volume / frequency, upon which the size and cost of the control alternative would depend.

8.2 Alternative Development for CSO and SSO Discharges

This section focuses on the technology and site screening process and the development of site alternatives. The development and evaluation of basin and system-wide alternatives are described in Sections 9 and 10.

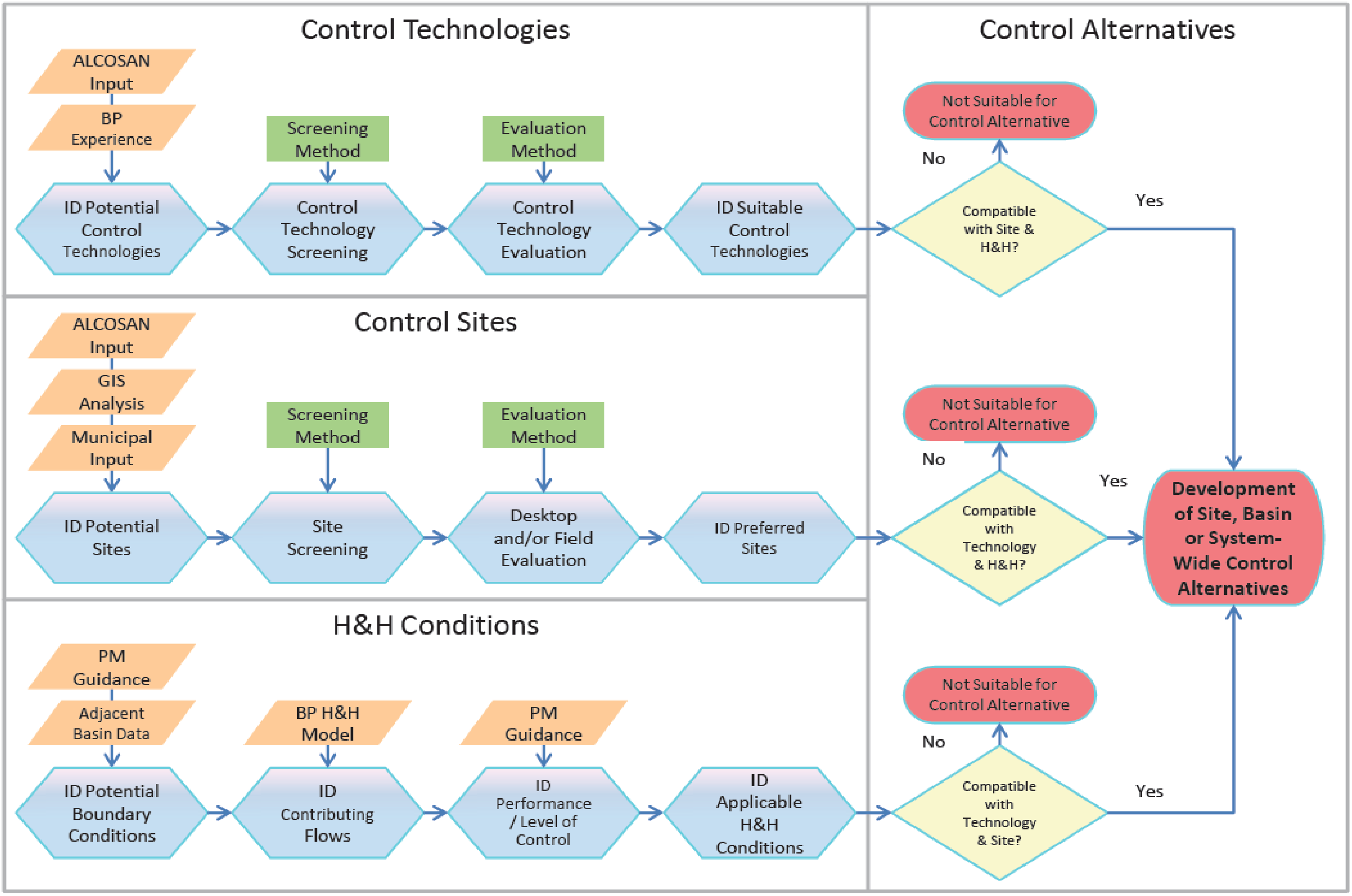
8.2.1 Sites and Technologies Screening Process

The initial technology and site screening evaluations for each planning basin were documented in detail in the basin planners' final SCSRs submitted to ALCOSAN between February and July 2010. These SCSRs provided a significant level of detailed information which is summarized later in this section.

The main objective of the SCSR was to generate a limited list of potentially feasible control technologies, control sites and potential relief sewer / overflow consolidation routes (as applicable) that could be combined with specific H&H conditions to form site alternatives. These site alternatives were then arrayed in groups designed to control overflows throughout each planning basin, a process that served as the starting point for the development of basin alternatives, as presented in Section 9. Using this phased screening and evaluation process, large numbers of potential technologies and sites were screened out at an early phase and low level of detail, thus allowing the basin planners to place a much higher degree of focus on the more favorable, and higher ranked technologies and sites.

Initially, all potential control technologies and sites were evaluated based on broad feasibility criteria and their applicability to specific planning basins. This broad evaluation allowed for the screening out of those control technologies and sites that were the least favorable or had an obvious fatal flaw. As illustrated in Figure 8-1, the remaining control technologies and sites that were carried forward were subjected to further evaluation as part of the basin and system-wide alternative development phases.

Figure 8-1: WWP Control Alternatives Development Process



The next step in the process was the preparation of a Feasibility Report and Present Worth Analysis (FRPW) for each planning basin. The majority of the basin planners submitted their draft FRPWs to ALCOSAN during the summer of 2011. These submissions represented a critical milestone in terms of meeting the overall WWP delivery schedule. The primary objective of the FRPWs was to develop and evaluate control alternatives using the highest-ranked control technologies and sites from the screening performed in the SCSRs. Thus, only a select number of high-ranking basin alternatives would be the focus of regional integration and optimization. Section 3 of the draft FRPW reports, "Evaluation of Site Alternatives", contain the content, findings, and recommendations provided in the SCSRs and describes the approaches used in conducting additional analyses for the development of wet weather control alternatives.

Per ALCOSAN guidance, draft FRPWs were not finalized but instead became the foundation of the next step in the planning process: the development of Basin Facilities Plans. Thus, the most preferred control alternatives identified in the draft FWPW reports were selected for further development and evaluation in the Basin Facilities Plans and ultimately the WWP.

It should be noted that while Section 8.1 presents the general evaluation processes that were used by all seven basin planners in the development of their respective SCSR and FRPW reports, total uniformity did not occur, nor was it desired, as each planning basin contained a number of basin-specific challenges that needed to be addressed. Some examples of the unique challenges that the basin planners faced included: severe capacity problems with the existing interceptor sewer; required higher levels of satellite treatment for SSO discharges due to an EPA-imposed Total Maximum Daily Load (TMDL) focused on total phosphorus loading in the watershed; and need to aggressively consolidate control alternatives due to the vast numbers of individual outfalls within the planning basin.

8.2.2 Identification of Potential Control Technologies

While each planning basin had slight variations in the definition of certain specific controls, particularly in the area of source controls and green infrastructure, the technologies contained in the SCSRs were generally grouped into the following broad categories:

- **Source Control/Source Reduction**: Green infrastructure; public and private I/I reduction and removal; sewer separation; best management practices/nine minimum controls (NMC) including floatables control.
- **Conveyance/Collection System Control**: Gravity sewers; pump stations; hydraulic relief structures; in-line storage; outfall relocation/consolidation; and regulator/diversion structure modification.
- **Storage**: Above and below ground tanks; and tunnels.
- **Treatment**: Screening and disinfection; vortex separation; retention/treatment basins; high rate clarification (sometimes called ballasted flocculation or sedimentation); and satellite sewage treatment.

The control of solids and floatable materials was to be integrated into proposed storage- or treatment- based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

Descriptions of the more commonly used, or "core", individual control technologies or categories of control technologies are as follows:

- **"Green" Infrastructure (GI)**: Specific sets of source controls that use natural processes to reduce the volume of stormwater entering the sewer system. Green infrastructure includes bioretention, subsurface infiltration, green roofs, porous pavement, rain gardens, and street trees; and is capable of providing significant levels of control over the course of a year through their performance in small- to moderate-sized storms.

- **Sewer Separation (SS)**: An inflow removal/source control method whereby a combined sewer system is divided into separate sewers/pipes for sanitary and stormwater flows. The scope of work could be limited to sewers within the public right-of-way or it could extend to private property. Sewer separation can be accomplished by providing new sanitary sewers, including private connections to existing structures and constructing a new separate sanitary collection system. The existing combined sewers will then serve as the new separate storm sewers. Sewer separation can also be accomplished by leaving the previously combined sewers as sanitary sewers and new storm sewers would be constructed. This is more commonly referred to "stormwater redirection." Complete separation involves both public and private inflow removal whereas partial separation involves only the public inflow sources, such as a catch basin in the public right-of-way.

- **Screening and Disinfection (SD):** A CSO control technology comprised of two phases – a screening step and a disinfecting step. Screening consists of bars, slots or perforated plates to remove floatables and other debris. Influent flow travels through the screening device leaving behind solids too large to pass through. Disinfection is accomplished in tanks through standard or high rate disinfection which occurs in a shortened period of time by incorporating a high dose of disinfection agent with intense mixing.

- **Vortex Separation (V)**: A process that removes floatables and settleable solids from a wastewater stream by directing influent flow tangentially into a cylindrical tank, thereby creating a vortex. The vortex action causes settleable solids to move toward the center of the tank where they are concentrated with a fraction of the influent flow and directed to the underflow at the bottom of the tank. The underflow is then conveyed to a downstream WWTP for ultimate treatment. The remaining influent flow travels under a baffle plate, which traps any floatables, then over a circular baffle located in the center of the tank. It is then discharged to receiving waters or conveyed to storage or treatment devices for further processing.

- **Retention/Treatment Basin (RTB)**: An off-line treatment method which is a combination of off-line storage and equivalent primary-level treatment. RTBs are generally designed to capture and store 100% of all small storms up to the prescribed design volume and some portion of medium to large storms. Contents of the RTB are pumped to the interceptor sewer at the end of the overflow event for treatment at the WWTP. During storm events when the volumetric capacity of the RTB is exceeded, RTBs provide flow-through treatment to remove floatables and settleable solids (known as total suspended solids [TSS]), with excess flow discharging to the environment. Solids remaining in the tank are flushed to a sump and pumped to the WWTP along with stored RTB contents.

- **High Rate Clarification (HRC):** A physical-chemical treatment process that uses a combination of coagulation, flocculation and clarification to remove suspended solids from the raw influent. The process utilizes the addition of coagulation/flocculation chemicals and a ballast material (normally sand or thickened sludge) to significantly increase the performance and efficiency of the clarification process. The chemical and ballast addition help to achieve uniform performance as variations in influent quality and flow occur. HRC systems can be expected to increase TSS removal for intermittent CSO events to more than 85%, with the HRC effluent blended with WWTP secondary effluent or discharged separately based on numerical permit limits.

- **Satellite Sewage Treatment (SST):** A method whereby satellite facilities provide biological treatment for excess wet weather flows, in separate sanitary sewer portions of the system. Examples of satellite sewage treatment include conventional activated sludge process, sequencing batch reactor process, and trickling filter process. SST facilities can be considered where sufficient average daily flow is available to sustain a biological treatment facility. Therefore, intermittent operation of an SST facility only during wet weather is not feasible. When evaluating a potential SST site, it was necessary to identify the existing base flow that can be diverted on a continuous basis to the SST.

- **Satellite Advanced Treatment (SAT):** A higher level of SST for use on smaller tributary streams where treatment beyond the secondary level is required due to a TMDL or other water quality factors.

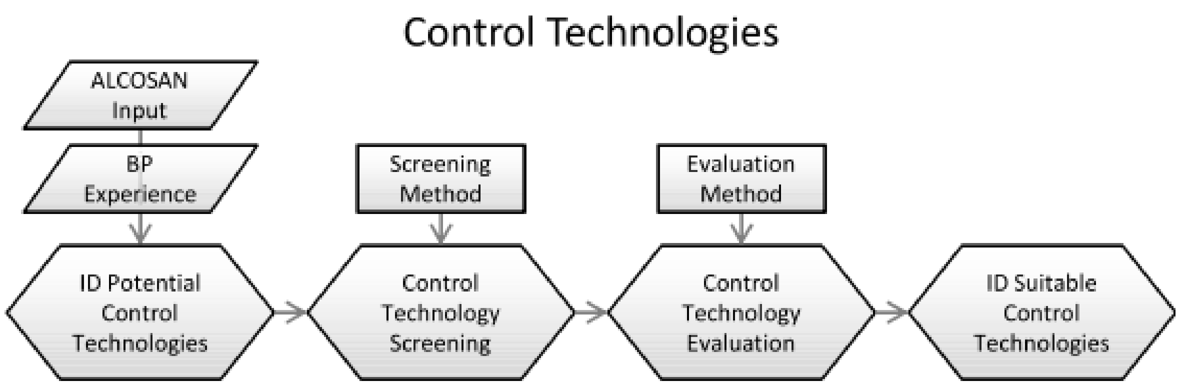
- **Off-Line Storage (OLS), Above Ground Tank (ATNK) and Below Ground Tank (BTNK):** Off-line or tank storage control technologies are designed to capture a prescribed volume of overflow, with no provisions for flow-through operation; volumes exceeding the design capacity are bypassed. The volume stored is sufficient to allow capture of all of smaller storms and some fraction of larger storms. The tanks have influent screening and automatic flushing systems to assist in the post-event tank cleaning. Dewatering pumps are provided to transport the contents of the tank and the collected solids to the ALCOSAN interceptor system following the overflow event.

- **Tunnel Storage (TNL)**: A system used to capture, store and convey large volumes of CSO or SSO discharge. The pumped effluent is transported and treated either at the WWTP or through another technology before being discharged to the environment. Tunnels can accommodate large overflow volumes with little or no disruption to the surrounding land surface area and capture all of the smaller storms and some fraction of the larger storms.

Though standardized design criteria related to the general sizing and configuration of storage and treatment technologies were followed, each basin planner's evaluation of control technologies followed a qualitative approach whereby engineering experience and best professional judgment guided the rating process. Technologies identified as potentially applicable were carried forward to potential sites and routes where they were evaluated against site-specific conditions such as hydraulic (i.e. the need for influent and/or effluent pumping), environmental, zoning, and regulatory requirements, to identify potential site alternatives (site- or outfall-specific controls) and basin alternatives (planning basin level aggregations of site alternatives). That process is described below.

8.2.3 Screening and Evaluation of Control Technologies

Screening and evaluation criteria were developed against which potential control technologies were compared to determine their appropriateness for use within the various planning basins. The "Control Technologies" portion of Figure 8-1, shown below, illustrates how this screening and evaluation fits into to the overall process.



These screening and evaluation steps are discussed below.

Screening: Though a primary factor in the decision-making process was the ability to achieve water quality standards, it was not the sole criteria used during the screening process. Impacts on the environment, ALCOSAN interceptors, customer municipality collection systems and the public were also considered. Screening criteria were developed to assess the overall impacts of applying each technology.

The list of potential control technologies were first screened based on broad feasibility criteria and their applicability to specific planning basins. The screening process varied slightly between basins, but each generally included the following sets of criteria:

- Demonstrated full-scale installation experience
- Ability to meet control objectives
- Operation and maintenance requirements
- Regulatory acceptance as a CSO or SSO control technology

This broad screening resulted in the elimination of lower ranked control technologies, streamlining the overall process of developing and evaluating control alternatives.

Evaluation: Following the initial screening, each of the retained control technologies were further evaluated using non-economic based criteria.

As was the case with the screening process, the process used to evaluate control technologies varied slightly between planning basins, but generally included comparisons of the following categories of factors:

- Economic
- Community
- Public health and environmental
- Operation and maintenance
- Implementation and construction

A composite version of the results of this screening process for the seven planning basins is presented in Table 8-1. Favorable ratings are denoted by "+" with negative ratings by "-"; neutral ratings are shown as "0". Economic factors, while considered by some basin planners at this early phase of screening, were not universally used and, as such, were not included in the summary table. As can be seen, while the composite ratings of the technologies may have varied, none were totally eliminated from consideration at this early stage of screening and were subsequently used in the future development of control alternatives.

Table 8-1: Technology Screening and General Scoring Summary

Control Technology	Community		Public Health and Environmental			Operation and Maintenance		Implementation and Construction		Carried Forward to Site Alternative Development
	Aesthetics and Odor	Secondary Benefits	Ability to meet Control Objectives	Impact on Sensitive Areas and Wildlife	Meet Future Regulatory Requirements	Operation and Maintenance	Proven, Reliable and Flexible	Constructability	Expandability	
Infiltration/ Inflow Reduction	+	0	+	+	0	+	+	0	0	Yes
Green Infrastructure/ Stormwater Management	+	0	-	+	0	+	+	0	0	Yes
Sewer Separation (SS)	0	+	+	0	0	+	+	0	0	Yes
Conveyance (C)	0	0	+	0	0	+	+	0	0	Yes
Inline Storage (INS)	-	-	0	0	0	0	+	0	-	Yes
Storage Tunnel (TNL)	0	0	+	+	0	0	+	-	0	Yes
Above or Below Ground Storage Tank (ATNK or BTNK)	-	+	+	+	+	0	+	-	0	Yes
Screening and Disinfection (SD)	0	-	0	+	0	0	+	+	0	Yes
Vortex Separator (V)	0	0	0	+	0	-	0	0	0	Yes
Retention Treatment Basin (RTB)	0	0	+	+	0	0	+	0	-	Yes
High Rate Clarification (HRC)	-	-	+	+	0	-	+	0	0	Yes
Satellite Sewage Treatment (SST)	-	-	+	+	0	-	+	0	-	Yes

The screening results specific to each planning basin formed the basis of that basin's site alternatives as described in Sections 8.3 through 8.9. It should be noted, however, that while certain control technologies may not have rated well at this early point in the screening process, the basin planners were directed by ALCOSAN to re-evaluate all technologies prior to moving into the basin and system-wide alternative phase to ensure that any new factors that arose during the process were fully considered. The results of this re-evaluation are summarized in the later basin-specific sections.

8.2.4 Identification of Potential Sites

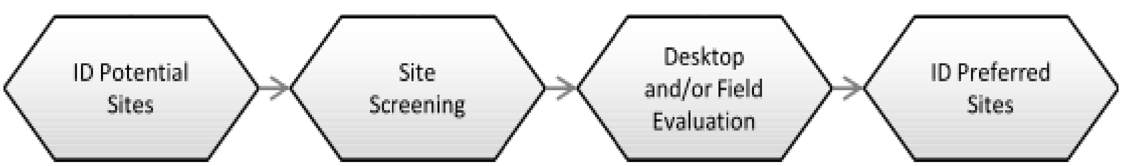
In a manner similar to that used for screening and evaluating control technologies, the basin planners identified, screened and evaluated potential control sites. As defined earlier, when a potential control site is combined with a control technology and a specific set of H&H conditions, the result is a control alternative.

The process began with the initial identification of a large number of potential sites. The process used to identify potential control sites varied slightly between planning basins, but each followed the following general process:

- Identify the significant outfalls within each respective basin.
- Identify the most downstream outfall in a consolidation of minor outfalls within each respective basin.
- Perform a GIS analysis to identify sites located within a certain distance (e.g., 2,000-foot radius) of the outfalls identified above. Sites identified were considered "Potential Sites."

8.2.5 Screening and Evaluation of Potential Sites

This sub-section presents the screening and evaluation criteria and methodology used to identify, screen and evaluate potential sites to accommodate a CSO or SSO control technology. The general process followed by the basin planners to screen and evaluate potential sites, as extracted from Figure 8-1, is illustrated below.



The initial step of identifying potential sites included a GIS analysis that considered parcels in close proximity to CSO or SSO outfalls, the land use with a preference for vacant parcels, parcel size slope and accessibility, and other basin-specific factors. Once this list of initial sites was formulated, the sites were then subjected to the site screening and evaluation steps that are discussed below.

Screening: The GIS analysis described above was fairly rudimentary, and still left the basin planners with a large number of sites to consider. In order to eliminate the numerous infeasible control sites, and to help streamline the overall process of developing and evaluating control alternatives, a means of screening the potential sites was necessary. The process used to screen potential control sites varied slightly between basins, but each generally followed the following process:

- Identify sites via GIS or other methods, which contain critical infrastructure, i.e., facilities which are extremely difficult and/or costly to displace. These sites were not preferred.
- Identify sites via GIS or other methods, having steep topography, i.e., grades greater than 20%. These sites were not preferred.
- Identify sites via GIS or other methods, which are included on the National Register of Historic Places. These sites were not preferred.
- Identify sites via GIS or other methods, which are included in Allegheny County Land Trust Greenways. These sites were not preferred.

Evaluation: To arrive at a list of preferred sites, i.e., those sites that could be combined with a control technology and a set of H&H conditions to form a control alternative, the basin planners developed processes to more rigorously evaluate the remaining potential sites. Again, the process used to evaluate potential control sites varied slightly between basins, but each followed the following general process:

- Conduct workshop(s) with representatives of each customer municipality in which a potential site had been identified.
- Review with them the results of the site identification and screening process.
- Gain a better understanding of the feasibility of locating control alternatives at the sites through discussions regarding:
    - Current land uses
    - Presence of previously unidentified critical infrastructure
    - Presence of public facilities
    - Engineering and constructability considerations
    - Presence of previously unidentified historical and cultural resources using Cultural Resources Geographic Information Systems (CRGIS) maintained by the Pennsylvania Historical and Museum Commission (PHMC)

- Check for presence of previously unidentified environmental resources such as:
  - Conducting an Environmental Database Records search from the Regional PaDEP Office
  - Pennsylvania Natural Diversity Inventory (PNDI)
  - National Wetlands Inventory Maps (NWI Maps)
  - Federal Emergency Management Agency (FEMA) Flood Maps
- Verify that there is adequate accessibility to the site.

The sites were screened using pertinent criteria and the specific information obtained by each basin planner's evaluation. As with the control technologies, the sites were screened utilizing some variation of favorable, neutral and negative ratings or judgment for each criterion. The site evaluation process resulted in a more realistic and streamlined list of preferred sites which, when combined with a control technology and a set of H&H conditions, formed a control alternative. Each basin planner documented their preferred sites in their SCSRs, details of which can be found in Sections 8.3 through 8.9, arranged by individual planning basin.

For planning basins that considered conveyance/relief sewers, conveyance routes were identified and evaluated concurrently using a similar process as the site identification and evaluations. The route evaluation process and results for each applicable basin are described in their respective planning basin sections.

The basin planners also identified, screened and evaluated feasible pipeline routes for consolidation flow conduits or sewers, (CFs). It should be noted that the discharge from both individual outfalls and the consolidated discharge from multiple outfalls in a CF pipeline or conduit can contribute to a proposed control alternative. The screening methods and criteria for identifying, screening and evaluating sites along CF pipelines were generally the same as those used for control sites with the following exception: in many cases it was possible that CF pipelines could be located within major transportation corridors.

8.2.6 Development and Evaluation of Site Alternatives

Using the results of the control technology and control site evaluations presented above, control alternatives for wet weather discharges were developed. At this point in the planning process, the basin planners were developing control alternatives for site-specific or basin-segment specific areas which would serve as one component of a larger control alternative, such as a basin alternative. These control alternatives are, by definition, site alternatives. The process followed to arrive at the preferred set of site alternatives for each basin was similar to that described above for technologies and sites. Each alternative was first developed, screened and then evaluated with the most preferred carried forward for further evaluation.

Site Alternative Development: For the purpose of developing site alternatives, unique combinations of the following items were assembled:

- A control technology: Per each basin's list of suitable technologies.
- A control site: Per each basin's list of preferred sites.
- A specific set of H&H conditions: A combination of:
  - A precipitation event: The typical year (for CSO controls); a 1, 2, 5 or 10-year design storm (for SSO controls).
  - A performance level: 0, 1 to 3, 4 to 6, 7 to 12 or 20 overflows per year for CSO control; SSO controls default to 0 overflows/year.
  - A boundary condition: An HGL and/or flow rate in the ALCOSAN interceptor system.
  - A contributing flow: Modeled flows, from a specific outfall or consolidation of outfalls, to the control alternative.

Each site alternative combination was given a unique name in accordance with standardized guidance developed by the Basin Coordinator. Each site alternative name consists of the six alpha-numeric components shown in Table 8-2.

Table 8-2: Examples of Site Alternative Naming Conventions

Component	Description	Examples
Planning Basin ID	Current Planning Basin acronyms	CC, LOGR, MR, SMR, TT, UA or UM
Individual or Consolidated Flow Source ID	ALCOSAN/municipal regulator name, or the name given to a consolidation of flows	M-29 (regulator); CF02 (consolidation)
Control Technology ID	The Alternative's primary control technology	HRC, RTB, SS, TNL etc.
Precipitation Event ID	Typical Year conditions and/or the design storm applied	TY (typical year); 02 (2-yr storm); TY02 (mixed flow areas)
Performance Level ID	The number of untreated overflow events allowed per year	00, 01, 02 etc. (CSO controls); 00 (SSO controls)
Boundary Condition ID[1]	The conditions that define duration, frequency and volume of flows to a site alternative	FD (free discharge); 600 (WWTP capacity); Basin-Based (BBS) and Regional-Based (RBS) Control Strategy; etc.

For example, a site alternative in the Saw Mill Run planning basin that treats a consolidation of flows using an RTB during the typical year to a level of 4 overflows per year would be named:

[1] This identifies this item as one component of a specific set of H&H Conditions.

SMR_CF01_RTB_TY_04_600

Note that in this example, the boundary conditions were defined by an assumed WWTP capacity of 600 MGD.

Given that each basin planner identified five or more suitable technologies, 13 or more preferred sites and that 10 or more sets of H&H conditions may apply, the number of site alternatives each basin planner would have needed to develop could have exceeded 600. It should be noted that if any one of the three items needed to form a site alternative was incompatible with the others, the combination was considered to be "non-viable" and no site alternative was possible.

Site Alternative Evaluation: As noted above, the number of site alternatives in each basin had the potential to be very large. To keep basin planner efforts at a reasonable and efficient level, guidance was provided to the basin planners regarding eight methods they could apply (but were not limited to) as they evaluated their numerous control technologies and site alternatives. These methods are summarized below:

- **Initial Independent Evaluation of SSO Controls**: The basin planners initially assumed hydraulic independence of CSOs and SSOs so that they could focus the early phase of alternatives development and evaluation on identifying the most appropriate level(s) of SSO control to maintain.
- **Additional SSO Approaches**: The basin planners focused initial site alternative development and evaluation on such options as:
    - Prioritizing storage over conveyance, or;
    - Reserving transmission capacity for the drainage of SSO storage tanks.
    - Draining the majority of SSO storage tanks during all wet weather periods and extending tank drainage beyond 24 hours for smaller, more frequent events to reserve post-event downstream conveyance capacity for CSO controls.
- **Single Technology Assessment**: The basin planners developed individual technology cost/performance (Knee of the Curve) plots for a given site or route for a subset of performance levels to identify the more cost-effective technologies for further consideration. At least three performance levels would be used.
- **Unit Cost Comparisons**: The basin planners derived unit costs from the Alternatives Costing Tool (ACT, see Section 9.1.3), and used them to assist in screening out more expensive technologies for a given site/route.
- **"Uniform" Base Case**: The basin planners established a standardized base case, e.g., assuming a two-year return SSO frequency and boundary condition 2 (plant expanded to 600 MGD) and developing control alternatives for the seven CSO control levels based on this assumption. This approach could lead to later modifications to the alternatives during regional integration using updated assumptions.

- **Bracketed Evaluation**: The basin planners evaluated "minimum level of control" options and "maximum level of control" options, bracketing the range of solutions to better target the controls that would likely be further evaluated.

- **Transmission-Intensive Alternative**: The basin planners established boundaries between the planning basins and the regional treatment and conveyance system at points of hydraulic separation. Utilizing the significant assumption that deep tunnel HGL levels would not influence diversion structures in the future, alternative analyses could proceed without the influence of the tunnel HGL.

- **Site Alternatives Assessment**: The basin planners eliminated control alternatives that score poorly based on a standard, widely accepted set of economic and non-economic criteria. This method was particularly useful to those basin planners with a large number of site alternatives to evaluate.

A screening form, intended to serve as a standardized method of assessing site alternatives, was used to assign grades to each site alternative. Generally, those receiving higher grades, such as "A", "B" or possibly "C", were subjected to a more detailed alternatives evaluation. Those receiving lower grades, such as a "D" or "F" were not. A sample Screening Summary Form is shown below in Figure 8-2.

Regardless of the method utilized, the alternatives evaluation process identified those basin-specific suites of site alternatives that were carried forward by each basin planner into the next phase of the planning process - the development and evaluation of basin alternatives.

The descriptions of the basin-specific screening process follow.

Figure 8-2: Sample Screening Summary Form (SMR Basin)

Planning Basin	Saw Mill Run
Technology Category	Tank Storage
Site Alternative Name	SMR_CF11_BTNK
Site Alternative Description	
Alternative Screening Grade (derived from weighted answers to questions)	**C**

Category		Criteria	Criteria Weighting	Category Weighting	Result (Y, S, N)
Economic Factors	1	Total Present Worth	25%	30%	No
	2	Predictability of Cost	5%		Somewhat
Public Factors	3	Community Disruption	2%	20%	No
	4	Potential for Nuisances (odor, noise, aestheti	6%		Somewhat
	5	Multiple Benefit Opportunities	6%		Yes
	6	Environmental Justice	6%		Yes
Water Quality, Public Heath and Environmental Impacts	7	Untreated Overflow Volume Reduction	5%	25%	Yes
	8	Bacteria Discharge Reduction	5%		Yes
	9	Solids and Floatables Capture	3%		Yes
	10	BOD Control	3%		Yes
	11	Nutrient Control	3%		Yes
	12	Control of Discharge to Sensitive Areas	4%		N/A
	13	Impact to Slopes, Shoreline, Wildlife	2%		Yes
Operation Impacts	14	Ease of Operation	4%	15%	Somewhat
	15	Ease of Maintenance	4%		Somewhat
	16	Reliability/Redundancy	4%		Yes
	17	O&M Consistency with Existing Practices	3%		Yes
Implementation Impacts	18	Constructability	4%	10%	Somewhat
	19	Ability to Expand Capacity	3%		Yes
	20	Land Acquisition	3%		Somewhat
TOTAL				**100%**	

8.3 Chartiers Creek Planning Basin Control Technology and Site Screening

Section 8.3 summarizes the approach used, assumptions made, and the results of the technology and site screening efforts undertaken for the Chartiers Creek (CC) planning basin. The overall screening process used by CC and the other six basin planners was described in Sections 8.1 and 8.2, along with relevant definitions and technology descriptions. As such, this section will primarily focus on results of that process and any features or methods that were unique to the CC planning basin. Much of the basin-specific background information related to this section can be found in the CC SCSR and FRPW reports.

8.3.1 Summary of Control Technology Screening Process

The CC Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the CC Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their knowledge and expertise combined with input from ALCOSAN and guidance from the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations to the list of technologies screened by each of the seven planning basins, the "core" of these technologies screened remained constant for all basins. The "core" technologies considered are described in Section 8.2. The complete list of technologies considered by CC BP is in the BP's Screening of Controls and Sites Report (SCSR).

The basin planner then selected criteria that best suited the CC planning basin and evaluated each technology utilizing the scoring method similar to what is described in Section 8.2 and illustrated in Figure 8-1.

In the unique context of the CC planning basin, source controls were not anticipated to be adequate to eliminate large capital facilities for conveyance and flow attenuation in separate sewer system (SSS) areas. This is due to the fact that the existing interceptor capacity is severely limited in its ability to transport wet weather flows. Nevertheless, a reduction in the wet weather flow generated by the customer municipalities will allow for the construction of smaller control facilities, help to provide capacity for growth, or help to offset system deterioration that occurs as the system ages.

For the combined sewer system (CSS) areas, source controls that could be applied in the customer municipality systems were considered. Various options were considered based on the unique characteristics of individual tributary areas and the opportunities they provide. The primary basis for this evaluation is the need to examine a full range of CSS options, including storage, treatment and source controls. Separation, partial separation, stream removal and green infrastructure applications in CSS areas are key source control options that were considered by the CC BP. Again, however, it is anticipated that the implementation of these technologies would be primarily the responsibility of the respective customer municipalities.

The control technologies the CC Basin Planner considered feasible and more appropriate for ALCOSAN to implement were carried forward into the site alternatives formation process. These technologies, listed in Table 8-3, include all the technologies shown in Table 8-1.

Sewer separation (full and partial) was also carried forward for further evaluation for CSO systems only. Even though it would not be implemented by ALCOSAN, ALCOSAN desired to use sewer separation as a benchmark for comparison to the other technologies.

Table 8-3: CC - Feasible Control Technologies Carried Forward Into Site Alternative Development

Technology Type	CSO or SSO Application
Conveyance/ Relief Sewers	Both
Sewer Separation, Partial Separation, Stream Removal	CSO only
Storage Tanks	Both
Storage Tunnel	Both
In-Line Storage	CSO only
Retention Treatment Basin	CSO only
Vortex Separation	CSO only
Screening and Disinfection	CSO only
Ballasted Flocculation or High Rate Treatment	CSO only
Satellite Sewage Treatment	Both

The Chartiers Creek basin planner also evaluated the ability of green infrastructure to provide wet weather control as a municipal alternative portion of a broader basin plan. An examination of these technologies in the context of Chartiers Creek system hydraulics revealed that green infrastructure must be coupled with improved conveyance capacity and a higher level of understanding of the existing system conveyance capacities in order to support the desired level of CSO control. Specific targets for green infrastructure application were identified based on the complexities of bringing flow to the existing interceptor or the relief interceptor. Combined sewer areas that were located downstream of proposed consolidation sewer intercept points were also considered. Hydraulic modeling of these areas was performed using gross hydrologic modification considerations consisting of initial abstraction modification in addition to impervious area reduction. Estimates of the necessary storage volume to achieve various levels of control were determined, and sewersheds with the greatest potential to meet desired levels of control underwent field screening based on land use within the sewershed.

The following sewersheds and municipalities were determined to have the greatest potential for green infrastructure applications:

- C-10 – McKees Rocks Borough
- O-06 – Stowe Township and McKees Rocks Borough
- O-08 through O-13 – City of Pittsburgh
- Carnegie Borough (various locations)

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.3.2 Summary of Site Screening Process

The CC Basin Planner performed an extensive screening and evaluation of potential sites and tunnel/conveyance routes in order to identify a group of preferred control sites or routes. These sites or routes would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the CC planning basin process generally followed that shown in Figure 8-1 and explained in Section 8.2.

Initially, the CC BP identified a list of 48 potential sites based on general site characteristics such as size, ground slope and proximity to the interceptor to be considered for wet weather flow control. Following this initial site identification, more extensive site data were gathered and the sites were further evaluated using input from two workshops with municipal representatives, engineers, fieldwork, aerial photos and GIS mapping of the interceptor and surrounding area.

Table 8-4 contains a listing of the 48 preliminary sites along with the results of the evaluation.

Table 8-4: CC - Identified Sites and Screening Results

Site ID	Site Name	Overall Rating	Carried Forward?
CC-01	Boyce Mayview Park	Medium-Low	
CC-02	Chartiers Park	Medium-High	Yes
CC-03	McLaughlin Run C	Medium	
CC-04	McLaughlin Run B	Medium	
CC-05	McLaughlin Run A	Medium-High	Yes
CC-06	Burgunder Dodge/ Gillece Plumbing	Medium	
CC-07	Old Star City Cinema	Medium	
CC-08	Hickman South	Medium-Low	
CC-09	Hickman North	Medium-High	Yes
CC-10	Bedner Farm	Medium-High	Yes
CC-11	Shannon Safety	Medium-High	Yes
CC-12	Millers Run	Low	
CC-13	Universal Stainless	Medium-High	Yes
CC-14	Chartiers Valley Shopping Center	Medium	
CC-15	Best Properties	Medium	
CC-16	Russell Standard	Medium	
CC-17	Best/Collier Properties	Medium	
CC-18	Trader Jacks	Medium-Low	

Table 8-4: CC - Identified Sites and Screening Results

Site ID	Site Name	Overall Rating	Carried Forward?
CC-19	Chartiers Valley Practice Field	Medium-Low	
CC-20	Woodville West	Medium-High	Yes
CC-21	Scott Twp Park	Low	
CC-22	Scott Twp Ball Field	Low	
CC-23	Green Tree Rd	Low	
CC-24	Keystone Oaks	Low	
CC-25	Scott Twp Industrial Park	Low	
CC-26	Heidelberg Park	Medium-High	Yes
CC-27	Carnegie Industrial Park	Medium-High	Yes
CC-28	Vesuvius and Ehrlich	Medium-Low	
CC-29	Suntory Water Bottling	Medium-Low	
CC-30	Carnegie Ball Field	Low	
CC-31	Kinney Engineers	Medium	Yes
CC-32	Jane St.	Medium-Low	
CC-33	Rosslyn Farms Industrial Park	Medium-High	Yes
C-34	Duncan/Meyer and Middleton Park	High	Yes
CC-35	Thornburg Golf Course	Medium-High	Yes
CC-36	Roswell & Woodwere	Medium-Low	
CC-37	Sun Life Assurance	Medium-High	Yes
CC-38	UPS Vacant Lot & Broadhead Manor - City of Pittsburgh Housing Authority	Medium-High	Yes
CC-39	Fairywood Warehouse Area	Medium-Low	
CC-40	Scully Tunnel/RR	Medium	
CC-41	Scully Yard	High	Yes
CC-42	Creek Road	Low	
CC-43	Wind Gap & Youghiogheny	Medium	
CC-44	McKees Rocks South	Medium-High	Yes
CC-45	Sheridan Park	Low	
CC-46	Power Line ROW	Medium-High	Yes
CC-47	McKees Rocks East	High	Yes
CC-48	Corliss	Medium-High	Yes

This resulted in 20 sites being retained as potential sites. The other sites, referred to as "secondary sites", were not evaluated further unless additional sites were needed as alternatives development progressed. The 20 potential sites were later checked to determine if there were any documented environmental issues.

As with the other planning basins, the CC Basin Planner also evaluated potential routes for possible relief sewers, flow consolidation (CF) pipes, and conveyance/storage tunnels. This was particularly important in the CC planning basin due to documented hydraulic limitations in the existing Chartiers Creek interceptor.

Several assumptions were made when investigating conveyance routing alternates:

- Relief sewers must extend virtually the entire length of the ALCOSAN interceptor.
- Pipe diameters would be sufficient to convey the peak flow rate.
- Relief sewers do not need to be adjacent to all current POCs.
- Relief sewer alignments would be limited to hydraulic relief of only the ALCOSAN interceptor.
- Relief sewers which convey dry weather flow must allow reconnection to the existing river crossing between the CC system and the WWTP.
- A deep tunnel would only be considered as a wet weather relief alternative (e.g., no flow in dry weather).

This process resulted in the identification of 16 potential routes that were evaluated further using screening criteria developed by the CC Basin Planner in coordination with ALCOSAN and the customer municipalities. The screening criteria considered the following factors: overall length, depth, location, constructability, dual-use opportunities (use of a single pipe to accomplish both a consolidation and a relief sewer function), creek crossings, railroad crossings, etc. This resulted in the elimination of six potential routes while the remaining 10 routes were carried forward into the site alternative development and evaluation process.

In addition to the evaluation of conveyance routes, the CC Basin Planner developed concepts for potential overflow consolidations. These consolidated flow (CF) concepts were eventually integrated with the conveyance concepts. The CF concepts focused on identifying those ALCOSAN overflows that could be consolidated at each of the remaining 20 potential sites. The general expectation was to consolidate overflows based on site specific flow, hydraulics and site opportunities because fewer facilities would result in lower capital and operations and maintenance costs. The likely overflow consolidations are listed in Table 8-5, along with likely control functions for the site in question.

Table 8-5: CC - Alternative Flow Consolidations at Preferred Control Sites

Site ID	Likely Function	Possible Consolidation Outfall(s)
CC-02	Site for tunnel related structure	C-55
CC-05	Site for tunnel related structure	C-55
CC-09	Equalization for inputs at C-54-16 and C-55-02	C-55
CC-10	Site for tunnel related structure	C-55
CC-11	Equalization for inputs at C-53-10 and Collier inputs	C-54
CC-13	Equalization for inputs at C-53 and C-53-10	C-53, C-54
CC-20	Equalization for inputs at C-53 and C-53-10	C-50, C-50B, C-51, C-52, C-53
CC-26	Equalization for interceptor/upstream sanitary areas, potential offset for inputs at C-45B-04, C-45B-08 and C-48	C-46, C-47, C-48, C-49, C-50
CC-27	Equalization for interceptor/upstream sanitary areas, potential offset for inputs at C-45B-04, C-45B-08 and C-48	C-45, C-45A, C-46, C-47, C-48
CC-31	Combined area storage/treatment or interceptor equalization	C-38B, C-39, C-40, C-41, C-42, C-43, C-44
CC-33	Combined area storage/treatment or interceptor equalization	C-24, C-25, C-26, C-26A, C-27, C-28, C-29, C-30, C-31
CC-34	Combined area storage/treatment for areas in Pittsburgh, Crafton, Carnegie	C-23, C-24, C-25
CC-35	Overall interceptor equalization, combined area storage/treatment for areas in Pittsburgh, Crafton, Carnegie	C-21, C-22, C-23, C-24, C-25
CC-37	Overall interceptor equalization, combined area storage/treatment for areas in Pittsburgh, Ingram, Crafton, Carnegie	C-15, C-19, C-20
CC-38	Overall interceptor equalization, combined area storage/treatment for areas in Pittsburgh, Ingram, Crafton	C-14, C-15, C-19, C-20
CC-41	Overall interceptor equalization, combined area storage/treatment for areas in Pittsburgh, Ingram, Crafton	C-13A
CC-44	Combined storage/treatment for areas in Pittsburgh, McKees Rocks, Stowe	C-10, C-11, C-12, C-13
CC-46	Combined storage/treatment for areas in Pittsburgh, McKees Rocks, Stowe	C-05, C-05A, C-06, C-07, C-08, C-09, C-10, C-11
CC-47	Combined storage/treatment for areas in Pittsburgh, McKees Rocks, Stowe	O-06-00, C-02, C-03, C-04, C-03A, C-05, C-05A, C-06, C-07, C-08, C-09
CC-48	Site for tunnel related structures	O-13, C-05, C-05A

The 20 control sites listed above, and the conveyance routing concepts, were the subject of future evaluations and refinements. This resulted in small numbers of sites being dropped or added as additional information became available. It soon became apparent that the control sites utilized in the development of site alternatives were highly dependent upon the conveyance and consolidation routing. This is further described in the following section.

8.3.3 Site Alternative Development

Using the results of the control technology and control site screening and evaluations, the CC Basin Planner combined control technologies, control sites and specific sets of H&H conditions to develop unique site alternatives. A site alternative is a control alternative being considered for controlling wet weather overflows that is site-specific or basin-segment-specific and serves as a component of a larger control alternative, such as a basin alternative.

As the site alternatives were developed for the CC planning basin, facility type, sizing and site configuration details were determined. Facility footprints and hydraulic profiles were developed to ensure adequate space was available for the appropriate type and size of facility.

The CC Basin Planner also based the development of their site alternatives on the consolidation of outfalls into storage (basin or tunnel) or treatment facilities in conjunction with conveyance improvements. After further analysis, six of the 20 control sites emerged as finalists for controlling consolidated flows and to use in the site alternative development process. The reasons for their selection are discussed below:

- CC-09: Hickman Street North – Located at the upstream end of the CC planning basin, where major flow inputs are generated. Would reduce the length of downstream interceptor relief sewer required and reduce peak flows traveling downstream in the system. Provides sizeable useable site in close proximity to the flows; site is not commercially viable and should be acquirable.

- CC-13a: AK Steel - Replaced site CC-13 Universal Stainless. Sites CC-13 and CC-13a are in close proximity to the flow inputs from McLaughlin Run (C53-10) and Painters Run (C53), which are major inputs to the system. Unlike the Universal Stainless property, the AK Steel property is not currently utilized. It is uphill and adjacent to the Universal Stainless site, requiring pumping of influent into a basin on the property.

- CC-26: Heidelberg Park – Municipally owned site in proximity to the interceptor near downstream end of area where sanitary flows are generated.

- CC-34: Duncan Properties/Crafton – Municipally owned site acquired for wet weather storage by the Borough of Crafton in proximity to Crafton CSO outfalls.

- CC-38: UPS Vacant Lot and Broadhead Manor Public Housing – Vacant or unused parcels in close proximity to outfalls C-14 and C-15, which are otherwise isolated from the combined area.
- CC-47: McKees Rocks East – Large Brownfield site at the downstream end of the CCPB.

In addition to these six sites, other sites were identified as potential locations for tunnel structures. The size required for these sites, and the long-term impact for various uses, is less than for a storage or treatment facility.

8.3.4 Evaluation and Ranking of Site Alternatives

The CC Basin Planner applied the Site Alternatives Assessment method to evaluate and screen their site alternatives, which is one of the eight site alternative evaluation methods described in Section 8.2. A Sample Screening Summary Form that was used is included as Figure 8-2. A unique name was assigned to each of their site alternatives as explained in Section 8.2.

The CC Basin Planner evaluated site alternatives for the full range of applicable levels of control (0, 1 to 3, 4 to 6, 7 to 12 and 20 overflows per year) in the typical year for CSOs and the 2-year storm for SSOs. The results of the development and evaluation process are presented in Table 8-6. As shown in the table, the SSO and CSO site alternatives were jointly evaluated. Also shown in the table are the results of the evaluation process, indicating whether the site alternative was carried forward into the basin alternative development phase.

As indicated, conveyance played a major role in most of the site alternatives for the CC planning basin. In fact, the basis for eliminating the only site alternatives not carried forward (CF06) was the addition of increased downstream conveyance. In general, as the evaluation process progressed, upstream sites were eventually eliminated from consideration as larger conveyance pipes were examined as a means of routing flows to downstream sites.

Table 8-6: CC - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
CC_CF01	C55-02, C54-16, C53-10	SSO	Storage Tunnel	Yes	
CC_CF02	C54-12, C54-07, C54-06, C54, C53-10, C53-08, C53-06, C53	SSO	Conveyance, Below Ground Tank, Storage Tunnel	Yes	
CC_CF03	C52, C51, C50B, C50A-12, C50A-06, C50A, C50, C49, C48, C47, C46, C45B-08	SSO	Conveyance, Below Ground Tank	Yes	
CC_CF04	C45B-04, C45A, C45, C44-12, C44-08, C44, C43, C42, C41, C40, C39, C38B, C38A, C38, C37, C36, C35, C34A, C34, C33, C32, C31, C30, C29, C28-04, C28, C27, C26A	CSO	Conveyance	Yes	
CC_CF05	C26, C25, C24, C23-14, C23-08	CSO	Retention/Treatment, Below Ground Tank, Conveyance	Yes	
CC-CF06	C14, C15	CSO	Below Ground Tank	No	Basin eliminated by increasing downstream relief conveyance capacity
CC_CF07	C23, C22, C21, C20-02, C20, C19, C15-04, C15, C14-06, C14, C13A, C13-12, C13-06, C13-02, C13, C12, C11, C10, C09, C08, C07, C06, C05A, C05, C04, C03A, C03, C02, O13, O11, O10, O09, O08, O06	Mixed	Conveyance, Retention/Treatment, High Rate Clarification, Secondary Sewage Treatment	Yes	
CC_CF08	C55-02, C55, C54-20, C54-18, C54-16	SSO	Conveyance, Below Ground Tank	Yes	
CC_CF09	N/A	CSO	Sewer Separation	Yes	CF09 includes sewer separation for all combined areas, thus there are no defined outfall consolidations.
CC_CF10	N/A	Mixed	Tunnel	Yes	CF10 is a deep tunnel intended to serve the entire CC basin, thus there are no defined outfall consolidations.

8.3.5 Control Technologies Carried Forward

Table 8-6 contains the status of site alternatives indicating those which advanced to basin alternative analyses. As the basin alternative development process progressed and alternatives were further evaluated, site alternatives were adjusted or eliminated and variations or new alternatives added.

Sewer separation (SS) was evaluated as a unique basin alternative in all combined sewersheds. In addition, other source control technologies, notably green infrastructure, were considered. These technologies alone, however, could not achieve the required level of control and would need to be implemented by the customer municipalities rather than by ALCOSAN.

Additional conveyance capacity is a specific need in the CC planning basin that is included in all alternative concepts in order to relieve the hydraulic limitations of the existing system. For site alternatives that include storage or treatment facilities, this additional conveyance capacity functions both as a relief interceptor and as a CF conduit.

In general, the control technologies having favorable ratings in Table 8-6 were carried forward to the site alternative evaluation process and are summarized as follows:

SSO control technologies under further consideration:

- Increased conveyance capacity through parallel interceptors or relief sewers – conveyance (C).
- Flow attenuation through storage - below ground storage tanks (BTNK) and/or storage tunnels (TNL).
- Satellite sewage treatment (SST).

CSO control technologies under further consideration:

- Storage – in-line storage (INL), BTNK, TNL.
- Treatment (at generated flow rates) – screening and disinfection (SD), retention treatment basin (RTB).
- Treatment (for consolidated facilities) – high rate clarification (HRC), SST.

It is important to note that source controls, including sewer separation, stormwater redirection, and green infrastructure, although not included in Table 8-6, continued to move forward into basin alternatives development and were subsequently considered as needed to achieve a desired level of control.

One TNL-based site alternative utilized a deep tunnel that ran the entire length of the existing Chartiers Creek interceptor, although along a somewhat modified alignment. The tunnel, and associated CF pipes, achieved SSO elimination and CSO control throughout the basin without using any additional storage, treatment, or conveyance technologies. CF conduits routed flows to tunnel drop shafts, and the captured flows would be transported across the Ohio River to the ALCOSAN WWTP.

8.4 Lower Ohio-Girty's Run Planning Basin Control Technology and Site Screening

This Section summarizes the approach used, assumptions made, and results of the technology and site screening efforts undertaken for the Lower Ohio-Girty's Run (LOGR) planning basin. The overall screening process used by the LOGR and the other six basin planners was described in Sections 8.1 and 8.2, as were key definitions and technology descriptions. As such, this section will primarily focus on results of that process and any features or methods that were unique to the LOGR planning basin.

8.4.1 Summary of Control Technology Screening Process

The LOGR Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the LOGR Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their own knowledge and expertise as well as that of ALCOSAN and the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations to the list of technologies screened by each of the seven basin planners, the "core" group of technologies screened remained constant for all basins. The "core" technologies considered are described in Section 8.2. The complete list of technologies considered by the LOGR BP is included in the LOGR Screening of Controls and Sites Report (SCSR).

The basin planner then selected criteria that best suited the LOGR planning basin and evaluated each technology utilizing the scoring method that was generally described in Section 8.2 and illustrated in Figure 8-1.

Input from the customer municipalities was also sought on the technology screening process. Several of the quarterly Basin Planning Committee (BPC) meetings held within the LOGR Basin focused on the process and were attended by ALCOSAN, Basin Coordinator, Basin Planner and LOGR customer municipality representatives. In addition, a Municipal Workshop was held for the LOGR BPC members on September 1, 2009. This workshop was a working meeting with the purpose of specifically presenting the overall process of technology screening and site selection and soliciting input from the municipalities.

As with the other planning basins, most of the available technologies were deemed suitable for CSO control. A more limited number of technologies were deemed suitable for SSO control; primarily source controls, storage and satellite secondary treatment. However, source controls for either CSO or SSO control were deemed more appropriate for the customer municipalities which own and operate the collection systems from where the excess flow originated.

The control technologies that the LOGR Basin Planner considered feasible and more appropriate for ALCOSAN to implement were carried forward into the site alternatives formation process. The list of technologies includes most of the "core" technologies shown in Table 8-7, and also includes public education, sewer system optimization, and constructed wetlands; the technologies brought forward are listed in Table 8-7. "Core" technologies not included in the LOGR technology list were green infrastructure and infiltration/inflow reduction. These were deemed more appropriate to implement at the municipal level and were discussed as such in the LOGR FRPW

Sewer separation was also carried forward for further evaluation. Even though it would likely require implementation by entities other than ALCOSAN, ALCOSAN wanted to use sewer separation as a benchmark for comparison to the other technologies.

Table 8-7: LOGR - Feasible Control Technologies Carried Forward into Site Alternative Development

Technology Type	CSO or SSO Application
BMP (Public Education)	CSO only
Sewer System Optimization (Capacity and connection hydraulic improvements)	Both
Sewer Separation	CSO only
In-Line Storage	CSO only
Tunnel Storage	Both
Tank Storage	Both
Vortex Separator	CSO only
Screening and Disinfection	CSO Only
Retention Treatment Basin	CSO Only
Constructed Wetland	CSO Only
High Rate Clarifier	CSO Only
Satellite Sewage Treatment Plant	SSO only

In conjunction with the control technology screening process, a sensitivity analysis relating the anticipated effects of green infrastructure on overflow frequencies was conducted. Outfalls producing the least frequent overflows under typical year conditions were evaluated to determine the percentage of flow reduction required to lower the frequency of overflow events to desired levels of control. The analysis compared overflow statistics from the fourth through eighth largest overflow events during the 2003 typical year to determine the amount of flow generated from the impervious and pervious portions of the sewershed. With this information, the primary flow source (impervious or pervious area) could be identified and a determination made as to whether green infrastructure should be investigated as a potential control.

The analysis indicated that CSOs at ALCOSAN POCs O-01, O-02 and O-05a within Stowe Township have the potential to eliminate the fourth through eighth largest overflows via the use of green infrastructure. Controls, including those incorporating other inflow reduction technologies, may need to be implemented in existing pervious and impervious areas to maintain this level of control. In addition, sewershed A-67 in Millvale Borough was identified as a host for potential green infrastructure installations. In A-67, the impervious area is relatively small compared to the total A-67 sewershed acreage and the removal of these impervious areas would not significantly reduce A-67-00 CSO frequency. However, they may be effective in reducing the volume and frequency of the GRJSA CSOs.

In both Millvale Borough and Stowe Township, the areas identified in the modeled analyses were assessed via a field survey, and potential green infrastructure installations were considered based on the local land use. Since implementation of green infrastructure in these areas is outside of ALCOSAN's jurisdiction, Stowe Township and Millvale Borough were contacted about the possibility of implementing green solutions within their sewersheds.

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.4.2 Summary of Site Screening Process

The LOGR Basin Planner performed an extensive screening and evaluation of potential sites and tunnel/conveyance routes in order to identify a group of preferred control sites or routes. These sites or routes would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the LOGR planning basin largely followed the process shown in Figure 8-1 and explained in Section 8.2. Notable basin-specific variances are noted below.

Initially, the LOGR BP identified an extensive list of potential sites to address the flows at each applicable outfall within the planning basin. The sites were then subjected to the site screening and evaluation steps that were discussed in Section 8.2, which resulted in the identification of 59 potential control sites. In order to obtain additional information and input for consideration in site selection, individual meetings were also held with municipal representatives of each municipality where a site was identified. Screening and evaluation was performed in two phases: site characterization and site screening. Each site was evaluated in the field, and then was subjected to a site screening process using information obtained from the field evaluations. If there was more than one potential site identified for a single outfall or grouping of outfalls, the sites were compared against each other and a "preferred" site was selected.

Due to the large number of "preferred sites" and the fact that many were in close proximity to each other, it was determined that it was not practical to construct control facilities at all of them. As with the other planning basins, each "preferred" site was further evaluated to assess its potential to handle larger, consolidated flows (CF) from a number of nearby outfalls. As such, 12 "Preferred Consolidation" sites were identified. In addition, one "preferred" corridor alignment for a potential storage tunnel or relief sewer was identified for each of the three major contiguous geographic areas, or sub-basins: Lower Ohio North (LON), Lower Ohio South (LOS), and Lower North Allegheny (LNA). The corridors generally parallel the Allegheny and Ohio Rivers where the ALCOSAN diversion chambers and outfalls are located.

The "Preferred Consolidation" control sites are listed in Table 8-8 along with the source identifiers (ID) that were assigned to each CF.

Table 8-8: LOGR - List Of "Preferred Consolidation" Control Sites

Site ID	Site Location	Applicable CF ID	Overflows Addressed	CSO or SSO
A-62.1	Between River Ave. and RR Tracks across the channel from Herr's Is. and downstream from 31st St. Bridge	CF10	A-62, A-64, A-65, A-67 and all upstream GRJSA and West View OFs	CSO
		CF17	A-62-00 and A-64-00	CSO
A-66.4	Space southwest and adjacent to Millvale near the B&O RR track bridge before it crosses from the mainland river bank to Herr's Is.	CF16	A-65, A-67, and all upstream GRJSA and West View OFs	CSO
A-67.3	At Bauerstown Volunteer Fire Dept. event parking lot near intersection of Wible Run Rd. and Lori Ann Way	CF11	A-67 and all GRJSA overflows upstream of and including Millvale SSO and West View overflows	CSO
O-04.1	Northwest of Hershey Way in Stowe Township	CF02	O-01, O-02, O-03, O-04, O-05, O-05A and O-05B	CSO
O-15.4	Baseball field; north of Ohio River Blvd east of Beaver Ave and west of New Brighton Rd in Emsworth Boro	CF03	O-15 and all upstream overflows, O-16, and O-16Z	SSO
O-15.7	Junction where Camp Horne Road changes to Lowries Run Road near Green Valley Golf Course	O-15	O-15 and all upstream overflows	SSO
O-18.1	Baseball fields; Intersection of Frederick St. and New Brighton Rd.	O-18, O-18Y, O-18Z	O-18, O-18Y, and O-18Z	SSO
O-20.1	Ohio River Blvd and Prospect St. Intersection	CF04	O-19 and O-20	SSO
O-21.1	Along the river side of Ohio River Blvd from about Sheridan Ave to near Shiloh Ave.	CF05	O-21 and O-22	SSO
		CF22	O-19-00, O-20-00, O-21-00 and O-22-00	SSO
O-24.6	Intersection of Ohio River Blvd and Kendall Ave.	CF06	O-23 and O-24	SSO
		CF19	O-23, O-24 and O-25	Mixed
O-25.1	Along Farragut Ave below bridge for Ohio River Blvd; on border between Bellevue Boro and City of Pittsburgh	O-25	O-25	CSO
O-26.2	Immediately downstream of ALCOSAN WWTP	O-26	O-26	CSO
		CF14	O-25 and O-26	CSO

8.4.3 Site Alternative Development

Using the results of the control technology and control site screening and evaluations in the previous sections, the LOGR BP combined those control technologies and control sites with specific sets of H&H conditions to develop unique site alternatives. A site alternative is a control alternative that is site-specific or basin-segment-specific and serves as a component of a larger control alternative, such as a basin alternative.

The first step in developing a site alternative was to list a set of control technologies applicable to each control site. Table 8-9 lists which technologies were considered to be appropriate for use at each "Preferred Consolidation" control site given the site characteristics, volume of overflow and type of overflow. This list of technologies and sites was the starting point for the detailed site alternative development process. Constructed wetland technology was eliminated at this step due to their need for large, flat areas which were not available at any of the preferred sites. With the exception of Site O-25.1, flow control strategies, such as in-line storage, were also eliminated due to insufficient upstream pipe capacities.

Next, the size of the control facility to adequately control the intended overflows was determined. CSO control technologies were sized using the future baseline conditions with conveyance of all municipal flow for 2003 typical year flow statistics, while SSO control technologies were sized using the future baseline conditions with conveyance of all municipal flow for the design storm statistics. Sizes for storage alternatives were based on peak overflow volume estimates, and sizes for treatment technologies were based on peak flow rate estimates.

The CF pipes were sized based on peak flow rate estimates for the particular level of control being considered, generated by the consolidated group of outfalls upstream of each CF segment. The alignments of CF pipes were selected to follow existing easements and rights-of-way where practical. Where conveyance pipe construction involved crossing state highways, railroads or streams, or where pipes needed to be deeper than 15 feet, trenchless construction techniques and costs were assumed. Otherwise, open cut construction techniques and costs were assumed. CSOs were evaluated for 0, 1 to 3, 4 to 6, 7 to 12, and 20 overflows for the 2003 typical year; while SSOs were evaluated for the 1-, 2-, 5-, and 10-year design storms.

Table 8-9: LOGR - Preliminary Couplings of Control Technologies and Sites

			Source Control	Collection System Control		Storage			Treatment					
Site	**CSO or SSO**	**Overflows Addressed**	**Public Education**	**Sewer Optimization**	**SS**	**Flow control strategies**	**TNL**	**BTNK**	**V**	**SD**	**RTB**	**Constructed Wetlands**	**HRC**	**SST**
A-62.1	CSO	A-62, A-64, A-65, A-67, all upstream GRJSA and West View OFs	√	√	√		√	√	√	√	√	Not applicable to any of the potential sites	√	
A-66.4	CSO	A-65, A-67, all upstream GRJSA and West View OFs	√	√	√		√	√	√	√	√		√	
A-67.3	CSO	A-67 and all upstream GRJSA and West View OFs	√	√	√			√	√	√	√		√	
O-04.1	CSO	O-01, O-02, O-03, O-04, O-05, O-05A and O-05B	√	√	√		√	√	√	√	√		√	
O-15.4	SSO	O-15, O-16 and O-16Z	√	√			√	√						
O-15.7	SSO	O-15	√											√
O-18.1	SSO	O-18, O-18Y and O-18Z	√	√			√	√						
O-20.1	SSO	O-19 and O-20	√	√			√	√						
O-21.1	SSO	O-21 and O-22	√	√			√	√						
O-24.6	SSO	O-23 and O-24	√	√			√	√						
O-25.1	CSO	O-25	√	√	√	√	√	√	√	√	√		√	
O-26.2	CSO	O-25 and O-26	√	√	√		√	√	√	√	√		√	

8.4.4 Evaluation and Ranking of Site Alternatives

The LOGR Basin Planner applied the *Site Alternatives Assessment* method to evaluate and screen their site alternatives, which is one of the eight site alternative evaluation methods described in Section 8.2. A Sample Screening Summary Form that was used is included as Figure 8-2. The LOGR Basin Planner assigned a unique name to each of their site alternatives as explained in Section 8.2.

Environmental assessments procedures, explained in Section 8.2, were conducted to reduce the uncertainty regarding the presence of environmental issues that could add difficulty or totally restrict the implementation of the control facilities and CF piping. Environmental conditions within the LOGR planning basin were typical of those found throughout the ALCOSAN service area, where heavy industry was historically located along river corridors. The environmental issues associated with these corridors may include: soil and groundwater contamination, undocumented waste disposal, and numerous buried utilities and structures. Based on the sizing and environmental and site information, a cost estimate for each site alternative was prepared using the ACT Version 2.0.

As described above, site alternatives were developed for a given control site (CS), level of control (LOC), and H&H boundary condition. Based on the cost and site information compiled during the site alternative development step, the site alternatives were screened to arrive at the highest ranked site alternative. The screening of the site alternative was performed utilizing the screening form illustrated in Figure 8-2. Both cost and non-cost factors were included in the screening process.

Appendix C of the LOGR FRPW contains the detailed screening forms and a summary of the site alternative evaluation and ranking results. The results of this process are summarized below in Table 8-10. Also noted are the type of area served, the principle control technology, and whether it was carried forward into the basin alternative evaluation and the key factor for screening out the site alternatives. Again, only the 4 to 6 overflows per year and 2-year design storm LOCs are included in this and the other summary tables.

Table 8-10: LOGR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
LOGR_CF10	A62, A64, A65, A67, all upstream GRJSA and West View overflows	CSO	RTB	Yes	
LOGR_CF10	A62, A64, A65, A67, all upstream GRJSA and West View overflows	CSO	SD, V, HRC, BTNK	No	SD not as effective as RTB; High comparative costs
LOGR_CF11	All GRJSA overflows upstream of and including Millvale SSO and West View overflows	CSO	BTNK	No	Storing upstream flows only provided marginal benefit
LOGR_CF16	A65, A67, all upstream GRJSA and West View overflows	CSO	RTB	Yes	
LOGR_CF16	A65, A67, all upstream GRJSA and West View overflows	CSO	SD, V, HRC, BTNK	No	SD not as effective as RTB; High comparative costs
LOGR_CF17	A62, A64	CSO	BTNK	Yes	
LOGR_CF17	A62, A64	CSO	RTB, SD, V, HRC, TNL	No	RTB and SD not as effective as storage; High comparative costs
LOGR_CF02	O01, O02, O03, O04, O05, O05A, O05B	CSO	RTB	Yes	
LOGR_CF02	O01, O02, O03, O04, O05, O05A, O05B	CSO	SD, V, HRC, BTNK	No	SD not as effective as RTB; High comparative costs
LOGR_O25	N/A	CSO	BTNK	Yes	
LOGR_O25	N/A	CSO	RTB, SD, V, HRC	No	RTB and SD less effective than BTNK; High comparative costs
LOGR_O26	N/A	CSO	BTNK	Yes	
LOGR_O26	N/A	CSO	RTB, SD, V, HRC, TNL	No	RTB and SD less effective than BTNK; High comparative costs
LOGR_CF14	O25, O26	CSO	BTNK	Yes	
LOGR_CF14	O25, O26	CSO	RTB, SD, V, HRC, TNL	No	RTB and SD less effective than BTNK; High comparative costs
LOGR_CF19	O23, O24, O25	Mixed	BTNK	Yes	
LOGR_CF19	O23, O24, O25	Mixed	RTB	No	RTB less effective than BTNK; High comparative costs

8.4.5 Control Technologies Carried Forward

Table 8-11 summarizes the control technologies that were carried forward. Based on the site alternative screening, high rate clarification, vortex separation, and tunnel storage were not carried forward as site-specific alternatives because they were not determined to be a preferred control technology at any of the LOGR preferred sites. It should be noted that tunnel storage is more applicable to regional alternatives and was considered again at the basin-alternative development stage. It is also important to note that source controls, although not included in Table 8-11, continued to be considered as needed to achieve a desired level of control.

Table 8-11: LOGR - Control Technologies Carried Forward

Control Technology	Carried Forward?	Primary Reason
Below Ground Storage Tank	Yes	
Tunnel Storage	No	Cost and non-monetary factors
Retention and Treatment Basin	Yes	
High Rate Clarification	No	Cost and non-monetary factors
Vortex Separation	No	Cost and non-monetary factors
Screening and Disinfection	Yes	
Sewer Separation	Yes	
Satellite Sewage Treatment	Yes	
Sewer System Optimization	Yes (Regional Basis Only)	

8.5 Main Rivers Planning Basin Control Technology and Site Screening

Section 8.5 summarizes the approach used, assumptions made, and results of the technology and site screening for the Main Rivers (MR) planning basin. The overall screening process used by the MR Basin Planner was described in Sections 8.1 and 8.2, along with key definitions and technology descriptions. As such, this section will primarily focus on results of that process and any features or methods that were unique to the MR planning basin. Much of the basin-specific background information related to this section can be found in the MR SCSR and FRPW reports.

8.5.1 Summary of Control Technology Screening Process

The MR Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the MR Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their knowledge and expertise combined with input from ALCOSAN and guidance from the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations to the list of technologies screened by each of the seven planning basins, the "core" of these technologies screened remained constant for all basins. The "core" technologies considered are described in Section 8.2. The complete list of technologies considered by MR BP is in the BP's Screening of Controls and Sites Report (SCSR).

Unlike the other planning basins, the MR Basin Planner primarily focused on the control of CSOs. The H&H results gathered from the 2003 Typical Year indicated that the two SSOs in the MR planning basin, both in Reserve Township, generally did not overflow for the control levels evaluated. Although SSO controls were not included in the screening process, it is important to note that the H&H model indicated that one of the two SSOs did overflow 0.003 MG during the 10-year storm. As a result, a relief pipe was added to the H&H model to capture these flows and to reduce related surcharging in the system. As will also be described below, the site screening process was also quite challenging for the MR planning basin due to intensive land use throughout the river front and downtown areas of the basin.

It should be noted that at this point in the planning process, the MR Basin Planner considered sewer separation to be a surrogate for all land based source control measures, including green infrastructure. In other words, wherever sewer separation was determined to be feasible, other source control methods were assumed to also be feasible.

In addition to the control technologies described above, overflow control via regulator modification was initially considered as a means to reduce costs. This was particularly applicable to the many smaller overflows in downtown and riverfront areas of the MR Basin.

The basin planner then selected criteria that best suited the MR planning basin and evaluated each technology utilizing the scoring method that was generally described in Section 8.2 and illustrated in Figure 8-1.

Nearly all the control technologies that MR BP considered were carried through to site alternative development. They include all the technologies shown in Table 8-1, except for infiltration/inflow reduction, green infrastructure and in-line storage. These technologies are listed in Table 8-12. Sewer separation was also carried forward for further evaluation for CSO systems only, even though it would not be implemented by ALCOSAN. ALCOSAN wanted to use sewer separation as a benchmark for comparison to the other technologies.

Table 8-12: MR - Feasible Control Technologies Carried Forward Into Site Alternative Development

Technology Type	CSO or SSO Application
Sewer Separation (SS)	CSO
Tunnel Storage (TNL)	CSO
Tank Storage (TNK)	CSO
Vortex Separator (V)	CSO
Screening and Disinfection (SD)	CSO
Retention Treatment Basin (RTB)	CSO
High Rate Clarifier (HRC)	CSO

While the evaluation system offered some useful information to compare the control technologies, the results did not suggest to the MR Basin Planner that any technologies should be removed from consideration at this point. Satellite sewage treatment Plant (SST) was not included in the screening for two reasons. First, SST is more applicable to SSO treatment, which was not a consideration within the MR planning basin at this time. Secondly, should SST become necessary, it would best be considered as part of a larger, basin-wide or system-wide concept where a detailed capacity analysis of the Woods Run WWTP would need to be factored into the equation.

At this stage of the screening process it was concluded that RTB should be viewed more favorably than HRC or V as a flow-through control technology. Further, should storage become desirable, tunnels (TNL) appeared to be more desirable than off-line storage (OLS) tanks (TNK). In both cases where storage was being considered, the issue of dewatering the stored volume within the desired time frame was identified as a potential limiting factor when viewed on basin-wide and system-wide bases. However, as will be revealed in later discussions in the MR planning process, these findings were modified to reflect both changes in the design criteria of certain technologies and proposed regional system-wide concepts.

In conjunction with the control technology screening process, a sensitivity analysis relating the anticipated effects of green infrastructure on overflow frequencies was conducted. Various reductions to impervious areas within a sewershed were modeled to determine whether the associated overflow reduction was significant enough to limit overflows to levels of control desired for ALCOSAN site alternatives.

Evaluation of green infrastructure proved to be complex, in that it was difficult to validate whether or not an overflow could be sufficiently controlled to achieve a desired level of control. However, the analysis did provide insight into areas where the application of green technologies would likely be beneficial and have the potential to supplement other source reduction efforts. As such, implementation of green infrastructure could potentially reduce the capacity, size and costs of consolidation sewers. Sewersheds in which green infrastructure showed the greatest benefit were identified based on their potential ability to reduce CSOs to under 11 events per typical year with 10% or less of impervious area reduction. These areas, all located in the City of Pittsburgh, include: A-05, A-08, A-12, A-18Y, A-56, M-08 and O-37.

Green infrastructure was only analyzed at the site alternative level, and was not carried forward as a stand-alone technology for basin alternative development. It will be retained as a potential municipal control to supplement ALCOSAN controls in the Main Rivers Basin.

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.5.2 Summary of Site Screening Process

The MR Basin Planner performed an extensive screening and evaluation of potential sites and tunnel/ conveyance routes in order to identify a group of preferred or control sites or routes. These sites or routes would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the MR planning basin process largely followed the process shown in Figure 8-1, but did vary somewhat. Variations in the approach are described in this section.

The approach of initially identifying potential sites used by MR BP was significantly different than the approach explained in Section 8.2. The MR BP identified potential sites initially by incorporating the Allegheny County Tax Assessment database into the current GIS to identify approximately 66,000 available "parcels" within the planning basin.

Then, a "fatal flaw" analysis involving concerns for public safety, presence of high-rise buildings and/or critical infrastructure, and a location in an extremely sensitive or costly area, significantly reduced the number of parcels to approximately 16,500. These surviving parcels were then rated using a parcel scoring system and criteria similar to the criteria explained in Section 8.2. Parcels that scored well in the above evaluation were then evaluated further by incorporating an orthophotographic analysis to identify potential sites – one or more grouped "parcels" - for control technologies. Upon completing this final screening effort, 63 potential sites, comprised of 127 parcels, were identified. Table 8-13 summarizes these 63 potential sites.

Table 8-13: MR - Potential Sites

Site Number	Number of Parcels In Site	Nearby ALCOSAN Diversion Structure(s)
1	1	M-29
2	1	M-29
3	1	M-29
4	1	A-21, 22, 23, 25
5	1	A-21, 22, 23
6	2	A-21, 22, 23
7	1	A-21, 22, 23
8	1	A-21, 22, 23, 25
9	15	A-60, 61
10	2	A-60, 61
11	18	A-60, 61
12	1	O-27
13	2	O-27
14	1	O-27
15	1	M-19, 19A, 19B
16	1	M-19, 19A, 19B
17	1	M-19, 19A, 19B
18	1	A-29, 29Z
19	1	A-29,29Z, 30
20	1	A-29, 29Z
21	1	O-31, 32, 33, 34
22	1	O-31, 32, 33, 34
23	4	O-31, 32, 33, 34
24	1	A-25
25	4	M-05
26	6	M-12, 12Z,13, 14, 15, 15Z, 16,17
27	1	M-18, 20, 21, 22, 23
28	1	M-18, 20, 21, 22, 23
29	1	M-18, 20, 21, 22, 23
30	30	M-24, 26, 27, 28
31	1	M-24, 26, 27, 28
32	1	M-24, 26, 27, 28
33	2	M-06, 07, 08, 10, 11
34	1	M-06, 07, 08, 10, 11
35	1	M-18, 20, 21, 22, 23
36	1	M-18, 20, 21, 22, 23
37	1	M-18, 20, 21, 22, 23
38	1	A-32, 33, 34
39	1	A-31, 32, 33, 34
40	1	A-32, 33, 34

Table 8-13: MR - Potential Sites

Site Number	Number of Parcels In Site	Nearby ALCOSAN Diversion Structure(s)
41	1	A-26, 27, 28
42	2	A-26, 27, 28
43	1	A-18, 18X, 18Y, 18Z
44	1	A-18, 18X, 18Y, 18Z
45	2	A-18, 18X, 18Y, 18Z
46	1	A-18, 18X, 18Y, 18Z, 19Z
47	6	A-19X, 20, 20Z
48	2	A-19X, 20, 20Z
49	1	M-24, 26, 27, 28
50	3	M-24, 26, 27, 28
51	1	O-39, 40, 41
52	2	M-12, 12Z,13, 14, 15, 15Z, 16,17
53	6	M-12, 12Z,13, 14, 15, 15Z, 16,17
54	3	M-06, 07, 08, 10, 11
55	1	M-18, 20, 21, 22, 23
56	1	A-26
57	2	A-15, 16, 17
58	1	O-29, 30
59	1	A-19Y
60	1	A-14Z
61	2	M-29
62	1	A-58, 59, 59Z, 60
63	1	A-21, 22, 23, 25

These 63 potential sites were then further evaluated to assess their potential for hosting a tunnel drop shaft, as well as applying environmental and social-economic criteria. In general, readily available sources of information were used. For example, the Pennsylvania Natural Diversity Inventory (PNDI) is an online resource that was used to identify potential impacts to threatened or endangered wildlife species.

Select sites were visited with representatives of ALCOSAN in February 2011 to validate possible use for a future control technology. These sites were subsequently discussed with ALCOSAN during a progress workshop that was held March 11, 2011. Based on the workshop and site visits, site refinement narrowed many areas to few or no sites available. In the case where no sites were available the use of control technologies that rely instead on source controls, such as sewer separation and green infrastructure, were applied. An updated list of 31 potential sites is provided in Table 8-14.

Table 8-14: MR - Potential Sites Carried Forward Into Site Alternative Development

Nearest ALCOSAN Diversion Structure	MR Basin Planner Site Designation	Potential Site for Control Facility?	Potential Site for a Tunnel Drop Shaft?
M-29	3	Yes	Yes
A-23	4	Yes	No
A-21	8	Yes	Yes
A-59	9	Yes	No
M-19	16	Yes	Yes
A-29	20	Yes	Yes
M-05	25	Yes	No
M-16	27	Yes	Yes
M-21	27	No	Yes
M-24	32	No	Yes
M-06	34	Yes	Yes
O-39	51	Yes	Yes
M-13	52	Yes	No
M-12	53	No	Yes
M-10	54	No	Yes
A-26	56	Yes	Yes
A-48	66	No	Yes
A-19X	67	No	Yes
A-23	68	No	Yes
A-32	69	No	Yes
A-58	70	No	Yes
A-60	71	No	Yes
A-22	72	No	Yes
A-07	73	No	Yes
M-01	74	Yes	Yes
M-03	75	No	Yes
M-05	76	No	Yes
O-27	77	Yes	Yes
O-32	78	Yes	Yes
A-51	79	No	Yes
O-36	80	No	Yes

8.5.3 Site Alternative Development

Using the results of the control technology and control site screening and evaluations in previous sections, the MR BP combined the control technologies, control sites and specific sets of H&H conditions to develop unique site alternatives.

In general, siting of the retention treatment basin (RTB), high rate clarification (HRC), vortex separation (V), storage tank (TNK), and screening and disinfection (SD) facilities within the MR planning basin was challenging due to the size of their required footprints and the scarcity of open land in the vicinity of the numerous CSO outfalls. Consequently, the site alternative development process began with the determination of the spatial requirements for RTB, HRC, V, off-line storage (OLS), and SD facilities over a range of flows and volumes – the specific set of H&H conditions. Note, that while seven control technologies were brought forward from the screening and evaluation process, two were not spatially critical. Sewer separation (SS), along with other source control technologies, including green infrastructure, does not require a specific site. Also, as mentioned previously, site requirements for tunnel (TNL) shafts are generally small and their locations may be somewhat flexible.

To manage the potentially overwhelming number of combinations, a benchmark performance level of four to six overflows per year was selected for the initial evaluation of site alternatives. This was determined to be a suitable starting point for sizing technologies; higher levels of control would be unlikely and lower levels of control would be more easily accommodated.

Based upon this level of control, the spatial requirements for each of the control technologies were determined, and matched with each of the 31 control sites brought forward. If the spatial requirements matched the available acreage of the site, a viable site alternative resulted; as was the case each potential site at this level of control. Other levels of control were also evaluated as the planning process progressed.

This initial process of matching spatial requirements with the 31 control sites carried forward revealed that a potential site of adequate size existed for each of the MR CSOs. Most importantly, sites were available for the ten largest CSOs in the MR planning basin which represent greater than 70% of the annual typical year overflow volume.

As a means to minimize the number of control facilities required in the MR planning basin and reduce the overall cost of construction, operation and maintenance of such facilities, consolidation of outfalls became an important consideration. Consequently, consolidated flow (CF) conduits were developed with the intent of combining smaller overflows with larger overflows wherever possible. As detailed in the SCSR, the availability of sizable sites and possible CF routes were limited, particularly within the central downtown area.

Initial CF concepts are shown in Table 8-15. These continued to be refined as the planning process progressed. It became apparent that CF conduits for any grouping of CSOs would vary in length and diameter to match the H&H conditions over the range of prescribed levels of control.

Table 8-15: MR - Initial Consolidated Flow (CF) Concepts

ALCOSAN Diversion Structure(s)
A-15, 16, 17
A-18, 18X, 18Y, 18Z, 19Z
A-19X, 20, 20Z
A-21, 22, 23, 25
A-26, 27, 28
A-29, 29Z, 30
A-31, 32, 33, 34
A-60, 61
M-06, 07, 08, 10, 11
M-10, 11, 12, 12Z
M-12, 12Z, 13, 14, 15, 15Z, 16, 17
M-16, 17, 18, 20, 21
M-19, 19A, 19B
M-18, 20, 21, 22, 23
M-24, 26, 27, 28
O-29, 30
O-31, 32, 33, 34, 34
O-37, 38, 39, 40, 41

As shown, the number of individual overflows that could be consolidated in this initial exercise ranged from a low of two to a high of eight. Again, this initial CF concept was modified throughout the planning process as more detailed information became available on factors such as routing constraints, H&H boundary conditions, tunnel alignments and shaft locations.

In summary, the MR Basin Planner now had a set of screened control technologies and control sites, along with a set of H&H conditions based upon an initial CF concept and a benchmark level of control of four to six overflows per year. Given the results of the technology and site screening process, the MR Basin Planner was ready to evaluate and rank site alternatives.

8.5.4 Evaluation and Ranking of Site Alternatives

The MR Basin Planner applied the *Site Alternatives Assessment* method to evaluate and screen their site alternatives, which is one of the eight Site Alternative Evaluation methods described in Section 8.2. A Sample Screening Summary Form that was used is included as Figure 8-2.

All site alternatives were for CSO applications and therefore, were developed at the 0, 1 to 3, 4 to 6, 7 to 12 and 20 overflows per year levels of control. A unique name was assigned to each, as explained in Section 8.2.

Each of the top three ranked site alternatives at each level of control were considered feasible for further analysis. However, the MR Basin Planner further evaluated them at the benchmark level of control, using two additional factors:

1. If one or more site alternative received the same letter grade, the numerical score was used as a tiebreaker. For example, if both the RTB- and SD-based alternatives were assigned a letter grade of "A", but the SD-based alternative received a higher numerical score, the SD-based alternative would be the "most feasible".

2. If the footprint of the highest ranked site alternative would not fit on a control site, the site alternative was considered to be a non-viable. For example, if a TNK-based alternative ranked higher than an RTB-based alternative but the site could not accommodate the storage tank, the RTB-based alternative would be the "most feasible".

At this point, the results of the benchmark analysis were assumed to be applicable to all other levels of control; higher levels of control were considered to be unlikely and lower levels of control would result in smaller site alternatives with more adaptable footprints.

It should be noted that of the various control technologies evaluated, the three highest ranked site alternatives under all conditions were based upon TNK, SD or RTB technologies. However, the control of overflows through modifications to existing ALCOSAN regulators was also considered for many of the smaller overflows. This was designated as in-line storage or INL. At this point in time, the applicability of each modification was evaluated by incorporating the modification into the MR H&H model; if it controlled overflows to the desired level, the result was a viable site alternative.

However, despite the favorable appearance of site alternatives based on regulator modification, many uncertainties remained. Subsequent discussions between ALCOSAN, the MR Basin Planner and the Basin Coordinator centered on the uncertainty in quantifying potential upstream hydraulic impacts and the feasibility of constructing the proposed modifications. Eventually, in an effort to take a more conservative approach to the development and evaluation of future control alternatives, site alternatives based on regulator modification were supplanted with site alternatives based upon storage tank, screening and disinfection or retention and treatment basin technologies.

Thus, the technologies upon which the feasible site alternatives were based shifted as the MR basin planning effort progressed. Tanks, screening and disinfection, and retention and treatment basins were utilized in initial suites of site alternatives and retained in subsequent suites of site alternatives. Regulator modification (INL) was not retained for subsequent suites of site alternatives.

The results of the evaluation and screening are presented in Table 8-16. In some cases, while SD was ranked highest, RTB was selected due to its improved performance abilities. Also, SD was sometimes selected over other technologies due to site limitations. Finally, certain implementation factors, such as tank pump-out times, favored SD over TNK.

It was assumed that the facilities would utilize below ground or subsurface tanks. Subsurface tanks offer various advantages when compared to above ground tanks (ATNK), including improved site aesthetics and the potential for efficient and effective utilization of highly visible, accessible and valuable property. These benefits are particularly important to an urban environment, such as that which comprises the MR Basin, and therefore above ground tanks were never considered for the MR Basin.

8.5.5 Control Technologies Carried Forward

Table 8-16 contains the status of site alternatives evaluated, indicating those which advanced to basin alternative analyses at the 4-6 level of control. It should also be noted that new site alternatives were developed, following the submittal of the FRPW, that were associated with a regional based control strategy that employed conventional tunnel technology. As will be seen in later sections, this control strategy played a major role in subsequent planning efforts.

It is also important to note that source controls, including sewer separation, stormwater redirection, and green infrastructure, although not included in Table 8-17, were carried forward into basin alternatives development and were subsequently considered as needed to achieve a desired level of control. Table 8-17 summarizes the technologies carried forward.

Table 8-16: MR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
MR_A01	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A04	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A07	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A09	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A10	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A49	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A50	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A51	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_A56	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_M01	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_M03	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O27	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O31	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O32	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O33	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O34	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O35	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O37	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O38	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O39	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_O41	N/A	CSO	Regulator mods (INL)	No	INL not considered as standalone technology
MR_CF12	A20, A21	CSO	Retention/Treatment	Yes	

Table 8-16: MR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
MR_CF12	A20, A21	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest
MR_CF02	A22, A23	CSO	Screening/Disinf.	Yes	
MR_CF02	A22, A23	CSO	Retention/Treatment, Storage Tank	No	SD ranked highest but site had size limitations; TNK ranked 3rd highest
MR_CF03	A25, A26, A27, A27Z, A28	CSO	Retention/Treatment	Yes	
MR_CF03	A25, A26, A27, A27Z, A28	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest
MR_CF04	A29, A29Z	CSO	Retention/Treatment	Yes	
MR_CF04	A29, A29Z	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest
MR_CF05	A30, A31, A32, A33, A34	CSO	Screening/Disinf.	Yes	
MR_CF05	A30, A31, A32, A33, A34	CSO	Retention/Treatment, Storage Tank	No	SD ranked highest as the site has intended multiple uses; TNK ranked 3rd highest
MR_CF06	A58, A59, A59Z, A60, A61	CSO	Retention/Treatment	Yes	
MR_CF06	A58, A59, A59Z, A60, A61	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest as the site has intended multiple uses; TNK ranked 3rd highest
MR_CF15	M01, M02, M03	CSO	Storage Tank	Yes	
MR_CF15	M01, M02, M03	CSO	Retention/Treatment, Screening/Disinf.	No	BTNK ranked highest; dewatering into existing system desirable deemed an implementation limitation
MR_M05	N/A	CSO	Storage Tank	Yes	
MR_M05	N/A	CSO	Retention/Treatment, Screening/Disinf.	No	BTNK ranked highest; dewatering into existing system desirable deemed an implementation limitation
MR_M06	N/A	CSO	Storage Tank	Yes	

Table 8-16: MR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
MR_M06	N/A	CSO	Retention/Treatment, Screening/Disinf.	No	BTNK ranked highest; dewatering into existing system desirable deemed an implementation limitation
MR_CF14	M04, M04Z, M05	CSO	Retention/Treatment	Yes	
MR_CF14	M04, M04Z, M05	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest
MR_CF13	M07, M08, M10, M11, M12, M13, M14, M15, M15Z, M16, M17	CSO	Retention/Treatment	Yes	
MR_CF13	M07, M08, M10, M11, M12, M13, M14, M15, M15Z, M16, M17	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest
MR_CF07	M19, M19B, M19A	CSO	Screening/Disinf.	Yes	
MR_CF07	M19, M19B, M19A	CSO	Retention/Treatment, Storage Tank	No	SD ranked highest as the site has intended multiple uses; TNK ranked 3rd highest
MR_M29	N/A	CSO	Retention/Treatment	Yes	
MR_M29	N/A	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest
MR_O27	N/A	CSO	Screening/Disinf.	Yes	SD ranked highest but site had size limitations; TNK ranked 3rd highest
MR_O27	N/A	CSO	Retention/Treatment, Storage Tank	No	INL not considered as standalone technology
MR_CF10	O31, O32, O33, O34, O35	CSO	Screening/Disinf.	Yes	
MR_CF10	O31, O32, O33, O34, O35	CSO	Retention/Treatment, Storage Tank	No	SD ranked highest as the site has intended multiple uses; TNK ranked 3rd highest
MR_CF11	O38, O39, O40, O41	CSO	Retention/Treatment	Yes	
MR_CF11	O38, O39, O40, O41	CSO	Screening/Disinf., Storage Tank	No	SD ranked highest, replaced by RTB for improved performance; TNK ranked 3rd highest

Table 8-17: MR - Control Technologies Carried Forward

Control Technology	Carried Forward?	Comments
Retention and Treatment Basin	Yes	
Screening and Disinfection	Yes	
Vortex Separation	No	More costly than screening/disinfection or retention/treatment; also, when compared to retention/treatment, provides lower overall volumetric capture and pollutant removal rate
Satellite Sewage Treatment	No	More suitable in context of regional integration than for MR Basin
Satellite Advanced Treatment	No	Not applicable to MR planning basin
Sewer Separation	Yes	Basin-Wide to reach 0 overflows per year
Above Ground Storage Tank	No	Below ground tank (BTNK) preferred over above ground tank (ATNK)
Below Ground Storage Tank	Yes	
In-line Storage	No	Proposed modifications to existing regulators were removed from consideration to avoid potential negative impacts to upstream HGL
Tunnel Storage	Yes	
Conveyance	Yes	
Source Control	Yes	Sewer separation, stormwater redirection, and green infrastructure were carried through; public I/I reduction was not
High Rate Clarification	No	Did not rank high in the site alternative evaluation in comparison to screening/disinfection and retention/treatment; future considerations are possible

8.6 Saw Mill Run Planning Basin Control Technology and Site Screening

This Section summarizes the approach used, assumptions made, and results of the technology and site screening for the Saw Mill Run (SMR) planning basin. The overall screening process used by SMR and the other six basin planners was described in Section 8.1, along with relevant definitions and technology descriptions. As such, this section will primarily focus on results of that process and any features or methods that were unique to the SMR planning basin. Much of the basin-specific background information related to this section can be found in the SMR SCSR and FRPW reports.

8.6.1 Summary of Control Technology Screening Process

The SMR Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the SMR Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their knowledge and expertise combined with input from ALCOSAN and guidance from the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations to the lists of technologies screened by each of the seven planning basins, the "core" of these technologies screened remained constant for all basins. The "core" technologies considered are described in Section 8.2. The complete list of technologies considered by SMR Basin Planner is in the SMR Screening of Controls and Sites Report (SCSR).

The basin planner then evaluated each technology utilizing the scoring method that was generally described in Section 8.2 and illustrated in Figure 8-1.

In addition to the specific requirements of the Consent Decree (CD), and the EPA CSO Control Policy, water bodies in the SMR planning basin tributary to Saw Mill Run, including Saw Mill Run, are also subject to an EPA Total Maximum Daily Load (TMDL) on total phosphorous (TP) loading in the watershed (USEPA, 2008). Thus, meeting this TMDL also became an evaluation criterion within the "Environmental Impacts" category.

The control technologies that SMR Basin Planner considered feasible were carried forward into the site alternatives formation process. They include all the technologies shown in Table 8-1 with the exception of high rate clarification (HRC) and satellite sewage treatment (SST); these technologies are listed in Table 8-18.

Technologies related to sewer separation, removal of I/I, green infrastructure and stormwater management, sewer optimization and relief sewers were deemed to be more appropriate for addressing small, remote outfalls or for reducing overall volumes and flows at larger overflows. Therefore, these technologies were not evaluated as primary technologies, but will be revisited for implementation as part of optimization of a preferred plan to address wet weather in the SMR planning basin.

Table 8-18: SMR - Feasible Control Technologies Carried Forward Into Site Alternative Development

Technology Type	CSO or SSO Application
Retention Treatment Basin with High Rate Disinfection (HRD)	CSO
Vortex Separation with HRD	CSO
Fine Screens with HRD	CSO
In-Line Storage	Both
Tunnel Storage	Both
Tank Storage	Both
Satellite Advanced Treatment	CSO
Sewer Separation	CSO
Inflow/Infiltration Removal	Both
Green Infrastructure and Stormwater Management	CSO
Sewer Optimization	CSO
Relief Sewer	CSO

Satellite advanced treatment (SAT) was added after completion of the SCSR evaluation in response to the need for TP removal in the watershed.

Of the technologies being carried forward, those listed below were deemed incapable of meeting the TMDL requirements and were therefore only considered for control facilities that discharged directly to the Ohio River.

- Retention treatment basin with high rate disinfection
- Vortex separation (V) with high rate disinfection
- Fine screening with high rate disinfection

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.6.2 Summary of Site Screening Process

The SMR Basin Planner performed an extensive screening and evaluation of potential sites and tunnel/conveyance routes in order to identify a group of preferred control sites or routes. These sites or routes would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the SMR planning basin process generally followed what is shown in Figure 8-1 and explained in Section 8.2. Variances from that process are detailed later in the section.

The SMR Basin Planner initially identified an extensive list of potential sites to address the flows at each applicable outfall within the planning basin. Once the preliminary sites were identified using GIS, a preliminary desktop site screening was conducted which resulted in 48 potential sites being identified.

The SMR Basin Planner then conducted sites/routes workshops with representatives of each customer municipality where a preliminary control site was identified. The purpose of the workshops was to review the results of the preliminary site screening process and gain a better understanding as to the feasibility of locating control facilities at the preliminary sites. Based on these workshops, additional detailed site screening criteria were developed and used to identify viable areas to be evaluated in the secondary site screening process. The secondary site screening and evaluation resulted in 15 potential control sites being carried forward for siting a control facility in the site alternative development process. The locations of the 15 preferred sites are shown in Figure 8-3.

8.6.3 Site Alternative Development

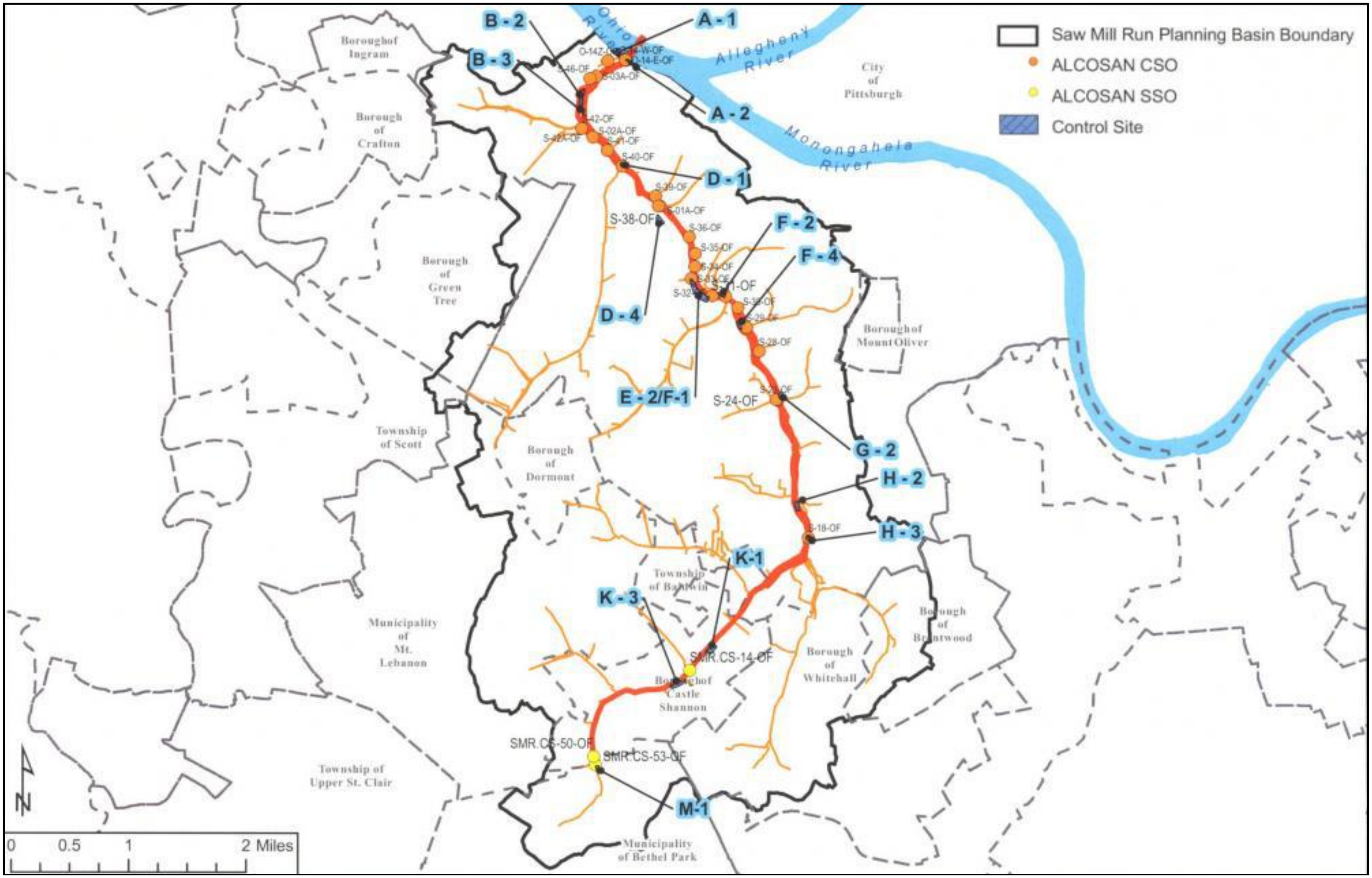
Using the results of the control technology and control site screening and evaluations in the previous sections, the SMR BP combined the control technologies, control sites and specific set of H&H conditions to develop site alternatives.

For the purpose of sizing site alternatives for this evaluation, the following two assumptions were used by the SMR Basin Planner based on guidance received from ALCOSAN:

- A "worst-case scenario" with respect to CSO and SSO flows and volumes was assumed. This was represented in the model by assuming that all municipal CSOs and SSOs were closed, all flooded manholes were alleviated, and parallel conveyances were constructed to allow all municipal wet weather flows to be conveyed to the nearest point of connection to the ALCOSAN interceptor system.
- For outfalls which include stormwater discharges and/or stream flow, it was assumed that a consolidation pipeline would be constructed to convey only CSO flows and that stormwater and/or stream flow components would discharge separately to surface waters.

The previous screening evaluations resulted in the identification of 15 potential control sites and six viable basin-wide control technologies: four treatment and two storage.

Figure 8-3: SMR – Potential Sites



As a means to minimize the number of control facilities required in the SMR planning basin, reduce the overall cost of construction, operation and maintenance of such facilities, consolidation of outfalls became an important consideration. As such, the SMR Basin Planner evaluated the feasibility of consolidating smaller overflows along with their associated consolidated flow (CF) pipeline routes. The screening criteria for locating CF pipelines were the same as the preliminary and secondary site screening criteria with the following exception: CF pipelines could be located within major transportation corridors. However, due to the topography of the SMR planning basin, the only feasible routes where land use is conducive to CF pipeline construction were those which parallel the existing interceptors and trunk sewers.

The SMR Basin Planner now had a set of screened control technologies and control sites, along with a set of H&H conditions based upon an initial CF concept and a benchmark level of control of four to six overflows per year. Given the results of the technology and site screening processes, the SMR Basin Planner was ready to evaluate and rank site alternatives.

8.6.4 Evaluation and Ranking of Site Alternatives

The SMR Basin Planner applied the "Uniform" Base Case method to evaluate and screen their site alternatives, which is one of the eight site alternative evaluation methods described in Section 8.2. Using this approach, a base LOC condition was assumed for the evaluation. The highest ranked site alternatives can then be identified at this base LOC condition and then those selected site alternatives can be evaluated for the remaining LOCs. For the evaluations, site alternatives were reviewed at the following specific LOC: 4 overflows per year for CSOs and at the 2-year design storm for SSOs.

The SMR site alternatives were grouped according to the relative location of the outfalls throughout the SMR planning basin. Because the SSOs are located upstream of the CSOs, separate site alternatives were developed for both the SSO and CSO outfalls.

A Sample Screening Summary Form that was used in the evaluation is included as Figure 8-2. To determine the scores related to the economic factors, preliminary present worth costs were developed for each site alternative using the ACT as provided by ALCOSAN. The site alternative with the highest score for each grouping of outfalls was carried forward. The results of this ranking are presented in Table 8-19 along with a notation as to whether the site alternative was carried forward and the key factors in the decision.

As shown in Table 8-19, the ranking process revealed which control technologies most optimally matched specific control sites to form a wide range of potentially suitable site alternatives. These preferred site alternatives all had "A" or "B" ratings and included a variety of control technologies which is discussed below.

Table 8-19: SMR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
SMR_CF01	SMRCS14, SMRCS50, SMRCS53	SSO	INL, C	Yes	
SMR_CF01A	SMRCS14, SMRCS50, SMRCS53	SSO	BTNK, TNL, ATNK	No	Economic factors
SMR_CF01B	SMRCS14, SMRCS50, SMRCS53	SSO	BTNK, TNL, ATNK	No	Economic factors
SMR_CF02	SMRCS14	SSO	INL	No	Implementation Impact factors. Not evaluated as it was determined that discharges did not occur during the 2-yr design storm.
SMR_CF02A	SMRCS14	SSO	ATNK, BTNK, TNL	No	
SMR_CF02B	SMRCS14	SSO	ATNK, BTNK, TNL	No	
SMR_CF03	SMRCS50, SMRCS53	SSO	ATNK	Yes	
SMR_CF03	SMRCS50, SMRCS53	SSO	BTNK, TNL, INL	No	Economic factors, Public factors, Implementation Impact factors
SMR_CF04	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23, S18	CSO	SS	No	Economic factors, Water Quality/Public Health/Environmental factors, Implementation Impact factors
SMR_CF04A	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23, S18	CSO	SD	Yes	
SMR_CF04A	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23, S18	CSO	V, RTB, TNL, ATNK, BTNK	No	Public factors, Operational Impact factors, Economic factors, Implementation Impact factors
SMR_CF04B	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23, S18	CSO	SD, V, RTB, TNL, ATNK, BTNK	No	Implementation Impact factors, Public factors, Operational Impact factors, Economic factors
SMR_CF05A	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23	CSO	SD	Yes	

Table 8-19: SMR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
SMR_CF05A	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23	CSO	V, RTB, TNL, ATNK, BTNK	No	Public factors, Operational Impact factors, Economic factors, Implementation Impact factors
SMR_CF05B	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33, S32, S31, S30, S29, S28, S24, S23	CSO	SD, V, RTB, TNL, ATNK, BTNK	No	Implementation Impact factors, Public factors, Operational Impact factors, Economic factors
SMR_CF06	S18	CSO	INL	No	Economic factors
SMR_CF06A	S18	CSO	TNL, ATNK, BTNK	No	Economic factors
SMR_CF06B	S18	CSO	ATNK	Yes	
SMR_CF06B	S18	CSO	TNL, BTNK	No	Economic factors
SMR_CF07A	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33	CSO	SD	Yes	
SMR_CF07A	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33	CSO	V, RTB, TNL, ATNK, BTNK	No	Public factors, Operational Impact factors, Economic factors, Implementation Impact factors
SMR_CF07B	O14E, O14W, O14Z, S03A, S46, S42A, S42, S02A, S41, S40, S39, S01A, S38, S36, S35, S34, S33	CSO	SD, V, RTB, TNL, ATNK, BTNK	No	Implementation Impact factors, Public factors, Operational Impact factors, Economic factors
SMR_CF08A	S32, S31, S30, S29, S28, S24, S23	CSO	ATNK	Yes	
SMR_CF08A	S32, S31, S30, S29, S28, S24, S23	CSO	TNL, BTNK, SAT	No	Public factors, Economic factors, Operational Impact factors, Implementation Impact factors
SMR_CF08B	S32, S31, S30, S29, S28, S24, S23	CSO	ATNK, TNL, BTNK, SAT	No	
SMR_CF09A	O14E, O14W, O14Z, S03A, S46	CSO	SD	Yes	
SMR_CF09A	O14E, O14W, O14Z, S03A, S46	CSO	V, RTB, TNL, ATNK, BTNK	No	Public factors, Operational Impact factors, Economic factors, Implementation Impact factors
SMR_CF09B	O14E, O14W, O14Z, S03A, S46	CSO	SD, V, RTB, TNL, ATNK, BTNK	No	
SMR_CF10A	S42A, S42, S02A, S41	CSO	ATNK, TNL, BTNK	No	Implementation Impact factors, Economic factors

Table 8-19: SMR - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
SMR_CF10B	S42A, S42, S02A, S41	CSO	ATNK	Yes	
SMR_CF10B	S42A, S42, S02A, S41	CSO	TNL, BTNK	No	Economic factors
SMR_CF11	S40, S39, S01A, S38, S36, S35, S34, S33	CSO	TNL	Yes	
SMR_CF11	S40, S39, S01A, S38, S36, S35, S34, S33	CSO	ATNK, BTNK	No	Economic factors
SMR_CF12	S40, S39, S01A, S38	CSO	ATNK	Yes	
SMR_CF12	S40, S39, S01A, S38	CSO	TNL, BTNK	No	Economic factors
SMR_CF13	S36, S35, S34, S33	CSO	ATNK	Yes	
SMR_CF13	S36, S35, S34, S33	CSO	TNL, INL, BTNK	No	Public factors, Economic factors, Implementation Impact factors
SMR_CF14A	S32, S31, S30	CSO	ATNK	Yes	
SMR_CF14A	S32, S31, S30	CSO	TNL, BTNK	No	Economic factors, Public factors
SMR_CF14B	S32, S31, S30	CSO	ATNK, TNL, BTNK	No	Public factors, Implementation Impact factors, Economic factors
SMR_CF15	S29, S28	CSO	ATNK	Yes	
SMR_CF15	S29, S28	CSO	TNL, BTNK, INL	No	Economic factors, Public factors, Implementation Impact factors
SMR_CF16	S24, S23	CSO	ATNK	Yes	
SMR_CF16	S24, S23	CSO	TNL, BTNK	No	Economic factors

8.6.5 Control Technologies Carried Forward

Table 8-19 summarized the site alternatives that were carried forward into the basin alternatives analysis. The factors as to why other combinations of sites and technologies were not carried forward are also provided in the table. These remaining site alternatives formed the basis for preferred CSO and SSO site alternatives.

Most source controls, including green infrastructure which was not included in Table 8-19, will continue to move forward into basin and system-wide alternatives development. As previously noted, while these technologies were not evaluated as primary technologies, they were revisited for implementation as part of optimization of the preferred basin plan as the planning progressed.

The following summarizes these findings and related decisions made by the SMR Basin Planner with respect to control technologies:

- Sewer separation (SS) was not initially carried forward primarily due to economic factors but was ultimately carried forward for basin and system-wide alternative development.
- Belowground storage tank (BTNK) was not carried forward primarily due to economic factors; however, it may be applicable as an alternate to aboveground storage tank (ATNK) based on specific site conditions.
- Retention treatment basin (RTB) and vortex separation (V) were not carried forward primarily due to economic factors.
- Satellite advanced treatment (SAT) was not carried forward due to economic, operational and siting factors.

8.7 Turtle Creek Planning Basin Control Technology and Site Screening

The approach used, assumptions made, and results of the technology and site screening for the Turtle Creek (TC) planning basin are described in Section 8.7. The overall screening process used by the TC and the other six basin planners was described in Sections 8.1 and 8.2, along with relevant definitions and technology descriptions. This section will primarily focus on results of that process and any features or methods that were unique to the TC planning basin.

8.7.1 Summary of Control Technology Screening Process

The TC Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the TC Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their knowledge and expertise combined with input from ALCOSAN and guidance from the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations between the seven planning basins, the "core" of these technologies screened remained constant for all basins. The "core" technologies considered are described in Section 8.2. The complete list of technologies considered by the TC BP is in the TC Screening of Controls and Sites Report (SCSR).

The Basin Planner then selected criteria that best suited the TC planning basin and evaluated each technology utilizing a methodology similar to the method that was described in Section 8.2 and illustrated in Figure 8-1.

Detailed results of the overall screening process may be found in the TC SCSR; summarized results are depicted in Table 8-20. Controls not recommended for the TC Basin included those that had not demonstrated consistent performance, or that are not expected to be effective for conditions in the TC Basin.

Table 8-20: TC - Feasible Control Technologies Carried Forward Into Site Alternative Development

Technology Type	CSO or SSO Application
Retention Treatment Basin (RTB)	CSO
Vortex Separation (V)	CSO
High Rate Clarification (HRC)	CSO
Conventional Disinfection	Both
Tunnel Storage (TNL)	Both
Tank Storage	Both
Satellite Sewage Treatment (SST)	SSO
Sewer Separation	CSO
Conveyance / Relief Sewer (C)	Both

As shown in the table, at this juncture, the TC Basin Planner carried forward control technologies considered feasible and more appropriate for ALCOSAN to implement into the site alternatives formation process. At this stage of the planning process, they also retained customer municipality system controls[8-2] for future consideration.

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.7.2 Summary of Site Screening Process

The TC Basin Planner performed an extensive screening and evaluation of potential sites and tunnel/ conveyance routes in order to identify a group of preferred or control sites or routes. These sites or routes would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the TC planning basin process generally followed what is shown in Figure 8-1 and explained in Section 8.2.

Initially, the TC BP identified an exhaustive list of potential sites to address the flows at each applicable outfall within the planning basin. Based on and initial site screening, a total of 42 potential control sites were selected for additional evaluation in the site assessment and site reconnaissance phase.

As summarized in Table 8-21, of the 42 sites evaluated, 27 sites were classified as unsuitable for control facilities. The 15 suitable sites were typically characterized by relatively large vacant areas, level topography, and close proximity to the interceptor system. These sites are shown in Figure 8-4.

Table 8-21: TC - Site Reconnaissance Summary

Site ID	25- or 100-year flood zone (Y/N)?	Land Use	Site Classification
1, 3	Y	Railroad	Suitable
2	N	Railroad	Unsuitable
4	N	Vacant	Unsuitable
5	Y	Vacant	Suitable Preferred
7	N	Railroad	Suitable Preferred
6, 8, 9, 10	N	Vacant	Unsuitable
11	N	Vacant and commercial	Unsuitable
12, 13, 14 15, 16, 17	N	Vacant	Unsuitable
18	N	Vacant and parking lot	Suitable Preferred

[8-2] Includes source control / source reduction (removal of I & I / roof leaders / groundwater / streams etc.) and conveyance/collection system control (real-time controls, regulator consolidation, in-line storage etc.) technologies deemed to be potentially effective, but best implemented by ALCOSAN's customer municipalities.

Table 8-21: TC - Site Reconnaissance Summary

Site ID	25- or 100-year flood zone (Y/N)?	Land Use	Site Classification
19, 20, 22	N	Vacant	Unsuitable
21	N	Vacant and commercial	Unsuitable
23	N	Vacant	Suitable
24	Y	Vacant and recreational	Unsuitable
25	Y	Industrial	Suitable
26, 29	N	Vacant	Unsuitable
27	N	Vacant	Suitable
28	Y	Vacant	Suitable
30, 31, 32	N	Vacant, RR, Commercial	Unsuitable
33	N	Vacant	Unsuitable
34	N	Industrial	Unsuitable
35	N	Commercial	Suitable Preferred
36	Y	Recreational	Suitable Preferred
37	N	Vacant	Suitable Preferred
A	Y	Vacant	Suitable Preferred
B	Y	Industrial	Suitable Preferred
C	Y	Railroad	Suitable
D	N	Commercial	Unsuitable
E	N	Vacant and industrial	Unsuitable

Based on the professional judgment of the TC Basin Planner, eight of the 15 suitable sites were classified as preferred sites that represented the best candidates from among the potential sites assessed for a control alternative. These eight sites, shown on Figure 8-5, are referred to as "Suitable Preferred" in Table 8-21. Detailed descriptions of each were provided in the basin SCSR. Later in the process, three additional sites were identified during discussions with customer municipalities; however, the development of site alternatives began using these eight sites. It should be noted that other suitable sites identified in the site assessment and reconnaissance may still be considered as basin alternatives are developed.

Figure 8-4: TC – Potential Sites

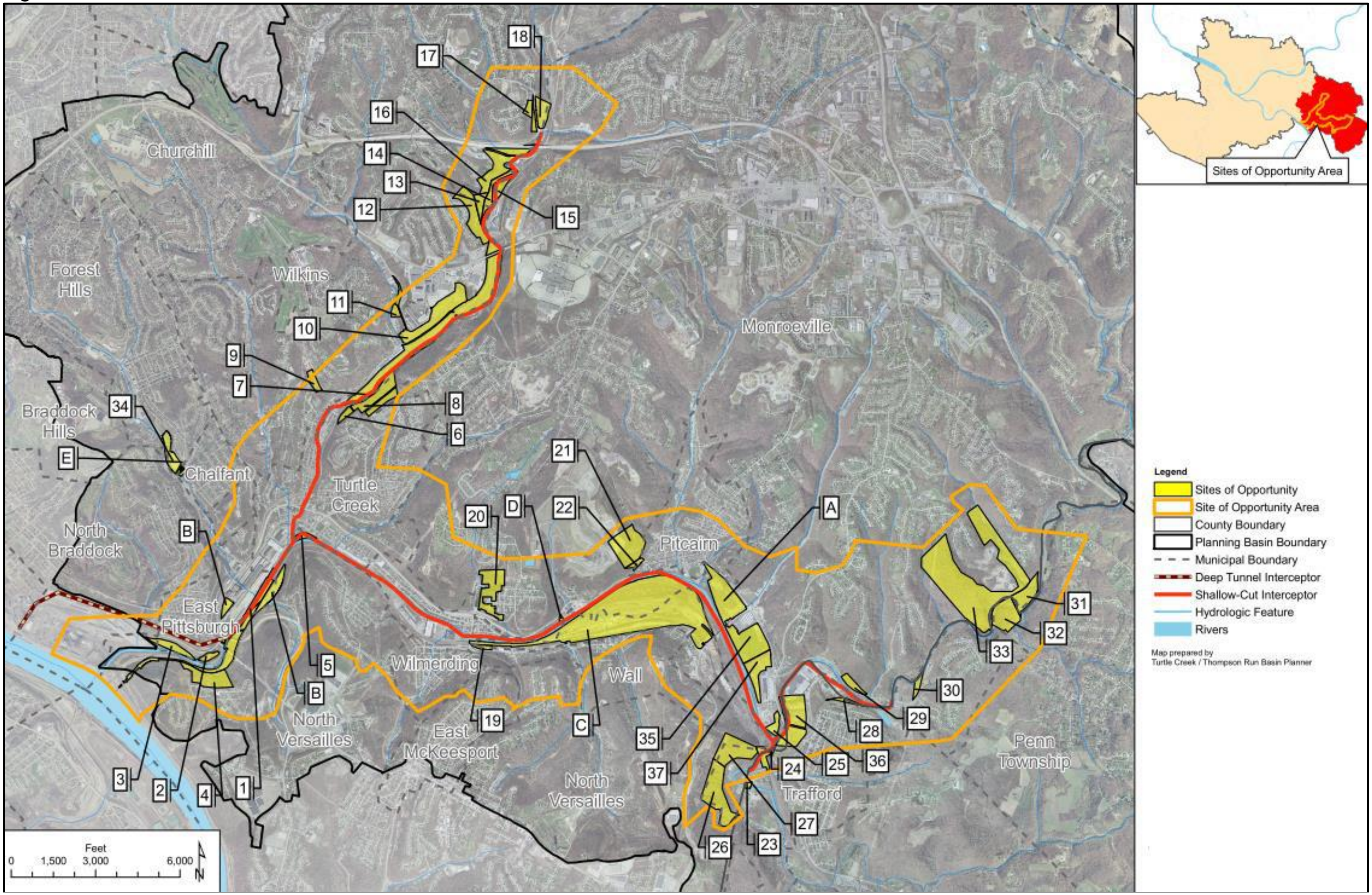
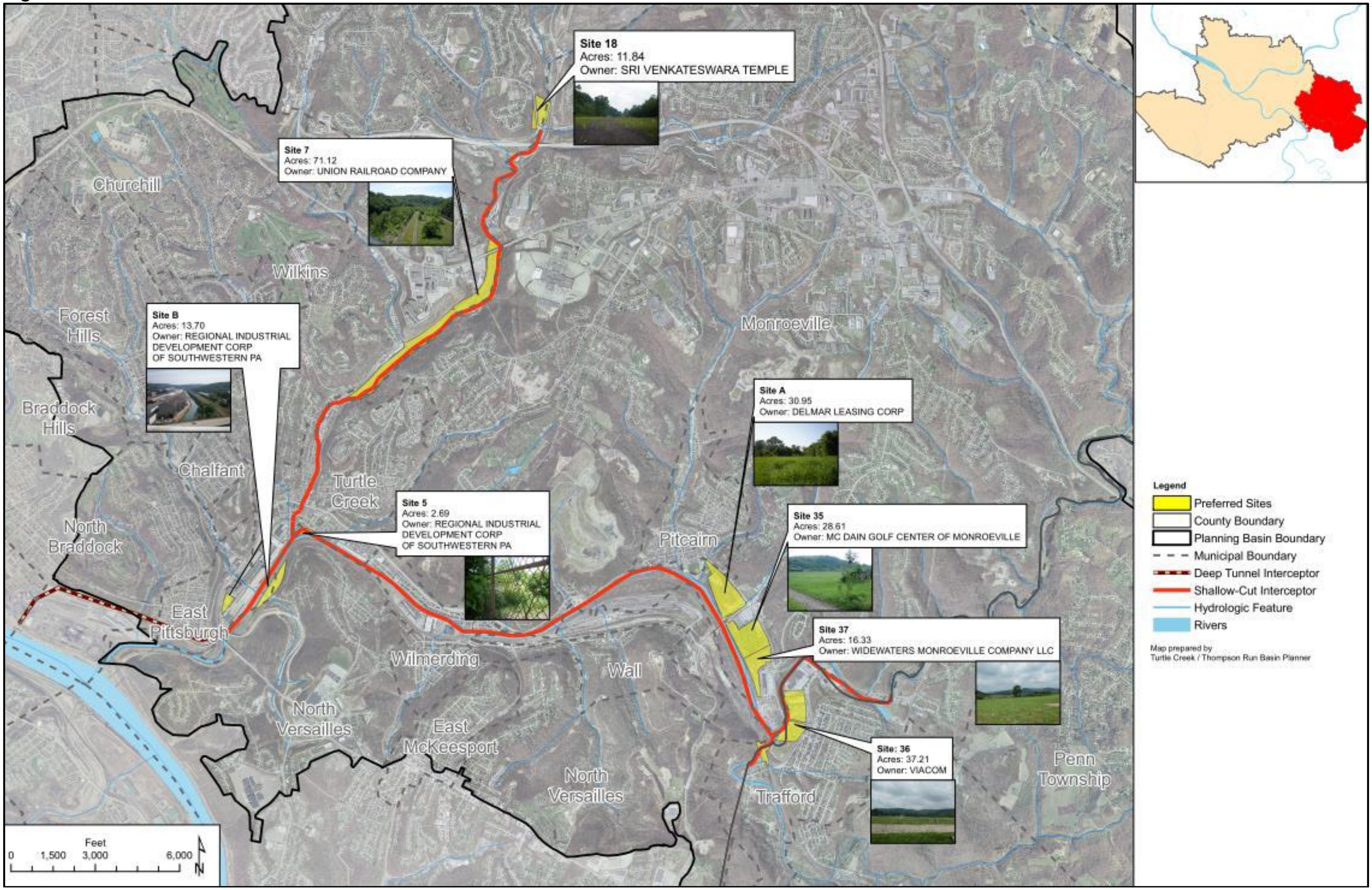


Figure 8-5: TC – Suitable Preferred Sites



8.7.3 Site Alternative Development

Using the results of the control technology and control site screening and evaluations in the previous sections, the TC Basin Planner combined the control technologies, control sites and specific sets of H&H conditions to develop site alternatives. Preliminary site alternatives were first developed using the following parameters:

- Controls were provided for both ALCOSAN and customer municipality overflows, including flooded manholes.
- Conveyance and storage capacities were first estimated based on controlling the largest CSOs at zero overflows per year and SSOs at the 10-year design storm.
- Space for additional storage capacity for future conditions, estimated conservatively as double the storage required for existing conditions, was evaluated for each control site.
- Storage facilities were based on the use of below ground tanks (BTNK).
- The effect of back-to-back storms was not considered, but would be assessed in future evaluations.
- Routing of new relief interceptors for conveyance and consolidation would follow the alignment of the existing ALCOSAN interceptor.

The preliminary site alternatives included the consolidation of overflows and new relief interceptors discharging to storage or treatment facilities at the following preferred sites:

- Site 36 – Control of SSOs and flooded manholes for the Monroeville and Trafford branches of the upper Turtle Creek interceptor and associated sewersheds.
    - Overflows controlled: T-29A, T-29A-10, T-27, T-31
    - Control technology(ies): C, BTNK
- Site A – Control of SSOs and CSOs from outfalls on the Turtle Creek interceptor in the immediate vicinity of Site A.
    - Overflows controlled: T-26, T-26A, T-26B
    - Control technology(ies): C, BTNK, SAT
- Site 18 – Control of the SSO at TR-06, with the potential relief of additional wet weather flows in the upper Thompson Run and Gascola interceptors.
    - Overflows controlled: TR-06
    - Control technology(ies): C, BTNK
- Site 5 – Control of the SSO at T-25 and the CSOs and flooded manholes for the middle Turtle Creek and lower Thompson Run interceptors and related sewersheds.

  - Overflows controlled: T-25, T-24, T-23, T-22, T-19, T-18, T-17, T-16A, T-16, T-15, T-14, T-13, T-12, T-11, T-10, TR-03, TR-02 and TR-01
  - Control technology(ies): C, BTNK, SD, V, RTB, HRC, TNL

- Site B – Control of CSOs and flooded manholes for the lower Turtle Creek interceptor and related sewersheds.
  - Overflows controlled: T-08, T-07, T-04, T-03, T-02 and T-01
  - Control technology(ies): C, BTNK, SD, V, RTB, HRC, TNL
- Site 7 – Control of the SSO at TR-04.
  - Overflows controlled: TR-04
  - Control technology(ies): C, BTNK

8.7.4 Evaluation and Ranking of Site Alternatives

The TC Basin Planner applied a combination of the *Single Technology Assessment* and *Site Alternatives Assessment* methods to evaluate and screen their site alternatives, which is one of the eight site alternative evaluation methods described in Section 8.2. The basin planner developed individual technology cost/performance (Knee of the Curve) plots for a given site or route for a subset of performance levels to identify the more cost-effective technologies for further consideration.

The TC Basin Planner assigned a unique name to each of their site alternatives as explained in Section 8.2.

The 17 site alternatives developed and screened for the TC planning basin are presented in Table 8-22. All of the treatment-based site alternatives – screening and disinfection (SD), vortex separation (V), high rate clarification (HRC) and satellite advanced treatment (SAT) – also included disinfection. Shown on the table, the preferred site alternatives, as indicated by whether or not they were carried forward, were predominantly below ground storage tank (BTNK)-based alternatives. Below ground tank-based alternatives represented the most cost-effective approach for the distributed control favored for the TC planning basin. The single exception to BTNK was the Site 5 site alternative for the 0 overflow per year level of control where a retention treatment basin (RTB) was carried forward. The primary reasons for eliminating the treatment-based site alternatives were their higher present worth costs and greater demands on ALCOSAN operations and maintenance personnel that provided no additional benefit in terms of overall wet weather control performance and water quality protection.

Table 8-22: TC - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology(ies)	Carried Forward?	Key Factors
TC_TR06	N/A	SSO	Below ground storage tank	Yes	
TC_TR04	N/A	SSO	Below ground storage tank	Yes	
TC_CF05_CF06	T-31, T-32, T-33, T-27, T-29, T-29A-10M1	SSO	Below ground storage tank	Yes	
TC_CF04	T-26, T-26A, T-26B	Mixed	Below ground storage tank	Yes	
TC_CF04_C05_CF06	T-26, T-26A, T-26B, T-31, T-32, T-33, T-27, T-29, T-29A-10M1	Mixed	Satellite advanced treatment	No	High cost, operations and maintenance demands
TC_CF03_CF07	T-10, T-11, T-12, T-13, T-14, T-15, T-16A, T-16, T-17, T-18, T-19, T-21, T-22, T-23, T-24, T-25, TR-01, TR-02, TR-03	Mixed	Below ground storage tank, retention/treatment, tunnel storage	Yes	
TC_CF03_CF07	T-10, T-11, T-12, T-13, T-14, T-15, T-16A, T-16, T-17, T-18, T-19, T-21, T-22, T-23, T-24, T-25, TR-01, TR-02, TR-03	Mixed	Screening and disinfection, vortex separation, high rate clarification	No	Relative cost, water quality impacts
TC_CF01_CF02	T-01, T-02, T-03, T-04, T-05, T-07, T-08	Mixed	Below ground storage tank, retention/treatment, tunnel storage	Yes	
TC_CF01_CF02	T-01, T-02, T-03, T-04, T-05, T-07, T-08	Mixed	Screening and disinfection, vortex separation, high rate clarification	No	Relative cost, water quality impacts

8.7.5 Control Technologies Carried Forward

Table 8-22 contained the ten site alternatives that were carried forward into the basin alternative development phase. As noted above, they were predominately BTNK-based alternatives. However, as the planning process continues, other technologies and controls will continue to be evaluated.

Table 8-23 summarizes the control technologies that were carried forward for both ALCOSAN and the customer municipalities. These latter controls will be important as the process moves into the basin alternatives phase as customer municipality controls, and the resulting reductions of wet weather flows, will affect the sizing of ALCOSAN facilities.

Table 8-23: TC - Summary of Control Technologies Carried Forward

Category	Control Technology	Carried Forward?	Comments
ALCOSAN System Controls	Conveyance: parallel interceptors and CF sewers	Yes	CF sewers for distributed control alternatives, parallel interceptors for basin-wide conveyance alternative
	Below Ground Storage Tank	Yes	Most cost-effective
	Tunnel Storage	Yes	Considered in intra-basin and regional alternatives
	Screening and Disinfection	No	More costly than BTNK
	Retention Treatment Basin	Yes	Second most cost-effective; used if BTNK is not feasible
	Vortex Separation	No	More costly than BTNK and RTBs
	High Rate Clarification	No	More costly than BTNK and RTBs
	Satellite Sewage/Advanced Treatment	No	More costly than BTNK
Customer Municipality System Controls	Conveyance: expanded sewer, trunk sewer capacity	Yes	Not directly evaluated; assumed as basis for maximum delivery of municipal flow to ALCOSAN
	I/I reduction	Yes	Screening and sensitivity of maximum inflow reduction
	Sewer Separation	Yes	Screening and sensitivity of maximum inflow reduction

Green infrastructure approaches can provide cost-effective alternatives with levels of wet weather control equivalent to more traditional I/I reduction and sewer separation that are retained for the basin alternatives analysis. However, since the appropriateness, applicability, and performance of green infrastructure approaches are highly site specific, it was judged to be infeasible to explicitly include green infrastructure in the TC basin alternatives analysis.

8.8 Upper Allegheny Planning Basin Control Technology and Site Screening

This Section summarizes the approach used, assumptions made, and the results of the technology and site screening efforts undertaken for the Upper Allegheny (UA) planning basin. The overall screening process used by UA and the other six basin planners was described in Sections 8.1 and 8.2, as were key definitions and technology descriptions. As such, this section will primarily focus on results of that process and any features or methods that were unique to the UA planning basin.

8.8.1 Summary of Control Technology Screening Process

The UA Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the UA Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their own knowledge and expertise as well as that of ALCOSAN and the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations to the lists of technologies screened by each of the seven basin planners, the "core" group of technologies screened remained constant for all basins. The "core" technologies considered are described in Section 8.2. The complete list of technologies considered by the UA BP is included in the UA Screening of Controls and Sites Report (SCSR).

The basin planner then selected criteria that best suited the UA planning basin and evaluated each technology utilizing the scoring method that was generally described in Section 8.2 and illustrated in Figure 8-1.

The control technologies that UA Basin Planner considered feasible and more appropriate for ALCOSAN to implement were carried forward into the site alternatives formation process. In addition to the "core" technologies shown in Table 8-1, ultraviolet disinfection was considered appropriate for the UA planning basin; the technologies brought forward at this stage are listed in Table 8-24.

Sewer separation was also carried forward for further evaluation. Even though it would likely require implementation by entities other than ALCOSAN, ALCOSAN wanted to use sewer separation as a benchmark for comparison to the other technologies.

Table 8-24: UA - Feasible Control Technologies Carried Forward Into Site Alternative Development

Technology Type	CSO or SSO Application
Screening	CSO
High Rate Clarification	CSO
Retention Treatment Basins	CSO
Vortex Separator	CSO
High Rate Disinfection (combined w/ other treatment technologies)	CSO
UV Disinfection	Both
Secondary Treatment	Both
Surface Stream Removal	CSO
Sewer Separation	CSO
Increased conveyance	Both
Conventional Tunnels	Both
Tanks	Both
Inline Storage	CSO

The UA basin planner also evaluated the ability of green infrastructure and other source control alternatives to provide wet weather flow reduction as a municipal alternative portion of a broader basin plan. A source control sensitivity analysis was conducted on a basin-wide basis to determine potential locations for application of source control within the municipal systems.

Hydraulic modeling for this analysis was performed using hydrologic modification to sewershed impervious areas in the combined sewer basins. Targeted reductions (25%/50%/75%) were made for each combined sewershed with 25% reduction assumed to represent aggressive green infrastructure programs and 50% to 75% reductions assumed to represent combinations of green infrastructure with other source reduction alternatives such as partial sewer separation. Sewersheds with the greatest potential to meet desired levels of control were documented. In general, overflow volume appeared to be more sensitive to the targeted reductions than the number of activations or the peak flow rates, with relatively high volume reductions projected for most of the targeted reduction categories. However, the sensitivity analysis indicated that in most sewersheds source reductions of 50% or greater would be required in order to achieve significant reductions in CSO activations, and therefore application of green infrastructure as a standalone technology would not be sufficient to achieve the targeted levels of control.

The sensitivity analysis results have been shared with the customer municipalities so they can better define the benefits of considering green infrastructure measures within their systems. However, most municipalities within the UA basin have not identified any specific green infrastructure projects as part of their preferred alternatives provided to-date.

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the CD, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.8.2 Summary of Site Screening Process

The UA Basin Planner performed an extensive screening and evaluation of potential sites in order to identify a group of preferred control sites. These sites would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the UA planning basin process largely followed the process shown in Figure 8-1 and explained in Section 8.2. Any notable basin-specific variances from this process are noted below.

Initially, the UA Basin Planner identified an extensive list of potential sites to address the flows at each applicable outfall within the planning basin. The sites were then subjected to the site screening and evaluation steps that were discussed in Section 8.2, which resulted in the identification of a much more reasonable number of preliminary control sites. This was accomplished by evaluating the remaining sites in more detail to determine their usefulness as part of a control alternative. A site evaluation matrix was used to identify positive, neutral, and negative impacts. In addition, the ALCOSAN customer municipalities were engaged and an iterative process of meetings, workshops, further desktop studies and site investigations were used in conjunction with the screening parameters to refine the list of preliminary sites. The municipal meetings were also used to solicit suggestions on additional sites for consideration.

The result of this process was the identification of 23 potential sites which were then carried forward and examined with respect to more specific screening criteria in order to generate a shortlist of preferred sites. This resulted in a list of 13 sites which were presented to each customer municipality in August 2009 in which an overflow or potential site was located.

Table 8-25 summarizes the screening process that led to the 13 control sites carried forth is presented in along with the site’s associated CSO or SSO outfall. Figure 8-6 shows the general locations of the 13 preferred sites and the other 23 potential sites.

Table 8-25: UA - Preliminary Site Screening Summary and Results

Site	Carried Forward	Land Use	Critical Infrastructure	Engineering Constructability	Historic & Cultural Resources	Environmental Resources	Accessibility	Comments
A-69 through A-74								
A-1	✓	+	-	0	-	+	+	
S-1	✓	+	-	0	-	+	+	
S-2	✓	+	+	0	-	+	+	
S-3		-						Only land use was evaluated in detail. Adjacent to a residential area, the noise, odor and visual aesthetics may be a concern. It is listed as a “Land Recycling Clean-Up Location” in DEP EMAPS database and occupant is listed as a captive hazardous waste generator. There is a high probability it may qualify as a brownfield site based on guidelines established by DEP. Due to this and the ID of other preferable sites, site was eliminated.
S-4		-		-			-	Guyasuta Run crosses through site and there is no direct access from a public road. There is concern that area may be developed into an office/industrial park. Site is further upstream from outfall A-69 than other sites in Sharpsburg. Due to these issues and the ID of other preferable sites for the same outfalls, site was eliminated.
P-4		-	-	-			-	Because site is furthest upstream (opposite of downstream flow to ALCOSAN) from A-69 - A-74, conveyance of CSO flows upstream to a control facility followed by conveyance back downstream to interceptor or outfalls would be considered technically illogical. Also, its proximity to the Aspinwall water treatment plant and marina was a concern. Therefore, it was eliminated from further consideration.
A-41								
P-1	✓	0	-	0	-	-	+	
P-2		-		-				Site has a relatively steep 35% cross slope, parcel is fairly narrow and construction would be expected to be difficult. Restricted on one side by Washington Blvd and on the other side by Allegheny River. A significant portion is owned by a railroad. Site passes under Highland Park Bridge. Because of these issues and the ID of other preferable sites for the same outfall, site was eliminated from further consideration.
P-6	✓	0	0	0	-	-	+	

Table 8-25: UA - Preliminary Site Screening Summary and Results

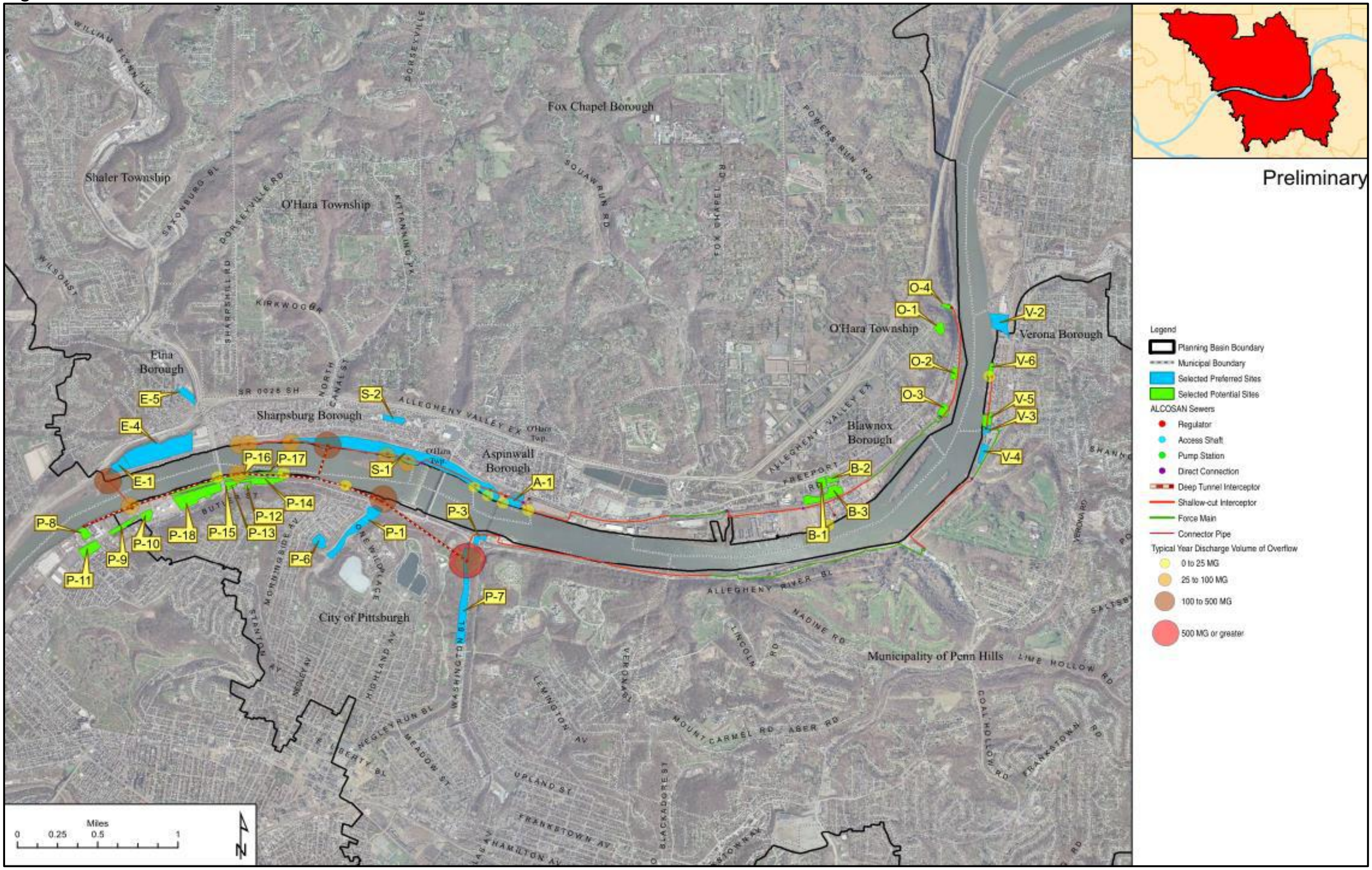
Site	Carried Forward	Land Use	Critical Infrastructure	Engineering Constructability	Historic & Cultural Resources	Environmental Resources	Accessibility	Comments
A-42								
P-3	✓	0	-	0	0	-	+	
P-5		-		-			-	Located in Highland Park near the swimming pool and within a potential Greenway location. An examination of contours in this area shows site is about el. 910-ft which drops off dramatically to the southeast. Elevation differences between the site and interceptor is at least 200-ft, making logistics of overflow conveyance and pumping to the location impractical. Therefore, site was eliminated from further consideration.
P-7	✓	+	0	-	0	-	+	
A-68								
E-1	✓	+	0	+	-	0	+	
E-2		-		-				Site is occupied by several firms and is utilized for industrial activities. It is located in an area associated with past industrial activities. Three of the firms are registered as captive hazardous waste generators. There is a high probability that the site may qualify as a brownfield site. Compared to other available sites in Etna, E-2 is much further away from the overflow and therefore the site was eliminated.
E-3		-	0	0	+	0	+	Site elevation is 970-ft which is much higher than the interceptor. The technical aspects of conveyance of CSOs to this upper elevation, then conveyance back to the interceptor, and distance from the site were the primary reasons that site was eliminated. May be more suitable for municipal control.
E-4	✓	0	0	+	-	0	+	
E-5	✓	-	+	-	-	+	+	

Table 8-25: UA - Preliminary Site Screening Summary and Results

Site	Carried Forward	Land Use	Critical Infrastructure	Engineering Constructability	Historic & Cultural Resources	Environmental Resources	Accessibility	Comments
E-6		-		-		-		Area falls within proposed greenway by the Allegheny Land Trust. Site is currently utilized as baseball fields though it is located in an area associated with past industrial activities. There is a high probability that it may qualify as a brownfield. Site is located with Pine Creek floodplain. Site is almost a mile from ALCOSAN overflow which would require conveyance up to site and then back to the ALCOSAN system. Based on location, it was considered more suitable for municipal control alternative and was eliminated.
E-7		-						Adjacent to residential area so noise, odor and visual aesthetics may be a concern although site is currently occupied and utilized for industrial activities. There is a high probability it may qualify as a brownfield site based on past owners. DEP lists one firm as captive hazardous waste generator and captive hazardous waste treatment facility. It is over a mile from ALCOSAN overflow which would require conveyance up to site, then back to ALCOSAN system. Based on location, it was considered more suitable for municipal control and was eliminated.
A-45								
V-1		-		-				Site has a number of owners and it is believed that it will have marina developments located in both municipalities. DEP EMAPS database lists several NPDES stormwater monitoring points, an abandoned residual waste landfill, numerous underground storage tanks, a captive hazardous waste generator, a toxic waste spill, gas/oil wells, and a land recycling clean-up permit associated with it. It is located fairly far upstream from the overflow, and was eliminated because other, closer sites had less concerns.
V-2	✓	+	+	-	0	0	+	
V-3	✓	0	0	+	0	+	+	
V-4	✓	+	+	+	0	+	+	

"+" indicated a Positive Impact/Improvement; 0" indicated a Neutral Impact/No Improvement; "-" indicated a Negative Impact/Deterioration

Figure 8-6: UA - Potential and Preferred Sites



8.8.3 Site Alternative Development

Using the results of the control technology and control site screening and evaluations in the previous sections, the UA Basin Planner uniquely combined the control technologies, control sites and specific set of H&H conditions to develop site alternatives. A site alternative is a control alternative being considered for controlling wet weather overflows that is site-specific or basin-segment-specific and serves as a component of a larger control alternative, such as a basin alternative.

As a means to minimize the number of control facilities required in the UA planning basin, reduce the overall cost of construction and the operation and maintenance of such facilities, consolidation of outfalls became an important consideration. Consequently, consolidated flow (CF) groupings, through near surface conduits or pipes, were developed with the intent of combining smaller overflows with larger overflows wherever possible.

All CSO sites in the UA planning basin were initially consolidated into seven logical groupings or CF units. Based on a more detailed review of the groupings, and potential costs of CF pipelines, the groupings were revised to focus only on consolidation of the majority of the CSOs. CSO A-68 and all SSOs were evaluated individually because it would be prohibitively expensive to consolidate these overflows. Figure 8-7 illustrates the resultant consolidation groupings.

As a result of this decoupling of SSO sites, additional sites and technologies were evaluated within the three SSO areas targeted for control. Combinations of CF grouping, control site and applicable control technologies for CSO and SSO outfalls are summarized in Table 8-26 and Table 8-27, respectively. Source controls, as identified by each customer municipality, would be considered in future CSO and SSO control evaluations in addition to, or instead of, conveyance, storage and treatment technologies.

The shaded columns in Tables 8-26 and 8-27 represent the preferred site alternatives carried forth. The other site alternatives were kept as contingency should new information become available during the course of the evaluation that would result in dismissing the preferred control sites.

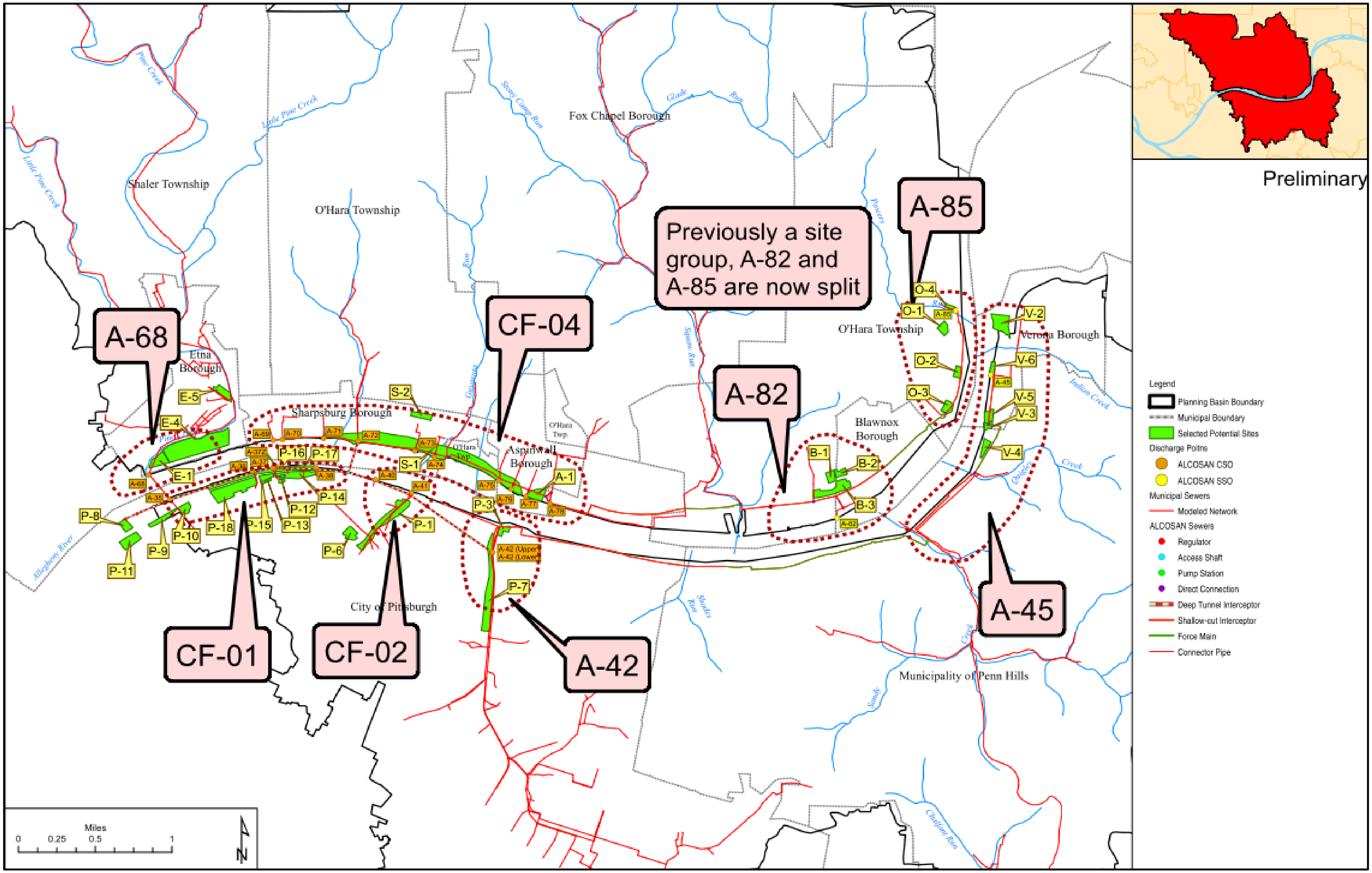
Table 8-26: UA - Preferred CSO Control Technologies and Control Sites For Further Consideration

CSO Site Alternative Matrix														
CFs	CF-04: A-69 thru A-74			CF-01: A-35 thru A-38				CF-02: A-40, A-41		A-42		A-68		
Sites	A-1	S-1	S-2	P-8	P-9	P-10	P-11	P-1	P-6	P-3	P-7	E-1	E-4	E-5
Treatment Technologies														
Screening	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
High Rate Clarification	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Retention Treatment Basin	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Vortex Separation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Disinfection	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
UV Disinfection (only w/ HRC)	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Storage Technologies														
Tunnel Storage	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Storage Tank	✓	✓	✓	✓	✓	✓	✓					✓	✓	✓

Table 8-27: UA - Preferred SSO Control Technologies and Sites For Further Consideration

Sites	SSO Site Alternative Matrix									
	A-45			A-82			A-85			
	V-2	V-3	V-4	B-1	B-2	B-3	O-1	O-2	O-3	O-4
Storage Tank	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Conveyance				✓	✓	✓	✓	✓	✓	✓
Satellite Sewage Treatment	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Figure 8-7: UA – Consolidated Flow Groupings



During the course of the site alternatives evaluation, the following information was discovered that affected the selection of two preferred UA planning basin site alternatives. First, one of the sites, Site E-1 in Etna, was being considered for possible development. Second, discussions with the MR Basin Planner revealed that one of the sites within the UA planning basin that could potentially serve both the MR and UA planning basins. After additional evaluation it was decided that the inter-basin approach would not be pursued further at this stage of the planning process.

In order to reduce the total number of site alternative potentially to a workable number, the UA Basin Planner only carried forward the highest ranked site alternatives.

8.8.4 Evaluation and Ranking of Site Alternatives

The UA Basin Planner applied the *Site Alternatives Assessment* method to evaluate and screen their site alternatives, which is one of the eight site alternative evaluation methods described in Section 8.2. A unique name was assigned to each site alternative as explained in Section 8.2.

The initial pool of site alternatives is included in Table 8-28. The UA Basin Planner evaluated and ranked their initial pool of site alternatives using the following steps:

- Estimated the site alternative footprint areas under the two most extreme H&H levels of control: 0 and 20 overflows per year for CSOs and the 2- and 10-year design storms (winter conditions) for SSOs.
- Compared the estimated footprint areas to the available space on the preferred site. Estimated footprints for intermediate performance levels were extrapolated from the values estimated in Step 1.
- Determined which site alternative footprint(s) will fit on each preferred control site.
- Developed CSO and SSO cost curves for all technologies for each performance level.
- Ranked the site alternatives using the economic and non-economic criteria illustrated in Figure 8-2.

With respect to economic criteria, treatment technology cost curves generally remained parallel for all levels of control; which indicated that generally the same control technology was considered to be cost effective at all control levels. Also, for some CSO groupings with low overflow volumes (e.g., CF01) storage became more cost effective for lower control levels. Conveyance, through both consolidation conduits and pumping, represented a substantial portion of the site alternative costs. This indicated further evaluation of consolidation and influent locations for CSO control facilities should be conducted in order to optimize consolidation/pumping sizes and costs. Finally, SSO cost curves were relatively flat, indicating that incremental costs for higher levels of SSO control were relatively small.

The top ranked site alternatives were carried forward into subsequent planning phases; those that received lower ratings were not. The results are shown in Table 8-28. As noted in the table, a number of site alternatives were carried forward that encompassed a wide variety of control technologies. Further discussion on the control technologies follows.

8.8.5 Control Technologies Carried Forward

Table 8-28 summarized the site alternatives that were carried forward into the basin alternatives analysis. The factors as to why other combinations of sites and technologies were not carried forward were also provided in the table. The remaining site alternatives formed the basis for preferred CSO and SSO basin alternatives.

As with the other planning basins, there were some adjustments made to the control technologies to accommodate basin-specific conditions and findings of the screening process. These included:

- Improved conveyance was not considered a viable site alternative for all CSOs due to the lack of the ALCOSAN interceptor capacity downstream of the UA planning basin. Instead, conveyance was used for consolidating overflows at a storage or treatment facility for CSO groupings CF01 and CF04.
- Vortex separation (V) was eliminated from all sites due to the uncertainty in vortex performance combined with higher costs. Vortex costs for all CSO sites were generally higher than the SD alternatives and slightly lower than the RTB alternatives. Therefore, it was decided to retain the SD and RTB alternatives while eliminating the vortex alternatives for all sites.
- Conveyance and storage tunnels (TNL) were not considered viable as single site alternatives but were considered later in the planning process as part of basin alternatives.
- Satellite sewage treatment (SST) alternatives were evaluated separately and were not included as part of the rankings.

It is also important to note that source controls, including sewer separation, stormwater redirection and green infrastructure, although not included in Table 8-28, were carried forward into basin alternatives development and were subsequently considered as needed to achieve a desired level of control.

Table 8-28: UA - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
UA_CF01	A35, A36, A37, A38	CSO	High Rate Clarification, Vortex Separation	No	Cost, site constraints; uncertainty of performance does not justify higher cost (vs. screening and disinfection)
UA_CF01	A35, A36, A37, A38	CSO	Retention/Treatment, Screening/Disinfection, Below Ground Tank	Yes	
UA_CF02	A40, A41	CSO	High Rate Clarification, Vortex Separation, Conveyance	No	Cost, site constraints; uncertainty of performance does not justify higher cost (vs. screening and disinfection); can't be used as basin alternative due to downstream capacity constraints; conveyance to consolidated facilities necessary
UA_CF02	A40, A41	CSO	Retention/Treatment, Screening/Disinfection, Tunnel Storage	Yes	
UA_CF03	A42L, A42U	CSO	High Rate Clarification, Vortex Separation, Conveyance	No	Cost, site and downstream capacity constraints; uncertainty of performance does not justify higher cost (vs. screening and disinfection)
UA_CF03	A42L, A42U	CSO	Retention/Treatment, Screening/Disinfection, Tunnel Storage	Yes	
UA_CF04	A69, A70, A71, A72, A73, A74, A75, A76, A77, A78	CSO	High Rate Clarification, Vortex Separation, Tunnel Storage, Below Ground Tank, Conveyance	No	Cost, site constraints; uncertainty of performance does not justify higher cost (vs. screening and disinfection); carried forward to basin alts; cost, conveyance for consolidation to regional facilities necessary for this alternative.
UA_CF04	A69, A70, A71, A72, A73, A74, A75, A76, A77, A78	CSO	Retention/Treatment, Screening/Disinfection	Yes	
UA_A68	N/A	Mixed	High Rate Clarification, Vortex Separation, Tunnel Storage, Conveyance	No	Cost, site constraints; uncertainty of performance does not justify higher cost (vs. screening and disinfection); carried forward to basin alts; no consolidation, any conveyance upgrades would be to customer municipality sewers.
UA_A68	N/A	Mixed	Retention/Treatment, Screening/Disinfection	Yes	
UA_A45	N/A	SSO	Below Ground Tank, Source Reduction, Conveyance	Yes	
UA_A82	N/A	SSO	Below Ground Tank, Source Reduction, Conveyance	Yes	
UA_A85	N/A	SSO	Below Ground Tank, Source Reduction, Conveyance	Yes	

8.9 Upper Monongahela Planning Basin Control Technology and Site Screening

Section 8.9 summarizes the approach used, assumptions made and results of the technology and site screening for the Upper Monongahela (UM) planning basin. The overall screening process used by UM and the other six basin planners was described in Sections 8.1 and 8.2, along with relevant definitions and technology descriptions. As such, this section will primarily focus on results of that process and any features or methods that were unique to the UM planning basin. Much of the basin-specific background information related to this section can be found in the UM SCSR and FRPW reports.

8.9.1 Summary of Control Technology Screening Process

The UM Basin Planner performed an extensive screening and evaluation process in order to identify viable control technologies that could be combined with suitable control sites to develop basin-specific site alternatives. Initially, the UM Basin Planner compiled an exhaustive list of technologies and solutions that could potentially be used to control CSOs and/or SSOs by drawing upon their knowledge and expertise combined with input from ALCOSAN and guidance from the Program Manager (PM). This extensive list of technologies was then narrowed down through the technology screening process described earlier. While there were some variations between the seven planning basins, the “core” of these technologies screened remained constant for all basins. The “core” technologies considered are described in Section 8.2. The complete list of technologies considered by the UM Basin Planner is in the UM Screening of Controls and Sites Report (SCSR).

The basin planner then selected criteria best suited to the UM planning basin and evaluated each technology utilizing the scoring method similar to the description in Section 8.2 and illustrated in Figure 8-1. However, instead of a “+”, “0”, “-“ system to represent the degree of favorability against each criterion, the UM Basin Planner utilized a slightly more detailed method comprising “excellent”, “good”, “average”, “below-average”, and “poor” scores. Also, there were some variations in criteria that the UM Basin Planner used including potential capital costs and O&M costs as well as land acquisition needs.

The control technologies that the UM Basin Planner considered feasible and more appropriate for ALCOSAN to implement were carried forward into the site alternatives formation process. They include all the technologies shown in Table 8-1, as well as additional technologies that would be effective in conjunction with them. These technologies are listed in Table 8-29.

Sewer separation was also carried forward for further evaluation for CSO systems within the planning basin, even though it would have to be implemented by the respective customer municipalities. This was done, in part, because ALCOSAN wanted sewer separation to be evaluated as a benchmark for comparison to the other technologies.

Table 8-29: UM - Feasible Control Technologies Carried Forward Into Site Alternative Development

Technology Type	CSO or SSO Application
Sewer Separation	CSO
Stream Inflow Removal	Both
Conveyance	Both
Conveyance Optimization (Pump Station/ Force Mains, Regulator and Hydraulic Relief Structure Modifications, Outfall Relocation/ Consolidation	Both
Tunnels	Both
Tank	Both
In-Line Storage	Both
Vortex Separation	CSO
Retention Treatment Basin	CSO
Ballasted Flocculation/ High Rate Clarifier	CSO
Satellite Sewage Treatment	CSO
Chlorination	CSO
Ultraviolet Irradiation	CSO
Baffles	CSO
Disposable Nets	CSO
Screening	CSO

In conjunction with the control technology screening process, a sensitivity analysis relating the anticipated effects of green infrastructure on overflow frequencies was conducted. Various reductions to impervious areas across the planning basin were modeled to determine whether there were particular sewersheds in which reasonable reductions to impervious area, achieved via green infrastructure, could produce overflow reductions significant enough to limit overflows to levels of control desired for ALCOSAN site alternatives. At a minimum, the overflow reductions should result in cost effective reductions to the size of the necessary gray infrastructure (pipes, tanks, etc.).

The analysis identified three sewersheds in which a reduction in impervious area, in combination with I/I reduction, could meet or exceed desired levels of control. These sewersheds were: M-31Z in the City of Pittsburgh, M-44 in West Homestead Borough and M-61 in North Braddock Borough. Because green infrastructure would need to be implemented in the tributary municipal systems at these locations, customer municipalities were apprised of these results as part of ALCOSAN's coordination and outreach efforts. Other planning activities identified simple modifications that could be made directly to M-31Z and M-61 that could reduce overflows to desired levels of control without upstream green infrastructure.

The control of solids and floatable materials will be integrated into proposed storage- or treatment-based control alternatives associated with the WWP. In addition, and in accordance with the requirements of the Consent Decree, solids and floatables control is being addressed in a separate Solids and Floatables Control Plan.

8.9.2 Summary of Site Screening Process

The UM Basin Planner performed an extensive screening and evaluation of potential sites and tunnel/ conveyance routes in order to identify a group of preferred control sites or routes. These sites or routes would be combined with the control technologies that were carried forward to form site alternatives. The identification, screening and evaluation of potential sites for the UM planning basin process generally followed that shown graphically in Figure 8-1 and explained in Section 8.2.

Initially, the UM Basin Planner identified an extensive "first cut" list of potential sites based solely on available GIS information. As additional investigation and field reconnaissance was performed the list of available sites was refined accordingly, including the addition of sites that were identified later in the process.

The SCSR identified potential control sites and summarized the meetings that had been held with the affected customer municipalities. Additional meetings and site reconnaissance have occurred since the SCSR was completed which added to the level of understanding of site suitability, including availability and access. This multi-phased screening process pared the list to 11 remaining control sites. These are listed in Table 8-30 and shown on Figure 8-8.

Table 8-30: UM - Remaining Control Sites

Site	Location	Description
B-1	City of Pittsburgh	Between active railroad tracks and the M-34-00 diversion structure. A rails-to-trails multi-use trail cuts through the site.
H-1	Munhall Borough	Adjacent to Marcegaglia U.S.A. facility.
N-2	City of Pittsburgh	Frick Park, along Commercial Street and beneath I-376 Bridge.
S–3	West Homestead Boro	Adjacent to ALCOSAN's 21-inch interceptor.
S–4	City of Pittsburgh and Baldwin Boro	West of Glenwood Bridge and along the south shore of the Monongahela River.
S–5	City of Pittsburgh and West Homestead Boro	East of Glenwood Bridge and along the south shore of the Monongahela River.
Hz-5 and Hz-6	City of Pittsburgh	Sites are part of Site Hz-1 identified in SCSR as former LTV Steel facility along Second Ave. Via coordination with property owner, the preferred site has changed from Hz-5 to Hz-6.
Hz-4	Hazelwood site	CSX railroad property near Glenwood Bridge.
N-5	Nine Mile Run site	Parking area along Eliza Furnace Trail near Nine Mile Run.
M-5	Mon Valley site	Underneath Rankin Bridge near M-51.
M-6	Mon Valley site	Between M-57 and M-58.

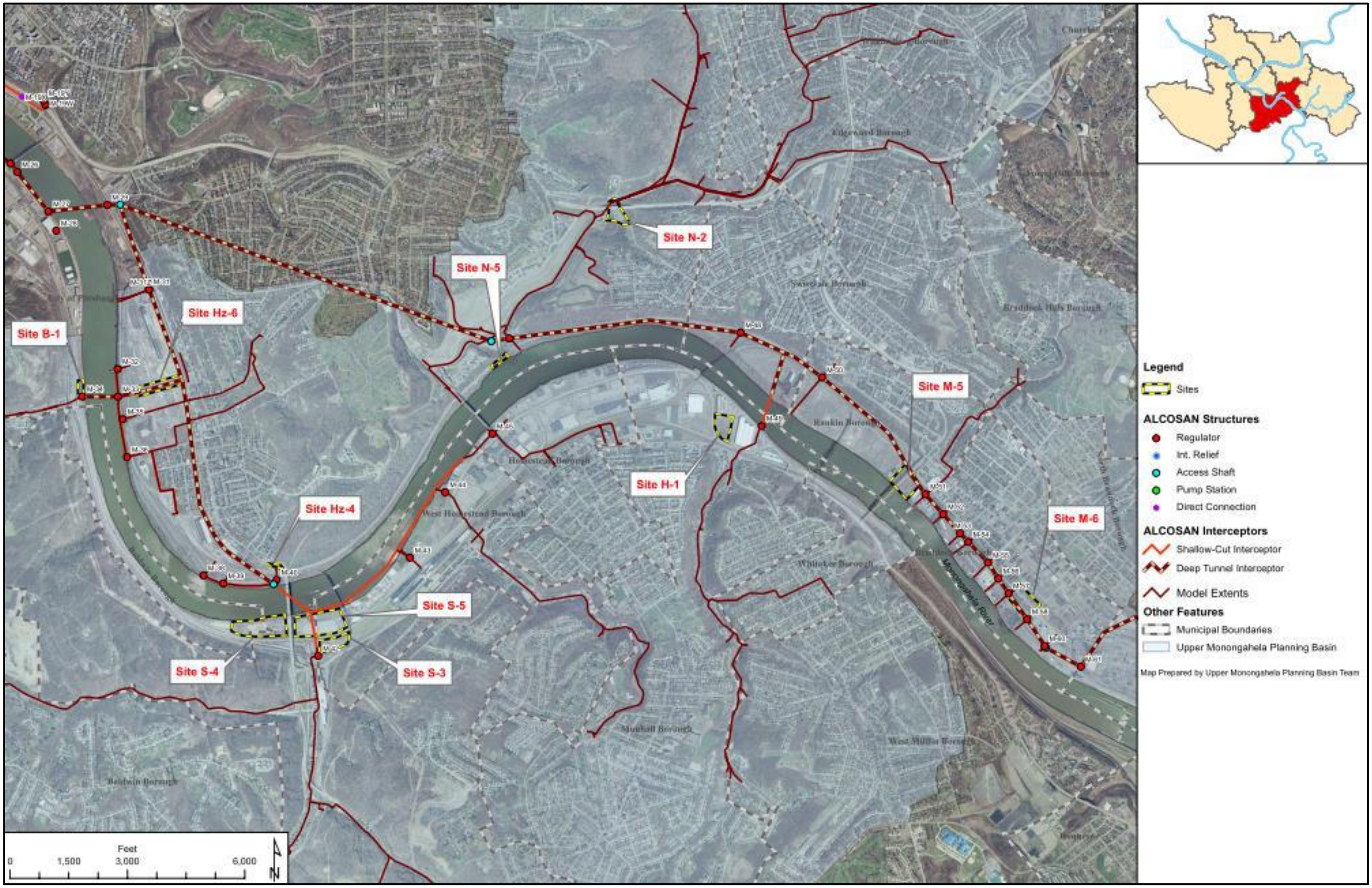
As was the case in other planning basins, the number of potential control sites at any given time in the screening and evaluation process was dynamic due to a number of variables including, but not limited to: local acceptance or opposition; issues with access; environmental concerns; and development plans on or adjacent to parcel(s) that comprised the control site.

In conjunction with the site evaluations, the UM Basin Planner identified a number of potential conveyance routes for consolidations of flows (CFs) from one or more POCs to a single combined or regional control facility. These proposed CF routes were also discussed during the site meetings with the affected customer municipalities. It was the consensus of these meetings that where feasible and cost effective, consolidation of overflows to a single site was preferred over siting multiple facilities. Table 8-31 provides a summary of the preliminary routes and initial determinations as to their relative degree of favorability.

Table 8-31: UM - Summary of Potential CF Routes

Route	ALCOSAN POC	Initial Determination
B_1	M-34-00	Consolidates flow from Becks Run to regional facility in Hazelwood; not very favorable since it would require a new river crossing.
Hz_{1A}	M-35-00 thru M-37-00	Gravity conveyance to a regional facility in Hazelwood; has significant potential and will be refined further.
Hz_{1B}	M-35-00 thru M-37-00	Combination of gravity and force main conveyance to a regional facility in Hazelwood; has significant potential and will be refined further.
Hz_2	M-40-00	Conveys flows from M-40-00 to M-37-00 for eventual conveyance to a regional facility in Hazelwood; has potential to address flows from M-40-00 and will be evaluated further.
Hz_3	M-31-00 and M-31Z-00	Conveys flows from M-31-00 and M-31Z-00 to a regional facility in Hazelwood; retained for further analysis.
W_{1A}	M-43-00 thru M-45-00	Gravity conveyance for potential to consolidate flows from 3 POCs to a regional facility in Streets Run; retained for further analysis.
W_{1B}	M-43-00 thru M-45-00	Potential to consolidate flows from 3 POCs to a regional facility in Streets Run via gravity or pumping; retained for further analysis.
H_{1A}	M-49-00	Potential to consolidate flows from M-49-00 to M-45-00 to a regional facility in Streets Run by gravity; retained for further analysis.
H_{1B}	M-49-00	Potential to consolidate flows from M-49-00 to M-45-00 to a regional facility in Streets Run by gravity or pumping; retained for further analysis.
H_2	M-49-00	Consolidates flow from Homestead Run to a regional facility in the Mon Valley; not favorable as it requires a new river crossing.
M_{1A}	M-51-00 thru M-60-00	Potential for gravity conveyance of 10 POCs to a regional facility.
M_{1B}	M-48-00 and M-50-00	Favorable for consolidating flows from two POCs to a regional facility.
M_2	M-52-00 thru M-60-00	Potential to convey flows from 9 POCs to regional facility at Site M-4.
Hz_4	M-31-00 thru M-37-00 (except M-34-00)	Gravity conveyance for consolidation of these POCs to a new dropshaft for the proposed regional tunnel near M-29-00.

Figure 8-8: UM - Potential Sites



8.9.3 Site Alternative Development

Using the results of the control technology and control site screening and evaluations in the previous sections, the UM BP uniquely combined the control technologies, control sites and specific set of H&H conditions to develop site alternatives. A site alternative is a control alternative being considered for controlling wet weather overflows that is site-specific or basin-segment-specific and serves as a component of a larger control alternative, such as a basin alternative.

The site alternatives were developed and analyzed to determine the most cost-effective control technology for each POC within the UM planning basin. For this analysis, it was assumed that any backwater conditions within the ALCOSAN Conveyance and Treatment System would be addressed. Additionally, consolidation of POCs was evaluated along with tunnel alternatives. During this phase, the existing conditions model was still being developed and the Phase I Analysis was performed outside of the H&H Model utilizing a post-processing spreadsheet tool to evaluate facilities sized for 0 and 20 overflows per year. Costs were developed utilizing the ACT.

The list of the site alternatives developed for the UM planning basin are shown in Table 8-32 in the following section.

8.9.4 Evaluation and Ranking of Site Alternatives

The UM Basin Planner applied the Bracketed Evaluation method to evaluate and screen their site alternatives, which is one of the eight site alternative evaluation methods described in Section 8.2. In this case the basin planner evaluated the levels of control of 0 and 20 overflows per year for CSO outfalls which formed the complete range or bracket of possible controls. Though there are no ALCOSAN SSOs in the UM planning basin, in the Bracketed Evaluation the BP eliminated all municipal overflows to the 10-year storm. A unique name was assigned to each site alternative as explained in Section 8.2.

Table 8-32 lists the site alternatives that were developed and evaluated along with the corresponding CFs or individual outfalls. It should be noted that H&H conditions were not included in the site alternative name. Table 8-32 also shows the results of the screening and the reason why the site alternative was or was not carried forward.

Table 8-32: UM - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
UM_M34	N/A	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive; lack of available sites
UM_M40	N/A	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M42	N/A	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M43	N/A	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M44	N/A	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M45	N/A	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M47	N/A	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	Yes	
UM_M48	N/A	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M49	N/A	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M50	N/A	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation
UM_M51	N/A	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to consolidation

Table 8-32: UM - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
UM_M59	N/A	N/A	RTB	Yes	
UM_CF01	M42, M43, M44, M45	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared CF02
UM_CF02	M42, M43, M44, M45, M49	Mixed	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	Yes	
UM_CF03	M31, M31Z, M32, M33, M35, M36, M37	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF04
UM_CF04	M31, M31Z, M32, M33, M34, M35, M36, M37, M40	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	Yes	
UM_CF05	M31, M31Z, M32, M33, M35, M36, M37, M40	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF04
UM_CF06	M31, M31Z, M32, M33, M34, M35, M36, M37	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF04
UM_CF07	M48, M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	Yes	
UM_CF08	M52, M53, M54, M55, M56, M57,M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07
UM_CF09	M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07 and CF04
UM_CF10	M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07 and CF04
UM_CF11	M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07 and CF04

Table 8-32: UM - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
UM_CF12	M51, M52, M53, M54, M55, M56, M57, M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost Prohibitive compared to CF07 and CF04
UM_CF13	M49, M51, M52, M53, M54, M55, M56, M57, M58, M60	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07 and CF04
UM_CF14	M48, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60 at Site M-4	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07, CF04 and M-59 Facility
UM_CF15	M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60 at Site M-4	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07, CF04 and M-59 Facility
UM_CF16	M51, M52, M53, M54, M55, M56, M57, M58, M59, M60 at Site M-4	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07, CF04 and M-59 Facility
UM_CF17	M48, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60 at Site M-1	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07, CF04 and M-59 Facility
UM_CF18	M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60 at Site M-1	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07, CF04 and M-59 Facility
UM_CF19	M51, M52, M53, M54, M55, M56, M57, M58, M59, M60 at Site M-1	CSO	Below Ground Tank, Screening/Disinfection, Vortex Separation, High Rate Clarification, Retention/Treatment	No	Cost prohibitive compared to CF07, CF04 and M-59 Facility
UM_CF20	M42, M43, M44, M45, M47, M48, M49, M50, M51	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25
UM_CF21	M42, M43, M44, M45, M47, M48, M49, M50, M51, M59	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25
UM_CF22	M42, M43, M44, M45, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25

Table 8-32: UM - Site Alternative Evaluation Results

Basin Flow Source	Outfalls Consolidated	Area Served	Principal Technology	Carried Forward?	Key Factors
UM_CF23	M42, M43, M44, M45, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25
UM_CF24	M34, M35, M36, M40, M42, M43, M44, M45, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25
UM_CF25	M34, M35, M36, M40, M42, M43, M44, M45, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60	Mixed	Tunnel Storage	Yes	
UM_CF26	M40, M42, M43, M44, M45, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M60	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25
UM_CF27	M40, M42, M43, M44, M45, M47, M48, M49, M50, M51, M52, M53, M54, M55, M56, M57, M58, M59, M60	Mixed	Tunnel Storage	No	Cost prohibitive compared to CF25

8.9.5 Control Technologies Carried Forward

Table 8-32 listed the site alternatives that were carried forward along with their respective control technologies. The following discussion focuses on the control technologies that were carried forward in that process.

Retention and treatment basin (RTB) technology proved to have the lowest present worth cost of the treatment alternatives evaluated. As such, RTB was retained for further consideration. BTNK resulted in a higher present worth value than the treatment technologies in some cases; in others it was estimated to have the lowest or nearly the lowest present worth value.

While screening and disinfection (SD) did not appear to be cost-effective when compared to RTB in this analysis, it is anticipated that SD will become cost competitive where contact time can be provided within existing infrastructure such as a long outfall or when site constraints increase the cost of a RTB. As such, SD was retained for further consideration. Also, because high rate clarification (HRC) is estimated to generally have the highest present worth cost it will only be considered as planning continues should specific water quality issues arise to necessitate it. Finally, the analysis indicated that the cost for vortex separation (V) was higher than that for either RTB or SD. Unlike high rate clarification, vortex separation does not provide a significant benefit when compared to other CSO treatment alternatives. Therefore, the vortex separation technology was not considered for further analysis.

Table 8-33 summarizes the control technologies that were carried or not carried forward. It is important to note that source controls, including sewer separation, stormwater redirection, and green infrastructure, although not included in Table 8-33, continued to move forward into basin alternatives development and were subsequently considered as needed to achieve a desired level of control.

Table 8-33: UM - Summary of Control Technologies Screening

Control Technology	Carried Forward?	Comments
High Rate Clarification	Y	Higher cost and level of treatment for some pollutants vs. RTB and SD; considered for specific applications
Retention Treatment Basin	Y	Cost effective treatment alternative
Screening and Disinfection	Y	May be cost effective in certain applications where appropriate existing infrastructure exist; considered for specific applications.
Belowground Storage Tank	Y	Applicability for core flow and where discharge is to a tributary; considered for specific applications
Vortex Separation	N	Not cost effective compared to other treatment alternatives
Storage Tank	Y	Will be considered as part of the Regional Based Strategy
Satellite Sewage Treatment	Y	Will be considered as part of the Regional Based Strategy