Northeast Redevelopment Area (NERA)

Appendix

A Table of Contents

Appendix

EXISTING CONDITIONS REPORT	SECTION 1
NERA MARKET CONDITIONS REPORT	SECTION 2
CRITICAL AREA STUDY	SECTION 3
COMMUNITY AND STAKEHOLDER INVOLVEMENT SUMMARY REPORT	SECTION 4
COMMUNITY INVOLVEMENT ATTACHMENTS	SECTION 5
TRANSPORTATION INFRASTRUCTURE MEMO AND COST ESTIMATES	SECTION 6
ECONOMIC SUMMARY REPORT	SECTION 7
COMPREHENSIVE PLAN AND ZONING AMENDMENTS	SECTION 8
MILLER CREEK GREENWAY CONCEPT REPORT	SECTION 9

A

Appendix - Section 1

Existing Conditions Report

City of Burien, Washington

Northeast Redevelopment Area Strategy

Task 2 Detailed Market and Existing Conditions Analysis

Table of Contents

I. Summary 2

II. Existing Conditions 2

III. Review of Plans, Policies, and Development Regulations 7

IV. Market Analysis 13

V. Case Study Research 14

VI. Existing Conditions Maps 18

VII. Appendix 26

VIII. References 27

I. Summary

Overall project and report summary

The Northeast Redevelopment Area (NERA) was created in 1997 through the adoption of the City of Burien Comprehensive Plan. The NERA was identified as an area affected by present and future aviation activities at Seattle-Tacoma International Airport (SeaTac). Special planning efforts are needed in this redevelopment area due to the effects of noise and land use restrictions associated with the development of the third runway. Extensive research has been completed on the effects of the new runway on the surrounding community and environment. Special focus has been aimed at the Burien Northeast Redevelopment Area, where existing single and multi-family residential uses are unsuitable for portions of the redevelopment area due to increased decibel levels and aviation development standards.

The NERA is located within the City of Burien, bordered by South 138th Street to the north, 8th Avenue South to the west and Des Moines Memorial Drive South to the east and south. The NERA, with close proximity to the SeaTac Airport and major transportation corridors, such as State Route, 518 and 509, Interstate 5 and 405, is ripe with redevelopment potential. Please refer to Exhibit 1 in Section VIII for a vicinity map and NERA boundary. Existing conditions of the NERA include mainly residential uses, Miller Creek and associated wetlands and existing infrastructure and services.

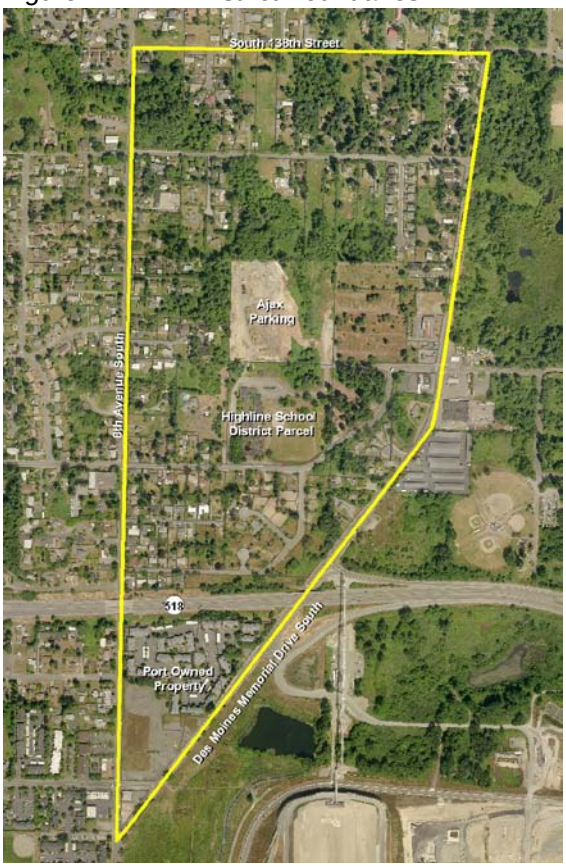
The existing conditions report for the NERA was developed through an extensive review of existing written and mapped materials related to the land use, economic and environmental conditions of the NERA. In order to fully understand the possible redevelopment opportunities for the area, the conditions and constraints must be fully understood. The Northeast Redevelopment Area has great potential for the redevelopment of uses more compatible with existing noise and development constraints.

II. Existing Conditions

Land Use

Land use in the NERA is constrained by both natural and man made elements, which include the Miller Creek corridor and associated wetlands, as well as, noise and land use constraints presented by the presence of the new third runway at SeaTac Airport. The area consists of mainly single-family, residential uses to the north and west with increased residential density in the southwestern portion of the NERA, north of SR-518.

Figure 1: NERA District Boundaries



NERA study area boundary with highlighted property uses as mentioned in this section. Aerial taken in 2007.

In addition to natural constraints presented by the presence of the Miller Creek Corridor, land in the NERA is further constrained by FAA (Federal Aviation Administration) restrictions due to the proximity of the new third runway and potential conflicts with flight patterns. Due to these land use restrictions and measured decibel levels, a number of properties within the NERA have been purchased by the Port of Seattle. There are varying levels of restriction

placed on land within the NERA depending on its location with the FAA regulated "object-free area" and depending on the funds used to purchase the property. This restricted land does not encompass the entire study area, but rather is focused in the south and east.

The NERA consists of approximately 158 acres of land, divided among private property ownership, Port of Seattle ownership, City of Burien ownership and ownership by the Highline School District. The majority of the land in the NERA is currently privately owned, single-family residences. Port of Seattle owned property, the second largest land ownership in the NERA (approximately 60 acres) consists of a majority of the southeastern properties within, which are within closest proximity to the new runway and most affected by its development and operations. These properties are most constrained by aviation regulations due to their location within the Runway Protection Zone (RPZ). No structures are allowed within this designated zone due to the level of negative effects of aviation traffic and safety concerns. Please refer to Exhibit 3: Aviation Constraints Map and Exhibit 4: Property Ownership Map in Section VIII.

Private property ownership within the NERA mainly consists of residential development, composed primarily of cul-de-sac development with access taken from major corridors, 8th Avenue South, South 138th Street and South 140th Street.

Figure 2: Example of Existing Residential Uses

Existing residential Uses along S 140th Street

The majority of existing homes in and around the NERA boundary consist of older home stock with varying setbacks. Adjoining properties outside of the NERA boundary, west of 8th Avenue South, vary in size and setback from the existing street. These adjoining properties consist of single-family residential uses, a commercial establishment (US West) and a church property, all located north of SR-518. Adjoining properties located west of the NERA boundary and south of SR-518 consist of more dense uses, including a multi-family apartment community, as well as, a mixed-use office complex and multifamily development at the southernmost tip of the NERA boundary. To the east of the NERA border, Des Moines Memorial Drive South and its adjacent land to the east is jurisdiction of the City of SeaTac. Within the City of SeaTac, adjacent to the NERA border is the North SeaTac Park and Sunset Playfield, which is owned by the Port of Seattle.

Uses within the NERA range in ownership and use. Single-family residential uses make up a majority of uses within the south and western areas of the NERA. Within central NERA there are three relatively large areas of land owned by three different parties, a privately owned airport parking facility, the Navos Mental Health center, owned by Highline School District and an approximately 3 acre portion of land owned by the City of Burien, also highly constrained by the physical presence of Miller Creek and its associated wetlands, as well as, regulatory constraints by the stormwater funds used to purchase the property.

The Navos Mental Health Facility, located at 1010 S 146TH ST (noted above) is situated on a 9-acre parcel in the center of the NERA. This parcel, currently under the ownership of the Highline School District is one of the larger, centrally located parcels in the NERA. Located just north of the Navos facility is a privately owned parcel, currently serving as an airport parking facility for Ajax Parking, which totals approximately 10 acres of land in central NERA, adjacent to Miller Creek. This parking facility and its associated improvements are relatively new, including access drives, grading, pavement and lighting were built around 2007.

The largest area of land with consolidated ownership is located south of SR 518. These

parcels consist of the now vacant Lora Lake apartment complex parcels and the vacant parcels to the south, together totaling approximately 12 acres of consolidated land, all within Port of Seattle owned land.

Figure 2: Vacant Parcel

Looking north onto vacant property and vacant multifamily development from S. 152nd Street. Both properties are owned by the Port of Seattle and reside directly adjacent to the Runway Protection Zone (RPZ), west of the third runway.

City of Burien Land Use Restrictions

Further restrictions to the properties come from existing land use regulations outlined in the City of Burien Comprehensive Plan and Zoning regulations as detailed in Section V. These regulations dictate the allowable uses and form of new development. The Comprehensive Plan divides the NERA into three subsections A, B and C, as referenced in Figure 5 in Section V. Land use designations in this special planning area range from residential to commercial and industrial uses. The existing zoning for the NERA includes: single-family (RS-7,200), multi-family residential (RM-18, RM-24), as well as, industrial (I) and intersection commercial (CI). Any new development must follow the Special Planning Area 4 (SPA-4) zoning standards rather than the requirements of the underlying zoning, which includes a 2-acre minimum on future development proposals, as well as specific design criteria.

Transportation

The Northeast Redevelopment Area has a thorough transportation network immediately surrounding it, linking it to major transportation corridors, including Interstate 5, Interstate 405, State Route 518, and State Route 509.

The Northeast Redevelopment Area is served by a number of area arterial roadways, both onsite and offsite, that provide connections to area freeways and other neighborhoods. These include South 128th Street, Des Moines Memorial Drive, 8th Avenue South, South 152nd Street, South 156th Street, and South 146th Street. The roadways around the perimeter of the NERA are generally in fair to good condition, and those in need of repairs and upgrades have opportunities for expansion due to availability of right-of-way. Des Moines Memorial Drive, in particular, provides a good connection to the NERA, therefore making it a potentially good candidate for a truck route due to its direct access from westbound SR 518 and relatively flat terrain. Conditions could be improved in this area to provide for a more direct access off of SR 518, as well as bringing roadways up to standard for non-residential traffic. Refer to Exhibit 5: Existing Road Conditions, in Section VIII and Infrastructure Technical Information Report in Section IX for more detailed information.

Figure 4: Northbound Des Moines Memorial Drive at SR 518.

Most of the internal roadways are minor access streets or private streets and would either require upgrades or complete reconstruction to make them adequate to handle additional traffic, especially truck traffic or pedestrian traffic. The roadways within the area do not receive much, if any, routine truck traffic, so it is uncertain whether pavements have been constructed to sustain regular loading from the heavy vehicles.

The Tukwila International Boulevard Light Rail Station, providing access to the Central Link Light Rail, is located approximately two miles east of the Northeast Redevelopment Area. King County Metro also operates a number of local and express bus routes within and nearby the Northeast Redevelopment Area. The Port of Seattle operates a large intermodal, freight transportation hub in the South Downtown (Sodo) and Harbor Island areas of Seattle, as well as nearby Seattle-Tacoma International Airport. King County International Airport, also known as Boeing Field, is located just four miles north of the Northeast Redevelopment Area.

Infrastructure

Water

Water services to the Northeast Redevelopment Area are supplied by King County Water Districts No. 20 and No. 125 via a 24-inch supply main and pump station operated by Seattle Public Utilities (SPU) at the southeast corner of South 146th Street and 8th Avenue South.

King County Water District No. 20 (KCWD 20) Record maps have been provided by KCWD 20. KCWD 20 provides water service to the majority of the Northeast Redevelopment Area. KCWD 20 merged with King County Water District No. 85 in 2003 and provides water service to a large portion of Burien and much of the North Highline area of unincorporated King County. According to KCWD 20's 2006 Annual Water Quality Report, the district receives most of its water from the Cedar River Watershed through Seattle Public Utilities. This 2006 report also states that the forecast for the district's future water supply is good.

The water system in the Lora Lake Triangle portion of the NERA consists of 12-inch ductile iron pipes in 8th Avenue South, 6-inch cast iron pipes installed in 1944 in Des Moines Memorial Drive, and a number of 8-inch ductile iron pipes within the Lora Lakes Apartment complex connecting these lines. Although the ductile iron pipes may have adequate capacity to serve an increased demand, the age of the pipes located in Des Moines Memorial Drive would likely require replacements and upgrades to this portion of the system.

The water system north of State Route 518 also varies a bit in size and age. According to record maps, pipe sizes range from four inches to eight inches and include both cast iron and ductile iron installed as far back as 1944 and as recent as 2007. As a result, a large portion of the water system in the area, particularly the sections that are newer, is likely adequate to serve an increased demand. Older portions of the system, however, would likely require replacements and upgrades.

King County Water District No 125 (KCWD 125) KCWD 125 provides water service to a small portion of the Northeast Redevelopment Area, including properties along Des Moines Memorial Drive north of 146th Street. KCWD 125 provides water service to large portions of SeaTac and Tukwila, and small portions of unincorporated King County and Burien. Record maps have been provided by KCWD 125 that show eight-inch ductile iron water mains within Des Moines Memorial Drive.

Both KCWD 125 and KCWD 20 share a six million gallon reservoir along with KCWD 45. According to the Environmental Impact Statement prepared for the City of Burien's Northeast Special Planning Area in 2002, KCWD 125 and KCWD 20 maintain four interties, two of which are within the Northeast Redevelopment Area.

Sanitary Sewer

The Northeast Redevelopment Area is served by two public sewer districts, Southwest Suburban Sewer District and Valley View Sewer District. Although the entire area is located within one of the two districts, a large portion of the Northeast Redevelopment Area does not currently have service and disposes of wastewater through individual privately owned and maintained systems. This is particularly problematic, because the central portion of the Northeast Redevelopment Area has very permeable soils which increase the likelihood of groundwater contamination. Moreover, a portion of the Northeast Redevelopment Area is located within a groundwater recharge area. Please refer to Exhibit 7 in Section VIII for sewer district service map.

Southwest Suburban Sewer District (SWSSD)

The majority of the Northeast Redevelopment Area is located within the SWSSD, including the entire study area south of South 140th Street, as well as the area west of 10th Avenue South in the northwest portion of the study area. SWSSD provides service to most of Burien and Normandy Park, as well as portions of SeaTac.

SWSSD currently has an 18-inch sewer main that runs through the heart of the Northeast Redevelopment Area, and has also planned routes for future sewer lines within both SWSSD and Valley View Sewer District (VVSD) which all connect to the existing 18-inch sewer main. The future planned sewer extensions encompass most of the existing un-sewered areas within the Northeast Redevelopment Area, including the areas within both the SWSSD and VVSD. The existing 18-inch sewer main begins at the intersection of South 136th Street and 8th Avenue South, and has likely been oversized for future flows from the north. This sewer main runs south along 8th Avenue, southeast via easements to 140th Street, southeast via easements to the west terminus of 144th Street, and exits the site to the east at the intersection of South 144th Street and Des Moines Memorial Drive. The sewer main collects sewage from other sewer mains and ultimately discharges to the Miller Creek Wastewater Treatment Plant, which is owned and operated by SWSSD. Because sewage flow from both SWSSD and VVSD within the Northeast Redevelopment Area is tributary to SWSSD's sewer mains and treatment plant, the ultimate authority on future capacity within the Northeast Redevelopment Area is SWSSD.

A letter has been sent to SWSSD to determine its capacity to serve increased demand in the study area.

Valley View Sewer District (VVSD)

A small portion of the Northeast Redevelopment Area is located within the Valley View Sewer District, formerly known as Val Vue Sewer District. In 1995, Rainier Vista Sewer District merged with Val Vue Sewer District. VVSD provides service to portions of SeaTac, Burien, Tukwila, and the North Highline area of unincorporated King County. VVSD does not own or operate any wastewater treatment plants and relies on contracts with King County Wastewater Treatment Division, Midway Sewer District, and Southwest Suburban Sewer District for the ultimate conveyance and treatment of wastewater.

A letter has been sent to VVSD to determine its capacity to serve increased demand in the study area.

Electricity

Electric service within the NERA is provided by Seattle City Light. From conversations with the utility it has been noted that the northeastern area of the City is already operating at near capacity, meaning that there is little room for growth in the existing electrical grid. The existing electrical capacity can accommodate the existing, low-intensity residential uses, however may not be able to provide electric service to a more high-intensity use such as industrial or commercial.

Conversations with City Light revealed plans for eventual substation development at a City Light owned parcel located along Route 509 at the NE 136th Street overpass to increase capacity for a number of areas, including the NERA. However, lead time to design and construct such a facility, as well as design, secure right-of-way for, and construct transmission lines connecting it to other similar facilities, could take over five years.

Natural Gas

Natural gas service is provides by Puget Sound Energy (PSE). The study area is currently served by a system of 2-inch natural gas lines. Additionally, a 12-inch, high pressure natural gas line follows the perimeter of the study are via South 136th Street from 8th Avenue South to Des Moines Memorial Drive South and along Des Moines Memorial South from South 136th Street to South 146th Street.

Telecommunications

Telephone and internet service within the Northeast Redevelopment Area is provided by Qwest Communications. A letter has been sent to Qwest to determine its capacity to serve increased demand in the study area.

Cable television, telephone, and internet service within the Northeast Redevelopment Area is provided by Comcast. A letter has been sent to Comcast to determine its capacity to serve increased demand in the study area.

Please refer to Technical Appendix A for the complete Infrastructure Technical Memorandum.

Stormwater and Drainage

The City of Burien has adopted the 2005 King County Surface Water Manual as its drainage design manual. As a result, the Northeast Redevelopment Area is subject to the regulations defined in this manual, including erosion control, water quality treatment, and flow control.

The entire Northeast Redevelopment Area is tributary to Miller Creek. Miller Creek has historically had poor water quality so a high level of water quality treatment may be required. Although neither the City nor the County has any published maps that show what level of flow control is necessary for areas within the City of Burien, it is likely that development would be subject to conservation flow control requirements.

The existing drainage system is intermittent, with the majority of the Northeast Redevelopment Area relying on open ditches and culverts, as well as infiltration, to manage surface runoff. According to a 1952 U.S. Department of Agriculture Soil Survey, roughly half of the area has soil consisting of Everett Gravelly Sandy Loam, which is in the Hydrologic Soil Group A. Group A soils generally have high infiltration rates, and Everett Soils are particularly well known for having excellent potential for stormwater infiltration. As a result, throughout a large portion of the site, particularly south of South 140th Street, east of the bluff along 8th Avenue South, and north of Lora Lake Apartments, no comprehensive drainage systems exist since most surface runoff can infiltrate into the soil. It should be noted, however, that any stormwater that does currently infiltrate likely resurfaces in Miller Creek. The 1952 Soil Survey also locates two mines or quarries within the project site, one at the intersection of South 144th Way and South 144th Street, and the other in the approximate location of SR 518. As a result, these locations may have a large amount of fill materials that may or may not be suitable building material.

The City does have mapping of existing stormwater systems, which are a combination of buried pipes and open ditches, particularly in the northern third of the Northeast Redevelopment Area, along 8th Avenue South, and within Lora Lake Apartments and the portion of the site south of Lora Lake Apartments. Stormwater travels through the site from a large offsite area along 8th Avenue South downstream to Lora Lake. It would be advantageous to maintain or replace this system when Lora Lake Apartments are demolished and when the area redevelops, without taking the system offline.

A small conveyance system in the northeast corner of the site conveys stormwater southeast to Tub Lake within North SeaTac Park. The remainder of the closed stormwater systems in the northwest portion of the site conveys runoff to Miller Creek.

Wetlands and Creeks

Overview and Methodology

Otak biologists delineated five wetlands and identified a perennial stream (West Fork of Miller Creek) within the NERA. Identification of these critical areas will guide land use decisions as this predominantly residential area is converted to commercial and industrial uses (Burien 2008a). This section describes the wetland and stream characteristics, wetland functions assessment, and applicable regulations relating to wetlands and streams.

The NERA is a roughly trapezoidal area located in the northeast corner of Burien. The NERA project area consists of rolling terrain with ridges and valleys that are roughly oriented from northwest to southeast. The elevations range from 295 to 425 feet above mean sea level. The West Fork of Miller Creek (Water Resource Inventory Area [WRIA] # 09-0376) bisects the NERA area flowing from northwest to southeast between 8th Avenue S to Des Moines Memorial Drive (Williams et al. 1975).

Creeks

The West Fork of Miller Creek originates northwest of the NERA project area in a Category 3 wetland identified on the City of Burien critical areas map (Burien 2008b). The West Fork of Miller Creek is culverted between this headwater wetland and 8th Avenue S where it enters the NERA. The West Fork of Miller Creek within the NERA alternates between open channels, culverts, and concrete-lined ditches. Downstream of the NERA, this tributary flows southeast and combines with the mainstem of Miller Creek flowing out of Tub Lake.

The Burien Municipal Code (BMC 19.40.340) designates four classes of streams: Types 1, 2, 3, or 4 (Burien 2008a). This classification makes a distinction between perennial and intermittent streams and whether there is salmonid use. We assume there is perennial flow in the West Fork of Miller Creek within the NERA based on flow rates observed in July 2008.

The West Fork of Miller Creek within the NERA is identified on the Burien critical area map as a Type 3 stream with a 50-foot buffer (Burien 2008b). The Burien critical area map does not identify any Fish and Wildlife Habitat Conservation Areas within the NERA project area as defined by BMC 19.40.380 (Burien 2008b).

The *Miller and Walker Creeks Basin Plan* (King County 2006) identifies the West Fork of Miller Creek within the NERA and assumes there is an impassable barrier to anadromous salmon due to a 150-foot-long culvert that is downstream of the NERA (King County 2006). However, because resident cutthroat trout are reported to occur in the West Fork of Miller Creek within the NERA (King County 2006), this indicates it is a Type 2 stream that requires a 100-foot buffer.

Wetlands

A total of five wetlands (Wetlands A through E) were delineated within the Burien NERA These wetlands are associated and hydrologically connected to the West Fork of Miller Creek.

- Wetland A is a 0.55-acre wetland associated with the West Fork of Miller Creek near 8th Avenue S. According to the Cowardin system (1979), Wetland A contains palustrine forested (PFO) and palustrine scrub/shrub (PSS) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland A is a riverine wetland.
- Wetland B is a 0.50-acre groundwater seep wetland hydrologically connected to the West Fork of Miller Creek. This wetland is formed by groundwater seeps on the north shoulder of S 140th Street that saturate a large area. According to the Cowardin system (1979), Wetland B contains palustrine scrub/shrub (PSS) and palustrine emergent (PEM) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland B is a slope wetland.
- Wetland C is a 3.33-acre riparian wetland associated with the West Fork of Miller Creek that is located between S 140th Street and S 144th Street. According to the Cowardin system (1979), Wetland C contains palustrine forested (PFO), palustrine scrub/shrub (PSS), and palustrine emergent (PEM) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland C is a riverine wetland.
- Wetland D is a 0.41-acre riparian wetland associated with the West Fork of Miller Creek on Port of Seattle property. According to the Cowardin system (1979), Wetland D contains palustrine scrub/shrub (PSS) and palustrine emergent (PEM) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland D is a riverine wetland.
- Wetland E is a 0-12-acre riparian wetland associated with the West Fork of Miller Creek located between Des Moines Memorial Drive and S 144th Way. According to the Cowardin system (1979), Wetland E contains palustrine forested (PFO) and palustrine scrub/shrub (PSS) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland E is a riverine wetland.

The wetland and buffer functions were assessed using the methodology and rating form from the *Washington State Wetland Rating System for Western Washington* (Hruby, 2004). Three general categories of wetland functions and the opportunity to perform those functions were assessed: water quality, hydrology, and habitat. The numeric values from the rating forms were translated into qualitative values of low, moderate, and high. Results of the functional assessment of five wetlands in the NERA project area are summarized in Table 1 below.

Table 1. Functional Assessment Rating for Wetlands in the NERA.

Wetland	Categories of Assessed Functions					
	Water Quality		Hydrology		Habitat	
	Potential	Opportunity	Potential	Opportunity	Potential	Opportunity
A	M	Yes	M	Yes	M	M
B	L	Yes	L	Yes	M	L
C	H	Yes	H	Yes	M	M
D	M	Yes	M	Yes	M	L
E	M	Yes	M	Yes	L	L

Where ratings for potential and opportunity is abbreviated as: L = Low, M = Moderate, and H = High

Wetlands A through E were rated using the criteria defined in the Department of Ecology's *Washington State Wetland Rating System for Western Washington* (Hruby 2004) and Burien Municipal Code (Burien 2008a). The Burien Municipal Code (BMC 19.40.300) designates four categories of wetlands: Categories 1, 2, 3, or 4 based on habitat scores from the Department of Ecology's rating system. Table 2 summarizes this information on wetland categories and buffer widths.

Wetlands A and C are rated Category II; while Wetlands B, D, and E are rated as Category III according to the Department of Ecology's *Washington State Wetland Rating System for Western Washington*. According to the Burien Municipal Code (Burien 2008a), Wetlands A and C are rated Category 2, while Wetlands B, D, and E are rated as Category 3.

Burien Municipal Code (BMC 19.40.310) provides for permanent protection of wetlands and their buffers by regulation of development and other activities within them. Wetland buffers provide important functions, including protection of wetland functions, water quality improvement, and wildlife habitat. The Burien Municipal Code requires a 100-foot buffer for Wetlands A and C that are Category 2, and a 50-foot buffer for Wetlands B, D, and E because they are Category 3.

Table 2: Wetland Rating Summary for Burien NERA

Wetland	Area (ft^2)	Area (acre)	Ecology Category[1]	Burien Category[2]	Buffer Width (ft^2)[3]
A	23,758	0.55	II	2	100
B	21,733	0.50	III	3	50
C	144,857	3.33	II	2	100
D	17,896	0.41	III	3	50
E	5,256	0.12	III	3	50

1–Wetland category based on Ecology rating system (Hruby 2004).
2 –Wetland and stream classification according to Burien Municipal Code (Burien 2008a)
3–Buffer width according to Burien Municipal Code (Burien 2008a)

Other Regulatory Issues

Several federal and state regulations affect development in critical areas. Agencies that may have jurisdiction over wetlands and streams include, but may not be limited to: the U.S. Army Corps of Engineers (Corps); Washington State Department of Ecology (Ecology), and Washington Department of Fish and Wildlife (WDFW).

The Corps administers Section 404 of the Clean Water Act, which regulates the discharge of dredged or fill materials into waters of the United States, including adjacent wetlands. The onsite wetlands are likely to be under the jurisdiction of the Corps because they are hydrologically associated with the West Fork of Miller Creek, which eventually outlets to the Puget Sound. Only Corps staff can make a Jurisdictional Determination (JD). It is our opinion that there is good probability that the Corps will take

jurisdiction; however that remains to be confirmed.

Ecology administers Section 401 of the Clean Water Act and has the authority to take jurisdiction over the onsite wetlands regardless of whether the Corps takes jurisdiction or not. Again, only Ecology can make the jurisdictional call, but they do have the authority to do so under the water quality provisions in the WAC (Washington Administrative Code).
The West Fork of Miller Creek is reported to be fish-bearing stream (resident cutthroat trout), so it is likely that WDFW will require a Hydraulic Project Application (HPA) approval for any work below the ordinary high water mark.

III. Review of Plans, Policies, and Development Regulations

Burien Special Planning Area 4 Comprehensive Plan Policies, Zoning Regulations, and Design Standards 2003-2004

The NERA is designated by the City of Burien Comprehensive Plan and Zoning Code as Special Planning Area 4. All development must conform to those standards set out in those policies and regulations. The Comprehensive Plan Policy for Special Planning Area 4 was adopted in 2002-2003 and provides the current policy framework for the associated zoning regulations and design standards for the NERA.

Uses
The development and siting of uses is affected by FAA regulations for runway protection. The permitted uses within SPA 4 should be airport-compatible, have minimal environmental and land use impacts, and support family-wage jobs. The specific permitted uses vary by subarea. In addition to specific subarea uses, open space, multi-purpose trails, and studio space for artists are also encouraged. Subarea A should be the most restrictive in terms of land use intensity and potential impacts. Allowable land use intensity and potential impacts increase from subarea A to B and from subarea B to C. As such, uses permitted in subarea A are also permitted in subarea B and C. Uses permitted in subarea B are also permitted in subarea C.

Figure 5: Special Planning Area 4 Map

Subarea A
Least intensive land uses and impacts

- Office, high tech
- Plant nurseries, cemeteries, parking, artist studios, recreation
- Low density and two story height limit

Subarea B
Moderate intensity and moderate impacts

- Subarea A uses
- Light Manufacturing
- Dense and higher than two stories
- Would require increased buffers and setbacks along north boundary (S 140th and 138th)—due to proximity to residential uses

Subarea C

Most intensive land uses and impacts

- Subarea A and B uses
- Air cargo
- Light manufacturing/ warehousing
- New car sales

Any new development within SPA 4 is currently reviewed under the standards of the 2002-2003 comprehensive plan and zoning code policies and regulations, including a two-acre minimum on development.

Transportation

Developments should cluster to provide internal circulation and minimize access requirements. Primary access should be from Des Moines Memorial Drive, S 140th Street, or S 144th/S 146th Street. As heavy trucking is not allowed as a principal use, the transportation system would not be designed to accommodate such uses under the currently regulations. Developments shall provide facilities for pedestrian and non-motorized circulation. Further, the development of the area should provide linkages to greater Burien bicycle and pedestrian routes.

Performance and Design Standards

The comprehensive plan provides policies that direct the development of performance and design standards. The standards consider: aquifer recharge; streams and wetlands; plants and animals; air quality; scenic resources; housing; transportation and access; utilities; storm drainage; noise; light and glare. Specific design standards can be found in the Burien Municipal Code, Chapter 19.

Site Development Standards

The minimum site required for a new use or development is two acres. The maximum building height shall be 30 feet in subarea A and 45 feet in subarea B and C. In all subareas, a lesser maximum building height may be determined by FAA requirements. There is no established building coverage percentage for development in SPA 4; however, all sites must not exceed the maximum impervious surface coverage of 75 percent. No setbacks are required, unless landscaping is required. Developments should use landscape and screening to reduce glare and visibility of storage areas and related activities.

Burien Special Planning Area 4 Design Standards

The design standards in chapter 19.48 of the Burien Municipal Code (BMC) comply with the City's Comprehensive Plan Policy SE 1.5. Site development should be coordinated with adjacent properties. This will allow a cohesively developed area that minimizes adverse impacts and ensures an efficient and effective transportation system. The design standards provide requirements for site planning and design; pedestrian and non-motorized circulation; vehicle access and parking; building design; and surface water treatment. Surface water treatment should result in no net increase.

NEST Study 2004

The New Economic Strategy Triangle (NEST) Study concluded the highest and best use for the properties identified and evaluated near Sea-Tac airport is product-oriented uses that include manufacturing, logistics, value-added assembly, distribution, and warehousing. The NERA was included as one of the study areas.

In terms of redevelopment, the greatest long-term benefit is the off-airport market (users that benefit from close proximity to airports), while the general industrial market offers the opportunity for immediate benefits. The NEST Study also concluded that the best strategy is to accommodate the general industrial market in the near-term, while remaining flexible for the needs of off-airport users in the long-term. The NEST Study divided the Burien's Northeast Redevelopment Area (NERA) into five distinct areas based upon similar conditions in terms of property ownership, feasibility of property acquisition, and the degree of regulation necessary. These five areas combined are referred to as the Northeast Special Planning Area (NESPA). It was determined property acquisition and development was not feasible for two of the areas, so the analysis focused on the three areas nearest Sea-Tac Airport. The market analysis for each of the three feasible areas identified building sizes, lot coverage,

grading, and other site design elements for conversion to industrial uses.

The five areas within the NEST Study NESPA translate to the Subareas defined in the adopted Comprehensive Plan map as follows:

- Subarea A: NESPA area 5
- Subarea B: NESPA area 1, 2, and 4
- Subarea C: NESPA area 3

Figure 6: NEST Study Area Map

However, the boundary between NESPA areas 2 and 5 is different than the Burien Comprehensive Plan boundary between subareas A and B.

The NESPA boundaries follow the FAA boundary for the Approach Transition Zone (ATZ), while the City of Burien SPA 4 boundary follows parcel boundaries. A small portion of SPA 4 subarea A encroaches into the ATZ.

NERA Planned Action EIS 2002-2003

The Final Supplemental Environmental Impact Statement for the Northeast Special Planning Area (SEIS) analyzes three land use intensity and location alternatives. Alternative 1, includes the entire study area. Alternative 2 includes the area affected by the airport overlay zone. Alternative 3 proposes no action. The SEIS then evaluates each alternative and identifies the effects and impacts on earth, water, land, energy, land use, transportation, housing, economics, utilities, noise and glare. The SEIS identified Alternative 1 as the preferred alternative.

14.05.060 Planned Actions of the Burien Municipal Code serves to expedite the permit review process for projects within Special Planning Area 4. To qualify as a planned action several requirements listed in the ordinance must be met. The development must not be deemed an essential public facility and must be consistent with SPA 4 Comprehensive Plan policies and SPA 4 zoning regulations. The environmental impact associated with the proposed use must have been addressed in the SEIS. Lastly, the proposal must not exceed development thresholds established in the SEIS.

FAA Regulations

The Federal Aviation Administration (FAA) has a number of regulations associated with the path of aircraft coming in and out of the airport. These regulations are in place to ensure safety and compatibility of land uses. The following FAA zones are present in the NERA. Please refer to Exhibit 3 in Section VI for a map of the FAA regulations.

ATZ: Approach Transition Zone
RPZ: Runway Protection Zone
CAA: Controlled Activity Area
XOFA: Extended Object Free Area
XXOFA: Double Extended Object Free Area

A small amount of the NERA lies within the Runway Protection Zone (RPZ). In the RPZ, no structures are permitted, but parking and passive recreation may be allowed in the Controlled Activity Area (CAA) of the RPZ. Per agreements in place with the FAA, the Port of Seattle has the ability purchase and develop parcels (#) located in the eastern portion of the NERA to airport compatible land uses. Although development on parcels (#) in the Double Extended Object Free Area (XXOFA) in the Approach Transition Zone, on the Northern end of the NERA may only be developed with infrastructure such as roads and stormwater, parking and passive recreation, no structures. Additionally, parcels (#), located in the XXOFA are also limited to parking or infrastructure uses. The regulations of these properties is based on the location of the parcel and what type of funds were used to purchase this property. For example, more stringent regulations are in place for future development of land purchased with federal money. Please refer to Exhibit 3: Aviation Constraints Map in Section VIII.

Regional FAA policies require that land uses in the ATZ of the proposed third runway meet the following criteria:

- *Be an aeronautical use or provide a noise buffer*
- *Be compatible with airport operations*
- *Not attract wildlife*
- *Not interfere with navigational aids*

Taken from EIS

IV. Market Analysis

Introduction & Scope

This market assessment presents market conditions for four general land use categories—industrial, office, retail and residential—that may be used to inform financial modeling in support of alternative redevelopment strategies developed by the consultant team in conjunction with the City of Burien and the Port of Seattle. New residential uses are not contemplated for NERA, but an understanding of the area's residential market is needed to inform economic development strategies that may seek to encourage non-residential uses on land that is currently in residential use.

Summary & Key Findings

While this assessment was not intended as a highest-and-best use analysis for the NERA, the information gained in the process of investigating market conditions can help to identify opportunities for the NERA and be used alongside public policy objectives to frame alternative economic development strategies.

Listed below are key findings from research of each of the identified land use categories:

Industrial

- Regional fundamentals for industrial/distribution are strong .
- The NERA is well positioned to compete with existing and proposed off-airport industrial space because of its access to Highway 509 and 518, very close proximity to the airport in general and to the on-airport industrial space at the north end of the airport.
    - Industrial land near the airport is poised to experience continued demand through regional cargo trade.
    - Burien could take advantage of the trend in industrial users moving south from the Duwamish Industrial Center in Seattle.

Office

- Burien has experienced little new office construction as a secondary suburban office hub and represents a small portion of regional office supply.
- Current Burien office stock is generally comprised of low-rise Class B space for small users.
- Burien contains a node of medical office space near the Highline Medical Center.
- The NERA could support professional offices, medical office and other office uses that are not very location-sensitive, but the amount of existing available office space in the market suggests that a professional/medical office complex in NERA would have to differentiate itself from existing product to be viable.
- The site's size and location near the airport may make it desirable for a larger build-to-suit project for a corporate user seeking proximity to the airport.

Retail

- The regional retail market has grown very quickly and is likely oversupplied given the contraction in consumer spending and planned slowdowns in expansions and in many cases, store closures, by national retailers.
- With the exception of car dealerships, Burien does not have many retailers that draw from outside the local trade area; regional retail opportunities are limited because Burien, and the NERA itself, are within the trade area of Southcenter Mall and regional retailers in Tukwila.
- While the retail vacancy rate in Burien is low, the area has experienced negative absorption over the past year.

- Redevelopment projects within downtown are seeking to re-format the Burien retail experience.
    - Most of the NERA is not ideal for general or large-format retail given the lack of visibility from major arterials. That said, should large contiguities of land be assembled, the area could be viable for large-format retail given the seeming lack of large, appropriately zoned sites in the trade area.
    - The Lora Lake triangle presents much more favorable conditions for retail, and presents an opportunity for large-format retail given the size of the land assemblage south of Highway 518.

Residential

- The regional residential market is more stable than many others in the nation but is weak due to a contraction of credit, the expansion of which in previous years had fueled rapid price escalations.
- In the short-term, lower home prices and a lack of credit for developers will likely limit new supply.
    - Further softening of the housing market could aid redevelopment of existing residential land to non-residential uses.
    - Assemblage of small parcels would be critical to facilitating a transition to non-residential uses on existing residential land.

Please refer to Technical Appendix C for the complete Market Analysis Report.

V. Case Study Research

The following case studies are intended to provide a brief example of present, existing conditions near large, urban airports. Case Studies include Boise, Idaho; Chicago, Illinois; and Portland, Oregon. These three case studies were chosen because of their representation of three different schemes for airport adjacent land use. In Boise, office, light manufacturing, and wholesale warehousing have begun to thrive. In fact, Boise has recently developed standards to limit office construction preserving industrial land for other uses. In Chicago, instead of redeveloping the residential areas surrounding Midway Airport, the City has established a comprehensive residential sound insulation program for every residence within the 65 Ldn isoline. In Portland, airport supportive land uses encircle the airport and recently added a Port owned retail center. Each of the case studies

Case Study One: Boise

Zoning

Between 2000 and 2006, Boise added more than 1.6 million square feet of office, commercial, and industrial space in the Airport Planning Area. The Airport Influence Area Overlay District requires land use in the planning area to be compatible with airport operation. Within the Airport Planning Area, industrial zoning controls much of the development, with land immediately adjacent to the terminal zoned commercial. The Airport Planning Area also contains a large amount of zoned open space.

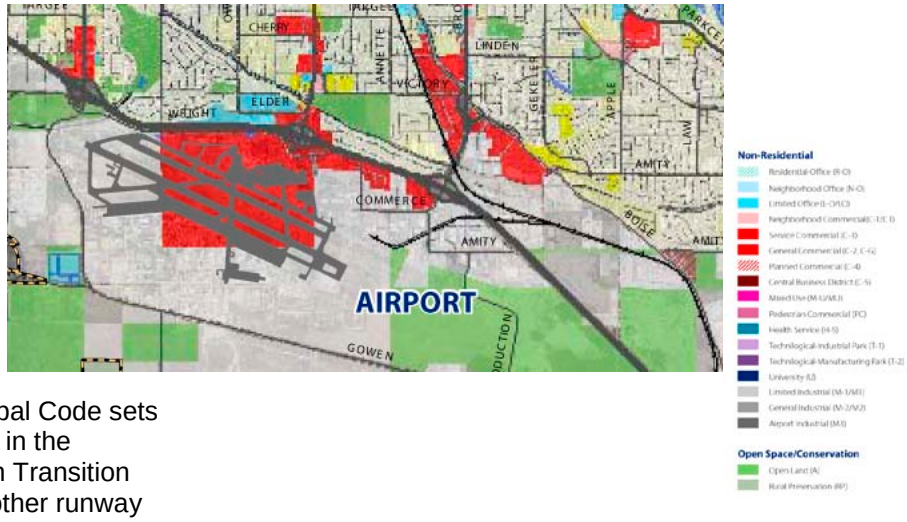
Figure 7: Boise Aerial

Boise City relies on a mixture of zoned requirements and comprehensive plan policies to carry out development regulations. The comprehensive plan policies protect the Airport Planning Area from the encroachment of residential uses and for the encouragement of light manufacturing, office, agriculture, low-intensity recreation, and commercial uses associated with air travel. The majority of industrial land is zoned Limited Industrial M-1, which is intended to accommodate light manufacturing and warehousing. The regulations of Title 12 of the Boise Municipal Code supersede the height requirements of the zone districts for land near the airport. Title 12 of the Boise Municipal Code sets maximum tree and building heights in the Runway Protection Zone, Approach Transition Zone, Noise Transition Zone, and other runway associated zones based upon the distance of the development from the end of the runway. For example, in the Approach Transition Zone (ATZ), one foot of height is gained for each seven feet of distance from the runway. Title 12 also supersedes use standards; chiefly, for industrial uses in the Noise Transition Zone, minimum required open space is 50% of the parcel, street frontage must exceed 100 feet, and minimum lot size is set at 15,000 sf.

Existing Land Use

The Airport Planning Area's land use designation is Airport. The land use is comprised largely of warehousing and light industrial users that are benefited by close proximity to the airport. Previous provisions allowed office uses to intensify near the airport. To preserve industrial lands and maintain office components to industrial uses, the City of Boise created a provision allowing a maximum of 25 percent office within each structure. In addition to warehousing, light industrial uses, and office uses, the airport area serves several large users and property owners. The Idaho Air National Guard and the National Interagency Fire Center are both located near the airport. The NIFC and the United States Forest Service use close proximity to Boise Airport to coordinate and conduct wild land firefighting. The Bureau of Land Management, Idaho Air National Guard, National Interagency Fire Center (NIFC), Boise City, and the Boise Airport are the major property owners in the Airport Planning Area.

Figure 8: Boise Zoning Map



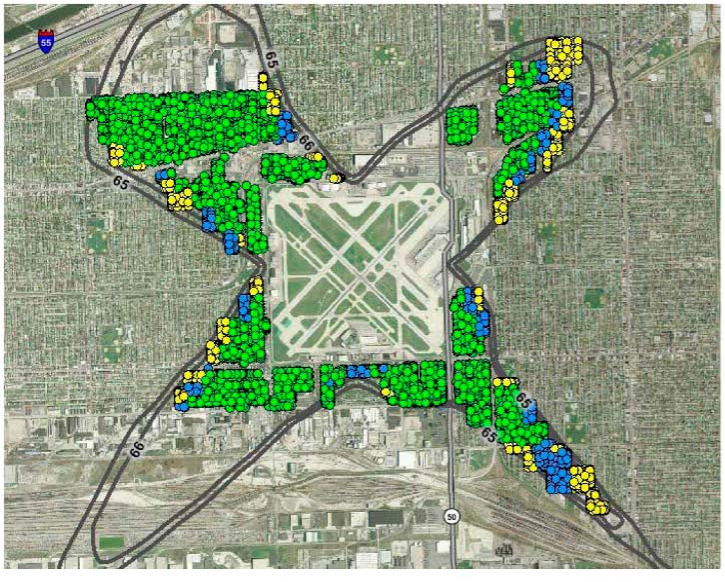
Case Study Two: Chicago

Zoning

Midway International Airport covers a square mile near downtown Chicago. The square mile extent is surrounded by residential and commercial uses. In 1996, the City of Chicago began a comprehensive residential sound mitigation program to insulate residences within the 65 Ldn contour.

Figure 9: Chicago Zoning Map

Figure 10: Midway Insulation Map



The Airport Insulation Map demonstrates the impact of this program since 1996 with the last of the residences slated for insulation in 2008. As shown in the Midway Airport Zoning Map most of the area surrounding the airport is zoned residential with manufacturing to the North of the airport. The industrial area to the South of the airport lies outside the City of Chicago.

Figure 11:Midway Aerial

Existing Land Use

With single family and multi-family residential and commercial uses immediately adjacent to Midway International, the character of the existing land use is that of a neighborhood. The neighborhood scale is also evident in the rectilinear street grid based on blocks 640 feet by 300 feet. As the airport dates back to the 1920s, compatibility wasn't achieved between the airport and surrounding land uses.

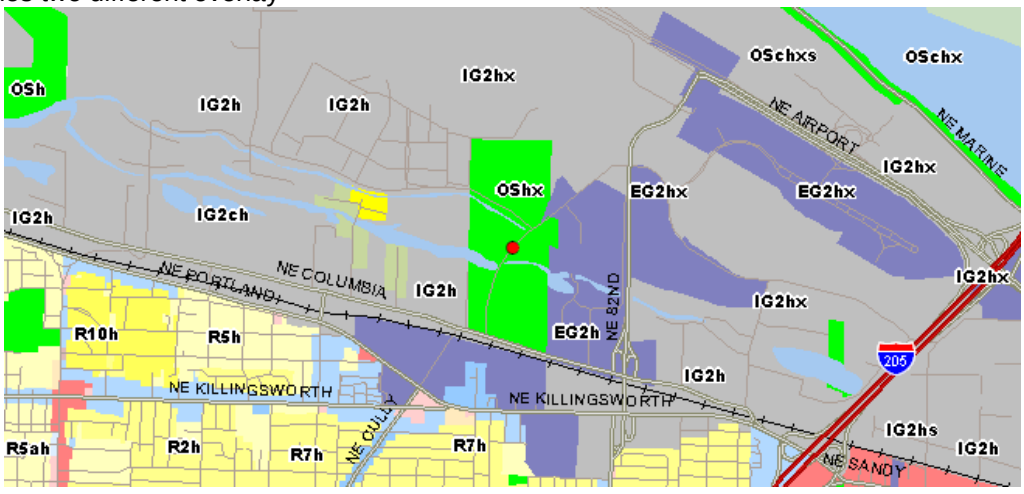
Case Study Three: Portland

Zoning

The Portland International Airport is located along the Northern edge of the City in an advantageous position against the Columbia River. As such, the airport only impacts land use on three sides. Areas near the Portland International Airport are zoned EG or IG. General employment zones provide for mixed employment opportunities that focus on industrial and industrial-related uses. The 2 in EG2 and IG2 relates to the character of the zone. In 2 zones, the parcels are generally larger on an irregular block pattern. Usually, the building coverages range from low to medium and the buildings are setback from the street. The City of Portland applies two different overlay designations to properties near the airport. The first is the Aircraft Landing (h) overlay zone. The second is the Portland International Airport Noise Impact (x) overlay zone. The (h) overlay provides additional height restrictions to the base zone for properties near the airport. The (x) overlay limits requires noise insulation and restricts new residential construction based upon noise contours. No new residential uses are allowed within noise contours of Ldn 68 or greater and new residential uses within noise contours Ldn 65 to 68 are required to dedicate a noise easement.

Existing Land Use

Lands located near the airport are characterized by large lot industrial, employment, and open space uses. This includes warehousing, light manufacturing, office, large format retail, and golf courses and other open space. The IC2hx zones include some off-airport uses such as a wholesale distribution center for airline caterer Sky Chefs Inc. The EC2hx zone includes airport supportive land uses and Cascade Station Retail Center to the east of the airport. The center is owned by the Port of Portland and includes IKEA, Best Buy, and several other retailers.



VI. Existing Conditions Maps

Exhibit 1: NERA Overview & Vicinity Map

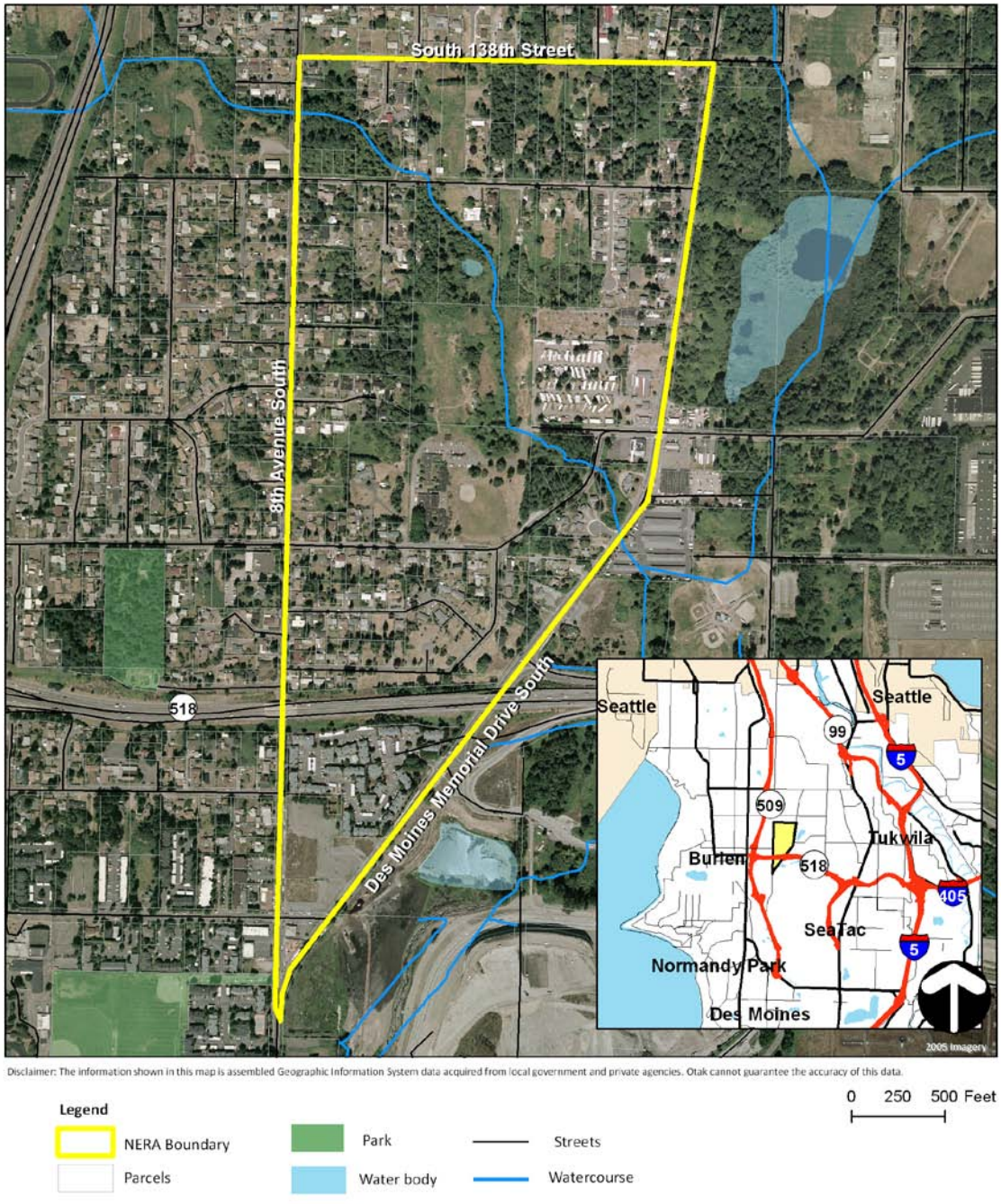


Exhibit 2: NERA Zoning

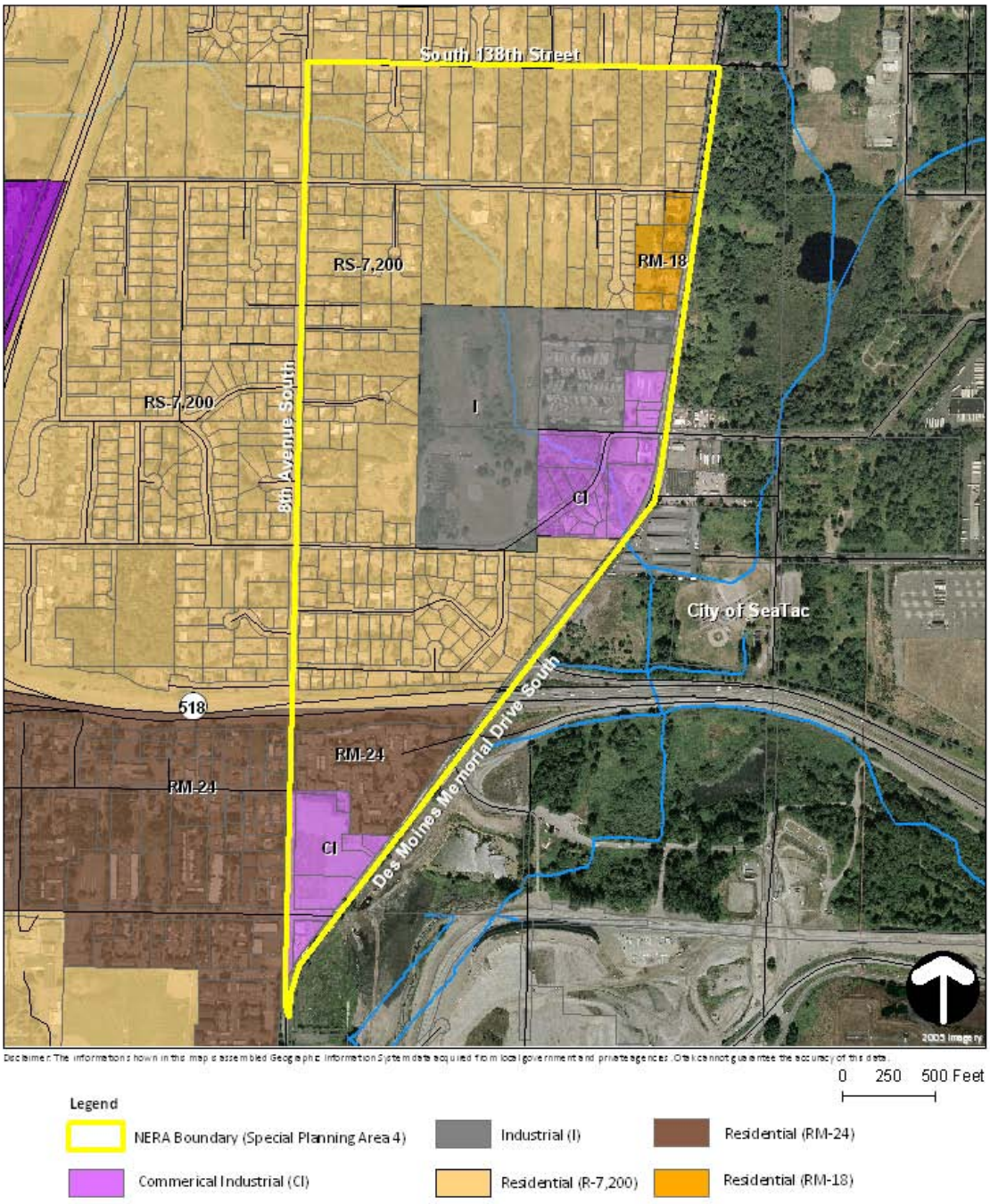


Exhibit 3: NERA Aviation Constraints

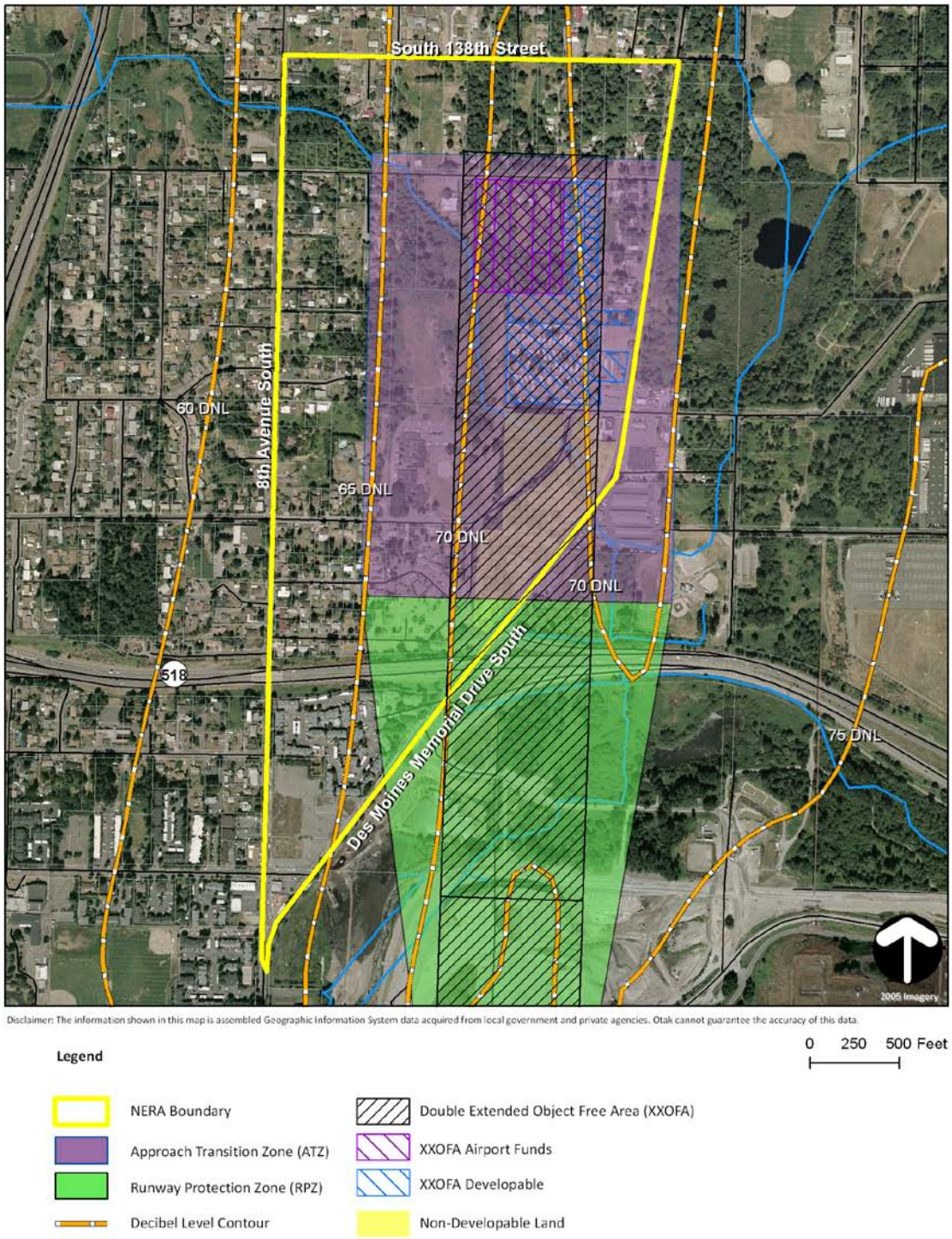
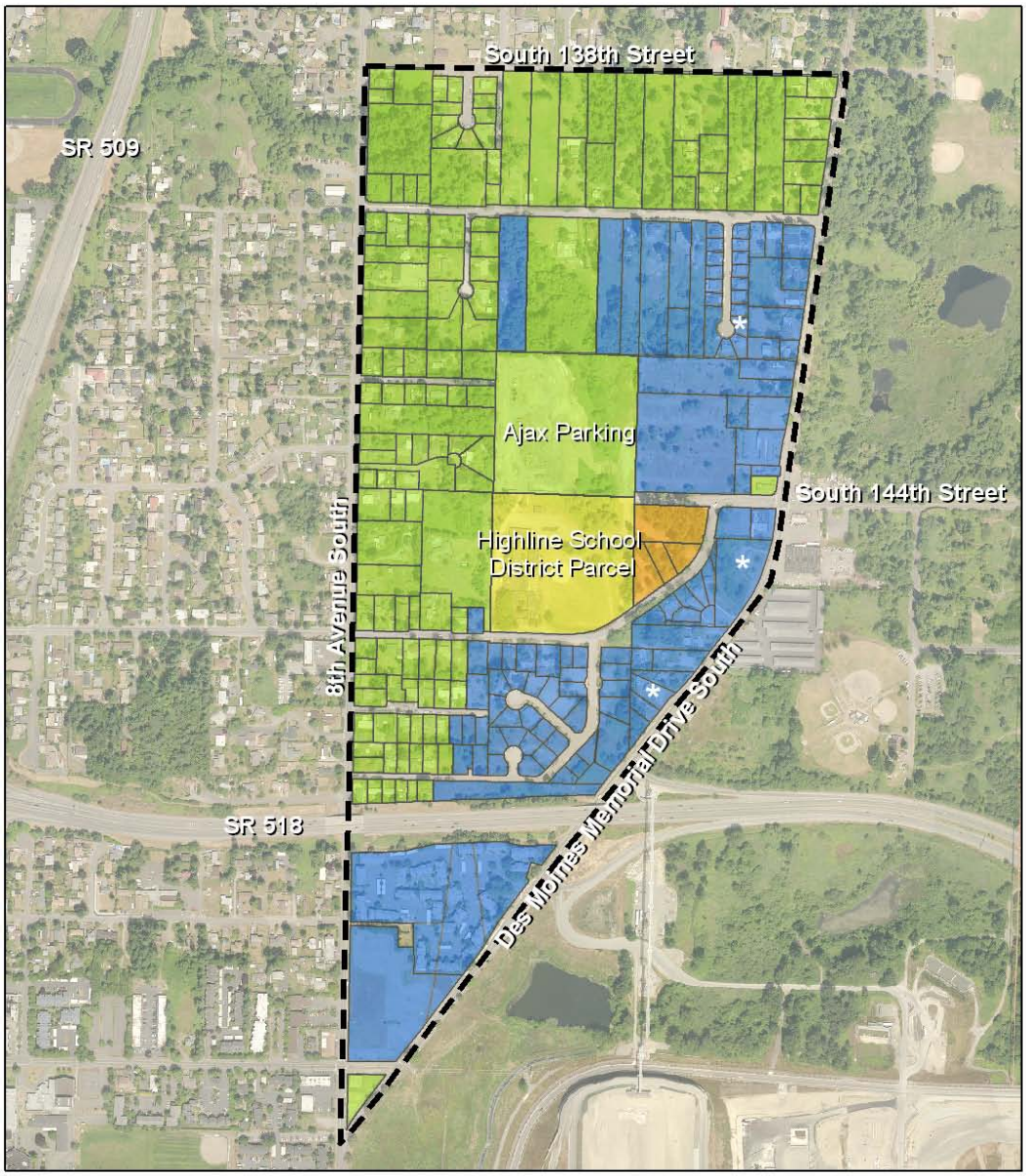


Exhibit 4: NERA Property Ownership



Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

Legend

- NERA Boundary
- Private Property
- Port of Seattle Ownership
- Port of Seattle Plans to Buy
- City of Burien Ownership
- Highline School District Ownership

Exhibit 5: NERA Street Conditions

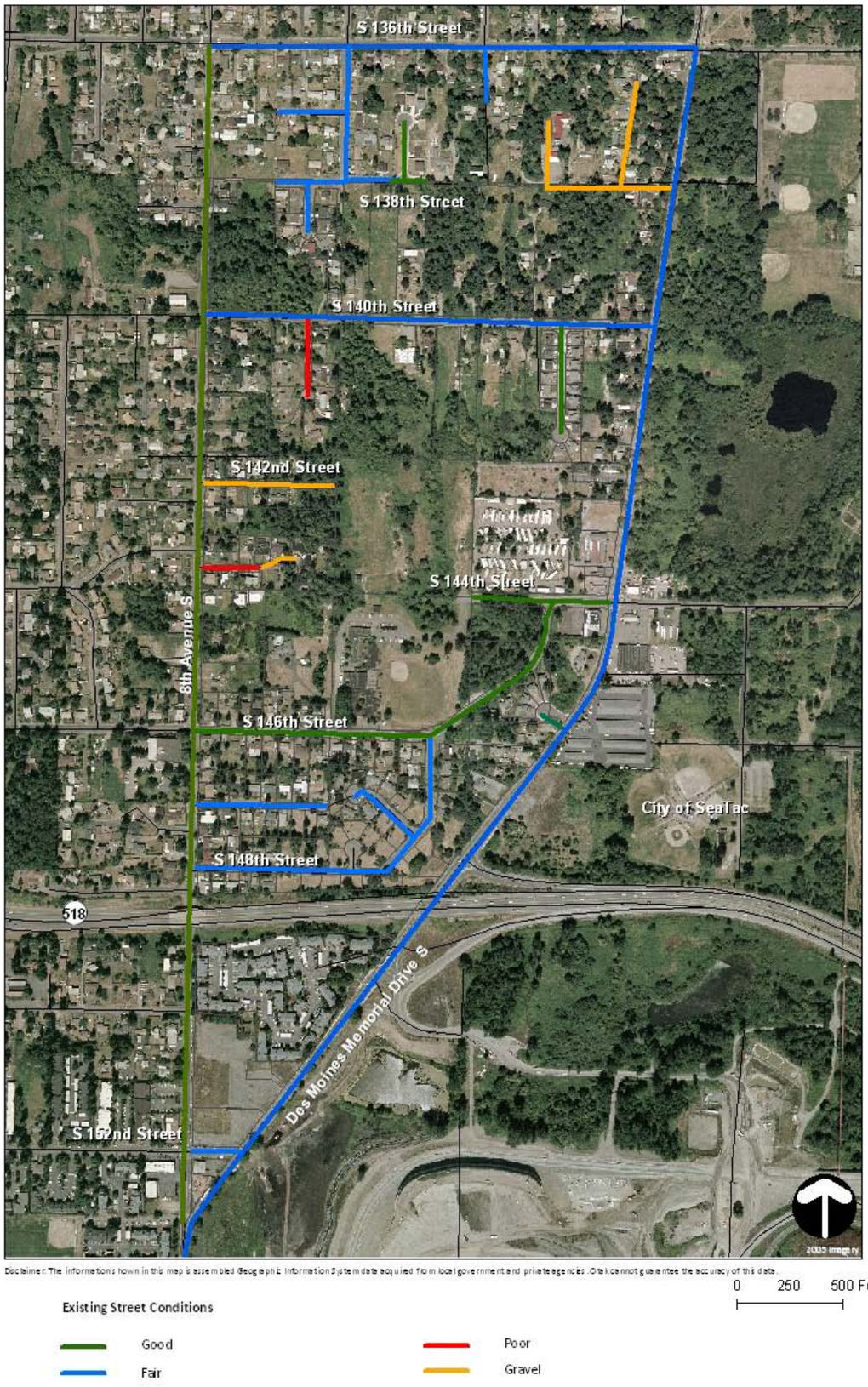


Exhibit 6: NERA Water District Jurisdiction

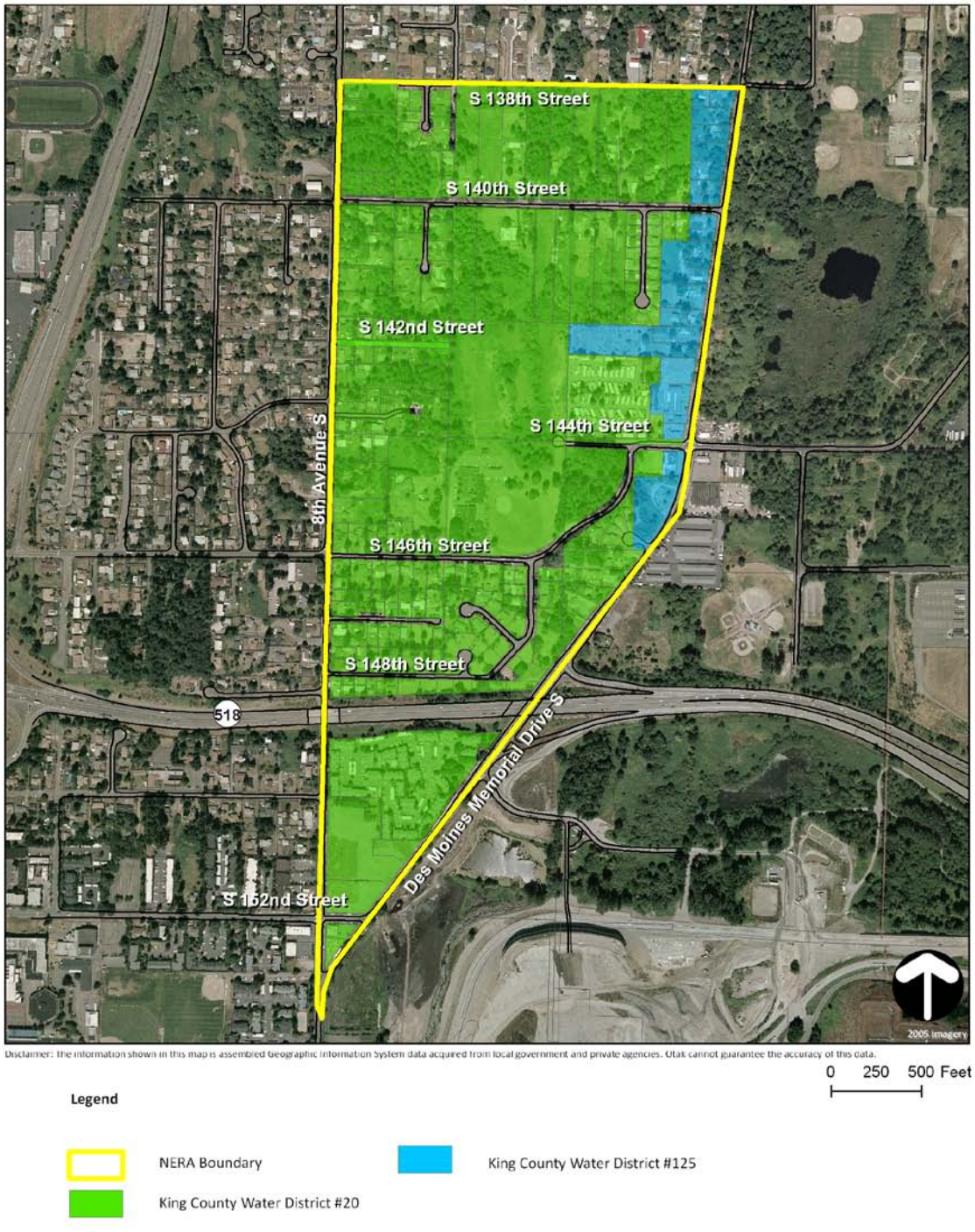


Exhibit 7: NERA Sewer District Jurisdiction

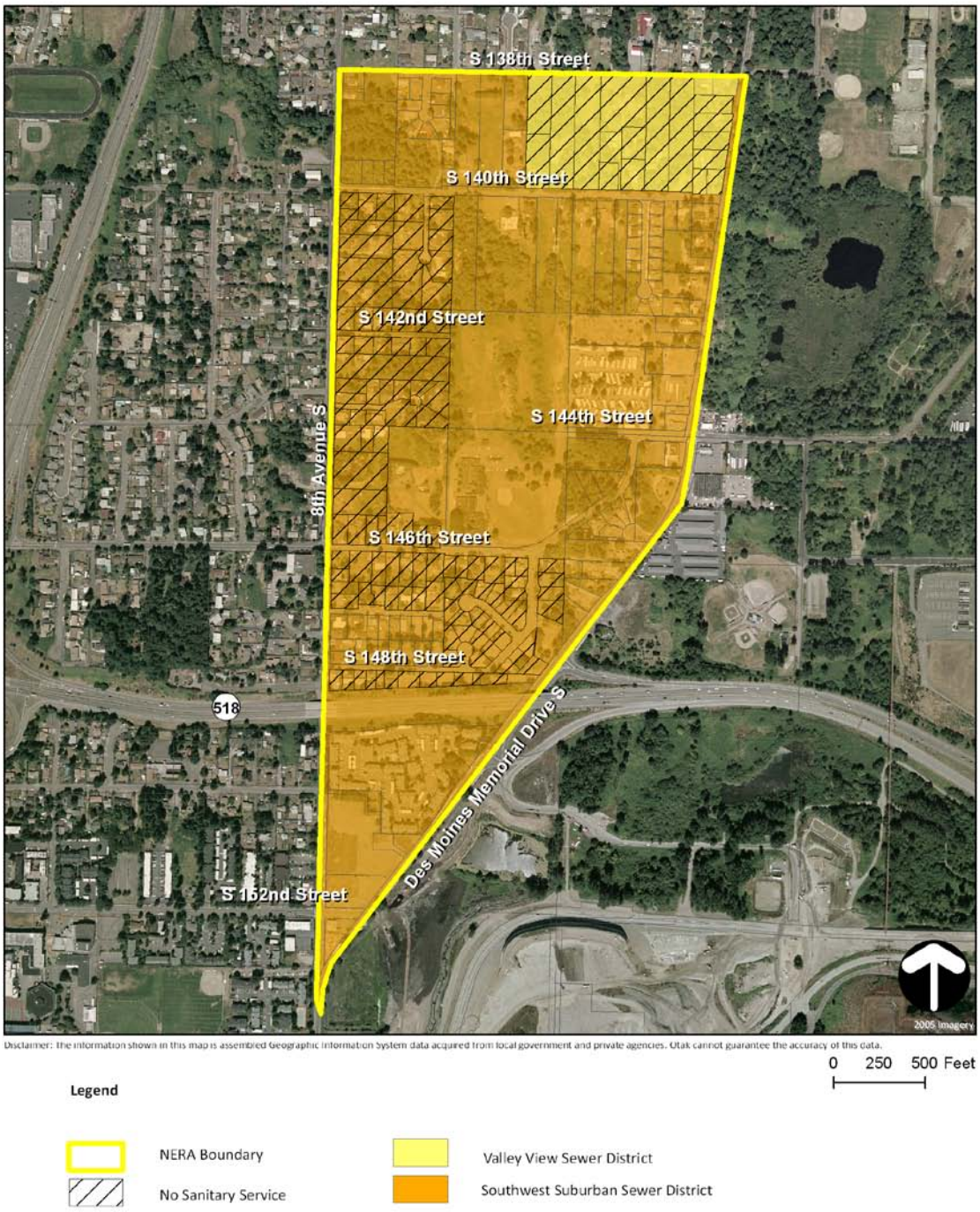


Exhibit 8: NERA Wetland Map
(DRAFT)

Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

Legend

- NERA Boundary
- Wetland Buffer
- Delineated Wetland
- 50 ft Stream Buffer
- Miller Creek

VII. Appendix (under separate cover)

Appendix A - Infrastructure Technical Memorandum

Appendix B—Critical Areas Study

Appendix C—Burien NERA Market Conditions Report

VIII. References

City of Burien, Northeast Special Planning Area, Final Supplemental Environmental Impact Statement (Final SEIS), Prepared by EDAW, Inc., Prepared for City of Burien, November 2002.

King County iMap, King County GIS Center, 201 South Jackson Street, Suite 706, Seattle, WA 98104, http://www.metrokc.gov/gis/Mapportal/iMAP_main.htm

Southwest Suburban Sewer District Map, CHS Engineers, LLC, October 2007

Southwest Suburban Sewer District Web Page, http://www.swssd.com/

Valley View Sewer District Web Page, http://www.valvue.com/home.asp

King County Water District No. 20 Web Page, http://www.kcwd20.com/

King County Water District No. 125 Web Page, http://www.waterdistrict125.com/

Seattle Public Utilities Web Page, http://www.seattle.gov/util/services/

Field Visit, July 30, 2008.

City of Burien GIS Data, year.

The Burien Plan, Comprehensive Plan for the City of Burien, Washington, November 2006.

Highline Choice Academy Web Page, http://www.hsd401.org/ChoiceAcademy/History.htm

City of Burien Northeast Redevelopment Area (NERA) Ownership Map, dated December 2007.

King County, Water & Land Resources Division, Drinking Water Supply Website: http://www.kingcounty.gov/sites/environment/waterandland/drinking-water/sources.aspx

Microsoft Live Search Maps, (used for aerial photography & mapping), last accessed yesterday, **August 14, 2008,** http://maps.live.com/

Google Maps, (used for aerial photography & mapping), last accessed yesterday, **August 14, 2008,** http://maps.google.com/

Soil Survey, King County, Washington, Series 1938, No.31, Issued Septemeber 1952, USDA.

GVA Kidder Mathews, NERA Real Estate Report, 2006.

EDAW, Inc., Northeast Special Planning Area EIS, 2002.

Central Puget Sound Economic Development District, NEST Study: Development Properties around Sea-Tac Airport, 2004.

Summerhays, Diane, ATZ Land Acquisition in Burien, 2005.

J.A. Brennan and Associates & Pomegranate Center, City of Burien: City of Burien Pedestrian and Bicycle Facilities, 2004. *<http://www.burienwa.gov/publicworks/bike_ped.htm>*

Washington Department of Transportation, Miller and Walker Creek Basin Plan, 2006.

Burien Municipal Code, 14.05.060 Planned Action Ordinance, 2005.

City of Burien, Comprehensive Plan: Policies relating to the Northeast Redevelopment Area/Special Planning Area 4, 2007.

Burien Municipal Code, 19.48, Special Planning Area 4 Design Standards, 2007.

Burien Municipal Code, Section 19.15.070, Special Planning Area 4 Zoning regulations (SPA-4), 2007.

Washington State Department of Transportation, Airport and Compatible Land Use, Volume 1, 1999.

City of Calgary, Plan it │Calgary: Integrated Land Use and Mobility Plan, 2007.

King County iMap, King County GIS Center, 201 South Jackson Street, Suite 706, Seattle, WA 98104, http://www.metrokc.gov/gis/Mapportal/iMAP_main.htm

Southwest Suburban Sewer District Map, CHS Engineers, LLC, October 2007

Field Visit, July 30, 2008.

City of Burien GIS Data, 2005, 2007.

The Burien Plan, Comprehensive Plan for the City of Burien, Washington, November 2006.

Highline Choice Academy Web Page, http://www.hsd401.org/ChoiceAcademy/History.htm

City of Burien Northeast Redevelopment Area (NERA) Ownership Map, dated December 2007.

King County, Water & Land Resources Division, Drinking Water Supply Website: http://www.kingcounty.gov/sites/environment/waterandland/drinking-water/sources.aspx

Microsoft Live Search Maps, (used for aerial photography & mapping), last accessed, **August 14, 2008,** http://maps.live.com/

Google Maps, (used for aerial photography & mapping), last accessed yesterday, **August 14, 2008,** http://maps.google.com/

Soil Survey, King County, Washington, Series 1938, No.31, Issued Septemeber 1952, USDA.

Brinson, M. M. 1993. *A hydrogeomorphic classification for wetlands*. Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

Burien. 2008a. City of Burien Municipal Code—Chapter 19.40 Critical Areas. Obtained from website: http://www.ci.burien.wa.us/commdvlpmnt/zoning/zoningcodeindex.htm

Burien. 2008b. City of Burien Critical Areas Map. Obtained from website: http://www.ci.burien.wa.us/commdvlpmnt/zoning/criticalmap%2010-03.pdf

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe.1979. *Classification of Wetlands and Deepwater Habitats of the United States.* U.S. Fish and Wildlife Service Publication FWS/OBS-79/31, Washington, D.C.

Hruby, T. 2004. *Washington State Wetland Rating System for Western Washington*. Washington State Department of Ecology Publication No. 04-06-025. Olympia, Washington.

Hruby, T., T. Granger and E. Teachout. 1999. *Methods for Assessing Wetlands Functions. Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington, Parts 1 and 2.* Washington State Department of Ecology Publication #99-115, Washington State Department of Ecology, Olympia, Washington.

King County. 2006. *Miller and Walker Creek Basin Plan*. Prepared by King County Department of Natural Resources, City of Burien, City of Normandy Park, City of SeaTac, Port of Seattle, and Washington Department of Transportation.

Olson, P. and E. Stockdale. 2008. *Determining the Ordinary High Water Mark on Streams in Washington State*. Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. Ecology Publication # 08-06-001.

Washington State Department of Ecology. 1997. *Washington State Wetlands Identification and Delineation Manual*. Ecology Publication #96-94, Washington State Department of Ecology, Olympia, Washington.

Washington State Department of Ecology. 2008. *Focus Sheet: Shorelands and Environmental Assistance, Using the Wetland Rating System in Compensatory Mitigation* Ecology Publication #08-06-009, Washington State Department of Ecology, Olympia, Washington.

Williams, R. Walter, Richard M. Laramie and James J. Ames. 1975. *A Catalog of Washington Streams and Salmon Utilization. Volume 1, Puget Sound Region*. Washington Department of Fisheries.

A

Appendix - Section 2

NERA Market Conditions Report

CITY OF BURIEN

NE Redevelopment Area
Market Conditions Report

HEARTLAND

July 2008

Burien NERA Market Conditions Report

Introduction & Scope

In 2003 Burien joined the NEST Partnership to explore economic growth potential in South King County. A result of this partnership was the identification of the Burien Northeast Redevelopment Area, or NERA, as an assemblage of underutilized properties adjacent to SeaTac airport that could be potentially redeveloped. Following this, Otak, Inc. was retained by the City of Burien as lead consultant to create a redevelopment strategy for NERA. Heartland was engaged by Otak as a sub-consultant for this project to provide services related to existing conditions research and market analysis. Data gathered in this market assessment will be included in the consultant team's Existing Conditions Summary Report for NERA.

This market assessment presents market conditions for four general land use categories—industrial, office, retail and residential—that may be used to inform financial modeling in support of alternative redevelopment strategies developed by the consultant team in conjunction with the City of Burien and the Port of Seattle. New residential uses are not contemplated for NERA, but an understanding of the area's residential market is needed to inform economic development strategies that may seek to encourage non-residential uses on land that is currently in residential use.

Executive Summary & Key Findings

While this assessment was not intended as a highest-and-best use analysis for the NERA property, the information gained in the process of investigating market conditions can help to identify opportunities for the NERA site and be used alongside public policy objectives to frame alternative economic development strategies.

Listed below are key findings from research of each of the identified land use categories:

- Industrial
    - Regional fundamentals for industrial/distribution are strong .
    - The NERA site is well position to compete with existing and proposed off-airport industrial space because of its access to Highway 509, very close proximity to the airport in general and to the airport entrance and on-airport industrial space at the north end of the airport.
    - Industrial land near the airport is poised to experience continued demand through regional cargo trade.
    - Burien could take advantage of the trend in industrial users moving south from the Duwamish Industrial Center .
- Office
    - Burien has experienced little new office construction as a secondary suburban office hub and represents a small portion of regional office supply.
    - Current Burien office stock is generally comprised of low-rise Class B space for small users.
    - Burien contains a node of medical office space with Highline Medical Center affiliation.

- The NERA site could support professional offices, medical office and other office uses that are not very location-sensitive, but the amount of existing available office space in the market suggests that a professional/medical office complex in NERA would have to differentiate itself from existing product to be viable.
- The site's size and location near the airport may make it desirable for a larger build-to-suit project for a corporate user seeking proximity to the airport.

- Retail

  - The regional retail market has grown very quickly and is likely oversupplied given the contraction in consumer spending and planned slowdowns in expansions and in many cases, store closures, by national retailers.
  - With the exception of car dealerships, Burien does not have many retailers that draw from outside the local trade area; regional retail opportunities are limited because Burien, and the NERA site itself, are within the trade area of Southcenter Mall and regional retailers in Tukwila.
  - While the retail vacancy rate in Burien is low, the area has experienced negative absorption over the past year.
  - Redevelopment projects within downtown are seeking to re-format the Burien retail experience.
  - Most of the NERA site is not ideal for general or large-format retail given the lack of visibility from major arterials. That said, should large contiguities of land be assembled, the site could be viable for large-format retail given the seeming lack of large, appropriately zoned sites in the trade area.
  - The Lora Lake triangle presents much more favorable conditions for retail, and presents an opportunity for large-format retail given the size of the land assemblage south of Highway 518.

- Residential

  - The regional residential market is more stable than many others in the nation but is weak due to a contraction of credit, the expansion of which in previous years had fueled rapid price escalations.
  - In the short-term, lower home prices and a lack of credit for developers will likely limit new supply.
  - Further softening of the housing market could aid redevelopment of existing residential land to non-residential uses.
  - Assemblage of small parcels would be critical to facilitating a transition to non-residential uses on existing residential land.

Industrial Market Analysis

Regional Trends & Activity

Domestic and international trade is a foundation of the Puget Sound region's economy. Import and export of containerized cargo, particularly through the marine terminals at the Ports of Seattle and Tacoma, has supported a robust regional industrial real estate market and has led to sustained strong growth in industrial development over the last decade. The regional market is generally divided into six submarkets—Northend, Seattle Close-In, Eastside, Kent Valley, Tacoma/Fife and Southend—with development of industrial buildings, distribution centers and warehousing facilities driven by proximity to rail and interstate highway transportation access, port facilities and land availability. The Kent Valley contains the largest percentage of regional industrial space and has largely been built out, pushing development south to the Tacoma/Fife area and in the last few years further south into Thurston and Lewis Counties as developers search for less expensive large developable parcels of land.

Despite weakened national economic conditions, the Puget Sound industrial market has remained relatively strong largely due to the area's constrained land supply and the low value of the dollar. The weak dollar has sustained overseas demand for goods that is in turn driving international exports and subsequently driving industrial growth. Although decreasing consumer confidence resulting from depressed economic conditions is likely to curb import activity of goods in the near term, the regional industrial market outlook is still positive. As of the end of the first quarter of 2008, the regional vacancy rate was very low at 5.6 percent. Strong absorption of 750,000 square feet of space was recorded and construction activity is very strong with 3,860,000 square feet under construction. Over two-thirds of this construction activity is occurring in the Tacoma-Fife and Southend submarkets as industrial uses move further south along the I-5 corridor. The region's average lease rate for distribution and warehouse space is $0.45 per square foot and $1.30 per square foot for office space that is found in flex industrial space.

Burien / SeaTac Sub-Market Trends & Activity

The Burien/SeaTac area is located within the larger Kent Valley industrial submarket and contains approximately 1.7 million square feet of space. The area's close proximity to SeaTac Airport and regional connectivity via Highway 509 to I-5 make the area ideally suited for air cargo distribution centers and other airport-related industrial development and users. Although the building types are similar to more traditional industrial space, airport-related development uses serve a smaller niche market and are highly desirable spaces to companies and site users who ship high value and/or time sensitive products via airplanes to domestic and international markets or serve airlines, such as caterers or parts suppliers. Most of the industrial space in the Burien/SeaTac market is positioned to serve airport-related users and this proximity increases rental rates above traditional industrial space like that found in the other areas like the Kent Valley. The industrially zoned areas within Burien itself are largely developed with mini-storage and light manufacturing uses however.

The airport-related industrial market can be divided into two categories: on-airport and off-airport. The on-airport market area is defined by the boundary of SeaTac Airport and contains a limited and highly constrained amount of land. At SeaTac Airport, there are currently approximately 635,000 square feet of on-site industrial space and 167,000 square feet of associated flex office space in 19 buildings at the northeast area of the airport. Most of this space is in average to good condition and is leased mainly to private sector companies who need direct runway access to load and unload cargo from airplanes. Some of the existing lessees include FedEx, SEKO, AMB and airlines including Alaska, United and Delta. The United States Postal Service also has a large warehouse including office space in this area. This direct runway access is the defining characteristic of on-airport real estate and is critical to the business operations of these lessees.

The unique nature of the supply and demand for on-airport industrial space, its role in the regional economy and constrained land area at SeaTac Airport available to accommodate these uses prompted the Puget Sound Regional Council to prepare a study in 2006 that evaluated the regional airport system and it's ability to accommodate air cargo needs over the next 20 years. Among other findings, this study concluded that with careful management and site programming the existing land area within the airport boundary will be capable of accommodating demand for on-site air cargo industrial needs for next 20 years. This study and these findings are important because they suggest that expansion of the airport boundary to include adjacent land area is not likely to be necessary.

The off-airport industrial market is driven by the need or desire of users to be in close proximity to the airport, which typically translates into time and ultimately cost savings by reducing the travel distance from their location to the airport. Different users have different criteria for what distance is ideal or close enough to the airport to serve their needs, but generally, off-airport air cargo and airport-related users want to be within a 15 minute travel time from the airport. In the Burien/SeaTac market, most existing space is located at the south end of the airport between South 188th Street SW and South 200th Street SW. This concentrated area contains over 1,000,000 square feet of mostly modern space (built between the late 1970's through 2008) that is divided into small to medium sized leasable areas ranging from a few thousand square feet to 40,000 square feet. These smaller spaces are in contrast to the large 100,000 to 500,000 square foot industrial buildings that are common in the traditional distribution center markets of the Kent Valley, Tacoma/Fife and elsewhere. Two new large buildings further to the south completed in 2008 at the ProLogis Park SeaTac are each 122,000 square feet and these represent the largest individual spaces currently on the market in the Burien/SeaTac submarket

Rental rates for off-airport industrial space in the Burien/SeaTac submarket range between $0.64 and $0.85 per square foot for warehouse space (triple net, or NNN, which means the lessee also pays for expense like electricity, water, etc.). Much of the space in the submarket is 'flex' space, which is industrial space that has an office component used by owners to run the day-to-day operations of the business. Rental rates for the office portions average between $1.01 and $1.20 per square foot (triple net). The tables and photos below provide a representative sample of current listings and building photos that illustrate typical buildings. The attached map also shows the spatial distribution of these listings in the submarket.

	Leasable SF	Avg. $/SF (Whse.)	Vacancy	2007 Absorption
Puget Sound region	[illegible]	$0.45	5.3%	752,495
Kent Valley submarket	108,118,000	$0.38	6.1%	652,558
Burien/SeaTac	1,700,000	$0.77	9.0%	N/A

INDUSTRIAL LISTINGS: Burien/Seatac submarket

	Name	Bldgs.	RSF	ASF	Year Built	Whse. Rate	Office Rate
1	ProLogis Park SeaTac	2	245,420	245,420	2008	$0.75	-
2	AMB Seattle Logistic Center I	3	244,000	40,661	1999	$0.84	$1.01
3	AMB Seattle Logistic Center II	3	229,000	40,143	2002	$0.82	$1.09
4	SeaTac Industrial Park Bldg.	1	186,259	8,169	1978	$0.60	-
5	AMB Des Moines Logistic Center	4	136,584	22,598	1999	$0.62	$1.20
6	200th Street Buiding	1	79,050	2325	1984	0.65	-
7	Pacific Gulf Airport 200	1	78,720	4,650	1988	$0.65	-
8	Leschi SeaTac Industrial Park	1	62,500	3,600	1979	0.36	-
9	Miller Beauty Supply Building	1	15,192	5,000	1975	0.75	-

6. 200th Street Building

Office Market Assessment

Regional Trends & Activity

The Puget Sound office market is relatively stratified, with demand highest in downtown Bellevue and Seattle followed by other Eastside centers (Redmond and Kirkland) and Tacoma, urban centers of Seattle (Queen Anne, Pioneer Square, Lake Union and Denny Triangle) and finally suburban office markets such as Lynnwood, Renton and Federal Way. The Puget Sound office market has sustained exceptional growth over the last five years, fueled by developments in downtown Bellevue and the Denny Triangle area of Seattle. Over 5.1 million square feet of space was under construction in the Puget Sound market as of the end of 2007, with 3.2 million square feet of that space in downtown Bellevue and 1.8 million square feet in downtown Seattle. These two markets have low vacancy rates, ranging from 9.6 percent in Bellevue to 11.1 percent in Seattle, and strong rental rates between $31 and $37 per square foot for full service space. There is growing apprehension in the market, however, that rates may decline due to an oversupply of space as these projects come online un-leased. Furthermore, large office space users such as Washington Mutual and Safeco are releasing space back to the market following economic problems and merger-related organization, respectively.

Southend & Burien / SeaTac Sub-Market Trends & Activity

The Burien/SeaTac submarket is located in the Southend office market, which also includes South Seattle, Tukwila, Renton, Kent, Auburn and Federal Way. Overall, the Southend market contains about 12 percent of the region's office space, most of which is located in Tukwila, Renton and Federal Way. Typical product types in this area are mainly older Class B buildings, although there has been some new construction. There is also a modest amount of Class A space in select areas, particularly around SeaTac Airport, Boeing facilities in Renton and around Southcenter mall in Tukwila. The vacancy rate is this larger area is significantly higher than the Seattle and Bellevue markets at 17.6 percent, and the average rental rates are lower as well, averaging $21.63 per square foot for full service space.

The Burien/SeaTac submarket contains approximately 865,000 square feet of space that is focused in two main areas: in several large buildings around SeaTac Airport and in a variety of smaller buildings throughout the Burien downtown area. Contrary to the development trends affecting Seattle and Bellevue, there has been very little new office development in the Burien/SeaTac area in recent years. Most of the office space in these areas was built during real estate development cycles in the mid-1960's and during the 1980's, and most is contained in mid or low-rise Class B structures with smaller spaces and floor plates suited for professional office users, service providers or medical offices. The exception to this are the two SeaTac Airport Center towers and an accompanying smaller office/parking structure located in the 18000 block of International Boulevard on the east side of the airport. These three buildings contain approximately 532,000 square feet of space, of which 211,000 square feet is leased to Boeing. The owner of this property also is marketing up to 600,000 square feet of build-to-suit space that could be developed behind these buildings for a large corporate user. A smaller node of office buildings is also located near Angel Lake in the southern area of SeaTac, and there is approximately 100,000 square feet of medical office space surrounding the Highline Medical Center in Burien.

The Burien/SeaTac submarket has approximately 208,000 square feet of available space and a vacancy rate of 13.9 percent. As noted, there has been very little new construction in the area, although in 2006 the 9,000 square foot Burien Professional Building was completed. Other than this building and several others that have been renovated in the last decade, most of the office space in this submarket is older and designed to accommodate small businesses. Rental rates range from $16 to $20 per square foot for most space, with asking rates peaking at $23 per square foot in SeaTac and $20 per square foot in Burien for new and remodeled space. The tables and photos below provide a representative sample of current

listings and building photos that illustrate typical building size and finishes. The comparables map at the end of this report also shows the spatial distribution of these listings in the submarket.

OFFICE	Leasable SF	Avg. Rate	Vacancy	2007 Absorption
Puget Sound Region	87,365,000	$30.48	10.9%	1,900,000
Southend Market	11,314,000	$21.63	17.6%	469,245
Burien/SeaTac Submarket	865,000	$18.48	13.9%	- 36,722

OFFICE LISTINGS: Burien/Seatac Submarket

	RSF	ASF	Year Built	Avg. Rate
1 SeaTac Office Ctr. South	209,904	44,649	1987	$20.50
2 SeaTac Office Ctr. III	111,387	43,963	1997	$23.00
3 Vintage Park	95,008	2,170	2005	$13.00
4 Michigan Building	81,893	30,919	1999	$21.50
5 SeaTac Commercial Bldg.	36,724	1,153	1991	$20.98
6 Airport Plaza Building	33,600	4,421	2008	$16.00
7 Park Place Prof. Center	29,300	11,636	2007	$18.00
8 Ambaum Prof. Center	25,984	1,420	1980	$20.75
9 3100 Building	24,000	11,738	1987	$18.00
10 Prudential Office Bldg.	18,630	2,786	1992	$19.00
11 21400 Building	16,573	5,500	1984	$19.50
12 Advantage Office Bldg.	16,000	2,500	1970	$18.50
13 5303 1st Ave.	15,000	15,000	2006	$20.00
14 Highline Prof. Building	14,468	3,053	1985	$21.80
15 Park Place Shores	13,869	9,030	1984	$20.50
16 Key Bank Building	13,732	2,000	1949	$14.00
17 Landmark Square	10,000	4,711	1980	$17.50
18 Burien Prof. Center	9,600	4,514	1980	$11.00
19 Burien Prof. Building	9,000	5,117	2006	$20.00
20 Ibanez Building	5,252	1,800	1980	$16.00

15. Park Place Prof. Center

11. 21400 Building

20. Ibanez Building

9. 3100 Building

1. SeaTac Office Center

6. Airport Plaza Bldg.

19. Burien Prof. Building

Retail Market Assessment

Regional Trends & Activity

Market conditions for the Puget Sound retail market has steadily become less sanguine over the past several quarters as reductions in consumer spending on discretionary items have hurt sales, especially among home improvement retailers, car dealers and apparel stores. The pressure is driven by declining home values and reduced levels of credit that have for the most part curtailed mortgage equity withdrawals that had boosted spending in previous years. That said, Puget Sound residents have tended to feel the economics pressures of the declining home prices and rising food and fuel costs less than other parts of the country, due largely to the fact that the region's strong exporting sector, anchored by Boeing and Microsoft, benefited from the weakened U.S. dollar. The Puget Sound region's job growth rate for 2008 is expected to be 1.6 percent, compared to 0.5 percent nationally, and median regional household income stands at $65,400. These relatively strong economic conditions have led to low retail vacancy rates, 3.4 percent regionally, and substantial new retail construction. However, an additional 2.9 million square feet is under construction in the form of additions to existing malls, new regional and neighborhood commercial centers and mixed-use projects in urban and suburban markets. Vacancy rates can be expected to rise as new product is delivered to the market at a time when fewer national retailers are planning to invest in new locations than in previous years. Over the course of 2007 nearly 1.1 million square feet of retail space was completed. Some of these developments include:

- *The Landing in Renton*: 800,000 square feet of retail accompanied with 900 residential units, a 140-room hotel and 57,000 square feet of office space; anchors include Target, Staples and Regal Cinemas.
- *Southcenter Mall*: 75 additional retailers in 400,000 square feet of retail with six restaurants, two parking structures and a cinema.
- *Tacoma Mall*: 105,000 square foot lifestyle-center addition to existing mall
- *Federal Way Crossing*: 218,000 square foot retail center; anchors include Sportsman's Warehouse and LA Fitness.
- *Normandy Park Town Center*: 54,000 square foot neighborhood retail center; anchored by Normandy Park Athletic Club.

Burien / SeaTac Sub-Market Trends & Activity

The Burien/SeaTac submarket is part of the Southend retail market, which contains approximately 403,000 square feet of space. Similar to the larger regional market, the Burien/SeaTac submarket is experiencing very low vacancy of 2.6 percent. Average asking rents of $21.65 are on the lower range compared with other submarkets but this is due in part to the larger stock of older buildings that are in the submarket.

Most of the retail in the Burien/SeaTac submarket is located along main arterial roadways and is occupied by a mix of general and convenience retail, restaurants and services that serve local residents and to some extent, commuters traveling along Highway 99 and 509. The retail environment in Burien and the submarket as a whole is characterized by low-density, low-rise retail with surface parking. The Burien area does not contain a significant number of 'big box' retail buildings that are commonly developed by national discount retailers and home improvement stores like Target, Costco and Home Depot. These buildings are designed to serve large, regional trade areas and are usually 100,000 square feet or greater with hundreds of surface parking stalls.

The retail building stock in the Burien area can be generally divided into four main categories:

- Older individual single-story buildings that contain one or two tenants;
- Newer big box retailers and automobile dealerships;
- New neighborhood shopping centers; and,
- Boutique retail in new mixed-use developments.

Retail development activity in the Burien area has been focused mainly on several large new developments in the downtown area as well as new and remodeled automobile dealerships, such as Burien Nissan, along 1st Avenue South. Like many other regional cities, Burien is trying to revitalize itself and attract neighborhood-oriented mixed use and pedestrian friendly development. As part of this initiative the City teamed with a local developer, Urban Partners, to begin development of the Burien Town Center project, which will ultimately contain 40,000 square feet of retail space (18,000 square feet is under construction in Phase I of the project). Additionally, the nearby Burien Town Plaza is a 127,000 square foot grocery-anchored neighborhood shopping center that was completed in 2007. The combined 167,000 square feet of general retail, restaurants and services (non-big box) in these two projects alone is considered to be a substantial quantity for a market area the size of Burien.

Including space that is available or under construction in these two projects, the Burien area has approximately 35,000 square feet of retail space currently available. Asking rents in new projects range from $18.00 to $27.00 per square foot (NNN) while rents for older buildings range from approximately $9.00 to $14.00 per square foot (NNN). The tables and photos below provide a representative sample of current listings and building photos that illustrate typical building size and finishes. The attached map also shows the spatial distribution of these listings in the submarket.

RETAIL	Leasable SF	Avg. Rate	Vacancy	2007 Absorption
Puget Sound Region	42,500,000	$24.06	3.4%	1,100,000
Southend Market	11,300,000	$24.70	3.9%	344,000
Burien/SeaTac Submarket	403,000	$21.65	2.6%	- 2,800

RETAIL LISTINGS: Burien/Seatac Submarket

	NAME	RSF	ASF	Year Built	Avg. Rate
1	Burien Plaza	130,786	4,559	2000	$22.75
2	SeaTac Center	65,230	41,466	1954	$19.50
3	Normandy Park Town Ctr.	52,670	28,977	2009	$30.00
4	Manhattan Village	49,681	4,412	1962	$26.00
5	JB Block Building	28,482	4,500	1957	$14.00
6	Mansfield Shopping Ctr.	23,576	2,163	1960	$12.00
7	Burien Town Square Ph. I	19,671	-	2008	$35.00
8	Landmark Square	17,066	4,711	1988	$17.50
9	Burien 152nd Center	14,734	1,200	1956	$12.00
10	Scott Plaza	13,500	5,613	2008	$18.00
11	Rahul Building	7,386	7,386	2009	$22.00
12	Five Corners Bldg.	6,250	6,250	1966	$13.57
13	Mud Bay Pet Supply	4,356	4,356	1965	$12.40
14	Burco Building	3,600	1,600	1961	$12.00
15	Normandy Place	2,350	2,350	2008	$19.00
16	Ambaum Retail	1,498	1,498	2006	$15.00

8. Burien 152nd Center

4. Manhattan Village

7. Burien Town Square Ph. I

1. Burien Plaza

9. Scott Plaza

Residential Market Overview

Assessment Goals for Residential Data

As mentioned in our memorandum dated May 23, "Discovery Day Notes and Gap Analysis," a key task in the NERA consultant team's work in moving forward will be determining the degree to which the residential portions of the study area, including the entirety of Subarea "A" and portions of Subarea "B," could be feasibly redeveloped to more intense uses and in what time horizon would such redevelopment be possible. We posed three questions:

- Should the City allow a greater range of uses (for example, small office, duplex/triplex, *etc.*) that could allow property values to be supported but could also undermine long-term ability for land to redevelop to non-residential uses?

- Are properties in Subarea "A" likely to redevelop during the planning horizon given parcel assemblage challenges, economics of redevelopment and the topographic separation from the Subarea "B" that makes momentum from any catalyst projects in Subarea "B" difficult to leverage in the development of Subarea "A"?

- Under what conditions could Subarea "A" be expected to redevelop, and how far in the future would that be likely to occur given market trends in residential and commercial development?

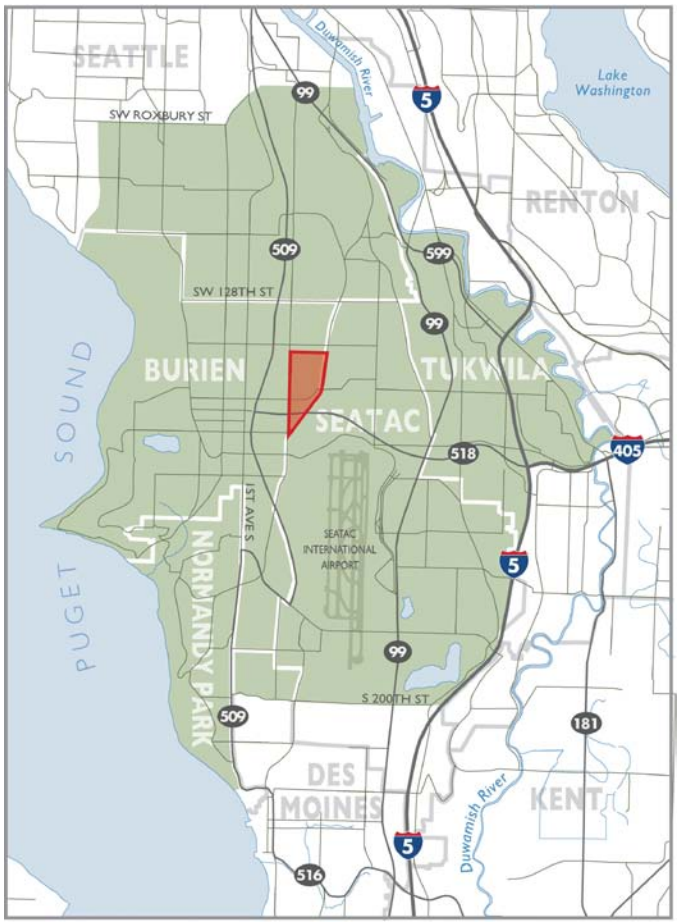
Should a rezone of single-family land occur, site-specific conditions would determine the rate at which properties redevelop. In general, the larger the gap in value between existing land values and potential land values under redevelopment, the sooner redevelopment would occur. In preparation of our team's work in answering these questions within the context of public policy goals, we have assembled the sale prices, land prices and value trends data that we believe will be useful to the analysis.

Sub-Market Trends & Activity

The local residential market trends mirror those of the majority of the Puget Sound region. Both condominium and for-sale inventory has grown substantially year-over-year while sales have decreased dramatically. Sales prices have not dropped significantly from the peak prices of the market set in summer 2007, but, should indicators from other markets be a guide for the Seattle region, the large number of homes for sale will eventually result in reductions in home prices, which would factor into the NERA consultant team's redevelopment alternatives analysis.

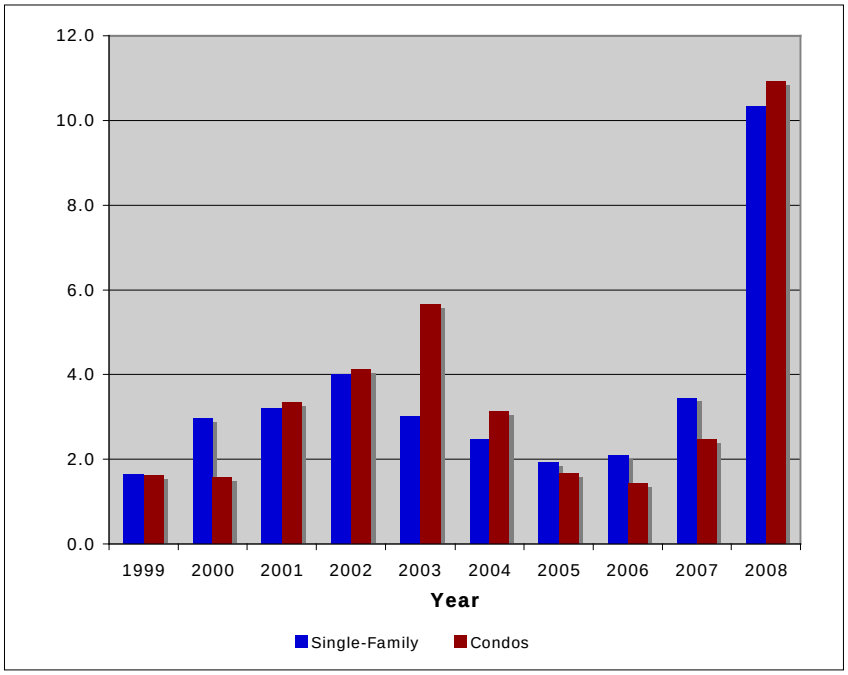
Residential data was gathered using MLS Area 130, which contains all of Burien, and portions of Sea-Tac, Des Moines, Tukwila and south Seattle, as identified in the map on the following page. Inventory of single-family homes in this area is up 15% while condominium inventory is up 77% year-over-year. Although the level of increase in single-family home inventory is gentle compared to many areas in the region year-over-year, the inventory of single-family homes is up 86% since summer 2006, suggesting that the market may have slowed in Burien sooner than in many other parts of the region. Both single-family and condominium sales are down 60% year-over-year, resulting in a inventory of homes for-sales that has spiked over 10 months for both single-family homes and condominiums. Generally, anything over 6 months of inventory is a buyers market.

NWMLS Area 130 Boundaries

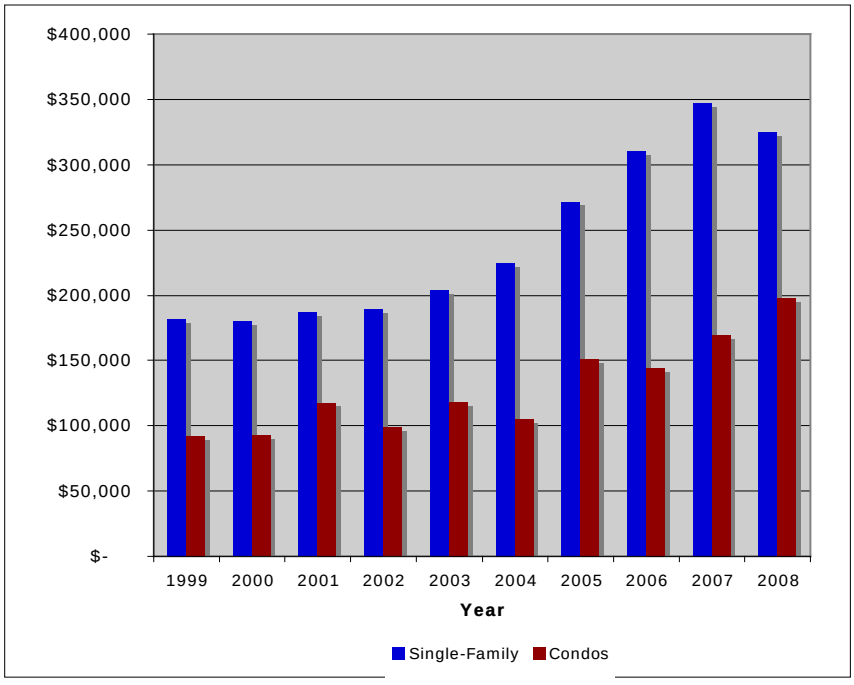


As of June 2008, median single-family home prices in MLS Area 130 have declined 6%, while median condominium prices have increased 16%. That said, median prices are not always reliable indicators of trends in value because the set of sales data is constantly changing. For example, in mid-2007, when the sub-prime crisis was in full bloom, the composition of sales sets may have been skewed toward larger homes and, conversely, as the access to jumbo mortgages is reduced, the sales set may increasingly be weighted with lower-end homes, which we would expect to cause the median homes sales price to drop. The more commoditized and similar the stock of homes is in the market area, the more reliable and valuable the median prices homes sales data. A better method for measuring trends in sales prices is the paired sales methods employed by the S&P/Case Shiller Index, whose data is aggregated on a metropolitan area basis but can be used as another point of reference to place the MLS' median sales data in perspective. S&P/Case Shiller data indicates the Seattle region's median price declined by 6.3% year-over-year as of its May data set.

Months of Inventory (NWMLS Area 130)



Median Sales Prices (NWMLS Area 130)



NERA Market Activity

Moving from the MLS sub-area to NERA, there have only been seven "arms-length" home sales in the last 24 months captured on the MLS and only five properties are listed for sale presently, providing a less-than-perfect sample set. That said, the sales prices and listing prices seem to be slightly less than those of the subarea as a whole, with median sales prices of $309,000 and listing prices of approximately 350,000. Because of the small sample size and because the sales occurred over the past 24 months, exact comparison to June 2008 sales prices across the MLS Area 130 is not possible.

Land prices will be important to consider in the event that the NERA team wants to analyze redevelopment scenarios for single-family zoned land in Subarea 'A.' It should be noted that several properties would be large enough to subdivide should the moratorium on subdivisions be lifted. The relatively high sales price per square foot for several of the homes in combination with the large lot sizes suggests that the speculative value of potential future subdivision may be priced into several of the sales. Land prices for the seven ranged from $9 to $46 per square foot of lot area, for an average of approximately $23 per square foot. This range of values can be contrasted with potential values of office, retail or multi-family uses to determine the likelihood and potential for development should a zoning change occur in the future.

NERA Home Sales (7/20/07-7/20/08)

MLS Number	Sold Price	Sold Date	Address	Beds/ Baths	Sq Foot	Age	Price/SF Bldg	Lot Size	Price/SF Land
26141894	$309,000	9/29/06	14103 9th Pl S	3/1.75	1,140	1979	$271	23,291	$13.27
27026368	$294,000	6/20/07	828 S 147th St	3/1	1,050	1962	$280	7,169	$41.01
27046864	$313,000	4/23/07	14445 8th Ave S	3/1	1,030	1954	$304	7,800	$40.13
27127425	$310,000	9/26/07	1266 S 140th St	3/1.5	1,660	1947	$187	10,803	$28.70
27177247	$334,000	11/16/07	1018 S 138th St	3/2.5	1,600	1999	$209	7,200	$46.39
27199761	$279,500	3/18/08	14110 9th Pl S	3/1	1,000	1979	$280	28,577	$9.78
28077573	$308,000	6/16/08	818 S 143rd Pl	4/1.75	1,880	1962	$164	10,454	$29.46
	$309,000				**1,337**	**1969**	**$229**	**13,613**	**$22.54**

NERA Active Listings in NERA

MLS Number	List Price	List Date	Address	Beds/ Baths	Sq Foot	Age	Price/SF	Lot Size	Price/SF Land
28096594	$329,000	6/3/08	14841 8th Ave S	4/1.75	2,120	1936	$155	7,344	$44.80
28104566	$549,950	6/16/08	1034 S 140th St	6/3.5	3,850	1942	$143	41,127	$13.37
28106418	$250,000	6/18/08	1266 S 140th St	3/1.5	1,660	1947	$151	10,803	$23.14
28125303	$270,000	7/17/08	14709 8th Ave S	2/1.75	1,900	1974	$142	10,141	$26.62
	$349,738				**2,383**		**$147**	**17,354**	**$20.15**

Land Sales

Moving into the next phase of work on NERA, it will be important to have an understanding for land sales for varying land uses in the area to anticipate the effect that zoning changes may have on land values, and in turn, anticipate what, if any, "lift" in values might occur should rezones be enacted. In general, the greater the level of lift in land values, the more likely redevelopment to new, higher value uses is likely to occur. The interface of building rents and land raw land values is important in analyzing economic development strategies because "as improved" values for redevelopment land may exceed what users can afford to pay for raw land. In this case, rezoning to more intense uses may not trigger redevelopment to what might seem like higher value uses.

COMMERCIAL LAND LISTINGS: Burien/Seatac submarket

PROPERTY ID	ADDRESS	SALE PRICE	LOT SIZE	PRICE/SF	SALE DATE
2923049057	215 S. 160th St.	$3,250,000	132,585	$24.51	2/26/08
2823049185	S. 176th & 32nd Ave. S.	$849,900	22,694	$37.45	2/18/08
1923049328	415 SW 150th St.	$2,882,393	141,831	$20.32	12/21/07
3445000126	20440 Pacific Hwy. S.	$5,000,000	290,545	$17.21	10/26/07
8709600015	168th and International Blvd.	$260,000	7,610	$34.17	6/9/07
5379801770	3766 S. 164th St.	$1,700,000	78,843	$21.56	5/16/07
2823049108	16802 S. International Blvd.	$1,285,000	28,457	$45.16	8/21/05
9409400195	164th and International Blvd.	$3,120,000	72,000	$43.33	12/27/04
1899400045	SW 149th St. & 8th Ave. SW	$225,000	16,213	$13.88	5/21/04

INDUSTRIAL LAND LISTINGS: Burien/Seatac submarket

PROPERTY ID	ADDRESS	SALE PRICE	LOT SIZE	PRICE/SF	SALE DATE
2023049370	S. 144th St. & S. 146th Pl.	$132,900	58,806	$2.26	12/2/05
1723049039	1022 144th St.	$850,000	423,838	$2.01	7/12/05
3223049096	18017 Des Moines Mem. Dr.	$525,000	115,856	$4.53	4/28/04
522049039	1106 S. 192nd St.	$215,000	33,357	$6.45	8/18/03

MULTI-FAMILY RESIDENTIAL LISTINGS: Burien/Seatac submarket

PROPERTY ID	ADDRESS	SALE PRICE	LOT SIZE	PRICE/SF	SALE DATE
2923049057	215 S. 160th St.	$3,250,000	132,858	$24.46	2/26/08
1823049138	13608 12th Ave. SW	$530,000	455,323	$1.16	1/16/08
3445000126	20440 International Blvd.	$5,000,000	290,545	$17.21	10/26/07
7637400110	2100 SW 146th St.	$750,000	396,381	$1.89	9/24/07
2923049501	176th & Des Moines Mem. Dr.	$662,257	173,412	$3.82	6/7/07
3223049049	18420 8th Ave. S.	$1,150,000	132,987	$8.65	4/13/07
1723049045	518 S. 140th St.	$1,890,000	161,172	$11.73	3/29/07
3023049089	162nd & SW 3rd Ave.	$970,000	116,305	$8.34	6/15/06
922049061	21428 Pacific Hwy. S.	$840,000	68,800	$12.21	8/25/05

Sources

The following sources were referenced in the compilation of this document:

- NEST Study and Market Analysis Appendix, December 2004
- 2006 City of Burien Comprehensive Plan
- CBRE Market View: Puget Sound Industrial (1Q08)
- Grub & Ellis broker reports: Retail Market Trends (Summer 2008), Office Market Trends (2Q08)
- Colliers International Knowledge Report: South King County Office (1Q08)
- City of Burien Community Profile, September 2003
- Commercial Brokers Association, www.commercialmls.com
- CoStar Group Inc., www.costar.com
- PSRC Regional Air Cargo Strategy Final Report, October 2006
- OfficeSpace.com, www.officespace.com

A

Appendix - Section 3

Critical Area Study

Burien Northeast Redevelopment Area

Critical Area Study

Submitted to:

City of Burien
Department of Community Development
15811 Ambaum Boulevard SW, Suite C
Burien, WA 98166

Prepared by:

Otak, Inc.
10230 NE Points Drive, Suite 400
Kirkland, WA 98033
Otak Project No. 31235

March 11, 2009

Table of Contents

Burien Northeast Redevelopment Area Critical Area Study

Section 1—Introduction....1
Section 2—Methods....3
Section 3—Findings....10
Section 4—Regulatory Implications....24
Section 5—References....26

Appendices

Appendix A—Photos
Appendix B—Stream/Wetland Maps
Appendix C—Wetland Data Sheets
Appendix D—Ecology Rating Forms

Figures

Figure 1—Vicinity map of Burien NERA in Burien, Washington....2
Figure 2. Location of critical areas within the NERA project area....11

Tables

Table 1. Wetland Plan Indicator Status....5
Table 2. List of Plant Species Observed in the Burien NERA Site....14
Table 3. Wetland Summary for Burien NERA....17
Table 4. Functional Assessment Rating for Wetlands in the NERA....22
Table 5. Wetland Rating Summary for Burien NERA....24

Section 1—Introduction

Introduction

Otak was contracted by the City of Burien Department of Community Development to identify wetland and stream areas within the Northeast Redevelopment Area (NERA). In order to manage land uses within the NERA, the City of Burien is studying existing critical areas in this approximately 162-acre area. Otak delineated five wetlands and identified a perennial stream (West Fork of Miller Creek) within the NERA. Identification of these critical areas will guide land use decisions as this predominantly residential area is converted to commercial and industrial uses (Burien 2008a). This draft report describes the site conditions, wetland and stream characteristics, and wetland functions assessment for properties where access was granted. The report also briefly summarizes applicable regulations relating to wetlands and streams.

Site Location

The Northeast Redevelopment Area is located in the northeast corner of the City of Burien, King County, Washington (see Figure 1). This approximately 162-acre area is bounded by 8th Avenue South on the west, Des Moines Memorial Drive on the east, SR 518 on the south, and South 138th Street on the north. The NERA is located in Sections 17 and 20, Township 23 North, Range 4 East. The West Fork of Miller Creek (Water Resource Inventory Area [WRIA] # 09-0376) bisects the NERA area flowing from northwest to southeast (Williams et al. 1975).

Proposed Action

The proposed action involves changing Comprehensive Plan designations and Zoning Code classifications in all or a portion of the NERA, as well as modifying and expanding the existing Comprehensive Plan language (Edaw 2002). The existing residential, commercial, and industrial Comprehensive Plan designations and zones would be changed to a new designation and zone (Special Planning Area 4), with three subareas that would allow for a mixture of office, commercial, industrial, and airport-compatible uses in a business park setting. Existing Comprehensive Plan language would change and a new Comprehensive Plan section for Special Planning Area 4 would be created. This assumes that the Port of Seattle may purchase and remove residences lying within the Approach Transition Zone and Runway Protection Zone associated with the third runway at SeaTac airport. The conversion of these residential neighborhoods within the flight path to a business park land use may affect critical areas within the NERA.

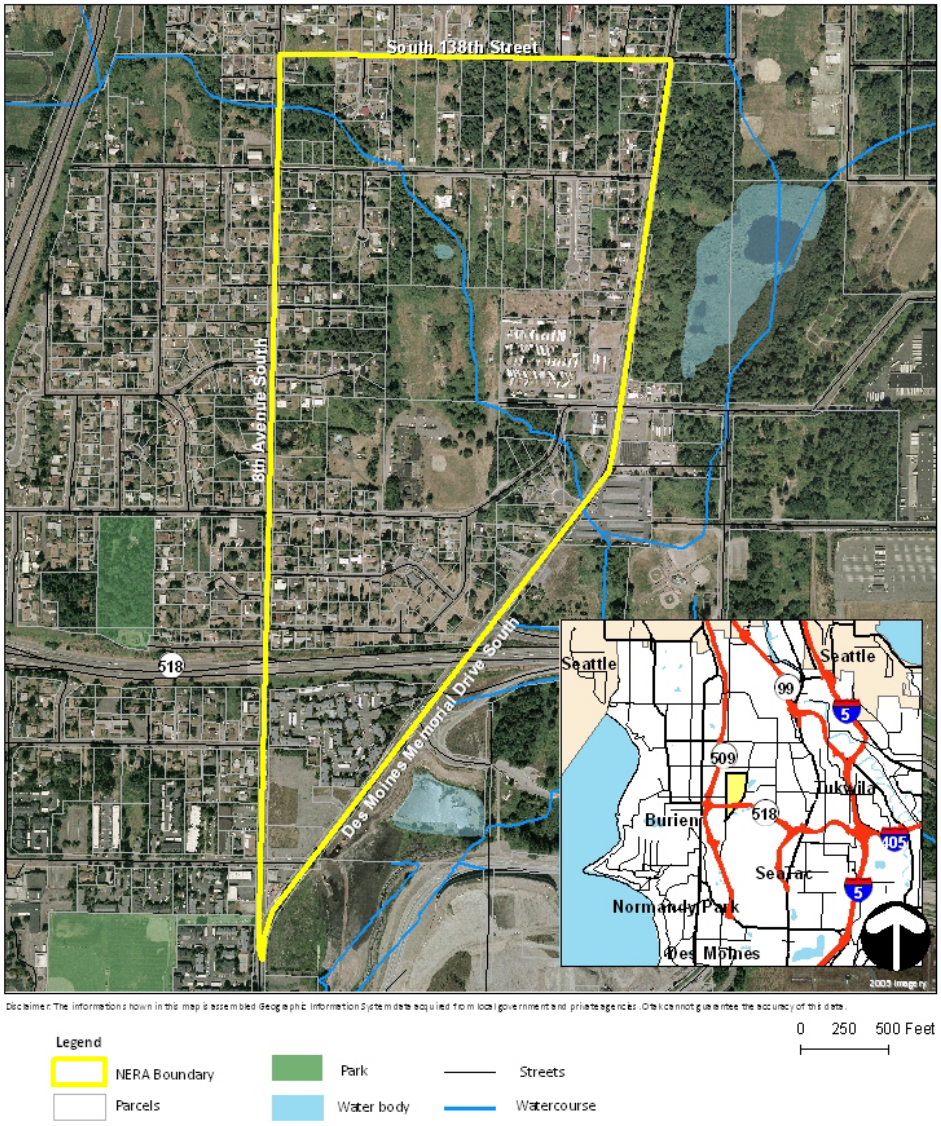


Figure 1—Vicinity map of Burien NERA in Burien, Washington.

Section 2—Methods

Review of Existing Information

Several existing documents were reviewed to gain specific background information on the NERA site. These include aerial photographs, reports, and maps of the site. In addition to the references listed at the end of this report, other information sources and documents reviewed for the preparation of this report included:

- Burien Municipal Code
- Burien Critical Area Map
- King County Soil Survey Map
- National Wetland Inventory (NWI) Map
- King County Sensitive Area Map

OHWM Flagging

The ordinary high water mark (OHWM) of the West Fork of Miller Creek within the NERA was flagged in order to define the stream banks (Olson and Stockdale 2008). This OHWM boundary was surveyed to support any shoreline substantial development permits issued by the City of Burien and Hydraulic Project Approval permits issued by the Washington Department of Fish and Wildlife. The method used to determine the OHWM is based on the RCW 90.58.030(2) (b) definition as follows:

> *"Ordinary high water mark on all lakes, streams, and tidal water is that mark that will be found by examining the bed and banks and ascertaining where the presence and action of waters are so common and usual, and so long continued in all ordinary years, as to mark upon the soil a character distinct from that of the abutting upland, in respect to vegetation as that condition exists on June 1, 1971, as it may naturally change thereafter, or as it may change thereafter in accordance with permits issued by a local government or the department: provided, that in any area where the ordinary high water mark cannot be found, the ordinary high water mark adjoining salt water shall be the line of mean higher high tide and the ordinary high water mark adjoining fresh water shall be the line of mean high water."*

Otak wetland ecologist, Doug Gresham, flagged the OHWM of the West Fork of Miller Creek on July 17 and August 12, 2008 for the properties where access was granted. This involved hanging sequentially numbered orange flags along both banks where there was evidence of scouring, a change in vegetation, drift lines, and sediment deposits.

Wetland Delineation Method

Otak wetland ecologist, Doug Gresham conducted the wetland delineations on July 23, 25, and 29, and August 18 and 20, 2008 for the properties where access was granted. This involved hanging sequentially numbered pink/black striped flags along the wetland boundary. The wetland delineation followed the Routine Methodology as specified in the *Washington State Wetlands Identification and Delineation Manual* (Washington Department of Ecology 1997). I also relied on methods specified in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (COE 2008). All of these manuals define wetlands as follows:

> *"Those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."*

In determining whether an area meets this definition, both methodologies require examination of three parameters: vegetation, soils, and hydrology. For an area to be classified as wetland, hydrophytic vegetation, hydric soils, and wetland hydrology must be exhibited. During the site visit, the property was walked to gain an overview of site conditions. Following routine methodology, data on vegetation, soils, and hydrology were collected in areas that appeared to have wetland characteristics. These three parameters, and the methods used to assess them, are discussed in the following sections.

Vegetation

Hydrophytic vegetation consists of those plant species that readily grow in water, soil or other substrates, which at least periodically lack oxygen in the root zone due to saturation or inundation. The hydrophytic vegetation criterion is met when more than 50 percent of the dominant species are hydrophytic, based on the wetland plant species indicator status from the Region 9 section of the National List of Plant Species Occurring in Wetlands (Reed 1988; Reed et al., 1993). The plant list separates vascular plants into five basic groups by their wetland indicator status (WIS), which is based on the frequency of occurrence of each species in a wetland. The indicator status rating system is summarized in Table 1.

Table 1 Wetland Plant Indicator Status	
Indicator Status	Definition
Obligate Wetland Plants (OBL)	Plants that almost always occur in wetlands under natural conditions - estimated probability of species occurring in wetlands is greater than 99% under natural conditions.
Facultative Wetland Plants (FACW)	Plants that usually occur in wetlands - estimated probability 67%-99%.
Facultative Plants (FAC)	Plants that are equally likely to occur in wetlands or non-wetlands: estimated probability of 34% – 66% to be found in wetlands.
Facultative Upland Plants (FACU)	Plants that usually occur in non-wetlands: estimated probability of 1% - 33% to be found in wetlands.
Obligate Upland (UPL)	Plants that almost always occur in non-wetlands - estimated probability of occurring in wetlands is <1%.

Plant species were identified using several standard taxonomic references (Cooke 1997; Guard 1995; Hitchcock & Cronquist 1973; Polar & MacKinnon 1994). Dominant plant species were determined by the 50/20 rule as defined in the *Washington State Wetlands Identification and Delineation Manual* (Washington State Department of Ecology 1997):

> "*Dominant plants species are those species in each stratum [tree, shrub, vine, herb] that when ranked in descending order of abundance [percent aerial coverage] and cumulatively totaled, immediately exceed 50 percent of the total dominance measure for that stratum, plus any additional plant species comprising 20 percent or more of the total dominance measure for that stratum.*"

Other indicators of hydrophytic vegetation include (in decreasing order of reliability): visual observation of plant species growing in areas of prolonged inundation and/or soil saturation; morphological adaptations to wetland conditions; technical literature references; and physiological and reproductive adaptations to wetland conditions (Washington State Department of Ecology 1997).

Plants live in relatively homogeneous and predictable species assemblages called communities. Plant communities on the site were identified according to a classification system developed by the U.S. Fish and Wildlife Service (Cowardin, et al. 1979). The Cowardin Community Classification System is based on vegetation, hydrology, and substrate (soil) characteristics.

For each data plot, plant species were recorded and their percent aerial coverage was estimated, then the percent aerial coverage was used to determine the dominant species. Vegetation was also sampled at regular intervals along, within, and outside the wetland boundaries for delineation purposes.

Soils

The presence of hydric soils is the second parameter required for wetland determination. Hydric soil is defined as *"... a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part*" (Washington State Department of Ecology 1997). The anaerobic conditions that result from biotic activity in soils saturated for longer than two weeks (generally) cause specific, recognizable changes to the soil. Prolonged anaerobic conditions result in a chemical environment where some soil components, such as iron and manganese, become reduced. Reduction of these minerals results in field indicators in the soil such as redoximorphic features and gleying.

Redoximorphic features are spots or blotches of color occurring within the soil matrix of a contrasting color. Redoximorphic features usually result from alternating anaerobic and aerobic soil conditions. Biotic activity in the saturated soils causes the iron and manganese to become reduced; drying of the soils creates aerobic conditions which lead to the oxidation of the minerals. Movement of the reduced minerals into concentrated zones in the matrix causes the accumulation of colors (redox features) and leaches the surrounding soils of the trace minerals, causing zones of depletion, where the soils are depleted of color. Gleying occurs under long term anaerobic conditions; it is the result of leaching of the reduced iron from the soils leaving the matrix completely depleted of color. Gleyed soils are predominantly neutral gray in color, although they are sometimes greenish or blue-gray.

Soil colors (hue, value, and chroma) were determined using Munsell Soil Color Charts (Gretag Macbeth 2000). Munsell colors are recorded as hue value/chroma (*e.g.* 10YR 4/1). Hydric soil indicators include: organic soils, gleyed soils; soils with redoximorphic features and a matrix chroma of 2 or less; and soils with a matrix chroma of 1 (Washington State Department of Ecology 1997).

Soils were sampled in each data plot to a depth of 16 to 20 inches. The soil was characterized and examined for hydric indicators immediately below the A-horizon or at ten inches, which ever was shallower (Washington State Department of Ecology 1997).

Hydrology

Wetland hydrology, or the presence of water, is the third parameter required for wetland determination (Washington State Department of Ecology 1997). Although direct observations of hydrology are often limited during the dry season, indicators may be present throughout the year. Indicators for wetland hydrology include recorded data, and field data such as: visual observation of inundation or saturation; watermarks; drift lines; sediment deposits; and drainage patterns. Guidelines for duration of inundation and/or soil saturation are based on the growing season.

Growing season is defined (Environmental Laboratory 1987) as, "the portion of the year when soil temperatures at 19.7 inches below the soil surface are higher than biologic zero (5°C). For ease of determination this period can be approximated by the number of frost-free days. For the Pacific Northwest, inundation or saturation to the surface for at least 12.5% of the growing season is the criteria used to establish wetland hydrology, although areas with shorter periods of surface saturation may also qualify as wetland. Based on the typical growing season for the lowlands of King County, the project area should have at least 21 days of continuous inundation or saturation within 12 inches of the surface during the growing season to meet the criteria for wetland hydrology.

Observations of hydrology indicators were made in and around the soil pit of each plot. The level of inundation above the soil surface, or the depth to saturation below the soil surface was recorded. Other visual indicators of hydrology such as sediment deposits, water-stained leaves, and oxidized root channels (rhizospheres) were noted. Hydrology indicators were also examined at regular intervals along, within, and outside the wetland boundaries for delineation purposes.

Wetland Rating and Functions Assessment

Wetlands perform various functions such as purifying water, minimizing shoreline erosion, controlling flood and storm water, exchanging groundwater, providing wildlife and plant habitat, providing food chain support and nutrient cycling, and offering opportunities for education and recreation (Hruby et al. 1999).

The wetland and buffer functions were assessed using the methodology and rating form from the *Washington State Wetland Rating System for Western Washington* (Hruby 2004). The methodology is based on *Methods for Assessing Wetlands Functions. Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington, Parts 1 and 2* (Hruby et al. 1999).

The methodology relies on indicators of functions to assess potential performance and the opportunity to perform the function, rather than direct measurements of functions. Indicators are characteristics of the wetland or its surrounding area that can be correlated to a specific function. For example, rather than trying to sample aquatic mammals directly, the presence of steep banks in the wetland can be used as an indicator of the suitability of the wetland habitat for aquatic mammals. The rating system assesses both the potential and opportunity to perform three general categories of functions: Water Quality, Hydrology, and Habitat. Using guidance from Washington State Department of Ecology (2008), numeric values from the rating forms were assigned qualitative function values of high, moderate, and low.

Water Quality Functions

Sediment Removal: Wetlands can improve water quality by filtering out sediments. This can occur by adhesion of the sediment to vegetation, and by settling which happens when water velocity is decreased. The potential of a wetland to remove sediment is based on a number of factors, including the residence time of the water, and the type and density of vegetation.

Nutrient and Toxicant Removal: Wetlands can also improve water quality by filtering out excess nutrients and toxic chemicals. This can occur through adhesion to clay particles and organic soil components, as well as by uptake and filtration by the vegetation. The capacity of a wetland to purify water is based on a number of factors, including the residence time of the water, presence of clay or organic soils, and the type and density of vegetation.

The opportunity for water quality improvement is based on sediment or pollutants entering the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. Sources for sediment and pollutants include untreated storm water, grazing, agricultural activities, development, etc.

Hydrologic Functions

Flood Flow Alteration: Wetlands can play an important role in flood reduction because of their ability to slow and store flood waters. During high rainfall events, water can be stored in wetlands and released slowly over time, thereby reducing the volume of water downstream during the time of peak flooding. This function is especially important in urbanizing areas. The ability of a particular wetland to reduce flooding is dependent on a number of factors, including the wetland's position in the watershed, its size, shape, outlet configuration, and association with other aquatic systems.

Erosion Control and Shoreline Stabilization: Vegetation in wetlands serves to anchor soil and filter out sediments that are suspended by water. Riparian or lakeshore wetlands where there is water flow or wave action sufficient to suspend and transport sediments are important in stabilizing banks and preventing erosion. The ability of a wetland to reduce erosion is primarily dependent on the characteristics of the vegetation, with dense woody vegetation being the most effective. This function is not significant in low flow areas such as depressional wetlands.

The opportunity for a wetland to perform these functions is dependent on many factors including: position in the landscape, whether the wetland drains to a river or stream that has flooding problems, and whether there are human structures and activities or natural resources located downstream that can be damaged by flooding.

Habitat Functions

Habitat Functions Assessment: Takes into consideration the potential for the wetland to provide different habitat niches by assessing: different water regimes required by different species (amphibians, macroinvertebrates, etc.); plant species richness; the degree of interspersion of habitats; special habitat features such as large woody debris, snags, undercut banks for denning, thin-stemmed vegetation for amphibian eggs, etc.; existing condition of buffers; connectivity of the wetland to other wetlands and priority habitats such as mature forests, urban natural open spaces, estuaries, etc.; and position in the watershed.

Section 3—Findings

General Site Characteristics

The NERA is a roughly trapezoidal area located in the northeast corner of Burien. Major roadways in the area include State Route (SR) 509 to the west, SR 518 in the southwest corner, and Des Moines Memorial Drive along the eastern edge. This area contains a mixture of single-family residential properties, commercial businesses, schools, and an airport parking lot. The eastern edge of the NERA lies within the flight path for the third runway at SeaTac airport, which is oriented from north to south. Several vacant properties exist due to conversion of this area from residential to commercial uses.

The NERA project area consists of rolling terrain with ridges and valleys that are roughly oriented from northwest to southeast. The West Fork of Miller Creek bisects the area flowing from 8th Avenue South to Des Moines Memorial Drive. The elevations range from 295 to 425 feet above mean sea level. The King County soil survey map indicates that Alderwood gravelly sandy loam and Everett gravelly sandy loam cover the NERA project area (USDA 1952). The Alderwood soil is mapped in the northwest and southwest portions, while the Everett soil is shown in the northeast and southeast portions of the NERA. Both soil series are non-hydric (USDA 2008) and consist of somewhat excessively drained soils that formed in very gravelly glacial outwash deposits along terraces.

The National Wetland Inventory map prepared by the U.S. Fish and Wildlife Service (USFWS 2008) does not identify any wetlands within the NERA. Both the City of Burien critical areas map (Burien 2008b) and King County sensitive areas map (King County 2008) identifies a wetland associated with the West Fork of Miller Creek near S 140th Street.

Figure 2 illustrates the location of the West Fork of Miller Creek and its associated wetlands, as well as buffer widths within the NERA. Photographs of the West Fork of Miller Creek and wetlands in the NERA project area are included in Appendix A. Sheets 1 through 3 in Appendix B illustrate the location of the West Fork of Miller Creek and wetlands within the NERA.

West Fork of Miller Creek

The West Fork of Miller Creek originates northwest of the NERA project area in a Category 3 wetland identified on the City of Burien critical areas map (Burien 2008b). The West Fork of Miller Creek is culverted between this headwater wetland and 8th Avenue South where it enters the NERA. The West Fork of Miller Creek within the NERA alternates between open channels, culverts, and concrete-lined ditches. Downstream of the NERA, this tributary flows southeast and combines with the mainstem of Miller Creek flowing out of Tub Lake.

Figure 2. Location of critical areas within the NERA project area.

The West Fork of Miller Creek within the NERA contains eight reaches that alternate between areas with an incised channel, broad floodplain, armored banks, and culverts. Listed below is a description of each reach that proceeds downstream from 8th Avenue South to Des Moines Memorial Drive.

- The first reach between the culvert outlet at 8th Avenue South and several homes along South 140th Street, flows within a forested tract of open space. The stream has an incised channel with steep unstable banks due to erosion during storm events. There are also areas where the banks are armored with riprap and there is no floodplain bench. The riparian zone consists of an upland deciduous forest of both native and invasive species.
- The second reach is located in the front yards of three homes on the north side of South 140th Street. The stream alternates between open ditches, culverts underneath driveways, and a concrete-lined sluiceway. The only vegetation along the stream banks consists of ornamental shrubs and lawn grass that is regularly mowed.
- The third reach is located between South 140th Street and the dog kennel property within a forested tract of open space. Although access was not granted for this property, it appears that there is an incised channel and the riparian zone consists of an upland deciduous forest of both native and invasive species.
- The fourth reach on the dog kennel property is divided into three segments that include an incised channel, depositional area, and artificially straightened channel. At the upstream end, there is an incised channel with steep unstable banks with some riprap armoring. The middle section contains sediment deposits at the transition between the upper and lower segments. The lower end has been artificially straightened with a backhoe so the channel is narrow and deep and the banks are unstable. The vegetation mainly consists of a deciduous tree canopy with grasses because livestock grazing has eliminated a shrub understory.
- The fifth reach on the Ajax Parking property flows through a large wetland complex where the channel loses definition. There is a broad floodplain and the stream braids around clumps of wetland vegetation. The riparian zone consists of palustrine forested, scrub/shrub, and emergent wetland vegetation.
- The sixth reach between the bridge to the Ajax parking lot and South 144th Street is highly disturbed. The channel has been artificially straightened with a backhoe so the channel is narrow and deep and the banks are unstable. The vegetation mainly consists of a deciduous tree canopy and invasive species.
- The seventh reach between South 144th Street and South 144th Way on Port of Seattle property has recently been restored. This restoration involved clearing invasive species in the understory of deciduous trees and supplemental planting of native wetland and buffer species. Although the stream banks are slightly incised, there are some floodplain benches and a meandering channel.

- The eighth reach between South 144th Way and Des Moines Memorial Drive contains an incised channel and some bank armoring. The stream has an incised channel with steep unstable banks, areas where the banks are armored with riprap, and minimal floodplain benches. The vegetation mainly consists of deciduous tree canopy and invasive species.

Upland Vegetation

The upland vegetation that surrounds the West Fork of Miller Creek includes a mixture of deciduous forest, dense thickets of non-native invasive species, and grass fields. Table 2 lists the plant species observed in upland and wetland areas within the NERA.

- The upland surrounding the West Fork of Miller Creek (Reach 1 and 3) on both the downstream and upstream sides of South 140th Street consists of deciduous forest with a mixture of native and invasive species. There is a tree canopy of red alder, black cottonwood, bigleaf maple, Douglas fir, and mountain ash. Some of the plants in the understory include indian plum, holly, cherry laurel, English ivy, and sword fern.
- The upland on the dog kennel property includes a forested slope in the southwest corner and livestock grazing areas surrounding the West Fork of Miller Creek (Reach 4). The plant community on the forested slope includes red alder, Himalayan blackberry, red elderberry, indian plum, and stinging nettle. The livestock grazing area lacks a shrub layer so there is mainly an overstory of red alder with upland grasses in the herbaceous layer.
- The upland surrounding the West Fork of Miller Creek (Reach 5) on the Ajax Parking property consists of red alder, Himalayan blackberry, Scot's broom, and upland grasses.
- A section of the West Fork of Miller Creek channel (Reach 7) on the Port of Seattle property between South 144th Way and South 144th Street has recently been restored. This involved clearing invasive species in the understory of deciduous trees and supplemental planting of native buffer species. This property has a tree canopy of black cottonwood and red alder, which has been planted with Sitka spruce, red cedar, Oregon ash, red-osier dogwood, and Nootka rose. The invasive species that are recolonizing this area includes Himalayan blackberry, holly, cherry laurel, common hawthorn, English ivy, morning glory, and Japanese knotweed.
- A section of the West Fork of Miller Creek channel (Reach 8) between South 144th Way and Des Moines Memorial Drive is incised and lacks riparian wetlands. The plant community in this area consists of Pacific willow, red alder, cherry laurel, Himalayan blackberry, and salmonberry.

Table 2
List of Plant Species Observed in the Burien NERA Site

Stratum	Scientific Name	Common Name	WIS[a]
Tree	*Acer macrophyllum*	Big leaf maple	FACU
	Aesculus hippocastanum	Horse chestnut	NI
	Alnus rubra	Red alder	FAC
	Populus balsamifera	Black cottonwood	FAC
	Prunus emarginata	Bitter cherry	FACU
	Pseudotsuga menziesii	Douglas fir	FACU
	Salix lucida	Pacific willow	FACW+
	Sorbus aucuparia	Mountain ash	NI
	Thuja plicata	Western red cedar	FAC
Shrub	*Acer circinatum*	Vine maple	FAC-
	Alnus rubra	Red alder sapling	FAC
	Cornus sericea	Red-osier dogwood	FACW
	Corylus cornuta	Beaked hazelnut	FACU
	Crataegus monogyna	Common hawthorn	FAC
	Cytisus scoparius	Scotch broom	FACU
	Fraxinus latifolia	Oregon ash	FACW
	Ilex aquifolium	Holly	FACU
	Lonicera involucrata	Black twinberry	FAC+
	Mahonia nervosa	Oregon grape	FACU
	Oemleria cerasiformis	Indian plum	FACU
	Physocarpus capitatus	Pacific ninebark	FACW-
	Picea sitchensis	Sitka spruce	FAC
	Populus balsamifera	Black cottonwood sapling	FAC
	Prunus laurocerasus	Cherry laurel	NI
	Pseudotsuga menziesii	Douglas fir sapling	FACU
	Rosa nutkana	Nootka rose	FAC
	Rubus spectabilis	Salmonberry	FAC+
	Salix sitchensis	Sitka willow	FACW
	Sambucus racemosa	Red elderberry	FACU
	Spiraea douglasii	Hardhack	FACW

Table 2
List of Plant Species Observed in the Burien NERA Site

Stratum	Scientific Name	Common Name	WIS[a]
Vine	*Hedera helix*	English ivy	NI
	Rubus armeniacus	Himalayan blackberry	FACU
	Rubus laciniatus	Evergreen blackberry	FACU+
	Rubus ursinus	Trailing blackberry	FACU
Herb	*Agrostis capillaris*	Colonial bentgrass	FAC
	Athyrium filix-femina	Lady fern	FAC
	Cirsium arvense	Canada thistle	FACU+
	Cirsium vulgare	Bull thistle	FACU
	Convolvulus arvensis	Morning glory	NI
	Dactylis glomerata	Orchardgrass	FACU
	Danthonia spicata	Oatgrass	NI
	Epilobium ciliatum	Watson willowherb	FACW-
	Equisetum arvense	Field horsetail	FAC
	Equisetum telmateia	Giant horsetail	FACW
	Festuca arundinacea	Tall fescue	FAC-
	Galium aparine	Bedstraw	FACU
	Glyceria elata	Tall mannagrass	FACW+
	Holcus lanatus	Common velvetgrass	FAC
	Hypochaeris radicata	Cat's ear	FACU
	Iris pseudacorus	Yellow flag iris	OBL
	Juncus effusus	Soft rush	FACW
	Lathyrus polyphyllus	Leafy peavine	NI
	Lolium perenne	Perennial ryegrass	FACU
	Lotus corniculatus	Birdsfoot trefoil	FAC
	Lycopus uniflorus	Bugleweed	OBL
	Lysichiton americanum	Skunk cabbage	OBL
	Maianthemum dilatatum	False lily-of-the-valley	FAC
	Myosotis laxa	Forget-me-not	OBL
	Phalaris arundinacea	Reed canarygrass	FACW
	Plantago lanceolata	English plantain	FAC
	Polygonum cuspidatum	Japanese knotweed	FACU

Table 2
List of Plant Species Observed in the Burien NERA Site

Stratum	Scientific Name	Common Name	WIS[a]
Herb	*Polygonum hydropiper*	Waterpepper	OBL
	Polystichum munitum	Sword fern	FACU
	Potentilla palustris	Marsh cinquefoil	OBL
	Pteridium aquilinum	Bracken fern	FACU
	Ranunculus repens	Creeping buttercup	FACW
	Rumex acetosella	Sheep sorrel	FACU+
	Scirpus microcarpus	Small-fruited bulrush	OBL
	Solanum dulcamara	Bittersweet nightshade	FAC+
	Tolmiea menziesii	Piggy-back plant	FAC
	Trifolium pretense	Red clover	FACU
	Typha latifolia	Cattail	OBL
	Urtica dioica	Stinging nettle	FAC+
	Veronica americana	American brooklime	OBL
	Vicia sativa	Common vetch	UPL

[a] Wetland indicator status based on Reed (1988 and 1993) are defined as: obligate wetland (OBL), facultative wetland (FACW), facultative (FAC), facultative upland (FACU), upland (UPL), and not indicated (NI).

Wetlands

A total of five wetlands (Wetlands A through E) were delineated within the Burien NERA (see Sheets 1 through 3 in Appendix B). These wetlands are associated and hydrologically connected to the West Fork of Miller Creek. Data for wetland and upland plots were recorded on field data sheets and copies are included in Appendix C. Table 3 summarizes the size and classification of Wetlands A through E.

Characteristics of Wetland A

Wetland A is a 0.55-acre riparian wetland associated with the West Fork of Miller Creek near 8th Avenue S. According to the Cowardin system (1979), Wetland A contains palustrine forested (PFO) and palustrine scrub/shrub (PSS) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland A is a riverine wetland.

Table 3 Wetland Classification Summary for Burien NERA				
Wetland	**Area (ft²)**	**Area (acre)**	**Cowardin Class[1]**	**HGM Class[2]**
A	23,758	0.55	PFO/PSS	Riverine
B	21,733	0.50	PSS/PEM	Slope
C	144,857	3.33	PFO/PSS/PEM	Riverine
D	17,896	0.41	PSS/PEM	Riverine
E	5,256	0.12	PFO/PSS	Riverine

1 –Where PFO is palustrine forested, PSS is palustrine scrub/shrub, and PEM is palustrine emergent classes according to Cowardin et al. (1979).
2 –Hydrogeomorphic classes according to Brinson (1993).

Hydrology

Wetland A primarily receives water from a high groundwater table with occasional overbank flooding. The banks are armored with riprap or are incised so there was little evidence of flooding during the winter season. Indicators of wetland hydrology include flowing water in the West Fork of Miller Creek; and sediment deposits, drift lines, and scour marks in the floodplain fringe of the stream.

Soils

Two soil pits (SP-1 and SP-2) were examined in Wetland A to determine the boundary. Soil pit SP-1 was located on a floodplain bench next to the West Fork of Miller Creek and the soil was a dark (10YR 3/2) sandy silt with mottles starting at three inches. Soil pit SP-2 was located on an upland bench approximately 30 feet north of the West Fork of Miller Creek in an area that was recently cleared of invasive species. The soil in the B horizon (10YR 4/3) did not have any redox features and so did not meet the hydric soil criteria.

Vegetation

This forested area contains invasive and native plants in a mosaic of hydrophytic and upland species. There is tree canopy of black cottonwood and red alder, with native shrubs in the understory that includes salmonberry, hardhack, beaked hazelnut, Indian plum, and red elderberry. Wetland A has emergent vegetation dominated by reed canary grass, giant horsetail, creeping buttercup, and stinging nettle. Invasive species within the area include Himalayan blackberry, holly, cherry laurel, common hawthorn, English ivy, morning glory, and Japanese knotweed.

Characteristics of Wetland B

Wetland B is a 0.50-acre groundwater seep wetland hydrologically connected to the West Fork of Miller Creek. This wetland is formed by groundwater seeps on the north shoulder of South 140th Street that saturate a large area. According to the Cowardin system (1979), Wetland B contains palustrine scrub/shrub (PSS) and palustrine emergent (PEM) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland B is a slope wetland.

Hydrology

Wetland B is saturated by groundwater flowing down a slope into the West Fork of Miller Creek. The groundwater seeps braid around hummocks of trees and forms defined channels in some locations. Indicators of wetland hydrology include flowing water in the West Fork of Miller Creek and saturated soil.

Soils

Two soil pits (SP-3 and SP-4) were examined in Wetland B to determine the boundary. Soil pit SP-3 was located in the groundwater seep wetland near the West Fork of Miller Creek. The soil in SP-3 was a dark (10YR 2/2) mucky silt with mottles that was saturated. Soil pit SP-4 was located on an upland slope approximately 30 feet west of the groundwater seep. The soil in the B horizon was dark (10YR 2/2) but there were no redox features and it did not meet the hydric soil criteria.

Vegetation

The plant community in Wetland B is a mixture of native and invasive species. There are hummocks of slightly higher ground covered with black cottonwood and red alder. The shrub understory includes salmonberry, red-osier dogwood, and Himalayan blackberry. Wetland B has emergent vegetation dominated by reed canary grass, giant horsetail, skunk cabbage, small-fruited bulrush, lady fern, bedstraw, and bittersweet nightshade. Some of the plants along the banks of the West Fork of Miller Creek include indian plum, holly, cherry laurel, English ivy, and sword fern.

Characteristics of Wetland C

Wetland C is a 3.33-acre riparian wetland associated with the West Fork of Miller Creek that is located between South 140th Street and South 144th Street. A portion of this wetland is identified as Category 3 (Wetland D) according to City of Burien critical area map (Burien 2008b). A portion of this wetland was delineated by Habitat Technologies (2004) for the Ajax Parking lot development. According to the Cowardin system (1979), Wetland C contains palustrine forested (PFO), palustrine scrub/shrub (PSS), and palustrine emergent

(PEM) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland C is a riverine wetland.

Hydrology

Wetland C primarily receives water from overbank flooding and a high groundwater table. In many areas near the West Fork of Miller Creek, the soil was saturated to the surface and there was evidence of flooding during the winter season. Indicators of wetland hydrology include flowing water in the West Fork of Miller Creek; and sediment deposits, drift lines, and scour marks in the floodplain fringe of the stream.

Soils

Four soil pits (SP-5 through SP-8) were examined in Wetland C to determine the boundary. Soil pit SP-5 was located west of the West Fork of Miller Creek in the wetland area identified on City of Burien critical area map. The soil in SP-5 was a dark (10YR 2/2) mucky silt with mottles starting at three inches. Soil pit SP-6 was located on an upland bench approximately 50 feet from the Miller Creek tributary in an area that appeared to be fill material. The soil in the B horizon (10YR 3/3) gravelly sand did not have any redox features and it did not meet the hydric soil criteria. Soil pit SP-7 was located on the east side of the West Fork of Miller Creek in an area with evidence of overbank flooding. The soil profile in SP-7 appeared to be sandy flood deposits (2.5Y 4/2 with mottles) that met the hydric soil criteria. Soil pit SP-8 was located on the east side of the West Fork of Miller Creek in a grassy area that was above the water table. The soil in the B horizon (10YR 3/3) gravelly sand did not have any redox features and did not meet the hydric soil criteria.

Vegetation

The plant community in Wetland C is a mosaic of native and invasive species in three canopy layers. The tree canopy includes black cottonwood, red alder, and Pacific willow. There are clumps of native shrubs such as Sitka willow, salmonberry, hardhack, and black twinberry. Wetland C has emergent vegetation consisting of reed canary grass, cattail, small-fruited bulrush, giant horsetail, skunk cabbage, creeping buttercup, and stinging nettle. Invasive species within the area include Himalayan blackberry, common hawthorn, yellow flag iris, and morning glory. The shrub layer on the dog kennel property is limited by livestock grazing and past filling.

Characteristics of Wetland D

Wetland D is a 0.41-acre riparian wetland associated with the West Fork of Miller Creek on Port of Seattle property. According to the Cowardin system (1979), Wetland D contains palustrine scrub/shrub (PSS) and palustrine emergent (PEM) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland D is a riverine wetland.

Hydrology

Wetland D primarily receives water from overbank flooding and a high groundwater table. At the time of the site visit (July 2008), the soil was not saturated to the surface but there was evidence of flooding during the winter season. Indicators of wetland hydrology include flowing water in the West Fork of Miller Creek; and sediment deposits, drift lines, and scour marks in the floodplain fringe of the stream.

Soils

Two soil pits (SP-9 and SP-10) were examined in Wetland D to determine the boundary. Soil pit SP-9 was located on a floodplain bench next to the West Fork of Miller Creek and the soil was a dark (10YR 3/2) sandy silt with mottles starting at three inches. Soil pit SP-10 was located on an upland bench approximately 30 feet north of the West Fork of Miller Creek in an area that was recently cleared of invasive species. The soil in the B horizon (10YR 4/3) did not have any redox features and so did not meet the hydric soil criteria.

Vegetation

The Port of Seattle property was recently cleared of invasive plants and planted with native species so the plant community is a mixture of native and invasive species. There is tree canopy of black cottonwood and red alder, with native shrubs in the understory that includes salmonberry and black twinberry. Wetland D has emergent vegetation dominated by reed canary grass, giant horsetail, skunk cabbage, creeping buttercup, and stinging nettle. Some of the installed plants include red cedar, Sitka spruce, red-osier dogwood, Oregon ash, Nootka rose and live stakes of Sitka and Pacific willow. Invasive species within the area include Himalayan blackberry, holly, cherry laurel, common hawthorn, English ivy, morning glory, and Japanese knotweed.

Characteristics of Wetland E

Wetland E is a 0.12-acre riparian wetland associated with the West Fork of Miller Creek located between Des Moines Memorial Drive and S 144th Way. According to the Cowardin system (1979), Wetland E contains palustrine forested (PFO) and palustrine scrub/shrub (PSS) classes. Based on the hydrogeomorphic classification system (Brinson 1993), Wetland E is a riverine wetland.

Hydrology

Wetland E primarily receives water from overbank flooding and a high groundwater table. At the time of the site visit (August 2008), the soil was not saturated to the surface but there was evidence of flooding during the winter season. Indicators of wetland hydrology include

flowing water in the West Fork of Miller Creek; and sediment deposits, drift lines, and scour marks in the floodplain fringe of the stream.

Soils

Two soil pits (SP-11 and SP-12) were examined in Wetland E to determine the boundary. Soil pit SP-11 was located on a floodplain bench next to the West Fork of Miller Creek and the soil was a dark (7.5YR 3/2) gravelly sand with mottles starting at four inches. Soil pit SP-12 was located on an upland slope approximately 20 feet south of the West Fork of Miller Creek in an area covered with invasive species. The soil in the B horizon (10YR 3/4) did not have any redox features and so did not meet the hydric soil criteria.

Vegetation

It appears that the banks of the West Fork of Miller Creek on this property were planted with native buffer species so the plant community is a mixture of native and invasive species. There is tree canopy of red alder, with installed shrubs in the understory that includes Pacific ninebark, vine maple, Oregon grape, and Douglas fir saplings. Wetland E has emergent vegetation such as reed canary grass, giant horsetail, skunk cabbage, creeping buttercup, and Watson's willowherb. Invasive species within the area include Himalayan blackberry, Scots broom, cherry laurel, English ivy, and morning glory.

Wetland Functions Assessment

The wetland and buffer functions were assessed using the methodology and rating form from the *Washington State Wetland Rating System for Western Washington* (Hruby, 2004). Three general categories of wetland functions and the opportunity to perform those functions were assessed: water quality, hydrology, and habitat. Using guidance from Washington State Department of Ecology (2008), numeric values from the rating forms were assigned qualitative function values of high, moderate, and low.

Results of the functional assessment of five wetlands in the NERA project area are discussed below. The hydrogeomorphic class of Wetlands A, C, D, and E are riverine; while Wetland B is slope. Table 4 summarizes the qualitative values for the functions that were assessed. Appendix D contains the Ecology rating forms completed for these wetlands.

Water Quality Functions

Wetlands A, D, and E have a moderate potential to improve water quality. Although the riparian wetland along the stream banks is densely vegetated and there are floodplain benches, there is only a small area that is seasonally ponded.

Table 4
Functional Assessment Rating for Wetlands in the NERA

Wetland	Categories of Assessed Functions					
	Water Quality		Hydrology		Habitat	
	Potential	Opportunity	Potential	Opportunity	Potential	Opportunity
A	Moderate	Yes	Moderate	Yes	Moderate	Moderate
B	Low	Yes	Low	Yes	Moderate	Low
C	High	Yes	High	Yes	Moderate	Moderate
D	Moderate	Yes	Moderate	Yes	Moderate	Low
E	Moderate	Yes	Moderate	Yes	Low	Low

Because there is a source of pollutants entering the wetland from upstream, there is an opportunity to perform water quality functions. Wetland B has low potential to improve water quality because this groundwater seep flows down a steep slope and is not detained in depressions. Although there is a limited source of pollutants entering the wetland from South 140th Street, there is an opportunity to perform water quality functions given its proximity to residential areas.

Wetland C has a high potential to improve water quality. The large riparian wetland on the Ajax Parking property is densely vegetated and there is a broad floodplain that allows floodwater to settle out. Because there is a source of pollutants entering the wetland from upstream, there is an opportunity to perform water quality functions.

Hydrology Functions

Wetlands A, D, and E have a moderate potential for hydrologic functions. The wetlands have constricted outlets and some storage capacity to reduce flooding and stream erosion. However, the relative size of the wetlands compared to the contributing basin for storm water runoff is low so they do little to reduce flooding from storm events. Wetlands A, D, and E have the opportunity to provide hydrologic functions because they drain to Miller Creek, which has flooding problems and sensitive resources downstream.

Wetland B has a low potential for hydrologic functions because it does not contain surface depressions that can attenuate storm flows. Wetland B has the opportunity to provide hydrologic functions because it drains to Miller Creek, which has flooding problems.

Wetland C has a high potential for hydrologic functions. The width of the wetland relative to the stream channel provides a large storage capacity to reduce flooding and stream erosion. In addition, the relative size of Wetland C compared to its contributing basin also allows it to reduce flooding. Wetland C has the opportunity to provide hydrologic functions because it drains to Miller Creek, which has flooding problems and sensitive resources downstream.

Habitat Functions

Wetlands A, B, C, and D have a moderate potential to provide habitat. These wetlands have moderate structural diversity, species diversity, interspersion of habitats, and habitat features. The opportunity to provide habitat is rated low to moderate because of their buffer condition, lack of priority habitats, and disturbed connections to other wetlands.

Wetland E has a low potential to provide habitat due to its lack of structural diversity, species diversity, and habitat features. The opportunity to provide habitat is rated low because of its buffer conditions, lack of priority habitats, and disturbed connections to other wetlands.

Wetlands Rating and Buffers

Wetlands A through E were rated using the criteria defined in the Department of Ecology's *Washington State Wetland Rating System for Western Washington* (Hruby 2004) and Burien Municipal Code (Burien 2008a). The Burien Municipal Code (BMC 19.40.300) designates four categories of wetlands: Categories 1, 2, 3, or 4 based on habitat scores from the Department of Ecology's rating system. Table 5 summarizes this information on wetland categories and buffer widths.

Wetlands A and C are rated Category II, while Wetlands B, D, and E are rated as Category III according to the Department of Ecology's *Washington State Wetland Rating System for Western Washington*. According to the Burien Municipal Code (Burien 2008a), Wetlands A and C are rated Category 2, while Wetlands B, D, and E are rated as Category 3.

Burien Municipal Code (BMC 19.40.310) provides for permanent protection of wetlands and their buffers by regulation of development and other activities within them. Wetland buffers provide important functions, including protection of wetland functions, water quality improvement, and wildlife habitat. The Burien Municipal Code requires a 100-foot buffer for Wetlands A and C that are Category 2, and a 50-foot buffer for Wetlands B, D, and E because they are Category 3.

Table 5
Wetland Rating Summary for Burien NERA

Wetland	Area (ft^2)	Area (acre)	Ecology Category[1]	Burien Category[2]	Buffer Width (ft^2)[3]
A	23,758	0.55	II	2	100
B	21,733	0.50	III	3	50
C	144,857	3.33	II	2	100
D	17,896	0.41	III	3	50
E	5,256	0.12	III	3	50

1–Wetland category based on Ecology rating system (Hruby 2004).
2 –Wetland and stream classification according to Burien Municipal Code (Burien 2008a)
3–Buffer width according to Burien Municipal Code (Burien 2008a)

Stream Rating and Buffer

The Burien Municipal Code (BMC 19.40.340) designates four classes of streams: Types 1, 2, 3, or 4 (Burien 2008a). This classification makes a distinction between perennial and intermittent streams and whether there is salmonid use. We assume there is perennial flow

in the West Fork of Miller Creek within the NERA based on flow rates observed in July 2008. The West Fork of Miller Creek within the NERA is identified on the Burien critical area map as a Type 3 stream with a 50-foot buffer (Burien 2008b). The Burien critical area map does not identify any Fish and Wildlife Habitat Conservation Areas within the NERA project area and it does not contain any habitats that are defined by BMC 19.40.380 (Burien 2008b).

The *Miller and Walker Creeks Basin Plan* (King County 2006) identifies the West Fork of Miller Creek within the NERA (Reach 10). This plan assumes there is an impassable barrier to anadromous salmon due to a 150-foot-long culvert that is downstream of the NERA (King County 2006). However, because resident cutthroat trout are reported to occur in the West Fork of Miller Creek within the NERA (King County 2006), this indicates it is a Type 2 stream with a 100-foot buffer (Burien 2008a).

Other Regulatory Issues

Several federal and state regulations affect development in critical areas. Agencies that may have jurisdiction over wetlands and streams include, but may not be limited to: the U.S. Army Corps of Engineers (Corps); Washington State Department of Ecology (Ecology), and Washington Department of Fish and Wildlife (WDFW).

The Corps administers Section 404 of the Clean Water Act, which regulates the discharge of dredged or fill materials into waters of the United States, including adjacent wetlands. The onsite wetlands are likely to be under the jurisdiction of the Corps because they are hydrologically associated with the West Fork of Miller Creek, which eventually outlets to the Puget Sound. Only Corps staff can make a Jurisdictional Determination (JD). It is our opinion that there is good probability that the Corps will take jurisdiction; however that remains to be confirmed.

Ecology administers Section 401 of the Clean Water Act and has the authority to take jurisdiction over the onsite wetlands regardless of whether the Corps takes jurisdiction or not. Again, only Ecology can make the jurisdictional call, but they do have the authority to do so under the water quality provisions in the WAC (Washington Administrative Code).

The West Fork of Miller Creek is reported to be fish-bearing stream (resident cutthroat trout), so it is likely that WDFW will require a Hydraulic Project Application (HPA) approval for any work below the ordinary high water mark.

Section 5—References

Brinson, M. M. 1993. *A hydrogeomorphic classification for wetlands*. Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS. NTIS No. AD A270 053.

Burien. 2008a. City of Burien Municipal Code—Chapter 19.40 Critical Areas. Obtained from website: http://www.ci.burien.wa.us/commdvlpmnt/zoning/zoningcodeindex.htm

Burien. 2008b. City of Burien Critical Areas Map. Obtained from website: http://www.ci.burien.wa.us/commdvlpmnt/zoning/criticalmap%2010-03.pdf

Cooke, S.S., ed. 1997. *A Field Guide to the Common Wetland Plants of Western Washington & Northwestern Oregon*. Seattle Audubon Society, Seattle Washington.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe.1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service Publication FWS/OBS-79/31, Washington, D.C.

Edaw. 2002. *Northeast Special Planning Area—Final Supplemental Environmental Impact Statement*. Prepared by EDAW, Inc., Seattle, WA.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Wetlands Research Program Technical Report Y-87-1 (on-line version). U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi. Accessed from: http://www.usace.army.mil/cw/cecwo/reg/wlman87.pdf

Gretag Macbeth. 2000. *Munsell soil color charts*. New Windsor, New York.

Guard, B.J. 1995. *Wetland Plants of Oregon and Washington*. Lone Pine Publishing, Vancouver, British Columbia, Canada

Habitat Technologies. 2004. *Wetland and drainage corridor evaluation and delineation report—E&M Investments Project Site, Parcel 1723049039*. Prepared by Habitat Technologies, Puyallup, WA.

Hitchcock, C.L. and A. Cronquist. 1973. *Flora of the Pacific Northwest*. University of Washington Press, Seattle, Washington.

Hruby, T. 2004. *Washington State Wetland Rating System for Western Washington*. Washington State Department of Ecology Publication No. 04-06-025. Olympia, Washington.

Hruby, T., T. Granger and E. Teachout. 1999. *Methods for Assessing Wetlands Functions. Volume I: Riverine and Depressional Wetlands in the Lowlands of Western Washington, Parts 1 and 2*. Washington State Department of Ecology Publication #99-115, Washington State Department of Ecology, Olympia, Washington.

King County. 2006. *Miller and Walker Creek Basin Plan*. Prepared by King County Department of Natural Resources, City of Burien, City of Normandy Park, City of SeaTac, Port of Seattle, and Washington Department of Transportation.

King County. 2008. Sensitive area map of project area obtained from website located at: http://www.metrokc.gov/gis/mapportal/iMAP_main.htm

Olson, P. and E. Stockdale. 2008. *Determining the Ordinary High Water Mark on Streams in Washington State*. Washington State Department of Ecology, Shorelands & Environmental Assistance Program, Lacey, WA. Ecology Publication # 08-06-001.

Section 5—References

Continued

Pojar, J. and A. MacKinnon, editors 1994. *Plants of the Pacific Northwest Coast: Washington, Oregon, British Columbia & Alaska*. Lone Pine Publishing, Vancouver, British Columbia, Canada

Reed, P.B., Jr. 1988. *National list of plant species that occur in wetlands: Northwest (Region 9)*. U.S. Fish and Wildlife Service Biological Report. 88 (26.9). U.S. Fish and Wildlife Service, Washington, D.C.

Reed, P.B., Jr., D. Peters, J. Goudzwaard, I. Lines and F. Weinmann. 1993. *Supplement to List of Plant Species that Occur in Wetlands: Northwest (Region 9). Supplement to Biological Report 88 (26.9), May 1988*. U.S. Fish and Wildlife Service, U.S. Fish and Wildlife Service, Washington, D.C.

U.S. Army Corps of Engineers. 2008. *Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region.* Environmental Laboratory ERDC/EL TR-08-13, Wetlands Regulatory Assistance Program, U.S. Army Corps of Engineers Engineer Research and Development Center, Vicksburg, Mississippi.

USDA. 1952. *Soil survey of King County Washington*. U.S. Department of Agriculture, Agricultural Research Administration, Bureau of Plant Industry, Soils, and Agricultural Engineering.

USDA. 2008. Washington State County Hydric Soils List. U.S. Department of Agriculture, Natural Resource Conservation Service. Obtained from website: http://www.wa.nrcs.usda.gov/technical/soils/county_hydric_lists.html.

USFWS. 2008. Wetlands Geodatabase. U.S. Fish and Wildlife Service, Division of Habitat and Resource Conservation, Washington, D.C. Obtained from website: http://wetlandsfws.er.usgs.gov/NWI/index.html

Washington State Department of Ecology. 1997. *Washington State Wetlands Identification and Delineation Manual*. Ecology Publication #96-94, Washington State Department of Ecology, Olympia, Washington.

Washington State Department of Ecology. 2008. *Focus Sheet: Shorelands and Environmental Assistance, Using the Wetland Rating System in Compensatory Mitigation* Ecology Publication #08-06-009, Washington State Department of Ecology, Olympia, Washington.

Williams, R. Walter, Richard M. Laramie and James J. Ames. 1975. *A Catalog of Washington Streams and Salmon Utilization. Volume 1, Puget Sound Region*. Washington Department of Fisheries.

A

Appendix - Section 4

Community and Stakeholder Involvement Summary Report

Northeast Redevelopment Area (NERA)
Redevelopment Plan and Implementation Strategy

COMMUNITY AND STAKEHOLDER INVOLVEMENT SUMMARY REPORT

CITY OF BURIEN AND PORT OF SEATTLE • FEBRUARY 2010

HEARTLAND

otak

Community and Stakeholder Involvement Summary Report

February 2010

Prepared By:

Otak, Inc
10230 NE Points Drive
Suite 400
Kirkland, WA 98033

Prepared For:

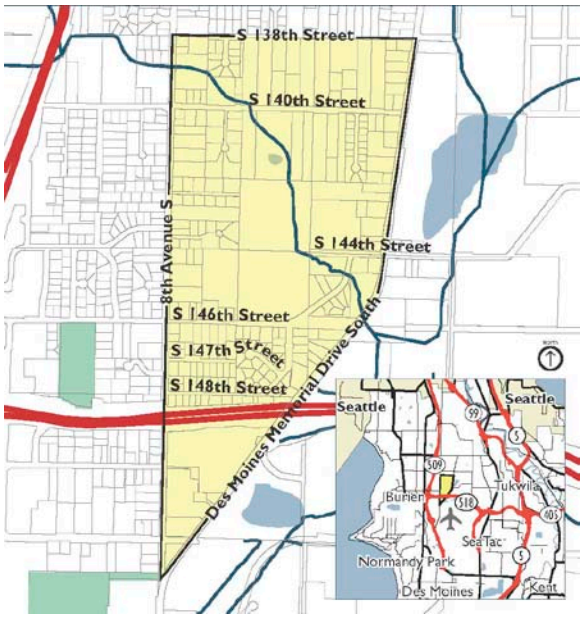
The City of Burien
and
The Port of Seattle

Table of Contents

Introduction & Project Background **3**
The Purpose of Public Involvement **4**
Community Dialogue Workshop Series **4**
Overview *4*
Workshop Series Goal *4*
Identifying and Involving Stakeholders and the General Public *4*
Notifying the Public *4*
Summary of Stakeholder Workshop Sessions **5**
Overview *5*
Summary of the General Public Workshop **8**
Overview *8*
Summary of General Comments *8*
Next Steps **9**
Study Work *9*
Ways to Stay Involved **10**
Contact Us *10*
Project Schedule **10**
NERA Strategy Outreach and Involvement Methods **11**

Introduction & Project Background

The City of Burien and the Port of Seattle are guiding the creation of a redevelopment strategy for the 135-acre Northeast Redevelopment Area (NERA) located north and northwest of the new third runway at Seattle-Tacoma International Airport, between 8th Avenue S., Des Moines Memorial Drive and S. 138th Street.



NERA Vicinity Map

The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at SeaTac Airport as well as existing and planned surrounding land uses and overall community planning interests. The NERA redevelopment strategy will include flexible and market-responsive redevelopment scenarios, recommended policies, and development regulations to guide long-term redevelopment in the NERA. This effort will build upon previously completed comprehensive planning and environmental review work.

To date, the study has focused on analysis of critical areas and existing conditions within the study area, which included the delineation and surveying of the Miller Creek Corridor and associated wetlands and review of Federal Aviation Administration (FAA) requirements and restrictions. An assessment of existing market conditions and influences was also completed, as a precursor to determining specific market opportunities for the NERA site. This assessment will aid in identifying the framework for alternative economic development strategies for the area. The project team, working closely with Burien and Port of Seattle representatives, then proceeded to analyze strengths, weaknesses, opportunities, and threats for the NERA planning. This analysis led to the creation of conceptual redevelopment scenarios. The project team identified potential redevelopment sub-areas and generated a list of potential land uses suitable for each area, based on physical conditions, topography, transportation and access considerations, parcel size, environmentally sensitive areas, and FAA development requirements and constraints.

NERA Public Meeting, October 23, 2008

The Purpose of Public Involvement
The purpose of the public and stakeholder involvement and outreach process is to involve a broad spectrum of community interests and perspectives in the development of the vision and strategic plan for the NERA. This level of involvement by the community will help to:

- Bring forward valuable insights and ideas that will shape the strategy;
- Build stronger community interest and support in the strategy; and
- Foster partnerships and cooperation to help ensure that the vision and strategy can be successfully implemented over the long-term.

Public and stakeholder involvement is a critical element of the planning process for the NERA strategy, and it will continue to play an important and valuable role through the completion of this study.

Refer to the end of this report for a list of outreach and involvement methods that will be ongoing during the development of the NERA Strategy.

Identifying and Involving Stakeholders and the General Public
Stakeholders were identified through property ownership, neighboring properties and local jurisdictions affected by the future NERA redevelopment strategy. Stakeholder groups included:

- City of Burien Staff
- Port of Seattle Staff
- City of SeaTac Staff
- City of Burien Leadership
- Auto Dealers of Burien
- General Public

Notifying the Public
The general public was notified about the public workshop in a variety of ways to ensure broad awareness of the event. To ensure effective notification to the public, a press release was issued along with a newspaper notice and a posted notice on the City of Burien website. General project information and public meeting notification was mailed to residents located inside the NERA and within a 500 foot radius of the study area boundary. Project information sheets were also available and displayed at Burien City Hall.

Community Dialogue Workshop Series October 23-24, 2008

Overview
Information gathered from work sessions with City of Burien and Port of Seattle staff, paired with findings from the existing conditions research, served as a framework for the draft conceptual redevelopment scenarios for sub-areas of the NERA. The results of the existing conditions analysis and the draft redevelopment scenarios were presented to stakeholder groups and the general public in workshop sessions held on October 23-24, 2008.

Workshop Series Goal
The goal of the October 2008 workshops was to create an open environment where participants could share their opinions and ideas for the future redevelopment of the NERA. Participants were asked to comment on possible opportunities and challenges related to redevelopment, as well as what specific types of uses they would like to see explored for the area.

NERA Public Meeting, October 23, 2008

Summary of Stakeholder Workshop Sessions

Overview

Stakeholder workshops were held at the conference room at Burien City Hall. Multiple meetings were held throughout the day on October 23rd and 24th. Each workshop session began with a background presentation that included information about the existing conditions analysis and opportunities and challenges associated with the NERA, including FAA development restrictions. After the presentation, stakeholder groups learned about the conceptual redevelopment scenarios being considered for the NERA sub-areas.

Participants were asked to comment on the redevelopment scenarios, as well as provide their own ideas and input about what they would like to see considered. Participants referred to aerial photo maps displayed on the table during the workshop sessions, which gave them the opportunity to review and comment on sub-area concepts, as well as provide input related to potential ideas for transportation improvements and open space enhancements.

Input gained from the stakeholder workshop sessions will help shape both the short term and the longer term vision for the NERA. A summary of the key points from each workshop session is provided below.

Burien City Leadership Stakeholder Workshop Session

City of Burien Staff and Leadership

- The Miller Creek Corridor provides the opportunity for open space and recreational uses, including a linear pathway system that could serve as a connection to the community's loop trail system, as well as provide opportunities for this area to function as an amenity for future businesses locating in the NERA (for employee lunch time recreation, picnicking, walking, etc.). The use of this corridor for a trail system link is identified in the City of Burien "Pedestrian and Bicycle Facilities Plan" as a portion of the "Burien Loop Trail."

- There is a need for more parks and open space in this area of the community.

- There may be opportunities to look at the transfer of development rights, as well as clustered development on properties where wetland, creek, buffers, and steep slopes constrain development potential.

- Large retail uses may be most viable in the southern tip of the NERA. There has been a lot of interest in this area related to large retail in the recent past.

.

- Interim land uses such as more home based businesses, small office, and small retail could be encouraged in the western and northern portions of the NERA.

- The creation of an enhanced internal roadway system within the NERA would take pressure off of Des Moines Memorial Drive and other nearby roadways. This internal circulation system could be as formal as a roadway or as informal as a system of connected parking areas with through access.

- Conversations are moving forward with WSDOT pertaining to the potential for improving the SR 518 interchange to a full diamond (one of the first steps will be to amend the route development plan).

- 8th Avenue South and S. 140th Street could be improved and upgraded with sidewalks and arterial level improvements.

- There are concerns about truck traffic extending into surrounding neighborhoods – these will need to be addressed with redevelopment.

- Would property acquisitions arranged through the City of Burien or other parties result in different FAA restrictions in certain areas of the NERA?

- The City is willing to offer flexibility related to design standards to encourage low impact development and ecologically sustainable uses.

- Consider transit related opportunities as it relates to the Sound Transit bus rapid transit route and SR 518. Confirm park and ride needs.

- Look at opportunities for phasing infrastructure to help activate redevelopment. Get the first project jump started so the rest will happen more easily.

- The City is interested in finding land for public works and potentially parks and recreation operations/facilities.

- Supportive of opportunities for infrastructure improvements and low-impact development. Would like to see this project become a model for ecologically sustainable development.

- NERA planning and design should honor the Des Moines Memorial Drive Corridor Plan. Providing alternative access routes from SR 518 would be beneficial in relieving congestion on Des Moines Memorial Drive.

- The Miller Creek Corridor provides open space and recreational opportunities for neighboring

properties and also serves as an amenity to future development.

- Consider limiting large retail to southern area of the NERA.
- Need to identify the highest and best uses for all areas in the NERA.
- Check with Highline School District on the plans for their property.
- Are there opportunities for revenue sharing agreements?

Stakeholder Workshop Session

Port of Seattle Staff

- Supportive of creative types of uses on lands where buildings are restricted – such as transportation, parking, roadways/access, stormwater facilities, passive recreation, some utilities, etc.
- Revenue-generating, airport supportive uses (such as air cargo, light manufacturing, etc.) are a priority to the Port.
- The Port's policy is typically to lease land rather than sell, however there might be some flexibility with this policy.
- Need to create suitably sized and configured parcels to attract a range of light industrial/commercial uses.
- Improvement of the SR 518 interchange will bring regional benefits beyond those to the NERA, and as such, any cost analysis/cost sharing scenarios need to consider benefits to the region through a holistic approach.
- The Port could continue to ask for flexibility on some of the FAA restrictions, but so far, recent requested changes have not been allowed.
- Need to consider market realities for both the short and long term. Identify areas to focus on first and update the strategy as projects are implemented.

City of SeaTac Staff

- Improvement of the SR 518 interchange may create the need for additional road improvements in the vicinity. The SR 518 interchange project will take a long time to implement.
- The use of an internal roadway system within the NERA would preserve the historic features and condition of Des Moines Memorial Drive.
- Planning and design in the NERA should honor the Des Moines Memorial Drive Corridor Plan and should consider potential roadway improvements to the east of the site as planned under the North SeaTac Roadways project.
- Proposed uses in the NERA should consider potential impacts to nearby areas related to traffic, light and glare, aesthetics, etc.

- Are there additional opportunities for tax revenue and retail/commercial uses within and adjacent to the NERA?
- Could the restoration of the Miller Creek Corridor continue into SeaTac?

Auto Dealers of Burien

- There are benefits related to the potential opportunity to relocate to the NERA – proximity to SR 518; ability to locate together, etc.
- Visibility and space is important to attract customers and provide the level of service expected.
- Typically need 4 to 7 acres per dealership; some facilities could be shared – such as parking areas; however, display areas cannot be shared.
- Look at scenario with SR 518 interchange improvement and without it.
- Upgrades to existing facilities are required by the franchise and should be included in the timing and schedule of redevelopment strategy.

Summary of the General Public Workshop

Overview

A general public workshop was held on the evening of October 23, 2008 at Cedarhurst Elementary School. Approximately 70 people participated in the workshop session. Exact participation is difficult to quantify since not all meeting attendees signed in.

After convening the general public meeting and providing a brief presentation on the project, meeting participants were divided into four groups for more detailed discussions. Facilitators of each group took notes of the comments and input provided by participants.

A summary of the comments and input gathered from the public meeting follows.

Public Meeting Discussion Group

Summary of General Comments

- Concerns were expressed about the general quality of life in the NERA today. Many expressed the need for immediate improvements and enhanced public services in the area to address crime, graffiti, abandoned buildings/properties, etc. Workshop participants were interested in near-term strategies for improving quality of life
- Regarding interim uses in the area while undergoing redevelopment - these uses need to be compatible with adjacent existing uses and must provide a safe environment for the neighboring community.
- Opportunities for infrastructure improvements and low-impact development should be explored.

- Implementation of the NERA strategy should provide high quality development that is respectful of neighboring properties.
- Interest was expressed in recreation and open space opportunities associated with the Miller Creek Corridor.
- Traffic and transportation infrastructure improvements are needed to accommodate commercial and light industrial uses proposed in the NERA, but these improvements must minimally impact neighboring residential uses (i.e. avoid truck traffic flow into neighborhoods).
- There is a need for stormwater infrastructure improvements to improve drainage for the NERA and surrounding residential areas. There are drainage problems affecting some properties along 8th Avenue S.
- Higher intensity uses should be located east of the Miller Creek Corridor since it serves as a natural barrier due to the topographic divide and dense vegetation.
- The potential for large retail uses located in the southern tip of the redevelopment area makes sense.
- Support was expressed for the creative use of FAA restricted land, for community-compatible uses, such as passive recreation, open space, etc.
- Protect and preserve Des Moines Memorial Drive.
- Supportive of the potential for allowing home-based businesses in an interim redevelopment phase. The 2-acre minimum rule for redevelopment should be lifted.

Public Meeting and Supplemental Environmental Impact Statement (SEIS) Scoping Meeting
April 29, 2009

Overview

In April 2009, a public meeting was held to gather information and input on the latest draft redevelopment alternatives for the NERA. This meeting provided the opportunity to gather additional information and comments from the public regarding potential redevelopment alternatives. The public meeting also served as an environmental scoping meeting. This meeting was facilitated by the City of Burien Hearing Examiner and featured break-out sessions for residents with concerns and opportunity for verbal and written comments on the two redevelopment alternatives and a "no action" alternative that would leave existing City of Burien land use designations and regulations in place.

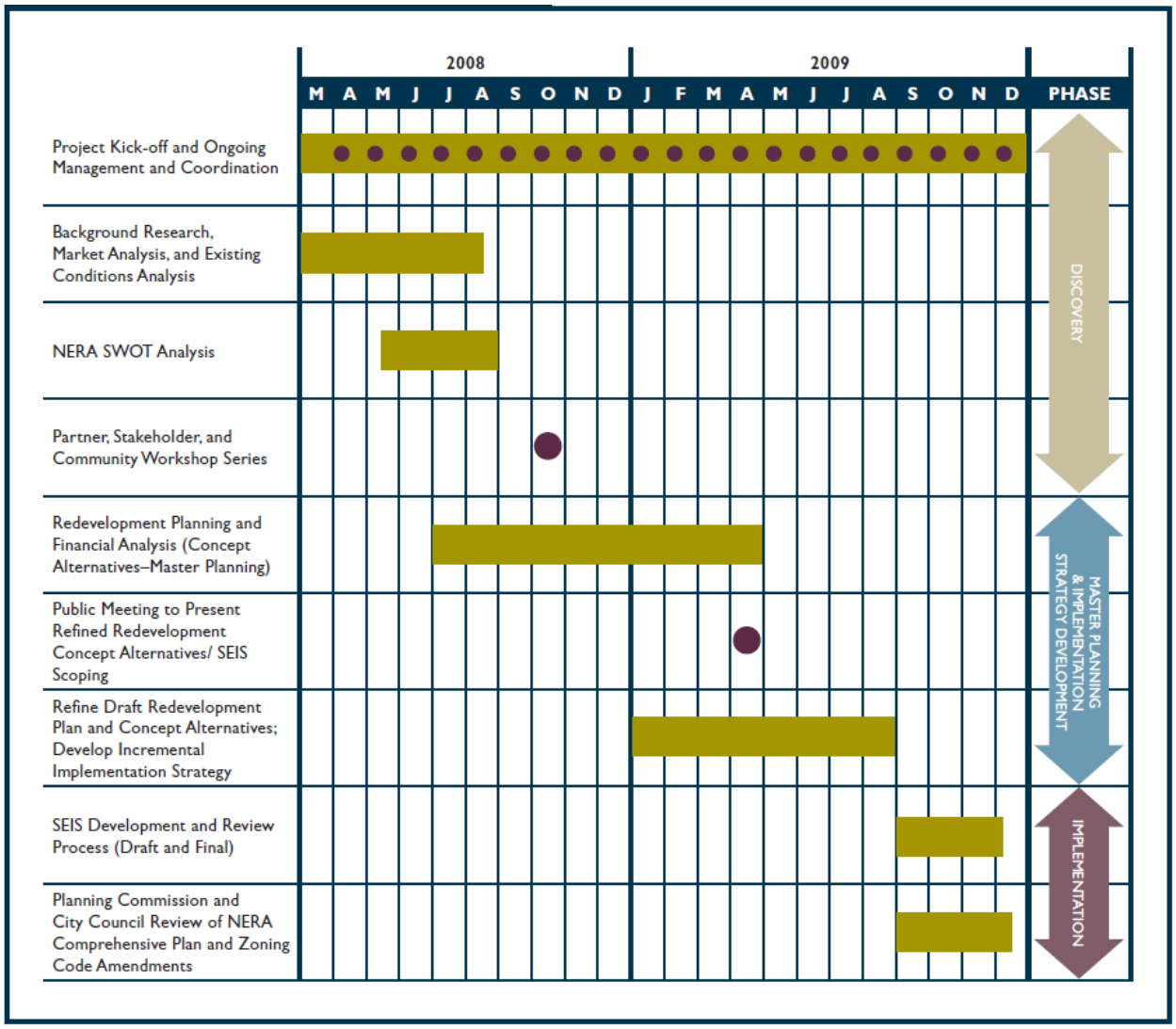
Several comments were provided at this meeting. Some participants were excited by the possibility for industry and new development in the area. However, some were concerned about potential environmental impacts, such as traffic, noise and light. Some property owners expressed interest in an expanded home-based business opportunities, while some were interested in staying in their residence and wanting to reinvest in their property.

Next Steps

Study Work

Over the next few months, the project team will be refining the conceptual redevelopment scenarios for the NERA and completing the draft financial analysis and study recommendations. Refer to the project schedule on the next page of this report for a graphic illustration of the study process and next steps.

Project Schedule



Ways to Stay Involved

Visit the Project Website
Information about the NERA Strategy, and upcoming participation can be found on the City of Burien website. Please see link below:

http://wa-burien.civicplus.com/index.asp?NID=320

Contact Us
Get in touch with us to share ideas, ask questions, or to request more information. You can email, call, or write us anytime, at:

- Email: NERA@burienwa.gov
- Phone: Kristen Clem at 425-822-4446
- Mail: Burien NERA
  c/o: Otak Inc.
  10230 NE Points Drive
  Suite 400
  Kirkland, WA 98033

NERA Strategy Outreach and Involvement Methods

Public and stakeholder involvement is an important aspect of the study process for creating the NERA Strategy. The study process includes the following types of public and stakeholder outreach and involvement methods.

Project Information Sheet
The project information sheet is a valuable communication tool that serves as a go-to source for the latest project news.

City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA) Strategy and Master Plan
Project Information Sheet • October 2008
Project Purpose
The City of Burien, in partnership with the Port of Seattle (operators of Seattle-Tacoma International Airport), are in the process of preparing a redevelopment strategy for the Northeast Redevelopment Area (NERA) in Burien. The NERA strategy will evaluate redevelopment options that are flexible and respond to market conditions, as well as propose ways to guide long-term development in the NERA.
The NERA strategy will identify preferred land uses on a conceptual level based on market research and public feedback. It will identify the potential environmental impacts of future development related to traffic, surface water, building bulk and location, and parking. The redevelopment strategy will also consider Federal Aviation Administration (FAA)-imposed development restrictions which affect the height and location of future development.
Built upon past planning and environmental studies, the strategy will include ideas and concepts to help property owners in the NERA envision how their properties could contribute to the area's transition from the current mixture of vacant, residential, public, and small commercial land uses to new uses that are compatible with operations at Sea-Tac.
Overall Vision for the NERA
Through strategic, phased redevelopment over time, the NERA will eventually transform into an area of airport compatible uses. Redevelopment will be responsive to regional economic conditions, adaptable to the physical and environmental limitations of the land, provide appropriate transitions with neighboring residential land uses, and consistent with the community's desires for the area.
Objectives – The NERA strategy and master plan will:
- Be realistic and implementable
- Build upon previous work
- Recognize and be designed to respond appropriately to economic conditions
- Be flexible and phased to promote cost effective and timely decision making
- Identify specific tools and resources for implementation
- Provide maximum possible revenues and returns to the City of Burien, Port of Seattle, and other property owners
- Conform to FAA land use and design restrictions for airport safety
Provide Your Input at a Public Meeting
October 23, 2008
6:30pm to 8:00pm
Cedarhurst Elementary School Cafetorium
611 South 132nd Street
Burien, WA 98168
Your input will help shape the NERA Strategy. Please join us at the public meeting to share your comments and perspectives. We will cover discussion related to the following topics:
- Market and economic conditions
- Land uses – community and airport compatibility
- Transportation
- Utilities and infrastructure
- Environmental considerations

It provides project background and goals, details about upcoming schedule and project team contact information. This document will be updated for the next stakeholder and public meetings.

Project Email and Contact
An important aspect of community outreach is opening an avenue for two-way communication. To facilitate this, a project specific email address (NERA@burienwa.gov) was set up and provided, along with general contact information on all the public information pieces distributed. This communication tool provides interested parties opportunities to provide input, get their questions answered and request information.

Website
Project background information, documents, updates and meeting announcements have been and will continue to be posted on the City of Burien's website: http://www.burienwa.gov/

Newspaper
Local newspapers provide yet another opportunity for public outreach. The project team has been working with the local paper in the form of press releases to update the public on the progress of the study. The project team will continue to work with the local paper to provide study progress.

Interactive Workshops with Stakeholders
Stakeholders have been and will continue to be invited to attend workshops and meetings to facilitate open discussion on opportunities for NERA redevelopment. Another stakeholder workshop series will be held once the redevelopment scenarios are further refined and analyzed, in early March 2009.

Public Workshop
One public workshop was held on October 23, 2008 for residents in and around the NERA. The format included a brief presentation on the project background and current status of the project. The meeting provided the opportunity to break into groups to discuss and provide comment on the potential redevelopment scenarios, challenges and opportunities of the NERA. An additional general public meeting/workshop will be held once the

redevelopment scenarios are further refined and analyzed, in early March 2009.

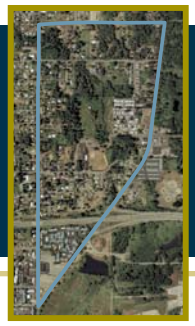
Comment Cards

Comment cards were provided at the public meeting to allow participants to opportunity to provide additional input. Meeting participants were encouraged to fill out the comment cards at the meeting, take them home to fill out later or distribute to interested neighbors who may have ideas to share.

A

Appendix - Section 5

Community Involvement Attachments



City of Burien and Port of Seattle

Northeast Redevelopment Area (NERA) Strategy and Master Plan

Project Information Sheet • October 2008

Project Purpose

The City of Burien, in partnership with the Port of Seattle (operators of Seattle-Tacoma International Airport), are in the process of preparing a redevelopment strategy for the Northeast Redevelopment Area (NERA) in Burien. The NERA strategy will evaluate redevelopment options that are flexible and respond to market conditions, as well as propose ways to guide long-term development in the NERA.

The NERA strategy will identify preferred land uses on a conceptual level based on market research and public feedback. It will identify the potential environmental impacts of future development related to traffic, surface water, building bulk and location, and parking. The redevelopment strategy will also consider Federal Aviation Administration (FAA)-imposed development restrictions which affect the height and location of future development.

Built upon past planning and environmental studies, the strategy will include ideas and concepts to help property owners in the NERA envision how their properties could contribute to the area's transition from the current mixture of vacant, residential, public, and small commercial land uses to new uses that are compatible with operations at Sea-Tac.

Overall Vision for the NERA

Through strategic, phased redevelopment over time, the NERA will eventually transform into an area of airport compatible uses. Redevelopment will be responsive to regional economic conditions, adaptable to the physical and environmental limitations of the land, provide appropriate transitions with neighboring residential land uses, and consistent with the community's desires for the area.

Objectives – The NERA strategy and master plan will:

- Be realistic and implementable
- Build upon previous work
- Recognize and be designed to respond appropriately to economic conditions
- Be flexible and phased to promote cost effective and timely decision making
- Identify specific tools and resources for implementation
- Provide maximum possible revenues and returns to the City of Burien, Port of Seattle, and other property owners
- Conform to FAA land use and design restrictions for airport safety

Miller Creek corridor

8th Avenue South (looking south)

Previous land uses in the NERA – now in transition

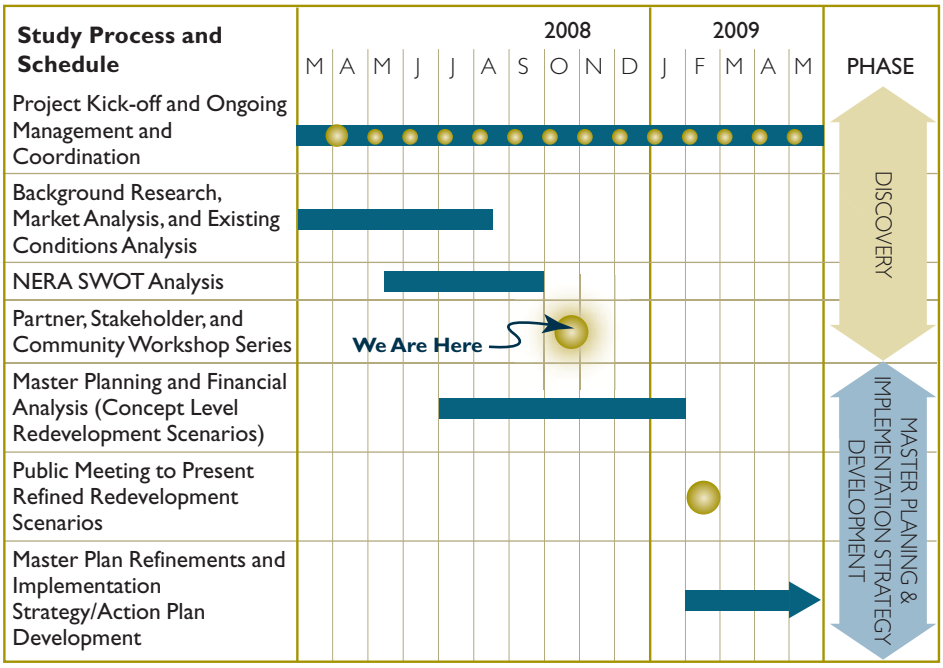
Provide Your Input at a Public Meeting

October 23, 2008
6:30pm to 8:00pm

Cedarhurst Elementary School
Cafetorium
611 South 132nd Street
Burien, WA 98168

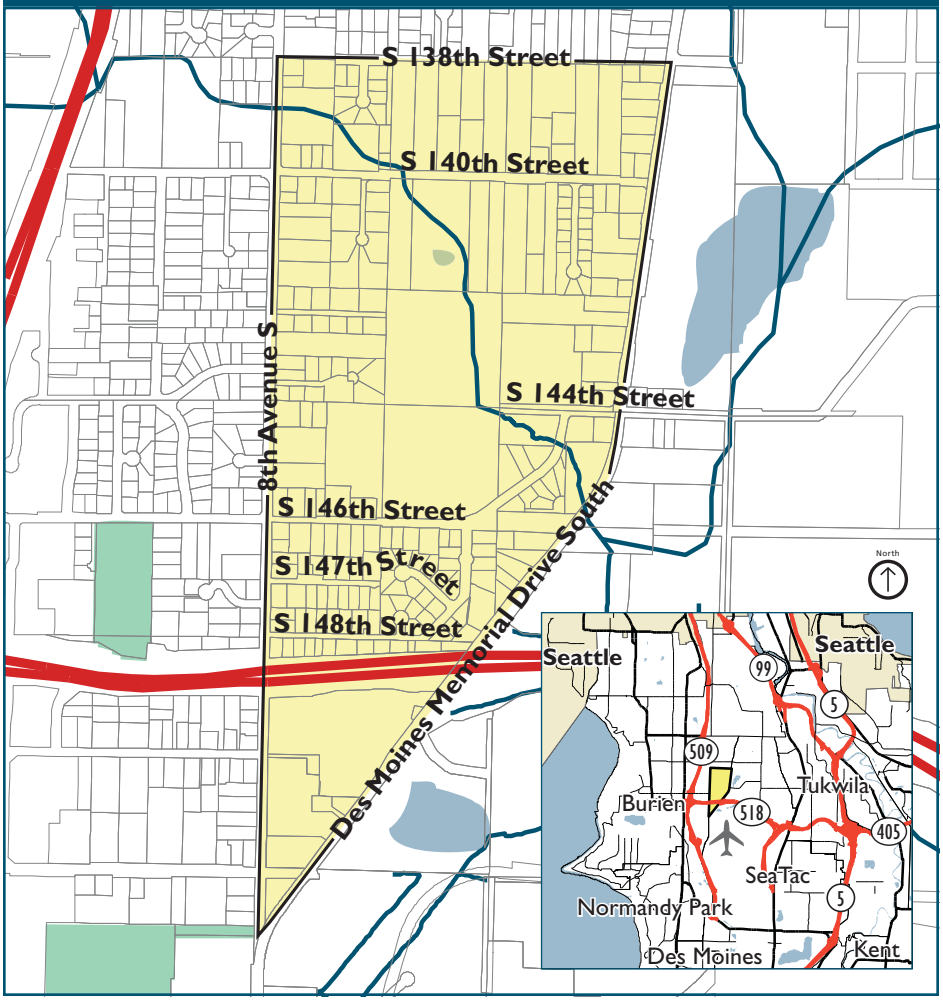
Your input will help shape the NERA Strategy. Please join us at the public meeting to share your comments and perspectives. We will cover discussion related to the following topics:

- Market and economic conditions
- Land uses – community and airport compatibility
- Transportation
- Utilities and infrastructure
- Environmental considerations



Burien NERA Strategy Project Area

The Northeast Redevelopment Area (NERA) is bounded by 138th Street to the north, 8th Avenue South to the west, and Des Moines Memorial Drive South to the east and south. The NERA is located just north and northwest of the new third runway at Sea-Tac International Airport.



Where We Are Now

Work to date has included existing conditions analysis, wetland and creek delineation, analysis of strengths, weaknesses, opportunities, and threats, and preliminary master planning of redevelopment scenarios on a conceptual level.

Important Dates

The Burien Northeast Redevelopment Area Strategy is scheduled to be completed by Summer of 2009. During the course of the project there will be two public meetings. The first meeting is designed to gather input from the public on broad, conceptual ideas and possibilities for the area. This meeting is scheduled for October 23, 2008. The second public meeting will be held in early 2009 to gather input on more specific redevelopment strategies. Please watch for future meeting announcements and project updates. You may feel free to contact us with any questions you may have at NERA@burienwa.gov.

Recently completed third runway

For More Information

– Kristen Clem –
Otak, Inc.
1218 Third Avenue, Suite 300
Seattle, WA 98101
425-739-7959
email: NERA@burienwa.gov

Additional project information will be available on the City of Burien website:
www.burienwa.gov

Redevelopment Concepts for Subareas in the NERA

October 23, 2008

Sub-area 1

- Good visibility and access
- Big box retail/commercial
- Airport-related Industrial
- Restricted Controlled Activity Area (CAA) in NE corner

Sub-area 2

- Retail, light industrial or airport related industrial use
- Analysis needed to assess benefits of upzoning from industrial to commercial

Sub-area 3

East

- Good visibility and access
- Airport related Industrial
- Parking (for area restricted to only parking use)
- Parking of cars related to automall use
- Continuation of automall if more capacity is needed
- Southern portion restricted to passive open space (no bird attraction)

West

- Majority restricted land for parking use only

Sub-area 4

- Developable airport compatible uses
- Airport related Industrial
- Non-airport “flex – tech” (higher percentage of office)
- Automall

Redevelopment Concepts for Subareas in the NERA *(continued)*

Sub-area 5

- Transitional from residential to other use
- Higher decibel levels to the east, may not be compatible for residential
- Restricted by wetland and stream buffers to the west
- Home-based business, small retail
- Office

Sub-area 6

- Transitional from residential to other use
- Home-based business, small retail
- Office

Sub-area 7

- Transitional from residential to other use
- Home-based business or office use
- Possibility of transportation improvements (SR 518 full diamond improvement)
- Little restriction, some present in southeastern portion due to presence of the Controlled Activity Area (CAA)
- Good visibility from 518 with little FAA restrictions present.

Infrastructure Improvement Area

- Possible SR 518 diamond improvement – cost/benefit analysis is needed
- Great use of restricted space

Miller Creek and Wetlands Corridor

- Trails/pathway system
- Linear nature park/open space amenity for future employment center

Ajax Parking Area

- What are the long-term redevelopment opportunities?

City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA)

otak HEARTLAND

NERA Subareas

31235

APRIL 2009

S 138th Street
S 140th Street
S 144th Street
S 146th Street
8th Avenue S
Des Moines Memorial Drive South
518

5
6
4
2b
2a
7
3
1

PROPOSED LAND USE

- Light Industrial/Flex-Tech or Auto Mall
- Light Industrial/Flex-Tech
- Commercial/Light Industrial
- Residential and Small Business
- Stormwater Management
- Miller Creek Corridor
- New Roadway
- Potential Ramps

North

0 100 Feet

Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

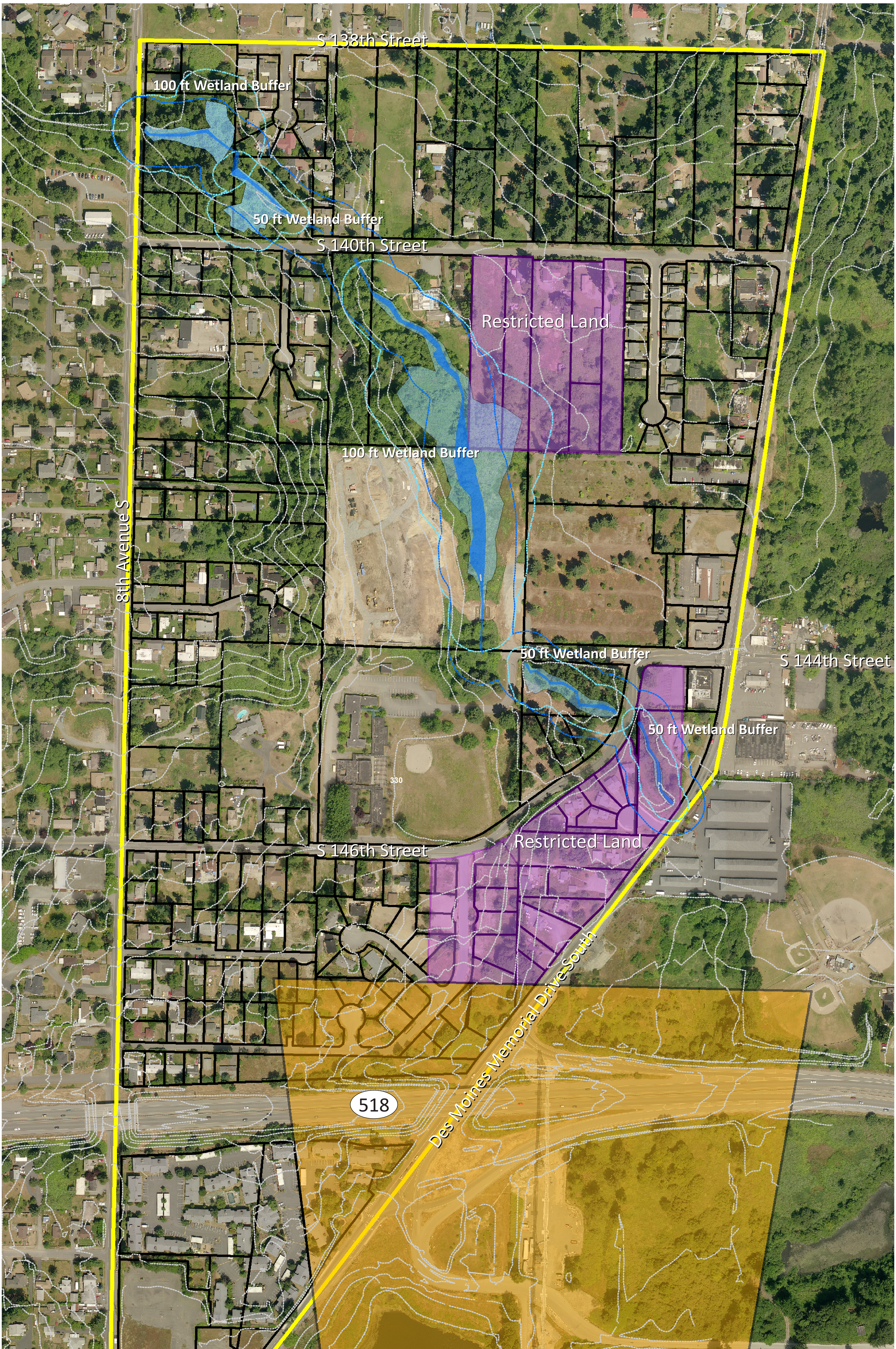
City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA)

otak HEARTLAND

NERA Existing Conditions

31235

APRIL 2009



Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

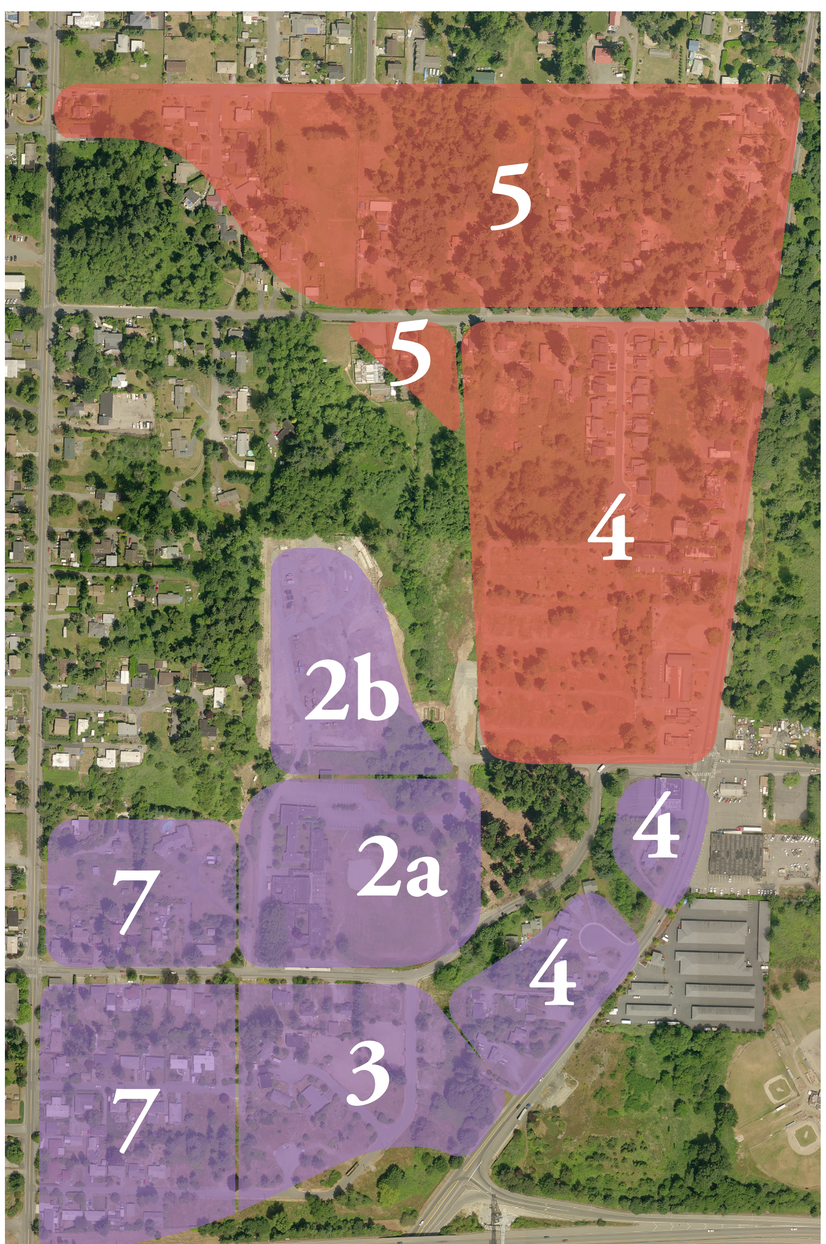
Land Use Examples

RESIDENTIAL/SMALL BUSINESS

Redevelopment of Subarea 6 is very long term.

We will be looking at several options to allow property owners the ability to create small office and commercial uses in conjunction with their homes.

Residential and Small Business



INDUSTRIAL/FLEX-TECH

Land uses that allow for a range of industrial and technological uses.

Examples of users include:

- transportation companies
- printing warehouse
- professional office
- engineering firm
- web hosting company

Light Industrial/Flex-Tech or Auto Mall

Light Industrial/Flex-Tech

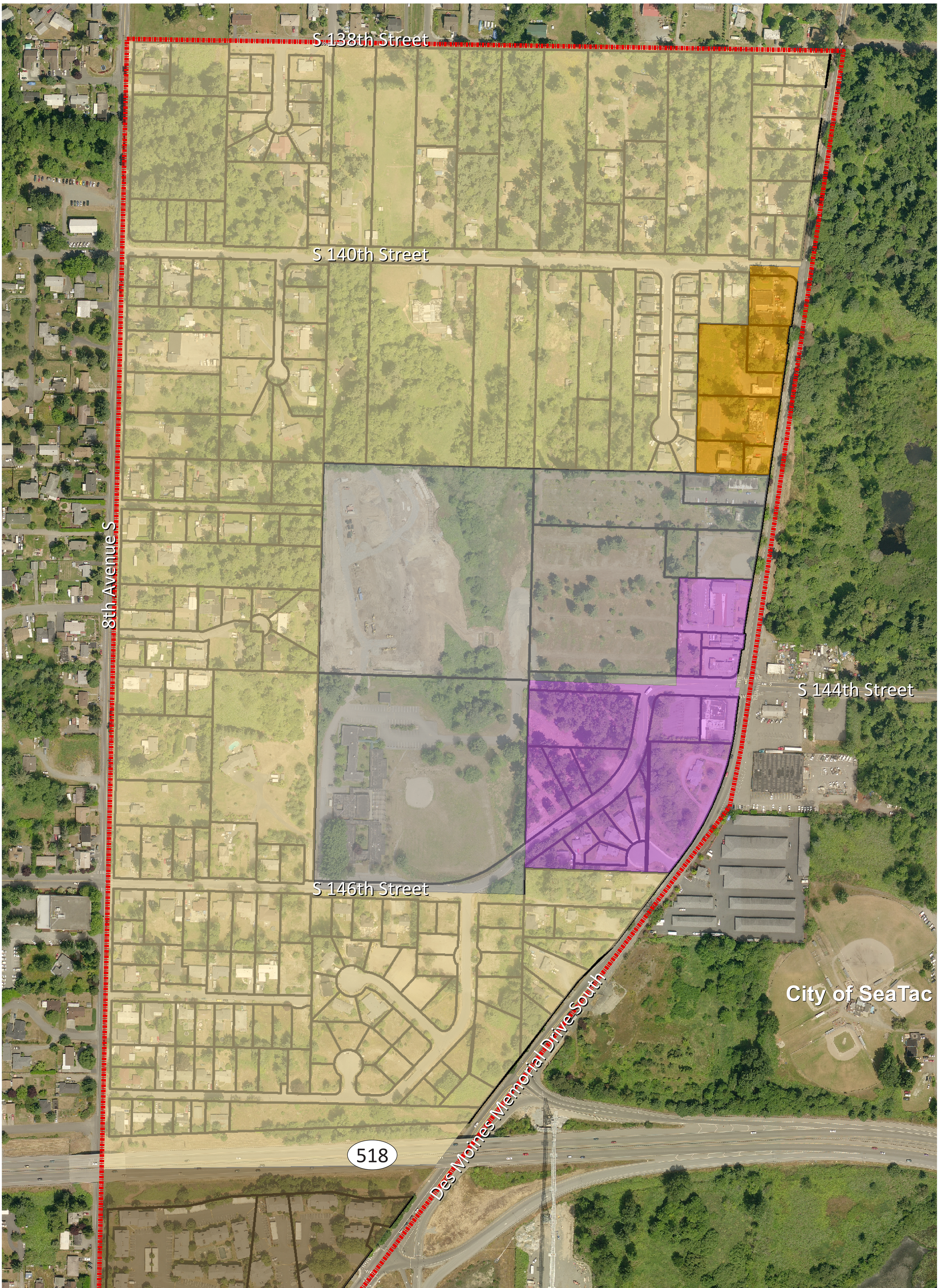
City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA)

otak HEARTLAND

ALTERNATIVE 3: No Action (leave existing regulations in place)

31235

APRIL 2009



Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

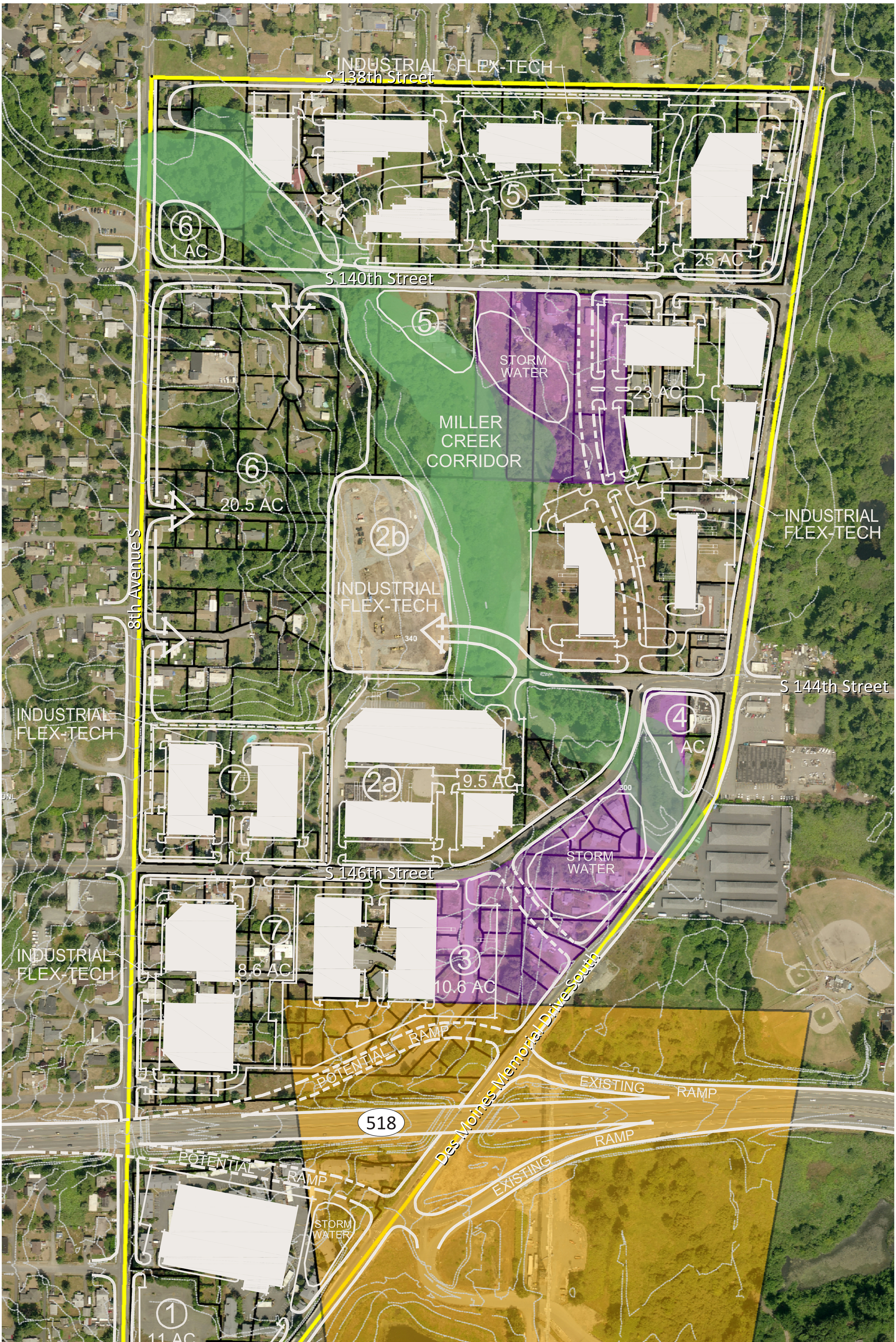
City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA)

otak HEARTLAND

ALTERNATIVE 2: Airport/Industrial Flex-Tech Option

31235

APRIL 2009



Legend

- NERA Boundary
- Parcel Lines
- 10' Elevation Contours
- Miller Creek Corridor

Aviation Constraints

- Controlled Activity Area (CAA)
  (No Structures, Passive recreation allowed - no bird attraction)
- Restricted land
  (Stormwater, parking and passive recreation only- No Structures)

Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

0 100 Feet

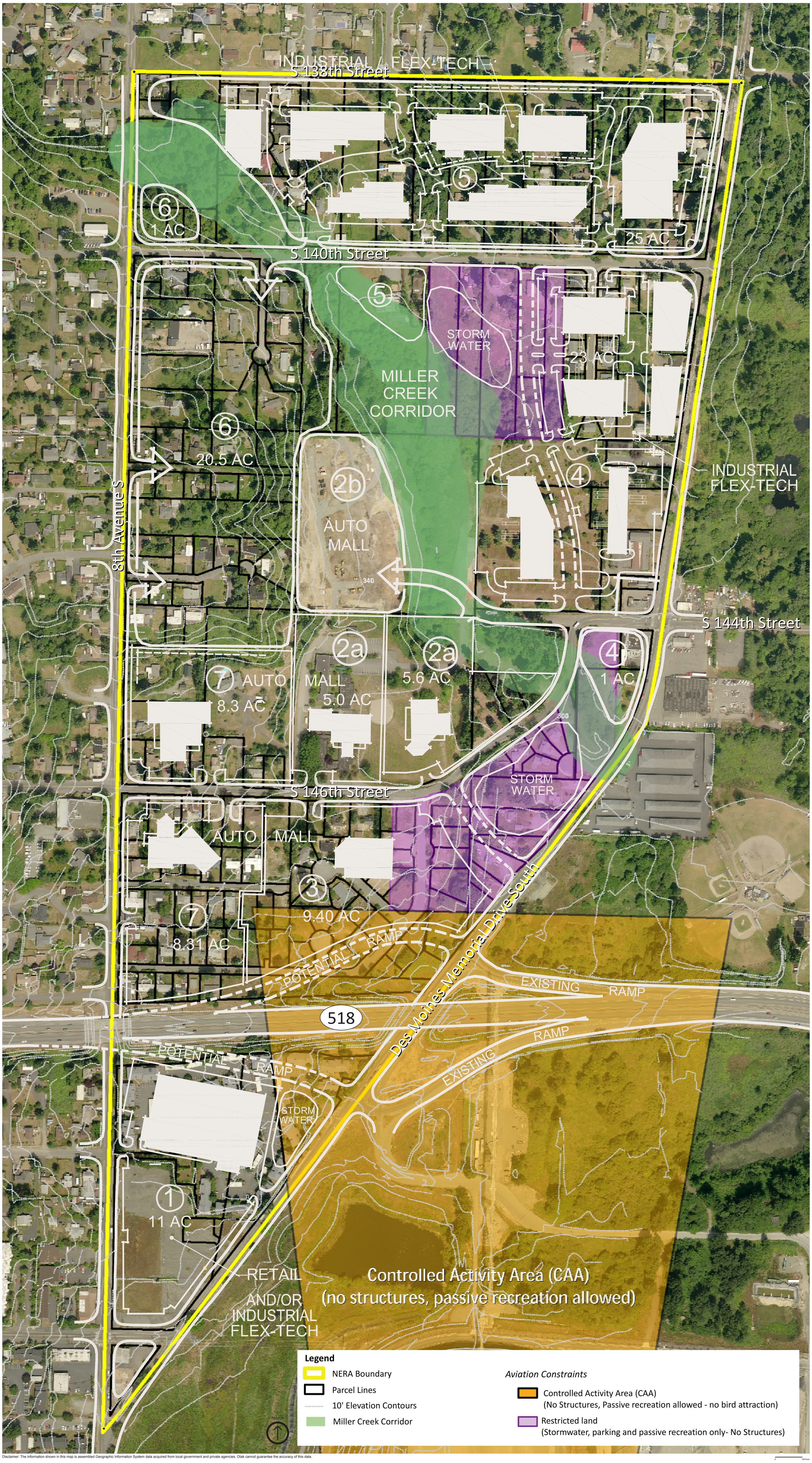
City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA)

HEARTLAND

ALTERNATIVE 1: Auto Mall/Flex-Tech and Light Industrial

31235

APRIL 2009



Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

City of Burien and Port of Seattle
Northeast Redevelopment Area (NERA)

otak HEARTLAND

NERA Property Ownership

31235

APRIL 2009

S 138th Street

S 140th Street

8th Avenue S

Ajax Parking Property

Highline School District Parcel

City of Burien Owned Parcels

S 144th Street

S 146th Street

Des Moines Memorial Drive South

518

Information updated as of March 2009

North

Legend

- NERA Boundary
- Private Property
- City of Burien Owned
- Highline School District Owned
- Port of Seattle Owns
- Port of Seattle Plans to Buy

Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

0 100 Feet

FOR IMMEDIATE RELEASE
October 9, 2008

Contact: Kristen Clem
Otak, Inc.
425-739-7959
NERA@burienwa.gov

Public Input Sought for Burien Northeast Redevelopment Area (NERA) Strategy and Master Plan

The City of Burien, in partnership with the Port of Seattle (operators of Sea-Tac International Airport), is studying the Northeast Redevelopment Area (NERA), located north of the recently constructed third runway. The study will identify ways to help property owners transition their properties from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport. The NERA redevelopment strategy and master plan will evaluate options that are flexible and respond to market conditions, as well as propose ways to guide long-term redevelopment in the NERA. This effort will build upon past planning and environmental studies.

The public is invited to attend a meeting on Thursday, October 23, 2008 from 6:30 pm to 8:00 pm at the Cafetorium in the Cedarhurst Elementary School (611 South 132nd Street in Burien) to share comments and perspectives related to strategies that are developing for the NERA. The evening's discussion will cover the following topics:

- Market and economic conditions
- Land uses – community and airport compatibility
- Transportation
- Utilities and infrastructure
- Environmental considerations

The consultant team working on the NERA strategy and master plan recently completed the existing conditions analysis, which included identifying the location of Miller Creek, adjacent wetlands and their protective buffers. A detailed market analysis also was prepared. The team has also been working with City of Burien and Port of Seattle staff to identify strengths, weaknesses, opportunities, and challenges in the NERA planning area, as well as to identify potential redevelopment scenarios. The results of this work to date will be summarized at the October 23, 2008.

If you have questions or would like to obtain additional information, you are encouraged to contact consultant team member Kristen Clem at Otak (phone number 425-739-7959). You can also send an email to the project email address: NERA@burienwa.gov or check the City's website at www.burienwa.gov.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

The City of Burien, in partnership with the Port of Seattle is preparing a redevelopment strategy for the 135-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S. 138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment strategy will include flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA. This effort will build upon comprehensive planning and environmental review work that has been completed to date.

Progress on Study Efforts

The consultant team is nearing completion of the existing conditions analysis phase, which includes the Miller Creek and wetland delineation and surveying. A market assessment that assesses market conditions to help identify opportunities for the NERA site to frame alternative economic development strategies is also nearing completion. The consultant team will be moving into analysis of strengths, weaknesses, opportunities, and threats for the NERA planning area and development of conceptual level redevelopment scenarios next.

Fall 2008 Public & Stakeholder Workshops

The NERA Strategy project team will conduct a series of public and stakeholder workshops this fall – tentatively scheduled for the week of October 20, 2008. For more information, please contact the City of Burien Dept. of Community Development at (206) 248-5510 or see our website at http://www.burienwa.gov/commdvlpmnt/commdvlpmnt.htm.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

The City of Burien, in partnership with the Port of Seattle is preparing a redevelopment strategy for the 135-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S. 138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment strategy will include flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA. This effort will build upon comprehensive planning and environmental review work that has been completed to date.

Progress on Study Efforts

The consultant team has completed the existing conditions analysis phase, which included the Miller Creek and wetland delineation and surveying, a market assessment that assessed market conditions and opportunities for the NERA and the completion of the analysis of strengths, weaknesses, opportunities, and threats for the NERA planning area. Conceptual level redevelopment scenarios have been produced and were presented at the Public Workshop on October 23rd and Stakeholder meetings on October 23rd and 24th. The Public and Stakeholder meetings provided valuable input that will shape the next phase of the study, which includes the development of specific redevelopment scenarios and phasing strategies for the NERA planning area. Input from both the Public and Stakeholders sessions included opportunities for public open space, retail, commercial, industrial and improved infrastructure within the NERA. If you would like to receive material available at the public meeting, please contact NERA@Burienwa.gov.

Next Steps

The NERA Strategy project team will conduct another series of public and stakeholder workshops at the end of Winter 2009. Exact meeting dates and times have not yet been scheduled. For more information, please contact the City of Burien Department of Community Development at NERA@Burienwa.gov or see our website at http://www.burienwa.gov/commdvlpmnt/commdvlpmnt.htm.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

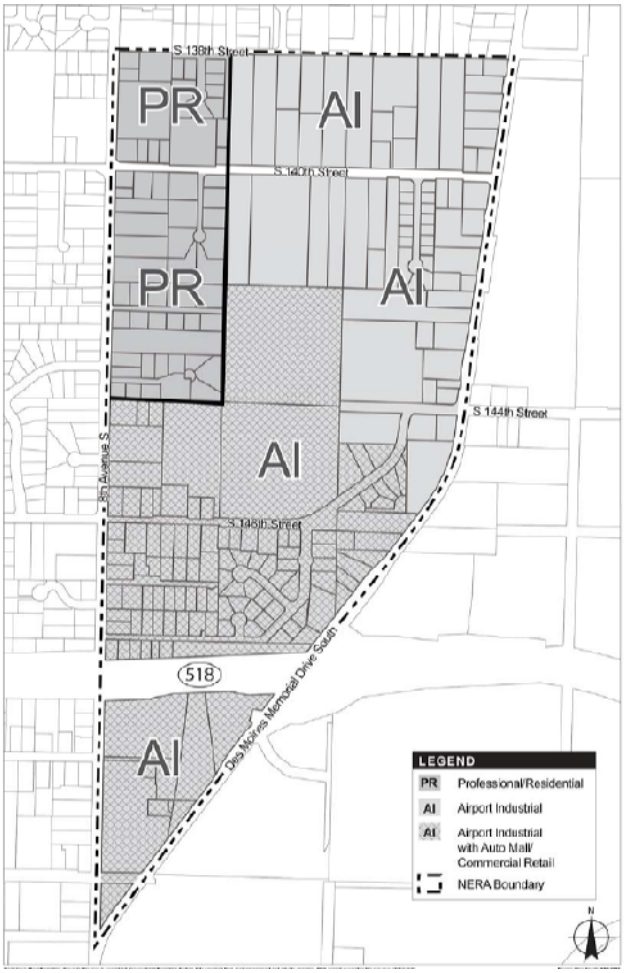
The City of Burien, in partnership with the Port of Seattle, has completed a redevelopment plan and implementation strategy for the 165-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S.138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment plan and implementation strategy includes flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA.

Progress on Study Efforts

A draft report for the NERA Redevelopment Plan and Implementation Strategy was completed in summer 2009. This report summarized all study efforts completed to date, including research into existing physical, environmental and market conditions and the analysis of potential redevelopment scenarios. The draft report also included recommendations for implementation of the study's redevelopment goals and a timeline action plan for implementation.

As an outcome of the NERA plan development, a preferred alternative was identified that would allow for a combination of commercial, business park, light industrial land uses in the southern, eastern, and northeastern portions of the NERA, designated as Airport Industrial (AI) and professional residential types of uses including home-based offices and professional services in the northwestern portion of the area, identified as Professional Residential (PR). Please refer to the map below. These land use designations were identified as the preferred alternative because it offers flexibility for redevelopment to adapt to changing market conditions over time.

A Final Supplemental Environmental Impact Statement (FSEIS), which analyzes the proposed redevelopment alternatives to the area was published on November 23, 2009. Comprehensive Plan and Zoning Code amendments to implement the preferred alternative were processed concurrently with the EIS and were formally adopted by City Council in December 2009.



For More Information

For more information, to review the NERA Master Plan & Implementation Strategy report and review all environmental documents, please contact the City of Burien Department of Community Development at NERA@Burienwa.gov or visit our website at http://www.burienwa.gov/index.asp?nid=320.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

The City of Burien, in partnership with the Port of Seattle, is nearing completion of the redevelopment plan and implementation strategy for the 165-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S.138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment plan and implementation strategy includes flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA.

Progress on Study Efforts

A draft report for the NERA Redevelopment Plan and Implementation Strategy was completed in summer 2009. This report summarized all study efforts completed to date, including research into existing physical, environmental and market conditions and the analysis of potential redevelopment scenarios. The draft report also included recommendations for implementation of the study's redevelopment goals and a timeline action plan for implementation. The consultant team is currently finalizing the report to be ready for publication early December.

A Draft Supplemental Environmental Impact Statement (SEIS), which analyzes the proposed alternatives to the area was published on October 5, 2009 with the comment period ending November 5, 2009. The Draft SEIS was developed based on the NERA Redevelopment Plan and Implementation Strategy. It presented two new land use alternatives and one "no action" alternative. The preferred alternative would allow a combination of commercial, business park, light industrial land uses in the southern, eastern, and northeastern portions of the NERA and professional residential types of uses in the northwestern portion of the area. This alternative is preferred because it would offer flexibility for redevelopment to adapt to changing market conditions over time. The Final SEIS will be published later this month and reviewed by City Council at their regularly scheduled December meeting. Comprehensive Plan and Zoning Code amendments to implement the preferred alternative are being processed concurrently with the EIS, with the intent of adoption by the end of the year.

For More Information

For more information, to review the NERA Master Plan & Implementation Strategy report and review all environmental documents, please contact the City of Burien Department of Community Development at NERA@Burienwa.gov or visit our website at http://www.burienwa.gov/index.asp?nid=320.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

The City of Burien, in partnership with the Port of Seattle is preparing a redevelopment strategy for the 135-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S.138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment strategy will include flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA.

Progress on Study Efforts

The consultant team has completed several steps leading to the development of the final NERA Strategy Master Plan Draft to be completed in the coming months. Initial research into existing physical, environmental and market conditions have been analyzed and redevelopment scenarios have been developed and were presented to the public in October 2008 and April 2009.

Next Steps

The NERA Strategy will now move forward with draft recommendations for the area based on past study research and findings from community and stakeholder participation regarding the area and the proposed redevelopment scenarios. The draft recommendations will be available this fall for public review and comment.
For more information, please contact the City of Burien Department of Community Development at NERA@Burienwa.gov or see our website at http://www.burienwa.gov/index.asp?nid=320.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

The City of Burien, in partnership with the Port of Seattle is preparing a redevelopment strategy for the 135-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S.138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment strategy will include flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA.

Progress on Study Efforts

The consultant team has completed the existing conditions analysis phase, which included the delineation and surveying of Miller Creek and associated wetlands, a market assessment of properties, and analysis of the strengths, weaknesses, opportunities, and threats for the NERA planning area. Conceptual level redevelopment scenarios were presented at the public and stakeholder workshop sessions held in October 2008. The concepts were then further developed and analyzed given market and economic conditions and potential infrastructure development costs. The refined concepts were then presented at a public meeting held on April 29, 2009. Over 100 citizens and representatives from local businesses and agencies participated in the meetings, providing valuable input regarding concerns and visions for the future of the area.

Conceptual land uses for the NERA have been developed by subarea. Subareas were configured based on existing conditions of the area, including: topography, Miller Creek and associated wetlands, infrastructure and property ownership. Recommended land uses broken down by subarea include flexible light industrial, office, airport compatible uses including cargo and warehouse in areas east and south of Miller Creek (subareas 2, 3, 4, 5), and commercial/large retail for the area south of SR 518 (subarea 1). Land use recommendations include strategies for opportunities for redevelopment and investment in subareas 5, 6 and 7 where redevelopment is more long-term.

The potential redevelopment scenarios were further analyzed through the development of potential implementation strategies. Planning level cost estimates of potential development and infrastructure costs associated with that development were prepared to better understand each scenario. Preliminary financial analysis of the various redevelopment scenarios also were developed, detailing projected costs and potential revenue.

A scoping meeting was held in April, as mentioned above (the same meeting where revised redevelopment concepts were presented). The public was asked to make comments regarding potential environmental impacts of the redevelopment plan. The information gathered at this meeting will be incorporated into the redevelopment study recommendations and the next stage in work for the NERA -- updating the Supplemental Environmental Impact Statement.

If you would like to review the initial public meeting summary and materials presented at the April meetings, please visit the city website (address found below).

Next Steps

The NERA Strategy will now move forward with draft recommendations for the area based on past study research and findings from community and stakeholder participation regarding the area and the proposed redevelopment scenarios. The draft recommendations will be available this summer for public review and comment.
For more information, please contact the City of Burien Department of Community Development at NERA@Burienwa.gov or see our website at http://www.burienwa.gov/index.asp?nid=320.

Update on the Burien Northeast Redevelopment Area (NERA) Strategy

Study Overview

The City of Burien, in partnership with the Port of Seattle is preparing a redevelopment strategy for the 135-acre Northeast Redevelopment Area (NERA) located between 8th Avenue S., Des Moines Memorial Drive, S. 138th Street and SR-518. The purpose of the strategy is to transform the NERA from a mixture of vacant, residential, public, and small commercial land uses to uses that are compatible with operations at Sea-Tac International Airport and existing and planned surrounding land uses. The NERA redevelopment strategy will include flexible and market-responsive redevelopment scenarios, as well as recommended policies and development regulations to guide long-term redevelopment in the NERA.

Progress on Study Efforts

The consultant team has completed the existing conditions analysis phase, which included the delineation and surveying of Miller Creek and associated wetlands, a market assessment of properties, and analysis of the strengths, weaknesses, opportunities, and threats for the NERA planning area. Conceptual level redevelopment scenarios were presented at the public and stakeholder workshop sessions held in October 2008. Over 100 citizens and representatives from local businesses and agencies participated in the workshop meetings. Conceptual ideas for the area include flexible light industrial, office, airport compatible uses including cargo and warehouse, as well as commercial and large retail sites located south of SR 518. If you would like to review the public meeting summary, please visit the city website (address found below).

Over the past several months potential redevelopment scenarios have been developed for each subarea in the NERA. These potential scenarios have been further analyzed through the development of potential implementation strategies. Planning level cost estimates of potential development and infrastructure costs associated with that development have been put together to better understand each scenario. Preliminary financial analysis of the various redevelopment scenarios have also been developed, which details projected costs and potential revenue.

Next Steps

The NERA Strategy will now move forward with the refinement of the potential redevelopment scenarios, the financial analysis associated with the proposed scenarios, and the collection of information from NERA property owners regarding their individual interests in redevelopment. The project team will also conduct another series of public and stakeholder workshops in March to gather input on the draft strategy for the NERA. Exact meeting dates and times have not yet been scheduled. For more information, please contact the City of Burien Department of Community Development at NERA@Burienwa.gov or see our website at http://www.burienwa.gov/index.asp?nid=320.

A

Appendix - Section 6

Transportation Infrastructure Memo and Cost Estimates

Technical Memorandum

10230 NE Points Drive
Suite 400
Kirkland, WA 98033
Phone (425) 822-4446
Fax (425) 827-9577

To:	Mandi Roberts
From:	Mark Cole
Copies:	
Date:	January 28, 2009
Subject:	Burien NERA Redevelopment Conceptual Level Cost Estimate
Project No.:	31235

The following memorandum is a summary of projected infrastructure improvement costs to support planned development of the study area. Improvement costs for significant infrastructure elements were developed based on creating "pad-ready" sites for planned onsite improvements of the various subareas, as indicated in the conceptual overlay. Infrastructure improvement costs were estimated for the following elements:

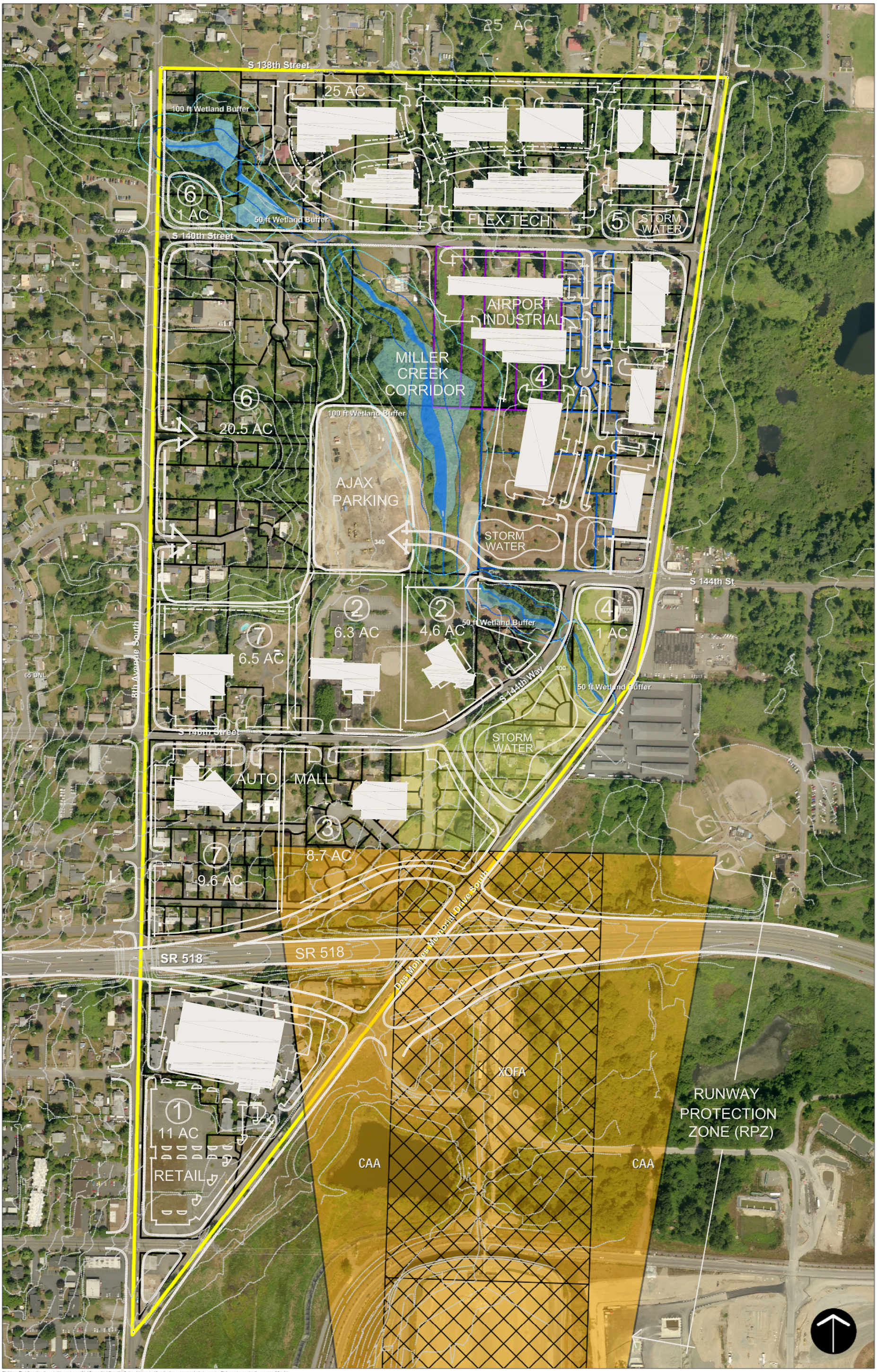
- Reconstruction of existing perimeter and planned interior streets to City standard
- Water and sanitary sewer main upgrades and extensions within the study area
- Demolition and rough grading to form subarea pad sites
- Potential stormwater treatment/detention regional facility
- Facility upgrade allowance of power, natural gas, and telecommunications facilities

Costs of each infrastructure element are identified into logical improvement projects that correspond to development of one or more subareas. Project costs were developed based on estimating construction costs for the significant components of construction and applying an appropriate contingency. Proportionate costs of individual projects have been assigned to seven subareas based on proximity and nature of the required infrastructure project; see Figure 1.

Basis of Cost Estimates

Street Improvements

Improvement costs for existing perimeter and planned interior streets reflect full reconstruction to City standard. Improvements are identified into logical projects that correspond to development of one or more subareas. Construction costs are based on estimated quantities using representative unit costs on significant construction elements and include curb and gutter, sidewalk, pavement reconstruction/widening, stormwater collection and treatment/detention facilities, and traffic



Disclaimer: The information shown in this map is assembled Geographic Information System data acquired from local government and private agencies. Otak cannot guarantee the accuracy of this data.

0' 50' 100' 200' 1 inch equals 100 feet

Legend

- NERA Boundary
- Burien Parcels
- 10' Elevation Contours
- Miller Creek
- Miller Creek 50 Foot Buffer
- Miller Creek Wetland
- Miller Creek Wetland Buffer

Aviation Constraints

- Approach Transition Zone (ATZ) - Airport compatible uses
- Controlled Activity Area (CAA) - Passive recreation (no bird attraction)
- Double Extended Object Free Area (XXOFA) -Located north of XOFA
- Non-Developable Land - Port to keep vacant or use for parking
- Decibel Level Contour
- XXOFA Airport Funds - Developable for compatible uses
- XXOFA Developable
  - Purchased w/Fed funds to develop into compatible uses
- Extended Object Free Area (XOFA) - No Structures

signal/illumination. Costs for traffic signal modifications and/or installation have been included along 8th Avenue South at the intersections of South 146th Street, and South 140th Street and along Des Moines Memorial Drive at 8th Avenue South, 11th Avenue South connection, South 144th Street, and South 140th Street.

A construction contingency of 35% has been included to reflect Washington State sales tax, mobilization, and other non-identified construction items. Project design, environmental permitting, and construction management costs have been estimated at 30% of construction.

Costs do not include improvements to the SR 518 interchange at Des Moines Memorial Drive and are being estimated separately by the Washington State Department of Transportation.

Water Improvements

Improvement costs for water main are based on system extensions and estimated line size upgrades along existing perimeter and planned interior streets. Improvements are identified into logical projects that correspond to development of one or more subareas. Construction costs are based on estimated quantities using representative unit costs on significant construction elements and include line installation with appurtenances, and removal and/or abandonment of existing applicable lines.

A construction contingency of 30% has been included to reflect Washington State sales tax, mobilization, and other non-identified construction items. Project design, environmental permitting, and construction management costs have been estimated at 25% of construction.

Sanitary Sewer Improvements

Improvement costs for sanitary sewers are based on system extension upgrades to existing lines for service coverage to each subarea. Improvements are identified into logical projects that correspond to development of one or more subareas. Construction costs are based on estimated quantities using representative unit costs on significant construction elements and include sewer main installation with manhole and other appurtenances, and removal and/or abandonment of existing applicable mains.

A construction contingency of 30% has been included to reflect Washington State sales tax, mobilization, and other non-identified construction items. Project design, environmental permitting, and construction management costs have been estimated at 25% of construction.

Site Demolition and Rough Grading

Site demolition and rough grading costs represent the cost to prepare individual subareas to "pad-ready" sites for development improvements. Demolition and grading is identified into logical projects that correspond to development of one or more subareas. Construction costs are based on

estimated unit costs on significant construction elements and include demolition and disposal of all building and other surface obstruction, and rough grading of subareas to create pad site locations.

A construction contingency of 35% has been included to reflect Washington State sales tax, mobilization, and other non-identified construction items. Project design, environmental permitting, and construction management costs have been estimated at 30% of construction.

Stormwater Facilities

Stormwater facility improvements represent costs for a possible regional stormwater treatment/ detention facility to service a portion of the study area. Contributing service area is limited to a facility that could be accommodated in the identified area adjacent to Miller Creek near Des Moines Memorial Drive. Costs are based on a two-acre facility that will accommodate stormwater runoff from approximately 40 areas of the study area. Collection conveyance piping cost is based on regional service to subareas 4 and 5. Construction costs are based on estimated quantities using representative unit costs on significant construction elements and include earthwork for an above-ground water quality and detention facility; control structures and facility piping; and collection conveyance piping.

A construction contingency of 35% has been included to reflect Washington State sales tax, mobilization, and other non-identified construction items. Project design, environmental permitting, and construction management costs have been estimated at 30% of construction.

Power, Natural Gas, and Telecommunications

Estimated costs for existing facility upgrades to power, natural gas, and telecommunications are undefined; coordination with applicable utility agencies continues in an effort to further understand facility upgrades, requirements, and costs. However, preliminary discussions with Seattle City Light indicate that significant electrical facility upgrades and improvements are required to service the study area. An allowance has been included.

Table 1
Estimated Infrastructure Project Costs

No.	Project	Limits	Length (feet)	Project Cost
ROADWAY PROJECTS				
R-1	**8th Avenue S. Phase 1 Improvement Project**			
R-1a	8th Avenue S.	Des Moines Memorial Drive to S. 146th Street	2,500	$4,475,250
R-1b	S. 152nd Street	8th Avenue S. to Des Moines Memorial Drive	300	$445,014
R-2	**8th Avenue S. Phase II Improvement Project**			

Table 1
Estimated Infrastructure Project Costs

No.	Project	Limits	Length (feet)	Project Cost
	8th Avenue S.	S. 146th Street to S. 140th Street	2,000	$3,667,950
R-3	**8th Avenue S. Phase III Improvement Project**			
	8th Avenue S.	S. 140th Street to S. 138th Street	700	$1,437,345
R-4	**Des Moines Memorial Drive, Phase I**			
	Des Moines Memorial Drive	8th Avenue S. to S. 144th Street	3,500	$4,576,163
R-5	**Des Moines Memorial Drive, Phase II**			
	Des Moines Memorial Drive	S. 144th Street To S. 138th Street	2,000	$2,614,950
R-6	**S. 140th Street**			
	S. 140th Street	8th Avenue S. to Des Moines Memorial Drive	2,200	$3,715,686
R-7	**S. 144th Street**			
	S. 144th Street	Des Moines Memorial Drive to Miller Creek Crossing	700	$1,138,995
R-8	**S. 146th/144th Way Improvement Project**			
R-8a	S. 146th Street	8th Avenue S. to S. 144th Way	1,200	$2,165,670
R-8b	S. 146th/D-M Drive Connector (new)	S. 146th Street to Des Moines Memorial Drive	500	$1,443,488
R-8c	S. 144th Way	S. 146th Street to S. 144th Street	800	$1,809,405
			Subtotal Roadway Projects	**$27,489,916**
WATER MAIN IMPROVEMENT PROJECTS				
W-1	S. 140th Street Water Main Improvements	8th Avenue S. to Des Moines Memorial Drive	2,200	$559,000
W-2	S. 146th/144th Way Water Main Improvements	8th Avenue S. to Des Moines Memorial Drive	2,900	$703,625
W-3	Des Moines Memorial Drive Water Main Improvements	8th Avenue S. to S. 146th Street	3,000	$625,625
W-4	8th Avenue Existing Water Main Upgrades	Des Moines Memorial Drive to S. 140th Street		$365,625
			Subtotal Water Main Projects	**$2,253,875**
SANITARY SEWER IMPROVEMENTS				
S-1	S. 140th Street Sewer Main Extension	Existing 18" Main to 12th Place S.	2,200	$1,348,750
S-2	Subarea 3 & & Sewer Extension	Existing 18" Main to S. 146th Street	2,500	$1,528,313
S-3	Existing 18" Trunk Sewer Rehabilitation	S. 140th Street to Des Moines Memorial Drive	2,200	$682,500
			Subtotal Sanitary Sewer Projects	**$3,559,563**

Table 1
Estimated Infrastructure Project Costs

No.	Project	Limits	Length (feet)	Project Cost
SITE DEMOLITION AND ROUGH GRADING				
SG-1	Subareas 7 (north of S. 146th) and 2	8th Avenue S. to Miller Creek		$1,484,375
SG-2	Subareas 7 (south of S. 146th) and 3	8th Avenue S. to Miller Creek		$3,398,438
SG-3	Subarea 4	S. 144th Street to S. 140th Street		$3,296,875
SG-4	Subarea 5	Miller Creek to Des Moines Memorial Drive		$2,226,563
SG-5	Subarea 1	8th Avenue S. to Des Moines Memorial Drive		$1,250,000
			Subtotal Site Demolition/Rough Grading Projects	**$11,656,251**
REGIONAL STORMWATER TREATMENT/DETENTION FACILITIES				
			Subtotal Regional Stormwater Treatment/Detention Facilities Projects	**$1,676,025**
POWER, NATURAL GAS, AND TELECOMMUNICATIONS (ALLOWANCE)				
			Subtotal Power, Natural Gas, and Telecommunications Allowance	**$3,500,000**
			TOTAL	**$50,135,630**

Table 2
Proportionate Subarea Infrastructure Costs

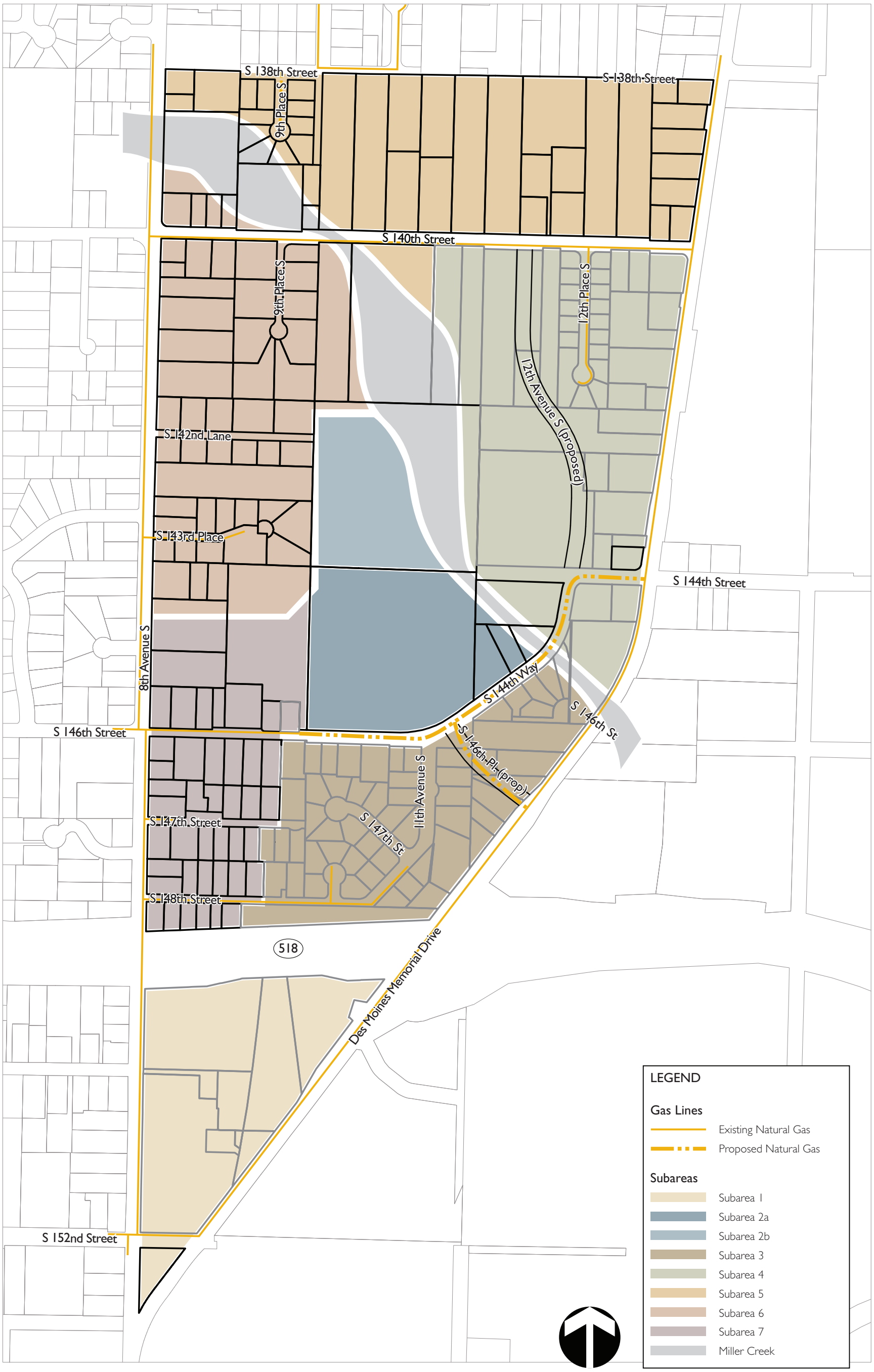
No.	Subarea 1		Subarea 2		Subarea 3		Subarea 4		Subarea 5		Subarea 6		Subarea 7	
	% of project	Cost	% of project	Cost	% of project	Cost	% of project	Cost	% of project	Cost	% of project	Cost	% of project	Cost
ROADWAY PROJECTS														
R-1a	50%	$2,237,625											50%	$2,237,625
R-1b	100%	$445,014												
R-2											75%	$2,750,963	25%	$916,988
R-3											100%	$1,437,345		
R-4	50%	$2,288,082					50%	$2,288,082						
R-5							60%	$1,568,970	40%	$1,045,980				
R-6							40%	$1,486,274	50%	$1,857,843	10%	$371,569		
R-7							100%	$1,138,995						
R-8a			25%	$541,418	25%	$541,418							50%	$1,082,835
R-8b					100%	$1,143,488								
R-8c			100%	$1,809,405										
Sub-total		**$4,970,721**		**$2,350,721**		**$1,984,906**		**$6,482,321**		**$2,903,823**		**$4,559,876**		**$4,237,448**
WATER MAIN IMPROVEMENT PROJECTS														
W-1							40%	$223,600	50%	279,500	10%	55,900		
W-2			50%	$351,813	25%	$175,906							25%	$175,906
W-3	75%	$469,219					25%	$156,406						
W-4											50%	$182,813	50%	$182,813
Sub-total		**$469,219**		**$351,813**		**$175,906**		**$380,006**		**$279,500**		**$238,713**		**$358,719**
SANITARY SEWER IMPROVEMENTS														
S-1							50%	$674,375	50%	674,375				
S-2					50%	$764,157							50%	$764,157
S-3	15%	$102,375	15%	$102,375	15%	102,375	15%	$102,375	15%	$102,375	10%	68,250	15%	$102,375
Sub-total		**$102,375**		**$102,375**		**$866,532**		**$776,750**		**$776,750**		**$68,250**		**$866,532**
SITE DEMOLITION AND ROUGH GRADING														
SG-1			50%	$742,188									50%	$742,188
SG-2					50%	$1,699,219							50%	$1,699,219

Table 2
Proportionate Subarea Infrastructure Costs

No.	Subarea 1		Subarea 2		Subarea 3		Subarea 4		Subarea 5		Subarea 6		Subarea 7	
SG-3							100%	$3,296,875						
SG-4									100%	$2,226,563				
SG-5	100%	$1,250,000												
Sub-total		**$1,250,000**		**$742,188**		**$1,699,219**		**$3,296,875**		**$2,226,563**				**$2,441,407**
REGIONAL STORMWATER TREATMENT/DETENTION FACILITIES														
							50%	$838,013	50%	$838,013				
Sub-total								**$838,013**		**$838,013**				
POWER, NATURAL GAS, AND TELECOMMUNICATIONS (ALLOWANCE)														
	15%	$525,000	15%	$525,000	15%	$525,000	15%	$525,000	15%	$525,000	10%	$350,000	15%	$525,000
Sub-total		**$525,000**		**$525,000**		**$525,000**		**$525,000**		**$525,000**		**$350,000**		**$525,000**
TOTAL		**$7,317,314**		**$4,072,198**		**$5,251,562**		**$12,298,965**		**$7,549,649**		**$5,216,839**		**$8,429,104**

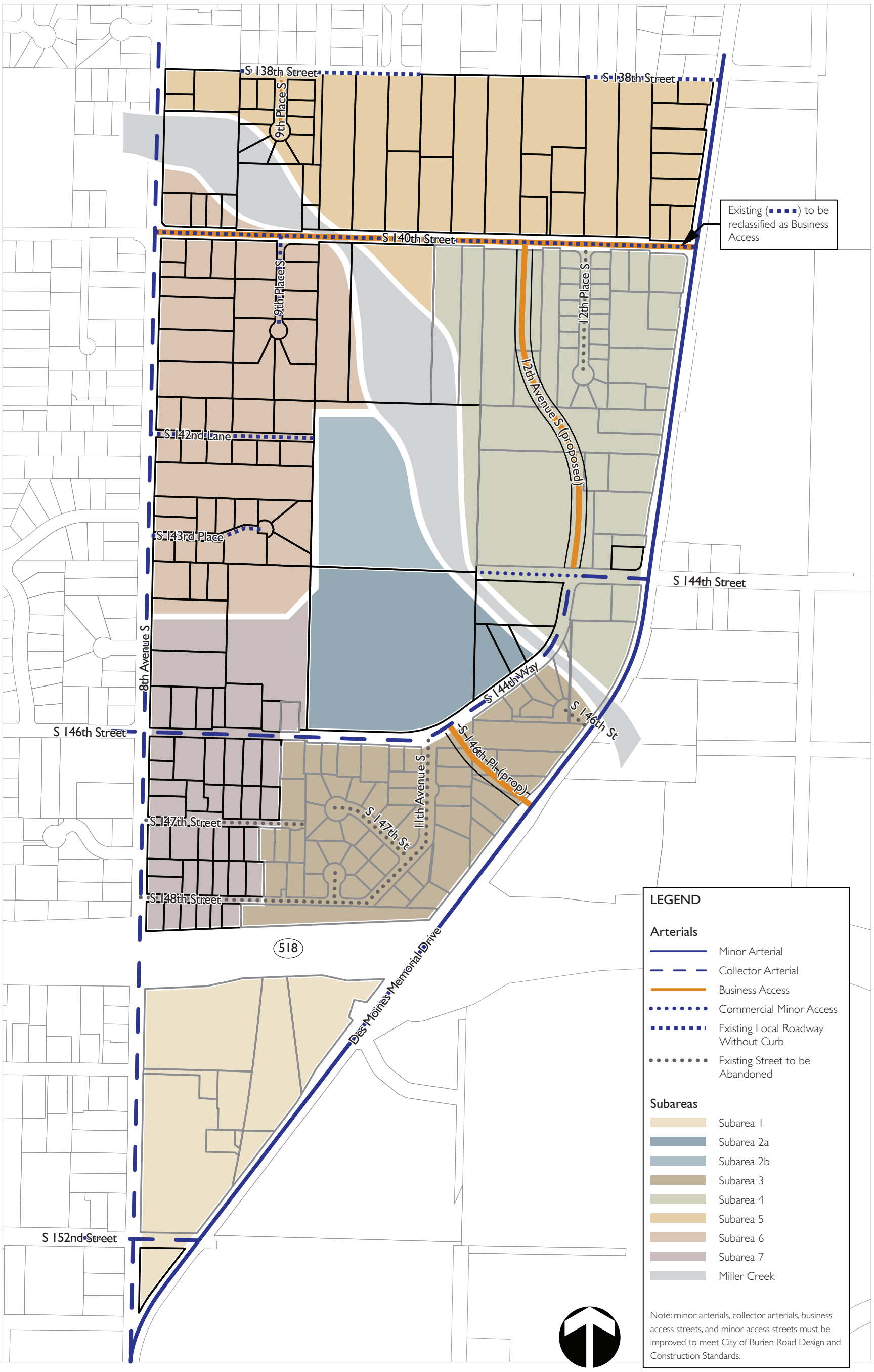
NERA Infrastructure Map

Existing and Proposed Natural Gas



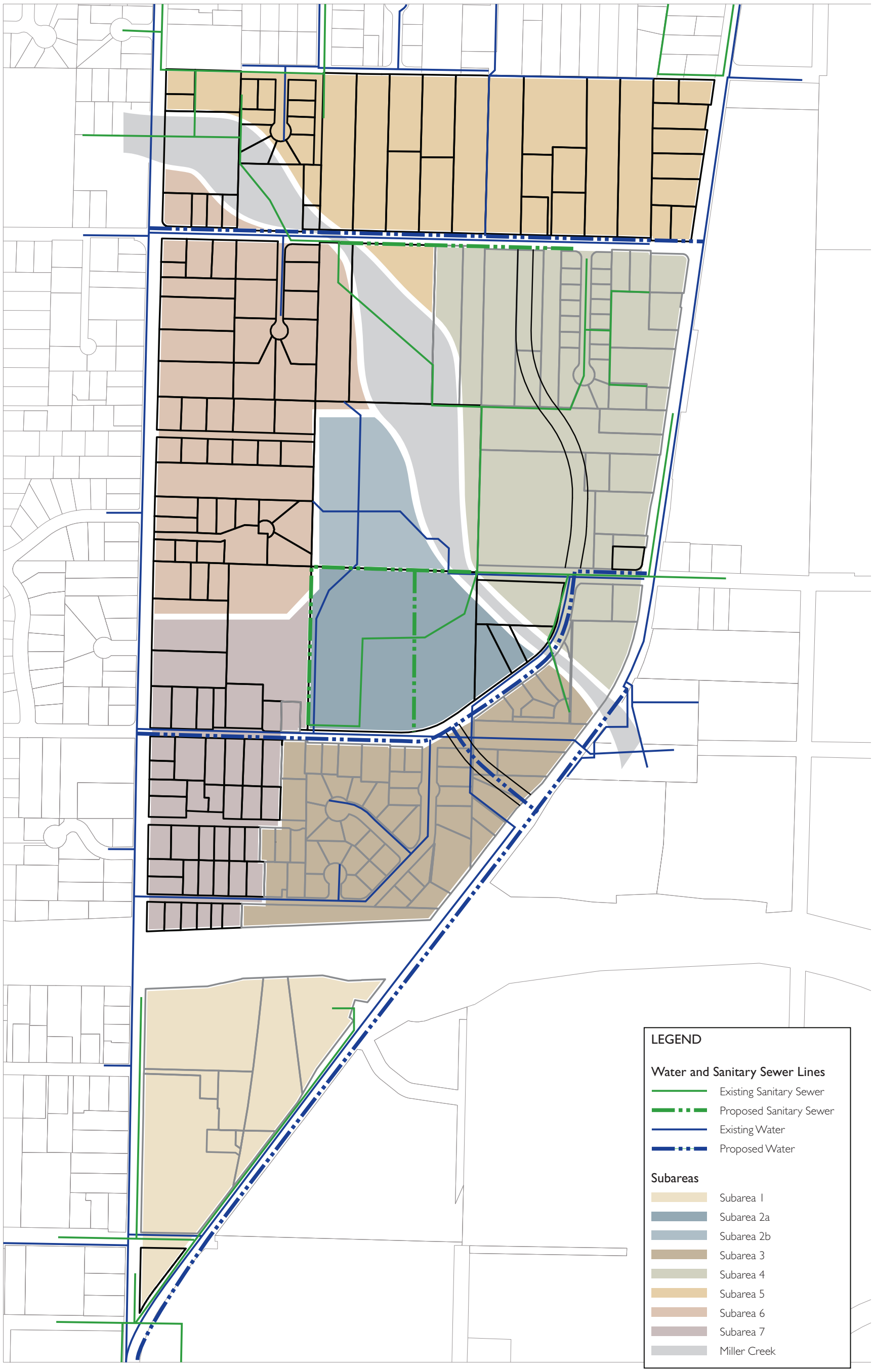
NERA Infrastructure Map

Existing and Proposed Roadways



NERA Infrastructure Map

Existing and Proposed Water and Sanitary Sewer



A

Appendix - Section 7

Financial Analysis Summary Report

HEARTLAND MEMORANDUM

TO: Scott Greenberg, City of Burien

CC: Mandi Roberts, Otak
Kristen Clem, Otak

FROM: Chris Fiori, Heartland
Matt Anderson, Heartland

DATE: June 29, 2009

RE: **Financial Analysis Summary for the Burien NERA Strategy Report**

Over the course of the past year, Heartland performed a market assessment and a series of financial models in support of Otak's creation of a redevelopment strategy for Burien's Special Planning Area 4: Northeast Redevelopment Zone (NERA). The market assessment, conducted in Summer 2008, examined four general land use categories: industrial, office, retail and residential. This work provided pricing and revenue assumptions for financial modeling activities that were conducted in Winter and Spring of 2009. The intent of this memorandum is to summarize key findings from the financial modeling activities performed over the past six months.

Approach to Financial Analysis

The City of Burien is seeking to promote future land uses in the NERA that are more compatible with airport-related activities than most existing uses. The tools available to the City of Burien are largely limited to zoning, some marketing activities, and, to an extent that is fiscally prudent, investment in predevelopment activities (environmental review, etc.) as well as some infrastructure items. Heartland's financial model may be used to assess how parties involved in potential redevelopment scenarios (*e.g.*, current land owners, future land developers, and the City of Burien) might logically respond to changes in zoning in conjunction with varying levels of potential City investment. To this end, Heartland performed a residual land value (RLV) analysis for six of the seven sub-areas in the NERA redevelopment zone.[1] In a RLV analysis, the assumed costs to create "finished" land, plus developer profit, is subtracted from the assumed "finished" land value to arrive at a residual land value for each proposed use, as summarized by the following formula:

RLV = Finished Land Value[2] – (Costs to Improve Land + Developer Profit)

The residual land value is important to understand in a redevelopment context because the actions of two key parties, the existing landowners and the future development entities, tend to be very focused on land values. The City is interested in residual land values because, to the extent that the existing land value equation does not favor redevelopment, there may be a public purpose in intervening in the market via regulatory or fiscal intervention. Below is a short

[1] Subarea 6 was excluded from the analysis because the planning team determined that the combination of the area's topographical separation from adjacent redevelopment areas, large average lot sizes, and adjacency to single-family homes made it a poor candidate for major redevelopment activity.

[2] For the purpose of this analysis "finished land" is assumed to have appropriate roads and utilities brought to the site, land that has been brought to its final grade and appropriate zoning for the chosen future land use in place.

summary of how residual land values are frequently viewed from the perspectives of the three parties":

- *Land owners*—Residual land values for the new use contemplating in a zoning change need to be at least as high as the existing value under the current zoning to motivate existing owners to sell to land developers seeking to developer a new use. Landowners are not typically interested in selling at a price that is less than the market value for the land under current zoning.

- *Developers*—From the developer, residual land value is the most one could afford to pay for the land for the future use. Therefore, the price of unimproved land needs to be less than or equal to residual land value for the future use to motivate a developer to buy the land for redevelopment purposes. Theoretically, the value increment between the land value under the existing zoning and the residual land value under the new zoning is split between the land seller and the land buyer. The degree to which the value would be shared between the parties depends on the amount of competition that there is for land with similar characteristics.

- *City of Burien*—The City of Burien can affect the relationship of the existing "as is" land values to residual values not just through zoning, but also through investment. To the extent that City investment in the area's infrastructure reduces assumed development costs needed to produce "finished" land, land residual values will improve, thus increasing the likelihood that a positive increment in value would exist between current land values and residual land values with rezoning. Like other parties, Burien should want to assess its return on investment in terms of the cost of investment relative to projected increases in future tax revenues, but other non-financial factors, such as job creation, and amelioration of noise pollution for residents, will likely be taken into consideration when assessing the costs and benefits of public investment.

The Heartland RLV analysis compared residual land values for specified uses contemplated under various rezoning scenarios to the existing land values under the existing zoning to gain a better understanding for how the landowners, developer and City would be likely to respond to a change in rezoning, along with potential levels of public investment that might serve to affect land values.

We examined the proposed uses identified in both the Airport/Industrial Redevelopment Option and the Auto Mall/Airport Industrial Redevelopment Option. In both redevelopment options, the uses remained constant in Area 1 (Retail), Area 4 (Airport Industrial) and Area 5 (Flex-Tech). In the Airport/Industrial development option, the airport-related uses, both flex-tech and airport-related warehousing, were extended into Area 1, Area 3 and Area 7. In the Auto Mall/Airport Industrial Option, an auto mall was assumed in Area 1, Area 3 and Area 7.

Definitions

The RLV approach compares the residual land value under a rezoning scenario to existing land values, or land basis. To arrive at a Residual Land Value, we used the following information:

- *Finished Land Values*—We used recent sales of similarly zoned and similarly located "finished" land to arrive at per-square foot value assumptions. Because there are very few recent comparable sales in the area for some of the uses we examined, in some cases we needed to triangulate between land that is likely of higher value (*e.g.*, the southern

Duwamish) and land that is likely of lower value (*e.g.*, the Kent Valley). Other uses like retail and industrial warehouse provided a much larger set of proximate and recent sales comparables.

- *Development Costs*—Projected development costs by sub-area were provided by Otak, and included items such roadway projects, wet and dry utilities, and site demolition and grading. These costs were assumed to be born by the developer/land in the baseline scenario ("High Developer Responsibility"), but we also utilized two other scenarios ("Medium Developer Responsibility" and "Low Developer Responsibility") with varying levels of City investment.

- *Developer Profit*—A 15% margin on costs was assumed for all redevelopment assumptions and sub-areas.

- *Land Basis*—Land basis assumptions varied by landowner. For land zoned single-family, the assessed home values as of January 2009 were used as the land basis. This may be a somewhat conservative proxy for valuation, however, as the most recent sales within the 130 MLS subarea in which Burien is located have generally been running 5-15% below assessed values in Q2 2009. Because assessed values are calculated on a three-year moving average, the decline in assessed values will almost certainly lag the decline in home values for a least a year looking ahead. Because single-family homeowners own a significant amount of land in the NERA zone, one recurring point of comparison was between future commercial values for land and existing residential home values. As a simple example, if a home on a 10,000 square foot lot is valued at $300,000, the residual land value for commercially-zoned land would need to be significantly higher than $30 per square foot to motivate the land owner to sell in most circumstances. For most non-residential properties, the assumed "as is", as zoned values were used as land basis, with the major exception being properties owned by the Port of Seattle, where the land basis was assumed to be its acquisition price. However, to the extent that the land acquired by the Port for the construction of the third-runway can be thought to be a "sunk cost" needed for the completion of a capital project in the past, the basis for the land can be considered zero. That is to say that the Port likely is motivated to lease or develop the land regardless of what might have been paid for it in the past given that the current income stream from the land is negligible.

- *Tax Benefits to the City*—Heartland worked with the City of Burien's Finance Department to create defensible assumptions for what the various redevelopment scenarios might be expected to yield in terms of tax benefits, including sales taxes during construction and operation, property and leasehold taxes, and B&O taxes. Other general fund revenue streams were considered but, for the purpose of this analysis, were assumed to constitute a minimal amount of value to the City. Heartland used common assumptions for bonding terms and cost of capital to arrive at an assumed present value for City investments by sub-area.

Findings

RLV analysis presented several key findings, listed below:

1) **Challenging Development Conditions Are Pervasive Across the NERA**: While conditions vary dramatically across the NERA zone, the overall conditions for redevelopment are generally very challenging. The uses that have been identified as most marketable for this location – "flex-tech" and warehouse industrial uses in particular –are not typically land uses that lend themselves to high land values. In addition, identified development costs are quite

high, at almost $50 million, or over $700,000 per developable acre, owing to both topography and a lack of infrastructure for such a large, urban infill site.

2) **Great Variation Exists Among Sub-areas**: The analysis results illustrated a supposition that had been present since our team first began site analysis, which is that dramatically different levels of near-term redevelopment opportunity exist across the subject area. Near-term redevelopment is much more likely where positive value increment exists between the residual value under the rezone scenario and the existing land basis. This condition is most likely to be present in areas where land basis is low (or assumed to zero), the development costs are low and assumed finished land value is high. Port of Seattle-owned properties generally have the best opportunities for near-term redevelopment because small parcels have already been assembled and to the extent that the Port is a motivated landowner with little productive use occurring on the land at present. By contrast, areas with large amounts of existing single-homes present the biggest hurdle for redevelopment.

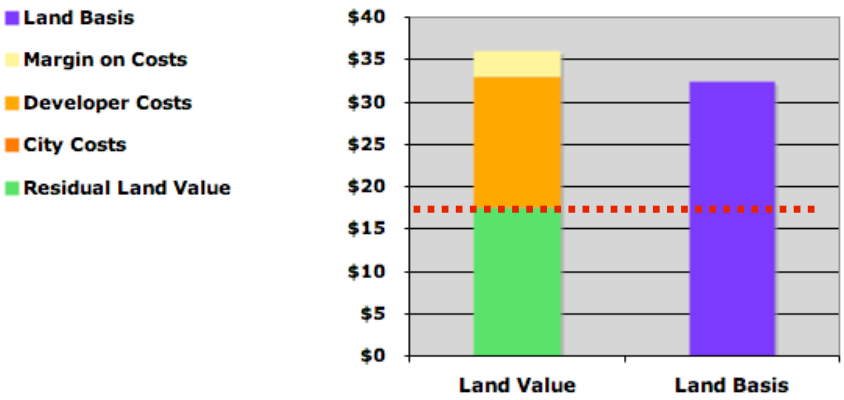
3) **Identification of Opportunity Areas**: Areas with the best combination of low land basis, low development costs and high-value "finished land" values include Area 1 and Area 5 in both redevelopment options, as well as Area 2 in the Auto-Mall Option. These areas all have positive residual land values, meaning that if the land basis is low enough (i.e., the landowner is willing to part with it at a low enough price) redevelopment would be possible. By contrast, in cases where residual land values are negative, redevelopment for the specified use is not likely to occur regardless of the asking price for the land.

The following graphics depict the comparative residual land values (in green) and land basis (in purple) for the three most-promising sub-areas and scenarios for redevelopment. In each case, the land value under the use contemplated in the rezone is compared to the existing land value (land basis). The dotted red line in each graphic indicates the land basis price equal to the residual land value.

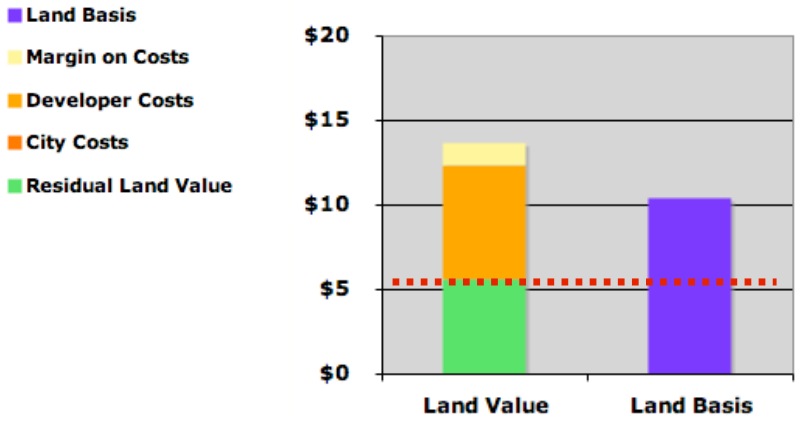
Area 1: Retail in Both Redevelopment Options

The assumed finished land value is above $35 per square foot and the costs, including developer margin, are assumed to be approximately $18 per square foot, for a residual value of approximately $17 per square foot before consideration of any City contribution to, or reduction of, required land development costs. The owner of this property is the Port of Seattle, which is important to note because that organization is likely to think differently about the price at which it is willing to sell or lease land than an individual single-family homeowners. First, even thought the Port paid a substantial sum for the land, that cost can be considered sunk, as that cost cannot be recovered (it was spent in pursuit of a past capital project) and therefore should not affect decision making going forward with respect to maximizing the value of the property. Second, the property as it exists presently has no positive value from present improvements, so the opportunity cost of putting the land into a new use in the future is low. For all these reason the land basis, in this case the price that the Port paid for the property in the past (as indicated in the purple bar chart), can be ignored for Area 1 and all of the Port properties.

More important is the fact that the RLV for the proposed use is significantly positive, which means that enough value should exist to interest development entities in the property, if zoned for a flexible mix of retail uses. That said, at almost $15 per square foot in assumed development costs, which equates to over $650,000 per acre, the development costs are very high relative to a typical big box development site.

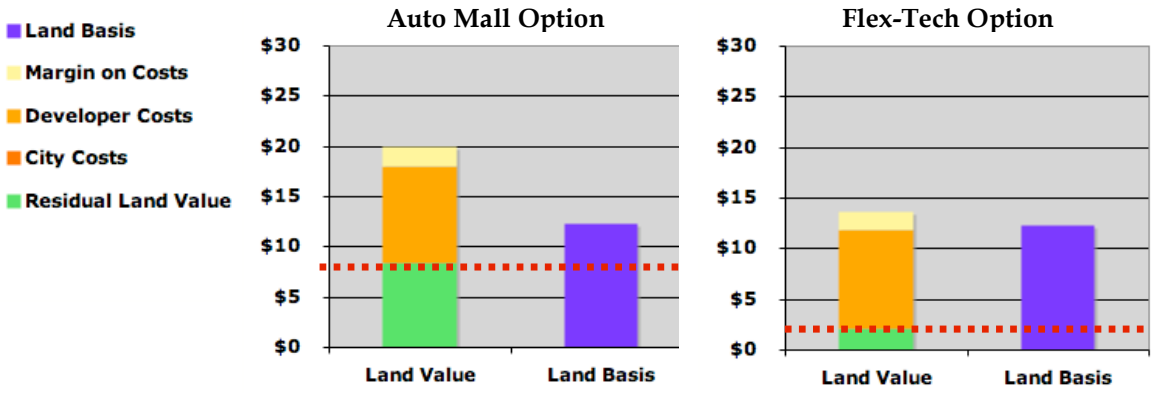


Area 5: Flex-Tech in Both Redevelopment Options
The assumed finished land value is above $14 per square foot, which constitutes an assumed blend of airport-related warehouse uses and flexible light manufacturing and office space. Development costs, including developer margin, are assumed to be under $8 per square foot, for a residual value of approximately $6 per square foot before consideration of any City contribution to, or reduction of, required land development costs. The RLV for Area 5 is less than the land basis for the sub-area when viewed in aggregate, but one could extrapolate than if the eastern half of the sub-area, which comprises the largest lots and thus the lowest per square foot land basis, where to be examined on its own with a pro-rata share of assumed development costs, the RLV for that area would likely exceed the land basis. Relative to other NERA sub-areas, this area exhibits strong near-term development potential



Area 2: Auto Mall Option
Area 2 presents a good illustration of how the assumed land use affects the residual land value. The first graphic presented below depicts the residual land value for Area 2 assuming an auto-mall scenario where a dealership or developer could afford to pay $20 per square foot for finished land. The second depicts the flex-tech option where finished land is assumed to be valued at approximately $14 per square foot. While the land basis and development costs have remained constant, the change in assumption about finished lot value creates a different RLV in each case. In neither case is the residual land value greater than the land basis, but the auto-mall option comes much closer to that condition.

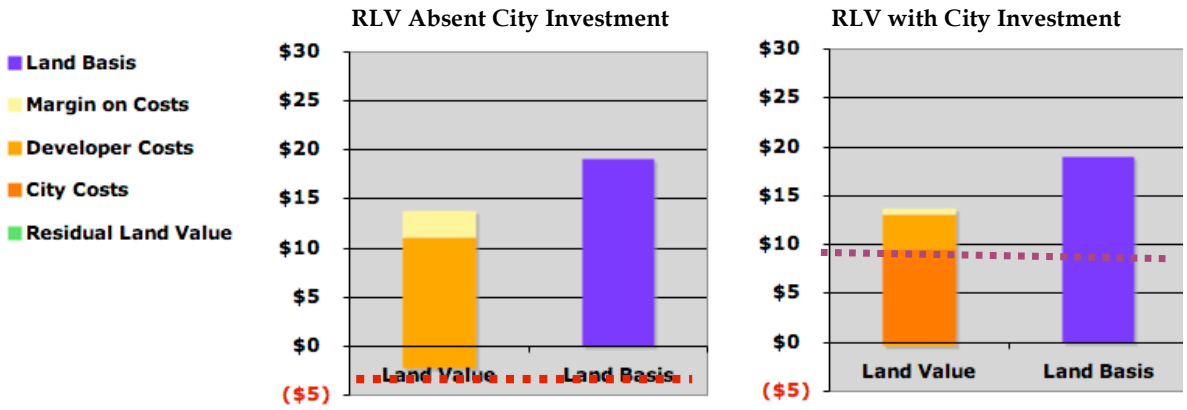
In addition, the potential for City contribution to or reduction of development costs has not been considered in either graph.



4) **Identification of Most Challenged Areas**: Several areas in the NERA exhibited negative land values under the future rezone, meaning the assumed development costs exceeded expected future land values. In such case the land will usually remain in its current use regardless of what that existing use is. To compound matters, in some cases the existing land basis was quite high, especially in areas with smaller, occupied single-family homes. Area 7 in the Flex-Tech Option is a case in point.

Area 7: Flex-Tech/Industrial Option

The assumed finished land value is above almost $14 per square foot, which constitutes an assumed blend of airport-related warehouse uses and flexible light manufacturing and office space. Cost, including developer margin, are assumed to be over $16 per square foot, for a residual value of approximately -$2 per square foot before consideration of any City contribution to, or reduction of, required land development costs. In addition, the land basis of the existing homes is almost $19 per square foot. This means that in Area 7, even if the City were to come out of pocket for all development costs related to infrastructure except site and grading improvements (about $6.4 million, or $10 per square foot), existing land values would still need to fall by about 50% before the value equation would work from the perspective of a third-party developer seeking to purchase land at a market rate.



5) **Targeted Opportunities for City Investment and/or Cost Reduction**: As noted earlier, total development costs across the NERA were estimated by Otak at about $45 million, based on existing City of Burien development standards. In the RLV analysis, we termed this baseline assumption the "High Developer Responsibility" scenario. In addition, we looked at a "Medium Developer Responsibility" scenario, in which the City would bear the costs of half-street improvement, watermain improvements and utilities. This total cost born by the City across the site would be $10 million, reducing the land development costs to $35 million. Finally, in the "Low Developer Responsibility" scenario, the developer is assumed to only pay for site work, with the City paying for the entirely of the infrastructure costs associated with redevelopment. The City portion would total approximately $33 million, reducing the development burden to $11 million. As can be seen from the table entitled "Summary of Potential Levels of City Investment" on the following page, the City would need to invest in the site at the magnitude of the "Low Developer Responsibility" level for the resulting residual land value to be comparable to the existing land basis. At that level of investment, the potential for redevelopment would still vary greatly across the site, and the assumed ROI to the City on such a level of investment would only be likely to recoup one-third of its financial investment on a present value basis.

Recognizing that limited financial resources exist for any type of infrastructure investment in the NERA, the City should set expectations for potential levels of improvement of the public realm. That said, the City may have a legitimate opportunity to help catalyze one or two development projects that could serve to lift the value of finished land across the redevelopment area, which in turn could make redevelopment across much of the NERA more financially feasible than it is presently. In addition to implementing the appropriate zoning (which the finished land values already assume is in place), the City can help catalyze redevelopment through either reducing the cost of redevelopment or investment in some elements of the redevelopment.

Summary of Potential Levels of City Investment

Flex-Industrial Redevelopment Scenario	**Level Of Developer Investment**		
	High	**Medium**	**Low**
Estimated Finished Land Value	$66,274,170	$66,274,170	$66,274,170
less Development Costs	($45,609,450)	($45,609,450)	($45,609,450)
less Margin on Costs	($9,121,890)	($7,029,770)	($2,331,600)
Residual Land Value	$11,542,830	$13,634,950	$18,333,120
Land Basis	$64,376,371	$64,376,371	$64,376,371
Value Surplus/(Deficit) to Land Basis	**($52,833,541)**	**($50,741,421)**	**($46,043,251)**
City Investment	$0	$10,460,600	$33,951,450
Value Surplus/(Deficit) to Land Basis w/City Investment	**($52,833,541)**	**($40,280,821)**	**($12,091,801)**
PV of Tax Benefits to City	$11,129,604	$11,129,604	$11,129,604
ROI of City Investment	100%	6%	-205%

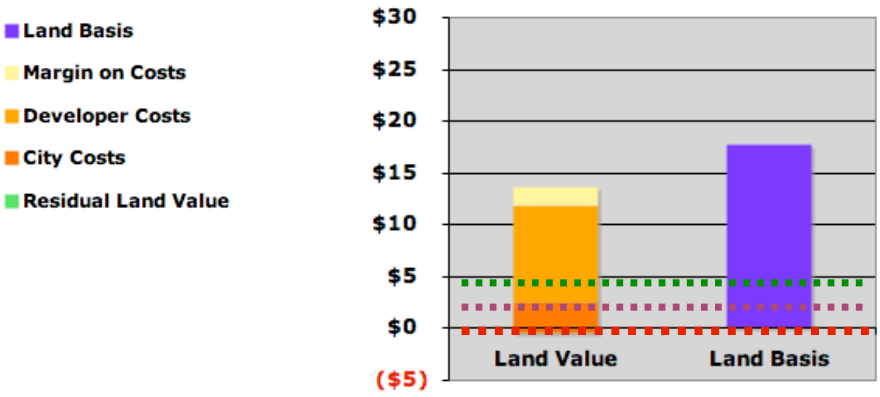
Auto Mall Redevelopment Scenario	**Level Of Developer Investment**		
	High	**Medium**	**Low**
Estimated Finished Land Value	$75,378,141	$75,378,141	$75,378,141
Development Costs	($45,609,450)	($45,609,450)	($45,609,450)
Margin on Costs	($9,121,890)	($7,029,770)	($2,331,600)
Residual Land Value	$20,646,801	$22,738,921	$27,437,091
Land Basis	$64,376,371	$64,376,371	$64,376,371
Value Surplus/(Deficit) to Land Basis	**($43,729,570)**	**($41,637,450)**	**($36,939,280)**
City Investment	$0	$10,460,600	$33,951,450
Value Surplus/(Deficit) to Land Basis w/City Investment	**($43,729,570)**	**($31,176,850)**	**($2,987,830)**
PV of Tax Benefits to City	$11,129,604	$11,129,604	$11,129,604
ROI of City Investment	100%	6%	-205%

Area 4 is a prime example of a sub-area where targeted investment or reduction of development costs may be warranted in order to catalyze private sector activity where it might not otherwise occur. As displayed in the graphic below, at present the sub-area's RLV is negative given the amount of development costs that are assumed to burden this sub-area (almost $14 per square foot, including developer margin), absent any city investment. At the level of "Medium Developer Responsibility," also depicted by the purple dotted line, the residual land value becomes positive, at approximately $2 per square foot. In this scenario, the City would invest approximately $2.50 per square foot in the site, for a total of about $2.5 million. Because the present value of the tax benefits would only suggest an economic value to the City of only about $1.3 million, the City would need to consider if other non-financial benefits could bridge the value gap between the present value of costs and revenues, should funds even be available to consider investment.

In addition to direct investment, the City could also consider how to reduce development costs in a manner consistent with city policies. In the case of Area 4, almost $4 million of the total costs is attributable to roadway improvements. Should the City be able to work with the city of Sea-Tac to lower the threshold for improvements, for example, or work to create a LID or other financing mechanism that could more broadly share the costs of roadway improvements over time, the resultant cost reductions could directly affect the feasibility of redevelopment within the sub-area, given the anticipated uses and the motivated landowner. The green line depicts the RLV after an assumed City investment and a 50% reduction on road improvement costs as a hypothetical scenario. While the overall residual value does not appear overwhelming in the graphic, such a reduction in costs would result in the RLV improving from (-$300,000) to almost $5 million.

Once again, this line of thinking assumes that the Port, the prime landowner in Area 4, has little or no basis in the land.

Area 4: Nearly Feasible if No Land Basis is Assumed



Summary

The RLV analysis model presents one framework for assessing near-term redevelopment opportunities that may be presented by an area-wide rezone, along with some level of City infrastructure investment. The RLV analysis indicates that levels of redevelopment opportunities vary across the site, but several sub-areas seem to have marginally feasible redevelopment opportunities that could be bolstered by City of Burien activities, either in terms of investment in infrastructure, reduction of costs, or even marketing activities. Given limited resources, we recommend focusing resources in those areas of the NERA with the greatest near-term redevelopment potential, while putting in place the appropriate zoning needed to serve both the near-term opportunities and longer-term ones. In addition, the RLV suggests that several areas of the NERA, most notably Area 7 (along with Area 6, which was not studied), in addition to the western portion of Area 5, may be many years away from financially feasible private sector redevelopment opportunities, barring major changes in the inputs used to generate the RLV outputs, such as land basis, develop cost or finished land values. Communication of this expectation to stakeholders in such areas may be advisable.

A

Appendix - Section 8

Comprehensive Plan and Zoning Amendments

CITY OF BURIEN
AGENDA BILL

Agenda Subject: Discussion of Proposed Northeast Redevelopment Area (NERA) Comprehensive Plan and Zoning Amendments		**Meeting Date:** November 23, 2009
Department: Community Development **Contact:** Scott Greenberg, Community Development Director **Telephone:** (206) 248-5519	**Attachments:** 1-Comprehensive Plan and Rezone Recommendations 2-Zoning Code Recommendations	**Fund Source:** N/A **Activity Cost:** N/A **Amount Budgeted:** N/A **Unencumbered Budget Authority:** N/A
Adopted Initiative: Yes No	**Initiative Description:** NE Redevelopment Area	

PURPOSE/REQUIRED ACTION: The purpose of this item is for City Council to discuss the Planning Commission's recommendations for amendments to the City's Comprehensive Plan text and map, and zoning text and map relating to the Northeast Redevelopment Area (NERA). No action is required at this meeting.

BACKGROUND (*Include prior Council action & discussion*):

The City has been working with the Port of Seattle on a Redevelopment Strategy and Implementation Plan for our NE Redevelopment Area since mid-2008. Since then, we have produced a detailed critical areas study, market analyses, land use options and preliminary strategy and implementation plans. A Draft Supplemental Environmental Impact Statement (SEIS) analyzing the impacts of proposed Comprehensive Plan and zoning amendments was issued on October 5, 2009 with a comment period ending Nov. 4, 2009. The Final SEIS is scheduled for release on Nov. 23, 2009 and will include all public comments since issuance of the Draft SEIS.

The Planning Commission held several meetings related to the NERA proposals, including a joint public hearing with the Hearing Examiner on the Draft SEIS and proposed amendments on Oct. 20, 2009. The Commission recommended approval of Alternative 1 as shown on Attachment 1 at their Nov. 10, 2009 meeting.

Council must adopt the Comprehensive Plan text and map amendments in a single package with our other Comprehensive Plan amendments by the end of 2009, or the amendments cannot be adopted until fall of 2010. The zoning code and map amendments could be delayed until early 2010 if Council needs more time to consider these. Proposed schedule is:

- Dec. 7: Review draft ordinances
- Dec. 14: Decision on proposed amendments

OPTIONS (*Including fiscal impacts*):
N/A

Administrative Recommendation: Receive staff presentation and provide direction to staff.

Committee Recommendation: N/A

Advisory Board Recommendation: Adopt Alternative 1 (Planning Commission)

Suggested Motion: N/A

Submitted by: Scott Greenberg
Administration SG

City Manager Mike Martin

Today's Date: November 17, 2009	**File Code:** R:\CC\Agenda Bill 2009\112309cd-1 NERA Comp Plan-Zoning.docx

CITY OF BURIEN
Dept. of Community Development
400 SW 152nd Street, Suite 300
Burien, WA 98166
(206) 248-5510

2009 Comprehensive Plan Amendment and Rezone Request

AMENDMENT REFERENCE NUMBER: 2009-3

APPLICANT(S): City of Burien

LOCATION: NE Redevelopment Area (NERA)

REQUEST:

1. Amend Policy SE-1.5
2. Amend Land Use Map LU-1
3. Rezone the NERA to AI and PR Zones

TAX PARCELNUMBER(S): Not applicable

PLANNING COMMISSION AND STAFF RECOMMENDATION:

Amend Policy SE-1.5, Land Use Map LU-1 and the Burien Zoning Map as set forth in Alternative 1 on Attachment 1.

FINDINGS

HISTORY:

In 1997, the City's initial Comprehensive Plan recognized the impact of airport operations on the northeast portion of Burien. The Plan created the "Northeast Special Planning Area" to provide policy guidance for future redevelopment to airport-compatible uses.

In 2001-2003, the City created a "Joint Advisory Committee" of interested area residents, property owners, Port of Seattle and business interests to create a more specific plan for facilitating such redevelopment in the newly named "Northeast Redevelopment Area (NERA). Following preparation of a Supplemental Environmental Impact Statement (SEIS), the City Council adopted new Comprehensive Plan policies and zoning regulations for "Special Planning Area 4" (SPA-4). The new SPA-4 was designed to encourage redevelopment of the entire NERA with business park uses. The Council established a 2 acre minimum parcel size for redevelopment and prohibited new residential uses.

Since 2003, SeaTac Airport's third runway opened, and the economy entered a recession. With little redevelopment over the past 6 years, the City Council authorized a new effort to redefine the NERA. The proposed Comprehensive Plan policy and map changes, and associated zoning map and code changes are shown in Attachments 1 and 2.

Two alternatives are shown. Both would encourage creation of an airport-compatible business park in a new "Airport Industrial" (AI) plan and zoning category, with new residential uses and small businesses allowed in a new "Professional-Residential" (PR) plan and zoning category in part of the area along 8th Avenue S. Both alternatives would also eliminate the 2 acre minimum required for redevelopment. The difference between the two alternatives is that auto sales and retail uses would be allowed in the southern portion of the AI area in Alternative 1 but not allowed in Alternative 2. A third alternative (maintaining existing plan and zoning provisions

ATTACHMENT 1

for SPA-4) is analyzed in the Draft SEIS issued October 5, 2009 for this new effort, but is not analyzed in this staff report.

REVIEW OF CRITERIA FOR COMPREHENSIVE PLAN AMENDMENT

Zoning Code section 19.65.095.4 contains the criteria for review of a proposed Comprehensive Plan amendment. To be approved, the proposed amendment must meet all of the following criteria (in italics, followed by Planning Commission and staff response):

A. The request has been filed in a timely manner.

The request to amend the Comprehensive Plan for new NERA policies and land use designations was made prior to June 1, 2009, as required in BMC 19.65.095.

B. There is a public need for the proposed amendment.

The public need for the amendment is to update existing policies and mapping to reflect changed conditions in the area—opening of the third runway, a significant economic downturn, desire on the part of the city for increased and diversified revenues and the fact that little redevelopment has occurred under current policies and regulations.

C. The proposed amendment is the best means for meeting the identified public need.

The proposed alternatives are based on a market analysis, critical area mapping and delineation, and coordination with the major property owner in the area (the Port of Seattle). The alternatives will provide for flexibility in land use in both the AI and PR areas. Alternative 1 will provide the expansion area needed by Burien's new car auto dealers, which is not available along 1st Avenue So. This in turn would open former auto dealer sites on 1st Avenue So. to other uses such as retail, lodging or other uses to compliment the downtown area.

D. The proposed amendment is consistent with the overall intent of the goals and policies of the Burien Comprehensive Plan, Growth Management Act and Countywide Planning Policies; and

Goal IN.1 supports the proposed amendments: *Provide opportunities for the development of attractive Business Park, Warehouse, Manufacturing and Airport-Related uses in the northeast part of the City where impacts on the surrounding environment can be minimized.*

The proposed PR designation is a new concept, and as such the Comprehensive Plan is silent on the concept. There are goals and policies that support maintaining residential neighborhoods, and other goals and policies that support business growth and a mix of uses.

There are no applicable policies in the King County Countywide Planning Policies or Growth Management Act applicable to the proposed amendments. However, PSRC's Vision 2040 and other sections of State Law encourage the establishment of land uses that are compatible with airport operations when an airport is in the vicinity:

(Vision 2040) MPP-DP-51 Protect the continued operation of general aviation airports from encroachment by incompatible uses and development on adjacent land.

E. The proposed amendment will result in a net benefit to the community.

The proposed amendments will facilitate redevelopment of land impacted by airport operations, providing additional revenues to the community and more flexibility for property owners in the area.

F. The revised Comprehensive Plan will be internally consistent.

The proposed amendments will be consistent with the remaining portions of the Comprehensive Plan.

G. The capability of the land can support the projected land use.

The projected land use is similar to the current land use allowed. The major constraint to land capability is Miller Creek and associated wetlands. Required buffers have already been accounted for in the projections of ultimate build-out under the proposed alternatives.

H. Adequate public facility capacity to support the projected land use exists or can be provided by the property owner(s) requesting the amendment, or can be cost-effectively provided by the City or other public agency.

The projected levels of redevelopment will need some infrastructure upgrades, but otherwise can be accommodated. Upgrades would be funded by developers and/or public funders if grants or other revenues were made available.

I. The proposed amendment will be compatible with nearby uses.

Existing and proposed NERA development standards based on the proposed amendments would result in adequate protections.

J. The proposed amendment would not result in the loss of capacity to meet other needed land uses, such as housing.

Land in the NERA is not being counted on to provide capacity for housing or other land uses. It is currently planned for retail and industrial-type uses, which would change little under the proposed amendments.

K. For a Comprehensive Plan map change, the applicable designation criteria are met and either of the following is met:

i. Conditions have so markedly changed since the property was given its present Comprehensive Plan designation that the current designation is no longer appropriate;

ii. The map change will correct a Comprehensive Plan designation that was inappropriate when established.

Either of these criteria could be met. The third runway is now in operation and the recent economic downturn has caused the City to re-evaluate its goals for the NERA.

REVIEW OF CRITERIA FOR REZONE

Zoning Code section 19.65.090.3 contains the criteria for review of a proposed rezone. To be approved, the proposed amendment must meet all of the following criteria (in italics, followed by staff response):

A. The rezone is consistent with the Comprehensive Plan.

The proposed rezone to PR and AI would be consistent with the proposed Comprehensive Plan if the Comprehensive Plan designation is changed (see criteria and discussion above). Staff is recommending that the Comprehensive Plan change be approved.

B. The rezone bears a substantial relation to the public health, safety or welfare.

The proposed rezones would provide additional flexibility for property owners in the NERA. For those in the proposed AI zone, the rezone would continue to allow for business parks and offices, and in a portion, auto sales and retail uses. The area where auto sales and retail uses would be allowed would be shifted south

from SPA 4C to other Port and privately owned lands closer to SR-518. This would open up other Port-owned and private land to business park development.

The PR zone would allow flexibility for owners to either convert their properties into small businesses or continue to have residential uses. The PR area is impacted by airport noise, but has many smaller lots insufficient for larger business park or warehouse uses. Allowing optional business use of these properties as well as the ability to build new homes that would be noise-insulated allows owners to make market choices in accordance with overall city objectives for the area.

C. The rezone will not be materially detrimental to uses or property in the immediate vicinity of the property.

The proposed rezone fits with the character of the surrounding land uses and would not be materially detrimental to uses or property in the immediate vicinity (see discussion under Comprehensive Plan amendment criteria section I).

D. The rezone has merit and value for the community as a whole.

The rezone has merit and value for the community as a whole (see discussion under Comprehensive Plan amendment criteria).

ATTACHMENTS

1—Proposed Comprehensive Plan amendments—Alternative 1
2—Proposed Comprehensive Plan amendments—Alternative 2

ALTERNATIVE 1: Proposed Comprehensive Plan Amendments

Replace existing Policy SE 1.5 with the following:

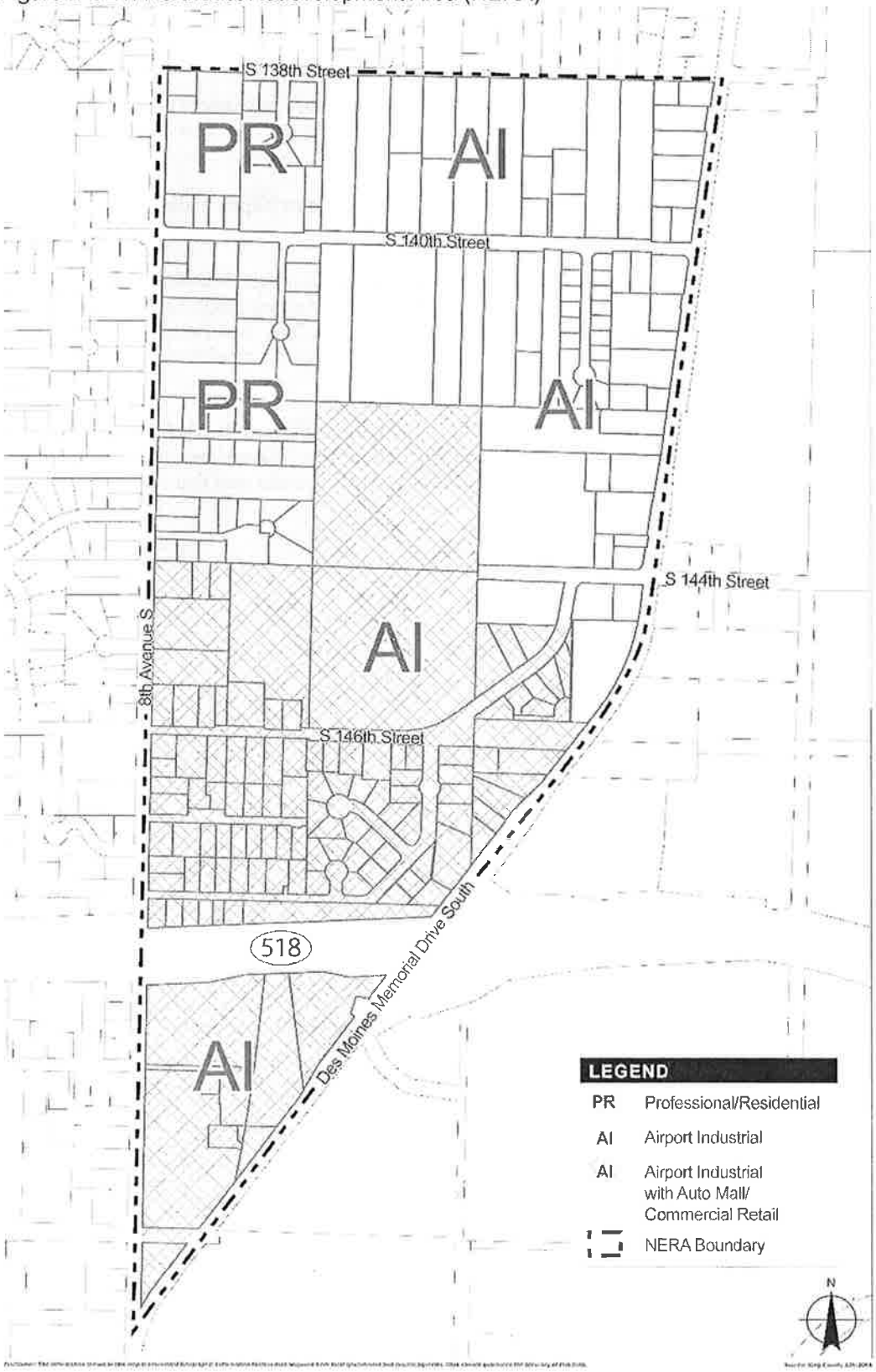
Comprehensive Plan Policy SE 1.5
The Northeast Redevelopment Area (NERA) is an approximately 158 acre area located in the northeastern part of Burien that has been affected by SeaTac International Airport operations (see Figure 2-SE1). The NERA provides near and long term opportunities for economic development.

Allowed Uses and Description: The NERA has been divided into two land use designations: Airport Industrial (AI) and Professional Residential (PR).

Airport Industrial: The purpose of this designation is to facilitate economic development and provide flexibility for airport-compatible uses in a campus-like setting with internal circulation to minimize the number of access points to Des Moines Memorial Drive. Allowed uses include, but are not limited to flex-tech, professional offices, light manufacturing, production, processing and distribution-related businesses; warehousing, utilities, retail, and new car auto sales developed in an auto mall configuration in designated locations. New residential uses are not allowed.

Professional Residential: The purpose of this designation is to provide flexibility by allowing both single-family homes and small businesses in an area near but not directly under SeaTac International Airport's third runway. Allowed uses include, but are not limited to moderate density residential, small office, small scale retail, art studios, and other similar uses that would be compatible with single-family homes.

Figure 2-SE1: Northeast Redevelopment Area (NERA)



ALTERNATIVE 2: Proposed Comprehensive Plan Amendments

Replace existing Policy SE 1.5 with the following:

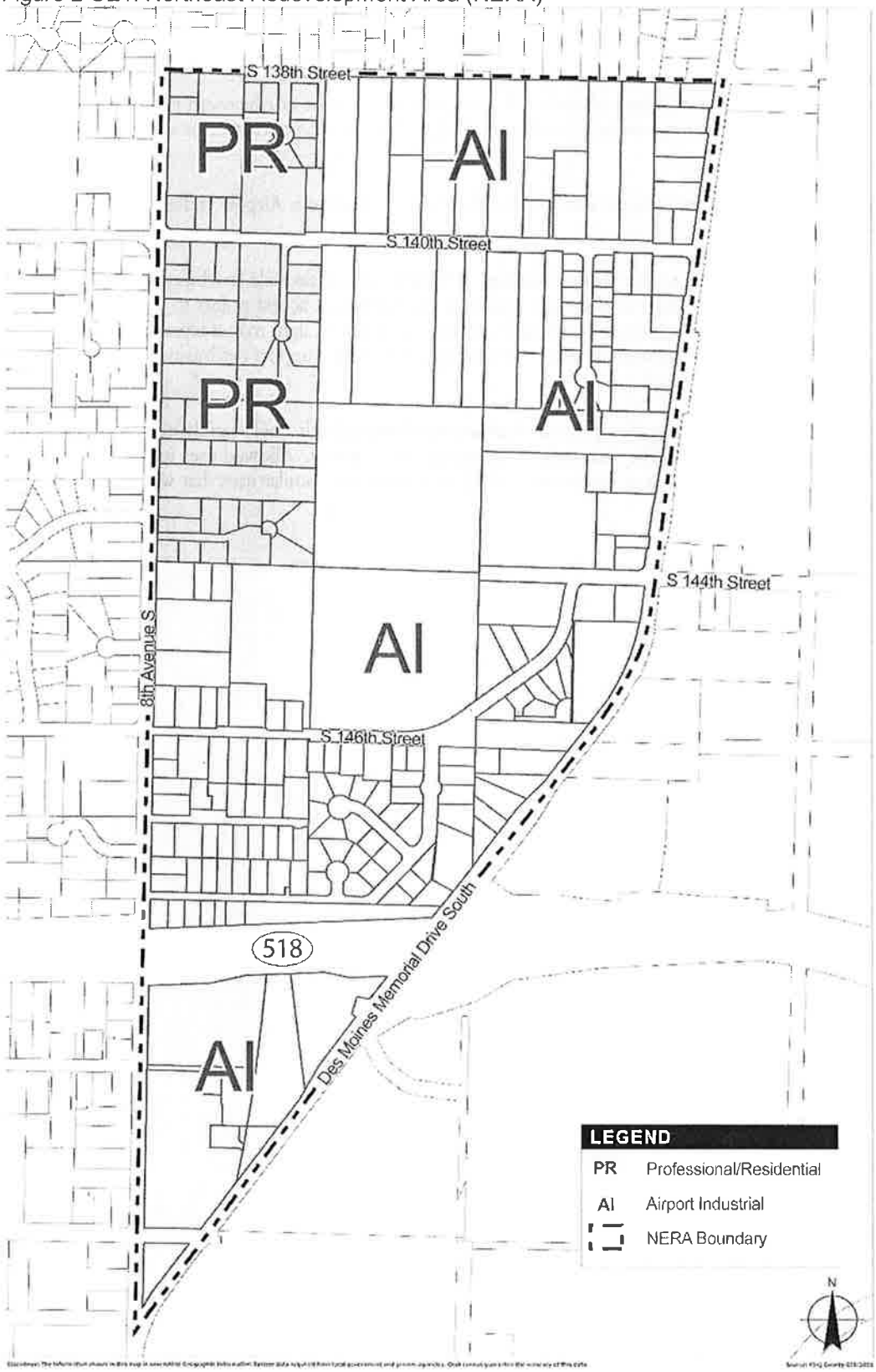
Comprehensive Plan Policy SE 1.5
The Northeast Redevelopment Area (NERA) is an approximately 158 acre area located in the northeastern part of Burien that has been affected by SeaTac International Airport operations (see Figure 2-SE1). The NERA provides near and long term opportunities for economic development.

Allowed Uses and Description: The NERA has been divided into two land use designations: Airport Industrial (AI) and Professional Residential (PR).

Airport Industrial: The purpose of this designation is to facilitate economic development and provide flexibility for airport-compatible uses in a campus-like setting with internal circulation to minimize the number of access points to Des Moines Memorial Drive. Allowed uses include, but are not limited to flex-tech, professional offices, light manufacturing, production, processing and distribution-related businesses; warehousing, utilities and accessory retail to support the business park uses. New residential uses are not allowed.

Professional Residential: The purpose of this designation is to provide flexibility by allowing both single-family homes and small businesses in an area near but not directly under SeaTac International Airport's third runway. Allowed uses include, but are not limited to moderate density residential, small office, small scale retail, art studios, and other similar uses that would be compatible with single-family homes.

Figure 2-SE1: Northeast Redevelopment Area (NERA)



CITY OF BURIEN, WASHINGTON
MEMORANDUM

DATE: November 17, 2009

TO: Mayor McGilton and City Council

FROM: Scott Greenberg, AICP SG
Community Development Director

SUBJECT: Proposed Zoning Code Amendments

As part of the NE Redevelopment Area (NERA) Redevelopment Strategy and Implementation Plan, staff and Planning Commission are recommending a number of amendments to the Zoning Code. The proposed changes are related to the proposed creation of two new zones—Airport Industrial (AI) and Professional Residential (PR)—and the elimination of the Special Planning Area 4 (SPA-4) zone.

The Draft Supplemental Environmental Impact Statement (DSEIS) analyzes two action alternatives. Alternatives 1 and 2 have separate (but similar) use zone charts for the AI zone. The rest of the proposed amendments are identical for both of these alternatives.

Attached to this memo are several documents containing all of the proposed amendments.

The proposed zoning code amendments would:

- Create new use zone charts for two new zones: AI and PR
- Eliminate the existing Special Planning Area 4 zone
- Amend Zoning Code Chapter 19.48 (SPA-4 Design Standards) to reflect the change from the SPA-4 zone to the AI zone.
- Amend 13 various Zoning Code sections. All changes involve removing references to the SPA-4 zone and adding references to the new AI and PR zones, except for:

    1. BMC 18.130: Repeal section that restricts use of publicly-owned property to parks & recreation or community facility use, unless specifically approved for another use by the City Council.

    2. BMC 19.17.080.3.I: Corrects an incorrect sign code reference (change BMC 18.50, which was repealed in 2002 to the current BMC 19.30).

    3. BMC 19.25.010.1: Adds missing reference to landscape category "F.

ATTACHMENT 2

REVIEW OF CRITERIA FOR ZONING CODE AMENDMENT

Zoning Code section 19.65.100.4 contains the criteria for review of a proposed Zoning Code amendment. To be approved, the proposed amendment must meet all of the following criteria (in italics, followed by Planning Commission and staff response):

A. The amendment is consistent with the Comprehensive Plan.

The proposed amendments will be consistent with the Comprehensive Plan, as it is proposed to be amended.

B. The amendment bears a substantial relation to the public health, safety or welfare.

The proposed amendments would implement changes proposed to the Comprehensive Plan and zoning map. Having regulations that are consistent with the Comprehensive Plan and that implement the zoning map will support public health, safety and welfare.

C. The amendment is in the best interest of the community as a whole.

The proposed amendments would implement changes proposed to the Comprehensive Plan and zoning map. As the Comprehensive Plan expresses community interest, having regulations that are consistent with the Comprehensive Plan can be considered as being in the best interest of the community as a whole.

ATTACHMENT
Proposed code amendments for Alternatives 1 and 2.

19.48 ~~Special Planning Area 4~~ Airport Industrial Design Standards (ALTERNATIVES 1 AND 2)

19.48.010 User Guide
19.48.020 General
19.48.030 Site Planning and Design.
19.48.040 Pedestrian and Non-Motorized Circulation.
19.48.050 Vehicular Access and Parking.
19.48.060 Building Design.
19.48.070 Surface Water.

19.48.010 User Guide

This chapter establishes design standards for ~~Special Planning Area 4 (SPA 4).)~~ properties zoned Airport Industrial (AI). If you are interested in developing or making changes to property ~~within SPA 4~~ with an AI zone designation, you should read this chapter. Also, ~~you should read~~ refer to BMC 19.15.070 which contains additional regulations relating to uses and other standards for AI zoned properties. ~~SPA 4, BMC 19.65.090 relating to the rezone process for SPA 4.~~ [Ord. 479 § 1, 2007, Ord. 396 § 1, 2003]

19.48.020 General

1. Purpose and Intent. These standards are intended to direct the design of *buildings* and *sites* within the ~~SPA 4~~Airport Industrial (AI) zone, in compliance with the City's Zoning Code and Comprehensive Plan. The standards will promote quality development and reinforce the opportunity for economic development in areas affected by aircraft noise from SeaTac International Airport. ~~SPA 4 is~~Allowed uses within the AI zone are intended to develop as a coordinated, well-landscaped business park, with substantial buffers along the perimeter ~~of the area.~~ where residential uses will continue to be allowed. The standards are not intended to slow or restrict development, but rather to add consistency and predictability to the permit review process.

2. Compliance ~~With~~with Design Standards. There are two types of design standards below. Mandatory standards contain the word "shall.~~".~~" All other standards must be complied with, unless the project design demonstrates a better means for achieving the standard. [Ord. 479 § 1, 2007, Ord. 396 § 1, 2003]

19.48.030 Site Planning and Design.

1. Coordinate proposed *site* development with planned development on adjacent properties.

2. *Screen* activities that produce glare ~~(such as arc welding)~~ from adjacent rights-of-way and residential uses.

3. Landscaping.

   A. *Landscaping* should comply with BMC 19.25.

   B. ~~Encourage use~~Landscaping along the Miller Creek Corridor shall include native plants that contribute to the overall health of ~~indigenous plant material with~~the creek. There shall be an emphasis on trees and shade cover for *landscaping* along Miller Creek~~.~~.

   C. Encourage use of drought-tolerant or indigenous plants to minimize the amount of water required for irrigation.

D. Encourage use of "gray water" for irrigation.

4 Mechanical equipment. *Screen* mechanical equipment with *landscaping* or attractive architectural features integrated into the *structure* itself.

5. Fencing. *Screen* chain link *fences* by a Type I landscape "full screen" as described in BMC 19.25, or a dark colored coating approved by the *Director*.

6. Outdoor service, storage and loading areas.

A. Loading areas shall not be oriented towards or be visible from *rights-of-way*.

B. Locate service areas, incidental outside storage, construction storage and other areas which tend to be unsightly away from residential uses, rights-of-way and vehicular tracts and easements.

C. *Screen* such areas from view by either:

i. Use of *building* design and layout to provide the required *screening*, or

ii. Installation of a minimum six foot high solid *fence* or enclosure using materials (such as wood or concrete) in the same architectural style of the *building* on the property, or

iii. Installation of a minimum ten foot wide Type I landscape buffer.

7. Biofiltration swales. Integrate bio-filtration swales into the *site* landscape concept. The *Director* may waive or modify required *landscaping* widths, types or materials to accommodate an integrated bio-filtration swale.

8. Site lighting.

A. Provide adequate lighting levels in all areas used by pedestrians and vehicles, especially at *building* entrances and walkways.

B. Use light sources, lighting levels and fixture designs that minimize spillage of light off-*site*.

C. Direct lighting toward the interior of the project and away from rights-of-way and existing or planned residential uses. [Ord. 396 § 1, 2003]

19.48.040 Pedestrian and Non-Motorized Circulation.

1. Pedestrian and non-motorized access should comply with BMC 19.20.090.

2. Provide facilities for pedestrian and non-motorized access in accordance with the Comprehensive Plan and when adopted, the non-motorized pedestrian and bicycle facilities plan. Special consideration shall be given to developing a complete non-motorized network, including development of a trail system along Miller Creek and connections to such system.

3. Provide a ~~minimum 6' wide pedestrian and non-motorized~~ trail along Miller Creek. The exact location, width and design of the trail should ~~be determined through a master trails plan for SPA-4. The trail~~

~~should be located within a minimum 25 foot wide easement/tract~~comply with the Burien Pedestrian and Bicycle Facilities Plan.

4. Develop an internal circulation plan to facilitate pedestrian and non-motorized access between major project phases and adjacent developments. The City may require recording of cross-easements and/or *right-of-way* dedication to achieve the objective of a coordinated, internal access system within ~~SPA 4.~~the AI zone. [Ord. 396 § 1, 2003]

19.48.050 Vehicular Access and Parking.

1. Vehicular access and parking should comply with BMC 19.20 and the City of Burien's adopted road standards (BMC 12.05).

2. Street system. Developments shall be designed to accommodate the planned internal *street* system shown conceptually on Figure 19.48-1.

3. Vehicle entrances and driveways.

   A. Encourage shared vehicular access to reduce *impervious surfaces* and minimize the number of access points.

   B. Limit vehicular access from the *right-of-way* to each property to no more than two locations. The City may allow additional access points upon review of *site* and traffic conditions, and on-*site* traffic patterns.

   C. Design access points to direct traffic ~~within SPA 4~~ to a limited number of access points onto Des Moines Memorial Drive, So. 140th St. or So. 144th/So. 146th St., as shown conceptually on Figure 19.48-1.

   D. Prohibit truck access onto 8th Avenue So. except for deliveries to properties accessed solely from 8th Avenue So. The City may allow truck access where necessary due to natural constraints (such as topography), or for required emergency access. [Ord. 396 § 1, 2003]

19.48.060 Building Design.

1. General.

   A. Design *buildings* to provide a sense of quality and permanence.

   B. Multiple *structures* within a development should share common design elements.

   C. Design or *screen* rear *building* elevations to avoid or substantially minimize negative visual impacts facing Des Moines Memorial Drive or 8th Ave. South.

   D. Photo-simulations of the completed development as viewed from adjacent hillsides, roadways and residential areas may be required.

2. Building facade. A *building façade* that exceeds 100 feet in length that is visible from a *right-of-way* or the shared internal *street* system shown conceptually on Figure 19.48-1 should be treated by one or more of the following methods:

A. Façade offset or modulation. The minimum offset or *modulation* depth should be 3 feet; minimum length should be 8 feet, minimum *height* should be 8 feet. The maximum wall length without offset or *modulation* should be 30 feet.

B. Material, color and texture variation. Use variation in *building* materials, colors and/or textures to minimize the visual effect of *building* scale.

3. Building colors. Use natural and earth tones on the major portions of the *building* façade. Accent colors are permitted on the minor portions of the *facade*.

4. Building materials.

A. Limit the percentage of wall area covered by reflective glass. The *applicant* may be required to provide documentation verifying reflective characteristics of glass proposed for *structures*. Provide awnings or other solar shading devices as needed to minimize sunlight reflection off of the glass.

B. The following materials shall not be used in visible locations unless an exception is granted by the City based on the integration of the material into the overall design of the *structure*.

i. Corrugated or beveled metal siding.
ii. Vinyl or plywood siding.
iii. Corrugated fiberglass.
iv. Crushed colored rock or crushed tumbled glass.

5. Building roof treatment.

A. Design and/or *screen* rooftop vents, air conditioning units, mechanical, electrical and other rooftop equipment to avoid unsightly appearance as viewed from surrounding properties. The *building* roof design and covering/*screening* materials shall be described in detail, and it shall be demonstrated how these items will mitigate the visual impact of the equipment.

B. Use non-reflective roofing materials in black, natural or earth tones.

C. Encourage the use of green roof technology to minimize the need for engineered storm water controls.

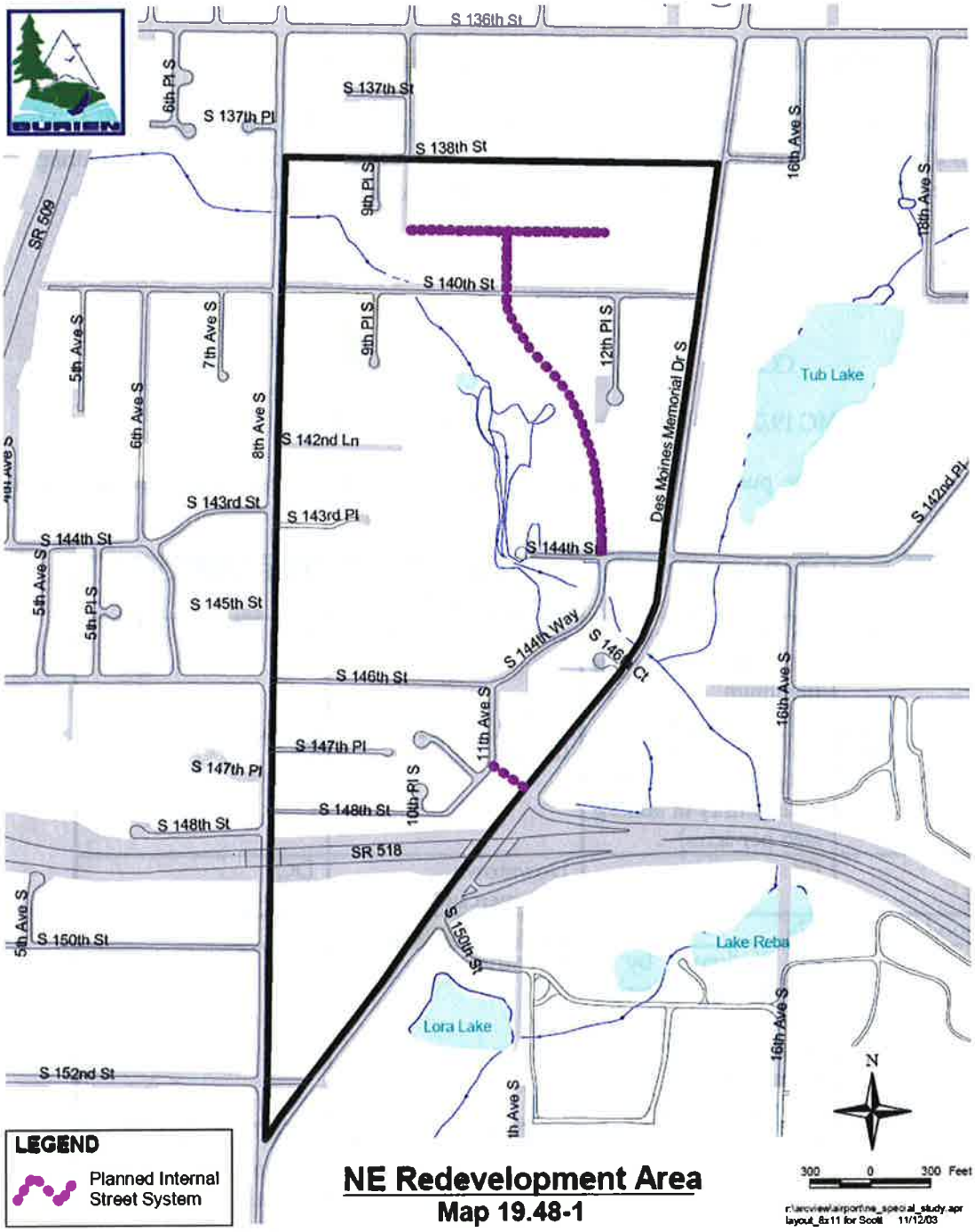
6. Water conservation. Encourage use of water conserving plumbing fixtures and other *building* conservation measures to minimize water consumption. [Ord. 396 § 1, 2003]

19.48.070 Surface Water.

1. Review proposed developments to ensure installation of proper drainage controls to prevent significant impacts to the storm drainage system, including Miller Creek.

2. Retain or slow release *site*-generated runoff using detention ponds, vegetated drainage swales, etc.

3. Encourage "zero" off-*site* release of on-*site* storm drainage runoff. [Ord. 396 § 1, 2003]


S 136th St
6th Pl S
S 137th Pl
S 137th St
S 138th St
9th Pl S
16th Ave S
18th Ave S
SR 509
S 140th St
5th Ave S
6th Ave S
7th Ave S
8th Ave S
9th Pl S
12th Pl S
Des Moines Memorial Dr S
Tub Lake
S 142nd Ln
S 142nd Pl
S 143rd St
S 143rd Pl
S 144th St
S 144th St
5th Ave S
5th Pl S
S 145th St
S 144th Way
S 146th Ct
S 146th St
11th Ave S
16th Ave S
S 147th Pl
S 147th Pl
10th Pl S
S 148th St
S 148th St
SR 518
5th Ave S
S 150th St
S 150th St
Lake Reba
Lora Lake
16th Ave S
S 152nd St
th Ave S
N
LEGEND
Planned Internal Street System
NE Redevelopment Area
Map 19.48-1
300 0 300 Feet
r:\arcview\airport\ne_special_study.apr
layout_8x11 for Scott 11/12/03

ADDITIONAL NERA-RELATED ZONING AMENDMENTS (ALTERNATIVES 1 AND 2)
(proposed changes highlighted)

1. Property Acquisition by Public Entities--BMC 18.130: Repeal entire section

2. User Guide--BMC 19.01.005.1. Find your property on the Zoning Map. This map is not included with this Code, but is available for review at the City of Burien Department of Community Development during regular business hours. The property will have one of the following zoning designations:

RS-A	RM-24	CR	SPA-2
RS-12,000	CN	O	SPA-3
RS-7,200	CI	I	~~SPA-4~~
RM-12	CC1	DC	AI
RM-18	CC2	SPA-1	PR

3. General provisions—BMC 19.05.120-Zones and map designations established.

   In order to accomplish the purposes of this Code the following zoning designations and zoning map symbols are established:

ZONING DESIGNATION	MAP SYMBOL	ZONING DESIGNATION	MAP SYMBOL
Residential, Single-Family	RS (followed by a designation indicating minimum *lot area* in square feet)	Regional Commercial	CR
Residential, Multi-Family	RM (followed by a designation indicating base density in *dwelling units* per acres)	Office	O
Professional Residential	PR	Downtown Commercial	DC
Neighborhood Center	CN	Airport Industrial	AI
Community Commercial	CC (followed by a designation indicating which sub-zone within the Community Commercial Zone)	Industrial	I
Intersection Commercial	CI	Special Planning Area	SPA (followed by a designation indicating which Special Planning Area)

4. Definitions.

19.10.369 Non-Residential Zone – The following zones: CN, CI, CC-1, CC-2, DC, CR, PR, O, AI, I, SPA-1, SPA-2, and SPA-3. ~~and SPA-4.~~

5. Use Zone Charts.

Repeal the following sections that require a rezone to SPA-4 for any new use or development:

- BMC 19.15.005.1.A

- BMC 19.15.010.1.A
- BMC 19.15.020.1.C
- BMC 19.15.050.1.E

6. Adult entertainment facilities.

   BMC 19.17.030.4. Location and separation requirements.

   A. An *adult entertainment facility* shall only be located in the I (Industrial) and ~~Special Planning Area 4C~~ Airport Industrial (AI) zones.

7. Cargo containers.

   BMC 19.17.040.3. *Cargo containers* are not allowed in the Downtown Commercial (DC), Office (O), Neighborhood Center (CN), Professional Residential (PR) and Special Planning Area 1 (SPA-1) zones, except as permitted in BMC 19.17.040.2.

   BMC 19.17.040.5. *Cargo containers* are permitted as *accessory uses* in the Industrial (I), Intersection Commercial (CI), Community Commercial (CC-1 and CC-2), Regional Commercial (CR), Special Planning Area 3 (SPA-3), ~~Special Planning Area 4 (SPA-4)~~ Airport Industrial (AI) zones and in the SPA-2 zone as part of the master plan review (pursuant to BMC 19.15.060.1). *Cargo containers* in these zones are subject to the requirements below. *Airplane unit load devices* located in the I and ~~SPA-4~~ AI zones are not regulated as *cargo containers*.

8. Bed and Breakfast establishments.

   BMC 19.17.080.2 Applicability. The regulations of section 19.17.080 apply to *bed and breakfast establishments* in residential zones (RS and RM), Professional Residential (PR) and the Neighborhood Center (CN) zone. *Bed and breakfast establishments* in zones that allow *lodging facilities* are subject to those regulations.

   BMC 19.17.080.3.I Signs. *Signs* for *bed and breakfasts* are subject to the standards in BMC ~~Chapter 18.50 Signs~~19.30, as now in affect, and as may be subsequently ~~be~~ amended.

9. Secure Community Transition Facilities.

   BMC 19.17.110.4. Siting Criteria:
   A. *SCTFs* shall locate in ~~an~~ the Industrial zone, ~~Special Planning Area 4A (SPA-4A) zone, or the portion of the Special Planning Area 4B (SPA-4B) zone north of South 140th St.~~ or Airport Industrial (AI) zone.

10. Lot area – Minimum lot area for construction.

    BMC 19.17.170 Except as provided for *nonconformances* by Chapter 19.55 BMC:
    In the R or PR zones construction may be permitted on:

    1. Any legally subdivided *lot* of record created by the City of Burien; or

    2. Any legally subdivided *lot* of record created prior to February 28, 1993, or created prior to any annexation into the City; or

    3. Any *lot* created prior to the enactment of any applicable state subdivision statute, provided the size of the lot was not reduced by more than 50 percent through acquisition for public purposes. On such lots new homes may be built and existing houses may be expanded and remodeled. [Applicable setbacks, lot coverage, critical area restrictions, design review requirements (if any), height limits and other applicable

regulations in the zoning code shall be met.]

11. Landscaping.

BMC 19.25.010.1 User Guide: Chapter 19.15 of this Code containing the use zone charts assign a *landscaping* category to each *use* in each zone. This category is either "A", "B", "C", "D" ~~or~~ "E" or "F". This Chapter contains the specific requirements that pertain to each category. This Chapter also establishes certain minimum requirements for all *uses*, and minimum requirements for *landscaping* of parking lots and retention of existing trees.

Table 19.25.040-1

Landscape Category	**Along *Property Line* Abutting a Public *Right-of-Way* (Except a Freeway or *Alley*)**	**Along *Property Line* Abutting a Freeway***	**Along All Other *Property Lines* (Except Along an *Alley*)**	**Along *Building Façade* Greater Than 35' High or 50' Wide**	**Surface Parking Area *Landscaping* Required? (see BMC 19.25.070)**
A	None	None	None	None	No
B	10' wide Type III	10' wide Type II	None, except in a transition area (see BMC 19.17.015)	5' wide Type IV	Yes
C	10' wide Type III	10' wide Type II	None, except in a transition area (see BMC 19.17.015)	5' wide Type IV	Yes
D	15' wide Type I	10' wide Type I	10' wide Type II, except when abutting an I zone, then none	5' wide Type IV	Yes
E	See BMC 19.47 and 19.49 for *landscaping* requirements in the DC and SPA-1 zones. The only sections of BMC 19.25 that apply to the DC and SPA-1 zones are: BMC 19.25.080, 19.25.100, 19.25.110, 19.25.170 and 19.25.180.				
F**	25' wide, Type II (along 8th Ave. So. or Des Moines Memorial Dr.); otherwise, 15' wide, Type III	None	50' wide Type I (along northern perimeter of the ~~SPA-4 Comp. Plan designation~~AI zone); otherwise, 10' wide Type III	5' wide Type IV	Yes

12. Freestanding Signs.

BMC 19.30.060.4 Freestanding signs: Certain permitted *signs* in Table 19.30-1 are included in total *sign area* allowed for a *freestanding sign*. The following standards apply to *freestanding signs*:

A. Freestanding sign area allowed: The maximum *freestanding sign area* allowed is 1 s.f. of *sign area* for each linear foot of *street frontage* per *site*, subject to the limitations below. The property owner shall allocate the amount of *sign area* allowed in this section to his or her tenants. This allocation shall be made in writing as part of the tenant's sign permit application. Minimum letter height for signs identifying more than one business or tenant shall be 10 inches.

i. DC, CN, PR and SPA-1 zones: Maximum 32 s.f.

ii. CI, CG-1, O and I zones: Maximum 48 s.f.

iii. AI, CG-2, CR and SPA-3 zones: 50 s.f. plus 1 additional square foot of signage for each three (3) linear feet of *street frontage* (or portion thereof) up to a maximum total of 200 s.f.

B. Maximum height allowed: The maximum allowable *height* for a *freestanding sign* is as follows:

i. DC, CN, PR and SPA-1 zones: 5 feet.

ii. CI, CG-1, O and I zones: 8 feet.

iii. AI, CG-2, CR and SPA-3 zones: 20 feet plus 1 additional foot of *height* for each 25 linear feet (or portion thereof) of *street frontage*, up to a maximum total *height* of 35 feet.

C. Number of freestanding signs allowed: One (1) *freestanding sign* per *site* per *street frontage*. An additional *monument sign* is allowed on a *site's street frontage* of 400 feet or greater. On a *site* with multiple *street frontages*, each *street frontage* shall be considered independent of the other *street frontages*. Multiple *freestanding signs* shall be separated by at least 150 feet, drawn in a straight line between the closest edges of the *signs*. The additional *monument sign* shall comply with the following standards:

i. DC, CN, PR and SPA-1 zones: Maximum 32 s.f. and 5 foot height.

ii. CI, CG-1, O and I zones: Maximum 48 s.f. and 8 foot height.

iii. AI, CG-2, CR and SPA-3 zones: Maximum 64 s.f. and 12 foot height.

13. Personal Wireless Service Facilities.

BMC 19.50.020.1 Personal Wireless Service Facility Locations and Permit Process. The following table indicates the hierarchy of locations to be used in reviewing an application for a *PWSF*. The *applicant* bears the burden to show that location in a higher priority is not technically feasible. Pursuant to WAC 197-11-800(27), some *PWSF* may require a SEPA Review as part of the review processes outlined below.

Priority (highest to lowest)	**Special Review Process (See Chapter 19.65)**	**Type of PWSF and Location**
1	None	A. *Collocation* of *antennas* on an existing *support structure* in a *non-residential zone.* B. Attachment of *antennas* to existing *structures* in the I, CR, CC-1, CC-2, and ~~SPA-4~~ AI zones. C. *Antennas* attached to existing or replacement ball field light standards, electrical transmission towers, water tanks or existing utility poles in any zone.
2	Type 1	Attachment of *antennas* to existing *structures* (except *single detached dwelling units* and their *accessory structures*) in the O, SPA-1, SPA-2, SPA-3, DC, CI, PR, RM and RS zones.
3	Type 2	Any *PWSF* not listed above, except for the following which are prohibited: lattice towers in all zones, new *monopoles* in the DC zone and new *monopoles* in *residential zones*.

AI Zone

Section 19.15.070—Airport Industrial—ALTERNATIVE 1

PURPOSE AND INTENT: The Airport Industrial (AI) zone implements the Airport Industrial Comprehensive Plan designation. The purpose and intent of this designation is to facilitate economic development and provide flexibility for airport-compatible uses in a campus-like setting with internal circulation to minimize the number of access points to Des Moines Memorial Drive.

ONLY THOSE USES LISTED ON THE FOLLOWING USE ZONE CHARTS MAY BE ALLOWED IN THE AI ZONE, SUBJECT TO MEETING ALL APPLICABLE REQUIREMENTS OF THE ZONING CODE. THE FOLLOWING SPECIAL REGULATIONS APPLY TO ALL USES IN THE AI ZONE. BE SURE TO CHECK THE APPLICABLE USE ZONE CHART FOR ADDITIONAL REQUIREMENTS THAT PERTAIN TO SPECIFIC USES. WHERE A SPECIAL REGULATION BELOW CONFLICTS WITH A SPECIAL REGULATION IN A USE ZONE CHART FOR A SPECIFIC USE, THE USE ZONE CHART SHALL APPLY.

19.15.070.1: SPECIAL REGULATIONS:

A. GENERAL.

i Use and development within this zone may be affected by *FAA* regulations associated with SeaTac Airport operations.

ii. Uses shall conform with the following requirements (excluding reasonable construction activity):

a. Does not emit significant quantities of dust, dirt, cinders, smoke, gases, fumes, odors or vapors into the atmosphere.

b. Does not emit any liquid or solid wastes or other matter into any stream, wetland, or other waterway.

c. Does not emit radiation or discharges glare or heat, or emits electromagnetic, microwave, ultrasonic, laser or other radiation levels over what is considered safe by the *FCC*.

d. Does not emit radiation or discharges glare or heat, or emits electromagnetic, microwave, ultrasonic, laser or other radiation levels that would adversely impact electronic equipment of residences or businesses outside of the boundaries of the property the business is located.

e. Does not use heavy trucking as a principal use, such as truck terminals or heavy truck repair.

f. Does not produce excessive noise or ground vibration perceptible without instruments at any point exterior to any *lot*.

g. Is not considered an aviation hazard as defined in State and Federal law.

h. Does not use high intensity lighting or make it difficult for pilots to distinguish between airport lights and others; create electrical interference with navigational signals or radio communication between the airport and aircraft; result in glare in the eyes of pilots using the airport; create reflectivity that interferes with airport radar function; create smoke, dust or other particulates that would impair visibility for aircraft; allow the storage of highly flammable or explosive materials, create bird-strike hazards; or otherwise create a hazard which may in any way endanger the landing, takeoff, or maneuvering of aircraft intending to use the airport.

B. DESIGN STANDARDS. Development within the AI zone is subject to compliance with the design standards in BMC 19.48.

C. BUILDING HEIGHT. No *structure* shall be permitted to be erected, altered or maintained that would constitute a hazard to air navigation, encroach into the limits of the *FAA* Part 77 imaginary surfaces, or cause an increase in minimum flight or approach procedure altitudes as determined by the *FAA*. An additional 12 feet of *height* is allowed for under-*building* or underground parking. A written certification of *height* compliance from the *FAA* may be required.

D. TRANSPORTATION IMPACT MITIGATION. In addition to providing *street* improvements on adjacent *streets* pursuant to BMC 12.05, the City may require off-*site improvements* necessary to mitigate transportation impacts of the proposal as part of the Supplemental Environmental Impact Statement for the Northeast Redevelopment Area dated _____, SEPA planned action or other SEPA review under BMC Title 14. Transportation impact fees also apply pursuant to BMC 19.35.

E. IMPERVIOUS SURFACE COVERAGE.

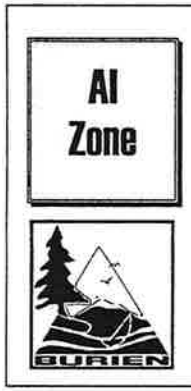
i. The maximum allowable impervious surface coverage is 95%.
ii. Public pedestrian and non-motorized facilities are excluded from *impervious surface* coverage.
iii. The City will give credit for low impact development techniques such as but not limited to pervious pavement and green roofs. The amount of credit shall be determined by the Public Works Director.

F. RESIDENTIAL USES. Existing residential uses may continue to exist pursuant to the standards located in BMC 19.55. New residential uses are prohibited.

AI Zone USE ⇩ ⇩ REGULATIONS	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.070.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	*SETBACKS*		Lot Coverage		*Building Height*			
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*				
19.15.070.2 Air Cargo Facility Distribution *Eating and Drinking Establishment* *Flex-Industrial* *Flex-Tech* Flight Kitchen *Light Industry* *Office* *Off-Site Commercial Parking* Plant Nursery *Retail* *Warehousing and Wholesale Trade*	None	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	
19.15.070.3 New Car Auto Dealer Auto Rental	None	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1 Sales of used vehicles and service facilities are only allowed as an *accessory* use.

AI Zone USE ⇩ ⇨ REGULATIONS	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.070.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	*SETBACKS*		Lot Coverage		*Building Height*			
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*				
19.15.070.4 *Community Facility* *Government Facility* *Public Park and Recreation Facilities* *Recreational Facility* *Religious Facility*	None	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	
19.15.070.5 *Public Utility*	Type 1	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. Shall be designed, located, constructed and buffered to blend in with their surroundings and minimize adverse impacts on adjacent properties. Special attention shall be given to minimizing noise, light and glare impacts.
19.15.070.6 On-site hazardous waste treatment and storage facility Off-site hazardous waste treatment and storage facility	Type 2	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. These uses are required to conduct an environmental review and mitigate all impacts. 2. Must comply with the state siting criteria adopted in accordance with RCW 70.105.210.
19.15.070.7 Essential Public Facility	Type 1	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. Shall be designed, located, constructed and buffered to blend in with their surroundings and minimize adverse impacts on adjacent properties. Special attention shall be given to minimizing noise, light and glare impacts. 2. Shall comply with criteria for siting found in the Burien Comprehensive Plan.

AI Zone USE ⇩ ⇨ REGULATIONS	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.070.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	*SETBACKS*		Lot Coverage					
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*	*Building Height*			
19.15.070.8 Any *use* not listed in the use column of any use zone chart	Type 2	Development standards shall be determined on a case-by-case basis through the Type 2 review process.								1. The proposed *use* shall be compatible with *adjoining uses*. 2. The facility shall be designed, located, constructed and buffered to blend in with its surroundings and mitigate all adverse impacts on *adjoining* properties and the community. Special attention shall be given to minimizing noise, light, and glare impacts.
19.15.070.9 *Adult Entertainment Facility*	Type 2	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. See Sec. 19.17.030 for additional requirements.
19.15.070.10 *Secure Community Transition Facility*	Type 2	See Section 19.17.110								
19.15.070.11 *Personal Wireless Service Facility*	See BMC 19.50 for specific requirements.									



Section 19.15.070—Airport Industrial—ALTERNATIVE 2

PURPOSE AND INTENT: The Airport Industrial (AI) zone implements the Airport Industrial Comprehensive Plan designation. The purpose and intent of this designation is to facilitate economic development and provide flexibility for airport-compatible uses in a campus-like setting with internal circulation to minimize the number of access points to Des Moines Memorial Drive.

ONLY THOSE USES LISTED ON THE FOLLOWING USE ZONE CHARTS MAY BE ALLOWED IN THE AI ZONE, SUBJECT TO MEETING ALL APPLICABLE REQUIREMENTS OF THE ZONING CODE. THE FOLLOWING SPECIAL REGULATIONS APPLY TO ALL USES IN THE AI ZONE. BE SURE TO CHECK THE APPLICABLE USE ZONE CHART FOR ADDITIONAL REQUIREMENTS THAT PERTAIN TO SPECIFIC USES. WHERE A SPECIAL REGULATION BELOW CONFLICTS WITH A SPECIAL REGULATION IN A USE ZONE CHART FOR A SPECIFIC USE, THE USE ZONE CHART SHALL APPLY.

19.15.070.1: SPECIAL REGULATIONS:

A. GENERAL.

i Use and development within this zone may be affected by *FAA* regulations associated with SeaTac Airport operations.

ii. Uses shall conform with the following requirements (excluding reasonable construction activity):

a. Does not emit significant quantities of dust, dirt, cinders, smoke, gases, fumes, odors or vapors into the atmosphere.

b. Does not emit any liquid or solid wastes or other matter into any stream, wetland, or other waterway.

c. Does not emit radiation or discharges glare or heat, or emits electromagnetic, microwave, ultrasonic, laser or other radiation levels over what is considered safe by the *FCC*.

d. Does not emit radiation or discharges glare or heat, or emits electromagnetic, microwave, ultrasonic, laser or other radiation levels that would adversely impact electronic equipment of residences or businesses outside of the boundaries of the property the business is located.

e. Does not use heavy trucking as a principal use, such as truck terminals or heavy truck repair.

f. Does not produce excessive noise or ground vibration perceptible without instruments at any point exterior to any *lot*.

g. Is not considered an aviation hazard as defined in State and Federal law.

h. Does not use high intensity lighting or make it difficult for pilots to distinguish between airport lights and others; create electrical interference with navigational signals or radio communication between the airport and aircraft; result in glare in the eyes of pilots using the airport; create reflectivity that interferes with airport radar function; create smoke, dust or other particulates that would impair visibility for aircraft; allow the storage of highly flammable or explosive materials, create bird-strike hazards; or otherwise create a hazard which may in any way endanger the landing, takeoff, or maneuvering of aircraft intending to use the airport.

B. DESIGN STANDARDS. Development within the AI zone is subject to compliance with the design standards in BMC 19.48.

C. BUILDING HEIGHT. No *structure* shall be permitted to be erected, altered or maintained that would constitute a hazard to air navigation, encroach into the limits of the *FAA* Part 77 imaginary surfaces, or cause an increase in minimum flight or approach procedure altitudes as determined by the *FAA*. An additional 12 feet of *height* is allowed for under-*building* or underground parking. A written certification of *height* compliance from the *FAA* may be required.

D. TRANSPORTATION IMPACT MITIGATION. In addition to providing *street* improvements on adjacent *streets* pursuant to BMC 12.05, the City may require off-*site improvements* necessary to mitigate transportation impacts of the proposal as part of the Supplemental Environmental Impact Statement for the Northeast Redevelopment Area dated _____, SEPA planned action or other SEPA review under BMC Title 14. Transportation impact fees also apply pursuant to BMC 19.35.

E. IMPERVIOUS SURFACE COVERAGE.

i. The maximum allowable impervious surface coverage is 95%.

ii. Public pedestrian and non-motorized facilities are excluded from *impervious surface* coverage.

iii. The City will give credit for low impact development techniques such as but not limited to pervious pavement and green roofs. The amount of credit shall be determined by the Public Works Director.

F. RESIDENTIAL USES. Existing residential uses may continue to exist pursuant to the standards located in BMC 19.55. New residential uses are prohibited.

AI Zone USE ⇩ ⇩ REGULATIONS	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.070.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	SETBACKS		Lot Coverage		*Building Height*			
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*				
19.15.070.2 Air Cargo Facility Distribution *Flex-Industrial* *Flex-Tech* Flight Kitchen *Light Industry* *Office* *Off-Site Commercial Parking* Plant Nursery *Warehousing and Wholesale Trade*	None	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	
19.15.070.3 *Convenience Retail* *Eating and Drinking Establishment*	None	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. Allowed only as *accessory* use related to or supporting the *primary use* of the *site*. 2. Total *gross floor area* devoted to *convenience retail* and eating & drinking establishments shall not exceed 20% of the *gross floor area* of the *primary use* on the *site*. 3. Occupancy of an *eating and drinking establishment* is limited to the lesser of 40 people per acre or the occupancy allowed by the *construction code*.

AI Zone USE ⇩ ⇩ REGULATIONS	DIRECTIONS: FIRST, read down to find use...THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.070.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	*SETBACKS*		Lot Coverage		*Building Height*			
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*				
19.15.070.4 *Community Facility* *Government Facility* *Public Park and Recreation Facilities* *Recreational Facility* *Religious Facility*	None	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	
19.15.070.5 *Public Utility*	Type 1	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. Shall be designed, located, constructed and buffered to blend in with their surroundings and minimize adverse impacts on adjacent properties. Special attention shall be given to minimizing noise, light and glare impacts.
19.15.070.6 On-site hazardous waste treatment and storage facility Off-site hazardous waste treatment and storage facility	Type 2	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. These uses are required to conduct an environmental review and mitigate all impacts. 2. Must comply with the state siting criteria adopted in accordance with RCW 70.105.210.
19.15.070.7 Essential Public Facility	Type 1	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. Shall be designed, located, constructed and buffered to blend in with their surroundings and minimize adverse impacts on adjacent properties. Special attention shall be given to minimizing noise, light and glare impacts. 2. Shall comply with criteria for siting found in the Burien Comprehensive Plan.

AI Zone ⇩ REGULATIONS / USE ⇩	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.070.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	*SETBACKS*		Lot Coverage					
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*	*Building Height*			
19.15.070.8 Any *use* not listed in the use column of any use zone chart	Type 2	Development standards shall be determined on a case-by-case basis through the Type 2 review process.								1. The proposed *use* shall be compatible with *adjoining uses*. 2. The facility shall be designed, located, constructed and buffered to blend in with its surroundings and mitigate all adverse impacts on *adjoining* properties and the community. Special attention shall be given to minimizing noise, light, and glare impacts.
19.15.070.9 *Adult Entertainment Facility*	Type 2	None	10'	10'	None	See BMC 19.15.070.1.E.	45' See BMC 19.15.070.1	F	See Section 19.20.030.2.	1. See Sec. 19.17.030 for additional requirements.
19.15.070.10 *Secure Community Transition Facility*	Type 2	See Section 19.17.110								
19.15.070.11 *Personal Wireless Service Facility*	See BMC 19.50 for specific requirements.									

PR Zone

Section 19.15.030—Professional Residential Zone—ALTERNATIVES 1 AND 2

PURPOSE AND INTENT: The Professional Residential zone implements the Northeast Redevelopment Area designation of the Comprehensive Plan. The purpose and intent of this zone is to provide land use flexibility by allowing both single-family homes and small businesses in an area near but not directly under SeaTac International Airport's third runway.

ONLY THOSE USES LISTED ON THE FOLLOWING USE ZONE CHARTS MAY BE ALLOWED IN THE PR ZONE, SUBJECT TO MEETING ALL APPLICABLE REQUIREMENTS OF THE ZONING CODE. THE FOLLOWING SPECIAL REGULATIONS APPLY TO ALL USES IN THE PR ZONE. BE SURE TO CHECK THE APPLICABLE USE ZONE CHART FOR ADDITIONAL REQUIREMENTS THAT PERTAIN TO SPECIFIC USES. WHERE A SPECIAL REGULATION BELOW CONFLICTS WITH A SPECIAL REGULATION IN A USE ZONE CHART FOR A SPECIFIC USE, THE USE ZONE CHART SHALL APPLY.

19.15.030.1: SPECIAL REGULATIONS:

A. GENERAL.

i. Hours of trash pickup should be restricted to reduce potential disturbance from noise.

ii. New and conversion of existing residential structures shall be architecturally consistent with the surrounding character of the neighborhood and include similarities in materials, color, roof pitch and detailing. The intent of this provision is for businesses to look like residential structures.

B. TRANSPORTATION MITIGATION. In addition to providing *street* improvements on adjacent *streets* pursuant to BMC 12.05, the City may require off-*site improvements* necessary to mitigate transportation impacts of the proposal as part of the Final Supplemental Environmental Impact Statement for the Northeast Redevelopment Area dated _____, SEPA planned action or other SEPA review under BMC Title 14. Transportation impact fees may also apply pursuant to BMC 19.35.

C. CONVERSION OF RESIDENTIAL STRUCTURES TO NON-RESIDENTIAL USES. In order to facilitate and encourage non-residential uses to reuse existing residential structures, the *Director* may modify landscaping and parking design requirements. The intent of this provision is to maintain the residential character of properties, reduce the amount of new paving and storm runoff, and provide landscaping and screening where it is most beneficial to buffer adjacent residential uses.

PR Zone USE ⇩ ⇩ REGULATIONS	DIRECTIONS: FIRST, read down to find use...THEN, across for REGULATIONS									
		MINIMUMS			MAXIMUMS					
			SETBACKS		Lot Coverage					
	Special Review Process (See Ch. 19.65)	*Lot Area*	*Front Setback*	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*	*Building Height*	Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.030.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
19.15.030.1 *Single Detached Dwelling Unit*	None	7,200 s.f.	20'	5'	35%	70%	35'	A	2 spaces per unit	1. One *single detached dwelling unit* may be built on a *lot* that has less than the stated minimum *lot area*. 2. No *lot* shall be created less than the minimum *lot area* except through the application of lot averaging. *Lot* averaging is permitted through a short plat, subdivision or *lot* line adjustment. However, no *lot* shall be created with an area less than 90 percent of the stated minimum *lot area*. 3. Chapter 19.17 contains regulations regarding home occupations, and other *accessory uses*, facilities and activities associated with this use.
19.15.030.2 *Professional Office*	None	7,200 s.f.	20'	10'	70%	85%	35'	C	See Sec. 19.20.030.2	
19.15.030.3 *Art Studio*	None	7,200 s.f.	20'	10'	70%	85%	35'	C	See Sec. 19.20.030.2	1. May include artists' lofts at a maximum density of one dwelling unit per 7,200 s.f. of lot area.
19.15.030.4 *Convenience Retail* *Eating and Drinking Establishments*	None	7,200 s.f.	20'	10'	70%	85%	35'	C	See Sec. 19.20.030.2	1. *Convenience auto service* uses are not permitted. 2. Outdoor activities related to *eating and drinking establishments* are only permitted between the hours of 7:00AM and 9:00PM. 3. Outdoor retail sales or storage are not permitted.
19.15.030.5 *Day Care Center*	None	None	20'	10'	70%	85%	35'	B	See Sec. 19.20.030.2	1. *Day Care Center:* Must provide State certification of safe passenger loading area.

PR Zone USE ⇩ ⇩ REGULATIONS	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.030.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	SETBACKS		Lot Coverage		*Building Height*			
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*				
19.15.030.6 *Family Day Care Home I and II*	None	See Special Regulation 1								1. Must comply with requirements of the *primary use*. 2. Must provide State certification of safe passenger loading area.
19.15.030.7 *Public Park and Recreation Facilities*	None	None.	20'	10'	70%	85%	35'	A	See Sec. 19.20.030.2	1. Lighting for *structures* and fields shall be directed away from *dwelling units*.
19.15.030.8 *Religious Facility*	Type 2	7,200 s.f.	20'	10'	70%	85%	35'	C	See Sec. 19.20.030.2	1. *Accessory use* shall comply with the requirements for that *use* listed in this use zone chart (BMC 19.15.030).
19.15.030.9 *Community Residential Facility*	Type 2	7,200 s.f.	20'	10'	70%	85%	35'	B	1 space for every 2 bedrooms	
19.15.030.10 School	Type 2	7,200 s.f.	20'	10'	70%	85%	35'	C	See Sec. 19.20.030.2	
19.15.030.11 Senior Citizen Assisted Dwelling Unit	Type 2	7,200 s.f.	20'	10'	70%	85%	35'	B	0.5 spaces per unit	1. Minimum lot area per dwelling unit is 7,200 s.f. 2. Conversion to another use is allowed, provided that all requirements for the new use are met, including density limitations.
19.15.030.12 *Essential Public Facility*	Type 2	Development standards shall be determined on a case-by-case basis through the Type 2 review process.								1. Shall be designed, located, constructed and buffered to blend in with their surroundings and minimize adverse impacts on adjacent properties. Special attention shall be given to minimizing noise, light and glare impacts. 2. Shall comply with criteria for siting found in the Burien Comprehensive Plan.

PR Zone USE ⇩ ⇩ REGULATIONS	DIRECTIONS: FIRST, read down to find use…THEN, across for REGULATIONS									
	Special Review Process (See Ch. 19.65)	MINIMUMS			MAXIMUMS			Landscape Category (See Ch. 19.25)	Minimum Required Parking Spaces (See Ch. 19.20)	Special Regulations (See also Section 19.15.030.1 and Miscellaneous Use, Development and Performance Standards Ch. 19.17)
		Lot Area	*SETBACKS*		Lot Coverage		*Building Height*			
			Front Setback	*Interior Setback*	*Building Coverage*	*Impervious Surface Coverage*				
19.15.030.13 *Community, Cultural or Government Facility*	Type 2	None	20'	10'	70%	85%	35'	C	See Sec. 19.20.030.2	
19.15.030.14 Public Utility	Type 2	None	30'	30'	35%	70%	20' See Spec. Reg. 1	D	See Sec. 19.20.030.2	1. The Hearing Examiner may approve height no greater than 35 feet if the applicant shows that no feasible alternative is available. 2. Shall be designed, located, constructed and buffered to blend in with their surroundings and minimize adverse impacts on adjacent properties. Special attention shall be given to minimizing noise, light and glare impacts.
19.15.030.15 *Personal Wireless Service Facility*	See Chapter 19.50									

A

Appendix - Section 9

Miller Creek Greenway Concept Report

Miller Creek Greenway Concept Report

Miller Creek Greenway Enhancements & Regional Stormwater Facility Technical Analysis

DRAFT

DECEMBER 18, 2009

Prepared for:
City of Burien
400 SW 152nd Street
Suite 300
Burien, WA 98166

Prepared by: Otak, Inc.
10230 NE Points Drive, Suite 400
Kirkland, WA 98033

TABLE OF CONTENTS

Miller Creek Greenway Concept Report

SECTION 1 — 1
Miller Creek Greenway Overview

SECTION 2 — 3
Potential Greenway Enhancements

SECTION 3 — 13
Hydrolic Analysis

SECTION 4 — 17
Flow Control and Water Quality

SECTION 5 — 21
Stormwater Infrastructure Options

SECTION 1

Miller Creek Greenway Overview

Background

The Northeast Redevelopment Area (NERA) was created in 1997 through the adoption of the City of Burien Comprehensive Plan. The NERA was identified as an area affected by present and future aviation activities at Seattle-Tacoma International Airport. Special planning provisions were needed for this redevelopment area due to the incompatibility of current land uses, mainly consisting of single-family residences, with current and future airport operations.

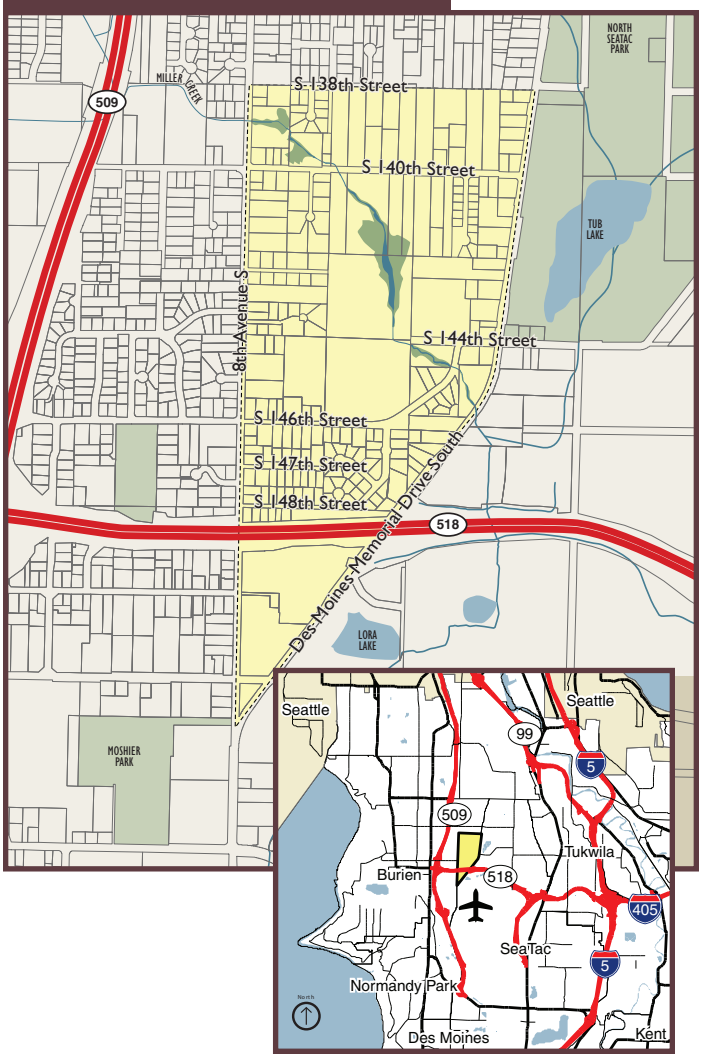
The City of Burien and Port of Seattle, a major land owner in NERA, partnered to develop a specific plan for redevelopment, supported by market and economic analysis, to determine the best course for the area's future. This analysis led to the development of the NERA Redevelopment Plan and Implementation Strategy. This plan provides a master plan for the area, which includes new commercial and industrial uses for the majority of the NERA and retains flexibility in the northwest portion for new residential, homes converted to offices, and other uses. A key component of this plan is the creative use of Federal Aviation Administration (FAA) restricted land for the development of a sub-regional stormwater facility. The sub-regional facilities paired with natural amenities of Miller Creek corridor would serve as a Greenway through NERA providing recreation and environmental enhancement opportunities.

This Greenway would provide recreational opportunities to City residents and new development by providing a vital link to the City's existing and planned Burien Loop Trail system. Additionally, a sub-regional stormwater facility would provide economic development incentives for future developers through its function in managing and treating stormwater from redevelopment sites thereby maintaining maximum developable area, reducing the costs of redevelopment for individual property owners, and providing recreational amenities for future employees.

Location

The Miller Creek Greenway bisects the NERA from the northwest to the southeast. The NERA is located in the City of Burien between 8th Avenue South to the west and Des Moines Memorial Drive to the east which merges with 8th Avenue South in the southern end of the NERA. To the north, the NERA is bounded by South 138th Street. Please refer to Figure 1—Vicinity Map.

Figure 1 – Vicinity Map



Miller

Purpose

The purpose of this report is to describe the proposed concept of developing the Miller Creek Greenway with sub-regional stormwater facilities within the NERA. The intent is to provide the City of Burien (City) with conceptual design options and cost data to inform future decision making and the pursuit of funding to implement the project. The report builds upon previous planning work by conceptualizing stormwater facilities to meet the needs of the City and NERA property owners through the establishment of the Miller Creek Greenway. The Miller Creek Greenway would serve multiple functions:

- Meeting the needs of future development through the sub-regional management and treatment of stormwater in FAA restricted and undevelopable areas of the site;
- Reducing the cost of redevelopment on individual properties and maximizing area for redevelopment by providing off-site facilities;
- Providing the opportunity for creek restoration and environmental enhancement along the Greenway;
- Serving as a natural buffer area and scenic backdrop between intensive land uses in the NERA;
- Providing a public corridor for extension of the Burien Loop Trail system and providing a vital linkage to other trails adjacent to the NERA; and
- Providing a variety of recreational opportunities for the community, including residents and employees of the NERA.

Existing Miller Creek Drainage Features - There is an opportunity to rehabilitate the creek corridor to a more natural condition.

Restricted land in the NERA includes critical areas such as the creek and its associated wetland buffers, as well as areas where development is restricted due to ownership and funding (primarily FAA funding) used to purchase the property. Miller Creek is a Type 2 stream, protected by a 100 foot buffer. Its five associated wetlands located in the NERA have buffers that range from 50 feet to 100 feet based on the type of wetland. The remainder of development restricted land is present in the eastern portion of the NERA, a majority of which is in Port ownership, with a few parcels in City of Burien ownership. Port owned property is restricted mostly due to the type of funding used to purchase the property as well as other reasons. The Port-owned (FAA restricted) land limits development to infrastructure (including stormwater facilities), parking, and open space. City of Burien-owned land was purchased with stormwater funds and is intended to serve stormwater needs and functions.

SECTION 2

Potential Greenway Enhancements

Miller Creek Existing Condi-

Elements of the Greenway

The proposed Miller Creek Greenway would include sub-regional stormwater facilities co-located with a shared-use trail and adjacent open space in the NERA, following the route of the Miller Creek corridor. The Greenway could provide a number of recreational opportunities for employees and residents of the NERA and the greater Burien community, such as a place for lunch-time walking and jogging, picnicking, environmental interpretation and education, exercise course, and other possible features.

Today, Miller Creek is an urban stream that has been heavily altered by development activities. The creek flows through ditches, culverts, underground pipes. There are only a few locations where the creek has been retained in a more natural state as it traverses the NERA. Stream and wetland enhancements including potential stream daylighting, could improve habitat and water quality, as well as general environmental quality of the area.

The proposed stormwater facilities (described in further detail in the next section of this report) ideally would be constructed as shallow wetlands with native landscaping. These facilities would provide water quality and detention for future NERA redevelopment. The shallow stormwater ponds and new wetlands, paired with the existing creek, wetlands, and their associated buffers would provide an extensive natural corridor and green space through the heart of the NERA. We are referring to this green space that encompasses both existing natural features and the proposed stormwater facilities as the Miller Creek Greenway.

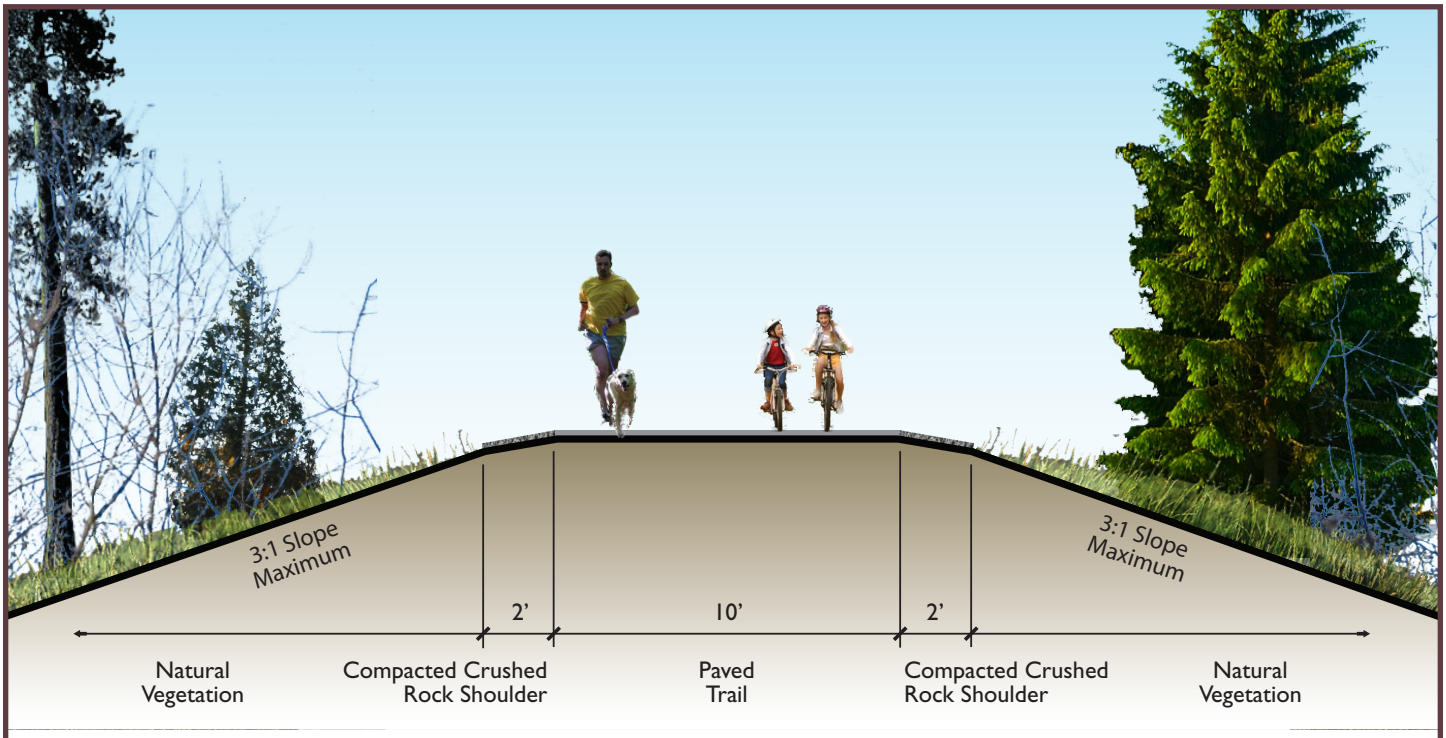
Shared-Use Trail and Recreational Opportunities

In addition to the opportunities for stormwater management and enhanced water quality and habitat functions in the creek corridor, a Greenway through the NERA would provide important recreational opportunities and economic incentives for redevelopment.

The City of Burien Bicycle and Pedestrian Plan, adoped in June 2004, identifies the Miller Creek corridor through NERA as a future trail link to the greater Burien Loop Trail. The NERA Greenway trail connection would connect the eastern portion of Burien to existing and future trail networks that eventually lead to Seahurst Park and Puget Sound. Due to the NERA's location adjacent to the City of SeaTac, this trail link would also provide opportunities for a regional connection to existing City of SeaTac parks and trails.

In addition to the creek and wetland enhancements, the Greenway could potentially include open space areas and amenities, such as the shared-use trail with one ore more bridge crossings, wayfinding elements, viewpoints, picnic areas, an exercise course and opportunities for environmental interpretation and education for people traveling through the Greenway. Refer to the graphics at the end of this section of the report for conceptual illustrations of Miller Creek Greenway enhancements and these elements, as well as cross sections illustrating area topography the relationship of the creek corridor to adjacent trail and recreation facilities, as well as existing and constructed wetland features. The conceptual plan depicts a potential alignment for the trail, as well as potential locations for recreational nodes and features along the trail.

The proposed Miller Creek Greenway Trail would be placed within a 15-foot-wide space along the creek, wetlands, and proposed stormwater facilities. This space could be an easement acquired via dedication by adjacent property owners or a public open space acquired through purchase. The trail may be located



Miller Creek Shared Use Trail
TYPICAL / SECTION DESIGN

within the Miller Creek stream and wetland buffers, in which case the width of those buffers would be increased by the 15-foot dimension.

It is recommended that the shared-use trail be constructed at a minimum width of 10 feet of hard surface with 2-foot shoulders on each side. This width will accommodate use by both pedestrians and bicyclists in the trail corridor, while also maintaining a more natural look to the linear open space. (The trail could be wider, such as 12 feet or 14 feet, depending on standards adapted for the design; however this would impact the aesthetics of the Greenway by creating a more urban character with more hardscape.)

The trail surfacing could be either asphalt or concrete to accommodate both wheels and feet. Forms of pervious pavement could be explored to increase infiltration opportunities. The shoulders should be constructed of compacted crushed rock material. The trail surface could also serve as an access drive for maintenance of the stormwater facilities.

As the trail makes its way through NERA, bridge crossings may be needed to navigate existing topography. Wayfinding signs at entrances and along the trail corridor would provide direction and information to trail users. These wayfinding signs would reinforce the identity of the trail corridor through "Burien Loop Trail" branding and could also provide information about segment lengths/ mile markers. At trail entrances, small maps of the trail system could be provided on wayfinding posts and information could be shared related to how to be a good steward of the Miller Creek Greenway (e.g. "Welcome to the Miller Creek Greenway -- Please Help Us Keep the Greenway Healthy" etc.).

Along the trail, small areas could be designated for resting spaces where benches and/or tables could be provided for picnicking. Overlook areas for viewing of the creek and wetlands could be created, along with segments of boardwalks and bridges. Interpretive displays could educate Greenway users about the creek and wetlands system, the benefits of the sub-regional stormwater facilities, as well as other general

Miller Creek Existing Condi-

environmental themes (keeping Puget Sound clean, urban wildlife, etc.) The viewpoints would allow opportunities for interaction between trail users and the natural beauty of the corridor and would provide a respite and refuge from the surrounding urban context. The Greenway could also be used for more active recreation functions, such as a fitness course with exercise stations accessible from the shared-use trail, benefiting people working in the NERA on a daily basis, as well as nearby residents.

Miller Creek Wet-

Estimated Cost of the Trail and Recreational Features

The estimated cost to develop the shared-use trail and recreational features described above would be approximately $2 million. The estimated cost for creek corridor rehabilitation and wetland enhancement along the Greenway, within the NERA, is approximately $2 million. This does not include estimated costs associated with construction of the stormwater facilities, which are discussed in Section 5. These are planning-level estimates in 2009 dollars, based on preliminary, conceptual design. The costs include construction as well as environmental permitting and design.

Benefits of the Greenway

The proposed Greenway would maximize the public usability and functions of the creek corridor. Development of the trail system and adjacent open space within the buffers of the creek and wetlands and along the fringes of the proposed stormwater facilities would expand the public benefits of these otherwise undevelopable areas. The use of FAA restricted lands for the proposed stormwater facilities would help to expand the sense of the Greenway beyond the immediate creek corridor. The Greenway would provide excellent amenities for future NERA developers and employees, not only by making efficient use of restricted land, but also by providing off-site stormwater facilities, which in turn maximizes development capacity on individual parcels and reduces costs of site development. The Greenway also would provide recreational and scenic opportunities, which may help to attract redevelopment and bring new businesses to the area.

SECTION 3

Hydrolic Analysis

Miller Creek Drainage

Introduction and Methodology

In order to inform the potential development of sub-regional stormwater facilities in the proposed Miller Creek Greenway, the total future stormwater runoff that may originate from the NERA must be calculated. Existing and planned land uses were analyzed using the hydrologic model MSG Flood. The model was used to generate the required size of detention and water quality facilities that would be necessary to treat stormwater runoff originating from the NERA in two types of facilities:

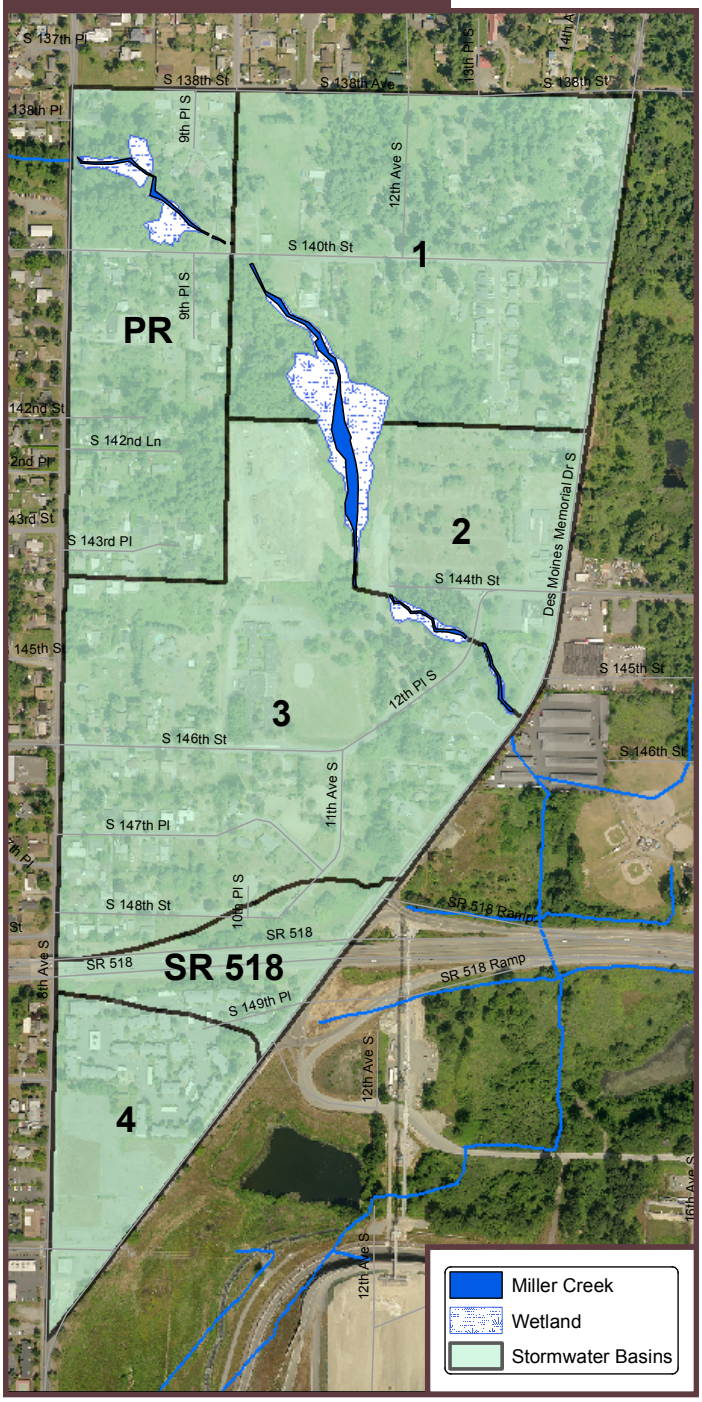
1. Combined stormwater wetland and detention areas; and
2. Underground vaults.

These types of facilities were selected because of their compatibility with future planned redevelopment by preserving developable area and providing recreation and enhancement opportunities for Miller Creek. Ultimately, the sub-regional stormwater facilities could be a combination of wetland and detention areas and vaults depending on costs and future decisions made by the City related to the potential for this project.

Based on conversations with City staff, the City will adopt the 2009 King County Surface Water Design Manual (KCSWDM) to regulate new development with regard to surface water management in early 2010 as mandated by State law. The King County manual is typically based off of the Department of Ecology manual with more specific stormwater regulations as it relates to the Puget Sound region. In 2009 the King County Manual was updated the manual to make it consistent with the Washington State Department of Ecology's 2005 Stormwater Management Manual for Western Washington (Ecology Manual). Analysis for this study is based on the 2009 KCSWDM.

The 2009 KCSWDM outlines eight core requirements and five special requirements that, depending

Figure 2 – Drainage Basins



on the amount of impervious surfaces, must be met by every development and redevelopment project. The conceptual design of the NERA sub-regional stormwater facilities will comply with Core Requirement #3—Flow Control Facilities [but not flow control Best Management Practices (BMPs)] and Core Requirement #8—Water Quality. While flow control and water quality facilities will be provided through the sub-regional facilities, each individual development project would still be required to complete a drainage review to determine what level of flow control and water quality treatment would be needed onsite before reaching the sub-regional facilities. On-site flow control and water quality could be provided through the presence of bioswales, infiltration features, or other low impact development (LID) applications.

Existing Drainage Patterns

The existing drainage pattern north of SR 518 in the NERA drains to Miller Creek via curb and gutter, ditches, overland flow, and underground pipes. A majority of this runoff is collected in the southern portion of the NERA, south of SR 518 on Port property, formerly Lora Lake Apartments, and is then conveyed east to Miller Creek outside the NERA boundaries.

Site Selection for Sub-regional Facilities

Several sites, delineated by existing parcel boundaries, were identified as potential locations for sub-regional stormwater facilities during the NERA master planning process. The sites were selected due to the development restrictions placed on the properties.

The project area was delineated into five basins draining to the proposed five flow control and water quality facilities. Refer to Figure 2 — Drainage Basins. The existing basins were delineated based on GIS mapping information including critical areas and topography analysis, field reconnaissance, and the conceptual design by the NERA planning group. The area labeled SR 518 is Washington State Department of Transportation (WSDOT) right-of-way was not included as part of this study.

Pre-Developed Hydrology

The MGS Flood model was used for the hydrologic modeling of the project site and for sizing of the detention volumes and water quality facilities. MGS Flood is a widely used and accepted model developed, in part, by WSDOT for analysis and design of surface water management facilities and is an accepted continuous hydrology model by the Washington State Department of Ecology. It is an acceptable model for flow control and water quality facility sizing and analysis in the 2009 KCSWDM.

Soils information for the NERA was correlated from GIS surface geology data at the University of Washington's Washington State Geospatial Data Archive. King County Soil Survey by the USDA Natural Resources Conservation Service does not extend to this portion of King County. The surface geology can be correlated with hydrologic soils types. Vashon Till (Vt) was modeled as a Type C soil in MGS Flood. Vashon Recessional outwash (Vr) closely resembles Type A/B soils. Holocene Peat (Hp) is pea in modern valley alluvial deposits, a Type D soil. See Figure 3 — Soils Data.

A Level 2 Basic Flow Control standard is required for the NERA, based on Section 1.2.3.1 of the 2009 KCSWDM and Section 2.5.5 of Volume I of the 2005 Ecology Manual. This standard requires the predeveloped land use condition be characteristic of natural conditions (i.e., prior to disturbance by European settlement). For this analysis, the historic site condition for the entire NERA was modeled as forested land cover. However, the initial analysis of the pre-developed condition produced unrealistic large detention volumes (e.g., detention ponds larger than the basin area). As a result, the pre-condition land use was modeled as Till Forest for all basins. Table 1 presents the proposed basin areas and the resulting peak discharge outputs from MGS Flood modeling.

Figure 3 – Soils Data

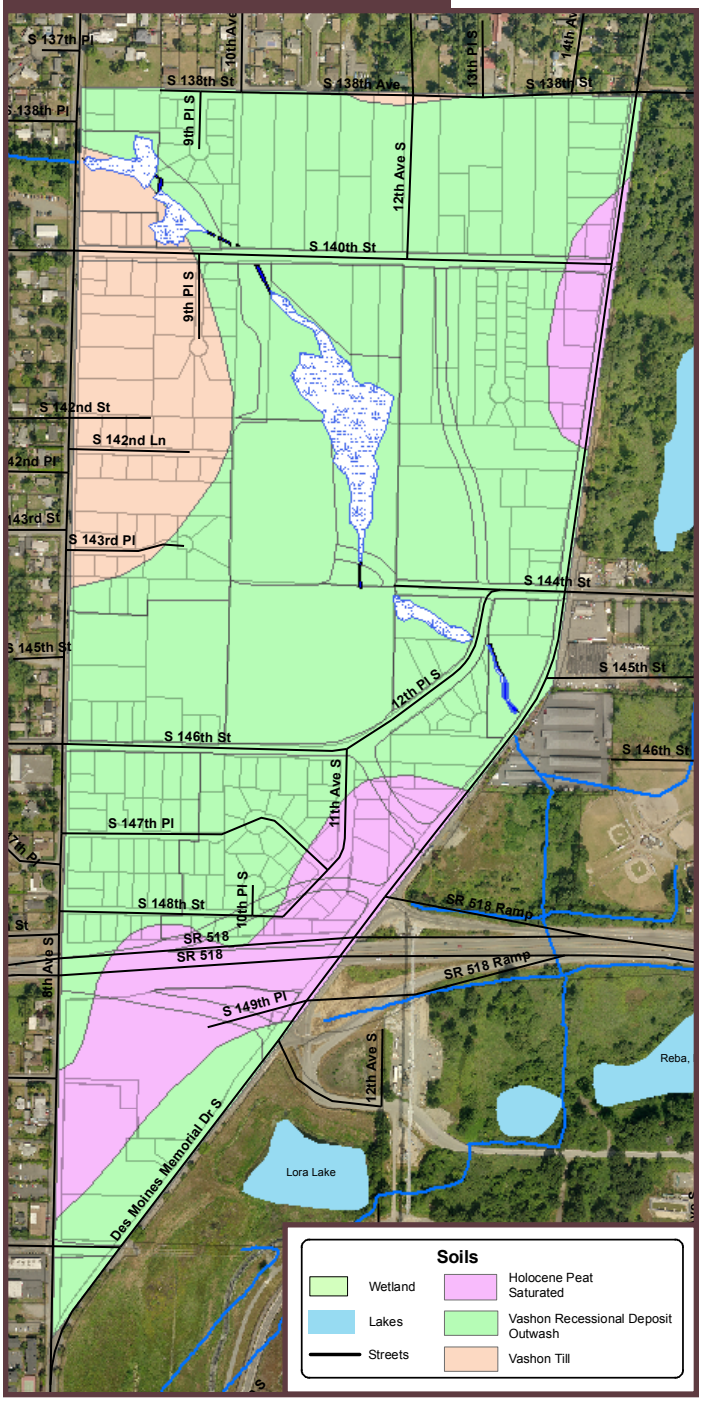


Table 1 – Pre-development Peak Flows (cfs)

Basin ID	Tributary Area (Acres)	2-Year	50-Year	100-Year
PR	29	0.6	2.0	2.1
1	46	0.9	3.1	3.4
2	17	0.4	1.2	1.3
3	55	1.1	3.8	4.1
4	14	0.3	1.0	1.1

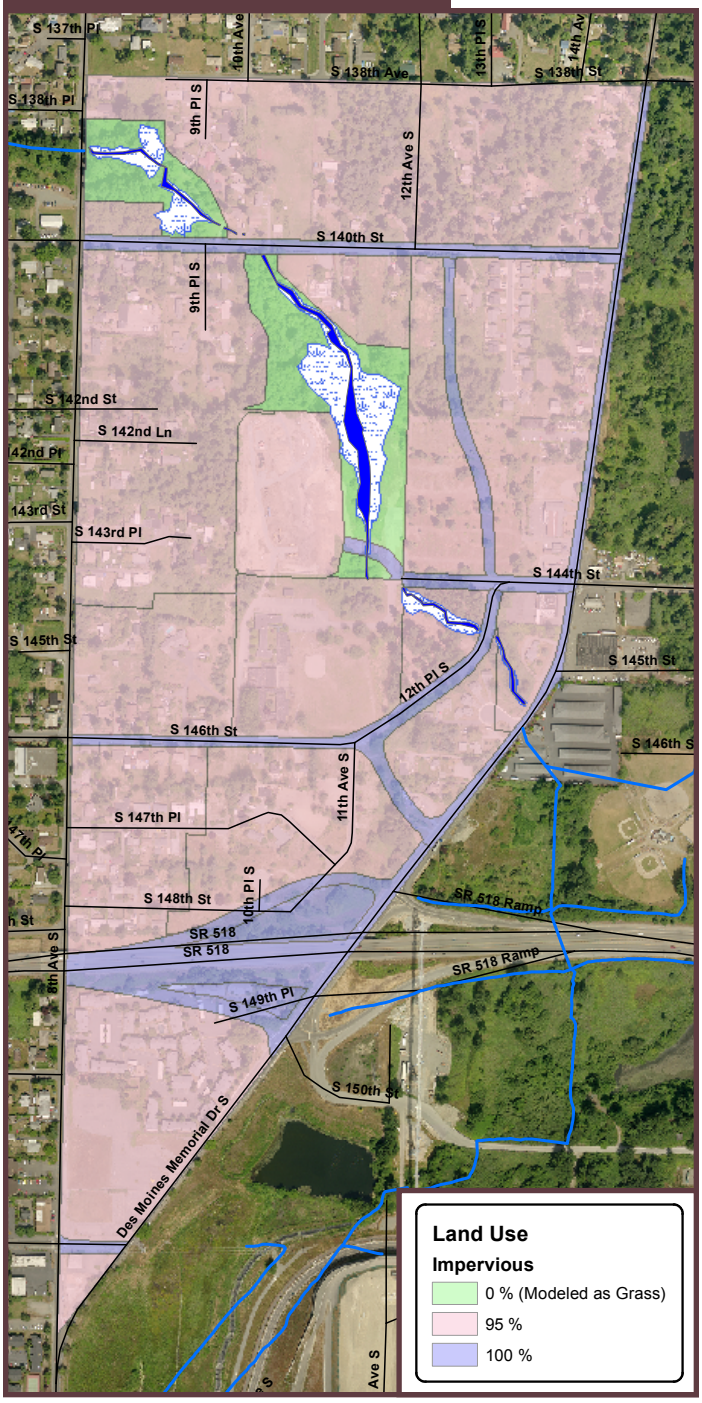
Proposed Hydrology

The planned redevelopment in the NERA, as described in the NERA Redevelopment Plan, would increase the amount of impervious surface (pavement and building). For the proposed conditions, land use within Basins 1 – 4, which include commercial and industrial uses, was determined to be 95 percent impervious, while land use within Basin PR is determined to be 85 percent impervious based on the information provided by the NERA planning group. This analysis assumes that all runoff from within the NERA will be detained and treated within five facilities, which include public right-of-way roadway runoff (excluding SR 518). Roadways in the public right-of-way are modeled as 100 percent impervious. The remaining areas, streams, wetlands and their buffers were delineated and surveyed as part of the NERA Critical Areas Study and were modeled as grass or wetland. Please refer to Figure 4 – Land Use for a graphical representation of the proposed uses and how they were modeled.

Basin Label SR 518 is WSDOT right-of-way and was not modeled in this study. It was assumed that WSDOT would provide a separate stormwater system.

The post development analysis looks at worst case scenario, the maximum amount of stormwater runoff and does not take into account land use credits that may be received through the use of flow control BMP, Section 5.2.2 in the 2009 KCSWDM. Since the actual on-site, parcel by parcel flow control BMP type is unknown at this conceptual planning level, the analysis did not include any facility sizing credits that may be available from viable BMPs. Should new development chose to provide or be required to provide more on-site flow control BMPs including Low Impact Development techniques such as infiltration, the actual sizing of the proposed facilities could shrink.

Figure 4 – Land Use



SECTION 4

Flow Control and Water Quality

Introduction

This section of the report describes basic flow control and water quality requirements and standards that would be required for the NERA stormwater facilities.

Flow Control

A Level 2 Basic Flow Control standard is required for the NERA, based on Section 1.2.3.1 of the 2009 KCSWDM and Section 2.5.5 the Volume I of the 2005 Ecology Manual. This standard requires developed condition discharge duration to match pre-developed duration for the range of pre-developed discharge rates from 50% of the 2-year flow up to the full 50-year peak flow. The objective of this standard is to prevent increases in the stream channel erosion rates above of natural conditions (i.e., prior to disturbance by European settlement). The standard intends to minimize the total amount of time that a receiving stream exceeds an erosion-causing threshold based upon historic rainfall and natural land cover conditions. For this analysis, the historic site condition for the entire NERA is required to be forested land cover.

The combined detention and wetpool configuration will allow for the water quality facility to be placed beneath the detention facility without increasing the facility surface area. It is assumed that the live storage component of the facility will be above the seasonal high water table as verification of the water table is beyond the scope of this analysis. The detention and wetpool facility will be integrated into an open space and passive recreation area along Miller Creek. See Table 2 for Detention Volume for each Basin.

Miller Creek

Table 2 – Detention Volume

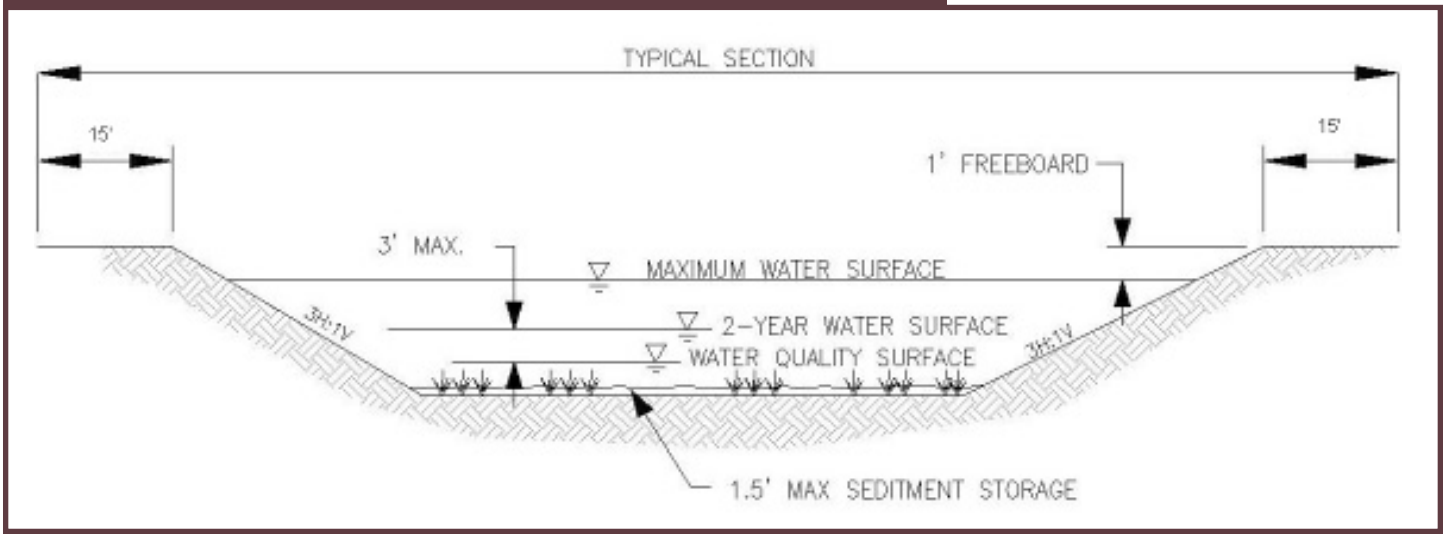
Basin ID	Tributary Area	Detention Volume (Acre-feet)
PR	29	13.2
1	46	19.9
2	17	7.3
3	55	30.3
4	14	7.3

Water Quality

In each basin, it is assumed 100 percent of the impervious areas from a commercial area will flow to the combined flow control and water quality facility. This is greater than the 45 percent impervious area threshold stated in the 2009 KCSWDM, triggering the enhanced basic water quality treatment goal for the facilities. This goal is intended to remove 80 percent of Total Suspended Solids (TSS) and to reduce 50 percent of total Zinc present in the runoff. Zinc is an indicator of a wider range of metals typically found in urban runoff.

The enhanced basic water quality menu in the 2009 KCSWDM (Section 6.1.2) includes three options: stormwater wetland (which can be combined with detention); a large sand filter; or a combination of facilities called "a treatment train" (see Table 6.1.2.A in Appendix D or in the 2009 KCSWDM for more information).

Schematic 1 — Typical Stormwater Wetland Cross Section

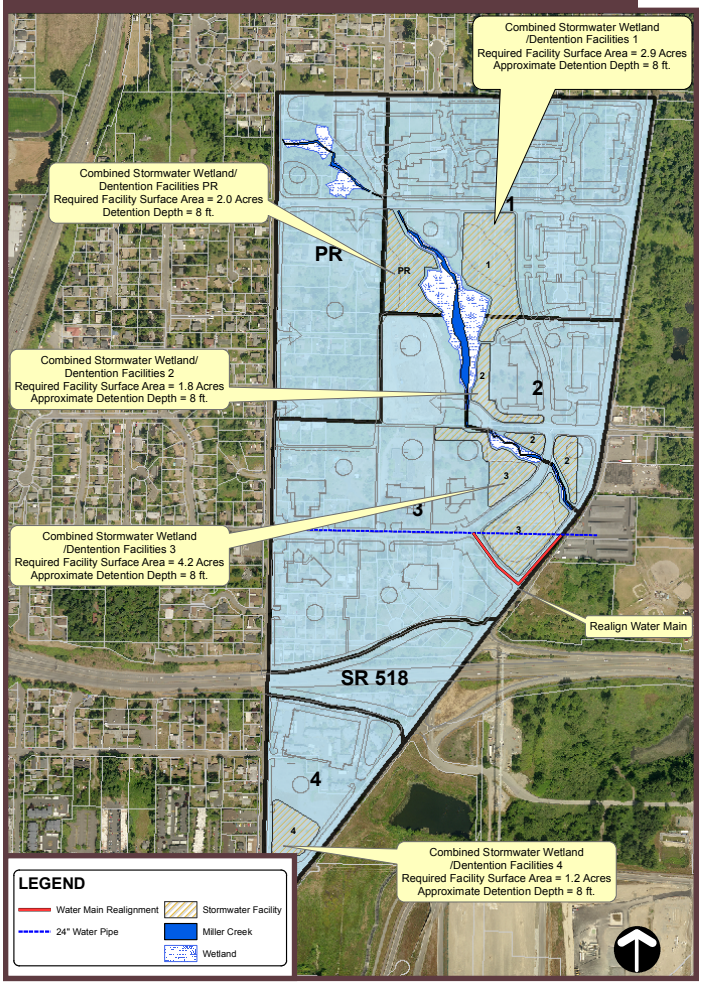


Combined Stormwater Wetland and Detention (Stormwater Wetland)

A stormwater wetland facility satisfies the 50 percent zinc removal goal of KCSWDM and is considered the most cost effective option because of the combination of the flow control volume plus the water quality treatment volume vertically into one footprint and no large underground vault is required. Although in some instances this option is not desirable because of their larger footprints, due to shallower depths of the facilities. However, for the NERA, this option provides many amenities for the area by enhancing the landscape and buffering existing residential areas, while using restricted land for the larger footprints needed. See Figure 6.4.4.A of the 2009 KCSWDM provided in Appendix D for more details on this type of facility. Please refer to Figure 5 for proposed stormwater wetland option layout.

The proposed Stormwater Wetland surface area for each basin was calculated from detention volume plus wetpool volume with 3 to 1 side slopes, 1 foot of freeboard and a 15-foot buffer to accommodate the minimum berm width, access roads, fences, and offsets from property lines. Due to the wetland vegetation in the combined facilities, the water level fluctuation is restricted to be no greater than 3 feet between the Water Quality design level and the water level associated with the 2-year runoff. See Schematic 1 and Table 3.

Figure 5 – Stormwater Wetland Layout



The proposed stormwater wetland design provides a shallow, vegetated area that serves as a stormwater function and providing habitat and green space for the area. Side slopes are designed to be very minimal in order to naturally integrate with surrounding wetlands and also potentially avoid the necessity of fencing. The 15-foot buffer along each side of the proposed facility would accommodate the proposed Miller Creek trail alignment. This trail alignment would be loaded, for the majority of the corridor, on the east side of Miller Creek, therefore in between the creek and stormwater wetlands—surrounded by continuous Greenway.

Maintenance in a stormwater wetland includes the estimated bi-annual cleaning of sediment and landscape maintenance to keep the wetland clear of noxious weeds and general maintenance of vegetation by clearing out dead material or vegetation that will hinder the facilities performance. For specific maintenance requirements, please refer to Appendix A of 2009 KCSWDM No. 18 (Stormwater Wetland).

The wetland sizing procedure, which is separate from the detention volume calculation in MGS Flood, is detailed in Section 6.4.1.1 of the 2009 KCSWDM and is used to determine the stormwater wetland size. Table 3 below summarizes the calculated water quality volumes. The wetland sizing calculations can be found Appendix C of this document.

Table 3 – Wetland & Detention Volume and Surface Area

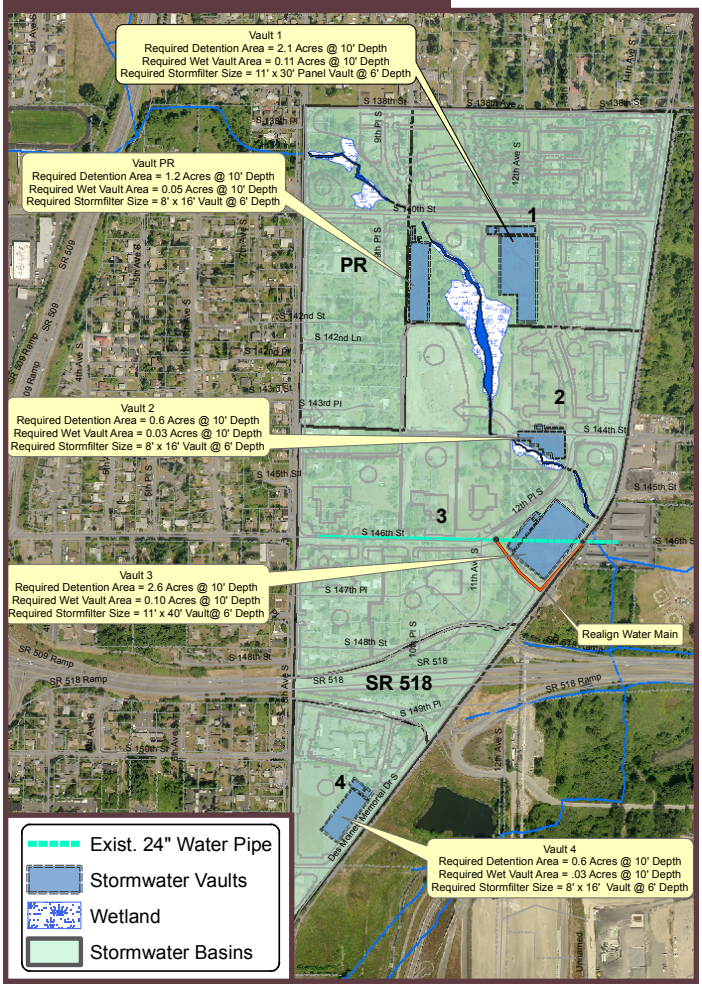
Basin ID	Tributary Area	Wetland Volume (Acre-feet)	Total Surface Area (Acres)
PR	29	2.7	2.5
1	46	4.3	3.6
2	17	1.6	2.2
3	55	5.6	5.3
4	14	1.5	1.5

Treatment Train

The treatment train option for water quality includes the use of underground vaults to minimize required facility footprint and is a viable alternative to Stormwater Wetland. The vaults may be placed underneath proposed parking areas, public roads, and other non-structural developable areas.

Each treatment train will include a wet vault, which provides basic water quality treatment, and a StormFilter vault with CSF leaf compost media, which provides the enhanced water quality treatment. This design assumes a 10-foot depth for the wet vaults and 6-foot depth for the StormFilters. A vault design provides opportunity for green space and parking above the facility, however are more costly to install and maintain due to the size of the structure and confined space which may make the facilities more challenging to maintain. Like the stormwater wetland

Figure 6 – Vault Layout



ponds, vaulted facilities too must be cleaned out on an estimated bi-yearly basis for sediment build-up. However, this maintenance can be more costly in a vault due to the confined space making it more challenging to maneuver and the need to replace filter media within the vault. For specific maintenance requirements, please refer to Appendix A of 2009 KCSWDM No. 17 (Wetvault), and 21 (StormFilter-Cartridge Type). Please refer to Figure 6 for the proposed vault option layout.

Table 4 Summarizes vault sizes for detention and water quality treatment.

Table 4 – Wetvault and StormFilters Vault Sizes

Basin ID	Tributary Area	*Wetvault Volume (Acre-feet)	Storm Filter Vault
PR	29	0.5	8' x 16' Vault
1	46	1.1	11' x 30' Panel Vault
2	17	0.3	8' x 16' Vault
3	55	1.3	11' x 40' Panel Vault
4	14	2.2	8' x 16' Vault

*Wetvault volume calculated from MGS Flood 91% exceedance Volume.

Flow Control Best Management Practices (BMPs) and Low Impact Development (LID)

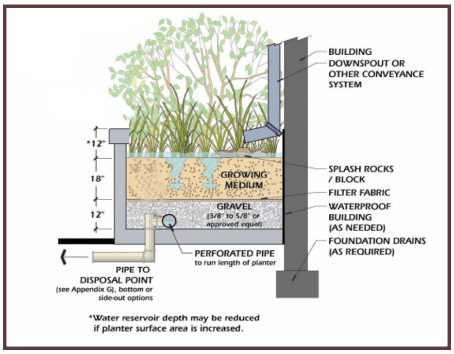
Flow control BMPs are methods and design techniques for dispersing, infiltrating, or otherwise reducing or preventing development-related increases in runoff at or near the source of those increases. In many cases, Low Impact Development techniques provide flow control BMPs on a given site. The 2009 KCSWDM requires that flow control BMPs be applied at each individual development and rather than provided for at the sub-regional facilities. This allows for the slowing and cleaning of stormwater on-site before it is sent to the sub-regional facilities. This limits sediment build-up at the sub-regional facilities and reduces the volume of water to be treated—therefore reducing the size of the sub-regional facilities because some of the stormwater is being treated or infiltrated on individual development sites. KCSWDM requires additional flow control BMPs for Large Lot (>22,000 square feet) High Impervious (>45% of site) development. Examples of these types of facilities are listed in Section 5.2.1.3 and Appendix C of the 2009 KCSWDM and can be found in Appendix D of this report. These are requirements in addition to the Level 2 flow control and enhanced water quality treatment provided by the sub-regional facilities.

It is recommended that the City review any development in the NERA to make sure that these developments have properly designed and installed Flow Control BMPs to the 2009 KCSWDM standard in order to prevent significant impacts downstream to the Miller Creek drainage system.

Infiltration

In Figure 3, the soils group identified as Vashon Recessional outwash is favorable for infiltration facilities (while the Type C and D soils are not favorable). Geotechnical investigations on a site by site basis are required for individual development to determine the infiltration rate flow and design on-site flow control BMPs. It is recommended that the City review each analysis to ensure that each development has properly designed and installed stormwater facilities per the 2009 KCSWDM for Flow Control BMPs and/or Low Impact Development (LID) facilities.

LID techniques may include processes such as, filtration, infiltration, detention/retention and aeration through natural and/or man-made elements. LID techniques should begin with required BMPs and be tailored to fit a given site. Examples of common stormwater LID techniques include: permeable pavement and concrete for use in parking areas or plaza space, the use of rain gardens and swales in parking lot landscaping islands, or on site open space and landscape buffers.



Building Landscaping LID Sche-

SECTION 5

Stormwater Infrastructure Options

Introduction

This section of the report describes potential stormwater infrastructure options and associated estimated costs for each of the defined basins in the Greenway as depicted in Figure __. It is important to note that this is a preliminary and conceptual analysis completed at an early planning stage of the project. As the project moves forward, the program and features of the Greenway and sub-regional stormwater facilities would be defined to a greater level of detail, and this may alter some of the assumptions presented below. The projected costs below are planning-level estimates in 2009 dollars, based on preliminary, conceptual design. The costs include construction as well as environmental permitting and design. Two sets of estimated costs are provided: one estimate for stormwater wetland/detention facilities and one estimate for underground vaults. Ultimately, if the system developed becomes a combination of above ground facilities and vaults, the estimated cost would fall somewhere between the two estimates provided.

Basin PR

Basin PR relates to the Professional Residential area located in the north western portion of the NERA. The stormwater wetland facility surface area required for Basin 1 is approximately 2.0 acres. Alternatively, the detention vault will acquire a 1.1 acre foot print. The available area, immediately south of the Miller Creek crossing of South 140th Street, is approximately 2.8 acres. However, to make either of these structures work in this area, a vertical wall approximately 30-feet in height will be required along the eastern and southern edge in order to accommodate the Stormwater Wetland. See Figure 5 and Figure 6.

According to the available soil data, the basin is situated within unfavorable soils for infiltration, flow control BMPs and LID facilities. However, infiltration investigation is recommended on a site by site basis. Due to the proximity of the facility to Miller Creek, the Stormwater Wetland facility may incorporate open space and passive recreation elements.

Runoff from the facility will be released directly to Miller Creek. There is an existing storm drain system at the north boundary of the NERA that collects street runoff from portions of the City that is outside of NERA. This storm drain system conveys runoff through NERA via open ditches and closed pipes then outfalls into Miller Creek at South 140th Street. Future development within NERA should protect the storm drain system. In addition the culvert crossing for Miller Creek at South 140th Street is often overtopped during significant rainfall events and should be replaced to avoid flooding in this area.

Total combined stormwater wetland estimate = $ 2,440,000
Total subsurface vault estimate = $ 4,280,000

Basin 1

The combined detention and stormwater wetland facility surface area required for Basin 1 is approximately 2.9 acres. Alternatively, the detention vault will acquire a 1.1 acre foot print. The available restricted land, located immediately north of the Miller Creek and south of South 140th Street, is approximately 4.0 acres and can accommodate either alternative.

A large portion of basin 1 is situated within favorable soils for infiltration, flow control BMPs and LID facilities. Infiltration investigation is recommended for all new development. Due to the proximity of the facility to Miller Creek, the facility may incorporate open space and passive recreation elements. Additionally, topography is favorable for open space above a buried vault. Runoff from either proposed facility would be released directly to Miller Creek. See Figure 5 and Figure 6.

Total combined stormwater wetland estimate = $ 1,870,000
Total subsurface vault estimate = $ 7,330,000

Basin 2

The combined detention and stormwater wetland facility surface area required for Basin 2 is approximately 1.8 acres. While a detention vault would require a 0.6 acre footprint. The available restricted area, immediately north of the Miller Creek and along South 144th Street, is approximately 2.0 acres and can accommodate either facility.

A large portion of the basin is situated within favorable soils for infiltration, flow control BMPs and LID facilities. Due to the proximity of the facility to Miller Creek, the Stormwater wetland may incorporate open space and passive recreation elements including a shared-use recreation trail. The Stormwater wetlands proposed for this basin is made up of three wetlands that run along the creek and in some instances are separated by roadways and developable land. Due to the flexibility of the stormwater wetland facilities, restricted area can be utilized for stormwater facilities. Runoff in this scenario would also release runoff directly to Miller Creek. The underground vault alternative is not as flexible in design due to the structure cells that need to be constructed. For this reason the vaulted facility would need to be located within City owned Right-of-Way or City owned property to avoid impacts on developable area. See Figure 5.

Total combined stormwater wetland estimate = $ 1,090,000
Total subsurface vault estimate = $ 2,470,000

Basin 3

The combined detention and stormwater wetland facility surface area required for Basin 3 is approximately 4.2 acres, while the detention vault will acquire a 2.4 acre footprint. The available restricted area, located immediately south of the Miller Creek and along South 144th Street, is approximately 5.0 acres and can accommodate either type of facility. Due to required depth needed for either facility, the existing 24" water transmission main will have to be realigned to allow for the construction of the stormwater facility. This would require the realignment of the water main of approximately 800-linear feet. This realignment costs has been included in the cost estimate of both alternatives.

A large portion of the basin is situated within favorable soils for infiltration, flow control BMPs and LID facilities. Due to the proximity of the facility to Miller Creek, the Stormwater wetland may incorporate open space and passive recreation elements including a shared-use recreation trail. The combined stormwater wetland and detention facility is made up of two Stormwater wetlands that run linearly along the creek and in some instances separated by roadways and developable land. Facilities in both alternatives would release runoff directly to Miller Creek. See Figure 5 and Figure 6.

Total combined stormwater pond estimate = $ 2,760,000
Total subsurface vault estimate = $ 9,200,000

Basin 4

The combined detention and stormwater wetland facility surface area required for Basin 4 is approximately 1.2 Acres. While the detention vault will acquire a 0.6 acre foot print. The available area is approximately 1.6 acres and can accommodate either facility.

A small portion of the basin is situated within favorable soils for infiltration, flow control BMPs and LID facilities. However infiltration investigation is recommended. The basin in not in the immediate vicinity to Miller Creek and runoff will be conveyed by an existing system to Lora lake east of Des Moines Memorial Drive South. See Figure 5 and Figure 6.

Total combined stormwater wetland estimate = $ 730,000
Total subsurface vault estimate = $ 2,150,000

SECTION 6

Next Steps and Conclusion

Moving Forward with the Project

Now that the concept of the Miller Creek Greenway and sub-regional stormwater facilities has been conceptually defined and analyzed, moving forward with the project would involve the following next steps.

1. FUNDING: Pursuing funding for ongoing design and implementation--there are a number of potential funding sources that could be explored to support development of the Miller Creek Greenway as a capital project. The City of Burien will be exploring opportunities to create a stormwater facilities systems charge program that NERA developers could pay into (fee in lieu of) to help support development of the project. This approach would need to be evaluated in balance with the importance of the project as an economic incentive for redevelopment. Based on similar programs in other municipalities, it is likely that paying a systems development charge would be far less costly than being required to develop the stormwater facilities on-site with each individual redevelopment project.

2. PRELIMINARY DESIGN AND MODELING: Preliminary design for the Greenway and stormwater facilities also would need to occur as a next step contingent upon available funding. Preliminary design would take the concepts and analysis explored in this report to 30 percent level of design, further defining potential phasing and implementation considerations for the project. More in-depth hydrologic modeling would occur as part of this step in concert with the increased level of design detail for the project.

3. ENVIRONMENTAL PERMITTING: Environmental permitting for the project would be required and could occur following or concurrent with design.

4. FINAL DESIGN: Final design and development of construction drawings and documents would follow preliminary design. Final design may be focused on a first phase of implementation, based on the analysis completed during preliminary design.

5. CONSTRUCTION: Construction would be the next step and could be focused on a first phase of implementation.

Conclusion

Development of the Miller Creek Greenway project would bring significant benefits to the NERA and Burien. A capital project involving construction of sub-regional stormwater facilities would benefit developers in the NERA by maximizing land capacity for redevelopment on individual sites and reducing overall costs of site development. Environmental rehabilitation of the creek corridor and wetland enhancements will improve water quality functions and general environmental health of the Miller Creek Basin. The creation of a Greenway system as a linear open space with a share-use trail and other recreational features and amenities will benefit future NERA employees, as well as nearby residents of the surrounding neighborhoods. The Miller Creek Greenway would become a lasting legacy for the community, expanding the Burien Loop Trail system and maximizing public usability of otherwise undevelopable areas in the NERA. This report has described a vision for the Miller Creek Greenway and provided a foundation to initiate the project. The City of Burien now has the opportunity to work closely with NERA property owners and other partners to move the Miller Creek Greenway project forward from vision to reality.

Miller Creek Greenway Concept Report

APPENDIX

DRAFT

DECEMBER 18, 2009

Prepared for:
City of Burien
400 SW 152nd Street
Suite 300
Burien, WA 98166

Prepared by: Otak, Inc.
10230 NE Points Drive, Suite 400
Kirkland, WA 98033

Miller Creek Greenway Concept Report

APPENDIX

A

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 10:40 AM**

Input File Name: pond1.fld
Project Name: Burien NERA
Analysis Title: Combined Stormwater Wetland and Detention Pond 1
Comments: 95% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

----------Developed----------			Predeveloped	To Node	Bypass Node
Till Forest	45.592	0.000	0.000		
Till Pasture	0.000	0.000	0.000		
Till Grass	0.000	0.019	0.000		
Outwash Forest	0.000	0.000	0.000		
Outwash Pasture	0.000	0.000	0.000		
Outwash Grass	0.000	5.016	0.000		
Wetland	0.000	2.108	0.000		
Impervious	0.000	38.449	0.000		
Subbasin Total	**45.592**	**45.592**	**0.000**		

----------Lateral Flow

Connnections----------	----------Predeveloped----------			
----------Developed----------	Surface	Interflow	Grnd Water	Surface
Interflow Grnd Water				
Till Forest Node	Node	Node	Node	
Till Pasture Node	Node	Node	Node	
Till Grass Node	Node	Node	Node	
Outwash Forest Node	Node	Node	Node	
Outwash Pasture Node	Node	Node	Node	
Outwash Grass Node	Node	Node	Node	
Wetland Node	Node	Node	Node	

Impervious Node Node
Lateral 1
Lateral 2

***** Subbasin Connection Summary *****

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

***** Postdeveloped Node Connection Summary *****

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

***** Predeveloped Structure Summary *****

***** Postdeveloped Structure Summary *****

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used

Pond Floor Elevation	: 100.00	ft	
Riser Crest Elevation	: 106.00	ft	
Max Pond Elevation	: 107.00	ft	
Max Storage Depth	: 6.00	ft	
Pond Bottom Length	: 465.9	ft	
Pond Bottom Width	: 232.9	ft	
Pond Side Slopes	: L1= 3.00	L2= 3.00	W1= 3.00 W2= 3.00 ft/ft
Pond Bottom Area	: 108523.	sq-ft	
Area at Riser Crest El	: 134,977.	sq-ft	
	: 3.099	acres	
Volume at Riser Crest	: 729,059.	cu-ft	
	: 16.737	ac-ft	
Area at Max Elevation	: 139638.	sq-ft	
	: 3.206	acres	
Vol at Max Elevation	: 866,279.	cu-ft	
	: 19.887	ac-ft	
Hydraulic Conductivity	: 0.00	in/hr	
Depth to Water Table	: 100.00	ft	

Riser Geometry

Riser Structure Type	: Circular
Riser Diameter	: 36.00 in
Common Length	: 0.180 ft
Riser Crest Elevation	: 106.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---

Device Type	: Circular Orifice	
Invert Elevation	: 100.00	ft
Diameter	: 3.09	in

Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Invert Elevation : 103.34 ft
Length : 2.16 in
Height : 31.95 in
Orientation : Vertical
Elbow : No

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.025	0.062	0.040	0.000
100.050	0.125	0.057	0.000
100.100	0.250	0.080	0.000
100.200	0.500	0.114	0.000
100.300	0.752	0.139	0.000
100.400	1.004	0.161	0.000
100.500	1.258	0.180	0.000
100.600	1.512	0.197	0.000
100.700	1.768	0.213	0.000
100.800	2.024	0.228	0.000
100.900	2.281	0.241	0.000
101.000	2.540	0.254	0.000
101.100	2.799	0.267	0.000
101.200	3.059	0.279	0.000
101.300	3.321	0.290	0.000
101.400	3.583	0.301	0.000
101.500	3.846	0.312	0.000
101.600	4.110	0.322	0.000
101.700	4.376	0.332	0.000
101.800	4.642	0.341	0.000
101.900	4.909	0.351	0.000
102.000	5.177	0.360	0.000
102.100	5.447	0.369	0.000
102.200	5.717	0.377	0.000
102.300	5.988	0.386	0.000
102.400	6.260	0.394	0.000
102.500	6.533	0.402	0.000
102.600	6.808	0.410	0.000
102.700	7.083	0.418	0.000
102.800	7.359	0.426	0.000
102.900	7.636	0.433	0.000
103.000	7.915	0.441	0.000
103.100	8.194	0.448	0.000
103.200	8.474	0.455	0.000
103.234	8.570	0.458	0.000
103.269	8.667	0.460	0.000
103.303	8.764	0.463	0.000
103.337	8.860	0.465	0.000
103.362	8.931	0.469	0.000
103.387	9.002	0.475	0.000
103.412	9.072	0.481	0.000
103.437	9.143	0.489	0.000
103.537	9.427	0.522	0.000
103.637	9.711	0.564	0.000

103.737	9.997	0.613	0.000
103.837	10.284	0.668	0.000
103.937	10.572	0.728	0.000
104.037	10.861	0.792	0.000
104.137	11.150	0.861	0.000
104.237	11.441	0.933	0.000
104.337	11.733	1.010	0.000
104.437	12.026	1.090	0.000
104.537	12.320	1.173	0.000
104.637	12.615	1.259	0.000
104.737	12.911	1.349	0.000
104.837	13.208	1.441	0.000
104.937	13.507	1.536	0.000
105.037	13.806	1.635	0.000
105.137	14.106	1.735	0.000
105.237	14.407	1.839	0.000
105.337	14.710	1.945	0.000
105.437	15.013	2.053	0.000
105.537	15.317	2.164	0.000
105.637	15.623	2.278	0.000
105.737	15.929	2.393	0.000
105.837	16.237	2.511	0.000
105.878	16.363	2.560	0.000
105.919	16.488	2.609	0.000
105.959	16.614	2.658	0.000
106.000	16.740	2.708	0.000
106.025	16.818	2.862	0.000
106.050	16.895	3.119	0.000
106.075	16.973	3.442	0.000
106.100	17.051	3.819	0.000
106.125	17.128	4.242	0.000
106.150	17.206	4.706	0.000
106.175	17.284	5.208	0.000
106.200	17.362	5.744	0.000
106.300	17.675	8.186	0.000
106.400	17.988	11.009	0.000
106.500	18.303	14.104	0.000
106.600	18.619	17.361	0.000
106.700	18.935	20.667	0.000
106.800	19.253	23.910	0.000
106.900	19.572	26.979	0.000
107.000	19.892	29.778	0.000
107.100	20.213	32.205	0.000
107.200	20.536	34.199	0.000
107.300	20.859	35.803	0.000
107.400	21.183	37.072	0.000
107.500	21.508	38.138	0.000
107.600	21.835	39.689	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	103.621
01/18/1941	102.101
12/20/1941	102.792
11/23/1942	103.995
10/17/1943	101.908
02/07/1945	103.621
02/05/1946	102.432
12/05/1946	103.140
10/19/1947	103.831
02/22/1949	103.100
01/22/1950	103.735
02/09/1951	104.439
10/03/1951	102.545
01/12/1953	103.967
01/22/1954	102.776
11/19/1954	102.764
01/06/1956	104.453
02/26/1957	103.171
01/17/1958	103.111
01/13/1959	103.926
11/21/1959	103.666
11/24/1960	104.121
12/24/1961	102.418
11/30/1962	102.451
11/14/1963	102.578
12/01/1964	103.198
01/07/1966	103.270
12/13/1966	103.921
10/27/1967	102.945
12/11/1968	103.271
01/27/1970	103.787
12/07/1970	103.563
03/05/1972	105.277
12/26/1972	104.309
03/02/1974	103.302
12/27/1974	102.938
02/27/1976	103.497
08/26/1977	102.367
12/15/1977	104.042
03/05/1979	102.332
12/18/1979	105.254
12/30/1980	103.277
10/06/1981	105.008
03/09/1983	103.530
03/21/1984	102.566
11/11/1984	102.667
01/19/1986	103.829
11/24/1986	105.012
04/06/1988	103.299
04/05/1989	103.463
01/09/1990	105.136
11/24/1990	105.497
01/31/1992	103.856
04/11/1993	102.256
03/03/1994	102.556
12/27/1994	104.069
02/09/1996	105.623
01/02/1997	105.270
10/08/1997	102.606
11/26/1998	105.336
02/28/2000	103.404
05/05/2001	102.473
11/15/2001	102.324
11/26/2002	105.011
10/24/2003	103.282
02/08/2005	102.418
11/28/2005	103.864
11/27/2006	103.308
01/07/2008	103.703
02/18/2009	105.103
01/10/2010	103.795
11/17/2010	104.600
10/02/2011	103.548
01/20/2013	105.568
01/28/2014	103.389
03/30/2015	102.502
01/04/2016	104.948
11/01/2016	103.082
01/31/2018	103.180
01/12/2019	103.744
04/21/2020	102.622
11/24/2020	104.488
12/21/2021	103.068
03/30/2023	103.338

01/25/2024	103.773
12/22/2024	104.916
01/03/2026	104.354
01/29/2027	102.801
02/23/2028	103.253
12/11/2028	103.258
01/26/2030	104.555
03/04/2031	103.254
01/21/2032	104.047
12/23/2032	103.121
11/16/2033	105.238
02/19/2035	103.366
02/27/2036	103.562
08/25/2037	101.576
12/15/2037	103.888
12/04/2038	102.178
01/14/2040	103.350
12/25/2040	103.802
04/15/2042	103.771
02/26/2043	103.476
03/21/2044	103.006
03/27/2045	103.341
02/17/2046	103.092
02/02/2047	102.810
12/10/2047	104.220
03/17/2049	102.862
12/04/2049	102.689
04/09/2051	102.519
04/17/2052	102.073
12/10/2052	102.684
12/11/2053	102.895
11/01/2054	105.001
02/07/2056	105.639
11/19/2056	105.107
05/21/2058	103.067
11/26/2058	104.448
01/23/2060	102.436
10/27/2060	103.686
01/03/2062	103.101
12/30/2062	103.308
12/23/2063	104.540
12/01/2064	102.920
01/13/2066	102.039
12/15/2066	104.347
01/19/2068	104.295
09/23/2069	102.292
12/14/2069	102.194
12/19/2070	102.159
11/03/2071	102.884
12/25/2072	106.141
12/15/2073	103.868
11/20/2074	102.433
10/30/2075	104.444
08/26/2077	101.786
12/02/2077	102.926
02/25/2079	102.258
12/17/2079	105.495
11/21/2080	104.652
02/19/2082	104.233
02/20/2083	104.189
11/26/2083	104.823
12/14/2084	103.781
11/01/2085	103.236
11/23/2086	103.723
12/09/2087	103.041
11/05/2088	103.857
11/10/2089	103.580
12/09/2090	104.881
01/31/2092	104.594
11/07/2092	102.277
12/14/2093	102.565
12/27/2094	103.503
12/14/2095	103.823
10/28/2096	104.190

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	101.576
1.01	101.786
1.02	101.908
1.02	102.039
1.03	102.073
1.04	102.101
1.04	102.159
1.05	102.178
1.06	102.194
1.06	102.256
1.07	102.258
1.08	102.277
1.09	102.292
1.09	102.324
1.10	102.332
1.11	102.367
1.12	102.418
1.12	102.418
1.13	102.432
1.14	102.433
1.15	102.436
1.16	102.451
1.17	102.473
1.18	102.502
1.18	102.519
1.19	102.545
1.20	102.556
1.21	102.565
1.22	102.566
1.23	102.578
1.24	102.606
1.25	102.622
1.26	102.667
1.27	102.684
1.28	102.689
1.29	102.764
1.30	102.776
1.31	102.792
1.32	102.801
1.33	102.810
1.35	102.862
1.36	102.884
1.37	102.895
1.38	102.920
1.39	102.926
1.40	102.938
1.42	102.945
1.43	103.006
1.44	103.041
1.46	103.067
1.47	103.068
1.48	103.082
1.50	103.092
1.51	103.100
1.53	103.101
1.54	103.111
1.56	103.121
1.57	103.140
1.59	103.171
1.60	103.180
1.62	103.198
1.64	103.236
1.65	103.253
1.67	103.254
1.69	103.258
1.71	103.270
1.73	103.271
1.75	103.277
1.77	103.282
1.79	103.299
1.81	103.302
1.83	103.308
1.85	103.308
1.87	103.338
1.89	103.341
1.92	103.350
1.94	103.366
1.96	103.389
1.99	103.404
2.01	103.463
2.04	103.476
2.07	103.497
2.09	103.503
2.12	103.530
2.15	103.548
2.18	103.562
2.21	103.563
2.24	103.580
2.27	103.621

2.31	103.621
2.34	103.666
2.38	103.686
2.41	103.703
2.45	103.723
2.49	103.735
2.53	103.744
2.57	103.771
2.61	103.773
2.65	103.781
2.70	103.787
2.75	103.795
2.80	103.802
2.85	103.823
2.90	103.829
2.95	103.831
3.01	103.856
3.07	103.857
3.13	103.864
3.19	103.868
3.26	103.888
3.32	103.921
3.40	103.926
3.47	103.967
3.55	103.995
3.63	104.042
3.72	104.047
3.80	104.069
3.90	104.121
4.00	104.189
4.10	104.190
4.21	104.220
4.32	104.233
4.45	104.295
4.58	104.309
4.71	104.347
4.86	104.354
5.01	104.439
5.17	104.444
5.35	104.448
5.54	104.453
5.74	104.488
5.95	104.540
6.19	104.555
6.44	104.594
6.71	104.600
7.01	104.652
7.33	104.823
7.69	104.881
8.08	104.916
8.52	104.948
9.00	105.001
9.55	105.008
10.16	105.011
10.86	105.012
11.66	105.103
12.59	105.107
13.68	105.136
14.97	105.238
16.54	105.254
18.47	105.270
20.92	105.277
24.10	105.336
28.44	105.495
34.68	105.497
44.42	105.568
61.77	105.623
101.36	105.639
282.36	106.141

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	**Link: 1**
1.05-Year	102.179
1.11-Year	102.382
1.25-Year	102.624
2.00-Year	103.434
3.33-Year	103.923
5-Year	104.435
10-Year	105.011
25-Year	105.275
50-Year	105.600
100-Year	105.639

Postdeveloped Infiltrated Water Statistics

Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	16943.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1

2-Year Discharge Rate : 10.027 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 36425. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 54637. cu-ft
2-Year Discharge Rate : 0.488 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		Postdevelopment Runoff	
Date	Annual Max Q (cfs)	Date	Annual Max Q (cfs)
04/30/1940	1.233	12/07/1939	0.557
01/31/1941	0.473	01/18/1941	0.369
12/15/1941	1.239	12/20/1941	0.425
02/10/1943	0.493	11/23/1942	0.765
01/23/1944	0.370	10/17/1943	0.351
02/07/1945	1.536	02/07/1945	0.557
02/05/1946	0.942	02/05/1946	0.397
02/02/1947	0.961	12/05/1946	0.451
03/21/1948	1.660	10/19/1947	0.665
02/22/1949	0.834	02/22/1949	0.448
03/03/1950	3.432	01/22/1950	0.612
02/09/1951	1.374	02/09/1951	1.091
01/24/1952	0.361	10/03/1951	0.406
01/11/1953	0.513	01/12/1953	0.747
01/22/1954	0.833	01/22/1954	0.424
04/12/1955	0.389	11/19/1954	0.423
03/04/1956	0.893	01/06/1956	1.103
02/25/1957	0.740	02/26/1957	0.453
01/16/1958	0.898	01/17/1958	0.449
01/12/1959	0.965	01/13/1959	0.721
12/15/1959	1.032	11/21/1959	0.578
02/14/1961	0.883	11/24/1960	0.850
03/04/1962	0.473	12/24/1961	0.396
02/03/1963	0.525	11/30/1962	0.398
01/01/1964	0.839	11/14/1963	0.409
02/26/1965	1.040	12/01/1964	0.455
01/06/1966	0.641	01/07/1966	0.460
01/19/1967	1.623	12/13/1966	0.718
02/03/1968	0.840	10/27/1967	0.437
12/03/1968	0.901	12/11/1968	0.460
01/13/1970	0.698	01/27/1970	0.641
12/06/1970	0.794	12/07/1970	0.532
02/28/1972	2.141	03/05/1972	1.881
01/13/1973	0.773	12/26/1972	0.988
02/18/1974	1.155	03/02/1974	0.462
12/26/1974	1.398	12/27/1974	0.436
01/27/1976	0.968	02/27/1976	0.508
05/31/1977	0.136	08/26/1977	0.392
12/10/1977	0.820	12/15/1977	0.796
03/04/1979	0.806	03/05/1979	0.389
12/17/1979	1.298	12/18/1979	1.857
12/26/1980	0.515	12/30/1980	0.461
10/06/1981	1.646	10/06/1981	1.606

01/05/1983	0.924	03/09/1983	0.519
03/14/1984	0.882	03/21/1984	0.408
02/11/1985	0.589	11/11/1984	0.416
01/18/1986	1.941	01/19/1986	0.664
11/24/1986	1.711	11/24/1986	1.610
04/06/1988	0.855	04/06/1988	0.462
04/05/1989	0.943	04/05/1989	0.497
01/09/1990	3.111	01/09/1990	1.734
11/24/1990	2.651	11/24/1990	2.120
01/27/1992	0.810	01/31/1992	0.679
06/09/1993	0.683	04/11/1993	0.382
03/03/1994	0.520	03/03/1994	0.407
02/19/1995	1.089	12/27/1994	0.814
02/09/1996	2.523	02/09/1996	2.262
01/02/1997	1.578	01/02/1997	1.874
02/28/1998	0.580	10/08/1997	0.411
11/25/1998	1.552	11/26/1998	1.944
03/26/2000	0.869	02/28/2000	0.479
05/05/2001	0.666	05/05/2001	0.400
05/03/2002	2.377	11/15/2001	0.388
03/31/2003	1.820	11/26/2002	1.608
01/23/2004	0.444	10/24/2003	0.461
02/07/2005	0.766	02/08/2005	0.396
02/27/2006	0.984	11/28/2005	0.684
12/14/2006	0.728	11/27/2006	0.463
03/21/2008	1.210	01/07/2008	0.596
02/17/2009	1.877	02/18/2009	1.701
01/10/2010	1.261	01/10/2010	0.645
11/17/2010	1.637	11/17/2010	1.227
01/31/2012	1.042	10/02/2011	0.526
01/20/2013	2.379	01/20/2013	2.199
12/06/2013	1.001	01/28/2014	0.475
03/30/2015	0.607	03/30/2015	0.402
01/04/2016	1.730	01/04/2016	1.547
03/07/2017	0.501	11/01/2016	0.447
01/31/2018	0.933	01/31/2018	0.454
03/30/2019	0.924	01/12/2019	0.617
04/14/2020	0.607	04/21/2020	0.412
02/10/2021	1.498	11/24/2020	1.132
03/26/2022	0.442	12/21/2021	0.446
03/30/2023	1.068	03/30/2023	0.465
01/19/2024	0.839	01/25/2024	0.633
12/22/2024	1.752	12/22/2024	1.516
03/09/2026	1.113	01/03/2026	1.023
01/27/2027	0.970	01/29/2027	0.426
02/19/2028	1.202	02/23/2028	0.459
12/04/2028	0.931	12/11/2028	0.459
02/16/2030	1.243	01/26/2030	1.188
12/30/2030	1.163	03/04/2031	0.459
01/20/2032	1.867	01/21/2032	0.799
03/01/2033	0.526	12/23/2032	0.450
01/15/2034	2.110	11/16/2033	1.840
02/19/2035	1.031	02/19/2035	0.470
03/24/2036	0.973	02/27/2036	0.532
03/09/2037	0.040	08/25/2037	0.319
12/15/2037	0.711	12/15/2037	0.699
02/07/2039	0.514	12/04/2038	0.376
01/14/2040	1.929	01/14/2040	0.467
12/25/2040	1.093	12/25/2040	0.649
02/20/2042	1.147	04/15/2042	0.632
03/31/2043	1.718	02/26/2043	0.502
05/01/2044	0.678	03/21/2044	0.441
02/11/2045	0.784	03/27/2045	0.466
02/16/2046	0.987	02/17/2046	0.447
02/01/2047	0.620	02/02/2047	0.427
04/21/2048	0.551	12/10/2047	0.921
03/16/2049	0.619	03/17/2049	0.431
12/04/2049	1.045	12/04/2049	0.417
04/06/2051	0.812	04/09/2051	0.404
04/17/2052	0.488	04/17/2052	0.366
06/04/2053	1.872	12/10/2052	0.417
04/08/2054	0.348	12/11/2053	0.433
02/17/2055	1.592	11/01/2054	1.599
02/07/2056	2.896	02/07/2056	2.280
11/19/2056	3.169	11/19/2056	1.705
01/24/2058	1.099	05/21/2058	0.446
12/28/2058	1.263	11/26/2058	1.098
01/19/2060	0.473	01/23/2060	0.397
01/10/2061	1.026	10/27/2060	0.588
02/03/2062	3.904	01/03/2062	0.448
12/29/2062	0.826	12/30/2062	0.463
12/23/2063	1.490	12/23/2063	1.175
11/30/2064	0.712	12/01/2064	0.435
01/13/2066	0.391	01/13/2066	0.363
01/19/2067	0.994	12/15/2066	1.018
01/18/2068	2.045	01/19/2068	0.978
01/04/2069	0.550	09/23/2069	0.385
04/09/2070	0.464	12/14/2069	0.377
02/14/2071	0.509	12/19/2070	0.374
02/27/2072	0.545	11/03/2071	0.432
12/25/2072	2.280	12/25/2072	4.533
03/16/2074	1.226	12/15/2073	0.687
01/23/2075	0.265	11/20/2074	0.397
03/24/2076	1.361	10/30/2075	1.095
03/02/2077	0.153	08/26/2077	0.340

12/02/2077	0.513	12/02/2077	0.435
02/25/2079	0.687	02/25/2079	0.382
12/17/2079	2.545	12/17/2079	2.117
11/21/2080	1.123	11/21/2080	1.272
02/13/2082	1.402	02/19/2082	0.931
02/19/2083	0.860	02/20/2083	0.899
11/26/2083	1.042	11/26/2083	1.428
12/14/2084	0.721	12/14/2084	0.637
01/18/2086	1.016	11/01/2085	0.458
12/21/2086	0.953	11/23/2086	0.606
01/14/2088	0.627	12/09/2087	0.444
11/05/2088	1.115	11/05/2088	0.680
01/07/2090	0.524	11/10/2089	0.540
12/04/2090	0.968	12/09/2090	1.483
04/28/2092	1.661	01/31/2092	1.222
03/22/2093	0.467	11/07/2092	0.384
03/01/2094	0.391	12/14/2093	0.408
02/18/2095	0.618	12/27/2094	0.510
01/14/2096	0.779	12/14/2095	0.660
01/29/2097	1.712	10/28/2096	0.899

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.040	1.00	0.319
1.01	0.136	1.01	0.340
1.02	0.153	1.02	0.351
1.02	0.265	1.02	0.363
1.03	0.348	1.03	0.366
1.04	0.361	1.04	0.369
1.04	0.370	1.04	0.374
1.05	0.389	1.05	0.376
1.06	0.391	1.06	0.377
1.06	0.391	1.06	0.382
1.07	0.442	1.07	0.382
1.08	0.444	1.08	0.384
1.09	0.464	1.09	0.385
1.09	0.467	1.09	0.388
1.10	0.473	1.10	0.389
1.11	0.473	1.11	0.392
1.12	0.473	1.12	0.396
1.12	0.488	1.12	0.396
1.13	0.493	1.13	0.397
1.14	0.501	1.14	0.397
1.15	0.509	1.15	0.397
1.16	0.513	1.16	0.398
1.17	0.513	1.17	0.400
1.18	0.514	1.18	0.402
1.18	0.515	1.18	0.404
1.19	0.520	1.19	0.406
1.20	0.524	1.20	0.407
1.21	0.525	1.21	0.408
1.22	0.526	1.22	0.408
1.23	0.545	1.23	0.409
1.24	0.550	1.24	0.411
1.25	0.551	1.25	0.412
1.26	0.580	1.26	0.416
1.27	0.589	1.27	0.417
1.28	0.607	1.28	0.417
1.29	0.607	1.29	0.423
1.30	0.618	1.30	0.424
1.31	0.619	1.31	0.425
1.32	0.620	1.32	0.426
1.33	0.627	1.33	0.427
1.35	0.641	1.35	0.431
1.36	0.666	1.36	0.432
1.37	0.678	1.37	0.433
1.38	0.683	1.38	0.435
1.39	0.687	1.39	0.435
1.40	0.698	1.40	0.436
1.42	0.711	1.42	0.437
1.43	0.712	1.43	0.441
1.44	0.721	1.44	0.444
1.46	0.728	1.46	0.446
1.47	0.740	1.47	0.446
1.48	0.766	1.48	0.447
1.50	0.773	1.50	0.447
1.51	0.779	1.51	0.448
1.53	0.784	1.53	0.448
1.54	0.794	1.54	0.449
1.56	0.806	1.56	0.450
1.57	0.810	1.57	0.451
1.59	0.812	1.59	0.453
1.60	0.820	1.60	0.454
1.62	0.826	1.62	0.455
1.64	0.833	1.64	0.458
1.65	0.834	1.65	0.459
1.67	0.839	1.67	0.459

1.69	0.839	1.69	0.459
1.71	0.840	1.71	0.460
1.73	0.855	1.73	0.460
1.75	0.860	1.75	0.461
1.77	0.869	1.77	0.461
1.79	0.882	1.79	0.462
1.81	0.883	1.81	0.462
1.83	0.893	1.83	0.463
1.85	0.898	1.85	0.463
1.87	0.901	1.87	0.465
1.89	0.924	1.89	0.466
1.92	0.924	1.92	0.467
1.94	0.931	1.94	0.470
1.96	0.933	1.96	0.475
1.99	0.942	1.99	0.479
2.01	0.943	2.01	0.497
2.04	0.953	2.04	0.502
2.07	0.961	2.07	0.508
2.09	0.965	2.09	0.510
2.12	0.968	2.12	0.519
2.15	0.968	2.15	0.526
2.18	0.970	2.18	0.532
2.21	0.973	2.21	0.532
2.24	0.984	2.24	0.540
2.27	0.987	2.27	0.557
2.31	0.994	2.31	0.557
2.34	1.001	2.34	0.578
2.38	1.016	2.38	0.588
2.41	1.026	2.41	0.596
2.45	1.031	2.45	0.606
2.49	1.032	2.49	0.612
2.53	1.040	2.53	0.617
2.57	1.042	2.57	0.632
2.61	1.042	2.61	0.633
2.65	1.045	2.65	0.637
2.70	1.068	2.70	0.641
2.75	1.089	2.75	0.645
2.80	1.093	2.80	0.649
2.85	1.099	2.85	0.660
2.90	1.113	2.90	0.664
2.95	1.115	2.95	0.665
3.01	1.123	3.01	0.679
3.07	1.147	3.07	0.680
3.13	1.155	3.13	0.684
3.19	1.163	3.19	0.687
3.26	1.202	3.26	0.699
3.32	1.210	3.32	0.718
3.40	1.226	3.40	0.721
3.47	1.233	3.47	0.747
3.55	1.239	3.55	0.765
3.63	1.243	3.63	0.796
3.72	1.261	3.72	0.799
3.80	1.263	3.80	0.814
3.90	1.298	3.90	0.850
4.00	1.361	4.00	0.899
4.10	1.374	4.10	0.899
4.21	1.398	4.21	0.921
4.32	1.402	4.32	0.931
4.45	1.490	4.45	0.978
4.58	1.498	4.58	0.988
4.71	1.536	4.71	1.018
4.86	1.552	4.86	1.023
5.01	1.578	5.01	1.091
5.17	1.592	5.17	1.095
5.35	1.623	5.35	1.098
5.54	1.637	5.54	1.103
5.74	1.646	5.74	1.132
5.95	1.660	5.95	1.175
6.19	1.661	6.19	1.188
6.44	1.711	6.44	1.222
6.71	1.712	6.71	1.227
7.01	1.718	7.01	1.272
7.33	1.730	7.33	1.428
7.69	1.752	7.69	1.483
8.08	1.820	8.08	1.516
8.52	1.867	8.52	1.547
9.00	1.872	9.00	1.599
9.55	1.877	9.55	1.606
10.16	1.929	10.16	1.608
10.86	1.941	10.86	1.610
11.66	2.045	11.66	1.701
12.59	2.110	12.59	1.705
13.68	2.141	13.68	1.734
14.97	2.280	14.97	1.840
16.54	2.377	16.54	1.857
18.47	2.379	18.47	1.874
20.92	2.523	20.92	1.881
24.10	2.545	24.10	1.944
28.44	2.651	28.44	2.117
34.68	2.896	34.68	2.120
44.42	3.111	44.42	2.199
61.77	3.169	61.77	2.262
101.36	3.432	101.36	2.280
282.36	3.904	282.36	4.533

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	**Discharge (cfs)**	**Tr (Years)**	**Discharge (cfs)**
2-Year	0.943	2-Year	0.488
5-Year	1.576	5-Year	1.087
10-Year	1.915	10-Year	1.608
25-Year	2.568	25-Year	1.982
50-Year	3.132	50-Year	2.222
100-Year	3.425	100-Year	2.280
200-Year	3.746	200-Year	3.775

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	**Exceedance Probability**	**Discharge (cfs)**	**Exceedance Probability**
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
0.020	2.3680E-01	0.023	6.9306E-01
0.039	1.8183E-01	0.045	6.6497E-01
0.059	1.4869E-01	0.068	6.2358E-01
0.078	1.2486E-01	0.091	5.7953E-01
0.098	1.0625E-01	0.113	5.3614E-01
0.117	9.1206E-02	0.136	4.8838E-01
0.137	7.8997E-02	0.159	4.4063E-01
0.156	6.8893E-02	0.181	3.9204E-01
0.176	6.0447E-02	0.204	3.4317E-01
0.195	5.3261E-02	0.227	2.9479E-01
0.215	4.7175E-02	0.249	2.4634E-01
0.234	4.1832E-02	0.272	2.0108E-01
0.254	3.7205E-02	0.295	1.5944E-01
0.273	3.3133E-02	0.317	1.2365E-01
0.293	2.9638E-02	0.340	9.2267E-02
0.312	2.6430E-02	0.363	6.7646E-02
0.332	2.3649E-02	0.385	4.7856E-02
0.351	2.1262E-02	0.408	3.2208E-02
0.371	1.9150E-02	0.431	2.0919E-02
0.390	1.7267E-02	0.453	1.2621E-02
0.410	1.5521E-02	0.471	8.9706E-03
0.429	1.4036E-02	0.499	7.3175E-03
0.449	1.2639E-02	0.521	6.4041E-03
0.471	1.1278E-02	0.544	5.7486E-03
0.488	1.0348E-02	0.567	5.1565E-03
0.508	9.4640E-03	0.589	4.7009E-03
0.527	8.5860E-03	0.612	4.2844E-03
0.547	7.8178E-03	0.635	3.9039E-03
0.566	7.1543E-03	0.657	3.5486E-03
0.586	6.5998E-03	0.680	3.2627E-03
0.605	6.0489E-03	0.703	3.0071E-03
0.625	5.5507E-03	0.725	2.7515E-03
0.644	5.1067E-03	0.748	2.5479E-03
0.664	4.7255E-03	0.771	2.3674E-03
0.683	4.3558E-03	0.793	2.1833E-03
0.703	4.0223E-03	0.816	2.0180E-03
0.722	3.7104E-03	0.839	1.8873E-03
0.742	3.4331E-03	0.861	1.7472E-03
0.761	3.1833E-03	0.884	1.6274E-03
0.781	2.9472E-03	0.907	1.5155E-03
0.800	2.7284E-03	0.929	1.3927E-03
0.820	2.5234E-03	0.943	1.3427E-03
0.839	2.3581E-03	0.975	1.2332E-03
0.859	2.1942E-03	0.997	1.1668E-03
0.879	2.0324E-03	1.020	1.0982E-03
0.898	1.9003E-03	1.043	1.0361E-03
0.918	1.7624E-03	1.065	9.7326E-04
0.943	1.6051E-03	1.088	9.1694E-04
0.957	1.5285E-03	1.111	8.6135E-04
0.976	1.4180E-03	1.133	8.1730E-04
0.996	1.3350E-03	1.156	7.6965E-04
1.015	1.2722E-03	1.179	7.2489E-04
1.035	1.2043E-03	1.201	6.8012E-04

1.054	1.1350E-03	1.224	6.3825E-04
1.074	1.0729E-03	1.247	6.0070E-04
1.093	1.0130E-03	1.269	5.7471E-04
1.113	9.6532E-04	1.292	5.3933E-04
1.132	9.1478E-04	1.315	5.1190E-04
1.152	8.6712E-04	1.337	4.8230E-04
1.171	8.1225E-04	1.360	4.5991E-04
1.191	7.6388E-04	1.383	4.4114E-04
1.210	7.2489E-04	1.405	4.2020E-04
1.230	6.8807E-04	1.428	3.9349E-04
1.249	6.5124E-04	1.451	3.7472E-04
1.269	6.2092E-04	1.473	3.5306E-04
1.288	5.8915E-04	1.496	3.3284E-04
1.308	5.6749E-04	1.519	3.1046E-04
1.328	5.4511E-04	1.541	2.8952E-04
1.347	5.2562E-04	1.564	2.7147E-04
1.367	5.0251E-04	1.576	2.6368E-04
1.386	4.7796E-04	1.609	2.3248E-04
1.406	4.5197E-04	1.632	2.1299E-04
1.425	4.3609E-04	1.655	1.9783E-04
1.445	4.1154E-04	1.677	1.8194E-04
1.464	3.9349E-04	1.700	1.6317E-04
1.484	3.6894E-04	1.723	1.5306E-04
1.503	3.5450E-04	1.745	1.4007E-04
1.523	3.3573E-04	1.768	1.3068E-04
1.542	3.1985E-04	1.791	1.1841E-04
1.562	3.0252E-04	1.813	1.0830E-04
1.576	2.9160E-04	1.836	9.8192E-05
1.601	2.7653E-04	1.859	8.3752E-05
1.620	2.6281E-04	1.881	7.7976E-05
1.640	2.5198E-04	1.904	6.9312E-05
1.659	2.3609E-04	1.927	6.7868E-05
1.679	2.2599E-04	1.949	5.9204E-05
1.698	2.1371E-04	1.972	5.4872E-05
1.718	2.0360E-04	1.995	5.0540E-05
1.737	1.9638E-04	2.017	4.6208E-05
1.757	1.8339E-04	2.040	4.2598E-05
1.777	1.7689E-04	2.063	3.7544E-05
1.796	1.6245E-04	2.085	3.4656E-05
1.816	1.5306E-04	2.108	2.7436E-05
1.835	1.4440E-04	2.131	2.2382E-05
1.855	1.3140E-04	2.153	2.1660E-05
1.874	1.2563E-04	2.176	1.8050E-05
1.894	1.1552E-04	2.199	1.7328E-05
1.913	1.0830E-04	2.221	1.4440E-05
1.933	1.0108E-04	2.244	1.3718E-05
1.952	9.3860E-05	2.267	1.1552E-05
1.972	8.9528E-05	2.289	1.0108E-05
1.991	8.1586E-05	2.312	9.3860E-06
2.011	7.4366E-05	2.335	8.6640E-06
2.030	7.1478E-05	2.357	8.6640E-06
2.050	6.5702E-05	2.380	7.9420E-06
2.069	6.2814E-05	2.403	7.9420E-06
2.089	5.9926E-05	2.425	7.9420E-06
2.108	5.7760E-05	2.448	7.2200E-06
2.128	5.0540E-05	2.471	7.2200E-06
2.147	4.7652E-05	2.493	7.2200E-06
2.167	4.2598E-05	2.516	7.2200E-06
2.187	3.8266E-05	2.539	6.4980E-06
2.206	3.4656E-05	2.561	5.7760E-06
2.226	3.2490E-05	2.584	5.7760E-06
2.245	3.0324E-05	2.607	5.0540E-06
2.265	2.8158E-05	2.629	5.0540E-06
2.284	2.4548E-05	2.652	5.0540E-06
2.304	2.3826E-05	2.675	4.3320E-06
2.323	2.1660E-05	2.697	4.3320E-06
2.343	1.9494E-05	2.720	4.3320E-06
2.362	1.8772E-05	2.743	4.3320E-06
2.382	1.5162E-05	2.765	4.3320E-06
2.401	1.4440E-05	2.788	3.6100E-06
2.421	1.3718E-05	2.811	3.6100E-06
2.440	1.2274E-05	2.833	3.6100E-06
2.460	1.1552E-05	2.856	3.6100E-06
2.479	1.0830E-05	2.879	2.8880E-06
2.499	1.0830E-05	2.901	2.8880E-06
2.518	1.0108E-05	2.924	2.8880E-06
2.538	8.6640E-06	2.947	2.8880E-06
2.557	7.9420E-06	2.969	2.8880E-06
2.577	7.9420E-06	2.992	2.8880E-06
2.596	7.9420E-06	3.015	2.8880E-06
2.616	7.9420E-06	3.037	2.8880E-06
2.636	7.9420E-06	3.060	2.8880E-06
2.655	7.2200E-06	3.083	2.8880E-06
2.675	7.2200E-06	3.105	2.8880E-06
2.694	7.2200E-06	3.132	2.8880E-06
2.714	7.2200E-06	3.151	2.8880E-06
2.733	7.2200E-06	3.173	2.8880E-06
2.753	7.2200E-06	3.196	2.8880E-06
2.772	7.2200E-06	3.219	2.8880E-06
2.792	7.2200E-06	3.241	2.8880E-06
2.811	7.2200E-06	3.264	2.8880E-06
2.831	7.2200E-06	3.287	2.8880E-06
2.850	6.4980E-06	3.309	2.8880E-06
2.870	6.4980E-06	3.332	2.8880E-06
2.889	6.4980E-06	3.355	2.8880E-06

2.909	5.7760E-06	3.377	2.8880E-06
2.928	5.0540E-06	3.400	2.8880E-06
2.948	5.0540E-06	3.423	2.8880E-06
2.967	5.0540E-06	3.445	2.8880E-06
2.987	5.0540E-06	3.468	2.8880E-06
3.006	4.3320E-06	3.491	2.8880E-06
3.026	4.3320E-06	3.513	2.8880E-06
3.045	4.3320E-06	3.536	2.8880E-06
3.065	3.6100E-06	3.559	2.1660E-06
3.085	3.6100E-06	3.581	2.1660E-06
3.104	3.6100E-06	3.604	2.1660E-06
3.132	2.8016E-06	3.627	2.1660E-06
3.143	2.8880E-06	3.649	2.1660E-06
3.163	2.8880E-06	3.672	2.1660E-06
3.182	2.1660E-06	3.695	2.1660E-06
3.202	2.1660E-06	3.717	2.1660E-06
3.221	2.1660E-06	3.740	2.1660E-06
3.241	2.1660E-06	3.763	2.1660E-06
3.260	2.1660E-06	3.785	2.1660E-06
3.280	2.1660E-06	3.808	2.1660E-06
3.299	2.1660E-06	3.831	2.1660E-06
3.319	2.1660E-06	3.853	2.1660E-06
3.338	2.1660E-06	3.876	2.1660E-06
3.358	2.1660E-06	3.899	1.4440E-06
3.377	2.1660E-06	3.921	1.4440E-06
3.397	2.1660E-06	3.944	1.4440E-06
3.416	2.1660E-06	3.967	1.4440E-06
3.436	7.2200E-07	3.989	1.4440E-06
3.455	7.2200E-07	4.012	1.4440E-06
3.475	7.2200E-07	4.035	1.4440E-06
3.494	7.2200E-07	4.057	1.4440E-06
3.514	7.2200E-07	4.080	1.4440E-06
3.534	7.2200E-07	4.103	1.4440E-06
3.553	7.2200E-07	4.125	1.4440E-06
3.573	7.2200E-07	4.148	1.4440E-06
3.592	7.2200E-07	4.171	1.4440E-06
3.612	7.2200E-07	4.193	1.4440E-06
3.631	7.2200E-07	4.216	1.4440E-06
3.651	7.2200E-07	4.239	1.4440E-06
3.670	7.2200E-07	4.261	1.4440E-06
3.690	7.2200E-07	4.284	7.2200E-07
3.709	7.2200E-07	4.307	7.2200E-07
3.729	7.2200E-07	4.329	7.2200E-07
3.748	7.2200E-07	4.352	7.2200E-07
3.768	7.2200E-07	4.375	7.2200E-07
3.787	7.2200E-07	4.397	7.2200E-07
3.807	7.2200E-07	4.420	7.2200E-07
3.826	7.2200E-07	4.443	7.2200E-07
3.846	7.2200E-07	4.465	7.2200E-07
3.865	7.2200E-07	4.488	7.2200E-07
3.885	7.2200E-07	4.511	7.2200E-07
3.904	7.2200E-07	4.533	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):	-23.5%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-16.2%	PASS
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/17/2009 5:36 PM**

Input File Name: **pond2.fld**
Project Name: Burien NERA
Analysis Title: Combined Stormwater Wetland and Detention Pond 2
Comments: 95% Impervious

********** **Precipitation Input** **********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **Watershed Definition** **********

Number of Subbasins: 1

********** **Subbasin Number: 1** **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

		----------Developed----------	
	Predeveloped	**To Node**	**Bypass Node**
Till Forest	17.134	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	1.948	0.000
Wetland	0.000	1.086	0.000
Impervious	0.000	14.100	0.000
Subbasin Total	**17.134**	**17.134**	**0.000**

----------Lateral Flow Connnections----------

	----------Predeveloped----------			**----------Developed----------**		
	Surface	**Interflow**	**Grnd Water**	**Surface**	**Interflow**	**Grnd Water**
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** **Subbasin Connection Summary** ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** **Postdeveloped Node Connection Summary** ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

*** **Predeveloped Structure Summary** ***

*** **Postdeveloped Structure Summary** ***

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used
Pond Floor Elevation : 100.00 ft
Riser Crest Elevation : 104.00 ft
Max Pond Elevation : 104.50 ft
Max Storage Depth : 4.00 ft
Pond Bottom Length : 247.1 ft

Pond Bottom Width : 247.1 ft
Pond Side Slopes : L1= 3.00 L2= 3.00 W1= 3.00 W2= 3.00 ft/ft
Pond Bottom Area : 61060. sq-ft
Area at Riser Crest El : 73,497. sq-ft
: 1.687 acres
Volume at Riser Crest : 268,731.cu-ft
: 6.169 ac-ft
Area at Max Elevation : 75133. sq-ft
: 1.725 acres
Vol at Max Elevation : 305,888. cu-ft
: 7.022 ac-ft
Hydraulic Conductivity : 0.00 in/hr
Depth to Water Table : 100.00 ft

Riser Geometry
Riser Structure Type : Circular
Riser Diameter : 24.00 in
Common Length : 0.120 ft
Riser Crest Elevation : 104.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Invert Elevation : 100.00 ft
Diameter : 2.10 in
Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Invert Elevation : 102.22 ft
Length : 1.44 in
Height : 21.41 in
Orientation : Vertical
Elbow : No

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.018	0.024	0.016	0.000
100.035	0.049	0.022	0.000
100.070	0.098	0.031	0.000
100.140	0.195	0.044	0.000
100.210	0.294	0.054	0.000
100.280	0.392	0.062	0.000
100.350	0.491	0.069	0.000
100.420	0.590	0.076	0.000
100.490	0.690	0.082	0.000
100.560	0.790	0.088	0.000
100.630	0.890	0.093	0.000
100.700	0.991	0.098	0.000
100.770	1.091	0.103	0.000
100.840	1.193	0.108	0.000
100.910	1.294	0.112	0.000
100.980	1.396	0.116	0.000
101.050	1.498	0.120	0.000
101.120	1.601	0.124	0.000
101.190	1.704	0.128	0.000
101.260	1.807	0.132	0.000
101.330	1.911	0.135	0.000
101.400	2.015	0.139	0.000
101.470	2.119	0.142	0.000
101.540	2.224	0.146	0.000
101.610	2.329	0.149	0.000
101.680	2.434	0.152	0.000
101.750	2.540	0.155	0.000
101.820	2.646	0.158	0.000
101.890	2.752	0.161	0.000
101.960	2.859	0.164	0.000
102.030	2.966	0.167	0.000
102.100	3.074	0.170	0.000
102.129	3.118	0.171	0.000
102.158	3.163	0.172	0.000
102.187	3.208	0.174	0.000
102.216	3.253	0.175	0.000
102.234	3.280	0.176	0.000
102.251	3.307	0.179	0.000
102.269	3.334	0.181	0.000
102.286	3.361	0.184	0.000
102.356	3.470	0.197	0.000
102.426	3.579	0.213	0.000
102.496	3.688	0.233	0.000
102.566	3.798	0.254	0.000
102.636	3.908	0.277	0.000
102.706	4.019	0.302	0.000
102.776	4.129	0.329	0.000
102.846	4.241	0.357	0.000

102.916	4.352	0.387	0.000
102.986	4.464	0.418	0.000
103.056	4.576	0.451	0.000
103.126	4.689	0.484	0.000
103.196	4.802	0.519	0.000
103.266	4.915	0.555	0.000
103.336	5.029	0.592	0.000
103.406	5.143	0.630	0.000
103.476	5.257	0.670	0.000
103.546	5.372	0.710	0.000
103.616	5.487	0.751	0.000
103.686	5.603	0.794	0.000
103.756	5.718	0.837	0.000
103.826	5.835	0.881	0.000
103.896	5.951	0.926	0.000
103.922	5.995	0.943	0.000
103.948	6.038	0.960	0.000
103.974	6.081	0.977	0.000
104.000	6.125	0.994	0.000
104.018	6.154	1.054	0.000
104.035	6.183	1.154	0.000
104.053	6.213	1.280	0.000
104.070	6.242	1.427	0.000
104.088	6.272	1.592	0.000
104.105	6.301	1.773	0.000
104.123	6.331	1.968	0.000
104.140	6.360	2.177	0.000
104.210	6.478	3.128	0.000
104.280	6.597	4.225	0.000
104.350	6.716	5.422	0.000
104.420	6.835	6.672	0.000
104.490	6.955	7.929	0.000
104.560	7.075	9.144	0.000
104.630	7.195	10.274	0.000
104.700	7.316	11.281	0.000
104.770	7.437	12.117	0.000
104.840	7.559	12.790	0.000
104.910	7.681	13.317	0.000
104.980	7.803	13.742	0.000
105.050	7.926	14.310	0.000
105.050	6.442	14.617	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	102.387
01/18/1941	101.382
12/20/1941	101.830
11/23/1942	102.617
10/17/1943	101.247
02/07/1945	102.393
02/05/1946	101.598
12/05/1946	102.036
10/19/1947	102.532
02/22/1949	102.055
01/22/1950	102.454
02/09/1951	102.949
10/03/1951	101.666
01/12/1953	102.612
01/22/1954	101.821
11/19/1954	101.804
01/06/1956	102.951
02/26/1957	102.103
01/17/1958	102.049
01/13/1959	102.581
11/21/1959	102.427
11/24/1960	102.718
12/24/1961	101.575
11/30/1962	101.599
11/14/1963	101.676
12/01/1964	102.102
01/07/1966	102.133
12/13/1966	102.574
10/27/1967	101.925
12/11/1968	102.143
01/27/1970	102.493
12/07/1970	102.332
03/05/1972	103.528
12/26/1972	102.864
03/01/1974	102.174
12/27/1974	101.931
02/27/1976	102.308
08/26/1977	101.559
12/15/1977	102.659
03/05/1979	101.526
12/18/1979	103.493
12/30/1980	102.153
10/06/1981	103.316
03/09/1983	102.314

03/21/1984	101.690
11/11/1984	101.740
01/19/1986	102.538
11/24/1986	103.320
04/06/1988	102.163
04/05/1989	102.274
01/09/1990	103.433
11/24/1990	103.654
01/31/1992	102.555
04/11/1993	101.469
03/03/1994	101.670
12/27/1994	102.665
02/09/1996	103.759
01/02/1997	103.518
10/08/1997	101.698
11/26/1998	103.529
02/28/2000	102.224
05/05/2001	101.632
11/15/2001	101.530
11/26/2002	103.324
10/24/2003	102.161
02/08/2005	101.588
11/28/2005	102.540
11/27/2006	102.160
01/07/2008	102.442
02/18/2009	103.406
01/10/2010	102.505
11/17/2010	103.044
10/02/2011	102.346
01/20/2013	103.698
01/28/2014	102.237
03/30/2015	101.647
01/04/2016	103.287
11/01/2016	102.015
01/31/2018	102.091
01/12/2019	102.469
04/21/2020	101.714
11/24/2020	102.963
12/21/2021	102.018
03/30/2023	102.213
01/25/2024	102.476
12/22/2024	103.253
01/03/2026	102.879
01/29/2027	101.839
02/23/2028	102.143
12/11/2028	102.145
01/26/2030	103.032
03/04/2031	102.133
01/21/2032	102.695
12/23/2032	102.050
11/16/2033	103.477
02/19/2035	102.208
02/27/2036	102.350
08/25/2037	101.035
12/15/2037	102.547
12/04/2038	101.420
01/14/2040	102.202
12/25/2040	102.506
04/15/2042	102.498
02/26/2043	102.286
03/21/2044	101.983
03/27/2045	102.212
02/17/2046	102.044
02/02/2047	101.844
12/10/2047	102.793
03/17/2049	101.865
12/04/2049	101.774
04/09/2051	101.661
04/17/2052	101.355
12/10/2052	101.753
12/11/2053	101.896
11/01/2054	103.318
02/07/2056	103.774
11/19/2056	103.404
05/21/2058	102.026
11/26/2058	102.930
01/23/2060	101.593
10/27/2060	102.420
01/03/2062	102.036
12/30/2062	102.183
12/23/2063	103.005
12/01/2064	101.929
01/13/2066	101.337
12/15/2066	102.857
01/19/2068	102.858
09/23/2069	101.503
12/14/2069	101.436
12/19/2070	101.400
11/03/2071	101.891
12/25/2072	104.101
12/15/2073	102.537
11/20/2074	101.588
10/30/2075	102.925
08/26/2077	101.173
12/02/2077	101.922

02/25/2079	101.484
12/17/2079	103.656
11/21/2080	103.076
02/19/2082	102.818
02/20/2083	102.783
11/26/2083	103.213
12/14/2084	102.484
11/01/2085	102.106
11/23/2086	102.453
12/09/2087	101.979
11/05/2088	102.547
11/10/2089	102.341
12/09/2090	103.245
01/31/2092	103.060
11/07/2092	101.479
12/14/2093	101.666
12/27/2094	102.294
12/14/2095	102.500
10/28/2096	102.748

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	101.035
1.01	101.173
1.02	101.247
1.02	101.337
1.03	101.355
1.04	101.382
1.04	101.400
1.05	101.420
1.06	101.436
1.06	101.469
1.07	101.479
1.08	101.484
1.09	101.503
1.09	101.526
1.10	101.530
1.11	101.559
1.12	101.575
1.12	101.588
1.13	101.588
1.14	101.593
1.15	101.598
1.16	101.599
1.17	101.632
1.18	101.647
1.18	101.661
1.19	101.666
1.20	101.666
1.21	101.670
1.22	101.676
1.23	101.690
1.24	101.698
1.25	101.714
1.26	101.740
1.27	101.753
1.28	101.774
1.29	101.804
1.30	101.821
1.31	101.830
1.32	101.839
1.33	101.844
1.35	101.865
1.36	101.891
1.37	101.896
1.38	101.922
1.39	101.925
1.40	101.929
1.42	101.931
1.43	101.979
1.44	101.983
1.46	102.015
1.47	102.018
1.48	102.026
1.50	102.036
1.51	102.036
1.53	102.044
1.54	102.049
1.56	102.050
1.57	102.055
1.59	102.091
1.60	102.102
1.62	102.103
1.64	102.106
1.65	102.133
1.67	102.133
1.69	102.143
1.71	102.143
1.73	102.145
1.75	102.153
1.77	102.160
1.79	102.161
1.81	102.163

1.83	102.174
1.85	102.183
1.87	102.202
1.89	102.208
1.92	102.212
1.94	102.213
1.96	102.224
1.99	102.237
2.01	102.274
2.04	102.286
2.07	102.294
2.09	102.308
2.12	102.314
2.15	102.332
2.18	102.341
2.21	102.346
2.24	102.350
2.27	102.387
2.31	102.393
2.34	102.420
2.38	102.427
2.41	102.442
2.45	102.453
2.49	102.454
2.53	102.469
2.57	102.476
2.61	102.484
2.65	102.493
2.70	102.498
2.75	102.500
2.80	102.505
2.85	102.506
2.90	102.532
2.95	102.537
3.01	102.538
3.07	102.540
3.13	102.547
3.19	102.547
3.26	102.555
3.32	102.574
3.40	102.581
3.47	102.612
3.55	102.617
3.63	102.659
3.72	102.665
3.80	102.695
3.90	102.718
4.00	102.748
4.10	102.783
4.21	102.793
4.32	102.818
4.45	102.857
4.58	102.858
4.71	102.864
4.86	102.879
5.01	102.925
5.17	102.930
5.35	102.949
5.54	102.951
5.74	102.963
5.95	103.005
6.19	103.032
6.44	103.044
6.71	103.060
7.01	103.076
7.33	103.213
7.69	103.245
8.08	103.253
8.52	103.287
9.00	103.316
9.55	103.318
10.16	103.320
10.86	103.324
11.66	103.404
12.59	103.406
13.68	103.433
14.97	103.477
16.54	103.493
18.47	103.518
20.92	103.528
24.10	103.529
28.44	103.654
34.68	103.656
44.42	103.698
61.77	103.759
101.36	103.774
282.36	104.101

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	101.425
1.11-Year	101.564
1.25-Year	101.716
2.00-Year	102.256
3.33-Year	102.575
5-Year	102.923
10-Year	103.320
25-Year	103.529
50-Year	103.727
100-Year	103.774

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	6234.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 3.680 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 13569. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 20354. cu-ft
2-Year Discharge Rate : 0.179 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		Postdevelopment Runoff	
Date	Annual Max Q (cfs)	Date	Annual Max Q (cfs)
04/30/1940	0.463	12/07/1939	0.204
01/31/1941	0.178	01/18/1941	0.138
12/15/1941	0.466	12/20/1941	0.159
02/10/1943	0.185	11/23/1942	0.271
01/23/1944	0.139	10/17/1943	0.131
02/07/1945	0.577	02/07/1945	0.206
02/05/1946	0.354	02/05/1946	0.148
02/02/1947	0.361	12/05/1946	0.167
03/21/1948	0.624	10/19/1947	0.244
02/22/1949	0.313	02/22/1949	0.168
03/03/1950	1.290	01/22/1950	0.221
02/09/1951	0.516	02/09/1951	0.402
01/24/1952	0.136	10/03/1951	0.151
01/11/1953	0.193	01/12/1953	0.269
01/22/1954	0.313	01/22/1954	0.158
04/12/1955	0.146	11/19/1954	0.158
03/04/1956	0.336	01/06/1956	0.403
02/25/1957	0.278	02/26/1957	0.170
01/16/1958	0.337	01/17/1958	0.168
01/12/1959	0.363	01/13/1959	0.259
12/15/1959	0.388	11/21/1959	0.214
02/14/1961	0.332	11/24/1960	0.307
03/04/1962	0.178	12/24/1961	0.147
02/03/1963	0.197	11/30/1962	0.148
01/01/1964	0.315	11/14/1963	0.152
02/26/1965	0.391	12/01/1964	0.170
01/06/1966	0.241	01/07/1966	0.171
01/19/1967	0.610	12/13/1966	0.257
02/03/1968	0.315	10/27/1967	0.163
12/03/1968	0.339	12/11/1968	0.172
01/13/1970	0.262	01/27/1970	0.232
12/06/1970	0.298	12/07/1970	0.192
02/28/1972	0.805	03/05/1972	0.700
01/13/1973	0.290	12/26/1972	0.365
02/18/1974	0.434	03/01/1974	0.173
12/26/1974	0.525	12/27/1974	0.163
01/27/1976	0.364	02/27/1976	0.188
05/31/1977	0.051	08/26/1977	0.147
12/10/1977	0.308	12/15/1977	0.285
03/04/1979	0.303	03/05/1979	0.145
12/17/1979	0.488	12/18/1979	0.679
12/26/1980	0.193	12/30/1980	0.172
10/06/1981	0.618	10/06/1981	0.582
01/05/1983	0.347	03/09/1983	0.189
03/14/1984	0.331	03/21/1984	0.153

02/11/1985	0.221	11/11/1984	0.155
01/18/1986	0.729	01/19/1986	0.245
11/24/1986	0.643	11/24/1986	0.584
04/06/1988	0.321	04/06/1988	0.173
04/05/1989	0.354	04/05/1989	0.182
01/09/1990	1.169	01/09/1990	0.645
11/24/1990	0.996	11/24/1990	0.774
01/27/1992	0.304	01/31/1992	0.251
06/09/1993	0.257	04/11/1993	0.142
03/03/1994	0.195	03/03/1994	0.152
02/19/1995	0.409	12/27/1994	0.288
02/09/1996	0.948	02/09/1996	0.839
01/02/1997	0.593	01/02/1997	0.694
02/28/1998	0.218	10/08/1997	0.153
11/25/1998	0.583	11/26/1998	0.700
03/26/2000	0.327	02/28/2000	0.175
05/05/2001	0.250	05/05/2001	0.150
05/03/2002	0.893	11/15/2001	0.145
03/31/2003	0.684	11/26/2002	0.586
01/23/2004	0.167	10/24/2003	0.173
02/07/2005	0.288	02/08/2005	0.148
02/27/2006	0.370	11/28/2005	0.246
12/14/2006	0.274	11/27/2006	0.172
03/21/2008	0.455	01/07/2008	0.218
02/17/2009	0.706	02/18/2009	0.630
01/10/2010	0.474	01/10/2010	0.235
11/17/2010	0.615	11/17/2010	0.445
01/31/2012	0.391	10/02/2011	0.195
01/20/2013	0.894	01/20/2013	0.801
12/06/2013	0.376	01/28/2014	0.177
03/30/2015	0.228	03/30/2015	0.151
01/04/2016	0.650	01/04/2016	0.566
03/07/2017	0.188	11/01/2016	0.167
01/31/2018	0.351	01/31/2018	0.170
03/30/2019	0.347	01/12/2019	0.225
04/14/2020	0.228	04/21/2020	0.154
02/10/2021	0.563	11/24/2020	0.408
03/26/2022	0.166	12/21/2021	0.167
03/30/2023	0.401	03/30/2023	0.175
01/19/2024	0.315	01/25/2024	0.227
12/22/2024	0.659	12/22/2024	0.548
03/09/2026	0.418	01/03/2026	0.371
01/27/2027	0.364	01/29/2027	0.159
02/19/2028	0.452	02/23/2028	0.172
12/04/2028	0.350	12/11/2028	0.172
02/16/2030	0.467	01/26/2030	0.439
12/30/2030	0.437	03/04/2031	0.171
01/20/2032	0.702	01/21/2032	0.299
03/01/2033	0.198	12/23/2032	0.168
01/15/2034	0.793	11/16/2033	0.670
02/19/2035	0.387	02/19/2035	0.174
03/24/2036	0.366	02/27/2036	0.196
03/09/2037	0.015	08/25/2037	0.119
12/15/2037	0.267	12/15/2037	0.248
02/07/2039	0.193	12/04/2038	0.140
01/14/2040	0.725	01/14/2040	0.174
12/25/2040	0.411	12/25/2040	0.236
02/20/2042	0.431	04/15/2042	0.233
03/31/2043	0.646	02/26/2043	0.184
05/01/2044	0.255	03/21/2044	0.165
02/11/2045	0.295	03/27/2045	0.175
02/16/2046	0.371	02/17/2046	0.168
02/01/2047	0.233	02/02/2047	0.159
04/21/2048	0.207	12/10/2047	0.336
03/16/2049	0.233	03/17/2049	0.160
12/04/2049	0.393	12/04/2049	0.156
04/06/2051	0.305	04/09/2051	0.151
04/17/2052	0.183	04/17/2052	0.137
06/04/2053	0.703	12/10/2052	0.155
04/08/2054	0.131	12/11/2053	0.162
02/17/2055	0.598	11/01/2054	0.582
02/07/2056	1.088	02/07/2056	0.848
11/19/2056	1.191	11/19/2056	0.629
01/24/2058	0.413	05/21/2058	0.167
12/28/2058	0.475	11/26/2058	0.393
01/19/2060	0.178	01/23/2060	0.148
01/10/2061	0.386	10/27/2060	0.212
02/03/2062	1.467	01/03/2062	0.167
12/29/2062	0.310	12/30/2062	0.173
12/23/2063	0.560	12/23/2063	0.427
11/30/2064	0.268	12/01/2064	0.163
01/13/2066	0.147	01/13/2066	0.136
01/19/2067	0.373	12/15/2066	0.362
01/18/2068	0.769	01/19/2068	0.362
01/04/2069	0.207	09/23/2069	0.144
04/09/2070	0.174	12/14/2069	0.141
02/14/2071	0.191	12/19/2070	0.139
02/27/2072	0.205	11/03/2071	0.161
12/25/2072	0.857	12/25/2072	1.726
03/16/2074	0.461	12/15/2073	0.245
01/23/2075	0.100	11/20/2074	0.148
03/24/2076	0.512	10/30/2075	0.391
03/02/2077	0.057	08/26/2077	0.127
12/02/2077	0.193	12/02/2077	0.163
02/25/2079	0.258	02/25/2079	0.143

12/17/2079	0.956	12/17/2079	0.775
11/21/2080	0.422	11/21/2080	0.460
02/13/2082	0.527	02/19/2082	0.346
02/19/2083	0.323	02/20/2083	0.332
11/26/2083	0.392	11/26/2083	0.528
12/14/2084	0.271	12/14/2084	0.229
01/18/2086	0.382	11/01/2085	0.170
12/21/2086	0.358	11/23/2086	0.221
01/14/2088	0.236	12/09/2087	0.165
11/05/2088	0.419	11/05/2088	0.248
01/07/2090	0.197	11/10/2089	0.194
12/04/2090	0.364	12/09/2090	0.544
04/28/2092	0.624	01/31/2092	0.453
03/22/2093	0.175	11/07/2092	0.143
03/01/2094	0.147	12/14/2093	0.152
02/18/2095	0.232	12/27/2094	0.185
01/14/2096	0.293	12/14/2095	0.234
01/29/2097	0.644	10/28/2096	0.319

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.015	1.00	0.119
1.01	0.051	1.01	0.127
1.02	0.057	1.02	0.131
1.02	0.100	1.02	0.136
1.03	0.131	1.03	0.137
1.04	0.136	1.04	0.138
1.04	0.139	1.04	0.139
1.05	0.146	1.05	0.140
1.06	0.147	1.06	0.141
1.06	0.147	1.06	0.142
1.07	0.166	1.07	0.143
1.08	0.167	1.08	0.143
1.09	0.174	1.09	0.144
1.09	0.175	1.09	0.145
1.10	0.178	1.10	0.145
1.11	0.178	1.11	0.147
1.12	0.178	1.12	0.147
1.12	0.183	1.12	0.148
1.13	0.185	1.13	0.148
1.14	0.188	1.14	0.148
1.15	0.191	1.15	0.148
1.16	0.193	1.16	0.148
1.17	0.193	1.17	0.150
1.18	0.193	1.18	0.151
1.18	0.193	1.18	0.151
1.19	0.195	1.19	0.151
1.20	0.197	1.20	0.152
1.21	0.197	1.21	0.152
1.22	0.198	1.22	0.152
1.23	0.205	1.23	0.153
1.24	0.207	1.24	0.153
1.25	0.207	1.25	0.154
1.26	0.218	1.26	0.155
1.27	0.221	1.27	0.155
1.28	0.228	1.28	0.156
1.29	0.228	1.29	0.158
1.30	0.232	1.30	0.158
1.31	0.233	1.31	0.159
1.32	0.233	1.32	0.159
1.33	0.236	1.33	0.159
1.35	0.241	1.35	0.160
1.36	0.250	1.36	0.161
1.37	0.255	1.37	0.162
1.38	0.257	1.38	0.163
1.39	0.258	1.39	0.163
1.40	0.262	1.40	0.163
1.42	0.267	1.42	0.163
1.43	0.268	1.43	0.165
1.44	0.271	1.44	0.165
1.46	0.274	1.46	0.167
1.47	0.278	1.47	0.167
1.48	0.288	1.48	0.167
1.50	0.290	1.50	0.167
1.51	0.293	1.51	0.167
1.53	0.295	1.53	0.168
1.54	0.298	1.54	0.168
1.56	0.303	1.56	0.168
1.57	0.304	1.57	0.168
1.59	0.305	1.59	0.170
1.60	0.308	1.60	0.170
1.62	0.310	1.62	0.170
1.64	0.313	1.64	0.170
1.65	0.313	1.65	0.171
1.67	0.315	1.67	0.171
1.69	0.315	1.69	0.172
1.71	0.315	1.71	0.172
1.73	0.321	1.73	0.172
1.75	0.323	1.75	0.172
1.77	0.327	1.77	0.172

1.79	0.331	1.79	0.173
1.81	0.332	1.81	0.173
1.83	0.336	1.83	0.173
1.85	0.337	1.85	0.173
1.87	0.339	1.87	0.174
1.89	0.347	1.89	0.174
1.92	0.347	1.92	0.175
1.94	0.350	1.94	0.175
1.96	0.351	1.96	0.175
1.99	0.354	1.99	0.177
2.01	0.354	2.01	0.182
2.04	0.358	2.04	0.184
2.07	0.361	2.07	0.185
2.09	0.363	2.09	0.188
2.12	0.364	2.12	0.189
2.15	0.364	2.15	0.192
2.18	0.364	2.18	0.194
2.21	0.366	2.21	0.195
2.24	0.370	2.24	0.196
2.27	0.371	2.27	0.204
2.31	0.373	2.31	0.206
2.34	0.376	2.34	0.212
2.38	0.382	2.38	0.214
2.41	0.386	2.41	0.218
2.45	0.387	2.45	0.221
2.49	0.388	2.49	0.221
2.53	0.391	2.53	0.225
2.57	0.391	2.57	0.227
2.61	0.392	2.61	0.229
2.65	0.393	2.65	0.232
2.70	0.401	2.70	0.233
2.75	0.409	2.75	0.234
2.80	0.411	2.80	0.235
2.85	0.413	2.85	0.236
2.90	0.418	2.90	0.244
2.95	0.419	2.95	0.245
3.01	0.422	3.01	0.245
3.07	0.431	3.07	0.246
3.13	0.434	3.13	0.248
3.19	0.437	3.19	0.248
3.26	0.452	3.26	0.251
3.32	0.455	3.32	0.257
3.40	0.461	3.40	0.259
3.47	0.463	3.47	0.269
3.55	0.466	3.55	0.271
3.63	0.467	3.63	0.285
3.72	0.474	3.72	0.288
3.80	0.475	3.80	0.299
3.90	0.488	3.90	0.307
4.00	0.512	4.00	0.319
4.10	0.516	4.10	0.332
4.21	0.525	4.21	0.336
4.32	0.527	4.32	0.346
4.45	0.560	4.45	0.362
4.58	0.563	4.58	0.362
4.71	0.577	4.71	0.365
4.86	0.583	4.86	0.371
5.01	0.593	5.01	0.391
5.17	0.598	5.17	0.393
5.35	0.610	5.35	0.402
5.54	0.615	5.54	0.403
5.74	0.618	5.74	0.408
5.95	0.624	5.95	0.427
6.19	0.624	6.19	0.439
6.44	0.643	6.44	0.445
6.71	0.644	6.71	0.453
7.01	0.646	7.01	0.460
7.33	0.650	7.33	0.528
7.69	0.659	7.69	0.544
8.08	0.684	8.08	0.548
8.52	0.702	8.52	0.566
9.00	0.703	9.00	0.582
9.55	0.706	9.55	0.582
10.16	0.725	10.16	0.584
10.86	0.729	10.86	0.586
11.66	0.769	11.66	0.629
12.59	0.793	12.59	0.630
13.68	0.805	13.68	0.645
14.97	0.857	14.97	0.670
16.54	0.893	16.54	0.679
18.47	0.894	18.47	0.694
20.92	0.948	20.92	0.700
24.10	0.956	24.10	0.700
28.44	0.996	28.44	0.774
34.68	1.088	34.68	0.775
44.42	1.169	44.42	0.801
61.77	1.191	61.77	0.839
101.36	1.290	101.36	0.848
282.36	1.467	282.36	1.726

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.354	2-Year	0.179
5-Year	0.592	5-Year	0.390
10-Year	0.720	10-Year	0.583
25-Year	0.965	25-Year	0.716
50-Year	1.177	50-Year	0.815
100-Year	1.287	100-Year	0.848
200-Year	1.408	200-Year	1.431

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
7.337E-03	2.3680E-01	8.630E-03	6.8658E-01
0.015	1.8183E-01	0.017	6.5773E-01
0.022	1.4869E-01	0.026	6.1508E-01
0.029	1.2486E-01	0.035	5.6984E-01
0.037	1.0625E-01	0.043	5.2479E-01
0.044	9.1206E-02	0.052	4.7584E-01
0.051	7.8997E-02	0.060	4.2710E-01
0.059	6.8893E-02	0.069	3.7780E-01
0.066	6.0447E-02	0.078	3.2818E-01
0.073	5.3261E-02	0.086	2.7870E-01
0.081	4.7175E-02	0.095	2.3036E-01
0.088	4.1832E-02	0.104	1.8592E-01
0.095	3.7205E-02	0.112	1.4580E-01
0.103	3.3133E-02	0.121	1.1122E-01
0.110	2.9638E-02	0.129	8.1647E-02
0.117	2.6430E-02	0.138	5.9340E-02
0.125	2.3649E-02	0.147	4.1025E-02
0.132	2.1262E-02	0.155	2.7371E-02
0.139	1.9150E-02	0.164	1.7379E-02
0.147	1.7267E-02	0.173	1.0167E-02
0.154	1.5521E-02	0.177	8.4551E-03
0.161	1.4036E-02	0.190	6.6684E-03
0.169	1.2639E-02	0.198	5.8352E-03
0.177	1.1278E-02	0.207	5.2251E-03
0.183	1.0348E-02	0.216	4.6908E-03
0.191	9.4640E-03	0.224	4.2714E-03
0.198	8.5860E-03	0.233	3.8678E-03
0.205	7.8178E-03	0.242	3.5198E-03
0.213	7.1543E-03	0.250	3.2079E-03
0.220	6.5998E-03	0.259	2.9436E-03
0.227	6.0489E-03	0.268	2.6996E-03
0.235	5.5507E-03	0.276	2.4794E-03
0.242	5.1067E-03	0.285	2.3082E-03
0.249	4.7255E-03	0.293	2.1176E-03
0.257	4.3558E-03	0.302	1.9660E-03
0.264	4.0223E-03	0.311	1.8339E-03
0.271	3.7104E-03	0.319	1.6989E-03
0.279	3.4331E-03	0.328	1.5769E-03
0.286	3.1833E-03	0.337	1.4527E-03
0.293	2.9472E-03	0.345	1.3473E-03
0.301	2.7284E-03	0.354	1.2616E-03
0.308	2.5234E-03	0.362	1.1906E-03
0.315	2.3581E-03	0.371	1.1198E-03
0.323	2.1942E-03	0.380	1.0534E-03
0.330	2.0324E-03	0.388	9.8698E-04
0.337	1.9003E-03	0.397	9.2633E-04
0.345	1.7624E-03	0.406	8.7362E-04
0.354	1.6051E-03	0.414	8.2886E-04
0.359	1.5285E-03	0.423	7.7904E-04
0.367	1.4180E-03	0.432	7.3572E-04
0.374	1.3350E-03	0.440	6.8518E-04
0.382	1.2722E-03	0.449	6.4114E-04
0.389	1.2043E-03	0.457	6.0359E-04
0.396	1.1350E-03	0.466	5.7038E-04
0.404	1.0729E-03	0.475	5.4078E-04
0.411	1.0130E-03	0.483	5.0396E-04
0.418	9.6532E-04	0.492	4.7869E-04
0.426	9.1478E-04	0.501	4.5558E-04
0.433	8.6712E-04	0.509	4.3609E-04
0.440	8.1225E-04	0.518	4.1010E-04
0.448	7.6388E-04	0.526	3.8699E-04
0.455	7.2489E-04	0.535	3.6172E-04
0.462	6.8807E-04	0.544	3.4006E-04
0.470	6.5124E-04	0.552	3.1624E-04
0.477	6.2092E-04	0.561	3.0180E-04
0.484	5.8915E-04	0.570	2.7797E-04
0.492	5.6749E-04	0.578	2.6209E-04

0.499	5.4511E-04	0.587	2.4259E-04
0.506	5.2562E-04	0.592	2.2757E-04
0.514	5.0251E-04	0.604	2.0360E-04
0.521	4.7796E-04	0.613	1.8700E-04
0.528	4.5197E-04	0.621	1.7400E-04
0.536	4.3609E-04	0.630	1.5812E-04
0.543	4.1154E-04	0.639	1.4584E-04
0.550	3.9349E-04	0.647	1.3213E-04
0.558	3.6894E-04	0.656	1.1913E-04
0.565	3.5450E-04	0.665	1.0902E-04
0.572	3.3573E-04	0.673	9.7470E-05
0.580	3.1985E-04	0.682	8.6640E-05
0.587	3.0252E-04	0.690	7.7254E-05
0.592	2.9160E-04	0.699	7.0034E-05
0.602	2.7653E-04	0.708	6.3536E-05
0.609	2.6281E-04	0.716	5.8482E-05
0.616	2.5198E-04	0.725	5.4150E-05
0.624	2.3609E-04	0.734	4.9818E-05
0.631	2.2599E-04	0.742	4.5486E-05
0.638	2.1371E-04	0.751	4.1154E-05
0.646	2.0360E-04	0.759	3.8266E-05
0.653	1.9638E-04	0.768	3.4656E-05
0.660	1.8339E-04	0.777	2.8880E-05
0.668	1.7689E-04	0.785	2.3104E-05
0.675	1.6245E-04	0.794	2.0938E-05
0.682	1.5306E-04	0.803	1.7328E-05
0.690	1.4440E-04	0.811	1.6606E-05
0.697	1.3140E-04	0.820	1.5884E-05
0.704	1.2563E-04	0.829	1.3718E-05
0.712	1.1552E-04	0.837	1.2274E-05
0.719	1.0830E-04	0.846	1.0108E-05
0.726	1.0108E-04	0.854	9.3860E-06
0.734	9.3860E-05	0.863	8.6640E-06
0.741	8.9528E-05	0.872	7.9420E-06
0.748	8.1586E-05	0.880	7.9420E-06
0.756	7.4366E-05	0.889	7.9420E-06
0.763	7.1478E-05	0.898	7.9420E-06
0.770	6.5702E-05	0.906	7.2200E-06
0.778	6.2814E-05	0.915	7.2200E-06
0.785	5.9926E-05	0.923	7.2200E-06
0.792	5.7760E-05	0.932	6.4980E-06
0.800	5.0540E-05	0.941	6.4980E-06
0.807	4.7652E-05	0.949	5.7760E-06
0.814	4.2598E-05	0.958	5.0540E-06
0.822	3.8266E-05	0.967	5.0540E-06
0.829	3.4656E-05	0.975	5.0540E-06
0.836	3.2490E-05	0.984	4.3320E-06
0.844	3.0324E-05	0.992	4.3320E-06
0.851	2.8158E-05	1.001	4.3320E-06
0.858	2.4548E-05	1.010	4.3320E-06
0.866	2.3826E-05	1.018	4.3320E-06
0.873	2.1660E-05	1.027	4.3320E-06
0.880	1.9494E-05	1.036	4.3320E-06
0.888	1.8772E-05	1.044	4.3320E-06
0.895	1.5162E-05	1.053	3.6100E-06
0.902	1.4440E-05	1.062	2.8880E-06
0.910	1.3718E-05	1.070	2.8880E-06
0.917	1.2274E-05	1.079	2.8880E-06
0.924	1.1552E-05	1.087	2.8880E-06
0.932	1.0830E-05	1.096	2.8880E-06
0.939	1.0830E-05	1.105	2.8880E-06
0.946	1.0108E-05	1.113	2.8880E-06
0.954	8.6640E-06	1.122	2.8880E-06
0.961	7.9420E-06	1.131	2.8880E-06
0.968	7.9420E-06	1.139	2.8880E-06
0.976	7.9420E-06	1.148	2.8880E-06
0.983	7.9420E-06	1.156	2.8880E-06
0.990	7.9420E-06	1.165	2.8880E-06
0.998	7.2200E-06	1.177	2.8880E-06
1.005	7.2200E-06	1.182	2.8880E-06
1.012	7.2200E-06	1.191	2.8880E-06
1.020	7.2200E-06	1.200	2.8880E-06
1.027	7.2200E-06	1.208	2.8880E-06
1.034	7.2200E-06	1.217	2.8880E-06
1.042	7.2200E-06	1.226	2.8880E-06
1.049	7.2200E-06	1.234	2.8880E-06
1.056	7.2200E-06	1.243	2.8880E-06
1.064	7.2200E-06	1.251	2.8880E-06
1.071	6.4980E-06	1.260	2.8880E-06
1.078	6.4980E-06	1.269	2.8880E-06
1.086	6.4980E-06	1.277	2.8880E-06
1.093	5.7760E-06	1.286	2.8880E-06
1.101	5.0540E-06	1.295	2.8880E-06
1.108	5.0540E-06	1.303	2.8880E-06
1.115	5.0540E-06	1.312	2.8880E-06
1.123	5.0540E-06	1.320	2.8880E-06
1.130	4.3320E-06	1.329	2.1660E-06
1.137	4.3320E-06	1.338	2.1660E-06
1.145	4.3320E-06	1.346	2.1660E-06
1.152	3.6100E-06	1.355	2.1660E-06
1.159	3.6100E-06	1.364	2.1660E-06
1.167	3.6100E-06	1.372	2.1660E-06
1.177	2.8016E-06	1.381	2.1660E-06
1.181	2.8880E-06	1.389	2.1660E-06
1.189	2.8880E-06	1.398	2.1660E-06

1.196	2.1660E-06	1.407	2.1660E-06
1.203	2.1660E-06	1.415	2.1660E-06
1.211	2.1660E-06	1.424	2.1660E-06
1.218	2.1660E-06	1.433	2.1660E-06
1.225	2.1660E-06	1.441	2.1660E-06
1.233	2.1660E-06	1.450	2.1660E-06
1.240	2.1660E-06	1.459	2.1660E-06
1.247	2.1660E-06	1.467	2.1660E-06
1.255	2.1660E-06	1.476	2.1660E-06
1.262	2.1660E-06	1.484	2.1660E-06
1.269	2.1660E-06	1.493	2.1660E-06
1.277	2.1660E-06	1.502	2.1660E-06
1.284	2.1660E-06	1.510	1.4440E-06
1.291	7.2200E-07	1.519	1.4440E-06
1.299	7.2200E-07	1.528	1.4440E-06
1.306	7.2200E-07	1.536	1.4440E-06
1.313	7.2200E-07	1.545	1.4440E-06
1.321	7.2200E-07	1.553	1.4440E-06
1.328	7.2200E-07	1.562	1.4440E-06
1.335	7.2200E-07	1.571	1.4440E-06
1.343	7.2200E-07	1.579	1.4440E-06
1.350	7.2200E-07	1.588	1.4440E-06
1.357	7.2200E-07	1.597	1.4440E-06
1.365	7.2200E-07	1.605	1.4440E-06
1.372	7.2200E-07	1.614	7.2200E-07
1.379	7.2200E-07	1.622	7.2200E-07
1.387	7.2200E-07	1.631	7.2200E-07
1.394	7.2200E-07	1.640	7.2200E-07
1.401	7.2200E-07	1.648	7.2200E-07
1.409	7.2200E-07	1.657	7.2200E-07
1.416	7.2200E-07	1.666	7.2200E-07
1.423	7.2200E-07	1.674	7.2200E-07
1.431	7.2200E-07	1.683	7.2200E-07
1.438	7.2200E-07	1.692	7.2200E-07
1.445	7.2200E-07	1.700	7.2200E-07
1.453	7.2200E-07	1.709	7.2200E-07
1.460	7.2200E-07	1.717	7.2200E-07
1.467	7.2200E-07	1.726	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-27.8%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-21.5%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 10:00 AM**

Input File Name: **pond3.fld**
Project Name: Burien NERA
Analysis Title: Combined Stormwater Wetland and Detention Pond 3
Comments: 95% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

		Developed	
	Predeveloped	**To Node**	**Bypass Node**
Till Forest	54.809	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	3.022	0.000
Wetland	0.000	1.049	0.000
Impervious	0.000	50.738	0.000
Subbasin Total	**54.809**	**54.809**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped			Developed		
	Surface	**Interflow**	**Grnd Water**	**Surface**	**Interflow**	**Grnd Water**
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** Predeveloped Structure Summary ***

*** Postdeveloped Structure Summary ***

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used
Pond Floor Elevation : 100.00 ft
Riser Crest Elevation : 104.00 ft
Max Pond Elevation : 105.00 ft
Max Storage Depth : 4.00 ft
Pond Bottom Length : 498.7 ft
Pond Bottom Width : 498.7 ft

Pond Side Slopes : L1= 3.00 L2= 3.00 W1= 3.00 W2= 3.00 ft/ft
Pond Bottom Area : 248678. sq-ft
Area at Riser Crest El : 273,190. sq-ft
: 6.272 acres
Volume at Riser Crest : 1,043,353. cu-ft
: 23.952 ac-ft
Area at Max Elevation : 279499. sq-ft
: 6.416 acres
Vol at Max Elevation : 1,319,691. cu-ft
: 30.296 ac-ft
Hydraulic Conductivity : 0.00 in/hr
Depth to Water Table : 100.00 ft

Riser Geometry

Riser Structure Type : Circular
Riser Diameter : 42.00 in
Common Length : 0.413 ft
Riser Crest Elevation : 104.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Invert Elevation : 100.00 ft
Diameter : 3.69 in
Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Invert Elevation : 102.35 ft
Length : 4.96 in
Height : 19.77 in
Orientation : Vertical
Elbow : No

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.020	0.114	0.051	0.000
100.040	0.228	0.073	0.000
100.080	0.457	0.103	0.000
100.160	0.915	0.146	0.000
100.240	1.374	0.178	0.000
100.320	1.834	0.206	0.000
100.400	2.295	0.230	0.000
100.480	2.756	0.252	0.000
100.560	3.219	0.272	0.000
100.640	3.682	0.291	0.000
100.720	4.146	0.309	0.000
100.800	4.611	0.326	0.000
100.880	5.077	0.341	0.000
100.960	5.544	0.357	0.000
101.040	6.012	0.371	0.000
101.120	6.481	0.385	0.000
101.200	6.950	0.399	0.000
101.280	7.421	0.412	0.000
101.360	7.892	0.425	0.000
101.440	8.364	0.437	0.000
101.520	8.837	0.449	0.000
101.600	9.311	0.460	0.000
101.680	9.786	0.472	0.000
101.760	10.262	0.483	0.000
101.840	10.739	0.494	0.000
101.920	11.216	0.504	0.000
102.000	11.695	0.515	0.000
102.080	12.174	0.525	0.000
102.160	12.655	0.535	0.000
102.240	13.136	0.545	0.000
102.268	13.306	0.548	0.000
102.296	13.475	0.552	0.000
102.325	13.645	0.555	0.000
102.353	13.815	0.558	0.000
102.373	13.936	0.565	0.000
102.393	14.057	0.574	0.000
102.413	14.178	0.585	0.000
102.433	14.299	0.598	0.000
102.513	14.783	0.658	0.000
102.593	15.268	0.729	0.000
102.673	15.754	0.806	0.000
102.753	16.241	0.885	0.000
102.833	16.729	0.979	0.000
102.913	17.218	1.083	0.000
102.993	17.708	1.193	0.000
103.073	18.198	1.311	0.000
103.153	18.690	1.434	0.000
103.233	19.183	1.563	0.000
103.313	19.676	1.698	0.000

103.393	20.170	1.838	0.000
103.473	20.665	1.983	0.000
103.553	21.162	2.133	0.000
103.633	21.659	2.288	0.000
103.713	22.157	2.448	0.000
103.793	22.656	2.611	0.000
103.873	23.155	2.780	0.000
103.905	23.354	2.848	0.000
103.936	23.553	2.916	0.000
103.968	23.753	2.986	0.000
104.000	23.952	3.056	0.000
104.020	24.078	3.201	0.000
104.040	24.203	3.431	0.000
104.060	24.329	3.715	0.000
104.080	24.454	4.043	0.000
104.100	24.580	4.409	0.000
104.120	24.706	4.810	0.000
104.140	24.831	5.242	0.000
104.160	24.957	5.702	0.000
104.240	25.461	7.796	0.000
104.320	25.966	10.233	0.000
104.400	26.472	12.952	0.000
104.480	26.979	15.899	0.000
104.560	27.487	19.024	0.000
104.640	27.995	22.276	0.000
104.720	28.505	25.525	0.000
104.800	29.016	28.771	0.000
104.880	29.527	31.981	0.000
104.960	30.039	35.102	0.000
105.040	30.553	38.086	0.000
105.120	31.067	40.888	0.000
105.200	31.582	43.469	0.000
105.280	32.098	45.801	0.000
105.360	32.615	47.866	0.000
105.440	33.133	49.658	0.000
105.520	33.652	51.192	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	102.339
01/18/1941	101.338
12/20/1941	101.902
11/23/1942	102.772
10/17/1943	101.228
02/07/1945	102.279
02/06/1946	101.608
12/05/1946	102.266
10/19/1947	102.427
02/22/1949	102.027
01/22/1950	102.587
02/09/1951	103.021
10/03/1951	101.651
01/18/1953	102.718
01/22/1954	101.901
11/19/1954	101.860
01/06/1956	103.136
02/26/1957	101.965
01/17/1958	102.043
01/13/1959	102.684
11/21/1959	102.282
11/24/1960	102.790
12/24/1961	101.652
11/30/1962	101.664
11/19/1963	101.849
12/01/1964	102.095
01/14/1966	102.306
12/13/1966	102.724
01/20/1968	102.060
12/11/1968	102.302
01/27/1970	102.579
12/07/1970	102.464
03/05/1972	103.639
12/26/1972	102.979
12/27/1973	102.355
12/27/1974	101.959
02/27/1976	102.379
08/26/1977	101.459
12/15/1977	102.750
03/05/1979	101.614
12/18/1979	103.619
12/30/1980	102.189
10/06/1981	103.318
03/09/1983	102.543
03/21/1984	101.760
11/11/1984	101.780
01/19/1986	102.427
11/24/1986	103.326
04/06/1988	102.184

04/05/1989	102.442
01/09/1990	103.284
11/24/1990	103.792
01/31/1992	102.544
04/11/1993	101.586
03/03/1994	101.727
12/27/1994	102.850
02/09/1996	103.834
01/02/1997	103.632
10/08/1997	101.775
11/26/1998	103.678
02/28/2000	102.422
05/05/2001	101.522
12/20/2001	101.474
11/26/2002	103.493
10/24/2003	102.090
02/08/2005	101.554
11/28/2005	102.662
11/27/2006	102.272
01/07/2008	102.409
02/18/2009	103.443
01/10/2010	102.533
11/17/2010	103.147
10/02/2011	102.217
01/20/2013	103.830
01/28/2014	102.292
04/22/2015	101.779
01/04/2016	103.462
11/01/2016	102.066
01/31/2018	102.134
01/12/2019	102.475
04/21/2020	101.847
11/24/2020	102.982
12/21/2021	101.970
03/30/2023	102.076
01/25/2024	102.567
12/22/2024	103.310
01/04/2026	102.970
01/29/2027	101.802
02/23/2028	102.113
01/13/2029	102.326
01/26/2030	103.192
03/04/2031	102.284
01/21/2032	102.594
12/24/2032	102.019
11/16/2033	103.585
02/19/2035	102.303
02/27/2036	102.364
03/09/2037	101.092
12/15/2037	102.710
12/11/2038	101.522
01/14/2040	102.234
12/25/2040	102.525
04/15/2042	102.537
02/26/2043	102.406
03/21/2044	102.042
11/28/2044	102.199
02/23/2046	102.046
02/02/2047	101.848
12/10/2047	102.915
03/17/2049	102.004
02/09/2050	101.754
04/09/2051	101.617
04/17/2052	101.360
12/10/2052	101.816
12/11/2053	101.904
11/01/2054	103.331
02/07/2056	103.807
01/02/2057	103.546
11/25/2057	101.999
12/02/2058	103.026
01/23/2060	101.655
01/15/2061	102.466
01/03/2062	102.122
01/02/2063	102.211
12/23/2063	103.072
12/02/2064	101.859
11/04/2065	101.313
12/15/2066	103.046
01/20/2068	102.846
09/23/2069	101.464
12/14/2069	101.409
12/19/2070	101.506
11/03/2071	101.893
12/25/2072	104.117
12/15/2073	102.669
11/24/2074	101.630
10/30/2075	103.115
08/26/2077	101.098
12/02/2077	101.933
03/05/2079	101.568
12/17/2079	103.689
11/21/2080	103.152
02/19/2082	102.913
02/20/2083	102.814

11/26/2083	103.364
12/14/2084	102.665
11/01/2085	102.242
11/23/2086	102.419
12/09/2087	102.123
11/05/2088	102.500
11/10/2089	102.458
12/09/2090	103.419
01/31/2092	103.095
11/07/2092	101.574
12/14/2093	101.776
12/27/2094	102.467
12/14/2095	102.740
10/28/2096	102.867

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	101.092
1.01	101.098
1.02	101.228
1.02	101.313
1.03	101.338
1.04	101.360
1.04	101.409
1.05	101.459
1.06	101.464
1.06	101.474
1.07	101.506
1.08	101.522
1.09	101.522
1.09	101.554
1.10	101.568
1.11	101.574
1.12	101.586
1.12	101.608
1.13	101.614
1.14	101.617
1.15	101.630
1.16	101.651
1.17	101.652
1.18	101.655
1.18	101.664
1.19	101.727
1.20	101.754
1.21	101.760
1.22	101.775
1.23	101.776
1.24	101.779
1.25	101.780
1.26	101.802
1.27	101.816
1.28	101.847
1.29	101.848
1.30	101.849
1.31	101.859
1.32	101.860
1.33	101.893
1.35	101.901
1.36	101.902
1.37	101.904
1.38	101.933
1.39	101.959
1.40	101.965
1.42	101.970
1.43	101.999
1.44	102.004
1.46	102.019
1.47	102.027
1.48	102.042
1.50	102.043
1.51	102.046
1.53	102.060
1.54	102.066
1.56	102.076
1.57	102.090
1.59	102.095
1.60	102.113
1.62	102.122
1.64	102.123
1.65	102.134
1.67	102.184
1.69	102.189
1.71	102.199
1.73	102.211
1.75	102.217
1.77	102.234
1.79	102.242
1.81	102.266
1.83	102.272
1.85	102.279
1.87	102.282
1.89	102.284
1.92	102.292

1.94	102.302
1.96	102.303
1.99	102.306
2.01	102.326
2.04	102.339
2.07	102.355
2.09	102.364
2.12	102.379
2.15	102.406
2.18	102.409
2.21	102.419
2.24	102.422
2.27	102.427
2.31	102.427
2.34	102.442
2.38	102.458
2.41	102.464
2.45	102.466
2.49	102.467
2.53	102.475
2.57	102.500
2.61	102.525
2.65	102.533
2.70	102.537
2.75	102.543
2.80	102.544
2.85	102.567
2.90	102.579
2.95	102.587
3.01	102.594
3.07	102.662
3.13	102.665
3.19	102.669
3.26	102.684
3.32	102.710
3.40	102.718
3.47	102.724
3.55	102.740
3.63	102.750
3.72	102.772
3.80	102.790
3.90	102.814
4.00	102.846
4.10	102.850
4.21	102.867
4.32	102.913
4.45	102.915
4.58	102.970
4.71	102.979
4.86	102.982
5.01	103.021
5.17	103.026
5.35	103.046
5.54	103.072
5.74	103.095
5.95	103.115
6.19	103.136
6.44	103.147
6.71	103.152
7.01	103.192
7.33	103.284
7.69	103.310
8.08	103.318
8.52	103.326
9.00	103.331
9.55	103.364
10.16	103.419
10.86	103.443
11.66	103.462
12.59	103.493
13.68	103.546
14.97	103.585
16.54	103.619
18.47	103.632
20.92	103.639
24.10	103.678
28.44	103.689
34.68	103.792
44.42	103.807
61.77	103.830
101.36	103.834
282.36	104.117

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	101.465
1.11-Year	101.576
1.25-Year	101.781
2.00-Year	102.315
3.33-Year	102.712
5-Year	103.019
10-Year	103.407
25-Year	103.634
50-Year	103.810
100-Year	103.834

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	22230.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 13.201 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 43836. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 65754. cu-ft
2-Year Discharge Rate : 0.554 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		Postdevelopment Runoff	
Date	Annual Max Q (cfs)	Date	Annual Max Q (cfs)
04/30/1940	1.482	12/07/1939	0.557
01/31/1941	0.569	01/18/1941	0.421
12/15/1941	1.489	12/20/1941	0.502
02/10/1943	0.593	11/23/1942	0.907
01/23/1944	0.445	10/17/1943	0.403
02/07/1945	1.847	02/07/1945	0.550
02/05/1946	1.133	02/06/1946	0.462
02/02/1947	1.155	12/05/1946	0.548
03/21/1948	1.996	10/19/1947	0.594
02/22/1949	1.002	02/22/1949	0.518
03/03/1950	4.126	01/22/1950	0.724
02/09/1951	1.652	02/09/1951	1.235
01/24/1952	0.434	10/03/1951	0.468
01/11/1953	0.617	01/18/1953	0.850
01/22/1954	1.002	01/22/1954	0.502
04/12/1955	0.468	11/19/1954	0.496
03/04/1956	1.074	01/06/1956	1.409
02/25/1957	0.890	02/26/1957	0.510
01/16/1958	1.080	01/17/1958	0.520
01/12/1959	1.160	01/13/1959	0.816
12/15/1959	1.241	11/21/1959	0.550
02/14/1961	1.062	11/24/1960	0.928
03/04/1962	0.569	12/24/1961	0.468
02/03/1963	0.631	11/30/1962	0.469
01/01/1964	1.009	11/19/1963	0.495
02/26/1965	1.250	12/01/1964	0.527
01/06/1966	0.771	01/14/1966	0.553
01/19/1967	1.951	12/13/1966	0.857
02/03/1968	1.009	01/20/1968	0.522
12/03/1968	1.083	12/11/1968	0.552
01/13/1970	0.839	01/27/1970	0.717
12/06/1970	0.955	12/07/1970	0.621
02/28/1972	2.574	03/05/1972	2.301
01/13/1973	0.929	12/26/1972	1.174
02/18/1974	1.389	12/27/1973	0.559
12/26/1974	1.681	12/27/1974	0.509
01/27/1976	1.164	02/27/1976	0.567
05/31/1977	0.164	08/26/1977	0.440
12/10/1977	0.985	12/15/1977	0.882
03/04/1979	0.969	03/05/1979	0.462
12/17/1979	1.561	12/18/1979	2.261
12/26/1980	0.619	12/30/1980	0.539
10/06/1981	1.978	10/06/1981	1.707

01/05/1983	1.110	03/09/1983	0.685
03/14/1984	1.060	03/21/1984	0.483
02/11/1985	0.708	11/11/1984	0.486
01/18/1986	2.333	01/19/1986	0.594
11/24/1986	2.057	11/24/1986	1.722
04/06/1988	1.028	04/06/1988	0.538
04/05/1989	1.133	04/05/1989	0.605
01/09/1990	3.740	01/09/1990	1.649
11/24/1990	3.187	11/24/1990	2.609
01/27/1992	0.973	01/31/1992	0.686
06/09/1993	0.821	04/11/1993	0.458
03/03/1994	0.625	03/03/1994	0.478
02/19/1995	1.309	12/27/1994	1.002
02/09/1996	3.032	02/09/1996	2.697
01/02/1997	1.896	01/02/1997	2.287
02/28/1998	0.698	10/08/1997	0.485
11/25/1998	1.866	11/26/1998	2.379
03/26/2000	1.045	02/28/2000	0.591
05/05/2001	0.801	05/05/2001	0.449
05/03/2002	2.858	12/20/2001	0.442
03/31/2003	2.188	11/26/2002	2.022
01/23/2004	0.534	10/24/2003	0.526
02/07/2005	0.921	02/08/2005	0.454
02/27/2006	1.183	11/28/2005	0.796
12/14/2006	0.875	11/27/2006	0.549
03/21/2008	1.454	01/07/2008	0.583
02/17/2009	2.257	02/18/2009	1.930
01/10/2010	1.516	01/10/2010	0.676
11/17/2010	1.968	11/17/2010	1.425
01/31/2012	1.252	10/02/2011	0.542
01/20/2013	2.860	01/20/2013	2.690
12/06/2013	1.204	01/28/2014	0.551
03/30/2015	0.730	04/22/2015	0.485
01/04/2016	2.080	01/04/2016	1.963
03/07/2017	0.602	11/01/2016	0.523
01/31/2018	1.122	01/31/2018	0.532
03/30/2019	1.110	01/12/2019	0.630
04/14/2020	0.730	04/21/2020	0.495
02/10/2021	1.801	11/24/2020	1.178
03/26/2022	0.532	12/21/2021	0.511
03/30/2023	1.284	03/30/2023	0.524
01/19/2024	1.008	01/25/2024	0.706
12/22/2024	2.107	12/22/2024	1.694
03/09/2026	1.338	01/04/2026	1.162
01/27/2027	1.166	01/29/2027	0.489
02/19/2028	1.445	02/23/2028	0.529
12/04/2028	1.119	01/13/2029	0.555
02/16/2030	1.494	01/26/2030	1.498
12/30/2030	1.398	03/04/2031	0.550
01/20/2032	2.245	01/21/2032	0.731
03/01/2033	0.633	12/24/2032	0.517
01/15/2034	2.537	11/16/2033	2.196
02/19/2035	1.239	02/19/2035	0.552
03/24/2036	1.169	02/27/2036	0.562
03/09/2037	0.048	03/09/2037	0.380
12/15/2037	0.855	12/15/2037	0.842
02/07/2039	0.618	12/11/2038	0.449
01/14/2040	2.318	01/14/2040	0.544
12/25/2040	1.313	12/25/2040	0.669
02/20/2042	1.378	04/15/2042	0.680
03/31/2043	2.065	02/26/2043	0.581
05/01/2044	0.815	03/21/2044	0.520
02/11/2045	0.942	11/28/2044	0.540
02/16/2046	1.186	02/23/2046	0.521
02/01/2047	0.745	02/02/2047	0.495
04/21/2048	0.662	12/10/2047	1.086
03/16/2049	0.744	03/17/2049	0.515
12/04/2049	1.257	02/09/2050	0.482
04/06/2051	0.976	04/09/2051	0.463
04/17/2052	0.586	04/17/2052	0.424
06/04/2053	2.250	12/10/2052	0.490
04/08/2054	0.418	12/11/2053	0.502
02/17/2055	1.914	11/01/2054	1.730
02/07/2056	3.481	02/07/2056	2.640
11/19/2056	3.810	01/02/2057	2.122
01/24/2058	1.321	11/25/2057	0.515
12/28/2058	1.519	12/02/2058	1.243
01/19/2060	0.569	01/23/2060	0.468
01/10/2061	1.234	01/15/2061	0.623
02/03/2062	4.694	01/03/2062	0.530
12/29/2062	0.993	01/02/2063	0.541
12/23/2063	1.791	12/23/2063	1.309
11/30/2064	0.856	12/02/2064	0.496
01/13/2066	0.470	11/04/2065	0.417
01/19/2067	1.194	12/15/2066	1.272
01/18/2068	2.459	01/20/2068	0.996
01/04/2069	0.661	09/23/2069	0.440
04/09/2070	0.558	12/14/2069	0.432
02/14/2071	0.612	12/19/2070	0.447
02/27/2072	0.655	11/03/2071	0.501
12/25/2072	2.740	12/25/2072	4.742
03/16/2074	1.473	12/15/2073	0.802
01/23/2075	0.318	11/24/2074	0.465
03/24/2076	1.637	10/30/2075	1.376
03/02/2077	0.184	08/26/2077	0.381

12/02/2077	0.616	12/02/2077	0.506
02/25/2079	0.826	03/05/2079	0.456
12/17/2079	3.059	12/17/2079	2.400
11/21/2080	1.350	11/21/2080	1.433
02/13/2082	1.686	02/19/2082	1.083
02/19/2083	1.034	02/20/2083	0.957
11/26/2083	1.253	11/26/2083	1.788
12/14/2084	0.867	12/14/2084	0.798
01/18/2086	1.221	11/01/2085	0.545
12/21/2086	1.146	11/23/2086	0.589
01/14/2088	0.754	12/09/2087	0.530
11/05/2088	1.340	11/05/2088	0.649
01/07/2090	0.630	11/10/2089	0.617
12/04/2090	1.164	12/09/2090	1.886
04/28/2092	1.997	01/31/2092	1.345
03/22/2093	0.561	11/07/2092	0.457
03/01/2094	0.470	12/14/2093	0.485
02/18/2095	0.743	12/27/2094	0.623
01/14/2096	0.936	12/14/2095	0.872
01/29/2097	2.059	10/28/2096	1.023

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.048	1.00	0.380
1.01	0.164	1.01	0.381
1.02	0.184	1.02	0.403
1.02	0.318	1.02	0.417
1.03	0.418	1.03	0.421
1.04	0.434	1.04	0.424
1.04	0.445	1.04	0.432
1.05	0.468	1.05	0.440
1.06	0.470	1.06	0.440
1.06	0.470	1.06	0.442
1.07	0.532	1.07	0.447
1.08	0.534	1.08	0.449
1.09	0.558	1.09	0.449
1.09	0.561	1.09	0.454
1.10	0.569	1.10	0.456
1.11	0.569	1.11	0.457
1.12	0.569	1.12	0.458
1.12	0.586	1.12	0.462
1.13	0.593	1.13	0.462
1.14	0.602	1.14	0.463
1.15	0.612	1.15	0.465
1.16	0.616	1.16	0.468
1.17	0.617	1.17	0.468
1.18	0.618	1.18	0.468
1.18	0.619	1.18	0.469
1.19	0.625	1.19	0.478
1.20	0.630	1.20	0.482
1.21	0.631	1.21	0.483
1.22	0.633	1.22	0.485
1.23	0.655	1.23	0.485
1.24	0.661	1.24	0.485
1.25	0.662	1.25	0.486
1.26	0.698	1.26	0.489
1.27	0.708	1.27	0.490
1.28	0.730	1.28	0.495
1.29	0.730	1.29	0.495
1.30	0.743	1.30	0.495
1.31	0.744	1.31	0.496
1.32	0.745	1.32	0.496
1.33	0.754	1.33	0.501
1.35	0.771	1.35	0.502
1.36	0.801	1.36	0.502
1.37	0.815	1.37	0.502
1.38	0.821	1.38	0.506
1.39	0.826	1.39	0.509
1.40	0.839	1.40	0.510
1.42	0.855	1.42	0.511
1.43	0.856	1.43	0.515
1.44	0.867	1.44	0.515
1.46	0.875	1.46	0.517
1.47	0.890	1.47	0.518
1.48	0.921	1.48	0.520
1.50	0.929	1.50	0.520
1.51	0.936	1.51	0.521
1.53	0.942	1.53	0.522
1.54	0.955	1.54	0.523
1.56	0.969	1.56	0.524
1.57	0.973	1.57	0.526
1.59	0.976	1.59	0.527
1.60	0.985	1.60	0.529
1.62	0.993	1.62	0.530
1.64	1.002	1.64	0.530
1.65	1.002	1.65	0.532
1.67	1.008	1.67	0.538
1.69	1.009	1.69	0.539
1.71	1.009	1.71	0.540
1.73	1.028	1.73	0.541

1.75	1.034	1.75	0.542
1.77	1.045	1.77	0.544
1.79	1.060	1.79	0.545
1.81	1.062	1.81	0.548
1.83	1.074	1.83	0.549
1.85	1.080	1.85	0.550
1.87	1.083	1.87	0.550
1.89	1.110	1.89	0.550
1.92	1.110	1.92	0.551
1.94	1.119	1.94	0.552
1.96	1.122	1.96	0.552
1.99	1.133	1.99	0.553
2.01	1.133	2.01	0.555
2.04	1.146	2.04	0.557
2.07	1.155	2.07	0.559
2.09	1.160	2.09	0.562
2.12	1.164	2.12	0.567
2.15	1.164	2.15	0.581
2.18	1.166	2.18	0.583
2.21	1.169	2.21	0.589
2.24	1.183	2.24	0.591
2.27	1.186	2.27	0.594
2.31	1.194	2.31	0.594
2.34	1.204	2.34	0.605
2.38	1.221	2.38	0.617
2.41	1.234	2.41	0.621
2.45	1.239	2.45	0.623
2.49	1.241	2.49	0.623
2.53	1.250	2.53	0.630
2.57	1.252	2.57	0.649
2.61	1.253	2.61	0.669
2.65	1.257	2.65	0.676
2.70	1.284	2.70	0.680
2.75	1.309	2.75	0.685
2.80	1.313	2.80	0.686
2.85	1.321	2.85	0.706
2.90	1.338	2.90	0.717
2.95	1.340	2.95	0.724
3.01	1.350	3.01	0.731
3.07	1.378	3.07	0.796
3.13	1.389	3.13	0.798
3.19	1.398	3.19	0.802
3.26	1.445	3.26	0.816
3.32	1.454	3.32	0.842
3.40	1.473	3.40	0.850
3.47	1.482	3.47	0.857
3.55	1.489	3.55	0.872
3.63	1.494	3.63	0.882
3.72	1.516	3.72	0.907
3.80	1.519	3.80	0.928
3.90	1.561	3.90	0.957
4.00	1.637	4.00	0.996
4.10	1.652	4.10	1.002
4.21	1.681	4.21	1.023
4.32	1.686	4.32	1.083
4.45	1.791	4.45	1.086
4.58	1.801	4.58	1.162
4.71	1.847	4.71	1.174
4.86	1.866	4.86	1.178
5.01	1.896	5.01	1.235
5.17	1.914	5.17	1.243
5.35	1.951	5.35	1.272
5.54	1.968	5.54	1.309
5.74	1.978	5.74	1.345
5.95	1.996	5.95	1.376
6.19	1.997	6.19	1.409
6.44	2.057	6.44	1.425
6.71	2.059	6.71	1.433
7.01	2.065	7.01	1.498
7.33	2.080	7.33	1.649
7.69	2.107	7.69	1.694
8.08	2.188	8.08	1.707
8.52	2.245	8.52	1.722
9.00	2.250	9.00	1.730
9.55	2.257	9.55	1.788
10.16	2.318	10.16	1.886
10.86	2.333	10.86	1.930
11.66	2.459	11.66	1.963
12.59	2.537	12.59	2.022
13.68	2.574	13.68	2.122
14.97	2.740	14.97	2.196
16.54	2.858	16.54	2.261
18.47	2.860	18.47	2.287
20.92	3.032	20.92	2.301
24.10	3.059	24.10	2.379
28.44	3.187	28.44	2.400
34.68	3.481	34.68	2.609
44.42	3.740	44.42	2.640
61.77	3.810	61.77	2.690
101.36	4.126	101.36	2.697
282.36	4.694	282.36	4.742

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.133	2-Year	0.554
5-Year	1.894	5-Year	1.231
10-Year	2.303	10-Year	1.861
25-Year	3.087	25-Year	2.383
50-Year	3.765	50-Year	2.658
100-Year	4.118	100-Year	2.697
200-Year	4.503	200-Year	4.054

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
0.023	2.3680E-01	0.024	7.4778E-01
0.047	1.8183E-01	0.047	7.2449E-01
0.070	1.4869E-01	0.071	6.9267E-01
0.094	1.2486E-01	0.095	6.5423E-01
0.117	1.0625E-01	0.119	6.1284E-01
0.141	9.1206E-02	0.142	5.7203E-01
0.164	7.8997E-02	0.166	5.2772E-01
0.188	6.8893E-02	0.190	4.8471E-01
0.211	6.0447E-02	0.213	4.4036E-01
0.235	5.3261E-02	0.237	3.9517E-01
0.258	4.7175E-02	0.261	3.4947E-01
0.282	4.1832E-02	0.285	3.0344E-01
0.305	3.7205E-02	0.308	2.5830E-01
0.329	3.3133E-02	0.332	2.1552E-01
0.352	2.9638E-02	0.356	1.7692E-01
0.376	2.6430E-02	0.379	1.4150E-01
0.399	2.3649E-02	0.403	1.1140E-01
0.422	2.1262E-02	0.427	8.5281E-02
0.446	1.9150E-02	0.451	6.3732E-02
0.469	1.7267E-02	0.474	4.6113E-02
0.493	1.5521E-02	0.498	3.2243E-02
0.516	1.4036E-02	0.522	2.1445E-02
0.540	1.2639E-02	0.545	1.3282E-02
0.567	1.1278E-02	0.567	9.2911E-03
0.587	1.0348E-02	0.593	7.9081E-03
0.610	9.4640E-03	0.616	7.1810E-03
0.634	8.5860E-03	0.640	6.5652E-03
0.657	7.8178E-03	0.664	5.9363E-03
0.681	7.1543E-03	0.688	5.4526E-03
0.704	6.5998E-03	0.711	5.0042E-03
0.728	6.0489E-03	0.735	4.6338E-03
0.751	5.5507E-03	0.759	4.3176E-03
0.774	5.1067E-03	0.782	4.0230E-03
0.798	4.7255E-03	0.806	3.7060E-03
0.821	4.3558E-03	0.830	3.4425E-03
0.845	4.0223E-03	0.854	3.1847E-03
0.868	3.7104E-03	0.877	2.9357E-03
0.892	3.4331E-03	0.901	2.7248E-03
0.915	3.1833E-03	0.925	2.5386E-03
0.939	2.9472E-03	0.948	2.3559E-03
0.962	2.7284E-03	0.972	2.1848E-03
0.986	2.5234E-03	0.996	2.0534E-03
1.009	2.3581E-03	1.020	1.9205E-03
1.033	2.1942E-03	1.043	1.7999E-03
1.056	2.0324E-03	1.067	1.6945E-03
1.080	1.9003E-03	1.091	1.5949E-03
1.103	1.7624E-03	1.114	1.5090E-03
1.133	1.6051E-03	1.133	1.4265E-03
1.150	1.5285E-03	1.162	1.3263E-03
1.173	1.4180E-03	1.186	1.2512E-03
1.197	1.3350E-03	1.209	1.1790E-03
1.220	1.2722E-03	1.233	1.1227E-03
1.244	1.2043E-03	1.257	1.0642E-03
1.267	1.1350E-03	1.280	1.0086E-03
1.291	1.0729E-03	1.304	9.5737E-04
1.314	1.0130E-03	1.328	9.0972E-04
1.338	9.6532E-04	1.352	8.6135E-04
1.361	9.1478E-04	1.375	8.1586E-04
1.385	8.6712E-04	1.399	7.7759E-04
1.408	8.1225E-04	1.423	7.3716E-04
1.432	7.6388E-04	1.446	6.9817E-04
1.455	7.2489E-04	1.470	6.6929E-04
1.479	6.8807E-04	1.494	6.3536E-04
1.502	6.5124E-04	1.518	6.0865E-04
1.525	6.2092E-04	1.541	5.7399E-04
1.549	5.8915E-04	1.565	5.4655E-04
1.572	5.6749E-04	1.589	5.2056E-04

1.596	5.4511E-04	1.612	4.9890E-04
1.619	5.2562E-04	1.636	4.7291E-04
1.643	5.0251E-04	1.660	4.4764E-04
1.666	4.7796E-04	1.683	4.2381E-04
1.690	4.5197E-04	1.707	4.0288E-04
1.713	4.3609E-04	1.731	3.8266E-04
1.737	4.1154E-04	1.755	3.6894E-04
1.760	3.9349E-04	1.778	3.5161E-04
1.784	3.6894E-04	1.802	3.2995E-04
1.807	3.5450E-04	1.826	3.1479E-04
1.831	3.3573E-04	1.849	3.0035E-04
1.854	3.1985E-04	1.873	2.8447E-04
1.878	3.0252E-04	1.894	2.7285E-04
1.894	2.9160E-04	1.921	2.5559E-04
1.924	2.7653E-04	1.944	2.3970E-04
1.948	2.6281E-04	1.968	2.2454E-04
1.971	2.5198E-04	1.992	2.0794E-04
1.995	2.3609E-04	2.015	1.9494E-04
2.018	2.2599E-04	2.039	1.7617E-04
2.042	2.1371E-04	2.063	1.6534E-04
2.065	2.0360E-04	2.087	1.5379E-04
2.089	1.9638E-04	2.110	1.3862E-04
2.112	1.8339E-04	2.134	1.2779E-04
2.136	1.7689E-04	2.158	1.1552E-04
2.159	1.6245E-04	2.181	1.1119E-04
2.183	1.5306E-04	2.205	9.9636E-05
2.206	1.4440E-04	2.229	9.2416E-05
2.230	1.3140E-04	2.253	8.0864E-05
2.253	1.2563E-04	2.276	7.2922E-05
2.276	1.1552E-04	2.300	6.6424E-05
2.300	1.0830E-04	2.324	6.1370E-05
2.323	1.0108E-04	2.347	5.7038E-05
2.347	9.3860E-05	2.371	5.1262E-05
2.370	8.9528E-05	2.395	4.6930E-05
2.394	8.1586E-05	2.419	4.4042E-05
2.417	7.4366E-05	2.442	4.2598E-05
2.441	7.1478E-05	2.466	3.9710E-05
2.464	6.5702E-05	2.490	3.8266E-05
2.488	6.2814E-05	2.513	3.1768E-05
2.511	5.9926E-05	2.537	3.0324E-05
2.535	5.7760E-05	2.561	2.6714E-05
2.558	5.0540E-05	2.584	2.0938E-05
2.582	4.7652E-05	2.608	1.8772E-05
2.605	4.2598E-05	2.632	1.6606E-05
2.629	3.8266E-05	2.656	1.2274E-05
2.652	3.4656E-05	2.679	1.2274E-05
2.675	3.2490E-05	2.703	9.3860E-06
2.699	3.0324E-05	2.727	8.6640E-06
2.722	2.8158E-05	2.750	8.6640E-06
2.746	2.4548E-05	2.774	8.6640E-06
2.769	2.3826E-05	2.798	7.9420E-06
2.793	2.1660E-05	2.822	7.9420E-06
2.816	1.9494E-05	2.845	7.9420E-06
2.840	1.8772E-05	2.869	7.2200E-06
2.863	1.5162E-05	2.893	6.4980E-06
2.887	1.4440E-05	2.916	6.4980E-06
2.910	1.3718E-05	2.940	6.4980E-06
2.934	1.2274E-05	2.964	5.7760E-06
2.957	1.1552E-05	2.988	5.7760E-06
2.981	1.0830E-05	3.011	5.7760E-06
3.004	1.0830E-05	3.035	5.0540E-06
3.028	1.0108E-05	3.059	5.0540E-06
3.051	8.6640E-06	3.082	5.0540E-06
3.074	7.9420E-06	3.106	4.3320E-06
3.098	7.9420E-06	3.130	4.3320E-06
3.121	7.9420E-06	3.154	4.3320E-06
3.145	7.9420E-06	3.177	4.3320E-06
3.168	7.9420E-06	3.201	4.3320E-06
3.192	7.2200E-06	3.225	4.3320E-06
3.215	7.2200E-06	3.248	3.6100E-06
3.239	7.2200E-06	3.272	3.6100E-06
3.262	7.2200E-06	3.296	3.6100E-06
3.286	7.2200E-06	3.320	3.6100E-06
3.309	7.2200E-06	3.343	3.6100E-06
3.333	7.2200E-06	3.367	3.6100E-06
3.356	7.2200E-06	3.391	3.6100E-06
3.380	7.2200E-06	3.414	3.6100E-06
3.403	7.2200E-06	3.438	3.6100E-06
3.426	6.4980E-06	3.462	3.6100E-06
3.450	6.4980E-06	3.486	3.6100E-06
3.473	6.4980E-06	3.509	3.6100E-06
3.497	5.7760E-06	3.533	3.6100E-06
3.520	5.0540E-06	3.557	3.6100E-06
3.544	5.0540E-06	3.580	3.6100E-06
3.567	5.0540E-06	3.604	3.6100E-06
3.591	5.0540E-06	3.628	3.6100E-06
3.614	4.3320E-06	3.651	3.6100E-06
3.638	4.3320E-06	3.675	3.6100E-06
3.661	4.3320E-06	3.699	3.6100E-06
3.685	3.6100E-06	3.723	2.8880E-06
3.708	3.6100E-06	3.746	2.8880E-06
3.732	3.6100E-06	3.765	2.8953E-06
3.765	2.8016E-06	3.794	2.8880E-06
3.779	2.8880E-06	3.817	2.8880E-06
3.802	2.8880E-06	3.841	2.8880E-06

3.825	2.1660E-06	3.865	2.8880E-06
3.849	2.1660E-06	3.889	2.8880E-06
3.872	2.1660E-06	3.912	2.8880E-06
3.896	2.1660E-06	3.936	2.1660E-06
3.919	2.1660E-06	3.960	2.1660E-06
3.943	2.1660E-06	3.983	2.1660E-06
3.966	2.1660E-06	4.007	2.1660E-06
3.990	2.1660E-06	4.031	2.1660E-06
4.013	2.1660E-06	4.055	2.1660E-06
4.037	2.1660E-06	4.078	2.1660E-06
4.060	2.1660E-06	4.102	2.1660E-06
4.084	2.1660E-06	4.126	2.1660E-06
4.107	2.1660E-06	4.149	2.1660E-06
4.131	7.2200E-07	4.173	2.1660E-06
4.154	7.2200E-07	4.197	2.1660E-06
4.177	7.2200E-07	4.221	2.1660E-06
4.201	7.2200E-07	4.244	2.1660E-06
4.224	7.2200E-07	4.268	2.1660E-06
4.248	7.2200E-07	4.292	2.1660E-06
4.271	7.2200E-07	4.315	2.1660E-06
4.295	7.2200E-07	4.339	1.4440E-06
4.318	7.2200E-07	4.363	1.4440E-06
4.342	7.2200E-07	4.387	1.4440E-06
4.365	7.2200E-07	4.410	1.4440E-06
4.389	7.2200E-07	4.434	1.4440E-06
4.412	7.2200E-07	4.458	1.4440E-06
4.436	7.2200E-07	4.481	1.4440E-06
4.459	7.2200E-07	4.505	1.4440E-06
4.483	7.2200E-07	4.529	1.4440E-06
4.506	7.2200E-07	4.553	1.4440E-06
4.530	7.2200E-07	4.576	1.4440E-06
4.553	7.2200E-07	4.600	1.4440E-06
4.576	7.2200E-07	4.624	1.4440E-06
4.600	7.2200E-07	4.647	1.4440E-06
4.623	7.2200E-07	4.671	7.2200E-07
4.647	7.2200E-07	4.695	7.2200E-07
4.670	7.2200E-07	4.718	7.2200E-07
4.694	7.2200E-07	4.742	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-19.5%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-11.0%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.7%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 11:24 AM**

Input File Name: **pond4.fld**
Project Name: Burien NERA
Analysis Title: Combined Stormwater Wetland and Detention Pond 4
Comments: 95% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

		Developed	
	Predeveloped	**To Node**	**Bypass Node**
Till Forest	14.274	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	0.353	0.000
Wetland	0.000	0.344	0.000
Impervious	0.000	13.577	0.000
Subbasin Total	**14.274**	**14.274**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped			Developed		
	Surface	**Interflow**	**Grnd Water**	**Surface**	**Interflow**	**Grnd Water**
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** Predeveloped Structure Summary ***

***** Postdeveloped Structure Summary *****

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used

Pond Floor Elevation	:	100.00	ft				
Riser Crest Elevation	:	104.00	ft				
Max Pond Elevation	:	104.50	ft				
Max Storage Depth			:	4.00	ft		
Pond Bottom Length	:	252.9	ft				
Pond Bottom Width			:	252.9	ft		
Pond Side Slopes			: L1= 3.00	L2= 3.00	W1= 3.00	W2= 3.00	ft/ft
Pond Bottom Area			:	63945.	sq-ft		
Area at Riser Crest El	:	76,659.	sq-ft				
			:	1.760	acres		
Volume at Riser Crest	:	280,822.	cu-ft				
			: 6.447		ac-ft		
Area at Max Elevation	:	78329.	sq-ft				
			:	1.798	acres		
Vol at Max Elevation	:	319,568.	cu-ft				
			:	7.336	ac-ft		
Hydraulic Conductivity	:	0.00			in/hr		
Depth to Water Table	:	100.00			ft		

Riser Geometry

Riser Structure Type	: Circular		
Riser Diameter		: 24.00	in
Common Length		: 0.105	ft
Riser Crest Elevation	: 104.00	ft	

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---

Device Type : Circular Orifice			
Invert Elevation	:	100.00	ft
Diameter	:	1.87	in
Orientation	: Horizontal		
Elbow	: No		

--- Device Number 2 ---

Device Type : Vertical Rectangular Orifice			
Invert Elevation	:	102.46	ft
Length	:	1.26	in
Height	:	18.45	in
Orientation	: Vertical		
Elbow	: No		

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.018	0.026	0.012	0.000
100.035	0.051	0.017	0.000
100.070	0.103	0.025	0.000
100.140	0.206	0.035	0.000
100.210	0.310	0.043	0.000
100.280	0.414	0.049	0.000
100.350	0.518	0.055	0.000
100.420	0.623	0.060	0.000
100.490	0.728	0.065	0.000
100.560	0.833	0.070	0.000
100.630	0.939	0.074	0.000
100.700	1.045	0.078	0.000
100.770	1.151	0.082	0.000
100.840	1.258	0.085	0.000
100.910	1.365	0.089	0.000
100.980	1.472	0.092	0.000
101.050	1.580	0.095	0.000
101.120	1.688	0.099	0.000
101.190	1.797	0.102	0.000
101.260	1.905	0.104	0.000
101.330	2.015	0.107	0.000
101.400	2.124	0.110	0.000
101.470	2.234	0.113	0.000
101.540	2.344	0.116	0.000
101.610	2.455	0.118	0.000
101.680	2.566	0.121	0.000
101.750	2.677	0.123	0.000
101.820	2.789	0.126	0.000
101.890	2.901	0.128	0.000
101.960	3.013	0.130	0.000
102.030	3.126	0.133	0.000
102.100	3.239	0.135	0.000
102.170	3.352	0.137	0.000
102.240	3.466	0.139	0.000

102.310	3.580	0.141	0.000
102.380	3.695	0.144	0.000
102.401	3.728	0.144	0.000
102.421	3.762	0.145	0.000
102.442	3.796	0.145	0.000
102.462	3.830	0.146	0.000
102.480	3.858	0.147	0.000
102.497	3.887	0.149	0.000
102.515	3.916	0.151	0.000
102.532	3.945	0.154	0.000
102.602	4.060	0.165	0.000
102.672	4.177	0.179	0.000
102.742	4.293	0.196	0.000
102.812	4.410	0.214	0.000
102.882	4.527	0.234	0.000
102.952	4.644	0.256	0.000
103.022	4.762	0.280	0.000
103.092	4.880	0.304	0.000
103.162	4.999	0.330	0.000
103.232	5.118	0.357	0.000
103.302	5.237	0.385	0.000
103.372	5.357	0.415	0.000
103.442	5.477	0.445	0.000
103.512	5.597	0.477	0.000
103.582	5.718	0.509	0.000
103.652	5.839	0.542	0.000
103.722	5.961	0.577	0.000
103.792	6.083	0.612	0.000
103.862	6.205	0.648	0.000
103.897	6.265	0.666	0.000
103.931	6.326	0.685	0.000
103.966	6.386	0.703	0.000
104.000	6.447	0.722	0.000
104.018	6.478	0.780	0.000
104.035	6.508	0.878	0.000
104.053	6.539	1.002	0.000
104.070	6.570	1.147	0.000
104.088	6.601	1.310	0.000
104.105	6.632	1.489	0.000
104.123	6.663	1.683	0.000
104.140	6.694	1.890	0.000
104.210	6.818	2.834	0.000
104.280	6.943	3.925	0.000
104.350	7.067	5.115	0.000
104.420	7.193	6.360	0.000
104.490	7.318	7.610	0.000
104.560	7.444	8.819	0.000
104.630	7.571	9.938	0.000
104.700	7.697	10.916	0.000
104.770	7.825	11.744	0.000
104.840	7.952	12.412	0.000
104.910	8.080	12.935	0.000
104.980	8.208	13.354	0.000
105.050	8.337	13.919	0.000
105.050	8.048	14.101	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	102.392
01/18/1941	101.390
12/20/1941	101.987
11/23/1942	102.867
10/17/1943	101.275
02/07/1945	102.327
02/06/1946	101.678
12/05/1946	102.378
10/19/1947	102.473
02/22/1949	102.100
03/05/1950	102.696
02/09/1951	103.126
10/03/1951	101.707
01/18/1953	102.842
01/22/1954	101.991
11/19/1954	101.929
01/06/1956	103.266
02/26/1957	102.014
01/17/1958	102.114
01/13/1959	102.774
11/21/1959	102.323
11/24/1960	102.872
12/24/1961	101.726
11/30/1962	101.734
11/23/1963	101.951
12/01/1964	102.163
01/14/1966	102.423
12/13/1966	102.823
01/20/1968	102.164

12/11/1968	102.412
01/27/1970	102.674
12/07/1970	102.556
03/05/1972	103.760
12/26/1972	103.092
12/27/1973	102.504
12/27/1974	102.034
02/27/1976	102.479
06/04/1977	101.509
12/15/1977	102.835
03/05/1979	101.696
12/18/1979	103.723
12/30/1980	102.272
10/06/1981	103.374
03/09/1983	102.677
03/21/1984	101.851
11/11/1984	101.846
01/19/1986	102.476
11/24/1986	103.388
04/06/1988	102.250
04/05/1989	102.554
01/09/1990	103.335
11/24/1990	103.891
02/01/1992	102.618
04/11/1993	101.669
03/03/1994	101.797
12/27/1994	102.954
02/09/1996	103.938
01/02/1997	103.747
10/08/1997	101.848
11/26/1998	103.770
02/28/2000	102.535
05/05/2001	101.564
12/20/2001	101.551
11/26/2002	103.607
10/24/2003	102.141
02/08/2005	101.611
11/28/2005	102.758
11/27/2006	102.360
01/07/2008	102.466
02/18/2009	103.533
01/10/2010	102.613
11/17/2010	103.244
10/02/2011	102.261
01/20/2013	103.921
01/28/2014	102.385
04/22/2015	101.880
01/04/2016	103.588
11/01/2016	102.135
01/31/2018	102.216
01/12/2019	102.547
04/21/2020	101.945
11/24/2020	103.047
12/21/2021	102.028
03/30/2023	102.124
01/25/2024	102.652
12/24/2024	103.394
01/05/2026	103.071
12/13/2026	101.884
02/23/2028	102.184
01/13/2029	102.463
01/26/2030	103.324
03/04/2031	102.394
01/21/2032	102.662
12/24/2032	102.081
11/16/2033	103.674
02/19/2035	102.392
02/27/2036	102.439
03/09/2037	101.150
12/15/2037	102.810
12/11/2038	101.600
01/14/2040	102.309
12/25/2040	102.601
04/15/2042	102.628
02/26/2043	102.511
03/21/2044	102.137
11/28/2044	102.309
12/08/2045	102.149
02/02/2047	101.916
12/10/2047	103.015
03/17/2049	102.094
02/09/2050	101.843
04/09/2051	101.681
04/17/2052	101.413
12/10/2052	101.888
12/11/2053	101.966
11/01/2054	103.390
02/08/2056	103.899
01/02/2057	103.673
11/25/2057	102.073
12/02/2058	103.152
01/23/2060	101.732
01/15/2061	102.564
01/03/2062	102.213
01/02/2063	102.303

12/23/2063	103.160
12/02/2064	101.920
11/04/2065	101.378
12/15/2066	103.157
01/20/2068	102.940
09/23/2069	101.513
12/14/2069	101.459
12/19/2070	101.579
11/03/2071	101.955
12/25/2072	104.120
12/15/2073	102.761
11/24/2074	101.705
10/30/2075	103.222
08/26/2077	101.135
12/02/2077	102.003
03/05/2079	101.652
12/17/2079	103.761
11/21/2080	103.236
02/19/2082	103.031
02/20/2083	102.911
11/26/2083	103.491
12/14/2084	102.780
11/01/2085	102.328
11/23/2086	102.479
12/09/2087	102.211
11/05/2088	102.560
11/10/2089	102.544
12/09/2090	103.549
01/31/2092	103.189
11/07/2092	101.646
12/14/2093	101.854
12/27/2094	102.578
12/14/2095	102.869
03/19/2097	102.983

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	101.135
1.01	101.150
1.02	101.275
1.02	101.378
1.03	101.390
1.04	101.413
1.04	101.459
1.05	101.509
1.06	101.513
1.06	101.551
1.07	101.564
1.08	101.579
1.09	101.600
1.09	101.611
1.10	101.646
1.11	101.652
1.12	101.669
1.12	101.678
1.13	101.681
1.14	101.696
1.15	101.705
1.16	101.707
1.17	101.726
1.18	101.732
1.18	101.734
1.19	101.797
1.20	101.843
1.21	101.846
1.22	101.848
1.23	101.851
1.24	101.854
1.25	101.880
1.26	101.884
1.27	101.888
1.28	101.916
1.29	101.920
1.30	101.929
1.31	101.945
1.32	101.951
1.33	101.955
1.35	101.966
1.36	101.987
1.37	101.991
1.38	102.003
1.39	102.014
1.40	102.028
1.42	102.034
1.43	102.073
1.44	102.081
1.46	102.094
1.47	102.100
1.48	102.114
1.50	102.124
1.51	102.135
1.53	102.137

1.54	102.141
1.56	102.149
1.57	102.163
1.59	102.164
1.60	102.184
1.62	102.211
1.64	102.213
1.65	102.216
1.67	102.250
1.69	102.261
1.71	102.272
1.73	102.303
1.75	102.309
1.77	102.309
1.79	102.323
1.81	102.327
1.83	102.328
1.85	102.360
1.87	102.378
1.89	102.385
1.92	102.392
1.94	102.392
1.96	102.394
1.99	102.412
2.01	102.423
2.04	102.439
2.07	102.463
2.09	102.466
2.12	102.473
2.15	102.476
2.18	102.479
2.21	102.479
2.24	102.504
2.27	102.511
2.31	102.535
2.34	102.544
2.38	102.547
2.41	102.554
2.45	102.556
2.49	102.560
2.53	102.564
2.57	102.578
2.61	102.601
2.65	102.613
2.70	102.618
2.75	102.628
2.80	102.652
2.85	102.662
2.90	102.674
2.95	102.677
3.01	102.696
3.07	102.758
3.13	102.761
3.19	102.774
3.26	102.780
3.32	102.810
3.40	102.823
3.47	102.835
3.55	102.842
3.63	102.867
3.72	102.869
3.80	102.872
3.90	102.911
4.00	102.940
4.10	102.954
4.21	102.983
4.32	103.015
4.45	103.031
4.58	103.047
4.71	103.071
4.86	103.092
5.01	103.126
5.17	103.152
5.35	103.157
5.54	103.160
5.74	103.189
5.95	103.222
6.19	103.236
6.44	103.244
6.71	103.266
7.01	103.324
7.33	103.335
7.69	103.374
8.08	103.388
8.52	103.390
9.00	103.394
9.55	103.491
10.16	103.533
10.86	103.549
11.66	103.588
12.59	103.607
13.68	103.673
14.97	103.674
16.54	103.723
18.47	103.747

20.92	103.760
24.10	103.761
28.44	103.770
34.68	103.891
44.42	103.899
61.77	103.921
101.36	103.938
282.36	104.120

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	101.512
1.11-Year	101.655
1.25-Year	101.881
2.00-Year	102.418
3.33-Year	102.813
5-Year	103.124
10-Year	103.529
25-Year	103.755
50-Year	103.899
100-Year	103.938

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	5952.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 3.533 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 11541. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 17311. cu-ft
2-Year Discharge Rate : 0.145 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		Postdevelopment Runoff	
Date	Annual Max Q (cfs)	Date	Annual Max Q (cfs)
04/30/1940	0.386	12/07/1939	0.144
01/31/1941	0.148	01/18/1941	0.110
12/15/1941	0.388	12/20/1941	0.131
02/10/1943	0.154	11/23/1942	0.230
01/23/1944	0.116	10/17/1943	0.105
02/07/1945	0.481	02/07/1945	0.142
02/05/1946	0.295	02/06/1946	0.121
02/02/1947	0.301	12/05/1946	0.144
03/21/1948	0.520	10/19/1947	0.147
02/22/1949	0.261	02/22/1949	0.135
03/03/1950	1.075	03/05/1950	0.185
02/09/1951	0.430	02/09/1951	0.317
01/24/1952	0.113	10/03/1951	0.122
01/11/1953	0.161	01/18/1953	0.223
01/22/1954	0.261	01/22/1954	0.131
04/12/1955	0.122	11/19/1954	0.129
03/04/1956	0.280	01/06/1956	0.371
02/25/1957	0.232	02/26/1957	0.132
01/16/1958	0.281	01/17/1958	0.135
01/12/1959	0.302	01/13/1959	0.204
12/15/1959	0.323	11/21/1959	0.142
02/14/1961	0.276	11/24/1960	0.232
03/04/1962	0.148	12/24/1961	0.122
02/03/1963	0.164	11/30/1962	0.123
01/01/1964	0.263	11/23/1963	0.130
02/26/1965	0.326	12/01/1964	0.137
01/06/1966	0.201	01/14/1966	0.145
01/19/1967	0.508	12/13/1966	0.217
02/03/1968	0.263	01/20/1968	0.137
12/03/1968	0.282	12/11/1968	0.145
01/13/1970	0.219	01/27/1970	0.180
12/06/1970	0.249	12/07/1970	0.158
02/28/1972	0.670	03/05/1972	0.596
01/13/1973	0.242	12/26/1972	0.304
02/18/1974	0.362	12/27/1973	0.150

12/26/1974	0.438	12/27/1974	0.133
01/27/1976	0.303	02/27/1976	0.147
05/31/1977	0.043	06/04/1977	0.114
12/10/1977	0.257	12/15/1977	0.221
03/04/1979	0.252	03/05/1979	0.121
12/17/1979	0.406	12/18/1979	0.577
12/26/1980	0.161	12/30/1980	0.140
10/06/1981	0.515	10/06/1981	0.415
01/05/1983	0.289	03/09/1983	0.180
03/14/1984	0.276	03/21/1984	0.127
02/11/1985	0.184	11/11/1984	0.126
01/18/1986	0.608	01/19/1986	0.147
11/24/1986	0.536	11/24/1986	0.422
04/06/1988	0.268	04/06/1988	0.140
04/05/1989	0.295	04/05/1989	0.157
01/09/1990	0.974	01/09/1990	0.399
11/24/1990	0.830	11/24/1990	0.663
01/27/1992	0.254	02/01/1992	0.168
06/09/1993	0.214	04/11/1993	0.120
03/03/1994	0.163	03/03/1994	0.125
02/19/1995	0.341	12/27/1994	0.257
02/09/1996	0.790	02/09/1996	0.688
01/02/1997	0.494	01/02/1997	0.589
02/28/1998	0.182	10/08/1997	0.127
11/25/1998	0.486	11/26/1998	0.601
03/26/2000	0.272	02/28/2000	0.154
05/05/2001	0.209	05/05/2001	0.116
05/03/2002	0.744	12/20/2001	0.116
03/31/2003	0.570	11/26/2002	0.521
01/23/2004	0.139	10/24/2003	0.136
02/07/2005	0.240	02/08/2005	0.118
02/27/2006	0.308	11/28/2005	0.200
12/14/2006	0.228	11/27/2006	0.143
03/21/2008	0.379	01/07/2008	0.146
02/17/2009	0.588	02/18/2009	0.486
01/10/2010	0.395	01/10/2010	0.167
11/17/2010	0.513	11/17/2010	0.362
01/31/2012	0.326	10/02/2011	0.140
01/20/2013	0.745	01/20/2013	0.679
12/06/2013	0.313	01/28/2014	0.144
03/30/2015	0.190	04/22/2015	0.128
01/04/2016	0.542	01/04/2016	0.512
03/07/2017	0.157	11/01/2016	0.136
01/31/2018	0.292	01/31/2018	0.139
03/30/2019	0.289	01/12/2019	0.156
04/14/2020	0.190	04/21/2020	0.130
02/10/2021	0.469	11/24/2020	0.288
03/26/2022	0.139	12/21/2021	0.133
03/30/2023	0.334	03/30/2023	0.136
01/19/2024	0.263	01/25/2024	0.175
12/22/2024	0.549	12/24/2024	0.424
03/09/2026	0.349	01/05/2026	0.297
01/27/2027	0.304	12/13/2026	0.128
02/19/2028	0.376	02/23/2028	0.138
12/04/2028	0.291	01/13/2029	0.146
02/16/2030	0.389	01/26/2030	0.394
12/30/2030	0.364	03/04/2031	0.144
01/20/2032	0.585	01/21/2032	0.177
03/01/2033	0.165	12/24/2032	0.134
01/15/2034	0.661	11/16/2033	0.553
02/19/2035	0.323	02/19/2035	0.144
03/24/2036	0.305	02/27/2036	0.145
03/09/2037	0.012	03/09/2037	0.100
12/15/2037	0.223	12/15/2037	0.214
02/07/2039	0.161	12/11/2038	0.118
01/14/2040	0.604	01/14/2040	0.141
12/25/2040	0.342	12/25/2040	0.165
02/20/2042	0.359	04/15/2042	0.170
03/31/2043	0.538	02/26/2043	0.151
05/01/2044	0.212	03/21/2044	0.136
02/11/2045	0.245	11/28/2044	0.141
02/16/2046	0.309	12/08/2045	0.136
02/01/2047	0.194	02/02/2047	0.129
04/21/2048	0.173	12/10/2047	0.277
03/16/2049	0.194	03/17/2049	0.135
12/04/2049	0.327	02/09/2050	0.126
04/06/2051	0.254	04/09/2051	0.121
04/17/2052	0.153	04/17/2052	0.111
06/04/2053	0.586	12/10/2052	0.128
04/08/2054	0.109	12/11/2053	0.131
02/17/2055	0.499	11/01/2054	0.423
02/07/2056	0.907	02/08/2056	0.668
11/19/2056	0.992	01/02/2057	0.553
01/24/2058	0.344	11/25/2057	0.134
12/28/2058	0.396	12/02/2058	0.326
01/19/2060	0.148	01/23/2060	0.123
01/10/2061	0.321	01/15/2061	0.159
02/03/2062	1.222	01/03/2062	0.138
12/29/2062	0.259	01/02/2063	0.141
12/23/2063	0.467	12/23/2063	0.329
11/30/2064	0.223	12/02/2064	0.129
01/13/2066	0.122	11/04/2065	0.109
01/19/2067	0.311	12/15/2066	0.328
01/18/2068	0.640	01/20/2068	0.252
01/04/2069	0.172	09/23/2069	0.115

04/09/2070	0.145	12/14/2069	0.112
02/14/2071	0.159	12/19/2070	0.117
02/27/2072	0.171	11/03/2071	0.130
12/25/2072	0.714	12/25/2072	1.654
03/16/2074	0.384	12/15/2073	0.201
01/23/2075	0.083	11/24/2074	0.122
03/24/2076	0.426	10/30/2075	0.353
03/02/2077	0.048	08/26/2077	0.099
12/02/2077	0.161	12/02/2077	0.132
02/25/2079	0.215	03/05/2079	0.120
12/17/2079	0.797	12/17/2079	0.596
11/21/2080	0.352	11/21/2080	0.359
02/13/2082	0.439	02/19/2082	0.283
02/19/2083	0.269	02/20/2083	0.243
11/26/2083	0.326	11/26/2083	0.467
12/14/2084	0.226	12/14/2084	0.206
01/18/2086	0.318	11/01/2085	0.142
12/21/2086	0.298	11/23/2086	0.147
01/14/2088	0.196	12/09/2087	0.138
11/05/2088	0.349	11/05/2088	0.158
01/07/2090	0.164	11/10/2089	0.156
12/04/2090	0.303	12/09/2090	0.494
04/28/2092	0.520	01/31/2092	0.341
03/22/2093	0.146	11/07/2092	0.119
03/01/2094	0.122	12/14/2093	0.127
02/18/2095	0.193	12/27/2094	0.161
01/14/2096	0.244	12/14/2095	0.231
01/29/2097	0.536	03/19/2097	0.267

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.012	1.00	0.099
1.01	0.043	1.01	0.100
1.02	0.048	1.02	0.105
1.02	0.083	1.02	0.109
1.03	0.109	1.03	0.110
1.04	0.113	1.04	0.111
1.04	0.116	1.04	0.112
1.05	0.122	1.05	0.114
1.06	0.122	1.06	0.115
1.06	0.122	1.06	0.116
1.07	0.139	1.07	0.116
1.08	0.139	1.08	0.117
1.09	0.145	1.09	0.118
1.09	0.146	1.09	0.118
1.10	0.148	1.10	0.119
1.11	0.148	1.11	0.120
1.12	0.148	1.12	0.120
1.12	0.153	1.12	0.121
1.13	0.154	1.13	0.121
1.14	0.157	1.14	0.121
1.15	0.159	1.15	0.122
1.16	0.161	1.16	0.122
1.17	0.161	1.17	0.122
1.18	0.161	1.18	0.123
1.18	0.161	1.18	0.123
1.19	0.163	1.19	0.125
1.20	0.164	1.20	0.126
1.21	0.164	1.21	0.126
1.22	0.165	1.22	0.127
1.23	0.171	1.23	0.127
1.24	0.172	1.24	0.127
1.25	0.173	1.25	0.128
1.26	0.182	1.26	0.128
1.27	0.184	1.27	0.128
1.28	0.190	1.28	0.129
1.29	0.190	1.29	0.129
1.30	0.193	1.30	0.129
1.31	0.194	1.31	0.130
1.32	0.194	1.32	0.130
1.33	0.196	1.33	0.130
1.35	0.201	1.35	0.131
1.36	0.209	1.36	0.131
1.37	0.212	1.37	0.131
1.38	0.214	1.38	0.132
1.39	0.215	1.39	0.132
1.40	0.219	1.40	0.133
1.42	0.223	1.42	0.133
1.43	0.223	1.43	0.134
1.44	0.226	1.44	0.134
1.46	0.228	1.46	0.135
1.47	0.232	1.47	0.135
1.48	0.240	1.48	0.135
1.50	0.242	1.50	0.136
1.51	0.244	1.51	0.136
1.53	0.245	1.53	0.136
1.54	0.249	1.54	0.136
1.56	0.252	1.56	0.136
1.57	0.254	1.57	0.137
1.59	0.254	1.59	0.137

1.60	0.257	1.60	0.138
1.62	0.259	1.62	0.138
1.64	0.261	1.64	0.138
1.65	0.261	1.65	0.139
1.67	0.263	1.67	0.140
1.69	0.263	1.69	0.140
1.71	0.263	1.71	0.140
1.73	0.268	1.73	0.141
1.75	0.269	1.75	0.141
1.77	0.272	1.77	0.141
1.79	0.276	1.79	0.142
1.81	0.276	1.81	0.142
1.83	0.280	1.83	0.142
1.85	0.281	1.85	0.143
1.87	0.282	1.87	0.144
1.89	0.289	1.89	0.144
1.92	0.289	1.92	0.144
1.94	0.291	1.94	0.144
1.96	0.292	1.96	0.144
1.99	0.295	1.99	0.145
2.01	0.295	2.01	0.145
2.04	0.298	2.04	0.145
2.07	0.301	2.07	0.146
2.09	0.302	2.09	0.146
2.12	0.303	2.12	0.147
2.15	0.303	2.15	0.147
2.18	0.304	2.18	0.147
2.21	0.305	2.21	0.147
2.24	0.308	2.24	0.150
2.27	0.309	2.27	0.151
2.31	0.311	2.31	0.154
2.34	0.313	2.34	0.156
2.38	0.318	2.38	0.156
2.41	0.321	2.41	0.157
2.45	0.323	2.45	0.158
2.49	0.323	2.49	0.158
2.53	0.326	2.53	0.159
2.57	0.326	2.57	0.161
2.61	0.326	2.61	0.165
2.65	0.327	2.65	0.167
2.70	0.334	2.70	0.168
2.75	0.341	2.75	0.170
2.80	0.342	2.80	0.175
2.85	0.344	2.85	0.177
2.90	0.349	2.90	0.180
2.95	0.349	2.95	0.180
3.01	0.352	3.01	0.185
3.07	0.359	3.07	0.200
3.13	0.362	3.13	0.201
3.19	0.364	3.19	0.204
3.26	0.376	3.26	0.206
3.32	0.379	3.32	0.214
3.40	0.384	3.40	0.217
3.47	0.386	3.47	0.221
3.55	0.388	3.55	0.223
3.63	0.389	3.63	0.230
3.72	0.395	3.72	0.231
3.80	0.396	3.80	0.232
3.90	0.406	3.90	0.243
4.00	0.426	4.00	0.252
4.10	0.430	4.10	0.257
4.21	0.438	4.21	0.267
4.32	0.439	4.32	0.277
4.45	0.467	4.45	0.283
4.58	0.469	4.58	0.288
4.71	0.481	4.71	0.297
4.86	0.486	4.86	0.304
5.01	0.494	5.01	0.317
5.17	0.499	5.17	0.326
5.35	0.508	5.35	0.328
5.54	0.513	5.54	0.329
5.74	0.515	5.74	0.341
5.95	0.520	5.95	0.353
6.19	0.520	6.19	0.359
6.44	0.536	6.44	0.362
6.71	0.536	6.71	0.371
7.01	0.538	7.01	0.394
7.33	0.542	7.33	0.399
7.69	0.549	7.69	0.415
8.08	0.570	8.08	0.422
8.52	0.585	8.52	0.423
9.00	0.586	9.00	0.424
9.55	0.588	9.55	0.467
10.16	0.604	10.16	0.486
10.86	0.608	10.86	0.494
11.66	0.640	11.66	0.512
12.59	0.661	12.59	0.521
13.68	0.670	13.68	0.553
14.97	0.714	14.97	0.553
16.54	0.744	16.54	0.577
18.47	0.745	18.47	0.589
20.92	0.790	20.92	0.596
24.10	0.797	24.10	0.596
28.44	0.830	28.44	0.601
34.68	0.907	34.68	0.663

44.42	0.974	44.42	0.668
61.77	0.992	61.77	0.679
101.36	1.075	101.36	0.688
282.36	1.222	282.36	1.654

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.295	2-Year	0.145
5-Year	0.493	5-Year	0.316
10-Year	0.600	10-Year	0.481
25-Year	0.804	25-Year	0.597
50-Year	0.981	50-Year	0.672
100-Year	1.072	100-Year	0.688
200-Year	1.173	200-Year	1.329

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
6.112E-03	2.3680E-01	8.271E-03	7.4757E-01
0.012	1.8183E-01	0.017	7.1223E-01
0.018	1.4869E-01	0.025	6.6472E-01
0.024	1.2486E-01	0.033	6.1039E-01
0.031	1.0625E-01	0.041	5.5386E-01
0.037	9.1206E-02	0.050	4.9653E-01
0.043	7.8997E-02	0.058	4.3711E-01
0.049	6.8893E-02	0.066	3.7660E-01
0.055	6.0447E-02	0.074	3.1538E-01
0.061	5.3261E-02	0.083	2.5445E-01
0.067	4.7175E-02	0.091	1.9917E-01
0.073	4.1832E-02	0.099	1.4961E-01
0.079	3.7205E-02	0.108	1.0831E-01
0.086	3.3133E-02	0.116	7.5332E-02
0.092	2.9638E-02	0.124	4.9403E-02
0.098	2.6430E-02	0.132	3.0177E-02
0.104	2.3649E-02	0.141	1.6849E-02
0.110	2.1262E-02	0.148	1.0169E-02
0.116	1.9150E-02	0.157	7.9435E-03
0.122	1.7267E-02	0.165	6.8121E-03
0.128	1.5521E-02	0.174	5.9912E-03
0.134	1.4036E-02	0.182	5.3103E-03
0.141	1.2639E-02	0.190	4.7789E-03
0.148	1.1278E-02	0.199	4.3010E-03
0.153	1.0348E-02	0.207	3.9392E-03
0.159	9.4640E-03	0.215	3.5616E-03
0.165	8.5860E-03	0.223	3.2425E-03
0.171	7.8178E-03	0.232	2.9241E-03
0.177	7.1543E-03	0.240	2.6541E-03
0.183	6.5998E-03	0.248	2.4050E-03
0.189	6.0489E-03	0.256	2.1776E-03
0.196	5.5507E-03	0.265	2.0014E-03
0.202	5.1067E-03	0.273	1.8476E-03
0.208	4.7255E-03	0.281	1.7018E-03
0.214	4.3558E-03	0.290	1.5537E-03
0.220	4.0223E-03	0.295	1.4727E-03
0.226	3.7104E-03	0.306	1.3234E-03
0.232	3.4331E-03	0.314	1.2310E-03
0.238	3.1833E-03	0.323	1.1292E-03
0.244	2.9472E-03	0.331	1.0440E-03
0.251	2.7284E-03	0.339	9.7109E-04
0.257	2.5234E-03	0.347	9.0756E-04
0.263	2.3581E-03	0.356	8.4763E-04
0.269	2.1942E-03	0.364	7.8915E-04
0.275	2.0324E-03	0.372	7.3283E-04
0.281	1.9003E-03	0.380	6.8662E-04
0.287	1.7624E-03	0.389	6.3103E-04
0.295	1.6051E-03	0.397	5.8265E-04
0.299	1.5285E-03	0.405	5.4367E-04
0.306	1.4180E-03	0.414	5.0612E-04
0.312	1.3350E-03	0.422	4.7219E-04
0.318	1.2722E-03	0.430	4.4403E-04
0.324	1.2043E-03	0.438	4.2165E-04
0.330	1.1350E-03	0.447	3.9782E-04
0.336	1.0729E-03	0.455	3.7400E-04
0.342	1.0130E-03	0.463	3.5017E-04
0.348	9.6532E-04	0.471	3.2273E-04
0.355	9.1478E-04	0.480	3.0180E-04
0.361	8.6712E-04	0.488	2.7725E-04
0.367	8.1225E-04	0.493	2.6345E-04
0.373	7.6388E-04	0.505	2.3393E-04
0.379	7.2489E-04	0.513	2.1010E-04

0.385	6.8807E-04	0.521	1.9061E-04
0.391	6.5124E-04	0.529	1.7039E-04
0.397	6.2092E-04	0.538	1.4440E-04
0.403	5.8915E-04	0.546	1.2563E-04
0.410	5.6749E-04	0.554	1.1119E-04
0.416	5.4511E-04	0.562	9.7470E-05
0.422	5.2562E-04	0.571	8.5918E-05
0.428	5.0251E-04	0.579	7.5088E-05
0.434	4.7796E-04	0.587	6.6424E-05
0.440	4.5197E-04	0.596	5.6316E-05
0.446	4.3609E-04	0.604	4.8374E-05
0.452	4.1154E-04	0.612	4.5486E-05
0.458	3.9349E-04	0.620	4.3320E-05
0.465	3.6894E-04	0.629	3.9710E-05
0.471	3.5450E-04	0.637	3.4656E-05
0.477	3.3573E-04	0.645	3.1046E-05
0.483	3.1985E-04	0.653	2.5992E-05
0.489	3.0252E-04	0.662	1.9494E-05
0.493	2.9160E-04	0.670	1.2996E-05
0.501	2.7653E-04	0.678	1.0830E-05
0.507	2.6281E-04	0.687	8.6640E-06
0.513	2.5198E-04	0.695	7.2200E-06
0.520	2.3609E-04	0.703	5.7760E-06
0.526	2.2599E-04	0.711	5.7760E-06
0.532	2.1371E-04	0.720	5.0540E-06
0.538	2.0360E-04	0.728	5.0540E-06
0.544	1.9638E-04	0.736	5.0540E-06
0.550	1.8339E-04	0.744	5.0540E-06
0.556	1.7689E-04	0.753	5.0540E-06
0.562	1.6245E-04	0.761	5.0540E-06
0.568	1.5306E-04	0.769	5.0540E-06
0.575	1.4440E-04	0.778	4.3320E-06
0.581	1.3140E-04	0.786	4.3320E-06
0.587	1.2563E-04	0.794	4.3320E-06
0.593	1.1552E-04	0.802	4.3320E-06
0.599	1.0830E-04	0.811	4.3320E-06
0.605	1.0108E-04	0.819	4.3320E-06
0.611	9.3860E-05	0.827	4.3320E-06
0.617	8.9528E-05	0.835	4.3320E-06
0.623	8.1586E-05	0.844	4.3320E-06
0.630	7.4366E-05	0.852	4.3320E-06
0.636	7.1478E-05	0.860	4.3320E-06
0.642	6.5702E-05	0.869	4.3320E-06
0.648	6.2814E-05	0.877	4.3320E-06
0.654	5.9926E-05	0.885	4.3320E-06
0.660	5.7760E-05	0.893	4.3320E-06
0.666	5.0540E-05	0.902	4.3320E-06
0.672	4.7652E-05	0.910	4.3320E-06
0.678	4.2598E-05	0.918	4.3320E-06
0.685	3.8266E-05	0.926	4.3320E-06
0.691	3.4656E-05	0.935	4.3320E-06
0.697	3.2490E-05	0.943	4.3320E-06
0.703	3.0324E-05	0.951	4.3320E-06
0.709	2.8158E-05	0.959	3.6100E-06
0.715	2.4548E-05	0.968	3.6100E-06
0.721	2.3826E-05	0.976	2.8880E-06
0.727	2.1660E-05	0.981	2.8250E-06
0.733	1.9494E-05	0.993	2.8880E-06
0.740	1.8772E-05	1.001	2.8880E-06
0.746	1.5162E-05	1.009	2.8880E-06
0.752	1.4440E-05	1.017	2.8880E-06
0.758	1.3718E-05	1.026	2.8880E-06
0.764	1.2274E-05	1.034	2.8880E-06
0.770	1.1552E-05	1.042	2.8880E-06
0.776	1.0830E-05	1.050	2.8880E-06
0.782	1.0830E-05	1.059	2.8880E-06
0.788	1.0108E-05	1.067	2.8880E-06
0.795	8.6640E-06	1.075	2.8880E-06
0.801	7.9420E-06	1.084	2.8880E-06
0.807	7.9420E-06	1.092	2.8880E-06
0.813	7.9420E-06	1.100	2.8880E-06
0.819	7.9420E-06	1.108	2.8880E-06
0.825	7.9420E-06	1.117	2.8880E-06
0.831	7.2200E-06	1.125	2.8880E-06
0.837	7.2200E-06	1.133	2.8880E-06
0.843	7.2200E-06	1.141	2.8880E-06
0.850	7.2200E-06	1.150	2.8880E-06
0.856	7.2200E-06	1.158	2.8880E-06
0.862	7.2200E-06	1.166	2.8880E-06
0.868	7.2200E-06	1.175	2.8880E-06
0.874	7.2200E-06	1.183	2.8880E-06
0.880	7.2200E-06	1.191	2.8880E-06
0.886	7.2200E-06	1.199	2.8880E-06
0.892	6.4980E-06	1.208	2.8880E-06
0.898	6.4980E-06	1.216	2.8880E-06
0.905	6.4980E-06	1.224	2.8880E-06
0.911	5.7760E-06	1.232	2.8880E-06
0.917	5.0540E-06	1.241	2.8880E-06
0.923	5.0540E-06	1.249	2.1660E-06
0.929	5.0540E-06	1.257	2.1660E-06
0.935	5.0540E-06	1.266	2.1660E-06
0.941	4.3320E-06	1.274	2.1660E-06
0.947	4.3320E-06	1.282	2.1660E-06
0.953	4.3320E-06	1.290	2.1660E-06
0.960	3.6100E-06	1.299	2.1660E-06

0.966	3.6100E-06	1.307	2.1660E-06
0.972	3.6100E-06	1.315	2.1660E-06
0.981	2.8016E-06	1.323	2.1660E-06
0.984	2.8880E-06	1.332	2.1660E-06
0.990	2.8880E-06	1.340	2.1660E-06
0.996	2.1660E-06	1.348	2.1660E-06
1.002	2.1660E-06	1.357	2.1660E-06
1.008	2.1660E-06	1.365	2.1660E-06
1.015	2.1660E-06	1.373	2.1660E-06
1.021	2.1660E-06	1.381	2.1660E-06
1.027	2.1660E-06	1.390	2.1660E-06
1.033	2.1660E-06	1.398	2.1660E-06
1.039	2.1660E-06	1.406	2.1660E-06
1.045	2.1660E-06	1.414	2.1660E-06
1.051	2.1660E-06	1.423	2.1660E-06
1.057	2.1660E-06	1.431	2.1660E-06
1.064	2.1660E-06	1.439	2.1660E-06
1.070	2.1660E-06	1.448	2.1660E-06
1.076	7.2200E-07	1.456	2.1660E-06
1.082	7.2200E-07	1.464	1.4440E-06
1.088	7.2200E-07	1.472	1.4440E-06
1.094	7.2200E-07	1.481	1.4440E-06
1.100	7.2200E-07	1.489	1.4440E-06
1.106	7.2200E-07	1.497	1.4440E-06
1.112	7.2200E-07	1.505	1.4440E-06
1.119	7.2200E-07	1.514	1.4440E-06
1.125	7.2200E-07	1.522	1.4440E-06
1.131	7.2200E-07	1.530	1.4440E-06
1.137	7.2200E-07	1.538	7.2200E-07
1.143	7.2200E-07	1.547	7.2200E-07
1.149	7.2200E-07	1.555	7.2200E-07
1.155	7.2200E-07	1.563	7.2200E-07
1.161	7.2200E-07	1.572	7.2200E-07
1.167	7.2200E-07	1.580	7.2200E-07
1.174	7.2200E-07	1.588	7.2200E-07
1.180	7.2200E-07	1.596	7.2200E-07
1.186	7.2200E-07	1.605	7.2200E-07
1.192	7.2200E-07	1.613	7.2200E-07
1.198	7.2200E-07	1.621	7.2200E-07
1.204	7.2200E-07	1.629	7.2200E-07
1.210	7.2200E-07	1.638	7.2200E-07
1.216	7.2200E-07	1.646	7.2200E-07
1.222	7.2200E-07	1.654	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-14.0%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-8.3%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	0.7%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 11:41 AM**

Input File Name: **pondPR.fld**
Project Name: Burien NERA
Analysis Title: Combined Stormwater Wetland and Detention Pond PR
Comments: 85% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

	Predeveloped	To Node	Developed Bypass Node
Till Forest	28.541	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	2.697	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	1.275	0.000
Wetland	0.000	1.050	0.000
Impervious	0.000	23.519	0.000
Subbasin Total	**28.541**	**28.541**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped Surface	Predeveloped Interflow	Predeveloped Grnd Water	Developed Surface	Developed Interflow	Developed Grnd Water
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	Link Type	Downstream Node
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** Predeveloped Structure Summary ***

***** Postdeveloped Structure Summary *****

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used

Pond Floor Elevation	:	100.00	ft				
Riser Crest Elevation	:	106.00	ft				
Max Pond Elevation	:	107.00	ft				
Max Storage Depth	:	6.00	ft				
Pond Bottom Length	:	374.0	ft				
Pond Bottom Width	:	187.0	ft				
Pond Side Slopes			: L1= 3.00	L2= 3.00	W1= 3.00	W2= 3.00	ft/ft
Pond Bottom Area			: 69952.	sq-ft			
Area at Riser Crest El	:	91,446.	sq-ft				
			: 2.099	acres			
Volume at Riser Crest	:	482,755.	cu-ft				
			: 11.083		ac-ft		
Area at Max Elevation	:	95280.	sq-ft				
			: 2.187	acres			
Vol at Max Elevation	:	576,033.	cu-ft				
			: 13.224	ac-ft			
Hydraulic Conductivity	:	0.00		in/hr			
Depth to Water Table	:	100.00		ft			

Riser Geometry

Riser Structure Type	: Circular		
Riser Diameter		: 30.00	in
Common Length		: 0.108	ft
Riser Crest Elevation	: 106.00	ft	

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---

Device Type : Circular Orifice			
Invert Elevation	:	100.00	ft
Diameter	:	2.41	in
Orientation : Horizontal			
Elbow	: No		

--- Device Number 2 ---

Device Type : Vertical Rectangular Orifice			
Invert Elevation	:	103.56	ft
Length	:	1.30	in
Height	:	29.33	in
Orientation : Vertical			
Elbow	: No		

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.025	0.040	0.025	0.000
100.050	0.080	0.035	0.000
100.100	0.161	0.049	0.000
100.200	0.323	0.069	0.000
100.300	0.485	0.085	0.000
100.400	0.649	0.098	0.000
100.500	0.813	0.110	0.000
100.600	0.977	0.120	0.000
100.700	1.143	0.130	0.000
100.800	1.310	0.139	0.000
100.900	1.477	0.147	0.000
101.000	1.645	0.155	0.000
101.100	1.814	0.163	0.000
101.200	1.983	0.170	0.000
101.300	2.154	0.177	0.000
101.400	2.325	0.183	0.000
101.500	2.497	0.190	0.000
101.600	2.669	0.196	0.000
101.700	2.843	0.202	0.000
101.800	3.017	0.208	0.000
101.900	3.192	0.214	0.000
102.000	3.368	0.219	0.000
102.100	3.545	0.225	0.000
102.200	3.723	0.230	0.000
102.300	3.901	0.235	0.000
102.400	4.080	0.240	0.000
102.500	4.260	0.245	0.000
102.600	4.441	0.250	0.000
102.700	4.623	0.255	0.000
102.800	4.805	0.259	0.000
102.900	4.989	0.264	0.000
103.000	5.173	0.268	0.000
103.100	5.358	0.273	0.000
103.200	5.543	0.277	0.000

103.300	5.730	0.282	0.000
103.400	5.917	0.286	0.000
103.439	5.991	0.287	0.000
103.478	6.064	0.289	0.000
103.517	6.138	0.291	0.000
103.556	6.211	0.292	0.000
103.581	6.259	0.295	0.000
103.606	6.306	0.298	0.000
103.631	6.353	0.302	0.000
103.656	6.401	0.306	0.000
103.756	6.591	0.326	0.000
103.856	6.782	0.352	0.000
103.956	6.974	0.381	0.000
104.056	7.167	0.414	0.000
104.156	7.361	0.450	0.000
104.256	7.556	0.489	0.000
104.356	7.751	0.530	0.000
104.456	7.947	0.574	0.000
104.556	8.144	0.620	0.000
104.656	8.342	0.668	0.000
104.756	8.541	0.718	0.000
104.856	8.741	0.770	0.000
104.956	8.941	0.823	0.000
105.056	9.142	0.879	0.000
105.156	9.345	0.936	0.000
105.256	9.548	0.995	0.000
105.356	9.752	1.056	0.000
105.456	9.956	1.118	0.000
105.556	10.162	1.182	0.000
105.656	10.368	1.247	0.000
105.756	10.576	1.314	0.000
105.856	10.784	1.382	0.000
105.892	10.859	1.407	0.000
105.928	10.935	1.432	0.000
105.964	11.010	1.457	0.000
106.000	11.086	1.483	0.000
106.025	11.138	1.604	0.000
106.050	11.191	1.811	0.000
106.075	11.243	2.074	0.000
106.100	11.296	2.381	0.000
106.125	11.349	2.727	0.000
106.150	11.402	3.108	0.000
106.175	11.455	3.520	0.000
106.200	11.507	3.959	0.000
106.300	11.720	5.958	0.000
106.400	11.933	8.245	0.000
106.500	12.146	10.700	0.000
106.600	12.361	13.200	0.000
106.700	12.577	15.621	0.000
106.800	12.793	17.845	0.000
106.900	13.011	19.777	0.000
107.000	13.229	21.347	0.000
107.100	13.448	22.533	0.000
107.200	13.668	23.434	0.000
107.300	13.889	24.509	0.000
107.400	14.111	25.386	0.000
107.500	14.334	26.232	0.000
107.600	14.558	27.052	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	103.616
01/18/1941	102.101
12/20/1941	102.887
11/23/1942	104.111
10/17/1943	101.854
02/07/1945	103.576
02/06/1946	102.483
12/05/1946	103.290
10/19/1947	103.722
02/22/1949	103.178
01/22/1950	103.898
02/09/1951	104.560
10/03/1951	102.477
01/12/1953	104.095
01/22/1954	102.838
11/19/1954	102.787
01/06/1956	104.700
02/26/1957	103.137
01/17/1958	103.155
01/13/1959	104.022
11/21/1959	103.601
11/24/1960	104.235
12/24/1961	102.511
11/30/1962	102.525
11/19/1963	102.656
12/01/1964	103.224

01/07/1966	103.407
12/13/1966	104.035
01/20/1968	103.035
12/11/1968	103.454
01/27/1970	103.939
12/07/1970	103.656
03/05/1972	105.488
12/26/1972	104.530
03/02/1974	103.521
12/27/1974	102.940
02/27/1976	103.632
08/26/1977	102.260
12/15/1977	104.154
03/05/1979	102.422
12/18/1979	105.477
12/30/1980	103.352
10/06/1981	104.976
03/09/1983	103.759
03/21/1984	102.654
11/11/1984	102.686
01/19/1986	103.771
11/24/1986	104.996
04/06/1988	103.331
04/05/1989	103.616
01/09/1990	105.114
11/24/1990	105.622
01/31/1992	103.973
04/11/1993	102.381
03/03/1994	102.610
12/27/1994	104.202
02/09/1996	105.758
01/02/1997	105.480
10/08/1997	102.648
11/26/1998	105.458
02/28/2000	103.585
05/05/2001	102.434
11/15/2001	102.286
11/26/2002	105.220
10/24/2003	103.179
02/08/2005	102.420
11/28/2005	103.992
11/27/2006	103.388
01/07/2008	103.731
02/18/2009	105.280
01/10/2010	103.876
11/17/2010	104.718
10/02/2011	103.416
01/20/2013	105.727
01/28/2014	103.474
04/22/2015	102.608
01/04/2016	105.154
11/01/2016	103.074
01/31/2018	103.236
01/12/2019	103.816
04/21/2020	102.768
11/24/2020	104.497
12/21/2021	103.049
03/30/2023	103.300
01/25/2024	103.898
12/24/2024	104.973
01/04/2026	104.492
01/29/2027	102.842
02/23/2028	103.338
01/13/2029	103.396
01/26/2030	104.815
03/04/2031	103.455
01/21/2032	104.004
12/24/2032	103.139
11/16/2033	105.379
02/19/2035	103.462
02/27/2036	103.667
03/09/2037	101.602
12/15/2037	104.033
12/11/2038	102.257
01/14/2040	103.398
12/25/2040	103.821
04/15/2042	103.909
02/26/2043	103.676
03/21/2044	103.136
03/27/2045	103.358
02/23/2046	103.160
02/02/2047	102.862
12/10/2047	104.397
03/17/2049	103.019
12/04/2049	102.619
04/09/2051	102.576
04/17/2052	102.109
12/10/2052	102.696
12/11/2053	102.881
11/01/2054	105.063
02/08/2056	105.762
01/02/2057	105.318
11/25/2057	103.123
12/02/2058	104.541
01/23/2060	102.520

01/15/2061	103.761
01/03/2062	103.198
01/02/2063	103.393
12/23/2063	104.599
12/02/2064	102.947
01/13/2066	102.030
12/15/2066	104.530
01/20/2068	104.411
09/23/2069	102.209
12/14/2069	102.214
12/19/2070	102.235
11/03/2071	102.874
12/25/2072	106.154
12/15/2073	103.948
11/20/2074	102.429
10/30/2075	104.590
08/26/2077	101.724
12/02/2077	102.994
03/05/2079	102.357
12/17/2079	105.593
11/21/2080	104.739
02/19/2082	104.457
02/20/2083	104.345
11/26/2083	105.064
12/14/2084	103.934
11/01/2085	103.268
11/23/2086	103.733
12/09/2087	103.101
11/05/2088	103.814
11/10/2089	103.672
12/09/2090	105.137
01/31/2092	104.728
11/07/2092	102.295
12/14/2093	102.613
12/27/2094	103.648
12/14/2095	104.045
10/28/2096	104.296

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	101.602
1.01	101.724
1.02	101.854
1.02	102.030
1.03	102.101
1.04	102.109
1.04	102.209
1.05	102.214
1.06	102.235
1.06	102.257
1.07	102.260
1.08	102.286
1.09	102.295
1.09	102.357
1.10	102.381
1.11	102.420
1.12	102.422
1.12	102.429
1.13	102.434
1.14	102.477
1.15	102.483
1.16	102.511
1.17	102.520
1.18	102.525
1.18	102.576
1.19	102.608
1.20	102.610
1.21	102.613
1.22	102.619
1.23	102.648
1.24	102.654
1.25	102.656
1.26	102.686
1.27	102.696
1.28	102.768
1.29	102.787
1.30	102.838
1.31	102.842
1.32	102.862
1.33	102.874
1.35	102.881
1.36	102.887
1.37	102.940
1.38	102.947
1.39	102.994
1.40	103.019
1.42	103.035
1.43	103.049
1.44	103.074
1.46	103.101
1.47	103.123
1.48	103.136
1.50	103.137

1.51	103.139
1.53	103.155
1.54	103.160
1.56	103.178
1.57	103.179
1.59	103.198
1.60	103.224
1.62	103.236
1.64	103.268
1.65	103.290
1.67	103.300
1.69	103.331
1.71	103.338
1.73	103.352
1.75	103.358
1.77	103.388
1.79	103.393
1.81	103.396
1.83	103.398
1.85	103.407
1.87	103.416
1.89	103.454
1.92	103.455
1.94	103.462
1.96	103.474
1.99	103.521
2.01	103.576
2.04	103.585
2.07	103.601
2.09	103.616
2.12	103.616
2.15	103.632
2.18	103.648
2.21	103.656
2.24	103.667
2.27	103.672
2.31	103.676
2.34	103.722
2.38	103.731
2.41	103.733
2.45	103.759
2.49	103.761
2.53	103.771
2.57	103.814
2.61	103.816
2.65	103.821
2.70	103.876
2.75	103.898
2.80	103.898
2.85	103.909
2.90	103.934
2.95	103.939
3.01	103.948
3.07	103.973
3.13	103.992
3.19	104.004
3.26	104.022
3.32	104.033
3.40	104.035
3.47	104.045
3.55	104.095
3.63	104.111
3.72	104.154
3.80	104.202
3.90	104.235
4.00	104.296
4.10	104.345
4.21	104.397
4.32	104.411
4.45	104.457
4.58	104.492
4.71	104.497
4.86	104.530
5.01	104.530
5.17	104.541
5.35	104.560
5.54	104.590
5.74	104.599
5.95	104.700
6.19	104.718
6.44	104.728
6.71	104.739
7.01	104.815
7.33	104.973
7.69	104.976
8.08	104.996
8.52	105.063
9.00	105.064
9.55	105.114
10.16	105.137
10.86	105.154
11.66	105.220
12.59	105.280
13.68	105.318
14.97	105.379

16.54	105.458
18.47	105.477
20.92	105.480
24.10	105.488
28.44	105.593
34.68	105.622
44.42	105.727
61.77	105.758
101.36	105.762
282.36	106.154

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	**Link: 1**
1.05-Year	102.216
1.11-Year	102.424
1.25-Year	102.657
2.00-Year	103.552
3.33-Year	104.034
5-Year	104.530
10-Year	105.135
25-Year	105.480
50-Year	105.755
100-Year	105.761

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	**Link: 1**
Total Inflow Volume (ac-ft)	10884.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 6.320 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 22929. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 34394. cu-ft
2-Year Discharge Rate : 0.293 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		**Postdevelopment Runoff**	
Date	**Annual Max Q (cfs)**	**Date**	**Annual Max Q (cfs)**
04/30/1940	0.772	12/07/1939	0.300
01/31/1941	0.296	01/18/1941	0.225
12/15/1941	0.776	12/20/1941	0.263
02/10/1943	0.309	11/23/1942	0.434
01/23/1944	0.232	10/17/1943	0.211
02/07/1945	0.962	02/07/1945	0.294
02/05/1946	0.590	02/06/1946	0.244
02/02/1947	0.602	12/05/1946	0.281
03/21/1948	1.039	10/19/1947	0.319
02/22/1949	0.522	02/22/1949	0.276
03/03/1950	2.149	01/22/1950	0.364
02/09/1951	0.860	02/09/1951	0.622
01/24/1952	0.226	10/03/1951	0.244
01/11/1953	0.321	01/12/1953	0.428
01/22/1954	0.522	01/22/1954	0.261
04/12/1955	0.244	11/19/1954	0.259
03/04/1956	0.559	01/06/1956	0.690
02/25/1957	0.463	02/26/1957	0.275
01/16/1958	0.562	01/17/1958	0.275
01/12/1959	0.604	01/13/1959	0.403
12/15/1959	0.646	11/21/1959	0.297
02/14/1961	0.553	11/24/1960	0.481
03/04/1962	0.296	12/24/1961	0.246
02/03/1963	0.329	11/30/1962	0.246
01/01/1964	0.525	11/19/1963	0.253
02/26/1965	0.651	12/01/1964	0.278
01/06/1966	0.402	01/07/1966	0.286
01/19/1967	1.016	12/13/1966	0.407
02/03/1968	0.526	01/20/1968	0.270
12/03/1968	0.564	12/11/1968	0.288
01/13/1970	0.437	01/27/1970	0.376
12/06/1970	0.497	12/07/1970	0.306
02/28/1972	1.340	03/05/1972	1.139
01/13/1973	0.484	12/26/1972	0.608

02/18/1974	0.723	03/02/1974	0.291
12/26/1974	0.875	12/27/1974	0.266
01/27/1976	0.606	02/27/1976	0.302
05/31/1977	0.085	08/26/1977	0.233
12/10/1977	0.513	12/15/1977	0.449
03/04/1979	0.505	03/05/1979	0.241
12/17/1979	0.813	12/18/1979	1.132
12/26/1980	0.322	12/30/1980	0.284
10/06/1981	1.030	10/06/1981	0.834
01/05/1983	0.578	03/09/1983	0.327
03/14/1984	0.552	03/21/1984	0.253
02/11/1985	0.369	11/11/1984	0.254
01/18/1986	1.215	01/19/1986	0.330
11/24/1986	1.071	11/24/1986	0.846
04/06/1988	0.535	04/06/1988	0.283
04/05/1989	0.590	04/05/1989	0.300
01/09/1990	1.948	01/09/1990	0.912
11/24/1990	1.660	11/24/1990	1.225
01/27/1992	0.507	01/31/1992	0.387
06/09/1993	0.427	04/11/1993	0.239
03/03/1994	0.325	03/03/1994	0.250
02/19/1995	0.682	12/27/1994	0.468
02/09/1996	1.579	02/09/1996	1.316
01/02/1997	0.988	01/02/1997	1.133
02/28/1998	0.363	10/08/1997	0.252
11/25/1998	0.972	11/26/1998	1.120
03/26/2000	0.544	02/28/2000	0.295
05/05/2001	0.417	05/05/2001	0.242
05/03/2002	1.488	11/15/2001	0.234
03/31/2003	1.139	11/26/2002	0.974
01/23/2004	0.278	10/24/2003	0.276
02/07/2005	0.480	02/08/2005	0.241
02/27/2006	0.616	11/28/2005	0.393
12/14/2006	0.456	11/27/2006	0.285
03/21/2008	0.757	01/07/2008	0.321
02/17/2009	1.175	02/18/2009	1.010
01/10/2010	0.790	01/10/2010	0.358
11/17/2010	1.025	11/17/2010	0.698
01/31/2012	0.652	10/02/2011	0.286
01/20/2013	1.489	01/20/2013	1.295
12/06/2013	0.627	01/28/2014	0.289
03/30/2015	0.380	04/22/2015	0.250
01/04/2016	1.083	01/04/2016	0.935
03/07/2017	0.313	11/01/2016	0.272
01/31/2018	0.584	01/31/2018	0.279
03/30/2019	0.578	01/12/2019	0.342
04/14/2020	0.380	04/21/2020	0.258
02/10/2021	0.938	11/24/2020	0.593
03/26/2022	0.277	12/21/2021	0.271
03/30/2023	0.669	03/30/2023	0.282
01/19/2024	0.525	01/25/2024	0.364
12/22/2024	1.097	12/24/2024	0.833
03/09/2026	0.697	01/04/2026	0.590
01/27/2027	0.607	01/29/2027	0.261
02/19/2028	0.752	02/23/2028	0.283
12/04/2028	0.583	01/13/2029	0.286
02/16/2030	0.778	01/26/2030	0.748
12/30/2030	0.728	03/04/2031	0.288
01/20/2032	1.169	01/21/2032	0.397
03/01/2033	0.329	12/24/2032	0.275
01/15/2034	1.321	11/16/2033	1.070
02/19/2035	0.645	02/19/2035	0.288
03/24/2036	0.609	02/27/2036	0.308
03/09/2037	0.025	03/09/2037	0.196
12/15/2037	0.445	12/15/2037	0.407
02/07/2039	0.322	12/11/2038	0.233
01/14/2040	1.207	01/14/2040	0.286
12/25/2040	0.684	12/25/2040	0.343
02/20/2042	0.718	04/15/2042	0.368
03/31/2043	1.075	02/26/2043	0.310
05/01/2044	0.424	03/21/2044	0.275
02/11/2045	0.491	03/27/2045	0.284
02/16/2046	0.618	02/23/2046	0.276
02/01/2047	0.388	02/02/2047	0.262
04/21/2048	0.345	12/10/2047	0.548
03/16/2049	0.388	03/17/2049	0.269
12/04/2049	0.654	12/04/2049	0.251
04/06/2051	0.508	04/09/2051	0.249
04/17/2052	0.305	04/17/2052	0.225
06/04/2053	1.172	12/10/2052	0.255
04/08/2054	0.218	12/11/2053	0.263
02/17/2055	0.997	11/01/2054	0.883
02/07/2056	1.813	02/08/2056	1.318
11/19/2056	1.984	01/02/2057	1.033
01/24/2058	0.688	11/25/2057	0.274
12/28/2058	0.791	12/02/2058	0.613
01/19/2060	0.296	01/23/2060	0.246
01/10/2061	0.642	01/15/2061	0.328
02/03/2062	2.444	01/03/2062	0.277
12/29/2062	0.517	01/02/2063	0.286
12/23/2063	0.933	12/23/2063	0.640
11/30/2064	0.446	12/02/2064	0.266
01/13/2066	0.245	01/13/2066	0.221
01/19/2067	0.622	12/15/2066	0.608
01/18/2068	1.280	01/20/2068	0.554

01/04/2069	0.344	09/23/2069	0.230
04/09/2070	0.290	12/14/2069	0.231
02/14/2071	0.319	12/19/2070	0.232
02/27/2072	0.341	11/03/2071	0.263
12/25/2072	1.427	12/25/2072	3.169
03/16/2074	0.767	12/15/2073	0.379
01/23/2075	0.166	11/20/2074	0.242
03/24/2076	0.852	10/30/2075	0.636
03/02/2077	0.096	08/26/2077	0.204
12/02/2077	0.321	12/02/2077	0.268
02/25/2079	0.430	03/05/2079	0.238
12/17/2079	1.593	12/17/2079	1.206
11/21/2080	0.703	11/21/2080	0.709
02/13/2082	0.878	02/19/2082	0.574
02/19/2083	0.538	02/20/2083	0.525
11/26/2083	0.652	11/26/2083	0.884
12/14/2084	0.451	12/14/2084	0.375
01/18/2086	0.636	11/01/2085	0.280
12/21/2086	0.597	11/23/2086	0.322
01/14/2088	0.392	12/09/2087	0.273
11/05/2088	0.698	11/05/2088	0.341
01/07/2090	0.328	11/10/2089	0.309
12/04/2090	0.606	12/09/2090	0.925
04/28/2092	1.040	01/31/2092	0.704
03/22/2093	0.292	11/07/2092	0.235
03/01/2094	0.245	12/14/2093	0.251
02/18/2095	0.387	12/27/2094	0.304
01/14/2096	0.488	12/14/2095	0.411
01/29/2097	1.072	10/28/2096	0.505

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.025	1.00	0.196
1.01	0.085	1.01	0.204
1.02	0.096	1.02	0.211
1.02	0.166	1.02	0.221
1.03	0.218	1.03	0.225
1.04	0.226	1.04	0.225
1.04	0.232	1.04	0.230
1.05	0.244	1.05	0.231
1.06	0.245	1.06	0.232
1.06	0.245	1.06	0.233
1.07	0.277	1.07	0.233
1.08	0.278	1.08	0.234
1.09	0.290	1.09	0.235
1.09	0.292	1.09	0.238
1.10	0.296	1.10	0.239
1.11	0.296	1.11	0.241
1.12	0.296	1.12	0.241
1.12	0.305	1.12	0.242
1.13	0.309	1.13	0.242
1.14	0.313	1.14	0.244
1.15	0.319	1.15	0.244
1.16	0.321	1.16	0.246
1.17	0.321	1.17	0.246
1.18	0.322	1.18	0.246
1.18	0.322	1.18	0.249
1.19	0.325	1.19	0.250
1.20	0.328	1.20	0.250
1.21	0.329	1.21	0.251
1.22	0.329	1.22	0.251
1.23	0.341	1.23	0.252
1.24	0.344	1.24	0.253
1.25	0.345	1.25	0.253
1.26	0.363	1.26	0.254
1.27	0.369	1.27	0.255
1.28	0.380	1.28	0.258
1.29	0.380	1.29	0.259
1.30	0.387	1.30	0.261
1.31	0.388	1.31	0.261
1.32	0.388	1.32	0.262
1.33	0.392	1.33	0.263
1.35	0.402	1.35	0.263
1.36	0.417	1.36	0.263
1.37	0.424	1.37	0.266
1.38	0.427	1.38	0.266
1.39	0.430	1.39	0.268
1.40	0.437	1.40	0.269
1.42	0.445	1.42	0.270
1.43	0.446	1.43	0.271
1.44	0.451	1.44	0.272
1.46	0.456	1.46	0.273
1.47	0.463	1.47	0.274
1.48	0.480	1.48	0.275
1.50	0.484	1.50	0.275
1.51	0.488	1.51	0.275
1.53	0.491	1.53	0.275
1.54	0.497	1.54	0.276
1.56	0.505	1.56	0.276
1.57	0.507	1.57	0.276

1.59	0.508	1.59	0.277
1.60	0.513	1.60	0.278
1.62	0.517	1.62	0.279
1.64	0.522	1.64	0.280
1.65	0.522	1.65	0.281
1.67	0.525	1.67	0.282
1.69	0.525	1.69	0.283
1.71	0.526	1.71	0.283
1.73	0.535	1.73	0.284
1.75	0.538	1.75	0.284
1.77	0.544	1.77	0.285
1.79	0.552	1.79	0.286
1.81	0.553	1.81	0.286
1.83	0.559	1.83	0.286
1.85	0.562	1.85	0.286
1.87	0.564	1.87	0.286
1.89	0.578	1.89	0.288
1.92	0.578	1.92	0.288
1.94	0.583	1.94	0.288
1.96	0.584	1.96	0.289
1.99	0.590	1.99	0.291
2.01	0.590	2.01	0.294
2.04	0.597	2.04	0.295
2.07	0.602	2.07	0.297
2.09	0.604	2.09	0.300
2.12	0.606	2.12	0.300
2.15	0.606	2.15	0.302
2.18	0.607	2.18	0.304
2.21	0.609	2.21	0.306
2.24	0.616	2.24	0.308
2.27	0.618	2.27	0.309
2.31	0.622	2.31	0.310
2.34	0.627	2.34	0.319
2.38	0.636	2.38	0.321
2.41	0.642	2.41	0.322
2.45	0.645	2.45	0.327
2.49	0.646	2.49	0.328
2.53	0.651	2.53	0.330
2.57	0.652	2.57	0.341
2.61	0.652	2.61	0.342
2.65	0.654	2.65	0.343
2.70	0.669	2.70	0.358
2.75	0.682	2.75	0.364
2.80	0.684	2.80	0.364
2.85	0.688	2.85	0.368
2.90	0.697	2.90	0.375
2.95	0.698	2.95	0.376
3.01	0.703	3.01	0.379
3.07	0.718	3.07	0.387
3.13	0.723	3.13	0.393
3.19	0.728	3.19	0.397
3.26	0.752	3.26	0.403
3.32	0.757	3.32	0.407
3.40	0.767	3.40	0.407
3.47	0.772	3.47	0.411
3.55	0.776	3.55	0.428
3.63	0.778	3.63	0.434
3.72	0.790	3.72	0.449
3.80	0.791	3.80	0.468
3.90	0.813	3.90	0.481
4.00	0.852	4.00	0.505
4.10	0.860	4.10	0.525
4.21	0.875	4.21	0.548
4.32	0.878	4.32	0.554
4.45	0.933	4.45	0.574
4.58	0.938	4.58	0.590
4.71	0.962	4.71	0.593
4.86	0.972	4.86	0.608
5.01	0.988	5.01	0.608
5.17	0.997	5.17	0.613
5.35	1.016	5.35	0.622
5.54	1.025	5.54	0.636
5.74	1.030	5.74	0.640
5.95	1.039	5.95	0.690
6.19	1.040	6.19	0.698
6.44	1.071	6.44	0.704
6.71	1.072	6.71	0.709
7.01	1.075	7.01	0.748
7.33	1.083	7.33	0.833
7.69	1.097	7.69	0.834
8.08	1.139	8.08	0.846
8.52	1.169	8.52	0.883
9.00	1.172	9.00	0.884
9.55	1.175	9.55	0.912
10.16	1.207	10.16	0.925
10.86	1.215	10.86	0.935
11.66	1.280	11.66	0.974
12.59	1.321	12.59	1.010
13.68	1.340	13.68	1.033
14.97	1.427	14.97	1.070
16.54	1.488	16.54	1.120
18.47	1.489	18.47	1.132
20.92	1.579	20.92	1.133
24.10	1.593	24.10	1.139
28.44	1.660	28.44	1.206

34.68	1.813	34.68	1.225
44.42	1.948	44.42	1.295
61.77	1.984	61.77	1.316
101.36	2.149	101.36	1.318
282.36	2.444	282.36	3.169

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.590	2-Year	0.293
5-Year	0.987	5-Year	0.608
10-Year	1.199	10-Year	0.922
25-Year	1.608	25-Year	1.154
50-Year	1.961	50-Year	1.302
100-Year	2.144	100-Year	1.318
200-Year	2.345	200-Year	2.546

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
0.012	2.3680E-01	0.016	7.0323E-01
0.024	1.8183E-01	0.032	6.6901E-01
0.037	1.4869E-01	0.048	6.2265E-01
0.049	1.2486E-01	0.063	5.7047E-01
0.061	1.0625E-01	0.079	5.1885E-01
0.073	9.1206E-02	0.095	4.6647E-01
0.086	7.8997E-02	0.111	4.1196E-01
0.098	6.8893E-02	0.127	3.5703E-01
0.110	6.0447E-02	0.143	3.0143E-01
0.122	5.3261E-02	0.158	2.4697E-01
0.134	4.7175E-02	0.174	1.9611E-01
0.147	4.1832E-02	0.190	1.5121E-01
0.159	3.7205E-02	0.206	1.1308E-01
0.171	3.3133E-02	0.222	8.0811E-02
0.183	2.9638E-02	0.238	5.6141E-02
0.196	2.6430E-02	0.254	3.6560E-02
0.208	2.3649E-02	0.269	2.2801E-02
0.220	2.1262E-02	0.285	1.2880E-02
0.232	1.9150E-02	0.295	9.5674E-03
0.244	1.7267E-02	0.317	7.1420E-03
0.257	1.5521E-02	0.333	6.2287E-03
0.269	1.4036E-02	0.349	5.5183E-03
0.281	1.2639E-02	0.364	4.8973E-03
0.295	1.1278E-02	0.380	4.3883E-03
0.306	1.0348E-02	0.396	3.9977E-03
0.318	9.4640E-03	0.412	3.6281E-03
0.330	8.5860E-03	0.428	3.3299E-03
0.342	7.8178E-03	0.444	3.0353E-03
0.354	7.1543E-03	0.459	2.7746E-03
0.367	6.5998E-03	0.475	2.5111E-03
0.379	6.0489E-03	0.491	2.2996E-03
0.391	5.5507E-03	0.507	2.0996E-03
0.403	5.1067E-03	0.523	1.9184E-03
0.416	4.7255E-03	0.539	1.7747E-03
0.428	4.3558E-03	0.555	1.6382E-03
0.440	4.0223E-03	0.570	1.5003E-03
0.452	3.7104E-03	0.590	1.3397E-03
0.464	3.4331E-03	0.602	1.2592E-03
0.477	3.1833E-03	0.618	1.1689E-03
0.489	2.9472E-03	0.634	1.0888E-03
0.501	2.7284E-03	0.650	1.0252E-03
0.513	2.5234E-03	0.665	9.5232E-04
0.526	2.3581E-03	0.681	8.9312E-04
0.538	2.1942E-03	0.697	8.2813E-04
0.550	2.0324E-03	0.713	7.6460E-04
0.562	1.9003E-03	0.729	7.1334E-04
0.574	1.7624E-03	0.745	6.6641E-04
0.590	1.6051E-03	0.761	6.2958E-04
0.599	1.5285E-03	0.776	5.8193E-04
0.611	1.4180E-03	0.792	5.4439E-04
0.623	1.3350E-03	0.808	5.1190E-04
0.635	1.2722E-03	0.824	4.8085E-04
0.648	1.2043E-03	0.840	4.4042E-04
0.660	1.1350E-03	0.856	4.0937E-04
0.672	1.0729E-03	0.871	3.8194E-04
0.684	1.0130E-03	0.887	3.5378E-04
0.697	9.6532E-04	0.903	3.3068E-04
0.709	9.1478E-04	0.919	3.0757E-04
0.721	8.6712E-04	0.935	2.8375E-04
0.733	8.1225E-04	0.951	2.6642E-04
0.745	7.6388E-04	0.967	2.4837E-04

0.758	7.2489E-04	0.987	2.2155E-04
0.770	6.8807E-04	0.998	2.0505E-04
0.782	6.5124E-04	1.014	1.8483E-04
0.794	6.2092E-04	1.030	1.6823E-04
0.807	5.8915E-04	1.046	1.5018E-04
0.819	5.6749E-04	1.062	1.3501E-04
0.831	5.4511E-04	1.077	1.2057E-04
0.843	5.2562E-04	1.093	1.0541E-04
0.855	5.0251E-04	1.109	9.0972E-05
0.868	4.7796E-04	1.125	7.7976E-05
0.880	4.5197E-04	1.141	6.3536E-05
0.892	4.3609E-04	1.157	5.7760E-05
0.904	4.1154E-04	1.172	5.4150E-05
0.917	3.9349E-04	1.188	4.8374E-05
0.929	3.6894E-04	1.204	4.2598E-05
0.941	3.5450E-04	1.220	3.6822E-05
0.953	3.3573E-04	1.236	3.4656E-05
0.965	3.1985E-04	1.252	3.1046E-05
0.978	3.0252E-04	1.268	2.6714E-05
0.987	2.9160E-04	1.283	2.3104E-05
1.002	2.7653E-04	1.299	1.8050E-05
1.014	2.6281E-04	1.315	1.2274E-05
1.027	2.5198E-04	1.331	8.6640E-06
1.039	2.3609E-04	1.347	8.6640E-06
1.051	2.2599E-04	1.363	7.9420E-06
1.063	2.1371E-04	1.378	7.9420E-06
1.075	2.0360E-04	1.394	7.2200E-06
1.088	1.9638E-04	1.410	7.2200E-06
1.100	1.8339E-04	1.426	5.7760E-06
1.112	1.7689E-04	1.442	5.7760E-06
1.124	1.6245E-04	1.458	5.0540E-06
1.137	1.5306E-04	1.474	5.0540E-06
1.149	1.4440E-04	1.489	4.3320E-06
1.161	1.3140E-04	1.505	4.3320E-06
1.173	1.2563E-04	1.521	4.3320E-06
1.185	1.1552E-04	1.537	4.3320E-06
1.198	1.0830E-04	1.553	4.3320E-06
1.210	1.0108E-04	1.569	4.3320E-06
1.222	9.3860E-05	1.584	4.3320E-06
1.234	8.9528E-05	1.600	4.3320E-06
1.247	8.1586E-05	1.616	4.3320E-06
1.259	7.4366E-05	1.632	4.3320E-06
1.271	7.1478E-05	1.648	4.3320E-06
1.283	6.5702E-05	1.664	4.3320E-06
1.295	6.2814E-05	1.680	4.3320E-06
1.308	5.9926E-05	1.695	4.3320E-06
1.320	5.7760E-05	1.711	4.3320E-06
1.332	5.0540E-05	1.727	4.3320E-06
1.344	4.7652E-05	1.743	4.3320E-06
1.357	4.2598E-05	1.759	4.3320E-06
1.369	3.8266E-05	1.775	3.6100E-06
1.381	3.4656E-05	1.790	3.6100E-06
1.393	3.2490E-05	1.806	3.6100E-06
1.405	3.0324E-05	1.822	3.6100E-06
1.418	2.8158E-05	1.838	2.8880E-06
1.430	2.4548E-05	1.854	2.8880E-06
1.442	2.3826E-05	1.870	2.8880E-06
1.454	2.1660E-05	1.885	2.8880E-06
1.467	1.9494E-05	1.901	2.8880E-06
1.479	1.8772E-05	1.917	2.8880E-06
1.491	1.5162E-05	1.933	2.8880E-06
1.503	1.4440E-05	1.949	2.8880E-06
1.515	1.3718E-05	1.961	2.8880E-06
1.528	1.2274E-05	1.981	2.8880E-06
1.540	1.1552E-05	1.996	2.8880E-06
1.552	1.0830E-05	2.012	2.8880E-06
1.564	1.0830E-05	2.028	2.8880E-06
1.577	1.0108E-05	2.044	2.8880E-06
1.589	8.6640E-06	2.060	2.8880E-06
1.601	7.9420E-06	2.076	2.8880E-06
1.613	7.9420E-06	2.091	2.8880E-06
1.625	7.9420E-06	2.107	2.8880E-06
1.638	7.9420E-06	2.123	2.8880E-06
1.650	7.9420E-06	2.139	2.8880E-06
1.662	7.2200E-06	2.155	2.8880E-06
1.674	7.2200E-06	2.171	2.8880E-06
1.687	7.2200E-06	2.187	2.8880E-06
1.699	7.2200E-06	2.202	2.8880E-06
1.711	7.2200E-06	2.218	2.8880E-06
1.723	7.2200E-06	2.234	2.8880E-06
1.735	7.2200E-06	2.250	2.8880E-06
1.748	7.2200E-06	2.266	2.8880E-06
1.760	7.2200E-06	2.282	2.8880E-06
1.772	7.2200E-06	2.297	2.8880E-06
1.784	6.4980E-06	2.313	2.1660E-06
1.797	6.4980E-06	2.329	2.1660E-06
1.809	6.4980E-06	2.345	2.1660E-06
1.821	5.7760E-06	2.361	2.1660E-06
1.833	5.0540E-06	2.377	2.1660E-06
1.845	5.0540E-06	2.393	2.1660E-06
1.858	5.0540E-06	2.408	2.1660E-06
1.870	5.0540E-06	2.424	2.1660E-06
1.882	4.3320E-06	2.440	2.1660E-06
1.894	4.3320E-06	2.456	2.1660E-06
1.906	4.3320E-06	2.472	2.1660E-06

1.919	3.6100E-06	2.488	2.1660E-06
1.931	3.6100E-06	2.503	2.1660E-06
1.943	3.6100E-06	2.519	2.1660E-06
1.961	2.8016E-06	2.535	2.1660E-06
1.968	2.8880E-06	2.551	2.1660E-06
1.980	2.8880E-06	2.567	2.1660E-06
1.992	2.1660E-06	2.583	2.1660E-06
2.004	2.1660E-06	2.598	2.1660E-06
2.016	2.1660E-06	2.614	2.1660E-06
2.029	2.1660E-06	2.630	2.1660E-06
2.041	2.1660E-06	2.646	2.1660E-06
2.053	2.1660E-06	2.662	2.1660E-06
2.065	2.1660E-06	2.678	2.1660E-06
2.078	2.1660E-06	2.694	2.1660E-06
2.090	2.1660E-06	2.709	2.1660E-06
2.102	2.1660E-06	2.725	2.1660E-06
2.114	2.1660E-06	2.741	2.1660E-06
2.126	2.1660E-06	2.757	2.1660E-06
2.139	2.1660E-06	2.773	2.1660E-06
2.151	7.2200E-07	2.789	2.1660E-06
2.163	7.2200E-07	2.804	2.1660E-06
2.175	7.2200E-07	2.820	1.4440E-06
2.188	7.2200E-07	2.836	1.4440E-06
2.200	7.2200E-07	2.852	1.4440E-06
2.212	7.2200E-07	2.868	1.4440E-06
2.224	7.2200E-07	2.884	7.2200E-07
2.236	7.2200E-07	2.900	7.2200E-07
2.249	7.2200E-07	2.915	7.2200E-07
2.261	7.2200E-07	2.931	7.2200E-07
2.273	7.2200E-07	2.947	7.2200E-07
2.285	7.2200E-07	2.963	7.2200E-07
2.298	7.2200E-07	2.979	7.2200E-07
2.310	7.2200E-07	2.995	7.2200E-07
2.322	7.2200E-07	3.010	7.2200E-07
2.334	7.2200E-07	3.026	7.2200E-07
2.346	7.2200E-07	3.042	7.2200E-07
2.359	7.2200E-07	3.058	7.2200E-07
2.371	7.2200E-07	3.074	7.2200E-07
2.383	7.2200E-07	3.090	7.2200E-07
2.395	7.2200E-07	3.106	7.2200E-07
2.408	7.2200E-07	3.121	7.2200E-07
2.420	7.2200E-07	3.137	7.2200E-07
2.432	7.2200E-07	3.153	7.2200E-07
2.444	7.2200E-07	3.169	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-20.4%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-16.7%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 12:18 PM**

Input File Name: **vault1.fld**
Project Name: Burien NERA
Analysis Title: Detention Vault 1
Comments: 95% ImperviousWetvault vol.

********** **Precipitation Input** **********

Extended Precipitation Timeseries Selected
Climatic Region Number: 3
Full Period of Record Available used for Routing
Precipitation Station : 950040 Puget West 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 951040 Puget West 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **Watershed Definition** **********

Number of Subbasins: 1

********** **Subbasin Number: 1** **********

***Tributary to Node: 1
***Bypass to Node : None

	Area(Acres) Predeveloped	Developed To Node	Developed Bypass Node
Till Forest	45.592	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.019	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	5.015	0.000
Wetland	0.000	2.108	0.000
Impervious	0.000	38.450	0.000
Subbasin Total	**45.592**	**45.592**	**0.000**

	Lateral Flow Connnections Predeveloped Surface	Predeveloped Interflow	Predeveloped Grnd Water	Developed Surface	Developed Interflow	Developed Grnd Water
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** **Subbasin Connection Summary** ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** **Postdeveloped Node Connection Summary** ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** **Predeveloped Structure Summary** ***

***** Postdeveloped Structure Summary *****

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used

Pond Floor Elevation	:	100.00	ft				
Riser Crest Elevation	:	110.00	ft				
Max Pond Elevation	:	111.00	ft				
Max Storage Depth			:	10.00	ft		
Pond Bottom Length	:	500.0	ft				
Pond Bottom Width			:	166.7	ft		
Pond Side Slopes			: L1= 0.00	L2= 0.00	W1= 0.00	W2= 0.00	ft/ft
Pond Bottom Area			:	83332.	sq-ft		
Area at Riser Crest El	:	83,332.	sq-ft				
			:	1.913	acres		
Volume at Riser Crest	:	833,322.	cu-ft				
			: 19.130			ac-ft	
Area at Max Elevation	:	83332.	sq-ft				
			:	1.913	acres		
Vol at Max Elevation	:	916,654.	cu-ft				
			:	21.043	ac-ft		
Hydraulic Conductivity	:	0.00			in/hr		
Depth to Water Table	:	100.00			ft		

Riser Geometry

Riser Structure Type	: Circular		
Riser Diameter		: 42.00	in
Common Length		: 0.109	ft
Riser Crest Elevation	: 110.00	ft	

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---

Device Type : Circular Orifice			
Invert Elevation	:	100.00	ft
Diameter	:	3.22	in
Orientation	: Horizontal		
Elbow	: No		

--- Device Number 2 ---

Device Type : Vertical Rectangular Orifice			
Invert Elevation	:	104.90	ft
Length	:	1.30	in
Height	:	61.16	in
Orientation	: Vertical		
Elbow	: No		

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.035	0.067	0.052	0.000
100.070	0.134	0.073	0.000
100.140	0.268	0.103	0.000
100.280	0.536	0.146	0.000
100.420	0.803	0.179	0.000
100.560	1.071	0.207	0.000
100.700	1.339	0.231	0.000
100.840	1.607	0.253	0.000
100.980	1.875	0.274	0.000
101.120	2.143	0.292	0.000
101.260	2.410	0.310	0.000
101.400	2.678	0.327	0.000
101.540	2.946	0.343	0.000
101.680	3.214	0.358	0.000
101.820	3.482	0.373	0.000
101.960	3.750	0.387	0.000
102.100	4.017	0.400	0.000
102.240	4.285	0.414	0.000
102.380	4.553	0.426	0.000
102.520	4.821	0.439	0.000
102.660	5.089	0.451	0.000
102.800	5.357	0.462	0.000
102.940	5.624	0.474	0.000
103.080	5.892	0.485	0.000
103.220	6.160	0.496	0.000
103.360	6.428	0.506	0.000
103.500	6.696	0.517	0.000
103.640	6.963	0.527	0.000
103.780	7.231	0.537	0.000
103.920	7.499	0.547	0.000
104.060	7.767	0.557	0.000
104.200	8.035	0.566	0.000
104.340	8.303	0.576	0.000
104.480	8.570	0.585	0.000

104.620	8.838	0.594	0.000
104.760	9.106	0.603	0.000
104.804	9.189	0.606	0.000
104.847	9.273	0.608	0.000
104.891	9.356	0.611	0.000
104.934	9.440	0.614	0.000
104.969	9.507	0.618	0.000
105.004	9.574	0.624	0.000
105.039	9.640	0.630	0.000
105.074	9.707	0.638	0.000
105.214	9.975	0.674	0.000
105.354	10.243	0.718	0.000
105.494	10.511	0.769	0.000
105.634	10.779	0.825	0.000
105.774	11.047	0.887	0.000
105.914	11.314	0.953	0.000
106.054	11.582	1.023	0.000
106.194	11.850	1.097	0.000
106.334	12.118	1.175	0.000
106.474	12.386	1.256	0.000
106.614	12.654	1.341	0.000
106.754	12.921	1.428	0.000
106.894	13.189	1.519	0.000
107.034	13.457	1.613	0.000
107.174	13.725	1.710	0.000
107.314	13.993	1.809	0.000
107.454	14.260	1.912	0.000
107.594	14.528	2.016	0.000
107.734	14.796	2.124	0.000
107.874	15.064	2.234	0.000
108.014	15.332	2.346	0.000
108.154	15.600	2.460	0.000
108.294	15.867	2.577	0.000
108.434	16.135	2.697	0.000
108.574	16.403	2.818	0.000
108.714	16.671	2.942	0.000
108.854	16.939	3.067	0.000
108.994	17.207	3.195	0.000
109.134	17.474	3.325	0.000
109.274	17.742	3.457	0.000
109.414	18.010	3.591	0.000
109.554	18.278	3.727	0.000
109.694	18.546	3.864	0.000
109.834	18.814	4.004	0.000
109.876	18.893	4.046	0.000
109.917	18.972	4.088	0.000
109.959	19.051	4.130	0.000
110.000	19.130	4.172	0.000
110.035	19.197	4.449	0.000
110.070	19.264	4.925	0.000
110.105	19.331	5.530	0.000
110.140	19.398	6.241	0.000
110.175	19.465	7.041	0.000
110.210	19.532	7.921	0.000
110.245	19.599	8.873	0.000
110.280	19.666	9.892	0.000
110.420	19.934	14.519	0.000
110.560	20.202	19.817	0.000
110.700	20.470	25.506	0.000
110.840	20.737	31.299	0.000
110.980	21.005	36.905	0.000
111.120	21.273	42.052	0.000
111.260	21.541	46.518	0.000
111.400	21.809	50.165	0.000
111.540	22.077	52.986	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	105.862
01/18/1941	103.652
12/20/1941	104.784
11/23/1942	106.067
10/17/1943	103.134
02/07/1945	105.935
02/05/1946	103.912
11/22/1946	105.023
10/19/1947	106.163
02/22/1949	105.383
01/22/1950	105.914
02/09/1951	107.116
10/03/1951	102.572
01/11/1953	106.261
01/06/1954	104.747
11/19/1954	104.267
01/06/1956	106.966
02/26/1957	105.481
01/17/1958	105.141
01/13/1959	106.171
11/21/1959	106.016

11/24/1960	106.579
12/20/1961	103.672
11/30/1962	103.766
11/14/1963	104.329
12/01/1964	105.225
01/07/1966	105.249
12/13/1966	106.208
01/20/1968	104.932
12/11/1968	104.944
01/27/1970	105.948
12/07/1970	105.619
03/05/1972	107.980
12/26/1972	106.861
01/18/1974	105.136
12/27/1974	104.634
12/04/1975	105.076
08/26/1977	103.865
12/15/1977	106.262
02/12/1979	102.919
12/17/1979	108.128
12/30/1980	105.539
10/06/1981	107.561
01/08/1983	105.079
11/24/1983	103.304
11/04/1984	104.159
01/18/1986	106.402
11/24/1986	108.091
12/09/1987	104.472
11/05/1988	104.082
01/09/1990	108.675
11/24/1990	108.451
01/31/1992	106.141
01/26/1993	103.286
02/17/1994	102.799
12/27/1994	106.538
02/09/1996	109.004
01/02/1997	108.188
10/30/1997	103.452
11/26/1998	108.163
02/28/2000	105.278
01/18/2001	102.990
11/15/2001	104.071
11/26/2002	107.635
10/24/2003	105.495
02/08/2005	104.007
11/27/2005	106.005
11/27/2006	105.126
01/07/2008	106.142
02/18/2009	108.056
01/10/2010	105.930
11/17/2010	107.238
10/02/2011	105.549
01/20/2013	108.823
01/28/2014	105.278
04/13/2015	102.732
01/04/2016	107.377
03/09/2017	104.506
01/31/2018	105.166
01/12/2019	106.084
02/09/2020	103.158
11/24/2020	107.097
12/20/2021	105.031
03/30/2023	105.700
01/25/2024	105.996
12/22/2024	107.962
01/03/2026	106.694
01/29/2027	104.564
02/21/2028	105.221
12/11/2028	105.059
01/26/2030	106.850
12/30/2030	105.010
01/21/2032	106.591
12/23/2032	105.252
11/16/2033	108.161
11/23/2034	103.788
02/27/2036	105.020
03/09/2037	104.116
12/15/2037	106.155
02/10/2039	102.640
01/14/2040	105.353
12/25/2040	106.052
11/17/2041	105.478
02/26/2043	105.213
11/17/2043	104.601
11/28/2044	104.781
02/17/2046	105.218
11/28/2046	104.768
12/10/2047	106.327
11/25/2048	104.242
12/04/2049	104.430
05/18/2051	103.164
02/22/2052	103.660
12/10/2052	104.336
12/11/2053	104.611
11/01/2054	107.582

02/07/2056	109.143
11/19/2056	108.251
01/24/2058	103.793
11/26/2058	106.888
01/23/2060	103.743
01/15/2061	105.641
01/03/2062	104.927
12/30/2062	105.574
12/23/2063	107.168
12/01/2064	104.710
01/13/2066	103.407
12/15/2066	106.194
01/19/2068	106.916
09/23/2069	103.776
12/14/2069	103.600
12/17/2070	103.614
11/03/2071	104.436
12/25/2072	109.897
12/15/2073	106.079
11/20/2074	103.897
10/30/2075	106.432
08/26/2077	103.017
12/02/2077	104.664
02/25/2079	103.634
12/17/2079	108.657
11/21/2080	107.138
02/15/2082	106.371
02/20/2083	106.648
11/26/2083	107.229
12/14/2084	105.860
11/01/2085	104.950
11/23/2086	105.795
12/09/2087	104.626
11/05/2088	106.257
11/10/2089	105.028
12/09/2090	107.644
01/31/2092	107.473
03/22/2093	103.382
10/23/2093	103.568
12/27/2094	105.373
12/14/2095	105.784
10/28/2096	106.451

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	102.572
1.01	102.640
1.02	102.732
1.02	102.799
1.03	102.919
1.04	102.990
1.04	103.017
1.05	103.134
1.06	103.158
1.06	103.164
1.07	103.286
1.08	103.304
1.09	103.382
1.09	103.407
1.10	103.452
1.11	103.568
1.12	103.600
1.12	103.614
1.13	103.634
1.14	103.652
1.15	103.660
1.16	103.672
1.17	103.743
1.18	103.766
1.18	103.776
1.19	103.788
1.20	103.793
1.21	103.865
1.22	103.897
1.23	103.912
1.24	104.007
1.25	104.071
1.26	104.082
1.27	104.116
1.28	104.159
1.29	104.242
1.30	104.267
1.31	104.329
1.32	104.336
1.33	104.430
1.35	104.436
1.36	104.472
1.37	104.506
1.38	104.564
1.39	104.601
1.40	104.611
1.42	104.626
1.43	104.634

1.44	104.664
1.46	104.710
1.47	104.747
1.48	104.768
1.50	104.781
1.51	104.784
1.53	104.927
1.54	104.932
1.56	104.944
1.57	104.950
1.59	105.010
1.60	105.020
1.62	105.023
1.64	105.028
1.65	105.031
1.67	105.059
1.69	105.076
1.71	105.079
1.73	105.126
1.75	105.136
1.77	105.141
1.79	105.166
1.81	105.213
1.83	105.218
1.85	105.221
1.87	105.225
1.89	105.249
1.92	105.252
1.94	105.278
1.96	105.278
1.99	105.353
2.01	105.373
2.04	105.383
2.07	105.478
2.09	105.481
2.12	105.495
2.15	105.539
2.18	105.549
2.21	105.574
2.24	105.619
2.27	105.641
2.31	105.700
2.34	105.784
2.38	105.795
2.41	105.860
2.45	105.862
2.49	105.914
2.53	105.930
2.57	105.935
2.61	105.948
2.65	105.996
2.70	106.005
2.75	106.016
2.80	106.052
2.85	106.067
2.90	106.079
2.95	106.084
3.01	106.141
3.07	106.142
3.13	106.155
3.19	106.163
3.26	106.171
3.32	106.194
3.40	106.208
3.47	106.257
3.55	106.261
3.63	106.262
3.72	106.327
3.80	106.371
3.90	106.402
4.00	106.432
4.10	106.451
4.21	106.538
4.32	106.579
4.45	106.591
4.58	106.648
4.71	106.694
4.86	106.850
5.01	106.861
5.17	106.888
5.35	106.916
5.54	106.966
5.74	107.097
5.95	107.116
6.19	107.138
6.44	107.168
6.71	107.229
7.01	107.238
7.33	107.377
7.69	107.473
8.08	107.561
8.52	107.582
9.00	107.635
9.55	107.644
10.16	107.962

10.86	107.980
11.66	108.056
12.59	108.091
13.68	108.128
14.97	108.161
16.54	108.163
18.47	108.188
20.92	108.251
24.10	108.451
28.44	108.657
34.68	108.675
44.42	108.823
61.77	109.004
101.36	109.143
282.36	109.897

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	**Link: 1**
1.05-Year	103.156
1.11-Year	103.585
1.25-Year	104.073
2.00-Year	105.373
3.33-Year	106.195
5-Year	106.862
10-Year	107.889
25-Year	108.218
50-Year	108.901
100-Year	109.140

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	**Link: 1**
Total Inflow Volume (ac-ft)	17233.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 11.192 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 49260. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 73890. cu-ft
2-Year Discharge Rate : 0.721 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		**Postdevelopment Runoff**	
Date	**Annual Max Q (cfs)**	**Date**	**Annual Max Q (cfs)**
04/30/1940	0.812	12/07/1939	0.928
01/17/1941	0.803	01/18/1941	0.528
12/15/1941	1.631	12/20/1941	0.604
03/28/1943	0.757	11/23/1942	1.030
01/23/1944	0.316	10/17/1943	0.489
02/07/1945	1.964	02/07/1945	0.963
02/05/1946	1.340	02/05/1946	0.546
02/02/1947	1.325	11/22/1946	0.627
03/21/1948	2.062	10/19/1947	1.080
02/22/1949	1.382	02/22/1949	0.728
03/03/1950	4.156	01/22/1950	0.952
02/09/1951	1.847	02/09/1951	1.669
01/30/1952	0.535	10/03/1951	0.443
01/11/1953	0.790	01/11/1953	1.134
01/22/1954	1.226	01/06/1954	0.602
02/07/1955	0.498	11/19/1954	0.571
01/06/1956	1.336	01/06/1956	1.567
02/25/1957	1.113	02/26/1957	0.764
01/16/1958	1.269	01/17/1958	0.655
01/24/1959	1.385	01/13/1959	1.084
12/15/1959	1.433	11/21/1959	1.003
02/14/1961	1.168	11/24/1960	1.319
12/17/1961	0.630	12/20/1961	0.529
02/03/1963	0.763	11/30/1962	0.536
01/01/1964	1.208	11/14/1963	0.575
04/19/1965	0.800	12/01/1964	0.677
01/05/1966	0.988	01/07/1966	0.685
01/19/1967	2.098	12/13/1966	1.104

02/03/1968	1.235	01/20/1968	0.614
12/03/1968	1.205	12/11/1968	0.615
01/13/1970	1.078	01/27/1970	0.970
12/06/1970	0.989	12/07/1970	0.819
02/28/1972	2.787	03/05/1972	2.318
01/13/1973	1.206	12/26/1972	1.497
01/15/1974	1.043	01/18/1974	0.654
12/26/1974	2.024	12/27/1974	0.595
12/03/1975	1.157	12/04/1975	0.638
03/09/1977	0.161	08/26/1977	0.543
12/10/1977	1.171	12/15/1977	1.134
03/04/1979	0.598	02/12/1979	0.472
12/15/1979	1.731	12/17/1979	2.438
12/26/1980	0.902	12/30/1980	0.787
10/06/1981	2.057	10/06/1981	1.992
01/05/1983	1.424	01/08/1983	0.639
01/03/1984	0.875	11/24/1983	0.502
02/11/1985	0.517	11/04/1984	0.563
01/18/1986	2.678	01/18/1986	1.214
11/24/1986	2.413	11/24/1986	2.409
01/14/1988	0.737	12/09/1987	0.584
04/05/1989	0.610	11/05/1988	0.558
01/09/1990	4.280	01/09/1990	2.907
11/24/1990	3.359	11/24/1990	2.711
01/27/1992	1.253	01/31/1992	1.069
03/23/1993	0.960	01/26/1993	0.501
03/03/1994	0.402	02/17/1994	0.462
02/19/1995	1.647	12/27/1994	1.294
02/08/1996	3.463	02/09/1996	3.204
01/02/1997	2.044	01/02/1997	2.489
01/23/1998	0.488	10/30/1997	0.513
11/25/1998	1.924	11/26/1998	2.468
03/26/2000	1.267	02/28/2000	0.694
12/20/2000	0.611	01/18/2001	0.478
12/02/2001	0.632	11/15/2001	0.557
03/31/2003	2.373	11/26/2002	2.048
01/23/2004	0.795	10/24/2003	0.769
02/05/2005	1.179	02/08/2005	0.553
11/27/2005	1.180	11/27/2005	0.998
12/14/2006	1.065	11/27/2006	0.651
03/21/2008	1.694	01/07/2008	1.069
02/17/2009	2.501	02/18/2009	2.380
01/10/2010	1.670	01/10/2010	0.961
11/17/2010	2.244	11/17/2010	1.755
01/31/2012	1.498	10/02/2011	0.791
01/20/2013	3.231	01/20/2013	3.039
02/13/2014	1.363	01/28/2014	0.694
04/12/2015	0.886	04/13/2015	0.457
01/04/2016	2.277	01/04/2016	1.855
03/07/2017	0.671	03/09/2017	0.586
01/31/2018	1.321	01/31/2018	0.661
02/14/2019	1.268	01/12/2019	1.038
02/08/2020	0.513	02/09/2020	0.491
02/10/2021	1.965	11/24/2020	1.656
12/20/2021	1.158	12/20/2021	0.629
03/30/2023	1.636	03/30/2023	0.854
01/19/2024	1.339	01/25/2024	0.993
12/22/2024	2.519	12/22/2024	2.304
03/09/2026	1.542	01/03/2026	1.390
01/27/2027	1.346	01/29/2027	0.590
02/19/2028	1.584	02/21/2028	0.676
12/04/2028	1.279	12/11/2028	0.634
02/16/2030	1.558	01/26/2030	1.490
12/30/2030	1.605	12/30/2030	0.625
01/20/2032	2.466	01/21/2032	1.326
01/13/2033	0.560	12/23/2032	0.686
01/15/2034	2.642	11/16/2033	2.466
02/19/2035	0.783	11/23/2034	0.538
12/04/2035	1.499	02/27/2036	0.627
03/08/2037	0.377	03/09/2037	0.560
12/15/2037	1.028	12/15/2037	1.076
02/07/2039	0.631	02/10/2039	0.449
01/14/2040	2.728	01/14/2040	0.718
12/25/2040	1.576	12/25/2040	1.022
02/20/2042	1.477	11/17/2041	0.763
03/31/2043	2.177	02/26/2043	0.673
02/13/2044	0.865	11/17/2043	0.593
11/27/2044	0.738	11/28/2044	0.604
02/16/2046	1.310	02/17/2046	0.675
02/01/2047	0.935	11/28/2046	0.603
01/11/2048	0.853	12/10/2047	1.170
03/05/2049	0.604	11/25/2048	0.569
12/04/2049	1.437	12/04/2049	0.581
05/17/2051	0.717	05/18/2051	0.491
02/20/2052	0.625	02/22/2052	0.529
06/04/2053	1.892	12/10/2052	0.575
02/24/2054	0.571	12/11/2053	0.593
02/17/2055	2.092	11/01/2054	2.007
02/07/2056	3.819	02/07/2056	3.333
11/19/2056	3.580	11/19/2056	2.541
01/24/2058	1.427	01/24/2058	0.538
01/17/2059	1.686	11/26/2058	1.515
01/19/2060	0.699	01/23/2060	0.535
01/10/2061	1.349	01/15/2061	0.828
02/03/2062	4.916	01/03/2062	0.613

12/29/2062	1.370	12/30/2062	0.801
12/23/2063	2.070	12/23/2063	1.705
02/05/2065	0.862	12/01/2064	0.600
01/13/2066	0.710	01/13/2066	0.510
01/19/2067	1.294	12/15/2066	1.097
01/18/2068	2.564	01/19/2068	1.534
01/04/2069	0.819	09/23/2069	0.537
12/14/2069	0.505	12/14/2069	0.524
02/14/2071	0.791	12/17/2070	0.525
02/27/2072	0.745	11/03/2071	0.582
12/25/2072	3.015	12/25/2072	4.067
03/16/2074	1.615	12/15/2073	1.036
12/20/2074	0.413	11/20/2074	0.545
03/24/2076	1.728	10/30/2075	1.231
02/12/2077	0.307	08/26/2077	0.480
11/25/2077	0.883	12/02/2077	0.597
02/25/2079	0.980	02/25/2079	0.527
12/17/2079	3.168	12/17/2079	2.891
11/21/2080	1.438	11/21/2080	1.685
02/14/2082	1.829	02/15/2082	1.196
02/19/2083	1.216	02/20/2083	1.362
11/26/2083	1.387	11/26/2083	1.748
12/14/2084	1.082	12/14/2084	0.927
01/18/2086	1.436	11/01/2085	0.616
12/21/2086	1.378	11/23/2086	0.896
01/14/2088	0.984	12/09/2087	0.594
11/05/2088	1.929	11/05/2088	1.132
01/06/2090	0.805	11/10/2089	0.628
12/04/2090	1.418	12/09/2090	2.055
01/31/2092	1.765	01/31/2092	1.926
03/22/2093	0.907	03/22/2093	0.508
03/01/2094	0.691	10/23/2093	0.522
12/27/2094	0.956	12/27/2094	0.725
01/14/2096	1.244	12/14/2095	0.891
01/29/2097	2.166	10/28/2096	1.242

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.161	1.00	0.443
1.01	0.307	1.01	0.449
1.02	0.316	1.02	0.457
1.02	0.377	1.02	0.462
1.03	0.402	1.03	0.472
1.04	0.413	1.04	0.478
1.04	0.488	1.04	0.480
1.05	0.498	1.05	0.489
1.06	0.505	1.06	0.491
1.06	0.513	1.06	0.491
1.07	0.517	1.07	0.501
1.08	0.535	1.08	0.502
1.09	0.560	1.09	0.508
1.09	0.571	1.09	0.510
1.10	0.598	1.10	0.513
1.11	0.604	1.11	0.522
1.12	0.610	1.12	0.524
1.12	0.611	1.12	0.525
1.13	0.625	1.13	0.527
1.14	0.630	1.14	0.528
1.15	0.631	1.15	0.529
1.16	0.632	1.16	0.529
1.17	0.671	1.17	0.535
1.18	0.691	1.18	0.536
1.18	0.699	1.18	0.537
1.19	0.710	1.19	0.538
1.20	0.717	1.20	0.538
1.21	0.737	1.21	0.543
1.22	0.738	1.22	0.545
1.23	0.745	1.23	0.546
1.24	0.757	1.24	0.553
1.25	0.763	1.25	0.557
1.26	0.783	1.26	0.558
1.27	0.790	1.27	0.560
1.28	0.791	1.28	0.563
1.29	0.795	1.29	0.569
1.30	0.800	1.30	0.571
1.31	0.803	1.31	0.575
1.32	0.805	1.32	0.575
1.33	0.812	1.33	0.581
1.35	0.819	1.35	0.582
1.36	0.853	1.36	0.584
1.37	0.862	1.37	0.586
1.38	0.865	1.38	0.590
1.39	0.875	1.39	0.593
1.40	0.883	1.40	0.593
1.42	0.886	1.42	0.594
1.43	0.902	1.43	0.595
1.44	0.907	1.44	0.597
1.46	0.935	1.46	0.600
1.47	0.956	1.47	0.602
1.48	0.960	1.48	0.603

1.50	0.980	1.50	0.604
1.51	0.984	1.51	0.604
1.53	0.988	1.53	0.613
1.54	0.989	1.54	0.614
1.56	1.028	1.56	0.615
1.57	1.043	1.57	0.616
1.59	1.065	1.59	0.625
1.60	1.078	1.60	0.627
1.62	1.082	1.62	0.627
1.64	1.113	1.64	0.628
1.65	1.157	1.65	0.629
1.67	1.158	1.67	0.634
1.69	1.168	1.69	0.638
1.71	1.171	1.71	0.639
1.73	1.179	1.73	0.651
1.75	1.180	1.75	0.654
1.77	1.205	1.77	0.655
1.79	1.206	1.79	0.661
1.81	1.208	1.81	0.673
1.83	1.216	1.83	0.675
1.85	1.226	1.85	0.676
1.87	1.235	1.87	0.677
1.89	1.244	1.89	0.685
1.92	1.253	1.92	0.686
1.94	1.267	1.94	0.694
1.96	1.268	1.96	0.694
1.99	1.269	1.99	0.718
2.01	1.279	2.01	0.725
2.04	1.294	2.04	0.728
2.07	1.310	2.07	0.763
2.09	1.321	2.09	0.764
2.12	1.325	2.12	0.769
2.15	1.336	2.15	0.787
2.18	1.339	2.18	0.791
2.21	1.340	2.21	0.801
2.24	1.346	2.24	0.819
2.27	1.349	2.27	0.828
2.31	1.363	2.31	0.854
2.34	1.370	2.34	0.891
2.38	1.378	2.38	0.896
2.41	1.382	2.41	0.927
2.45	1.385	2.45	0.928
2.49	1.387	2.49	0.952
2.53	1.418	2.53	0.961
2.57	1.424	2.57	0.963
2.61	1.427	2.61	0.970
2.65	1.433	2.65	0.993
2.70	1.436	2.70	0.998
2.75	1.437	2.75	1.003
2.80	1.438	2.80	1.022
2.85	1.477	2.85	1.030
2.90	1.498	2.90	1.036
2.95	1.499	2.95	1.038
3.01	1.542	3.01	1.069
3.07	1.558	3.07	1.069
3.13	1.576	3.13	1.076
3.19	1.584	3.19	1.080
3.26	1.605	3.26	1.084
3.32	1.615	3.32	1.097
3.40	1.631	3.40	1.104
3.47	1.636	3.47	1.132
3.55	1.647	3.55	1.134
3.63	1.670	3.63	1.134
3.72	1.686	3.72	1.170
3.80	1.694	3.80	1.196
3.90	1.728	3.90	1.214
4.00	1.731	4.00	1.231
4.10	1.765	4.10	1.242
4.21	1.829	4.21	1.294
4.32	1.847	4.32	1.319
4.45	1.892	4.45	1.326
4.58	1.924	4.58	1.362
4.71	1.929	4.71	1.390
4.86	1.964	4.86	1.490
5.01	1.965	5.01	1.497
5.17	2.024	5.17	1.515
5.35	2.044	5.35	1.534
5.54	2.057	5.54	1.567
5.74	2.062	5.74	1.656
5.95	2.070	5.95	1.669
6.19	2.092	6.19	1.685
6.44	2.098	6.44	1.705
6.71	2.166	6.71	1.748
7.01	2.177	7.01	1.755
7.33	2.244	7.33	1.855
7.69	2.277	7.69	1.926
8.08	2.373	8.08	1.992
8.52	2.413	8.52	2.007
9.00	2.466	9.00	2.048
9.55	2.501	9.55	2.055
10.16	2.519	10.16	2.304
10.86	2.564	10.86	2.318
11.66	2.642	11.66	2.380
12.59	2.678	12.59	2.409
13.68	2.728	13.68	2.438

14.97	2.787	14.97	2.466
16.54	3.015	16.54	2.468
18.47	3.168	18.47	2.489
20.92	3.231	20.92	2.541
24.10	3.359	24.10	2.711
28.44	3.463	28.44	2.891
34.68	3.580	34.68	2.907
44.42	3.819	44.42	3.039
61.77	4.156	61.77	3.204
101.36	4.280	101.36	3.333
282.36	4.916	282.36	4.067

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	**Discharge (cfs)**	**Tr (Years)**	**Discharge (cfs)**
2-Year	1.274	2-Year	0.721
5-Year	1.965	5-Year	1.497
10-Year	2.514	10-Year	2.240
25-Year	3.382	25-Year	2.751
50-Year	3.940	50-Year	3.098
100-Year	4.277	100-Year	3.330
200-Year	4.702	200-Year	3.820

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	**Exceedance Probability**	**Discharge (cfs)**	**Exceedance Probability**
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
0.025	2.1389E-01	0.020	5.9662E-01
0.049	1.6399E-01	0.041	5.7148E-01
0.074	1.3424E-01	0.061	5.4694E-01
0.098	1.1283E-01	0.081	5.1517E-01
0.123	9.6399E-02	0.102	4.8477E-01
0.147	8.3131E-02	0.122	4.4974E-01
0.172	7.2248E-02	0.142	4.1939E-01
0.197	6.3278E-02	0.163	3.8731E-01
0.221	5.5593E-02	0.183	3.5725E-01
0.246	4.9051E-02	0.203	3.2772E-01
0.270	4.3531E-02	0.224	2.9912E-01
0.295	3.8682E-02	0.244	2.7193E-01
0.320	3.4493E-02	0.264	2.4561E-01
0.344	3.0982E-02	0.285	2.2070E-01
0.369	2.7924E-02	0.305	1.9641E-01
0.393	2.5245E-02	0.325	1.7322E-01
0.418	2.2799E-02	0.346	1.5137E-01
0.442	2.0656E-02	0.366	1.3079E-01
0.467	1.8751E-02	0.386	1.1217E-01
0.492	1.7048E-02	0.407	9.5215E-02
0.516	1.5550E-02	0.427	8.1118E-02
0.541	1.4210E-02	0.447	6.8220E-02
0.565	1.3018E-02	0.468	5.6583E-02
0.590	1.1956E-02	0.488	4.6389E-02
0.614	1.0951E-02	0.508	3.7685E-02
0.637	1.0158E-02	0.529	3.0306E-02
0.664	9.3037E-03	0.549	2.3997E-02
0.688	8.5954E-03	0.569	1.8261E-02
0.713	7.9666E-03	0.590	1.3764E-02
0.737	7.3760E-03	0.610	9.9087E-03
0.762	6.8164E-03	0.637	7.8687E-03
0.787	6.3377E-03	0.651	7.3947E-03
0.811	5.8742E-03	0.671	6.7312E-03
0.836	5.4540E-03	0.691	6.2258E-03
0.860	5.0619E-03	0.712	5.7724E-03
0.885	4.7082E-03	0.732	5.3652E-03
0.909	4.3941E-03	0.752	4.9854E-03
0.934	4.0959E-03	0.773	4.6194E-03
0.959	3.8468E-03	0.793	4.3313E-03
0.983	3.6013E-03	0.813	4.0584E-03
1.008	3.3717E-03	0.834	3.8158E-03
1.032	3.1674E-03	0.854	3.6006E-03
1.057	2.9580E-03	0.874	3.3912E-03
1.082	2.7703E-03	0.895	3.1884E-03
1.106	2.5862E-03	0.915	2.9811E-03
1.131	2.4180E-03	0.935	2.8266E-03
1.155	2.2642E-03	0.956	2.6757E-03
1.180	2.1119E-03	0.976	2.5306E-03
1.204	1.9610E-03	0.996	2.3869E-03
1.229	1.8288E-03	1.017	2.2505E-03
1.254	1.7097E-03	1.037	2.1241E-03
1.274	1.6199E-03	1.057	2.0101E-03
1.303	1.4989E-03	1.078	1.8960E-03
1.327	1.3992E-03	1.098	1.7963E-03
1.352	1.3032E-03	1.118	1.7018E-03

1.376	1.2310E-03	1.139	1.6043E-03
1.401	1.1631E-03	1.159	1.5213E-03
1.426	1.1039E-03	1.179	1.4592E-03
1.450	1.0418E-03	1.200	1.3942E-03
1.475	9.8986E-04	1.220	1.3292E-03
1.499	9.3355E-04	1.240	1.2722E-03
1.524	8.8156E-04	1.261	1.2223E-03
1.549	8.3680E-04	1.274	1.1907E-03
1.573	7.9131E-04	1.301	1.1256E-03
1.598	7.4799E-04	1.322	1.0837E-03
1.622	7.0539E-04	1.342	1.0433E-03
1.647	6.6568E-04	1.362	9.9708E-04
1.671	6.3319E-04	1.383	9.6243E-04
1.696	5.9637E-04	1.403	9.2055E-04
1.721	5.7399E-04	1.423	8.8445E-04
1.745	5.4439E-04	1.444	8.5124E-04
1.770	5.1551E-04	1.464	8.2091E-04
1.794	4.8735E-04	1.484	7.8770E-04
1.819	4.6930E-04	1.505	7.6099E-04
1.843	4.4547E-04	1.525	7.3066E-04
1.868	4.2815E-04	1.545	7.0612E-04
1.893	3.9999E-04	1.566	6.8373E-04
1.917	3.8410E-04	1.586	6.5413E-04
1.942	3.6100E-04	1.606	6.2886E-04
1.965	3.4360E-04	1.627	6.0865E-04
1.991	3.2923E-04	1.647	5.8554E-04
2.016	3.1190E-04	1.667	5.5594E-04
2.040	2.9530E-04	1.688	5.3428E-04
2.065	2.7653E-04	1.708	5.0829E-04
2.089	2.6064E-04	1.728	4.9096E-04
2.114	2.4765E-04	1.749	4.6930E-04
2.138	2.3321E-04	1.769	4.5342E-04
2.163	2.2526E-04	1.789	4.3753E-04
2.188	2.1371E-04	1.810	4.2309E-04
2.212	2.0577E-04	1.830	4.1226E-04
2.237	1.9422E-04	1.850	3.9854E-04
2.261	1.8483E-04	1.871	3.8122E-04
2.286	1.7400E-04	1.891	3.6750E-04
2.311	1.6389E-04	1.911	3.5378E-04
2.335	1.5162E-04	1.932	3.3862E-04
2.360	1.4296E-04	1.952	3.2923E-04
2.384	1.3285E-04	1.965	3.2067E-04
2.409	1.2852E-04	1.993	3.0252E-04
2.433	1.2130E-04	2.013	2.9241E-04
2.458	1.1624E-04	2.033	2.7941E-04
2.483	1.0830E-04	2.054	2.6642E-04
2.507	9.9636E-05	2.074	2.5848E-04
2.532	9.2416E-05	2.094	2.4837E-04
2.556	8.9528E-05	2.115	2.3898E-04
2.581	8.3030E-05	2.135	2.3176E-04
2.605	7.5810E-05	2.155	2.2671E-04
2.630	7.2922E-05	2.176	2.1732E-04
2.655	6.5702E-05	2.196	2.1010E-04
2.679	6.0648E-05	2.216	2.0072E-04
2.704	5.6316E-05	2.237	1.9350E-04
2.728	5.1984E-05	2.257	1.8555E-04
2.753	5.0540E-05	2.277	1.7111E-04
2.778	4.7652E-05	2.298	1.6245E-04
2.802	4.2598E-05	2.318	1.4801E-04
2.827	4.0432E-05	2.338	1.4223E-04
2.851	3.6100E-05	2.359	1.3357E-04
2.876	3.3934E-05	2.379	1.2346E-04
2.900	3.3212E-05	2.399	1.1552E-04
2.925	2.9602E-05	2.420	1.1047E-04
2.950	2.8880E-05	2.440	9.8914E-05
2.974	2.6714E-05	2.460	9.1694E-05
2.999	2.5270E-05	2.481	8.5196E-05
3.023	2.2382E-05	2.501	8.3030E-05
3.048	2.0938E-05	2.521	8.0864E-05
3.072	1.9494E-05	2.542	7.5810E-05
3.097	1.8050E-05	2.562	7.2200E-05
3.122	1.7328E-05	2.582	7.0756E-05
3.146	1.6606E-05	2.603	6.9312E-05
3.171	1.5162E-05	2.623	6.4980E-05
3.195	1.4440E-05	2.643	6.4258E-05
3.220	1.3718E-05	2.664	6.1370E-05
3.245	1.2996E-05	2.684	5.9926E-05
3.269	1.0830E-05	2.704	5.7760E-05
3.294	1.0830E-05	2.725	5.1984E-05
3.318	1.0108E-05	2.745	5.0540E-05
3.343	9.3860E-06	2.765	4.3320E-05
3.367	8.6640E-06	2.786	4.1876E-05
3.392	8.6640E-06	2.806	3.9710E-05
3.417	8.6640E-06	2.826	3.6822E-05
3.441	8.6640E-06	2.847	3.3212E-05
3.466	7.2200E-06	2.867	2.8880E-05
3.490	7.2200E-06	2.887	2.8158E-05
3.515	7.2200E-06	2.908	2.4548E-05
3.540	7.2200E-06	2.928	2.4548E-05
3.564	7.2200E-06	2.948	2.2382E-05
3.589	6.4980E-06	2.969	2.0938E-05
3.613	6.4980E-06	2.989	2.0938E-05
3.638	6.4980E-06	3.009	1.8772E-05
3.662	6.4980E-06	3.030	1.8050E-05
3.687	5.7760E-06	3.050	1.7328E-05

3.712	5.7760E-06	3.070	1.6606E-05
3.736	5.7760E-06	3.091	1.5884E-05
3.761	5.7760E-06	3.111	1.5162E-05
3.785	5.7760E-06	3.131	1.5162E-05
3.810	5.7760E-06	3.152	1.5162E-05
3.834	5.0540E-06	3.172	1.2996E-05
3.859	4.3320E-06	3.192	1.2996E-05
3.884	4.3320E-06	3.213	1.1552E-05
3.908	4.3320E-06	3.233	1.0830E-05
3.940	4.3308E-06	3.253	1.0830E-05
3.957	4.3320E-06	3.274	9.3860E-06
3.982	4.3320E-06	3.294	9.3860E-06
4.007	4.3320E-06	3.314	9.3860E-06
4.031	4.3320E-06	3.335	7.2200E-06
4.056	2.8880E-06	3.355	7.2200E-06
4.080	2.8880E-06	3.375	7.2200E-06
4.105	2.8880E-06	3.396	7.2200E-06
4.129	2.8880E-06	3.416	7.2200E-06
4.154	2.8880E-06	3.436	7.2200E-06
4.179	2.1660E-06	3.457	7.2200E-06
4.203	2.1660E-06	3.477	6.4980E-06
4.228	2.1660E-06	3.497	6.4980E-06
4.252	1.4440E-06	3.518	6.4980E-06
4.277	1.4440E-06	3.538	6.4980E-06
4.301	7.2200E-07	3.558	6.4980E-06
4.326	7.2200E-07	3.579	6.4980E-06
4.351	7.2200E-07	3.599	5.0540E-06
4.375	7.2200E-07	3.619	5.0540E-06
4.400	7.2200E-07	3.640	5.0540E-06
4.424	7.2200E-07	3.660	5.0540E-06
4.449	7.2200E-07	3.680	5.0540E-06
4.474	7.2200E-07	3.701	5.0540E-06
4.498	7.2200E-07	3.721	5.0540E-06
4.523	7.2200E-07	3.741	4.3320E-06
4.547	7.2200E-07	3.762	4.3320E-06
4.572	7.2200E-07	3.782	4.3320E-06
4.596	7.2200E-07	3.802	4.3320E-06
4.621	7.2200E-07	3.823	4.3320E-06
4.646	7.2200E-07	3.843	3.6100E-06
4.670	7.2200E-07	3.863	3.6100E-06
4.695	7.2200E-07	3.884	2.8880E-06
4.719	7.2200E-07	3.904	2.8880E-06
4.744	7.2200E-07	3.924	2.8880E-06
4.769	7.2200E-07	3.940	2.8989E-06
4.793	7.2200E-07	3.965	2.8880E-06
4.818	7.2200E-07	3.985	2.8880E-06
4.842	7.2200E-07	4.006	1.4440E-06
4.867	7.2200E-07	4.026	1.4440E-06
4.891	7.2200E-07	4.046	1.4440E-06
4.916	7.2200E-07	4.067	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-22.5%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-22.5%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	2.6%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 12:29 PM**

Input File Name: **vault2.fld**
Project Name: Burien NERA
Analysis Title: Detention Vault and Wetvault 2
Comments: 95% Impervious

********** **Precipitation Input** **********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** **Watershed Definition** **********
Number of Subbasins: 1

********** **Subbasin Number: 1** **********
***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

	Predeveloped	To Node	Developed Bypass Node
Till Forest	17.134	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	1.948	0.000
Wetland	0.000	1.086	0.000
Impervious	0.000	14.100	0.000
Subbasin Total	**17.134**	**17.134**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped Surface	Predeveloped Interflow	Predeveloped Grnd Water	Developed Surface	Developed Interflow	Developed Grnd Water
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** **Subbasin Connection Summary** ***
Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** **Postdeveloped Node Connection Summary** ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** **Predeveloped Structure Summary** ***

*** **Postdeveloped Structure Summary** ***

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used
Pond Floor Elevation : 100.00 ft
Riser Crest Elevation : 110.00 ft
Max Pond Elevation : 110.50 ft
Max Storage Depth : 10.00 ft
Pond Bottom Length : 273.9 ft
Pond Bottom Width : 91.3 ft
Pond Side Slopes : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00 ft/ft

Pond Bottom Area : 25010. sq-ft
Area at Riser Crest El : 25,010. sq-ft
: 0.574 acres
Volume at Riser Crest : 250,100.cu-ft
: 5.742 ac-ft
Area at Max Elevation : 25010. sq-ft
: 0.574 acres
Vol at Max Elevation : 262,605. cu-ft
: 6.029 ac-ft
Hydraulic Conductivity : 0.00 in/hr
Depth to Water Table : 100.00 ft

Riser Geometry

Riser Structure Type : Circular
Riser Diameter : 24.00 in
Common Length : 0.028 ft
Riser Crest Elevation : 110.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Invert Elevation : 100.00 ft
Diameter : 1.69 in
Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Invert Elevation : 105.22 ft
Length : 0.33 in
Height : 57.38 in
Orientation : Vertical
Elbow : No

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.033	0.019	0.014	0.000
100.065	0.037	0.020	0.000
100.130	0.075	0.028	0.000
100.260	0.149	0.039	0.000
100.390	0.224	0.048	0.000
100.520	0.299	0.055	0.000
100.650	0.373	0.062	0.000
100.780	0.448	0.068	0.000
100.910	0.522	0.073	0.000
101.040	0.597	0.078	0.000
101.170	0.672	0.083	0.000
101.300	0.746	0.087	0.000
101.430	0.821	0.092	0.000
101.560	0.896	0.096	0.000
101.690	0.970	0.100	0.000
101.820	1.045	0.103	0.000
101.950	1.120	0.107	0.000
102.080	1.194	0.110	0.000
102.210	1.269	0.114	0.000
102.340	1.343	0.117	0.000
102.470	1.418	0.120	0.000
102.600	1.493	0.123	0.000
102.730	1.567	0.127	0.000
102.860	1.642	0.129	0.000
102.990	1.717	0.132	0.000
103.120	1.791	0.135	0.000
103.250	1.866	0.138	0.000
103.380	1.941	0.141	0.000
103.510	2.015	0.143	0.000
103.640	2.090	0.146	0.000
103.770	2.165	0.149	0.000
103.900	2.239	0.151	0.000
104.030	2.314	0.154	0.000
104.160	2.388	0.156	0.000
104.290	2.463	0.159	0.000
104.420	2.538	0.161	0.000
104.550	2.612	0.163	0.000
104.680	2.687	0.166	0.000
104.810	2.762	0.168	0.000
104.940	2.836	0.170	0.000
105.070	2.911	0.172	0.000
105.107	2.932	0.173	0.000
105.144	2.954	0.174	0.000
105.181	2.975	0.174	0.000
105.218	2.996	0.175	0.000
105.251	3.015	0.176	0.000
105.283	3.033	0.177	0.000
105.316	3.052	0.179	0.000
105.348	3.071	0.181	0.000
105.478	3.145	0.189	0.000
105.608	3.220	0.199	0.000

105.738	3.295	0.211	0.000
105.868	3.369	0.224	0.000
105.998	3.444	0.239	0.000
106.128	3.519	0.254	0.000
106.258	3.593	0.270	0.000
106.388	3.668	0.288	0.000
106.518	3.743	0.306	0.000
106.648	3.817	0.325	0.000
106.778	3.892	0.344	0.000
106.908	3.966	0.365	0.000
107.038	4.041	0.386	0.000
107.168	4.116	0.407	0.000
107.298	4.190	0.430	0.000
107.428	4.265	0.453	0.000
107.558	4.340	0.477	0.000
107.688	4.414	0.501	0.000
107.818	4.489	0.526	0.000
107.948	4.564	0.551	0.000
108.078	4.638	0.577	0.000
108.208	4.713	0.604	0.000
108.338	4.787	0.631	0.000
108.468	4.862	0.658	0.000
108.598	4.937	0.687	0.000
108.728	5.011	0.715	0.000
108.858	5.086	0.744	0.000
108.988	5.161	0.774	0.000
109.118	5.235	0.804	0.000
109.248	5.310	0.834	0.000
109.378	5.385	0.865	0.000
109.508	5.459	0.897	0.000
109.638	5.534	0.929	0.000
109.768	5.609	0.961	0.000
109.826	5.642	0.975	0.000
109.884	5.675	0.990	0.000
109.942	5.708	1.005	0.000
110.000	5.741	1.020	0.000
110.033	5.760	1.152	0.000
110.065	5.779	1.386	0.000
110.098	5.797	1.687	0.000
110.130	5.816	2.041	0.000
110.163	5.835	2.441	0.000
110.195	5.853	2.879	0.000
110.228	5.872	3.351	0.000
110.260	5.891	3.853	0.000
110.390	5.965	6.059	0.000
110.520	6.040	8.354	0.000
110.650	6.115	10.438	0.000
110.780	6.189	12.068	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)
Link: 1

Max Date	WSEL (ft)
12/07/1939	105.982
01/18/1941	103.438
12/20/1941	104.546
11/23/1942	106.496
10/17/1943	103.076
02/07/1945	106.073
02/05/1946	103.974
12/05/1946	104.992
10/19/1947	106.436
02/22/1949	105.151
01/22/1950	106.097
02/09/1951	107.434
10/03/1951	104.138
01/11/1953	106.492
01/22/1954	104.520
11/19/1954	104.474
01/06/1956	107.245
02/26/1957	105.315
01/17/1958	105.143
01/13/1959	106.494
11/21/1959	106.161
11/24/1960	106.769
12/24/1961	103.867
11/30/1962	103.941
11/14/1963	104.130
12/01/1964	105.267
01/07/1966	105.283
12/13/1966	106.422
10/27/1967	104.803
12/11/1968	105.308
01/27/1970	106.177
12/07/1970	105.814
03/05/1972	108.805
12/23/1972	107.100
03/01/1974	105.390
12/27/1974	104.843
02/27/1976	105.747
08/26/1977	103.895

12/15/1977	106.681
03/05/1979	103.750
12/18/1979	108.731
12/30/1980	105.385
10/06/1981	108.502
03/09/1983	105.699
03/21/1984	104.178
11/11/1984	104.301
01/18/1986	106.470
11/24/1986	108.534
04/06/1988	105.431
04/05/1989	105.657
01/09/1990	108.881
11/24/1990	109.269
01/31/1992	106.340
04/11/1993	103.597
03/03/1994	104.131
12/27/1994	106.651
02/09/1996	109.598
01/02/1997	108.806
10/08/1997	104.196
11/26/1998	108.942
02/28/2000	105.477
05/05/2001	104.085
11/15/2001	103.821
11/26/2002	108.244
10/24/2003	105.459
02/08/2005	103.959
11/28/2005	106.307
11/27/2006	105.380
01/07/2008	106.184
02/18/2009	108.544
01/10/2010	106.307
11/17/2010	107.675
10/02/2011	105.960
01/20/2013	109.378
01/28/2014	105.602
03/30/2015	104.099
01/04/2016	108.172
11/01/2016	105.032
01/31/2018	105.251
01/12/2019	106.208
04/21/2020	104.197
11/24/2020	107.513
12/21/2021	105.076
03/30/2023	105.610
01/25/2024	106.163
12/22/2024	108.300
01/03/2026	107.100
01/29/2027	104.603
02/23/2028	105.375
12/11/2028	105.357
01/26/2030	107.401
03/04/2031	105.277
01/21/2032	106.869
12/23/2032	105.145
01/16/2034	108.738
02/19/2035	105.504
02/27/2036	105.881
08/25/2037	102.556
12/15/2037	106.357
12/04/2038	103.491
01/14/2040	105.539
12/25/2040	106.346
04/15/2042	106.194
02/26/2043	105.633
03/21/2044	104.918
03/27/2045	105.569
02/17/2046	105.156
02/02/2047	104.599
12/10/2047	106.805
03/17/2049	104.602
12/04/2049	104.469
04/09/2051	104.133
04/17/2052	103.344
12/10/2052	104.355
12/11/2053	104.737
11/01/2054	108.350
02/07/2056	109.633
11/19/2056	108.800
05/21/2058	105.098
11/26/2058	107.429
01/23/2060	103.930
10/27/2060	106.076
01/03/2062	105.070
12/30/2062	105.506
12/23/2063	107.632
12/01/2064	104.842
01/13/2066	103.309
12/15/2066	107.071
01/19/2068	107.263
09/23/2069	103.736
12/14/2069	103.553
12/19/2070	103.419
11/03/2071	104.733

12/25/2072	110.180
12/15/2073	106.361
11/20/2074	103.930
10/30/2075	107.243
08/26/2077	102.904
12/02/2077	104.801
02/25/2079	103.673
12/17/2079	109.341
11/21/2080	107.781
02/19/2082	106.888
02/20/2083	106.912
11/26/2083	107.901
12/14/2084	106.178
11/01/2085	105.223
11/23/2086	106.197
12/09/2087	104.908
11/05/2088	106.473
11/10/2089	105.820
12/09/2090	107.997
01/31/2092	107.675
11/07/2092	103.631
12/14/2093	104.089
12/27/2094	105.698
12/14/2095	106.132
10/28/2096	106.908

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	102.556
1.01	102.904
1.02	103.076
1.02	103.309
1.03	103.344
1.04	103.419
1.04	103.438
1.05	103.491
1.06	103.553
1.06	103.597
1.07	103.631
1.08	103.673
1.09	103.736
1.09	103.750
1.10	103.821
1.11	103.867
1.12	103.895
1.12	103.930
1.13	103.930
1.14	103.941
1.15	103.959
1.16	103.974
1.17	104.085
1.18	104.089
1.18	104.099
1.19	104.130
1.20	104.131
1.21	104.133
1.22	104.138
1.23	104.178
1.24	104.196
1.25	104.197
1.26	104.301
1.27	104.355
1.28	104.469
1.29	104.474
1.30	104.520
1.31	104.546
1.32	104.599
1.33	104.602
1.35	104.603
1.36	104.733
1.37	104.737
1.38	104.801
1.39	104.803
1.40	104.842
1.42	104.843
1.43	104.908
1.44	104.918
1.46	104.992
1.47	105.032
1.48	105.070
1.50	105.076
1.51	105.098
1.53	105.143
1.54	105.145
1.56	105.151
1.57	105.156
1.59	105.223
1.60	105.251
1.62	105.267
1.64	105.277
1.65	105.283
1.67	105.308
1.69	105.315
1.71	105.357

1.73	105.375
1.75	105.380
1.77	105.385
1.79	105.390
1.81	105.431
1.83	105.459
1.85	105.477
1.87	105.504
1.89	105.506
1.92	105.539
1.94	105.569
1.96	105.602
1.99	105.610
2.01	105.633
2.04	105.657
2.07	105.698
2.09	105.699
2.12	105.747
2.15	105.814
2.18	105.820
2.21	105.881
2.24	105.960
2.27	105.982
2.31	106.073
2.34	106.076
2.38	106.097
2.41	106.132
2.45	106.161
2.49	106.163
2.53	106.177
2.57	106.178
2.61	106.184
2.65	106.194
2.70	106.197
2.75	106.208
2.80	106.307
2.85	106.307
2.90	106.340
2.95	106.346
3.01	106.357
3.07	106.361
3.13	106.422
3.19	106.436
3.26	106.470
3.32	106.473
3.40	106.492
3.47	106.494
3.55	106.496
3.63	106.651
3.72	106.681
3.80	106.769
3.90	106.805
4.00	106.869
4.10	106.888
4.21	106.908
4.32	106.912
4.45	107.071
4.58	107.100
4.71	107.100
4.86	107.243
5.01	107.245
5.17	107.263
5.35	107.401
5.54	107.429
5.74	107.434
5.95	107.513
6.19	107.632
6.44	107.675
6.71	107.675
7.01	107.781
7.33	107.901
7.69	107.997
8.08	108.172
8.52	108.244
9.00	108.300
9.55	108.350
10.16	108.502
10.86	108.534
11.66	108.544
12.59	108.731
13.68	108.738
14.97	108.800
16.54	108.805
18.47	108.806
20.92	108.881
24.10	108.942
28.44	109.269
34.68	109.341
44.42	109.378
61.77	109.598
101.36	109.633
282.36	110.180

Postdeveloped Water Surface Elevation Data (ft)

Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	103.514
1.11-Year	103.874
1.25-Year	104.202
2.00-Year	105.620
3.33-Year	106.474
5-Year	107.247
10-Year	108.466
25-Year	108.856
50-Year	109.451
100-Year	109.636

Postdeveloped Infiltrated Water Statistics

Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	6234.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1

2-Year Discharge Rate : 3.680 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 13841. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 20761. cu-ft
2-Year Discharge Rate : 0.201 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		Postdevelopment Runoff	
Date	Annual Max Q (cfs)	Date	Annual Max Q (cfs)
04/30/1940	0.463	12/07/1939	0.237
01/31/1941	0.178	01/18/1941	0.142
12/15/1941	0.466	12/20/1941	0.163
02/10/1943	0.185	11/23/1942	0.303
01/23/1944	0.139	10/17/1943	0.134
02/07/1945	0.577	02/07/1945	0.248
02/05/1946	0.354	02/05/1946	0.153
02/02/1947	0.361	12/05/1946	0.171
03/21/1948	0.624	10/19/1947	0.294
02/22/1949	0.313	02/22/1949	0.174
03/03/1950	1.290	01/22/1950	0.250
02/09/1951	0.516	02/09/1951	0.454
01/24/1952	0.136	10/03/1951	0.156
01/11/1953	0.193	01/11/1953	0.302
01/22/1954	0.313	01/22/1954	0.163
04/12/1955	0.146	11/19/1954	0.162
03/04/1956	0.336	01/06/1956	0.421
02/25/1957	0.278	02/26/1957	0.179
01/16/1958	0.337	01/17/1958	0.174
01/12/1959	0.363	01/13/1959	0.302
12/15/1959	0.388	11/21/1959	0.258
02/14/1961	0.332	11/24/1960	0.343
03/04/1962	0.178	12/24/1961	0.151
02/03/1963	0.197	11/30/1962	0.152
01/01/1964	0.315	11/14/1963	0.156
02/26/1965	0.391	12/01/1964	0.177
01/06/1966	0.241	01/07/1966	0.177
01/19/1967	0.610	12/13/1966	0.292
02/03/1968	0.315	10/27/1967	0.168
12/03/1968	0.339	12/11/1968	0.178
01/13/1970	0.262	01/27/1970	0.260
12/06/1970	0.298	12/07/1970	0.219
02/28/1972	0.805	03/05/1972	0.732
01/13/1973	0.290	12/23/1972	0.396
02/18/1974	0.434	03/01/1974	0.183
12/26/1974	0.525	12/27/1974	0.169
01/27/1976	0.364	02/27/1976	0.212
05/31/1977	0.051	08/26/1977	0.151
12/10/1977	0.308	12/15/1977	0.329
03/04/1979	0.303	03/05/1979	0.148
12/17/1979	0.488	12/18/1979	0.716
12/26/1980	0.193	12/30/1980	0.183
10/06/1981	0.618	10/06/1981	0.666
01/05/1983	0.347	03/09/1983	0.208
03/14/1984	0.331	03/21/1984	0.156
02/11/1985	0.221	11/11/1984	0.159

01/18/1986	0.729	01/18/1986	0.299
11/24/1986	0.643	11/24/1986	0.673
04/06/1988	0.321	04/06/1988	0.186
04/05/1989	0.354	04/05/1989	0.204
01/09/1990	1.169	01/09/1990	0.749
11/24/1990	0.996	11/24/1990	0.839
01/27/1992	0.304	01/31/1992	0.281
06/09/1993	0.257	04/11/1993	0.145
03/03/1994	0.195	03/03/1994	0.156
02/19/1995	0.409	12/27/1994	0.325
02/09/1996	0.948	02/09/1996	0.919
01/02/1997	0.593	01/02/1997	0.733
02/28/1998	0.218	10/08/1997	0.157
11/25/1998	0.583	11/26/1998	0.763
03/26/2000	0.327	02/28/2000	0.189
05/05/2001	0.250	05/05/2001	0.155
05/03/2002	0.893	11/15/2001	0.150
03/31/2003	0.684	11/26/2002	0.611
01/23/2004	0.167	10/24/2003	0.188
02/07/2005	0.288	02/08/2005	0.152
02/27/2006	0.370	11/28/2005	0.277
12/14/2006	0.274	11/27/2006	0.183
03/21/2008	0.455	01/07/2008	0.261
02/17/2009	0.706	02/18/2009	0.675
01/10/2010	0.474	01/10/2010	0.277
11/17/2010	0.615	11/17/2010	0.498
01/31/2012	0.391	10/02/2011	0.235
01/20/2013	0.894	01/20/2013	0.865
12/06/2013	0.376	01/28/2014	0.199
03/30/2015	0.228	03/30/2015	0.155
01/04/2016	0.650	01/04/2016	0.596
03/07/2017	0.188	11/01/2016	0.172
01/31/2018	0.351	01/31/2018	0.176
03/30/2019	0.347	01/12/2019	0.264
04/14/2020	0.228	04/21/2020	0.157
02/10/2021	0.563	11/24/2020	0.468
03/26/2022	0.166	12/21/2021	0.173
03/30/2023	0.401	03/30/2023	0.200
01/19/2024	0.315	01/25/2024	0.258
12/22/2024	0.659	12/22/2024	0.623
03/09/2026	0.418	01/03/2026	0.396
01/27/2027	0.364	01/29/2027	0.164
02/19/2028	0.452	02/23/2028	0.182
12/04/2028	0.350	12/11/2028	0.181
02/16/2030	0.467	01/26/2030	0.448
12/30/2030	0.437	03/04/2031	0.177
01/20/2032	0.702	01/21/2032	0.358
03/01/2033	0.198	12/23/2032	0.174
01/15/2034	0.793	01/16/2034	0.717
02/19/2035	0.387	02/19/2035	0.191
03/24/2036	0.366	02/27/2036	0.226
03/09/2037	0.015	08/25/2037	0.122
12/15/2037	0.267	12/15/2037	0.284
02/07/2039	0.193	12/04/2038	0.143
01/14/2040	0.725	01/14/2040	0.194
12/25/2040	0.411	12/25/2040	0.282
02/20/2042	0.431	04/15/2042	0.262
03/31/2043	0.646	02/26/2043	0.202
05/01/2044	0.255	03/21/2044	0.170
02/11/2045	0.295	03/27/2045	0.196
02/16/2046	0.371	02/17/2046	0.174
02/01/2047	0.233	02/02/2047	0.164
04/21/2048	0.207	12/10/2047	0.348
03/16/2049	0.233	03/17/2049	0.164
12/04/2049	0.393	12/04/2049	0.162
04/06/2051	0.305	04/09/2051	0.156
04/17/2052	0.183	04/17/2052	0.140
06/04/2053	0.703	12/10/2052	0.160
04/08/2054	0.131	12/11/2053	0.167
02/17/2055	0.598	11/01/2054	0.633
02/07/2056	1.088	02/07/2056	0.927
11/19/2056	1.191	11/19/2056	0.731
01/24/2058	0.413	05/21/2058	0.173
12/28/2058	0.475	11/26/2058	0.453
01/19/2060	0.178	01/23/2060	0.152
01/10/2061	0.386	10/27/2060	0.248
02/03/2062	1.467	01/03/2062	0.172
12/29/2062	0.310	12/30/2062	0.191
12/23/2063	0.560	12/23/2063	0.490
11/30/2064	0.268	12/01/2064	0.168
01/13/2066	0.147	01/13/2066	0.139
01/19/2067	0.373	12/15/2066	0.391
01/18/2068	0.769	01/19/2068	0.424
01/04/2069	0.207	09/23/2069	0.148
04/09/2070	0.174	12/14/2069	0.144
02/14/2071	0.191	12/19/2070	0.142
02/27/2072	0.205	11/03/2071	0.167
12/25/2072	0.857	12/25/2072	2.678
03/16/2074	0.461	12/15/2073	0.284
01/23/2075	0.100	11/20/2074	0.152
03/24/2076	0.512	10/30/2075	0.420
03/02/2077	0.057	08/26/2077	0.130
12/02/2077	0.193	12/02/2077	0.168
02/25/2079	0.258	02/25/2079	0.147
12/17/2079	0.956	12/17/2079	0.857

11/21/2080	0.422	11/21/2080	0.519
02/13/2082	0.527	02/19/2082	0.361
02/19/2083	0.323	02/20/2083	0.365
11/26/2083	0.392	11/26/2083	0.542
12/14/2084	0.271	12/14/2084	0.260
01/18/2086	0.382	11/01/2085	0.175
12/21/2086	0.358	11/23/2086	0.263
01/14/2088	0.236	12/09/2087	0.170
11/05/2088	0.419	11/05/2088	0.299
01/07/2090	0.197	11/10/2089	0.220
12/04/2090	0.364	12/09/2090	0.561
04/28/2092	0.624	01/31/2092	0.499
03/22/2093	0.175	11/07/2092	0.146
03/01/2094	0.147	12/14/2093	0.155
02/18/2095	0.232	12/27/2094	0.208
01/14/2096	0.293	12/14/2095	0.255
01/29/2097	0.644	10/28/2096	0.365

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.015	1.00	0.122
1.01	0.051	1.01	0.130
1.02	0.057	1.02	0.134
1.02	0.100	1.02	0.139
1.03	0.131	1.03	0.140
1.04	0.136	1.04	0.142
1.04	0.139	1.04	0.142
1.05	0.146	1.05	0.143
1.06	0.147	1.06	0.144
1.06	0.147	1.06	0.145
1.07	0.166	1.07	0.146
1.08	0.167	1.08	0.147
1.09	0.174	1.09	0.148
1.09	0.175	1.09	0.148
1.10	0.178	1.10	0.150
1.11	0.178	1.11	0.151
1.12	0.178	1.12	0.151
1.12	0.183	1.12	0.152
1.13	0.185	1.13	0.152
1.14	0.188	1.14	0.152
1.15	0.191	1.15	0.152
1.16	0.193	1.16	0.153
1.17	0.193	1.17	0.155
1.18	0.193	1.18	0.155
1.18	0.193	1.18	0.155
1.19	0.195	1.19	0.156
1.20	0.197	1.20	0.156
1.21	0.197	1.21	0.156
1.22	0.198	1.22	0.156
1.23	0.205	1.23	0.156
1.24	0.207	1.24	0.157
1.25	0.207	1.25	0.157
1.26	0.218	1.26	0.159
1.27	0.221	1.27	0.160
1.28	0.228	1.28	0.162
1.29	0.228	1.29	0.162
1.30	0.232	1.30	0.163
1.31	0.233	1.31	0.163
1.32	0.233	1.32	0.164
1.33	0.236	1.33	0.164
1.35	0.241	1.35	0.164
1.36	0.250	1.36	0.167
1.37	0.255	1.37	0.167
1.38	0.257	1.38	0.168
1.39	0.258	1.39	0.168
1.40	0.262	1.40	0.168
1.42	0.267	1.42	0.169
1.43	0.268	1.43	0.170
1.44	0.271	1.44	0.170
1.46	0.274	1.46	0.171
1.47	0.278	1.47	0.172
1.48	0.288	1.48	0.172
1.50	0.290	1.50	0.173
1.51	0.293	1.51	0.173
1.53	0.295	1.53	0.174
1.54	0.298	1.54	0.174
1.56	0.303	1.56	0.174
1.57	0.304	1.57	0.174
1.59	0.305	1.59	0.175
1.60	0.308	1.60	0.176
1.62	0.310	1.62	0.177
1.64	0.313	1.64	0.177
1.65	0.313	1.65	0.177
1.67	0.315	1.67	0.178
1.69	0.315	1.69	0.179
1.71	0.315	1.71	0.181
1.73	0.321	1.73	0.182
1.75	0.323	1.75	0.183
1.77	0.327	1.77	0.183
1.79	0.331	1.79	0.183

1.81	0.332	1.81	0.186
1.83	0.336	1.83	0.188
1.85	0.337	1.85	0.189
1.87	0.339	1.87	0.191
1.89	0.347	1.89	0.191
1.92	0.347	1.92	0.194
1.94	0.350	1.94	0.196
1.96	0.351	1.96	0.199
1.99	0.354	1.99	0.200
2.01	0.354	2.01	0.202
2.04	0.358	2.04	0.204
2.07	0.361	2.07	0.208
2.09	0.363	2.09	0.208
2.12	0.364	2.12	0.212
2.15	0.364	2.15	0.219
2.18	0.364	2.18	0.220
2.21	0.366	2.21	0.226
2.24	0.370	2.24	0.235
2.27	0.371	2.27	0.237
2.31	0.373	2.31	0.248
2.34	0.376	2.34	0.248
2.38	0.382	2.38	0.250
2.41	0.386	2.41	0.255
2.45	0.387	2.45	0.258
2.49	0.388	2.49	0.258
2.53	0.391	2.53	0.260
2.57	0.391	2.57	0.260
2.61	0.392	2.61	0.261
2.65	0.393	2.65	0.262
2.70	0.401	2.70	0.263
2.75	0.409	2.75	0.264
2.80	0.411	2.80	0.277
2.85	0.413	2.85	0.277
2.90	0.418	2.90	0.281
2.95	0.419	2.95	0.282
3.01	0.422	3.01	0.284
3.07	0.431	3.07	0.284
3.13	0.434	3.13	0.292
3.19	0.437	3.19	0.294
3.26	0.452	3.26	0.299
3.32	0.455	3.32	0.299
3.40	0.461	3.40	0.302
3.47	0.463	3.47	0.302
3.55	0.466	3.55	0.303
3.63	0.467	3.63	0.325
3.72	0.474	3.72	0.329
3.80	0.475	3.80	0.343
3.90	0.488	3.90	0.348
4.00	0.512	4.00	0.358
4.10	0.516	4.10	0.361
4.21	0.525	4.21	0.365
4.32	0.527	4.32	0.365
4.45	0.560	4.45	0.391
4.58	0.563	4.58	0.396
4.71	0.577	4.71	0.396
4.86	0.583	4.86	0.420
5.01	0.593	5.01	0.421
5.17	0.598	5.17	0.424
5.35	0.610	5.35	0.448
5.54	0.615	5.54	0.453
5.74	0.618	5.74	0.454
5.95	0.624	5.95	0.468
6.19	0.624	6.19	0.490
6.44	0.643	6.44	0.498
6.71	0.644	6.71	0.499
7.01	0.646	7.01	0.519
7.33	0.650	7.33	0.542
7.69	0.659	7.69	0.561
8.08	0.684	8.08	0.596
8.52	0.702	8.52	0.611
9.00	0.703	9.00	0.623
9.55	0.706	9.55	0.633
10.16	0.725	10.16	0.666
10.86	0.729	10.86	0.673
11.66	0.769	11.66	0.675
12.59	0.793	12.59	0.716
13.68	0.805	13.68	0.717
14.97	0.857	14.97	0.731
16.54	0.893	16.54	0.732
18.47	0.894	18.47	0.733
20.92	0.948	20.92	0.749
24.10	0.956	24.10	0.763
28.44	0.996	28.44	0.839
34.68	1.088	34.68	0.857
44.42	1.169	44.42	0.865
61.77	1.191	61.77	0.919
101.36	1.290	101.36	0.927
282.36	1.467	282.36	2.678

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff **Postdevelopment Runoff**

Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.354	2-Year	0.201
5-Year	0.592	5-Year	0.421
10-Year	0.720	10-Year	0.657
25-Year	0.965	25-Year	0.780
50-Year	1.177	50-Year	0.884
100-Year	1.287	100-Year	0.927
200-Year	1.408	200-Year	2.089

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
7.337E-03	2.3680E-01	1.339E-02	6.6980E-01
0.015	1.8183E-01	0.027	6.0656E-01
0.022	1.4869E-01	0.040	5.3623E-01
0.029	1.2486E-01	0.054	4.6177E-01
0.037	1.0625E-01	0.067	3.8691E-01
0.044	9.1206E-02	0.080	3.1160E-01
0.051	7.8997E-02	0.094	2.3764E-01
0.059	6.8893E-02	0.107	1.7107E-01
0.066	6.0447E-02	0.120	1.1542E-01
0.073	5.3261E-02	0.134	7.2640E-02
0.081	4.7175E-02	0.147	4.3019E-02
0.088	4.1832E-02	0.161	2.3246E-02
0.095	3.7205E-02	0.177	9.8224E-03
0.103	3.3133E-02	0.187	8.0337E-03
0.110	2.9638E-02	0.201	6.5781E-03
0.117	2.6430E-02	0.214	5.5818E-03
0.125	2.3649E-02	0.228	4.8287E-03
0.132	2.1262E-02	0.241	4.1833E-03
0.139	1.9150E-02	0.254	3.6504E-03
0.147	1.7267E-02	0.268	3.1573E-03
0.154	1.5521E-02	0.281	2.7458E-03
0.161	1.4036E-02	0.295	2.4216E-03
0.169	1.2639E-02	0.308	2.1465E-03
0.177	1.1278E-02	0.321	1.9090E-03
0.183	1.0348E-02	0.335	1.6996E-03
0.191	9.4640E-03	0.354	1.4465E-03
0.198	8.5860E-03	0.361	1.3754E-03
0.205	7.8178E-03	0.375	1.2498E-03
0.213	7.1543E-03	0.388	1.1465E-03
0.220	6.5998E-03	0.402	1.0505E-03
0.227	6.0489E-03	0.415	9.5376E-04
0.235	5.5507E-03	0.428	8.7579E-04
0.242	5.1067E-03	0.442	8.0431E-04
0.249	4.7255E-03	0.455	7.3788E-04
0.257	4.3558E-03	0.469	6.7796E-04
0.264	4.0223E-03	0.482	6.2020E-04
0.271	3.7104E-03	0.495	5.6388E-04
0.279	3.4331E-03	0.509	5.1695E-04
0.286	3.1833E-03	0.522	4.7219E-04
0.293	2.9472E-03	0.536	4.3176E-04
0.301	2.7284E-03	0.549	3.9566E-04
0.308	2.5234E-03	0.562	3.6678E-04
0.315	2.3581E-03	0.576	3.4078E-04
0.323	2.1942E-03	0.592	3.1212E-04
0.330	2.0324E-03	0.602	2.8880E-04
0.337	1.9003E-03	0.616	2.5631E-04
0.345	1.7624E-03	0.629	2.2454E-04
0.354	1.6051E-03	0.643	2.0216E-04
0.359	1.5285E-03	0.656	1.8267E-04
0.367	1.4180E-03	0.669	1.6750E-04
0.374	1.3350E-03	0.683	1.4223E-04
0.382	1.2722E-03	0.696	1.2852E-04
0.389	1.2043E-03	0.710	1.1119E-04
0.396	1.1350E-03	0.723	9.0972E-05
0.404	1.0729E-03	0.736	7.8698E-05
0.411	1.0130E-03	0.750	6.7146E-05
0.418	9.6532E-04	0.763	6.1370E-05
0.426	9.1478E-04	0.777	5.6316E-05
0.433	8.6712E-04	0.790	5.1262E-05
0.440	8.1225E-04	0.803	4.6930E-05
0.448	7.6388E-04	0.817	3.8266E-05
0.455	7.2489E-04	0.830	2.6714E-05
0.462	6.8807E-04	0.843	2.3104E-05
0.470	6.5124E-04	0.857	1.8050E-05
0.477	6.2092E-04	0.870	1.5162E-05
0.484	5.8915E-04	0.884	1.4440E-05
0.492	5.6749E-04	0.897	1.2274E-05
0.499	5.4511E-04	0.910	1.1552E-05
0.506	5.2562E-04	0.924	8.6640E-06
0.514	5.0251E-04	0.937	6.4980E-06
0.521	4.7796E-04	0.951	5.7760E-06
0.528	4.5197E-04	0.964	5.7760E-06
0.536	4.3609E-04	0.977	5.0540E-06
0.543	4.1154E-04	0.991	5.0540E-06
0.550	3.9349E-04	1.004	4.3320E-06
0.558	3.6894E-04	1.018	4.3320E-06
0.565	3.5450E-04	1.031	4.3320E-06

0.572	3.3573E-04	1.044	4.3320E-06
0.580	3.1985E-04	1.058	4.3320E-06
0.587	3.0252E-04	1.071	4.3320E-06
0.592	2.9160E-04	1.084	3.6100E-06
0.602	2.7653E-04	1.098	3.6100E-06
0.609	2.6281E-04	1.111	3.6100E-06
0.616	2.5198E-04	1.125	2.8880E-06
0.624	2.3609E-04	1.138	2.8880E-06
0.631	2.2599E-04	1.151	2.8880E-06
0.638	2.1371E-04	1.165	2.8880E-06
0.646	2.0360E-04	1.177	2.8882E-06
0.653	1.9638E-04	1.192	2.8880E-06
0.660	1.8339E-04	1.205	2.8880E-06
0.668	1.7689E-04	1.218	2.8880E-06
0.675	1.6245E-04	1.232	2.8880E-06
0.682	1.5306E-04	1.245	2.8880E-06
0.690	1.4440E-04	1.259	2.8880E-06
0.697	1.3140E-04	1.272	2.8880E-06
0.704	1.2563E-04	1.285	2.8880E-06
0.712	1.1552E-04	1.299	2.8880E-06
0.719	1.0830E-04	1.312	2.8880E-06
0.726	1.0108E-04	1.325	2.8880E-06
0.734	9.3860E-05	1.339	2.8880E-06
0.741	8.9528E-05	1.352	2.8880E-06
0.748	8.1586E-05	1.366	2.8880E-06
0.756	7.4366E-05	1.379	2.8880E-06
0.763	7.1478E-05	1.392	2.8880E-06
0.770	6.5702E-05	1.406	2.8880E-06
0.778	6.2814E-05	1.419	2.8880E-06
0.785	5.9926E-05	1.433	2.8880E-06
0.792	5.7760E-05	1.446	2.8880E-06
0.800	5.0540E-05	1.459	2.8880E-06
0.807	4.7652E-05	1.473	2.8880E-06
0.814	4.2598E-05	1.486	2.8880E-06
0.822	3.8266E-05	1.500	2.8880E-06
0.829	3.4656E-05	1.513	2.8880E-06
0.836	3.2490E-05	1.526	2.8880E-06
0.844	3.0324E-05	1.540	2.1660E-06
0.851	2.8158E-05	1.553	2.1660E-06
0.858	2.4548E-05	1.566	2.1660E-06
0.866	2.3826E-05	1.580	2.1660E-06
0.873	2.1660E-05	1.593	2.1660E-06
0.880	1.9494E-05	1.607	2.1660E-06
0.888	1.8772E-05	1.620	2.1660E-06
0.895	1.5162E-05	1.633	2.1660E-06
0.902	1.4440E-05	1.647	2.1660E-06
0.910	1.3718E-05	1.660	2.1660E-06
0.917	1.2274E-05	1.674	2.1660E-06
0.924	1.1552E-05	1.687	2.1660E-06
0.932	1.0830E-05	1.700	2.1660E-06
0.939	1.0830E-05	1.714	2.1660E-06
0.946	1.0108E-05	1.727	2.1660E-06
0.954	8.6640E-06	1.741	2.1660E-06
0.961	7.9420E-06	1.754	2.1660E-06
0.968	7.9420E-06	1.767	2.1660E-06
0.976	7.9420E-06	1.781	2.1660E-06
0.983	7.9420E-06	1.794	2.1660E-06
0.990	7.9420E-06	1.807	2.1660E-06
0.998	7.2200E-06	1.821	2.1660E-06
1.005	7.2200E-06	1.834	2.1660E-06
1.012	7.2200E-06	1.848	2.1660E-06
1.020	7.2200E-06	1.861	2.1660E-06
1.027	7.2200E-06	1.874	2.1660E-06
1.034	7.2200E-06	1.888	2.1660E-06
1.042	7.2200E-06	1.901	2.1660E-06
1.049	7.2200E-06	1.915	2.1660E-06
1.056	7.2200E-06	1.928	2.1660E-06
1.064	7.2200E-06	1.941	2.1660E-06
1.071	6.4980E-06	1.955	2.1660E-06
1.078	6.4980E-06	1.968	2.1660E-06
1.086	6.4980E-06	1.982	2.1660E-06
1.093	5.7760E-06	1.995	2.1660E-06
1.101	5.0540E-06	2.008	2.1660E-06
1.108	5.0540E-06	2.022	2.1660E-06
1.115	5.0540E-06	2.035	2.1660E-06
1.123	5.0540E-06	2.048	2.1660E-06
1.130	4.3320E-06	2.062	2.1660E-06
1.137	4.3320E-06	2.075	2.1660E-06
1.145	4.3320E-06	2.089	2.1660E-06
1.152	3.6100E-06	2.102	1.4440E-06
1.159	3.6100E-06	2.115	1.4440E-06
1.167	3.6100E-06	2.129	1.4440E-06
1.177	2.8016E-06	2.142	1.4440E-06
1.181	2.8880E-06	2.156	1.4440E-06
1.189	2.8880E-06	2.169	1.4440E-06
1.196	2.1660E-06	2.182	1.4440E-06
1.203	2.1660E-06	2.196	1.4440E-06
1.211	2.1660E-06	2.209	1.4440E-06
1.218	2.1660E-06	2.223	1.4440E-06
1.225	2.1660E-06	2.236	1.4440E-06
1.233	2.1660E-06	2.249	1.4440E-06
1.240	2.1660E-06	2.263	1.4440E-06
1.247	2.1660E-06	2.276	1.4440E-06
1.255	2.1660E-06	2.289	1.4440E-06
1.262	2.1660E-06	2.303	1.4440E-06

1.269	2.1660E-06	2.316	1.4440E-06
1.277	2.1660E-06	2.330	1.4440E-06
1.284	2.1660E-06	2.343	1.4440E-06
1.291	7.2200E-07	2.356	1.4440E-06
1.299	7.2200E-07	2.370	1.4440E-06
1.306	7.2200E-07	2.383	1.4440E-06
1.313	7.2200E-07	2.397	1.4440E-06
1.321	7.2200E-07	2.410	1.4440E-06
1.328	7.2200E-07	2.423	1.4440E-06
1.335	7.2200E-07	2.437	1.4440E-06
1.343	7.2200E-07	2.450	1.4440E-06
1.350	7.2200E-07	2.464	1.4440E-06
1.357	7.2200E-07	2.477	1.4440E-06
1.365	7.2200E-07	2.490	1.4440E-06
1.372	7.2200E-07	2.504	1.4440E-06
1.379	7.2200E-07	2.517	1.4440E-06
1.387	7.2200E-07	2.530	7.2200E-07
1.394	7.2200E-07	2.544	7.2200E-07
1.401	7.2200E-07	2.557	7.2200E-07
1.409	7.2200E-07	2.571	7.2200E-07
1.416	7.2200E-07	2.584	7.2200E-07
1.423	7.2200E-07	2.597	7.2200E-07
1.431	7.2200E-07	2.611	7.2200E-07
1.438	7.2200E-07	2.624	7.2200E-07
1.445	7.2200E-07	2.638	7.2200E-07
1.453	7.2200E-07	2.651	7.2200E-07
1.460	7.2200E-07	2.664	7.2200E-07
1.467	7.2200E-07	2.678	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-14.5%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-9.7%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):		5.7%	PASS
Percent Excursion from Q2 to Q50 (Must be less than 50%):		19.5%	PASS

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 12:40 PM**

Input File Name: **vault3.fld**
Project Name: Burien NERA
Analysis Title: Detention and Wet Vault 3
Comments: 95% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

		Developed	
	Predeveloped	**To Node**	**Bypass Node**
Till Forest	54.809	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	3.022	0.000
Wetland	0.000	1.049	0.000
Impervious	0.000	50.738	0.000
Subbasin Total	**54.809**	**54.809**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped			Developed		
	Surface	**Interflow**	**Grnd Water**	**Surface**	**Interflow**	**Grnd Water**
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

*** Predeveloped Structure Summary ***

*** Postdeveloped Structure Summary ***

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used
Pond Floor Elevation : 100.00 ft
Riser Crest Elevation : 110.00 ft
Max Pond Elevation : 111.00 ft
Max Storage Depth : 10.00 ft
Pond Bottom Length : 557.8 ft

Pond Bottom Width : 185.9 ft
Pond Side Slopes : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00 ft/ft
Pond Bottom Area : 103701. sq-ft
Area at Riser Crest El : 103,701. sq-ft
: 2.381 acres
Volume at Riser Crest : 1,037,014. cu-ft
: 23.807 ac-ft
Area at Max Elevation : 103701. sq-ft
: 2.381 acres
Vol at Max Elevation : 1,140,716. cu-ft
: 26.187 ac-ft
Hydraulic Conductivity : 0.00 in/hr
Depth to Water Table : 100.00 ft

Riser Geometry
Riser Structure Type : Circular
Riser Diameter : 42.00 in
Common Length : 0.099 ft
Riser Crest Elevation : 110.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Invert Elevation : 100.00 ft
Diameter : 2.97 in
Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Invert Elevation : 105.61 ft
Length : 1.18 in
Height : 52.69 in
Orientation : Vertical
Elbow : No

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.035	0.083	0.044	0.000
100.070	0.167	0.062	0.000
100.140	0.333	0.088	0.000
100.280	0.667	0.124	0.000
100.420	1.000	0.152	0.000
100.560	1.333	0.176	0.000
100.700	1.666	0.196	0.000
100.840	2.000	0.215	0.000
100.980	2.333	0.232	0.000
101.120	2.666	0.248	0.000
101.260	3.000	0.263	0.000
101.400	3.333	0.278	0.000
101.540	3.666	0.291	0.000
101.680	4.000	0.304	0.000
101.820	4.333	0.316	0.000
101.960	4.666	0.328	0.000
102.100	4.999	0.340	0.000
102.240	5.333	0.351	0.000
102.380	5.666	0.362	0.000
102.520	5.999	0.372	0.000
102.660	6.333	0.383	0.000
102.800	6.666	0.393	0.000
102.940	6.999	0.402	0.000
103.080	7.332	0.412	0.000
103.220	7.666	0.421	0.000
103.360	7.999	0.430	0.000
103.500	8.332	0.439	0.000
103.640	8.666	0.448	0.000
103.780	8.999	0.456	0.000
103.920	9.332	0.464	0.000
104.060	9.665	0.473	0.000
104.200	9.999	0.481	0.000
104.340	10.332	0.489	0.000
104.480	10.665	0.497	0.000
104.620	10.999	0.504	0.000
104.760	11.332	0.512	0.000
104.900	11.665	0.519	0.000
105.040	11.998	0.527	0.000
105.180	12.332	0.534	0.000
105.320	12.665	0.541	0.000
105.460	12.998	0.548	0.000
105.497	13.087	0.550	0.000
105.535	13.176	0.552	0.000
105.572	13.265	0.554	0.000
105.609	13.354	0.556	0.000
105.644	13.437	0.559	0.000
105.679	13.520	0.564	0.000
105.714	13.604	0.570	0.000

105.749	13.687	0.576	0.000
105.889	14.020	0.608	0.000
106.029	14.353	0.648	0.000
106.169	14.687	0.693	0.000
106.309	15.020	0.743	0.000
106.449	15.353	0.798	0.000
106.589	15.687	0.857	0.000
106.729	16.020	0.920	0.000
106.869	16.353	0.986	0.000
107.009	16.686	1.056	0.000
107.149	17.020	1.129	0.000
107.289	17.353	1.205	0.000
107.429	17.686	1.284	0.000
107.569	18.020	1.366	0.000
107.709	18.353	1.451	0.000
107.849	18.686	1.538	0.000
107.989	19.019	1.627	0.000
108.129	19.353	1.719	0.000
108.269	19.686	1.814	0.000
108.409	20.019	1.911	0.000
108.549	20.353	2.010	0.000
108.689	20.686	2.111	0.000
108.829	21.019	2.214	0.000
108.969	21.353	2.320	0.000
109.109	21.686	2.428	0.000
109.249	22.019	2.537	0.000
109.389	22.352	2.649	0.000
109.529	22.686	2.762	0.000
109.669	23.019	2.878	0.000
109.809	23.352	2.995	0.000
109.857	23.466	3.036	0.000
109.905	23.579	3.076	0.000
109.952	23.693	3.117	0.000
110.000	23.807	3.158	0.000
110.035	23.890	3.429	0.000
110.070	23.973	3.900	0.000
110.105	24.057	4.501	0.000
110.140	24.140	5.206	0.000
110.175	24.223	6.002	0.000
110.210	24.307	6.877	0.000
110.245	24.390	7.825	0.000
110.280	24.473	8.838	0.000
110.420	24.807	13.448	0.000
110.560	25.140	18.728	0.000
110.700	25.473	24.400	0.000
110.840	25.806	30.176	0.000
110.980	26.140	35.764	0.000
111.120	26.473	40.894	0.000
111.260	26.806	45.341	0.000
111.400	27.140	48.969	0.000
111.540	27.473	51.769	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	105.753
01/18/1941	103.257
12/20/1941	104.650
11/23/1942	106.802
10/17/1943	102.984
02/07/1945	105.611
02/06/1946	103.924
12/05/1946	105.541
10/19/1947	105.981
02/22/1949	104.969
01/22/1950	106.346
02/09/1951	107.447
10/03/1951	104.031
01/12/1953	106.637
01/22/1954	104.644
11/19/1954	104.547
01/06/1956	107.663
02/26/1957	104.820
01/17/1958	105.010
01/13/1959	106.610
11/21/1959	105.617
11/24/1960	106.863
12/24/1961	104.025
11/30/1962	104.058
11/19/1963	104.508
12/01/1964	105.138
01/14/1966	105.635
12/13/1966	106.698
01/20/1968	105.035
12/11/1968	105.640
01/27/1970	106.331
12/07/1970	106.047
03/05/1972	108.963
12/26/1972	107.274

12/27/1973	105.737
12/27/1974	104.800
02/27/1976	105.835
08/26/1977	103.559
12/15/1977	106.775
03/05/1979	103.932
12/18/1979	108.933
12/30/1980	105.367
10/06/1981	108.239
03/09/1983	106.216
03/21/1984	104.295
11/11/1984	104.344
01/19/1986	105.985
11/24/1986	108.259
04/06/1988	105.363
04/05/1989	105.990
01/09/1990	108.155
11/24/1990	109.400
01/31/1992	106.244
04/11/1993	103.863
03/03/1994	104.218
12/27/1994	107.010
02/09/1996	109.523
01/02/1997	108.957
10/08/1997	104.335
11/26/1998	109.125
02/28/2000	105.926
05/05/2001	103.712
12/20/2001	103.587
11/26/2002	108.588
10/24/2003	105.132
02/08/2005	103.792
11/28/2005	106.532
11/27/2006	105.572
01/07/2008	105.926
02/18/2009	108.503
01/10/2010	106.232
11/17/2010	107.760
10/02/2011	105.453
01/20/2013	109.491
01/28/2014	105.628
04/22/2015	104.333
01/04/2016	108.508
11/01/2016	105.064
01/31/2018	105.236
01/12/2019	106.090
04/21/2020	104.504
11/24/2020	107.368
12/21/2021	104.828
03/30/2023	105.097
01/25/2024	106.308
12/22/2024	108.207
01/03/2026	107.297
01/29/2027	104.410
02/23/2028	105.181
01/13/2029	105.677
01/26/2030	107.797
03/04/2031	105.595
01/21/2032	106.400
12/24/2032	104.949
11/16/2033	108.865
02/19/2035	105.652
02/27/2036	105.809
03/09/2037	102.648
12/15/2037	106.660
12/11/2038	103.701
01/14/2040	105.489
12/25/2040	106.217
04/15/2042	106.227
02/26/2043	105.892
03/21/2044	104.996
11/28/2044	105.378
02/23/2046	105.004
02/02/2047	104.521
12/10/2047	107.126
03/17/2049	104.900
02/09/2050	104.273
04/09/2051	103.943
04/17/2052	103.309
12/10/2052	104.440
12/11/2053	104.662
11/01/2054	108.239
02/07/2056	109.456
01/02/2057	108.719
11/25/2057	104.892
11/26/2058	107.407
01/23/2060	104.036
01/15/2061	106.054
01/03/2062	105.199
01/02/2063	105.420
12/23/2063	107.596
12/02/2064	104.548
11/04/2065	103.191
12/15/2066	107.474
01/20/2068	106.982

09/23/2069	103.568
12/14/2069	103.431
12/19/2070	103.664
11/03/2071	104.637
12/25/2072	110.192
12/15/2073	106.570
11/24/2074	103.969
10/30/2075	107.652
08/26/2077	102.667
12/02/2077	104.731
03/05/2079	103.815
12/17/2079	109.175
11/21/2080	107.792
02/19/2082	107.118
02/20/2083	106.920
11/26/2083	108.234
12/14/2084	106.545
11/01/2085	105.498
11/23/2086	105.956
12/09/2087	105.200
11/05/2088	106.162
11/10/2089	106.034
12/09/2090	108.388
01/31/2092	107.631
11/07/2092	103.835
12/14/2093	104.333
12/27/2094	106.047
12/14/2095	106.688
10/28/2096	107.070

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	102.648
1.01	102.667
1.02	102.984
1.02	103.191
1.03	103.257
1.04	103.309
1.04	103.431
1.05	103.559
1.06	103.568
1.06	103.587
1.07	103.664
1.08	103.701
1.09	103.712
1.09	103.792
1.10	103.815
1.11	103.835
1.12	103.863
1.12	103.924
1.13	103.932
1.14	103.943
1.15	103.969
1.16	104.025
1.17	104.031
1.18	104.036
1.18	104.058
1.19	104.218
1.20	104.273
1.21	104.295
1.22	104.333
1.23	104.333
1.24	104.335
1.25	104.344
1.26	104.410
1.27	104.440
1.28	104.504
1.29	104.508
1.30	104.521
1.31	104.547
1.32	104.548
1.33	104.637
1.35	104.644
1.36	104.650
1.37	104.662
1.38	104.731
1.39	104.800
1.40	104.820
1.42	104.828
1.43	104.892
1.44	104.900
1.46	104.949
1.47	104.969
1.48	104.996
1.50	105.004
1.51	105.010
1.53	105.035
1.54	105.064
1.56	105.097
1.57	105.132
1.59	105.138
1.60	105.181
1.62	105.199
1.64	105.200
1.65	105.236

1.67	105.363
1.69	105.367
1.71	105.378
1.73	105.420
1.75	105.453
1.77	105.489
1.79	105.498
1.81	105.541
1.83	105.572
1.85	105.595
1.87	105.611
1.89	105.617
1.92	105.628
1.94	105.635
1.96	105.640
1.99	105.652
2.01	105.677
2.04	105.737
2.07	105.753
2.09	105.809
2.12	105.835
2.15	105.892
2.18	105.926
2.21	105.926
2.24	105.956
2.27	105.981
2.31	105.985
2.34	105.990
2.38	106.034
2.41	106.047
2.45	106.047
2.49	106.054
2.53	106.090
2.57	106.162
2.61	106.216
2.65	106.217
2.70	106.227
2.75	106.232
2.80	106.244
2.85	106.308
2.90	106.331
2.95	106.346
3.01	106.400
3.07	106.532
3.13	106.545
3.19	106.570
3.26	106.610
3.32	106.637
3.40	106.660
3.47	106.688
3.55	106.698
3.63	106.775
3.72	106.802
3.80	106.863
3.90	106.920
4.00	106.982
4.10	107.010
4.21	107.070
4.32	107.118
4.45	107.126
4.58	107.274
4.71	107.297
4.86	107.368
5.01	107.407
5.17	107.447
5.35	107.474
5.54	107.596
5.74	107.631
5.95	107.652
6.19	107.663
6.44	107.760
6.71	107.792
7.01	107.797
7.33	108.155
7.69	108.207
8.08	108.234
8.52	108.239
9.00	108.239
9.55	108.259
10.16	108.388
10.86	108.503
11.66	108.508
12.59	108.588
13.68	108.719
14.97	108.865
16.54	108.933
18.47	108.957
20.92	108.963
24.10	109.125
28.44	109.175
34.68	109.400
44.42	109.456
61.77	109.491
101.36	109.523
282.36	110.192

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	103.573
1.11-Year	103.839
1.25-Year	104.348
2.00-Year	105.660
3.33-Year	106.640
5-Year	107.405
10-Year	108.349
25-Year	108.949
50-Year	109.461
100-Year	109.522

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	22230.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 13.201 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 44017. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 66025. cu-ft
2-Year Discharge Rate : 0.562 cfs

************Compliance Point Results ***************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		Postdevelopment Runoff	
Date	Annual Max Q (cfs)	Date	Annual Max Q (cfs)
04/30/1940	1.482	12/07/1939	0.577
01/31/1941	0.569	01/18/1941	0.423
12/15/1941	1.489	12/20/1941	0.506
02/10/1943	0.593	11/23/1942	0.955
01/23/1944	0.445	10/17/1943	0.405
02/07/1945	1.847	02/07/1945	0.556
02/05/1946	1.133	02/06/1946	0.465
02/02/1947	1.155	12/05/1946	0.552
03/21/1948	1.996	10/19/1947	0.634
02/22/1949	1.002	02/22/1949	0.523
03/03/1950	4.126	01/22/1950	0.758
02/09/1951	1.652	02/09/1951	1.294
01/24/1952	0.434	10/03/1951	0.471
01/11/1953	0.617	01/12/1953	0.878
01/22/1954	1.002	01/22/1954	0.506
04/12/1955	0.468	11/19/1954	0.500
03/04/1956	1.074	01/06/1956	1.423
02/25/1957	0.890	02/26/1957	0.515
01/16/1958	1.080	01/17/1958	0.525
01/12/1959	1.160	01/13/1959	0.866
12/15/1959	1.241	11/21/1959	0.556
02/14/1961	1.062	11/24/1960	0.983
03/04/1962	0.569	12/24/1961	0.471
02/03/1963	0.631	11/30/1962	0.473
01/01/1964	1.009	11/19/1963	0.498
02/26/1965	1.250	12/01/1964	0.532
01/06/1966	0.771	01/14/1966	0.558
01/19/1967	1.951	12/13/1966	0.906
02/03/1968	1.009	01/20/1968	0.526
12/03/1968	1.083	12/11/1968	0.559
01/13/1970	0.839	01/27/1970	0.752
12/06/1970	0.955	12/07/1970	0.653
02/28/1972	2.574	03/05/1972	2.315
01/13/1973	0.929	12/26/1972	1.197
02/18/1974	1.389	12/27/1973	0.574
12/26/1974	1.681	12/27/1974	0.514
01/27/1976	1.164	02/27/1976	0.596
05/31/1977	0.164	08/26/1977	0.443
12/10/1977	0.985	12/15/1977	0.942
03/04/1979	0.969	03/05/1979	0.465
12/17/1979	1.561	12/18/1979	2.293
12/26/1980	0.619	12/30/1980	0.543
10/06/1981	1.978	10/06/1981	1.794
01/05/1983	1.110	03/09/1983	0.710
03/14/1984	1.060	03/21/1984	0.486
02/11/1985	0.708	11/11/1984	0.489

01/18/1986	2.333	01/19/1986	0.635
11/24/1986	2.057	11/24/1986	1.807
04/06/1988	1.028	04/06/1988	0.543
04/05/1989	1.133	04/05/1989	0.637
01/09/1990	3.740	01/09/1990	1.737
11/24/1990	3.187	11/24/1990	2.658
01/27/1992	0.973	01/31/1992	0.720
06/09/1993	0.821	04/11/1993	0.461
03/03/1994	0.625	03/03/1994	0.482
02/19/1995	1.309	12/27/1994	1.057
02/09/1996	3.032	02/09/1996	2.757
01/02/1997	1.896	01/02/1997	2.311
02/28/1998	0.698	10/08/1997	0.488
11/25/1998	1.866	11/26/1998	2.440
03/26/2000	1.045	02/28/2000	0.618
05/05/2001	0.801	05/05/2001	0.452
05/03/2002	2.858	12/20/2001	0.444
03/31/2003	2.188	11/26/2002	2.038
01/23/2004	0.534	10/24/2003	0.531
02/07/2005	0.921	02/08/2005	0.457
02/27/2006	1.183	11/28/2005	0.833
12/14/2006	0.875	11/27/2006	0.554
03/21/2008	1.454	01/07/2008	0.619
02/17/2009	2.257	02/18/2009	1.977
01/10/2010	1.516	01/10/2010	0.715
11/17/2010	1.968	11/17/2010	1.482
01/31/2012	1.252	10/02/2011	0.548
01/20/2013	2.860	01/20/2013	2.732
12/06/2013	1.204	01/28/2014	0.558
03/30/2015	0.730	04/22/2015	0.488
01/04/2016	2.080	01/04/2016	1.981
03/07/2017	0.602	11/01/2016	0.528
01/31/2018	1.122	01/31/2018	0.537
03/30/2019	1.110	01/12/2019	0.667
04/14/2020	0.730	04/21/2020	0.498
02/10/2021	1.801	11/24/2020	1.250
03/26/2022	0.532	12/21/2021	0.515
03/30/2023	1.284	03/30/2023	0.530
01/19/2024	1.008	01/25/2024	0.743
12/22/2024	2.107	12/22/2024	1.772
03/09/2026	1.338	01/03/2026	1.210
01/27/2027	1.166	01/29/2027	0.493
02/19/2028	1.445	02/23/2028	0.534
12/04/2028	1.119	01/13/2029	0.564
02/16/2030	1.494	01/26/2030	1.505
12/30/2030	1.398	03/04/2031	0.555
01/20/2032	2.245	01/21/2032	0.779
03/01/2033	0.633	12/24/2032	0.522
01/15/2034	2.537	11/16/2033	2.242
02/19/2035	1.239	02/19/2035	0.560
03/24/2036	1.169	02/27/2036	0.590
03/09/2037	0.048	03/09/2037	0.382
12/15/2037	0.855	12/15/2037	0.889
02/07/2039	0.618	12/11/2038	0.451
01/14/2040	2.318	01/14/2040	0.550
12/25/2040	1.313	12/25/2040	0.710
02/20/2042	1.378	04/15/2042	0.713
03/31/2043	2.065	02/26/2043	0.609
05/01/2044	0.815	03/21/2044	0.524
02/11/2045	0.942	11/28/2044	0.544
02/16/2046	1.186	02/23/2046	0.525
02/01/2047	0.745	02/02/2047	0.499
04/21/2048	0.662	12/10/2047	1.117
03/16/2049	0.744	03/17/2049	0.519
12/04/2049	1.257	02/09/2050	0.485
04/06/2051	0.976	04/09/2051	0.466
04/17/2052	0.586	04/17/2052	0.427
06/04/2053	2.250	12/10/2052	0.494
04/08/2054	0.418	12/11/2053	0.507
02/17/2055	1.914	11/01/2054	1.793
02/07/2056	3.481	02/07/2056	2.703
11/19/2056	3.810	01/02/2057	2.133
01/24/2058	1.321	11/25/2057	0.519
12/28/2058	1.519	11/26/2058	1.272
01/19/2060	0.569	01/23/2060	0.471
01/10/2061	1.234	01/15/2061	0.656
02/03/2062	4.694	01/03/2062	0.535
12/29/2062	0.993	01/02/2063	0.546
12/23/2063	1.791	12/23/2063	1.382
11/30/2064	0.856	12/02/2064	0.500
01/13/2066	0.470	11/04/2065	0.419
01/19/2067	1.194	12/15/2066	1.310
01/18/2068	2.459	01/20/2068	1.043
01/04/2069	0.661	09/23/2069	0.443
04/09/2070	0.558	12/14/2069	0.435
02/14/2071	0.612	12/19/2070	0.449
02/27/2072	0.655	11/03/2071	0.505
12/25/2072	2.740	12/25/2072	6.414
03/16/2074	1.473	12/15/2073	0.849
01/23/2075	0.318	11/24/2074	0.467
03/24/2076	1.637	10/30/2075	1.416
03/02/2077	0.184	08/26/2077	0.383
12/02/2077	0.616	12/02/2077	0.510
02/25/2079	0.826	03/05/2079	0.458
12/17/2079	3.059	12/17/2079	2.479

11/21/2080	1.350	11/21/2080	1.502
02/13/2082	1.686	02/19/2082	1.113
02/19/2083	1.034	02/20/2083	1.012
11/26/2083	1.253	11/26/2083	1.790
12/14/2084	0.867	12/14/2084	0.838
01/18/2086	1.221	11/01/2085	0.550
12/21/2086	1.146	11/23/2086	0.627
01/14/2088	0.754	12/09/2087	0.535
11/05/2088	1.340	11/05/2088	0.691
01/07/2090	0.630	11/10/2089	0.649
12/04/2090	1.164	12/09/2090	1.896
04/28/2092	1.997	01/31/2092	1.403
03/22/2093	0.561	11/07/2092	0.459
03/01/2094	0.470	12/14/2093	0.488
02/18/2095	0.743	12/27/2094	0.653
01/14/2096	0.936	12/14/2095	0.901
01/29/2097	2.059	10/28/2096	1.088

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.048	1.00	0.382
1.01	0.164	1.01	0.383
1.02	0.184	1.02	0.405
1.02	0.318	1.02	0.419
1.03	0.418	1.03	0.423
1.04	0.434	1.04	0.427
1.04	0.445	1.04	0.435
1.05	0.468	1.05	0.443
1.06	0.470	1.06	0.443
1.06	0.470	1.06	0.444
1.07	0.532	1.07	0.449
1.08	0.534	1.08	0.451
1.09	0.558	1.09	0.452
1.09	0.561	1.09	0.457
1.10	0.569	1.10	0.458
1.11	0.569	1.11	0.459
1.12	0.569	1.12	0.461
1.12	0.586	1.12	0.465
1.13	0.593	1.13	0.465
1.14	0.602	1.14	0.466
1.15	0.612	1.15	0.467
1.16	0.616	1.16	0.471
1.17	0.617	1.17	0.471
1.18	0.618	1.18	0.471
1.18	0.619	1.18	0.473
1.19	0.625	1.19	0.482
1.20	0.630	1.20	0.485
1.21	0.631	1.21	0.486
1.22	0.633	1.22	0.488
1.23	0.655	1.23	0.488
1.24	0.661	1.24	0.488
1.25	0.662	1.25	0.489
1.26	0.698	1.26	0.493
1.27	0.708	1.27	0.494
1.28	0.730	1.28	0.498
1.29	0.730	1.29	0.498
1.30	0.743	1.30	0.499
1.31	0.744	1.31	0.500
1.32	0.745	1.32	0.500
1.33	0.754	1.33	0.505
1.35	0.771	1.35	0.506
1.36	0.801	1.36	0.506
1.37	0.815	1.37	0.507
1.38	0.821	1.38	0.510
1.39	0.826	1.39	0.514
1.40	0.839	1.40	0.515
1.42	0.855	1.42	0.515
1.43	0.856	1.43	0.519
1.44	0.867	1.44	0.519
1.46	0.875	1.46	0.522
1.47	0.890	1.47	0.523
1.48	0.921	1.48	0.524
1.50	0.929	1.50	0.525
1.51	0.936	1.51	0.525
1.53	0.942	1.53	0.526
1.54	0.955	1.54	0.528
1.56	0.969	1.56	0.530
1.57	0.973	1.57	0.531
1.59	0.976	1.59	0.532
1.60	0.985	1.60	0.534
1.62	0.993	1.62	0.535
1.64	1.002	1.64	0.535
1.65	1.002	1.65	0.537
1.67	1.008	1.67	0.543
1.69	1.009	1.69	0.543
1.71	1.009	1.71	0.544
1.73	1.028	1.73	0.546
1.75	1.034	1.75	0.548
1.77	1.045	1.77	0.550
1.79	1.060	1.79	0.550

1.81	1.062	1.81	0.552
1.83	1.074	1.83	0.554
1.85	1.080	1.85	0.555
1.87	1.083	1.87	0.556
1.89	1.110	1.89	0.556
1.92	1.110	1.92	0.558
1.94	1.119	1.94	0.558
1.96	1.122	1.96	0.559
1.99	1.133	1.99	0.560
2.01	1.133	2.01	0.564
2.04	1.146	2.04	0.574
2.07	1.155	2.07	0.577
2.09	1.160	2.09	0.590
2.12	1.164	2.12	0.596
2.15	1.164	2.15	0.609
2.18	1.166	2.18	0.618
2.21	1.169	2.21	0.619
2.24	1.183	2.24	0.627
2.27	1.186	2.27	0.634
2.31	1.194	2.31	0.635
2.34	1.204	2.34	0.637
2.38	1.221	2.38	0.649
2.41	1.234	2.41	0.653
2.45	1.239	2.45	0.653
2.49	1.241	2.49	0.656
2.53	1.250	2.53	0.667
2.57	1.252	2.57	0.691
2.61	1.253	2.61	0.710
2.65	1.257	2.65	0.710
2.70	1.284	2.70	0.713
2.75	1.309	2.75	0.715
2.80	1.313	2.80	0.720
2.85	1.321	2.85	0.743
2.90	1.338	2.90	0.752
2.95	1.340	2.95	0.758
3.01	1.350	3.01	0.779
3.07	1.378	3.07	0.833
3.13	1.389	3.13	0.838
3.19	1.398	3.19	0.849
3.26	1.445	3.26	0.866
3.32	1.454	3.32	0.878
3.40	1.473	3.40	0.889
3.47	1.482	3.47	0.901
3.55	1.489	3.55	0.906
3.63	1.494	3.63	0.942
3.72	1.516	3.72	0.955
3.80	1.519	3.80	0.983
3.90	1.561	3.90	1.012
4.00	1.637	4.00	1.043
4.10	1.652	4.10	1.057
4.21	1.681	4.21	1.088
4.32	1.686	4.32	1.113
4.45	1.791	4.45	1.117
4.58	1.801	4.58	1.197
4.71	1.847	4.71	1.210
4.86	1.866	4.86	1.250
5.01	1.896	5.01	1.272
5.17	1.914	5.17	1.294
5.35	1.951	5.35	1.310
5.54	1.968	5.54	1.382
5.74	1.978	5.74	1.403
5.95	1.996	5.95	1.416
6.19	1.997	6.19	1.423
6.44	2.057	6.44	1.482
6.71	2.059	6.71	1.502
7.01	2.065	7.01	1.505
7.33	2.080	7.33	1.737
7.69	2.107	7.69	1.772
8.08	2.188	8.08	1.790
8.52	2.245	8.52	1.793
9.00	2.250	9.00	1.794
9.55	2.257	9.55	1.807
10.16	2.318	10.16	1.896
10.86	2.333	10.86	1.977
11.66	2.459	11.66	1.981
12.59	2.537	12.59	2.038
13.68	2.574	13.68	2.133
14.97	2.740	14.97	2.242
16.54	2.858	16.54	2.293
18.47	2.860	18.47	2.311
20.92	3.032	20.92	2.315
24.10	3.059	24.10	2.440
28.44	3.187	28.44	2.479
34.68	3.481	34.68	2.658
44.42	3.740	44.42	2.703
61.77	3.810	61.77	2.732
101.36	4.126	101.36	2.757
282.36	4.694	282.36	6.414

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	1.133	2-Year	0.562
5-Year	1.894	5-Year	1.270
10-Year	2.303	10-Year	1.873
25-Year	3.087	25-Year	2.448
50-Year	3.765	50-Year	2.713
100-Year	4.118	100-Year	2.757
200-Year	4.503	200-Year	5.183

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
0.023	2.3680E-01	0.032	7.4046E-01
0.047	1.8183E-01	0.064	7.0202E-01
0.070	1.4869E-01	0.096	6.5057E-01
0.094	1.2486E-01	0.128	5.9655E-01
0.117	1.0625E-01	0.160	5.3749E-01
0.141	9.1206E-02	0.192	4.7880E-01
0.164	7.8997E-02	0.224	4.1797E-01
0.188	6.8893E-02	0.257	3.5639E-01
0.211	6.0447E-02	0.289	2.9452E-01
0.235	5.3261E-02	0.321	2.3453E-01
0.258	4.7175E-02	0.353	1.8113E-01
0.282	4.1832E-02	0.385	1.3405E-01
0.305	3.7205E-02	0.417	9.5851E-02
0.329	3.3133E-02	0.449	6.5507E-02
0.352	2.9638E-02	0.481	4.2444E-02
0.376	2.6430E-02	0.513	2.5577E-02
0.399	2.3649E-02	0.545	1.3987E-02
0.422	2.1262E-02	0.567	1.0308E-02
0.446	1.9150E-02	0.609	7.8113E-03
0.469	1.7267E-02	0.641	6.8511E-03
0.493	1.5521E-02	0.673	6.0078E-03
0.516	1.4036E-02	0.706	5.3110E-03
0.540	1.2639E-02	0.738	4.7486E-03
0.567	1.1278E-02	0.770	4.3140E-03
0.587	1.0348E-02	0.802	3.9320E-03
0.610	9.4640E-03	0.834	3.5638E-03
0.634	8.5860E-03	0.866	3.2331E-03
0.657	7.8178E-03	0.898	2.9487E-03
0.681	7.1543E-03	0.930	2.6822E-03
0.704	6.5998E-03	0.962	2.4310E-03
0.728	6.0489E-03	0.994	2.2165E-03
0.751	5.5507E-03	1.026	2.0281E-03
0.774	5.1067E-03	1.058	1.8490E-03
0.798	4.7255E-03	1.090	1.6953E-03
0.821	4.3558E-03	1.133	1.5164E-03
0.845	4.0223E-03	1.155	1.4317E-03
0.868	3.7104E-03	1.187	1.3292E-03
0.892	3.4331E-03	1.219	1.2288E-03
0.915	3.1833E-03	1.251	1.1379E-03
0.939	2.9472E-03	1.283	1.0635E-03
0.962	2.7284E-03	1.315	9.9203E-04
0.986	2.5234E-03	1.347	9.2705E-04
1.009	2.3581E-03	1.379	8.6568E-04
1.033	2.1942E-03	1.411	8.0286E-04
1.056	2.0324E-03	1.443	7.4438E-04
1.080	1.9003E-03	1.475	6.9890E-04
1.103	1.7624E-03	1.507	6.4836E-04
1.133	1.6051E-03	1.539	6.1009E-04
1.150	1.5285E-03	1.571	5.7327E-04
1.173	1.4180E-03	1.604	5.3284E-04
1.197	1.3350E-03	1.636	5.0179E-04
1.220	1.2722E-03	1.668	4.7435E-04
1.244	1.2043E-03	1.700	4.4114E-04
1.267	1.1350E-03	1.732	4.1298E-04
1.291	1.0729E-03	1.764	3.8844E-04
1.314	1.0130E-03	1.796	3.5522E-04
1.338	9.6532E-04	1.828	3.3140E-04
1.361	9.1478E-04	1.860	3.1118E-04
1.385	8.6712E-04	1.894	2.8574E-04
1.408	8.1225E-04	1.924	2.6714E-04
1.432	7.6388E-04	1.956	2.4909E-04
1.455	7.2489E-04	1.988	2.2671E-04
1.479	6.8807E-04	2.020	2.0649E-04
1.502	6.5124E-04	2.053	1.8628E-04
1.525	6.2092E-04	2.085	1.6895E-04
1.549	5.8915E-04	2.117	1.5090E-04
1.572	5.6749E-04	2.149	1.3935E-04
1.596	5.4511E-04	2.181	1.2563E-04

1.619	5.2562E-04	2.213	1.1191E-04
1.643	5.0251E-04	2.245	1.0108E-04
1.666	4.7796E-04	2.277	8.8806E-05
1.690	4.5197E-04	2.309	7.4366E-05
1.713	4.3609E-04	2.341	6.4258E-05
1.737	4.1154E-04	2.373	6.0648E-05
1.760	3.9349E-04	2.405	5.2706E-05
1.784	3.6894E-04	2.437	4.8374E-05
1.807	3.5450E-04	2.469	4.3320E-05
1.831	3.3573E-04	2.502	3.9710E-05
1.854	3.1985E-04	2.534	3.6100E-05
1.878	3.0252E-04	2.566	3.1046E-05
1.894	2.9160E-04	2.598	2.5270E-05
1.924	2.7653E-04	2.630	2.1660E-05
1.948	2.6281E-04	2.662	1.7328E-05
1.971	2.5198E-04	2.694	1.4440E-05
1.995	2.3609E-04	2.726	1.1552E-05
2.018	2.2599E-04	2.758	8.6640E-06
2.042	2.1371E-04	2.790	7.9420E-06
2.065	2.0360E-04	2.822	7.9420E-06
2.089	1.9638E-04	2.854	7.9420E-06
2.112	1.8339E-04	2.886	7.2200E-06
2.136	1.7689E-04	2.918	7.2200E-06
2.159	1.6245E-04	2.951	5.7760E-06
2.183	1.5306E-04	2.983	5.7760E-06
2.206	1.4440E-04	3.015	5.0540E-06
2.230	1.3140E-04	3.047	5.0540E-06
2.253	1.2563E-04	3.079	5.0540E-06
2.276	1.1552E-04	3.111	4.3320E-06
2.300	1.0830E-04	3.143	4.3320E-06
2.323	1.0108E-04	3.175	3.6100E-06
2.347	9.3860E-05	3.207	3.6100E-06
2.370	8.9528E-05	3.239	2.8880E-06
2.394	8.1586E-05	3.271	2.8880E-06
2.417	7.4366E-05	3.303	2.8880E-06
2.441	7.1478E-05	3.335	2.8880E-06
2.464	6.5702E-05	3.367	2.8880E-06
2.488	6.2814E-05	3.400	2.8880E-06
2.511	5.9926E-05	3.432	2.8880E-06
2.535	5.7760E-05	3.464	2.8880E-06
2.558	5.0540E-05	3.496	2.8880E-06
2.582	4.7652E-05	3.528	2.8880E-06
2.605	4.2598E-05	3.560	2.8880E-06
2.629	3.8266E-05	3.592	2.8880E-06
2.652	3.4656E-05	3.624	2.8880E-06
2.675	3.2490E-05	3.656	2.8880E-06
2.699	3.0324E-05	3.688	2.8880E-06
2.722	2.8158E-05	3.720	2.8880E-06
2.746	2.4548E-05	3.765	2.8880E-06
2.769	2.3826E-05	3.784	2.8880E-06
2.793	2.1660E-05	3.816	2.8880E-06
2.816	1.9494E-05	3.849	2.8880E-06
2.840	1.8772E-05	3.881	2.8880E-06
2.863	1.5162E-05	3.913	2.8880E-06
2.887	1.4440E-05	3.945	2.8880E-06
2.910	1.3718E-05	3.977	2.8880E-06
2.934	1.2274E-05	4.009	2.8880E-06
2.957	1.1552E-05	4.041	2.8880E-06
2.981	1.0830E-05	4.073	2.8880E-06
3.004	1.0830E-05	4.105	2.8880E-06
3.028	1.0108E-05	4.137	2.8880E-06
3.051	8.6640E-06	4.169	2.8880E-06
3.074	7.9420E-06	4.201	2.8880E-06
3.098	7.9420E-06	4.233	2.1660E-06
3.121	7.9420E-06	4.265	2.1660E-06
3.145	7.9420E-06	4.298	2.1660E-06
3.168	7.9420E-06	4.330	2.1660E-06
3.192	7.2200E-06	4.362	2.1660E-06
3.215	7.2200E-06	4.394	2.1660E-06
3.239	7.2200E-06	4.426	2.1660E-06
3.262	7.2200E-06	4.458	2.1660E-06
3.286	7.2200E-06	4.490	2.1660E-06
3.309	7.2200E-06	4.522	2.1660E-06
3.333	7.2200E-06	4.554	2.1660E-06
3.356	7.2200E-06	4.586	2.1660E-06
3.380	7.2200E-06	4.618	2.1660E-06
3.403	7.2200E-06	4.650	2.1660E-06
3.426	6.4980E-06	4.682	2.1660E-06
3.450	6.4980E-06	4.714	2.1660E-06
3.473	6.4980E-06	4.747	2.1660E-06
3.497	5.7760E-06	4.779	2.1660E-06
3.520	5.0540E-06	4.811	2.1660E-06
3.544	5.0540E-06	4.843	2.1660E-06
3.567	5.0540E-06	4.875	2.1660E-06
3.591	5.0540E-06	4.907	2.1660E-06
3.614	4.3320E-06	4.939	2.1660E-06
3.638	4.3320E-06	4.971	2.1660E-06
3.661	4.3320E-06	5.003	2.1660E-06
3.685	3.6100E-06	5.035	2.1660E-06
3.708	3.6100E-06	5.067	2.1660E-06
3.732	3.6100E-06	5.099	2.1660E-06
3.765	2.8016E-06	5.131	2.1660E-06
3.779	2.8880E-06	5.163	2.1660E-06
3.802	2.8880E-06	5.196	2.1660E-06
3.825	2.1660E-06	5.228	2.1660E-06

3.849	2.1660E-06	5.260	2.1660E-06
3.872	2.1660E-06	5.292	2.1660E-06
3.896	2.1660E-06	5.324	1.4440E-06
3.919	2.1660E-06	5.356	1.4440E-06
3.943	2.1660E-06	5.388	1.4440E-06
3.966	2.1660E-06	5.420	1.4440E-06
3.990	2.1660E-06	5.452	1.4440E-06
4.013	2.1660E-06	5.484	1.4440E-06
4.037	2.1660E-06	5.516	1.4440E-06
4.060	2.1660E-06	5.548	1.4440E-06
4.084	2.1660E-06	5.580	1.4440E-06
4.107	2.1660E-06	5.612	1.4440E-06
4.131	7.2200E-07	5.645	7.2200E-07
4.154	7.2200E-07	5.677	7.2200E-07
4.177	7.2200E-07	5.709	7.2200E-07
4.201	7.2200E-07	5.741	7.2200E-07
4.224	7.2200E-07	5.773	7.2200E-07
4.248	7.2200E-07	5.805	7.2200E-07
4.271	7.2200E-07	5.837	7.2200E-07
4.295	7.2200E-07	5.869	7.2200E-07
4.318	7.2200E-07	5.901	7.2200E-07
4.342	7.2200E-07	5.933	7.2200E-07
4.365	7.2200E-07	5.965	7.2200E-07
4.389	7.2200E-07	5.997	7.2200E-07
4.412	7.2200E-07	6.029	7.2200E-07
4.436	7.2200E-07	6.061	7.2200E-07
4.459	7.2200E-07	6.094	7.2200E-07
4.483	7.2200E-07	6.126	7.2200E-07
4.506	7.2200E-07	6.158	7.2200E-07
4.530	7.2200E-07	6.190	7.2200E-07
4.553	7.2200E-07	6.222	7.2200E-07
4.576	7.2200E-07	6.254	7.2200E-07
4.600	7.2200E-07	6.286	7.2200E-07
4.623	7.2200E-07	6.318	7.2200E-07
4.647	7.2200E-07	6.350	7.2200E-07
4.670	7.2200E-07	6.382	7.2200E-07
4.694	7.2200E-07	6.414	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-12.6%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-5.4%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	8.0%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 12:49 PM**

Input File Name: **vault4.fld**
Project Name: Burien NERA
Analysis Title: Detention and Wet Vault 4
Comments: 95% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

	Predeveloped	To Node	Developed Bypass Node
Till Forest	14.274	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	0.000	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	0.353	0.000
Wetland	0.000	0.344	0.000
Impervious	0.000	13.577	0.000
Subbasin Total	**14.274**	**14.274**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped Surface	Predeveloped Interflow	Predeveloped Grnd Water	Developed Surface	Developed Interflow	Developed Grnd Water
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	Link Type	Downstream Node
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** Predeveloped Structure Summary ***

*** Postdeveloped Structure Summary ***

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used
Pond Floor Elevation : 100.00 ft
Riser Crest Elevation : 110.00 ft
Max Pond Elevation : 110.50 ft
Max Storage Depth : 10.00 ft
Pond Bottom Length : 289.4 ft
Pond Bottom Width : 96.5 ft
Pond Side Slopes : L1= 0.00 L2= 0.00 W1= 0.00 W2= 0.00 ft/ft
Pond Bottom Area : 27910. sq-ft

Area at Riser Crest El : 27,910. sq-ft
: 0.641 acres
Volume at Riser Crest : 279,105.cu-ft
: 6.407 ac-ft
Area at Max Elevation : 27910. sq-ft
: 0.641 acres
Vol at Max Elevation : 293,060. cu-ft
: 6.728 ac-ft
Hydraulic Conductivity : 0.00 in/hr
Depth to Water Table : 100.00 ft

Riser Geometry
Riser Structure Type : Circular
Riser Diameter : 24.00 in
Common Length : 0.025 ft
Riser Crest Elevation : 110.00 ft

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---
Device Type : Circular Orifice
Invert Elevation : 100.00 ft
Diameter : 1.50 in
Orientation : Horizontal
Elbow : No

--- Device Number 2 ---
Device Type : Vertical Rectangular Orifice
Invert Elevation : 105.89 ft
Length : 0.30 in
Height : 49.36 in
Orientation : Vertical
Elbow : No

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.033	0.021	0.011	0.000
100.065	0.042	0.015	0.000
100.130	0.083	0.022	0.000
100.260	0.167	0.031	0.000
100.390	0.250	0.037	0.000
100.520	0.333	0.043	0.000
100.650	0.416	0.048	0.000
100.780	0.500	0.053	0.000
100.910	0.583	0.057	0.000
101.040	0.666	0.061	0.000
101.170	0.750	0.065	0.000
101.300	0.833	0.068	0.000
101.430	0.916	0.072	0.000
101.560	1.000	0.075	0.000
101.690	1.083	0.078	0.000
101.820	1.166	0.081	0.000
101.950	1.249	0.084	0.000
102.080	1.333	0.086	0.000
102.210	1.416	0.089	0.000
102.340	1.499	0.092	0.000
102.470	1.583	0.094	0.000
102.600	1.666	0.097	0.000
102.730	1.749	0.099	0.000
102.860	1.832	0.101	0.000
102.990	1.916	0.104	0.000
103.120	1.999	0.106	0.000
103.250	2.082	0.108	0.000
103.380	2.166	0.110	0.000
103.510	2.249	0.112	0.000
103.640	2.332	0.114	0.000
103.770	2.416	0.116	0.000
103.900	2.499	0.118	0.000
104.030	2.582	0.120	0.000
104.160	2.665	0.122	0.000
104.290	2.749	0.124	0.000
104.420	2.832	0.126	0.000
104.550	2.915	0.128	0.000
104.680	2.999	0.130	0.000
104.810	3.082	0.131	0.000
104.940	3.165	0.133	0.000
105.070	3.248	0.135	0.000
105.200	3.332	0.137	0.000
105.330	3.415	0.138	0.000
105.460	3.498	0.140	0.000
105.590	3.582	0.142	0.000
105.720	3.665	0.143	0.000
105.762	3.692	0.144	0.000
105.803	3.718	0.144	0.000
105.845	3.745	0.145	0.000
105.887	3.772	0.145	0.000
105.919	3.793	0.146	0.000

105.952	3.813	0.147	0.000
105.984	3.834	0.149	0.000
106.017	3.855	0.150	0.000
106.147	3.938	0.158	0.000
106.277	4.022	0.167	0.000
106.407	4.105	0.177	0.000
106.537	4.188	0.189	0.000
106.667	4.272	0.201	0.000
106.797	4.355	0.215	0.000
106.927	4.438	0.229	0.000
107.057	4.521	0.245	0.000
107.187	4.605	0.261	0.000
107.317	4.688	0.278	0.000
107.447	4.771	0.295	0.000
107.577	4.855	0.314	0.000
107.707	4.938	0.332	0.000
107.837	5.021	0.352	0.000
107.967	5.105	0.372	0.000
108.097	5.188	0.393	0.000
108.227	5.271	0.414	0.000
108.357	5.354	0.436	0.000
108.487	5.438	0.458	0.000
108.617	5.521	0.481	0.000
108.747	5.604	0.504	0.000
108.877	5.688	0.528	0.000
109.007	5.771	0.553	0.000
109.137	5.854	0.577	0.000
109.267	5.937	0.603	0.000
109.397	6.021	0.629	0.000
109.527	6.104	0.655	0.000
109.657	6.187	0.681	0.000
109.787	6.271	0.708	0.000
109.840	6.305	0.720	0.000
109.893	6.339	0.731	0.000
109.947	6.373	0.742	0.000
110.000	6.407	0.754	0.000
110.033	6.428	0.885	0.000
110.065	6.449	1.118	0.000
110.098	6.470	1.418	0.000
110.130	6.491	1.771	0.000
110.163	6.511	2.169	0.000
110.195	6.532	2.606	0.000
110.228	6.553	3.077	0.000
110.260	6.574	3.578	0.000
110.390	6.657	5.779	0.000
110.520	6.741	8.070	0.000
110.650	6.824	10.150	0.000
110.780	6.907	11.775	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	105.817
10/24/1940	103.324
12/20/1941	104.823
11/23/1942	107.031
10/17/1943	103.031
02/07/1945	105.659
02/06/1946	104.047
12/05/1946	105.800
10/19/1947	106.024
02/22/1949	105.091
03/05/1950	106.609
02/09/1951	107.727
10/03/1951	104.094
01/18/1953	106.911
01/22/1954	104.837
11/19/1954	104.662
01/06/1956	108.007
02/26/1957	104.852
01/17/1958	105.132
01/13/1959	106.830
11/21/1959	105.632
11/24/1960	107.057
12/24/1961	104.160
11/30/1962	104.181
11/23/1963	104.731
12/01/1964	105.247
01/14/1966	105.907
12/13/1966	106.938
01/20/1968	105.277
12/11/1968	105.901
01/27/1970	106.543
12/07/1970	106.262
03/05/1972	109.310
12/26/1972	107.555
12/27/1973	106.111
12/27/1974	104.946
02/27/1976	106.067
06/04/1977	103.612

12/15/1977	106.978
03/05/1979	104.096
12/18/1979	109.225
12/30/1980	105.535
10/06/1981	108.381
03/09/1983	106.553
03/21/1984	104.486
11/11/1984	104.443
01/19/1986	106.043
11/24/1986	108.424
04/06/1988	105.472
04/05/1989	106.264
01/09/1990	108.270
11/24/1990	109.723
02/01/1992	106.388
04/11/1993	104.031
03/03/1994	104.338
12/27/1994	107.281
02/09/1996	109.857
01/02/1997	109.293
10/08/1997	104.464
11/26/1998	109.404
02/28/2000	106.192
05/05/2001	103.726
12/20/2001	103.738
11/26/2002	108.909
10/24/2003	105.183
02/08/2005	103.870
11/28/2005	106.753
11/27/2006	105.759
01/07/2008	106.017
02/18/2009	108.744
01/10/2010	106.406
11/17/2010	108.021
10/02/2011	105.476
01/20/2013	109.791
01/28/2014	105.839
04/22/2015	104.558
01/04/2016	108.862
11/01/2016	105.184
01/31/2018	105.406
01/12/2019	106.231
04/21/2020	104.717
11/24/2020	107.509
12/21/2021	104.906
03/30/2023	105.135
01/25/2024	106.496
12/22/2024	108.412
01/04/2026	107.529
12/13/2026	104.557
02/23/2028	105.297
01/13/2029	106.018
01/26/2030	108.137
03/04/2031	105.855
01/21/2032	106.532
12/24/2032	105.034
11/16/2033	109.127
02/19/2035	105.848
02/27/2036	105.949
03/09/2037	102.747
12/15/2037	106.907
12/11/2038	103.851
01/14/2040	105.639
12/25/2040	106.377
04/15/2042	106.434
02/26/2043	106.132
03/21/2044	105.196
11/28/2044	105.629
12/08/2045	105.232
02/02/2047	104.635
12/10/2047	107.366
03/17/2049	105.090
02/09/2050	104.458
04/09/2051	104.039
04/17/2052	103.378
12/10/2052	104.569
12/11/2053	104.753
11/01/2054	108.383
02/07/2056	109.750
01/02/2057	109.072
11/25/2057	105.020
12/02/2058	107.694
01/23/2060	104.182
01/15/2061	106.282
01/03/2062	105.395
01/02/2063	105.620
12/23/2063	107.831
12/02/2064	104.627
11/04/2065	103.306
12/15/2066	107.765
01/20/2068	107.203
09/23/2069	103.616
12/14/2069	103.481
12/19/2070	103.802
11/03/2071	104.731

12/25/2072	110.171
12/15/2073	106.792
11/24/2074	104.104
10/30/2075	107.934
08/26/2077	102.680
12/02/2077	104.852
03/05/2079	103.984
12/17/2079	109.391
11/21/2080	108.010
02/19/2082	107.412
02/20/2083	107.154
11/26/2083	108.577
12/14/2084	106.836
11/01/2085	105.672
11/23/2086	106.049
12/09/2087	105.386
11/05/2088	106.264
11/10/2089	106.220
12/09/2090	108.737
01/31/2092	107.875
11/07/2092	103.964
12/14/2093	104.477
12/27/2094	106.319
12/14/2095	107.008
03/19/2097	107.336

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	102.680
1.01	102.747
1.02	103.031
1.02	103.306
1.03	103.324
1.04	103.378
1.04	103.481
1.05	103.612
1.06	103.616
1.06	103.726
1.07	103.738
1.08	103.802
1.09	103.851
1.09	103.870
1.10	103.964
1.11	103.984
1.12	104.031
1.12	104.039
1.13	104.047
1.14	104.094
1.15	104.096
1.16	104.104
1.17	104.160
1.18	104.181
1.18	104.182
1.19	104.338
1.20	104.443
1.21	104.458
1.22	104.464
1.23	104.477
1.24	104.486
1.25	104.557
1.26	104.558
1.27	104.569
1.28	104.627
1.29	104.635
1.30	104.662
1.31	104.717
1.32	104.731
1.33	104.731
1.35	104.753
1.36	104.823
1.37	104.837
1.38	104.852
1.39	104.852
1.40	104.906
1.42	104.946
1.43	105.020
1.44	105.034
1.46	105.090
1.47	105.091
1.48	105.132
1.50	105.135
1.51	105.183
1.53	105.184
1.54	105.196
1.56	105.232
1.57	105.247
1.59	105.277
1.60	105.297
1.62	105.386
1.64	105.395
1.65	105.406
1.67	105.472
1.69	105.476

1.71	105.535
1.73	105.620
1.75	105.629
1.77	105.632
1.79	105.639
1.81	105.659
1.83	105.672
1.85	105.759
1.87	105.800
1.89	105.817
1.92	105.839
1.94	105.848
1.96	105.855
1.99	105.901
2.01	105.907
2.04	105.949
2.07	106.017
2.09	106.018
2.12	106.024
2.15	106.043
2.18	106.049
2.21	106.067
2.24	106.111
2.27	106.132
2.31	106.192
2.34	106.220
2.38	106.231
2.41	106.262
2.45	106.264
2.49	106.264
2.53	106.282
2.57	106.319
2.61	106.377
2.65	106.388
2.70	106.406
2.75	106.434
2.80	106.496
2.85	106.532
2.90	106.543
2.95	106.553
3.01	106.609
3.07	106.753
3.13	106.792
3.19	106.830
3.26	106.836
3.32	106.907
3.40	106.911
3.47	106.938
3.55	106.978
3.63	107.008
3.72	107.031
3.80	107.057
3.90	107.154
4.00	107.203
4.10	107.281
4.21	107.336
4.32	107.366
4.45	107.412
4.58	107.509
4.71	107.529
4.86	107.555
5.01	107.694
5.17	107.727
5.35	107.765
5.54	107.831
5.74	107.875
5.95	107.934
6.19	108.007
6.44	108.010
6.71	108.021
7.01	108.137
7.33	108.270
7.69	108.381
8.08	108.383
8.52	108.412
9.00	108.424
9.55	108.577
10.16	108.737
10.86	108.744
11.66	108.862
12.59	108.909
13.68	109.072
14.97	109.127
16.54	109.225
18.47	109.293
20.92	109.310
24.10	109.391
28.44	109.404
34.68	109.723
44.42	109.750
61.77	109.791
101.36	109.857
282.36	110.171

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	Link: 1
1.05-Year	103.617
1.11-Year	103.994
1.25-Year	104.559
2.00-Year	105.906
3.33-Year	106.912
5-Year	107.687
10-Year	108.712
25-Year	109.300
50-Year	109.744
100-Year	109.856

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	Link: 1
Total Inflow Volume (ac-ft)	5952.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 3.533 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 11542. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 17313. cu-ft
2-Year Discharge Rate : 0.146 cfs

************Compliance Point Results ***************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff Date	Annual Max Q (cfs)	Postdevelopment Runoff Date	Annual Max Q (cfs)
04/30/1940	0.386	12/07/1939	0.145
01/31/1941	0.148	10/24/1940	0.109
12/15/1941	0.388	12/20/1941	0.132
02/10/1943	0.154	11/23/1942	0.242
01/23/1944	0.116	10/17/1943	0.104
02/07/1945	0.481	02/07/1945	0.143
02/05/1946	0.295	02/06/1946	0.121
02/02/1947	0.301	12/05/1946	0.144
03/21/1948	0.520	10/19/1947	0.151
02/22/1949	0.261	02/22/1949	0.135
03/03/1950	1.075	03/05/1950	0.196
02/09/1951	0.430	02/09/1951	0.335
01/24/1952	0.113	10/03/1951	0.121
01/11/1953	0.161	01/18/1953	0.228
01/22/1954	0.261	01/22/1954	0.132
04/12/1955	0.122	11/19/1954	0.129
03/04/1956	0.280	01/06/1956	0.378
02/25/1957	0.232	02/26/1957	0.132
01/16/1958	0.281	01/17/1958	0.136
01/12/1959	0.302	01/13/1959	0.219
12/15/1959	0.323	11/21/1959	0.142
02/14/1961	0.276	11/24/1960	0.245
03/04/1962	0.148	12/24/1961	0.122
02/03/1963	0.164	11/30/1962	0.123
01/01/1964	0.263	11/23/1963	0.130
02/26/1965	0.326	12/01/1964	0.137
01/06/1966	0.201	01/14/1966	0.146
01/19/1967	0.508	12/13/1966	0.231
02/03/1968	0.263	01/20/1968	0.138
12/03/1968	0.282	12/11/1968	0.146
01/13/1970	0.219	01/27/1970	0.189
12/06/1970	0.249	12/07/1970	0.166
02/28/1972	0.670	03/05/1972	0.611
01/13/1973	0.242	12/26/1972	0.311
02/18/1974	0.362	12/27/1973	0.156
12/26/1974	0.438	12/27/1974	0.133
01/27/1976	0.303	02/27/1976	0.153
05/31/1977	0.043	06/04/1977	0.114
12/10/1977	0.257	12/15/1977	0.236
03/04/1979	0.252	03/05/1979	0.121
12/17/1979	0.406	12/18/1979	0.595
12/26/1980	0.161	12/30/1980	0.141
10/06/1981	0.515	10/06/1981	0.440
01/05/1983	0.289	03/09/1983	0.190
03/14/1984	0.276	03/21/1984	0.127
02/11/1985	0.184	11/11/1984	0.126

01/18/1986	0.608	01/19/1986	0.152
11/24/1986	0.536	11/24/1986	0.447
04/06/1988	0.268	04/06/1988	0.140
04/05/1989	0.295	04/05/1989	0.166
01/09/1990	0.974	01/09/1990	0.421
11/24/1990	0.830	11/24/1990	0.695
01/27/1992	0.254	02/01/1992	0.176
06/09/1993	0.214	04/11/1993	0.120
03/03/1994	0.163	03/03/1994	0.125
02/19/1995	0.341	12/27/1994	0.273
02/09/1996	0.790	02/09/1996	0.723
01/02/1997	0.494	01/02/1997	0.608
02/28/1998	0.182	10/08/1997	0.127
11/25/1998	0.486	11/26/1998	0.630
03/26/2000	0.272	02/28/2000	0.161
05/05/2001	0.209	05/05/2001	0.116
05/03/2002	0.744	12/20/2001	0.116
03/31/2003	0.570	11/26/2002	0.534
01/23/2004	0.139	10/24/2003	0.136
02/07/2005	0.240	02/08/2005	0.118
02/27/2006	0.308	11/28/2005	0.210
12/14/2006	0.228	11/27/2006	0.144
03/21/2008	0.379	01/07/2008	0.150
02/17/2009	0.588	02/18/2009	0.504
01/10/2010	0.395	01/10/2010	0.177
11/17/2010	0.513	11/17/2010	0.381
01/31/2012	0.326	10/02/2011	0.140
01/20/2013	0.745	01/20/2013	0.709
12/06/2013	0.313	01/28/2014	0.145
03/30/2015	0.190	04/22/2015	0.128
01/04/2016	0.542	01/04/2016	0.526
03/07/2017	0.157	11/01/2016	0.136
01/31/2018	0.292	01/31/2018	0.139
03/30/2019	0.289	01/12/2019	0.163
04/14/2020	0.190	04/21/2020	0.130
02/10/2021	0.469	11/24/2020	0.304
03/26/2022	0.139	12/21/2021	0.133
03/30/2023	0.334	03/30/2023	0.136
01/19/2024	0.263	01/25/2024	0.185
12/22/2024	0.549	12/22/2024	0.445
03/09/2026	0.349	01/04/2026	0.307
01/27/2027	0.304	12/13/2026	0.128
02/19/2028	0.376	02/23/2028	0.138
12/04/2028	0.291	01/13/2029	0.150
02/16/2030	0.389	01/26/2030	0.399
12/30/2030	0.364	03/04/2031	0.145
01/20/2032	0.585	01/21/2032	0.188
03/01/2033	0.165	12/24/2032	0.134
01/15/2034	0.661	11/16/2033	0.576
02/19/2035	0.323	02/19/2035	0.145
03/24/2036	0.305	02/27/2036	0.147
03/09/2037	0.012	03/09/2037	0.099
12/15/2037	0.223	12/15/2037	0.227
02/07/2039	0.161	12/11/2038	0.118
01/14/2040	0.604	01/14/2040	0.142
12/25/2040	0.342	12/25/2040	0.175
02/20/2042	0.359	04/15/2042	0.180
03/31/2043	0.538	02/26/2043	0.157
05/01/2044	0.212	03/21/2044	0.137
02/11/2045	0.245	11/28/2044	0.142
02/16/2046	0.309	12/08/2045	0.137
02/01/2047	0.194	02/02/2047	0.129
04/21/2048	0.173	12/10/2047	0.284
03/16/2049	0.194	03/17/2049	0.135
12/04/2049	0.327	02/09/2050	0.127
04/06/2051	0.254	04/09/2051	0.120
04/17/2052	0.153	04/17/2052	0.110
06/04/2053	0.586	12/10/2052	0.128
04/08/2054	0.109	12/11/2053	0.131
02/17/2055	0.499	11/01/2054	0.440
02/07/2056	0.907	02/07/2056	0.701
11/19/2056	0.992	01/02/2057	0.565
01/24/2058	0.344	11/25/2057	0.134
12/28/2058	0.396	12/02/2058	0.331
01/19/2060	0.148	01/23/2060	0.123
01/10/2061	0.321	01/15/2061	0.167
02/03/2062	1.222	01/03/2062	0.139
12/29/2062	0.259	01/02/2063	0.142
12/23/2063	0.467	12/23/2063	0.351
11/30/2064	0.223	12/02/2064	0.129
01/13/2066	0.122	11/04/2065	0.109
01/19/2067	0.311	12/15/2066	0.341
01/18/2068	0.640	01/20/2068	0.263
01/04/2069	0.172	09/23/2069	0.114
04/09/2070	0.145	12/14/2069	0.112
02/14/2071	0.159	12/19/2070	0.117
02/27/2072	0.171	11/03/2071	0.130
12/25/2072	0.714	12/25/2072	2.276
03/16/2074	0.384	12/15/2073	0.214
01/23/2075	0.083	11/24/2074	0.121
03/24/2076	0.426	10/30/2075	0.367
03/02/2077	0.048	08/26/2077	0.098
12/02/2077	0.161	12/02/2077	0.132
02/25/2079	0.215	03/05/2079	0.120
12/17/2079	0.797	12/17/2079	0.627

11/21/2080	0.352	11/21/2080	0.379
02/13/2082	0.439	02/19/2082	0.291
02/19/2083	0.269	02/20/2083	0.257
11/26/2083	0.326	11/26/2083	0.474
12/14/2084	0.226	12/14/2084	0.219
01/18/2086	0.318	11/01/2085	0.143
12/21/2086	0.298	11/23/2086	0.152
01/14/2088	0.196	12/09/2087	0.139
11/05/2088	0.349	11/05/2088	0.166
01/07/2090	0.164	11/10/2089	0.163
12/04/2090	0.303	12/09/2090	0.503
04/28/2092	0.520	01/31/2092	0.358
03/22/2093	0.146	11/07/2092	0.119
03/01/2094	0.122	12/14/2093	0.127
02/18/2095	0.193	12/27/2094	0.170
01/14/2096	0.244	12/14/2095	0.239
01/29/2097	0.536	03/19/2097	0.280

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.012	1.00	0.098
1.01	0.043	1.01	0.099
1.02	0.048	1.02	0.104
1.02	0.083	1.02	0.109
1.03	0.109	1.03	0.109
1.04	0.113	1.04	0.110
1.04	0.116	1.04	0.112
1.05	0.122	1.05	0.114
1.06	0.122	1.06	0.114
1.06	0.122	1.06	0.116
1.07	0.139	1.07	0.116
1.08	0.139	1.08	0.117
1.09	0.145	1.09	0.118
1.09	0.146	1.09	0.118
1.10	0.148	1.10	0.119
1.11	0.148	1.11	0.120
1.12	0.148	1.12	0.120
1.12	0.153	1.12	0.120
1.13	0.154	1.13	0.121
1.14	0.157	1.14	0.121
1.15	0.159	1.15	0.121
1.16	0.161	1.16	0.121
1.17	0.161	1.17	0.122
1.18	0.161	1.18	0.123
1.18	0.161	1.18	0.123
1.19	0.163	1.19	0.125
1.20	0.164	1.20	0.126
1.21	0.164	1.21	0.127
1.22	0.165	1.22	0.127
1.23	0.171	1.23	0.127
1.24	0.172	1.24	0.127
1.25	0.173	1.25	0.128
1.26	0.182	1.26	0.128
1.27	0.184	1.27	0.128
1.28	0.190	1.28	0.129
1.29	0.190	1.29	0.129
1.30	0.193	1.30	0.129
1.31	0.194	1.31	0.130
1.32	0.194	1.32	0.130
1.33	0.196	1.33	0.130
1.35	0.201	1.35	0.131
1.36	0.209	1.36	0.132
1.37	0.212	1.37	0.132
1.38	0.214	1.38	0.132
1.39	0.215	1.39	0.132
1.40	0.219	1.40	0.133
1.42	0.223	1.42	0.133
1.43	0.223	1.43	0.134
1.44	0.226	1.44	0.134
1.46	0.228	1.46	0.135
1.47	0.232	1.47	0.135
1.48	0.240	1.48	0.136
1.50	0.242	1.50	0.136
1.51	0.244	1.51	0.136
1.53	0.245	1.53	0.136
1.54	0.249	1.54	0.137
1.56	0.252	1.56	0.137
1.57	0.254	1.57	0.137
1.59	0.254	1.59	0.138
1.60	0.257	1.60	0.138
1.62	0.259	1.62	0.139
1.64	0.261	1.64	0.139
1.65	0.261	1.65	0.139
1.67	0.263	1.67	0.140
1.69	0.263	1.69	0.140
1.71	0.263	1.71	0.141
1.73	0.268	1.73	0.142
1.75	0.269	1.75	0.142
1.77	0.272	1.77	0.142
1.79	0.276	1.79	0.142
1.81	0.276	1.81	0.143

1.83	0.280	1.83	0.143
1.85	0.281	1.85	0.144
1.87	0.282	1.87	0.144
1.89	0.289	1.89	0.145
1.92	0.289	1.92	0.145
1.94	0.291	1.94	0.145
1.96	0.292	1.96	0.145
1.99	0.295	1.99	0.146
2.01	0.295	2.01	0.146
2.04	0.298	2.04	0.147
2.07	0.301	2.07	0.150
2.09	0.302	2.09	0.150
2.12	0.303	2.12	0.151
2.15	0.303	2.15	0.152
2.18	0.304	2.18	0.152
2.21	0.305	2.21	0.153
2.24	0.308	2.24	0.156
2.27	0.309	2.27	0.157
2.31	0.311	2.31	0.161
2.34	0.313	2.34	0.163
2.38	0.318	2.38	0.163
2.41	0.321	2.41	0.166
2.45	0.323	2.45	0.166
2.49	0.323	2.49	0.166
2.53	0.326	2.53	0.167
2.57	0.326	2.57	0.170
2.61	0.326	2.61	0.175
2.65	0.327	2.65	0.176
2.70	0.334	2.70	0.177
2.75	0.341	2.75	0.180
2.80	0.342	2.80	0.185
2.85	0.344	2.85	0.188
2.90	0.349	2.90	0.189
2.95	0.349	2.95	0.190
3.01	0.352	3.01	0.196
3.07	0.359	3.07	0.210
3.13	0.362	3.13	0.214
3.19	0.364	3.19	0.219
3.26	0.376	3.26	0.219
3.32	0.379	3.32	0.227
3.40	0.384	3.40	0.228
3.47	0.386	3.47	0.231
3.55	0.388	3.55	0.236
3.63	0.389	3.63	0.239
3.72	0.395	3.72	0.242
3.80	0.396	3.80	0.245
3.90	0.406	3.90	0.257
4.00	0.426	4.00	0.263
4.10	0.430	4.10	0.273
4.21	0.438	4.21	0.280
4.32	0.439	4.32	0.284
4.45	0.467	4.45	0.291
4.58	0.469	4.58	0.304
4.71	0.481	4.71	0.307
4.86	0.486	4.86	0.311
5.01	0.494	5.01	0.331
5.17	0.499	5.17	0.335
5.35	0.508	5.35	0.341
5.54	0.513	5.54	0.351
5.74	0.515	5.74	0.358
5.95	0.520	5.95	0.367
6.19	0.520	6.19	0.378
6.44	0.536	6.44	0.379
6.71	0.536	6.71	0.381
7.01	0.538	7.01	0.399
7.33	0.542	7.33	0.421
7.69	0.549	7.69	0.440
8.08	0.570	8.08	0.440
8.52	0.585	8.52	0.445
9.00	0.586	9.00	0.447
9.55	0.588	9.55	0.474
10.16	0.604	10.16	0.503
10.86	0.608	10.86	0.504
11.66	0.640	11.66	0.526
12.59	0.661	12.59	0.534
13.68	0.670	13.68	0.565
14.97	0.714	14.97	0.576
16.54	0.744	16.54	0.595
18.47	0.745	18.47	0.608
20.92	0.790	20.92	0.611
24.10	0.797	24.10	0.627
28.44	0.830	28.44	0.630
34.68	0.907	34.68	0.695
44.42	0.974	44.42	0.701
61.77	0.992	61.77	0.709
101.36	1.075	101.36	0.723
282.36	1.222	282.36	2.276

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.295	2-Year	0.146
5-Year	0.493	5-Year	0.329
10-Year	0.600	10-Year	0.495
25-Year	0.804	25-Year	0.628
50-Year	0.981	50-Year	0.704
100-Year	1.072	100-Year	0.723
200-Year	1.173	200-Year	1.753

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
6.112E-03	2.3680E-01	1.138E-02	7.4387E-01
0.012	1.8183E-01	0.023	6.7924E-01
0.018	1.4869E-01	0.034	6.0502E-01
0.024	1.2486E-01	0.046	5.2493E-01
0.031	1.0625E-01	0.057	4.4307E-01
0.037	9.1206E-02	0.068	3.5820E-01
0.043	7.8997E-02	0.080	2.7323E-01
0.049	6.8893E-02	0.091	1.9563E-01
0.055	6.0447E-02	0.102	1.3058E-01
0.061	5.3261E-02	0.114	8.1063E-02
0.067	4.7175E-02	0.125	4.5883E-02
0.073	4.1832E-02	0.137	2.2597E-02
0.079	3.7205E-02	0.148	1.0361E-02
0.086	3.3133E-02	0.159	7.9658E-03
0.092	2.9638E-02	0.171	6.6374E-03
0.098	2.6430E-02	0.182	5.5890E-03
0.104	2.3649E-02	0.193	4.8042E-03
0.110	2.1262E-02	0.205	4.2071E-03
0.116	1.9150E-02	0.216	3.6974E-03
0.122	1.7267E-02	0.228	3.2425E-03
0.128	1.5521E-02	0.239	2.8447E-03
0.134	1.4036E-02	0.250	2.4967E-03
0.141	1.2639E-02	0.262	2.1913E-03
0.148	1.1278E-02	0.273	1.9393E-03
0.153	1.0348E-02	0.284	1.7220E-03
0.159	9.4640E-03	0.295	1.5607E-03
0.165	8.5860E-03	0.307	1.3718E-03
0.171	7.8178E-03	0.319	1.2447E-03
0.177	7.1543E-03	0.330	1.1249E-03
0.183	6.5998E-03	0.341	1.0180E-03
0.189	6.0489E-03	0.353	9.2344E-04
0.196	5.5507E-03	0.364	8.4185E-04
0.202	5.1067E-03	0.376	7.6460E-04
0.208	4.7255E-03	0.387	6.9240E-04
0.214	4.3558E-03	0.398	6.2958E-04
0.220	4.0223E-03	0.410	5.6821E-04
0.226	3.7104E-03	0.421	5.1767E-04
0.232	3.4331E-03	0.432	4.7580E-04
0.238	3.1833E-03	0.444	4.3392E-04
0.244	2.9472E-03	0.455	3.9566E-04
0.251	2.7284E-03	0.467	3.6750E-04
0.257	2.5234E-03	0.478	3.3284E-04
0.263	2.3581E-03	0.493	2.9203E-04
0.269	2.1942E-03	0.501	2.7436E-04
0.275	2.0324E-03	0.512	2.4404E-04
0.281	1.9003E-03	0.523	2.1516E-04
0.287	1.7624E-03	0.535	1.8989E-04
0.295	1.6051E-03	0.546	1.6534E-04
0.299	1.5285E-03	0.558	1.3790E-04
0.306	1.4180E-03	0.569	1.1769E-04
0.312	1.3350E-03	0.580	9.8914E-05
0.318	1.2722E-03	0.592	8.3030E-05
0.324	1.2043E-03	0.603	6.8590E-05
0.330	1.1350E-03	0.614	5.9926E-05
0.336	1.0729E-03	0.626	5.0540E-05
0.342	1.0130E-03	0.637	4.2598E-05
0.348	9.6532E-04	0.649	4.1154E-05
0.355	9.1478E-04	0.660	3.6100E-05
0.361	8.6712E-04	0.671	2.8880E-05
0.367	8.1225E-04	0.683	2.1660E-05
0.373	7.6388E-04	0.694	1.5884E-05
0.379	7.2489E-04	0.706	1.0830E-05
0.385	6.8807E-04	0.717	7.9420E-06
0.391	6.5124E-04	0.728	5.7760E-06
0.397	6.2092E-04	0.740	4.3320E-06
0.403	5.8915E-04	0.751	3.6100E-06
0.410	5.6749E-04	0.762	3.6100E-06
0.416	5.4511E-04	0.774	3.6100E-06
0.422	5.2562E-04	0.785	3.6100E-06
0.428	5.0251E-04	0.797	3.6100E-06

0.434	4.7796E-04	0.808	3.6100E-06
0.440	4.5197E-04	0.819	3.6100E-06
0.446	4.3609E-04	0.831	3.6100E-06
0.452	4.1154E-04	0.842	3.6100E-06
0.458	3.9349E-04	0.853	3.6100E-06
0.465	3.6894E-04	0.865	3.6100E-06
0.471	3.5450E-04	0.876	3.6100E-06
0.477	3.3573E-04	0.888	3.6100E-06
0.483	3.1985E-04	0.899	3.6100E-06
0.489	3.0252E-04	0.910	3.6100E-06
0.493	2.9160E-04	0.922	3.6100E-06
0.501	2.7653E-04	0.933	3.6100E-06
0.507	2.6281E-04	0.945	3.6100E-06
0.513	2.5198E-04	0.956	3.6100E-06
0.520	2.3609E-04	0.967	3.6100E-06
0.526	2.2599E-04	0.981	2.8375E-06
0.532	2.1371E-04	0.990	2.8880E-06
0.538	2.0360E-04	1.001	2.8880E-06
0.544	1.9638E-04	1.013	2.8880E-06
0.550	1.8339E-04	1.024	2.8880E-06
0.556	1.7689E-04	1.036	2.8880E-06
0.562	1.6245E-04	1.047	2.8880E-06
0.568	1.5306E-04	1.058	2.8880E-06
0.575	1.4440E-04	1.070	2.8880E-06
0.581	1.3140E-04	1.081	2.8880E-06
0.587	1.2563E-04	1.092	2.8880E-06
0.593	1.1552E-04	1.104	2.8880E-06
0.599	1.0830E-04	1.115	2.8880E-06
0.605	1.0108E-04	1.127	2.8880E-06
0.611	9.3860E-05	1.138	2.8880E-06
0.617	8.9528E-05	1.149	2.8880E-06
0.623	8.1586E-05	1.161	2.8880E-06
0.630	7.4366E-05	1.172	2.8880E-06
0.636	7.1478E-05	1.183	2.8880E-06
0.642	6.5702E-05	1.195	2.8880E-06
0.648	6.2814E-05	1.206	2.8880E-06
0.654	5.9926E-05	1.218	2.8880E-06
0.660	5.7760E-05	1.229	2.8880E-06
0.666	5.0540E-05	1.240	2.8880E-06
0.672	4.7652E-05	1.252	2.8880E-06
0.678	4.2598E-05	1.263	2.8880E-06
0.685	3.8266E-05	1.275	2.8880E-06
0.691	3.4656E-05	1.286	2.8880E-06
0.697	3.2490E-05	1.297	2.8880E-06
0.703	3.0324E-05	1.309	2.8880E-06
0.709	2.8158E-05	1.320	2.8880E-06
0.715	2.4548E-05	1.331	2.8880E-06
0.721	2.3826E-05	1.343	2.8880E-06
0.727	2.1660E-05	1.354	2.8880E-06
0.733	1.9494E-05	1.366	2.8880E-06
0.740	1.8772E-05	1.377	2.8880E-06
0.746	1.5162E-05	1.388	2.8880E-06
0.752	1.4440E-05	1.400	2.8880E-06
0.758	1.3718E-05	1.411	2.8880E-06
0.764	1.2274E-05	1.422	2.8880E-06
0.770	1.1552E-05	1.434	2.8880E-06
0.776	1.0830E-05	1.445	2.8880E-06
0.782	1.0830E-05	1.457	2.1660E-06
0.788	1.0108E-05	1.468	2.1660E-06
0.795	8.6640E-06	1.479	2.1660E-06
0.801	7.9420E-06	1.491	2.1660E-06
0.807	7.9420E-06	1.502	2.1660E-06
0.813	7.9420E-06	1.513	2.1660E-06
0.819	7.9420E-06	1.525	2.1660E-06
0.825	7.9420E-06	1.536	2.1660E-06
0.831	7.2200E-06	1.548	2.1660E-06
0.837	7.2200E-06	1.559	2.1660E-06
0.843	7.2200E-06	1.570	2.1660E-06
0.850	7.2200E-06	1.582	2.1660E-06
0.856	7.2200E-06	1.593	2.1660E-06
0.862	7.2200E-06	1.605	2.1660E-06
0.868	7.2200E-06	1.616	2.1660E-06
0.874	7.2200E-06	1.627	2.1660E-06
0.880	7.2200E-06	1.639	2.1660E-06
0.886	7.2200E-06	1.650	2.1660E-06
0.892	6.4980E-06	1.661	1.4440E-06
0.898	6.4980E-06	1.673	1.4440E-06
0.905	6.4980E-06	1.684	1.4440E-06
0.911	5.7760E-06	1.696	1.4440E-06
0.917	5.0540E-06	1.707	1.4440E-06
0.923	5.0540E-06	1.718	1.4440E-06
0.929	5.0540E-06	1.730	1.4440E-06
0.935	5.0540E-06	1.741	1.4440E-06
0.941	4.3320E-06	1.752	1.4440E-06
0.947	4.3320E-06	1.764	1.4440E-06
0.953	4.3320E-06	1.775	1.4440E-06
0.960	3.6100E-06	1.787	1.4440E-06
0.966	3.6100E-06	1.798	1.4440E-06
0.972	3.6100E-06	1.809	1.4440E-06
0.981	2.8016E-06	1.821	1.4440E-06
0.984	2.8880E-06	1.832	1.4440E-06
0.990	2.8880E-06	1.843	1.4440E-06
0.996	2.1660E-06	1.855	1.4440E-06
1.002	2.1660E-06	1.866	1.4440E-06
1.008	2.1660E-06	1.878	1.4440E-06

1.015	2.1660E-06	1.889	1.4440E-06
1.021	2.1660E-06	1.900	1.4440E-06
1.027	2.1660E-06	1.912	1.4440E-06
1.033	2.1660E-06	1.923	1.4440E-06
1.039	2.1660E-06	1.935	1.4440E-06
1.045	2.1660E-06	1.946	1.4440E-06
1.051	2.1660E-06	1.957	1.4440E-06
1.057	2.1660E-06	1.969	1.4440E-06
1.064	2.1660E-06	1.980	7.2200E-07
1.070	2.1660E-06	1.991	7.2200E-07
1.076	7.2200E-07	2.003	7.2200E-07
1.082	7.2200E-07	2.014	7.2200E-07
1.088	7.2200E-07	2.026	7.2200E-07
1.094	7.2200E-07	2.037	7.2200E-07
1.100	7.2200E-07	2.048	7.2200E-07
1.106	7.2200E-07	2.060	7.2200E-07
1.112	7.2200E-07	2.071	7.2200E-07
1.119	7.2200E-07	2.082	7.2200E-07
1.125	7.2200E-07	2.094	7.2200E-07
1.131	7.2200E-07	2.105	7.2200E-07
1.137	7.2200E-07	2.117	7.2200E-07
1.143	7.2200E-07	2.128	7.2200E-07
1.149	7.2200E-07	2.139	7.2200E-07
1.155	7.2200E-07	2.151	7.2200E-07
1.161	7.2200E-07	2.162	7.2200E-07
1.167	7.2200E-07	2.173	7.2200E-07
1.174	7.2200E-07	2.185	7.2200E-07
1.180	7.2200E-07	2.196	7.2200E-07
1.186	7.2200E-07	2.208	7.2200E-07
1.192	7.2200E-07	2.219	7.2200E-07
1.198	7.2200E-07	2.230	7.2200E-07
1.204	7.2200E-07	2.242	7.2200E-07
1.210	7.2200E-07	2.253	7.2200E-07
1.216	7.2200E-07	2.265	7.2200E-07
1.222	7.2200E-07	2.276	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-10.0%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-2.8%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	13.3%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

MGS FLOOD
PROJECT REPORT

Program Version: 3.12 **Run Date: 11/10/2009 1:14 PM**

Input File Name: **vaultPR.fld**
Project Name: Burien NERA
Analysis Title: Detention and Wet Vault PR
Comments: 85% Impervious

********** Precipitation Input**********

Extended Precipitation Timeseries Selected
Climatic Region Number: 13
Full Period of Record Available used for Routing
Precipitation Station : 960040 Puget East 40 in MAP 10/01/1939-10/01/2097
Evaporation Station : 961040 Puget East 40 in MAP
Evaporation Scale Factor : 0.750

HSPF Parameter Region Number: 1
HSPF Parameter Region Name : USGS Default

********** Default HSPF Parameters Used (Not Modified by User) **********

********** Watershed Definition **********

Number of Subbasins: 1

********** Subbasin Number: 1 **********

***Tributary to Node: 1
***Bypass to Node : None

----------Area(Acres) ----------

		Developed	
	Predeveloped	**To Node**	**Bypass Node**
Till Forest	28.541	0.000	0.000
Till Pasture	0.000	0.000	0.000
Till Grass	0.000	2.697	0.000
Outwash Forest	0.000	0.000	0.000
Outwash Pasture	0.000	0.000	0.000
Outwash Grass	0.000	1.275	0.000
Wetland	0.000	1.050	0.000
Impervious	0.000	23.519	0.000
Subbasin Total	**28.541**	**28.541**	**0.000**

----------Lateral Flow Connnections----------

	Predeveloped			Developed		
	Surface	**Interflow**	**Grnd Water**	**Surface**	**Interflow**	**Grnd Water**
Till Forest	Node	Node	Node	Node		
Till Pasture	Node	Node	Node	Node		
Till Grass	Node	Node	Node	Node		
Outwash Forest	Node	Node	Node	Node		
Outwash Pasture	Node	Node	Node	Node		
Outwash Grass	Node	Node	Node	Node		
Wetland	Node	Node	Node	Node		
Impervious	Node		Node			
Lateral 1						
Lateral 2						

*** Subbasin Connection Summary ***

Subbasin 1 ----------> Node 1

*** By-Pass Area Connection Summary ***
No By-Passed Areas in Watershed

*** Postdeveloped Node Connection Summary ***

Upstream Node No.	**Link Type**	**Downstream Node**
Node 1	Pond	Node 2

Predeveloped Compliance Node: **1**
Postdeveloped Compliance Node: **2**

*** Predeveloped Structure Summary ***

***** Postdeveloped Structure Summary *****

Link No. 1, Pond: New

Upstream Node : 1, Downstream Node: 2

Prismatic Pond Option Used

Pond Floor Elevation	:	100.00	ft				
Riser Crest Elevation	:	110.00	ft				
Max Pond Elevation	:	111.00	ft				
Max Storage Depth			:	10.00	ft		
Pond Bottom Length	:	381.4	ft				
Pond Bottom Width			:	127.1	ft		
Pond Side Slopes			: L1= 0.00	L2= 0.00	W1= 0.00	W2= 0.00	ft/ft
Pond Bottom Area			:	48484.	sq-ft		
Area at Riser Crest El	:	48,484.	sq-ft				
			:	1.113	acres		
Volume at Riser Crest	:	484,840.	cu-ft				
			: 11.130			ac-ft	
Area at Max Elevation	:	48484.	sq-ft				
			:	1.113	acres		
Vol at Max Elevation	:	533,323.	cu-ft				
			:	12.243	ac-ft		
Hydraulic Conductivity	:	0.00			in/hr		
Depth to Water Table	:	100.00			ft		

Riser Geometry

Riser Structure Type	: Circular		
Riser Diameter		: 30.00	in
Common Length		: 0.050	ft
Riser Crest Elevation	: 110.00	ft	

Hydraulic Structure Geometry

Number of Devices: 2

---Device Number 1 ---

Device Type : Circular Orifice			
Invert Elevation	:	100.00	ft
Diameter	:	2.15	in
Orientation	: Horizontal		
Elbow	: No		

--- Device Number 2 ---

Device Type : Vertical Rectangular Orifice			
Invert Elevation	:	105.59	ft
Length	:	0.60	in
Height	:	52.96	in
Orientation	: Vertical		
Elbow	: No		

************Postdeveloped Hydraulic Rating Table**************

Postdeveloped Link: 1

Elev (ft)	Storage (ac-ft)	Discharge (cfs)	Infilt Discharge (cfs)
100.000	0.000	0.000	0.000
100.035	0.039	0.023	0.000
100.070	0.078	0.033	0.000
100.140	0.156	0.046	0.000
100.280	0.312	0.065	0.000
100.420	0.467	0.080	0.000
100.560	0.623	0.092	0.000
100.700	0.779	0.103	0.000
100.840	0.935	0.113	0.000
100.980	1.091	0.122	0.000
101.120	1.247	0.130	0.000
101.260	1.402	0.138	0.000
101.400	1.558	0.146	0.000
101.540	1.714	0.153	0.000
101.680	1.870	0.160	0.000
101.820	2.026	0.166	0.000
101.960	2.182	0.172	0.000
102.100	2.337	0.178	0.000
102.240	2.493	0.184	0.000
102.380	2.649	0.190	0.000
102.520	2.805	0.195	0.000
102.660	2.961	0.201	0.000
102.800	3.117	0.206	0.000
102.940	3.272	0.211	0.000
103.080	3.428	0.216	0.000
103.220	3.584	0.221	0.000
103.360	3.740	0.226	0.000
103.500	3.896	0.230	0.000
103.640	4.051	0.235	0.000
103.780	4.207	0.239	0.000
103.920	4.363	0.244	0.000
104.060	4.519	0.248	0.000
104.200	4.675	0.252	0.000
104.340	4.831	0.256	0.000
104.480	4.986	0.261	0.000

104.620	5.142	0.265	0.000
104.760	5.298	0.269	0.000
104.900	5.454	0.273	0.000
105.040	5.610	0.276	0.000
105.180	5.766	0.280	0.000
105.320	5.921	0.284	0.000
105.387	5.996	0.286	0.000
105.453	6.070	0.288	0.000
105.520	6.144	0.289	0.000
105.587	6.218	0.291	0.000
105.622	6.257	0.293	0.000
105.657	6.296	0.295	0.000
105.692	6.335	0.298	0.000
105.727	6.374	0.302	0.000
105.867	6.530	0.318	0.000
106.007	6.686	0.338	0.000
106.147	6.841	0.361	0.000
106.287	6.997	0.387	0.000
106.427	7.153	0.415	0.000
106.567	7.309	0.445	0.000
106.707	7.465	0.477	0.000
106.847	7.620	0.511	0.000
106.987	7.776	0.546	0.000
107.127	7.932	0.583	0.000
107.267	8.088	0.622	0.000
107.407	8.244	0.662	0.000
107.547	8.400	0.704	0.000
107.687	8.555	0.747	0.000
107.827	8.711	0.791	0.000
107.967	8.867	0.837	0.000
108.107	9.023	0.884	0.000
108.247	9.179	0.932	0.000
108.387	9.335	0.981	0.000
108.527	9.490	1.031	0.000
108.667	9.646	1.083	0.000
108.807	9.802	1.135	0.000
108.947	9.958	1.189	0.000
109.087	10.114	1.244	0.000
109.227	10.269	1.299	0.000
109.367	10.425	1.356	0.000
109.507	10.581	1.414	0.000
109.647	10.737	1.473	0.000
109.787	10.893	1.532	0.000
109.840	10.952	1.555	0.000
109.893	11.012	1.578	0.000
109.947	11.071	1.602	0.000
110.000	11.130	1.625	0.000
110.035	11.169	1.813	0.000
110.070	11.208	2.144	0.000
110.105	11.247	2.568	0.000
110.140	11.286	3.066	0.000
110.175	11.325	3.628	0.000
110.210	11.364	4.245	0.000
110.245	11.403	4.913	0.000
110.280	11.442	5.624	0.000
110.420	11.598	8.800	0.000
110.560	11.754	12.259	0.000
110.700	11.910	15.657	0.000
110.840	12.065	18.668	0.000
110.980	12.221	21.051	0.000
111.120	12.377	22.734	0.000
111.260	12.533	24.170	0.000
111.400	12.689	25.427	0.000
111.540	12.844	26.628	0.000
111.540	12.038	26.747	0.000

***** Post-Developed Link Statistics *****

Postdeveloped Pond Water Surface Elevation Statistics

Annual Maxima Water Surface Elevation (ft)

Link: 1

Max Date	WSEL (ft)
12/07/1939	105.734
01/18/1941	103.232
12/20/1941	104.557
11/23/1942	106.608
10/17/1943	102.843
02/07/1945	105.653
02/06/1946	103.879
12/05/1946	105.237
10/19/1947	105.902
02/22/1949	105.028
01/22/1950	106.272
02/09/1951	107.411
10/03/1951	103.845
01/12/1953	106.559
01/22/1954	104.482
11/19/1954	104.381
01/06/1956	107.582
02/26/1957	104.907
01/17/1958	104.985
01/13/1959	106.483
11/21/1959	105.683

11/24/1960	106.813
12/24/1961	103.925
11/30/1962	103.953
11/19/1963	104.199
12/01/1964	105.082
01/07/1966	105.421
12/13/1966	106.498
01/20/1968	104.827
12/11/1968	105.525
01/27/1970	106.300
12/07/1970	105.858
03/05/1972	108.963
12/26/1972	107.260
03/02/1974	105.635
12/27/1974	104.643
02/27/1976	105.806
08/26/1977	103.464
12/15/1977	106.699
03/05/1979	103.809
12/18/1979	108.925
12/30/1980	105.311
10/06/1981	108.133
03/09/1983	106.041
03/21/1984	104.186
11/11/1984	104.196
01/19/1986	106.001
11/24/1986	108.167
04/06/1988	105.284
04/05/1989	105.813
01/09/1990	108.342
11/24/1990	109.275
01/31/1992	106.333
04/11/1993	103.745
03/03/1994	104.097
12/27/1994	106.792
02/09/1996	109.521
01/02/1997	108.960
10/08/1997	104.158
11/26/1998	108.964
02/28/2000	105.734
05/05/2001	103.745
11/15/2001	103.522
11/26/2002	108.484
10/24/2003	104.995
02/08/2005	103.753
11/28/2005	106.407
11/27/2006	105.385
01/07/2008	105.940
02/18/2009	108.596
01/10/2010	106.209
11/17/2010	107.657
10/02/2011	105.373
01/20/2013	109.445
01/28/2014	105.555
04/22/2015	104.124
01/04/2016	108.378
11/01/2016	104.858
01/31/2018	105.142
01/12/2019	106.099
04/21/2020	104.374
11/24/2020	107.271
12/21/2021	104.781
03/30/2023	105.186
01/25/2024	106.243
12/22/2024	108.090
01/04/2026	107.229
01/29/2027	104.441
02/23/2028	105.261
01/13/2029	105.434
01/26/2030	107.737
03/04/2031	105.522
01/21/2032	106.415
12/24/2032	104.932
11/16/2033	108.795
02/19/2035	105.526
02/27/2036	105.848
03/09/2037	102.482
12/15/2037	106.501
12/11/2038	103.535
01/14/2040	105.411
12/25/2040	106.115
04/15/2042	106.259
02/26/2043	105.866
03/21/2044	104.971
03/27/2045	105.289
02/23/2046	104.986
02/02/2047	104.492
12/10/2047	107.034
03/17/2049	104.790
02/09/2050	104.081
04/09/2051	104.005
04/17/2052	103.264
12/10/2052	104.241
12/11/2053	104.523
11/01/2054	108.221

02/07/2056	109.513
01/02/2057	108.659
11/25/2057	104.920
11/26/2058	107.276
01/23/2060	103.946
01/15/2061	106.019
01/03/2062	105.086
01/02/2063	105.398
12/23/2063	107.486
12/02/2064	104.614
01/13/2066	103.121
12/15/2066	107.317
01/20/2068	107.086
09/23/2069	103.407
12/14/2069	103.413
12/19/2070	103.493
11/03/2071	104.517
12/25/2072	110.170
12/15/2073	106.363
11/24/2074	103.791
10/30/2075	107.421
08/26/2077	102.613
12/02/2077	104.713
03/05/2079	103.700
12/17/2079	109.201
11/21/2080	107.711
02/19/2082	107.152
02/20/2083	106.987
11/26/2083	108.184
12/14/2084	106.341
11/01/2085	105.194
11/23/2086	105.941
12/09/2087	104.928
11/05/2088	106.086
11/10/2089	105.866
12/09/2090	108.313
01/31/2092	107.674
11/07/2092	103.592
12/14/2093	104.104
12/27/2094	105.851
12/14/2095	106.493
03/19/2097	106.948

Postdeveloped Ranked Annual Maxima Water Level (ft)

Tr (yrs)	Link: 1
1.00	102.482
1.01	102.613
1.02	102.843
1.02	103.121
1.03	103.232
1.04	103.264
1.04	103.407
1.05	103.413
1.06	103.464
1.06	103.493
1.07	103.522
1.08	103.535
1.09	103.592
1.09	103.700
1.10	103.745
1.11	103.745
1.12	103.753
1.12	103.791
1.13	103.809
1.14	103.845
1.15	103.879
1.16	103.925
1.17	103.946
1.18	103.953
1.18	104.005
1.19	104.081
1.20	104.097
1.21	104.104
1.22	104.124
1.23	104.158
1.24	104.186
1.25	104.196
1.26	104.199
1.27	104.241
1.28	104.374
1.29	104.381
1.30	104.441
1.31	104.482
1.32	104.492
1.33	104.517
1.35	104.523
1.36	104.557
1.37	104.614
1.38	104.643
1.39	104.713
1.40	104.781
1.42	104.790
1.43	104.827

1.44	104.858
1.46	104.907
1.47	104.920
1.48	104.928
1.50	104.932
1.51	104.971
1.53	104.985
1.54	104.986
1.56	104.995
1.57	105.028
1.59	105.082
1.60	105.086
1.62	105.142
1.64	105.186
1.65	105.194
1.67	105.237
1.69	105.261
1.71	105.284
1.73	105.289
1.75	105.311
1.77	105.373
1.79	105.385
1.81	105.398
1.83	105.411
1.85	105.421
1.87	105.434
1.89	105.522
1.92	105.525
1.94	105.526
1.96	105.555
1.99	105.635
2.01	105.653
2.04	105.683
2.07	105.734
2.09	105.734
2.12	105.806
2.15	105.813
2.18	105.848
2.21	105.851
2.24	105.858
2.27	105.866
2.31	105.866
2.34	105.902
2.38	105.940
2.41	105.941
2.45	106.001
2.49	106.019
2.53	106.041
2.57	106.086
2.61	106.099
2.65	106.115
2.70	106.209
2.75	106.243
2.80	106.259
2.85	106.272
2.90	106.300
2.95	106.333
3.01	106.341
3.07	106.363
3.13	106.407
3.19	106.415
3.26	106.483
3.32	106.493
3.40	106.498
3.47	106.501
3.55	106.559
3.63	106.608
3.72	106.699
3.80	106.792
3.90	106.813
4.00	106.948
4.10	106.987
4.21	107.034
4.32	107.086
4.45	107.152
4.58	107.229
4.71	107.260
4.86	107.271
5.01	107.276
5.17	107.317
5.35	107.411
5.54	107.421
5.74	107.486
5.95	107.582
6.19	107.657
6.44	107.674
6.71	107.711
7.01	107.737
7.33	108.090
7.69	108.133
8.08	108.167
8.52	108.184
9.00	108.221
9.55	108.313
10.16	108.342

10.86	108.378
11.66	108.484
12.59	108.596
13.68	108.659
14.97	108.795
16.54	108.925
18.47	108.960
20.92	108.963
24.10	108.964
28.44	109.201
34.68	109.275
44.42	109.445
61.77	109.513
101.36	109.521
282.36	110.170

Postdeveloped Water Surface Elevation Data (ft)
Recurrence Interval Computed Using Gringorten Plotting Position

Tr (yrs)	**Link: 1**
1.05-Year	103.424
1.11-Year	103.744
1.25-Year	104.197
2.00-Year	105.650
3.33-Year	106.493
5-Year	107.276
10-Year	108.339
25-Year	108.967
50-Year	109.496
100-Year	109.519

Postdeveloped Infiltrated Water Statistics
Volume Statistics Computed for Entire Simulation

Statistic	**Link: 1**
Total Inflow Volume (ac-ft)	10884.
Total Volume Infiltrated (ac-ft)	0.
Percent Infiltrated	0.00 %

************Water Quality Facility Data **************

Node No: 1
2-Year Discharge Rate : 6.320 cfs

Node No: 2

Basic Wet Pond Volume (91% Exceedance): 22851. cu-ft
Computed Large Wet Pond Volume, 1.5*Basic Volume: 34277. cu-ft
2-Year Discharge Rate : 0.294 cfs

************Compliance Point Results **************

Predeveloped Compliance Node: 1
Postdeveloped Compliance Node: 2

****Point of Compliance Annual Maxima Flow Data ****

Predevelopment Runoff		**Postdevelopment Runoff**	
Date	**Annual Max Q (cfs)**	**Date**	**Annual Max Q (cfs)**
04/30/1940	0.772	12/07/1939	0.302
01/31/1941	0.296	01/18/1941	0.221
12/15/1941	0.776	12/20/1941	0.263
02/10/1943	0.309	11/23/1942	0.454
01/23/1944	0.232	10/17/1943	0.208
02/07/1945	0.962	02/07/1945	0.295
02/05/1946	0.590	02/06/1946	0.242
02/02/1947	0.602	12/05/1946	0.282
03/21/1948	1.039	10/19/1947	0.323
02/22/1949	0.522	02/22/1949	0.276
03/03/1950	2.149	01/22/1950	0.384
02/09/1951	0.860	02/09/1951	0.663
01/24/1952	0.226	10/03/1951	0.241
01/11/1953	0.321	01/12/1953	0.443
01/22/1954	0.522	01/22/1954	0.261
04/12/1955	0.244	11/19/1954	0.258
03/04/1956	0.559	01/06/1956	0.715
02/25/1957	0.463	02/26/1957	0.273
01/16/1958	0.562	01/17/1958	0.275
01/12/1959	0.604	01/13/1959	0.427
12/15/1959	0.646	11/21/1959	0.298
02/14/1961	0.553	11/24/1960	0.503
03/04/1962	0.296	12/24/1961	0.244
02/03/1963	0.329	11/30/1962	0.245
01/01/1964	0.525	11/19/1963	0.252
02/26/1965	0.651	12/01/1964	0.278
01/06/1966	0.402	01/07/1966	0.287
01/19/1967	1.016	12/13/1966	0.430
02/03/1968	0.526	01/20/1968	0.270

12/03/1968	0.564	12/11/1968	0.289
01/13/1970	0.437	01/27/1970	0.389
12/06/1970	0.497	12/07/1970	0.317
02/28/1972	1.340	03/05/1972	1.196
01/13/1973	0.484	12/26/1972	0.620
02/18/1974	0.723	03/02/1974	0.294
12/26/1974	0.875	12/27/1974	0.265
01/27/1976	0.606	02/27/1976	0.311
05/31/1977	0.085	08/26/1977	0.229
12/10/1977	0.513	12/15/1977	0.475
03/04/1979	0.505	03/05/1979	0.240
12/17/1979	0.813	12/18/1979	1.181
12/26/1980	0.322	12/30/1980	0.284
10/06/1981	1.030	10/06/1981	0.893
01/05/1983	0.578	03/09/1983	0.344
03/14/1984	0.552	03/21/1984	0.252
02/11/1985	0.369	11/11/1984	0.252
01/18/1986	1.215	01/19/1986	0.337
11/24/1986	1.071	11/24/1986	0.904
04/06/1988	0.535	04/06/1988	0.283
04/05/1989	0.590	04/05/1989	0.312
01/09/1990	1.948	01/09/1990	0.965
11/24/1990	1.660	11/24/1990	1.319
01/27/1992	0.507	01/31/1992	0.396
06/09/1993	0.427	04/11/1993	0.238
03/03/1994	0.325	03/03/1994	0.249
02/19/1995	0.682	12/27/1994	0.497
02/09/1996	1.579	02/09/1996	1.420
01/02/1997	0.988	01/02/1997	1.194
02/28/1998	0.363	10/08/1997	0.251
11/25/1998	0.972	11/26/1998	1.196
03/26/2000	0.544	02/28/2000	0.302
05/05/2001	0.417	05/05/2001	0.238
05/03/2002	1.488	11/15/2001	0.231
03/31/2003	1.139	11/26/2002	1.016
01/23/2004	0.278	10/24/2003	0.275
02/07/2005	0.480	02/08/2005	0.239
02/27/2006	0.616	11/28/2005	0.411
12/14/2006	0.456	11/27/2006	0.286
03/21/2008	0.757	01/07/2008	0.328
02/17/2009	1.175	02/18/2009	1.057
01/10/2010	0.790	01/10/2010	0.372
11/17/2010	1.025	11/17/2010	0.738
01/31/2012	0.652	10/02/2011	0.285
01/20/2013	1.489	01/20/2013	1.388
12/06/2013	0.627	01/28/2014	0.290
03/30/2015	0.380	04/22/2015	0.250
01/04/2016	1.083	01/04/2016	0.978
03/07/2017	0.313	11/01/2016	0.271
01/31/2018	0.584	01/31/2018	0.279
03/30/2019	0.578	01/12/2019	0.353
04/14/2020	0.380	04/21/2020	0.258
02/10/2021	0.938	11/24/2020	0.623
03/26/2022	0.277	12/21/2021	0.269
03/30/2023	0.669	03/30/2023	0.280
01/19/2024	0.525	01/25/2024	0.379
12/22/2024	1.097	12/22/2024	0.878
03/09/2026	0.697	01/04/2026	0.612
01/27/2027	0.607	01/29/2027	0.259
02/19/2028	0.752	02/23/2028	0.282
12/04/2028	0.583	01/13/2029	0.287
02/16/2030	0.778	01/26/2030	0.763
12/30/2030	0.728	03/04/2031	0.289
01/20/2032	1.169	01/21/2032	0.412
03/01/2033	0.329	12/24/2032	0.273
01/15/2034	1.321	11/16/2033	1.131
02/19/2035	0.645	02/19/2035	0.289
03/24/2036	0.609	02/27/2036	0.316
03/09/2037	0.025	03/09/2037	0.194
12/15/2037	0.445	12/15/2037	0.431
02/07/2039	0.322	12/11/2038	0.231
01/14/2040	1.207	01/14/2040	0.286
12/25/2040	0.684	12/25/2040	0.356
02/20/2042	0.718	04/15/2042	0.382
03/31/2043	1.075	02/26/2043	0.318
05/01/2044	0.424	03/21/2044	0.275
02/11/2045	0.491	03/27/2045	0.283
02/16/2046	0.618	02/23/2046	0.275
02/01/2047	0.388	02/02/2047	0.261
04/21/2048	0.345	12/10/2047	0.559
03/16/2049	0.388	03/17/2049	0.269
12/04/2049	0.654	02/09/2050	0.249
04/06/2051	0.508	04/09/2051	0.246
04/17/2052	0.305	04/17/2052	0.222
06/04/2053	1.172	12/10/2052	0.254
04/08/2054	0.218	12/11/2053	0.262
02/17/2055	0.997	11/01/2054	0.923
02/07/2056	1.813	02/07/2056	1.417
11/19/2056	1.984	01/02/2057	1.080
01/24/2058	0.688	11/25/2057	0.273
12/28/2058	0.791	11/26/2058	0.625
01/19/2060	0.296	01/23/2060	0.245
01/10/2061	0.642	01/15/2061	0.340
02/03/2062	2.444	01/03/2062	0.278
12/29/2062	0.517	01/02/2063	0.286

12/23/2063	0.933	12/23/2063	0.686
11/30/2064	0.446	12/02/2064	0.264
01/13/2066	0.245	01/13/2066	0.217
01/19/2067	0.622	12/15/2066	0.636
01/18/2068	1.280	01/20/2068	0.572
01/04/2069	0.344	09/23/2069	0.227
04/09/2070	0.290	12/14/2069	0.227
02/14/2071	0.319	12/19/2070	0.230
02/27/2072	0.341	11/03/2071	0.262
12/25/2072	1.427	12/25/2072	3.551
03/16/2074	0.767	12/15/2073	0.402
01/23/2075	0.166	11/24/2074	0.240
03/24/2076	0.852	10/30/2075	0.667
03/02/2077	0.096	08/26/2077	0.199
12/02/2077	0.321	12/02/2077	0.267
02/25/2079	0.430	03/05/2079	0.237
12/17/2079	1.593	12/17/2079	1.289
11/21/2080	0.703	11/21/2080	0.755
02/13/2082	0.878	02/19/2082	0.590
02/19/2083	0.538	02/20/2083	0.546
11/26/2083	0.652	11/26/2083	0.910
12/14/2084	0.451	12/14/2084	0.398
01/18/2086	0.636	11/01/2085	0.281
12/21/2086	0.597	11/23/2086	0.329
01/14/2088	0.392	12/09/2087	0.273
11/05/2088	0.698	11/05/2088	0.351
01/07/2090	0.328	11/10/2089	0.318
12/04/2090	0.606	12/09/2090	0.955
04/28/2092	1.040	01/31/2092	0.743
03/22/2093	0.292	11/07/2092	0.233
03/01/2094	0.245	12/14/2093	0.249
02/18/2095	0.387	12/27/2094	0.316
01/14/2096	0.488	12/14/2095	0.429
01/29/2097	1.072	03/19/2097	0.536

******Point of Compliance Ranked Maxima Flow Data ******

Predevelopment		Postdevelopment	
Tr (yrs)	**Q (cfs)**	**Tr (yrs)**	**Q (cfs)**
1.00	0.025	1.00	0.194
1.01	0.085	1.01	0.199
1.02	0.096	1.02	0.208
1.02	0.166	1.02	0.217
1.03	0.218	1.03	0.221
1.04	0.226	1.04	0.222
1.04	0.232	1.04	0.227
1.05	0.244	1.05	0.227
1.06	0.245	1.06	0.229
1.06	0.245	1.06	0.230
1.07	0.277	1.07	0.231
1.08	0.278	1.08	0.231
1.09	0.290	1.09	0.233
1.09	0.292	1.09	0.237
1.10	0.296	1.10	0.238
1.11	0.296	1.11	0.238
1.12	0.296	1.12	0.239
1.12	0.305	1.12	0.240
1.13	0.309	1.13	0.240
1.14	0.313	1.14	0.241
1.15	0.319	1.15	0.242
1.16	0.321	1.16	0.244
1.17	0.321	1.17	0.245
1.18	0.322	1.18	0.245
1.18	0.322	1.18	0.246
1.19	0.325	1.19	0.249
1.20	0.328	1.20	0.249
1.21	0.329	1.21	0.249
1.22	0.329	1.22	0.250
1.23	0.341	1.23	0.251
1.24	0.344	1.24	0.252
1.25	0.345	1.25	0.252
1.26	0.363	1.26	0.252
1.27	0.369	1.27	0.254
1.28	0.380	1.28	0.258
1.29	0.380	1.29	0.258
1.30	0.387	1.30	0.259
1.31	0.388	1.31	0.261
1.32	0.388	1.32	0.261
1.33	0.392	1.33	0.262
1.35	0.402	1.35	0.262
1.36	0.417	1.36	0.263
1.37	0.424	1.37	0.264
1.38	0.427	1.38	0.265
1.39	0.430	1.39	0.267
1.40	0.437	1.40	0.269
1.42	0.445	1.42	0.269
1.43	0.446	1.43	0.270
1.44	0.451	1.44	0.271
1.46	0.456	1.46	0.273
1.47	0.463	1.47	0.273
1.48	0.480	1.48	0.273
1.50	0.484	1.50	0.273
1.51	0.488	1.51	0.275

1.53	0.491	1.53	0.275
1.54	0.497	1.54	0.275
1.56	0.505	1.56	0.275
1.57	0.507	1.57	0.276
1.59	0.508	1.59	0.278
1.60	0.513	1.60	0.278
1.62	0.517	1.62	0.279
1.64	0.522	1.64	0.280
1.65	0.522	1.65	0.281
1.67	0.525	1.67	0.282
1.69	0.525	1.69	0.282
1.71	0.526	1.71	0.283
1.73	0.535	1.73	0.283
1.75	0.538	1.75	0.284
1.77	0.544	1.77	0.285
1.79	0.552	1.79	0.286
1.81	0.553	1.81	0.286
1.83	0.559	1.83	0.286
1.85	0.562	1.85	0.287
1.87	0.564	1.87	0.287
1.89	0.578	1.89	0.289
1.92	0.578	1.92	0.289
1.94	0.583	1.94	0.289
1.96	0.584	1.96	0.290
1.99	0.590	1.99	0.294
2.01	0.590	2.01	0.295
2.04	0.597	2.04	0.298
2.07	0.602	2.07	0.302
2.09	0.604	2.09	0.302
2.12	0.606	2.12	0.311
2.15	0.606	2.15	0.312
2.18	0.607	2.18	0.316
2.21	0.609	2.21	0.316
2.24	0.616	2.24	0.317
2.27	0.618	2.27	0.318
2.31	0.622	2.31	0.318
2.34	0.627	2.34	0.323
2.38	0.636	2.38	0.328
2.41	0.642	2.41	0.329
2.45	0.645	2.45	0.337
2.49	0.646	2.49	0.340
2.53	0.651	2.53	0.344
2.57	0.652	2.57	0.351
2.61	0.652	2.61	0.353
2.65	0.654	2.65	0.356
2.70	0.669	2.70	0.372
2.75	0.682	2.75	0.379
2.80	0.684	2.80	0.382
2.85	0.688	2.85	0.384
2.90	0.697	2.90	0.389
2.95	0.698	2.95	0.396
3.01	0.703	3.01	0.398
3.07	0.718	3.07	0.402
3.13	0.723	3.13	0.411
3.19	0.728	3.19	0.412
3.26	0.752	3.26	0.427
3.32	0.757	3.32	0.429
3.40	0.767	3.40	0.430
3.47	0.772	3.47	0.431
3.55	0.776	3.55	0.443
3.63	0.778	3.63	0.454
3.72	0.790	3.72	0.475
3.80	0.791	3.80	0.497
3.90	0.813	3.90	0.503
4.00	0.852	4.00	0.536
4.10	0.860	4.10	0.546
4.21	0.875	4.21	0.559
4.32	0.878	4.32	0.572
4.45	0.933	4.45	0.590
4.58	0.938	4.58	0.612
4.71	0.962	4.71	0.620
4.86	0.972	4.86	0.623
5.01	0.988	5.01	0.625
5.17	0.997	5.17	0.636
5.35	1.016	5.35	0.663
5.54	1.025	5.54	0.667
5.74	1.030	5.74	0.686
5.95	1.039	5.95	0.715
6.19	1.040	6.19	0.738
6.44	1.071	6.44	0.743
6.71	1.072	6.71	0.755
7.01	1.075	7.01	0.763
7.33	1.083	7.33	0.878
7.69	1.097	7.69	0.893
8.08	1.139	8.08	0.904
8.52	1.169	8.52	0.910
9.00	1.172	9.00	0.923
9.55	1.175	9.55	0.955
10.16	1.207	10.16	0.965
10.86	1.215	10.86	0.978
11.66	1.280	11.66	1.016
12.59	1.321	12.59	1.057
13.68	1.340	13.68	1.080
14.97	1.427	14.97	1.131
16.54	1.488	16.54	1.181

18.47	1.489	18.47	1.194
20.92	1.579	20.92	1.196
24.10	1.593	24.10	1.196
28.44	1.660	28.44	1.289
34.68	1.813	34.68	1.319
44.42	1.948	44.42	1.388
61.77	1.984	61.77	1.417
101.36	2.149	101.36	1.420
282.36	2.444	282.36	3.551

***** Point of Compliance Flow Frequency Data *****

Recurrence Interval Computed Using Gringorten Plotting Position

Predevelopment Runoff		Postdevelopment Runoff	
Tr (Years)	Discharge (cfs)	Tr (Years)	Discharge (cfs)
2-Year	0.590	2-Year	0.294
5-Year	0.987	5-Year	0.625
10-Year	1.199	10-Year	0.963
25-Year	1.608	25-Year	1.216
50-Year	1.961	50-Year	1.399
100-Year	2.144	100-Year	1.420
200-Year	2.345	200-Year	2.834

** Record too Short to Compute Peak Discharge for These Recurrence Intervals

***** Point of Compliance Flow Duration Data *****

Predevelopment Runoff		Postdevelopment Runoff	
Discharge (cfs)	Exceedance Probability	Discharge (cfs)	Exceedance Probability
0.000E+00	1.0000E+00	0.000E+00	1.0000E+00
0.012	2.3680E-01	0.018	7.1047E-01
0.024	1.8183E-01	0.036	6.6558E-01
0.037	1.4869E-01	0.053	6.0820E-01
0.049	1.2486E-01	0.071	5.4912E-01
0.061	1.0625E-01	0.089	4.8816E-01
0.073	9.1206E-02	0.107	4.2562E-01
0.086	7.8997E-02	0.124	3.6209E-01
0.098	6.8893E-02	0.142	2.9812E-01
0.110	6.0447E-02	0.160	2.3652E-01
0.122	5.3261E-02	0.178	1.8053E-01
0.134	4.7175E-02	0.195	1.3287E-01
0.147	4.1832E-02	0.213	9.3536E-02
0.159	3.7205E-02	0.231	6.3268E-02
0.171	3.3133E-02	0.249	4.0315E-02
0.183	2.9638E-02	0.266	2.4256E-02
0.196	2.6430E-02	0.284	1.3135E-02
0.208	2.3649E-02	0.295	9.6663E-03
0.220	2.1262E-02	0.320	7.1550E-03
0.232	1.9150E-02	0.337	6.1760E-03
0.244	1.7267E-02	0.355	5.3991E-03
0.257	1.5521E-02	0.373	4.7746E-03
0.269	1.4036E-02	0.391	4.2786E-03
0.281	1.2639E-02	0.408	3.8345E-03
0.295	1.1278E-02	0.426	3.4591E-03
0.306	1.0348E-02	0.444	3.1313E-03
0.318	9.4640E-03	0.462	2.8360E-03
0.330	8.5860E-03	0.479	2.5537E-03
0.342	7.8178E-03	0.497	2.3198E-03
0.354	7.1543E-03	0.515	2.0960E-03
0.367	6.5998E-03	0.533	1.9068E-03
0.379	6.0489E-03	0.550	1.7400E-03
0.391	5.5507E-03	0.568	1.5985E-03
0.403	5.1067E-03	0.590	1.4183E-03
0.416	4.7255E-03	0.604	1.3241E-03
0.428	4.3558E-03	0.621	1.2166E-03
0.440	4.0223E-03	0.639	1.1242E-03
0.452	3.7104E-03	0.657	1.0469E-03
0.464	3.4331E-03	0.675	9.7687E-04
0.477	3.1833E-03	0.692	9.0683E-04
0.489	2.9472E-03	0.710	8.5268E-04
0.501	2.7284E-03	0.728	7.8337E-04
0.513	2.5234E-03	0.746	7.1911E-04
0.526	2.3581E-03	0.764	6.6641E-04
0.538	2.1942E-03	0.781	6.2092E-04
0.550	2.0324E-03	0.799	5.8121E-04
0.562	1.9003E-03	0.817	5.4006E-04
0.574	1.7624E-03	0.835	5.0323E-04
0.590	1.6051E-03	0.852	4.7074E-04
0.599	1.5285E-03	0.870	4.3898E-04
0.611	1.4180E-03	0.888	4.0360E-04
0.623	1.3350E-03	0.906	3.7472E-04
0.635	1.2722E-03	0.923	3.4078E-04
0.648	1.2043E-03	0.941	3.1840E-04
0.660	1.1350E-03	0.959	2.9241E-04
0.672	1.0729E-03	0.977	2.7147E-04
0.684	1.0130E-03	0.987	2.6179E-04
0.697	9.6532E-04	1.012	2.3826E-04
0.709	9.1478E-04	1.030	2.1371E-04
0.721	8.6712E-04	1.048	1.8989E-04
0.733	8.1225E-04	1.065	1.7184E-04
0.745	7.6388E-04	1.083	1.5812E-04

0.758	7.2489E-04	1.101	1.4368E-04
0.770	6.8807E-04	1.119	1.2924E-04
0.782	6.5124E-04	1.136	1.1191E-04
0.794	6.2092E-04	1.154	9.9636E-05
0.807	5.8915E-04	1.172	8.5918E-05
0.819	5.6749E-04	1.190	7.2200E-05
0.831	5.4511E-04	1.207	6.1370E-05
0.843	5.2562E-04	1.225	5.4150E-05
0.855	5.0251E-04	1.243	5.1262E-05
0.868	4.7796E-04	1.261	4.6930E-05
0.880	4.5197E-04	1.278	4.3320E-05
0.892	4.3609E-04	1.296	3.7544E-05
0.904	4.1154E-04	1.314	3.3934E-05
0.917	3.9349E-04	1.332	2.9602E-05
0.929	3.6894E-04	1.349	2.5270E-05
0.941	3.5450E-04	1.367	2.0938E-05
0.953	3.3573E-04	1.385	1.6606E-05
0.965	3.1985E-04	1.403	1.1552E-05
0.978	3.0252E-04	1.420	8.6640E-06
0.987	2.9160E-04	1.438	7.9420E-06
1.002	2.7653E-04	1.456	7.9420E-06
1.014	2.6281E-04	1.474	7.2200E-06
1.027	2.5198E-04	1.492	7.2200E-06
1.039	2.3609E-04	1.509	6.4980E-06
1.051	2.2599E-04	1.527	6.4980E-06
1.063	2.1371E-04	1.545	5.0540E-06
1.075	2.0360E-04	1.563	5.0540E-06
1.088	1.9638E-04	1.580	5.0540E-06
1.100	1.8339E-04	1.598	4.3320E-06
1.112	1.7689E-04	1.616	4.3320E-06
1.124	1.6245E-04	1.634	3.6100E-06
1.137	1.5306E-04	1.651	3.6100E-06
1.149	1.4440E-04	1.669	3.6100E-06
1.161	1.3140E-04	1.687	3.6100E-06
1.173	1.2563E-04	1.705	3.6100E-06
1.185	1.1552E-04	1.722	3.6100E-06
1.198	1.0830E-04	1.740	3.6100E-06
1.210	1.0108E-04	1.758	3.6100E-06
1.222	9.3860E-05	1.776	3.6100E-06
1.234	8.9528E-05	1.793	3.6100E-06
1.247	8.1586E-05	1.811	3.6100E-06
1.259	7.4366E-05	1.829	3.6100E-06
1.271	7.1478E-05	1.847	3.6100E-06
1.283	6.5702E-05	1.864	3.6100E-06
1.295	6.2814E-05	1.882	2.8880E-06
1.308	5.9926E-05	1.900	2.8880E-06
1.320	5.7760E-05	1.918	2.8880E-06
1.332	5.0540E-05	1.935	2.8880E-06
1.344	4.7652E-05	1.961	2.8930E-06
1.357	4.2598E-05	1.971	2.8880E-06
1.369	3.8266E-05	1.989	2.8880E-06
1.381	3.4656E-05	2.006	2.8880E-06
1.393	3.2490E-05	2.024	2.1660E-06
1.405	3.0324E-05	2.042	2.1660E-06
1.418	2.8158E-05	2.060	2.1660E-06
1.430	2.4548E-05	2.077	2.1660E-06
1.442	2.3826E-05	2.095	2.1660E-06
1.454	2.1660E-05	2.113	2.1660E-06
1.467	1.9494E-05	2.131	2.1660E-06
1.479	1.8772E-05	2.148	2.1660E-06
1.491	1.5162E-05	2.166	2.1660E-06
1.503	1.4440E-05	2.184	2.1660E-06
1.515	1.3718E-05	2.202	2.1660E-06
1.528	1.2274E-05	2.220	2.1660E-06
1.540	1.1552E-05	2.237	2.1660E-06
1.552	1.0830E-05	2.255	2.1660E-06
1.564	1.0830E-05	2.273	2.1660E-06
1.577	1.0108E-05	2.291	2.1660E-06
1.589	8.6640E-06	2.308	2.1660E-06
1.601	7.9420E-06	2.326	2.1660E-06
1.613	7.9420E-06	2.344	2.1660E-06
1.625	7.9420E-06	2.362	2.1660E-06
1.638	7.9420E-06	2.379	2.1660E-06
1.650	7.9420E-06	2.397	2.1660E-06
1.662	7.2200E-06	2.415	2.1660E-06
1.674	7.2200E-06	2.433	2.1660E-06
1.687	7.2200E-06	2.450	2.1660E-06
1.699	7.2200E-06	2.468	2.1660E-06
1.711	7.2200E-06	2.486	2.1660E-06
1.723	7.2200E-06	2.504	2.1660E-06
1.735	7.2200E-06	2.521	2.1660E-06
1.748	7.2200E-06	2.539	2.1660E-06
1.760	7.2200E-06	2.557	2.1660E-06
1.772	7.2200E-06	2.575	2.1660E-06
1.784	6.4980E-06	2.592	2.1660E-06
1.797	6.4980E-06	2.610	2.1660E-06
1.809	6.4980E-06	2.628	2.1660E-06
1.821	5.7760E-06	2.646	2.1660E-06
1.833	5.0540E-06	2.663	2.1660E-06
1.845	5.0540E-06	2.681	2.1660E-06
1.858	5.0540E-06	2.699	2.1660E-06
1.870	5.0540E-06	2.717	2.1660E-06
1.882	4.3320E-06	2.734	2.1660E-06
1.894	4.3320E-06	2.752	2.1660E-06
1.906	4.3320E-06	2.770	2.1660E-06

1.919	3.6100E-06	2.788	2.1660E-06
1.931	3.6100E-06	2.805	2.1660E-06
1.943	3.6100E-06	2.823	1.4440E-06
1.961	2.8016E-06	2.841	1.4440E-06
1.968	2.8880E-06	2.859	1.4440E-06
1.980	2.8880E-06	2.876	1.4440E-06
1.992	2.1660E-06	2.894	1.4440E-06
2.004	2.1660E-06	2.912	1.4440E-06
2.016	2.1660E-06	2.930	1.4440E-06
2.029	2.1660E-06	2.948	1.4440E-06
2.041	2.1660E-06	2.965	1.4440E-06
2.053	2.1660E-06	2.983	1.4440E-06
2.065	2.1660E-06	3.001	1.4440E-06
2.078	2.1660E-06	3.019	1.4440E-06
2.090	2.1660E-06	3.036	1.4440E-06
2.102	2.1660E-06	3.054	1.4440E-06
2.114	2.1660E-06	3.072	1.4440E-06
2.126	2.1660E-06	3.090	1.4440E-06
2.139	2.1660E-06	3.107	1.4440E-06
2.151	7.2200E-07	3.125	1.4440E-06
2.163	7.2200E-07	3.143	1.4440E-06
2.175	7.2200E-07	3.161	1.4440E-06
2.188	7.2200E-07	3.178	1.4440E-06
2.200	7.2200E-07	3.196	1.4440E-06
2.212	7.2200E-07	3.214	1.4440E-06
2.224	7.2200E-07	3.232	1.4440E-06
2.236	7.2200E-07	3.249	1.4440E-06
2.249	7.2200E-07	3.267	1.4440E-06
2.261	7.2200E-07	3.285	1.4440E-06
2.273	7.2200E-07	3.303	1.4440E-06
2.285	7.2200E-07	3.320	1.4440E-06
2.298	7.2200E-07	3.338	1.4440E-06
2.310	7.2200E-07	3.356	1.4440E-06
2.322	7.2200E-07	3.374	1.4440E-06
2.334	7.2200E-07	3.391	1.4440E-06
2.346	7.2200E-07	3.409	1.4440E-06
2.359	7.2200E-07	3.427	1.4440E-06
2.371	7.2200E-07	3.445	1.4440E-06
2.383	7.2200E-07	3.462	1.4440E-06
2.395	7.2200E-07	3.480	7.2200E-07
2.408	7.2200E-07	3.498	7.2200E-07
2.420	7.2200E-07	3.516	7.2200E-07
2.432	7.2200E-07	3.533	7.2200E-07
2.444	7.2200E-07	3.551	7.2200E-07

****** Flow Duration Performance According to Dept. of Ecology Criteria ******

Excursion at Predeveloped ½Q2 (Must be Less Than 0%):		-19.2%	PASS
Maximum Excursion from ½Q2 to Q2 (Must be Less Than 0%):	-11.8%	PASS	
Maximum Excursion from Q2 to Q50 (Must be less than 10%):	3.1%	PASS	
Percent Excursion from Q2 to Q50 (Must be less than 50%):	0.9%	PASS	

*** POND MEETS ALL DURATION DESIGN CRITERIA: PASS**

Miller Creek Greenway Concept Report

APPENDIX

B

Photo ID: 006
Location: S 138th St and 9th PL
Description: Roadside ditch and culverts. Piped drainage to vegetated ditches on 10th Ave. Between 137th and 138th Street, driveway culverts with ditches. Piped conveyance on East side of street.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 011
Location: S 138th St and 10th Ave
Description: Ditched conveyance at 10th Ave.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 015
Location: S 138th St and 10th Ave
Description: Ditch conveyance with driveway culverts on both sides of 10th Ave. Piped storm on west side of street.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 022
Location: S 138th St and 11th PL (Facing North)
Description: City of Burien Stormwater facility to reduce downstream flooding and improve water quality. Control structure located at SE corner.
Observations: Drains cul-de-sac development.

Photo ID: 024
Location: S 138th St and 11th PL (Facing South)

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Description: City of Burien Stormwater flow control structure with riser. This facility discharges on to the NERA project limits.

Photo ID: 030
Location: Airport parking lot called Ajax Parking (Facing West)
Description: New arch culvert under a bridge for the new parking lot. The parking lot also has 2 Contech Stormwater treatment vaults.

Photo ID: 031
Location: Miller Creek Wetland adjacent to Airport parking lot (Facing NW)
Description: Miller Creek U/S wetland
Observations: U/S wetland is served by the arched culvert (030) above and is of described adequate capacity (as per Bob Pegnam).

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 037
Location: Miller Creek Wetland adjacent to Airport parking lot (Facing Northwest)
Description: Miller Creek D/S wetland culvert
Observations: Reportedly undersized[1] culvert w/riprap. Approximately 2' diameter.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 038
Location: Miller Creek Wetland adjacent to Airport parking lot (Facing East)
Description: Miller Creek across Parking access road, U/S
Observations: Reportedly undersized[1] culvert with new bank stabilization implemented in the area. New plantings, woody debris present.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 039
Location: Miller Creek Wetland adjacent to Airport parking lot (Facing East)
Description: Miller Creek across Parking access road, looking D/S
Observations: Reportedly undersized[1] culvert with new bank stabilization implemented in the area. New plantings, woody debris present.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 040 and 041
Location: Miller Creek Wetland adjacent to Airport parking lot flow control structure (Facing East)
Description: Wetland portion west of Des Moines Drive.
Observations: Reportedly undersized[1] pipe coming into the structure, but the outlet culvert is not undersized, for most rain storms.

Photo ID: 050
Location: West of Des Moines Road, South of Miller Creek
Description: City of Burien Stormwater facility
Observations: Reportedly undersized[1] pipe into the birdcage structure for most rain storms. Overflow volumes are dealt with by a large vegetated detention area located south of the wetland and west of Des Moines Drive.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 059
Location: East of SR-509, South of 136th Street
Description: WSDOT right of way at SR 509
Observations: Two 4-ft diameter, reportedly undersized[1] culverts. During rain events flood the 30-ft D/S easement and onto the property. Have been evaluated to initiate the flooding of the Miller Creek region, causing most severe of damage D/S. Water quality also an issue. Remnants from last oil spill present, and are a constant issue as to the environmental integrity of the wetland.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 062
Location: S 140th St and 8th Ave
Description: Looking North at 8th Ave
Observations: Catchbasin at 8th Ave. takes runoff from road North. No offsite drainage west of 8th Ave.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 064
Location: S 140th St and 8th Ave
Description: Lookin East on 140th St
Observations: Curb and sidewalk on North side of 140th for half of the street length. South side has ditches with storm pipe (8").

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Photo ID: 068
Location: S 146th St and 8th Ave (Lookin East on 146th St)
Description: Looking East on 146th St
Observations: No curb or gutter, ditch by 8th Ave.

Location: Des Moines Drive
Description: Stretch of Des Moines length of project area
Observations: Before SR-518, Des Moines West side has curb, gutter. East sidewalk has a sidewalk at some portions. Newly paved road, catch basin storm data is not up to date with the improvements.

[1] As per conversation with Robert Pegnam, a property owner in Burien and resident of Bellevue.

Miller Creek Greenway Concept Report

APPENDIX C

Stormwater Wetland Volume Calculator

Updated: 11/24/09 JSA
Checker: SJS

Directions: Use for sizing/designing stormwater wetlands by either the KCSWDM or the DOE Manual.
Fill in the numbers in the shaded cells. The remaining cells calculate automatically.

Requirements:

Basic Wetpond Volume =	117,409	cu ft	(2009 KCSWDM Equ. 6-13, 6-14)
Total Surface Area =	39,136	sq ft	(volume/3-ftaverage depth)
First Cell Volume =	39,136	cu ft	(1/3 of Volume)
First Cell Top Area =	9,784	sq ft	(volume/4-ft depth in first cell)
Wetland Cell Surface Area =	29,352	sq ft	(total surface area - first cell surface area)

Proposed Facility Design

First Cell - Wetpond

	Elevation	Area (sf)	Partial Volume (cf)	Total Volume (cf)
	78	4,500		
top of sed:	79	5,341	-	-
	80	6,254	5,797	5,797
	81	7,239	6,746	12,544
	82	8,296	7,767	20,311
	83	9,425	8,860	29,172
	84	10,626	10,025	39,197
		Area Okay		**Volume Okay**

Total Surface Area (sq ft) = 40,126
SA Okay

Second and Third Cell - Wetland

Elevation	Contour Area (sf)	Partial Volume (cf)	Total Volume (cf)	Partial Area (sf)	Average Depth (ft)	Area by Depth	Percent of Depth
80	-	-	-	-		-	0.0%
81	5,000	2,500	2,500	5,000	3.5	17,500	50.0%
82	10,000	7,500	10,000	5,000	2.5	12,500	33.3%
83	15,000	12,500	22,500	5,000	1.5	7,500	25.0%
83.5	20,000	8,750	31,250	5,000	0.75	3,750	16.9%
84	29,500	12,375	43,625	9,500	0.25	2,375	32.2%
	Area Okay						

Total Area by Depth 43625
Average Depth (ft) 1.48 ← Average must be btw 1.25 and 1.75 feet
Depth Okay

Detention Design

Depth	Elevation	Area (sf)	Area (AC)	Partial Volume (cf)	Total Volume (cf)	Total Volume (AC-FT)			
0.0	84.0	40,126	0.92	-		-			
0.5	84.5	53,000	1.22	23,281	23,281	0.53			
1.0	85.0	54,390	1.25	26,848	50,129	1.15			
2.0	86.0	57,225	1.31	55,808	105,937	2.43		13.22	Max detention Volume from MGSFlood
3.0	87.0	60,132	1.38	58,678	164,615	3.78			
4.0	88.0	63,110	1.45	61,621	226,236	5.19			
5.0	89.0	66,161	1.52	64,635	290,871	6.68			
6.0	90.0	69,283	1.59	67,722	358,593	8.23			
7.0	91.0	72,478	1.66	70,881	429,474	9.86			
8.0	92.0	75,745	1.74	74,111	503,585	11.56	84226.07	2.01	<- total acres inculciding 15' Buffer
9.0	93.0	79,083	1.82	77,414	580,999	13.34	**Total Volume Okay**		

Stormwater Wetland Volume Calculator

Updated: 11/24/09 JSA
Checker: SJS

Directions: Use for sizing/designing stormwater wetlands by either the KCSWDM or the DOE Manual.
Fill in the numbers in the shaded cells. The remaining cells calculate automatically.

Requirements:

Basic Wetpond Volume =	186,202	cu ft	(2009 KCSWDM Equ. 6-13, 6-14)
Total Surface Area =	62,067	sq ft	(volume/3-ftaverage depth)
First Cell Volume =	62,067	cu ft	(1/3 of Volume)
First Cell Top Area =	15,517	sq ft	(volume/4-ft depth in first cell)
Wetland Cell Surface Area =	46,551	sq ft	(total surface area - first cell surface area)

Proposed Facility Design

First Cell - Wetpond

	Elevation	Area (sf)	Partial Volume (cf)	Total Volume (cf)
	78	8,200		
top of sed:	79	9,323	-	-
	80	10,517	9,920	9,920
	81	11,784	11,151	21,071
	82	13,123	12,453	33,524
	83	14,533	13,828	47,352
	84	16,016	15,275	62,626
		Area Okay		**Volume Okay**

Second and Third Cell - Wetland

Elevation	Contour Area (sf)	Partial Volume (cf)	Total Volume (cf)	Partial Area (sf)	Average Depth (ft)	Area by Depth	Percent of Depth
80	-	-	-	-		-	0.0%
81	3,000	1,500	1,500	3,000	3.5	10,500	30.0%
82	10,000	6,500	8,000	7,000	2.5	17,500	28.0%
83	25,000	17,500	25,500	15,000	1.5	22,500	42.9%
83.5	35,000	15,000	40,500	10,000	0.75	7,500	21.3%
84	47,000	20,500	61,000	12,000	0.25	3,000	25.5%
	Area Okay						

Total Surface Area (sq ft) = 63,016
SA Okay

Total Area by Depth 61000
Average Depth (ft) 1.30 ← Average must be btw 1.25 and 1.75 feet
Depth Okay

Detention Design

Depth	Elevation	Area (sf)	Area (AC)	Partial Volume (cf)	Total Volume (cf)	Total Volume (AC-FT)	
0.0	84.0	63,016	1.45	-		-	
0.5	84.5	82,500	1.89	36,379	36,379	0.84	
1.0	85.0	84,232	1.93	41,683	78,062	1.79	
2.0	86.0	87,751	2.01	85,992	164,054	3.77	19.89 Total detention Volume from MGSFlood
3.0	87.0	91,342	2.10	89,546	253,600	5.82	
4.0	88.0	95,005	2.18	93,173	346,773	7.96	
5.0	89.0	98,739	2.27	96,872	443,645	10.18	
6.0	90.0	102,546	2.35	100,643	544,288	12.50	
7.0	91.0	106,425	2.44	104,485	648,774	14.89	
8.0	92.0	110,376	2.53	108,400	757,174	17.38	2.86 <- total acres inculciding 15' Buffer
9.0	93.0	114,398	2.63	112,387	869,561	19.96	**Total Volume Okay**

Stormwater Wetland Volume Calculator

Updated: 11/24/09 JSA
Checker: SJS

Directions: Use for sizing/designing stormwater wetlands by either the KCSWDM or the DOE Manual.
Fill in the numbers in the shaded cells. The remaining cells calculate automatically.

Requirements:

Basic Wetpond Volume =	68,280	cu ft	(2009 KCSWDM Equ. 6-13, 6-14)
Total Surface Area =	22,760	sq ft	(volume/3-ftaverage depth)
First Cell Volume =	22,760	cu ft	(1/3 of Volume)
First Cell Top Area =	5,690	sq ft	(volume/4-ft depth in first cell)
Wetland Cell Surface Area =	17,070	sq ft	(total surface area - first cell surface area)

Proposed Facility Design

First Cell - Wetpond

	Elevation	Area (sf)	Partial Volume (cf)	Total Volume (cf)
	78	1,900		
top of sed:	79	2,459	2,180	2,180
	80	3,090	2,775	4,954
	81	3,793	3,442	8,396
	82	4,568	4,181	12,577
	83	5,415	4,992	17,568
	84	6,334	5,875	23,443
		Area Okay		Volume Okay

Second and Third Cell - Wetland

Elevation	Contour Area (sf)	Partial Volume (cf)	Total Volume (cf)	Partial Area (sf)	Average Depth (ft)	Area by Depth	Percent of Depth
80	-	-	-	-		-	0.0%
81	2,000	1,000	1,000	2,000	3.5	7,000	33.3%
82	6,000	4,000	5,000	4,000	2.5	10,000	38.1%
83	10,500	8,250	13,250	4,500	1.5	6,750	32.1%
83.5	14,000	6,125	19,375	3,500	0.75	2,625	20.5%
84	17,100	7,775	27,150	3,100	0.25	775	18.1%
	Area Okay						

Total Surface Area (sq ft) = 23,434
SA Okay

Total Area by Depth 27150
Average Depth (ft) 1.59 ← Average must be btw 1.25 and 1.75 feet
Depth Okay

Detention Design

Depth	Elevation	Area (sf)	Area (AC)	Partial Volume (cf)	Total Volume (cf)	Total Volume (AC-FT)	
0.0	84.0	23,434	0.54	-		-	
0.5	84.5	57,000	1.31	20,109	20,109	0.46	
1.0	85.0	58,441	1.34	28,860	48,969	1.12	
2.0	86.0	61,378	1.41	59,910	108,879	2.50	
3.0	87.0	64,387	1.48	62,883	171,762	3.94	
4.0	88.0	67,468	1.55	65,928	237,690	5.46	
5.0	89.0	70,621	1.62	69,045	306,735	7.04	Total Volume Okay

7.03 Total detention Volume from MGSFlood

1.81 <- total acres inculciding 15' Buffer

Stormwater Wetland Volume Calculator

Updated: 11/24/09 JSA
Checker: SJS

Directions: Use for sizing/designing stormwater wetlands by either the KCSWDM or the DOE Manual.
Fill in the numbers in the shaded cells. The remaining cells calculate automatically.

Requirements:

Basic Wetpond Volume =	245,489	cu ft	(2009 KCSWDM Equ. 6-13, 6-14)
Total Surface Area =	81,830	sq ft	(volume/3-ftaverage depth)
First Cell Volume =	81,830	cu ft	(1/3 of Volume)
First Cell Top Area =	20,457	sq ft	(volume/4-ft depth in first cell)
Wetland Cell Surface Area =	61,372	sq ft	(total surface area - first cell surface area)

Proposed Facility Design

First Cell - Wetpond

	Elevation	Area (sf)	Partial Volume (cf)	Total Volume (cf)
	78	11,500		
top of sed:	79	12,823	12,161	12,161
	80	14,218	13,520	25,682
	81	15,685	14,951	40,633
	82	17,223	16,454	57,087
	83	18,834	18,029	75,116
	84	20,517	19,676	94,791
		Area Okay		**Volume Okay**

Second and Third Cell - Wetland

Elevation	Contour Area (sf)	Partial Volume (cf)	Total Volume (cf)	Partial Area (sf)	Average Depth (ft)	Area by Depth	Percent of Depth
80	-	-	-	-		-	0.0%
81	10,000	5,000	5,000	10,000	3.5	35,000	40.0%
82	25,000	17,500	22,500	15,000	2.5	37,500	50.0%
83	30,000	27,500	50,000	5,000	1.5	7,500	11.1%
83.5	45,000	18,750	68,750	15,000	0.75	11,250	24.2%
84	62,000	26,750	95,500	17,000	0.25	4,250	27.4%
	Area Okay						

Total Surface Area (sq ft) = 82,517
SA Okay

Total Area by Depth 95500
Average Depth (ft) 1.54 ← Average must be btw 1.25 and 1.75 feet
Depth Okay

Detention Design

Depth	Elevation	Area (sf)	Area (AC)	Partial Volume (cf)	Total Volume (cf)	Total Volume (AC-FT)
0.0	84.0	82,517	1.89	-		-
0.5	84.5	130,000	2.98	53,129	53,129	1.22
1.0	85.0	132,172	3.03	65,543	118,672	2.72
2.0	86.0	136,571	3.14	134,372	253,044	5.81
3.0	87.0	141,042	3.24	138,806	391,850	9.00
4.0	88.0	145,584	3.34	143,313	535,163	12.29
5.0	89.0	150,199	3.45	147,892	683,055	15.68
6.0	90.0	154,886	3.56	152,542	835,597	19.18
7.0	91.0	159,644	3.66	157,265	992,862	22.79
8.0	92.0	164,475	3.78	162,060	1,154,922	26.51
9.0	93.0	169,378	3.89	166,926	1,321,848	30.35

Total Volume Okay

30.3 Total detention Volume from MGSFlood

4.18 <- total acres including 15' Buffer

181949.277

Stormwater Wetland Volume Calculator

Updated: 11/24/09 JSA
Checker: SJS

Directions: Use for sizing/designing stormwater wetlands by either the KCSWDM or the DOE Manual.
Fill in the numbers in the shaded cells. The remaining cells calculate automatically.

Requirements:

Basic Wetpond Volume =	65,666	cu ft	(2009 KCSWDM Equ. 6-13, 6-14)
Total Surface Area =	21,889	sq ft	(volume/3-ftaverage depth)
First Cell Volume =	21,889	cu ft	(1/3 of Volume)
First Cell Top Area =	5,472	sq ft	(volume/4-ft depth in first cell)
Wetland Cell Surface Area =	16,416	sq ft	(total surface area - first cell surface area)

Proposed Facility Design

First Cell - Wetpond

	Elevation	Area (sf)	Partial Volume (cf)	Total Volume (cf)
	78	2,000		
top of sed:	79	2,573	-	-
	80	3,217	2,895	2,895
	81	3,934	3,576	6,471
	82	4,723	4,328	10,799
	83	5,583	5,153	15,952
	84	6,516	6,050	22,001
		Area Okay		**Volume Okay**

Second and Third Cell - Wetland

Elevation	Contour Area (sf)	Partial Volume (cf)	Total Volume (cf)	Partial Area (sf)	Average Depth (ft)	Area by Depth	Percent of Depth
80	-	-	-	-		-	0.0%
81	1,000	500	500	1,000	3.5	3,500	20.0%
82	5,000	3,000	3,500	4,000	2.5	10,000	40.0%
83	10,000	7,500	11,000	5,000	1.5	7,500	33.3%
83.5	15,000	6,250	17,250	5,000	0.75	3,750	30.3%
84	16,500	7,875	25,125	1,500	0.25	375	9.1%
	Area Okay						

Total Surface Area (sq ft) = 23,016
SA Okay

Total Area by Depth 25125
Average Depth (ft) 1.52 ← Average must be btw 1.25 and 1.75 feet
Depth Okay

Detention Design

Depth	Elevation	Area (sf)	Area (AC)	Partial Volume (cf)	Total Volume (cf)	Total Volume (AC-FT)	
0.0	84.0	23,016	0.53	-		-	
0.5	84.5	27,000	0.62	12,504	12,504	0.29	
1.0	85.0	27,995	0.64	13,749	26,253	0.60	
2.0	86.0	30,039	0.69	29,017	55,270	1.27	
3.0	87.0	32,155	0.74	31,097	86,366	1.98	
4.0	88.0	34,342	0.79	33,248	119,615	2.75	
5.0	89.0	36,602	0.84	35,472	155,087	3.56	
6.0	90.0	38,934	0.89	37,768	192,855	4.43	
7.0	91.0	41,338	0.95	40,136	232,991	5.35	
8.0	92.0	43,814	1.01	42,576	275,566	6.33	
9.0	93.0	46,361	1.06	45,087	320,654	7.36	**Total Volume Okay**

7.34 Total detention Volume from MGSFlood

1.22 <- total acres inculciding 15 Buffer

PROJECT:	**31235**
DATE:	**11/24/2009**

Volume Factor, f: 3
Rainfall, R: 0.49 in
0.04 ft

Vr=(0.9Ai +0.25Atg+0.1Atf + 0.01Ao)* R (2009 KCSWDM Equ. 6-13)
Wetpool Volume = f * Vr (2009 KCSWDM Equ. 6-14)

	Ai	**Atg**	**Atf**	**Ao**	**Vr**	**Wetpool Volume**	
Basin	*0.9*	*0.25*	*0.1*	*0.01*	Ac-ft	Ac-ft	cf
PR	23.519	2.697	0	1.275	0.90	2.6953	117,409
1	38.449	0.019	0	5.015	1.42	4.2746	186,202
2	14.1	0	0	1.948	0.52	1.5675	68,280
3	50.738	0	0	3.022	1.88	5.6356	245,489
4	13.577	0	0	0.353	0.50	1.5075	65,666

	PR	***1***	***2***	***3***	***4***
Till Grass	2.697	0.019	0.000	0.000	0.000
Outwash Grass	1.275	5.015	1.948	3.022	0.353
Wetland	1.050	2.108	1.086	1.049	0.345
Impervious	23.519	38.449	14.100	50.738	13.577
Total Sum	28.541	45.592	17.134	54.809	14.274
Total Area	28.541	45.592	17.134	54.809	14.274
% check	100.000%	100.000%	100.000%	100.000%	100.000%

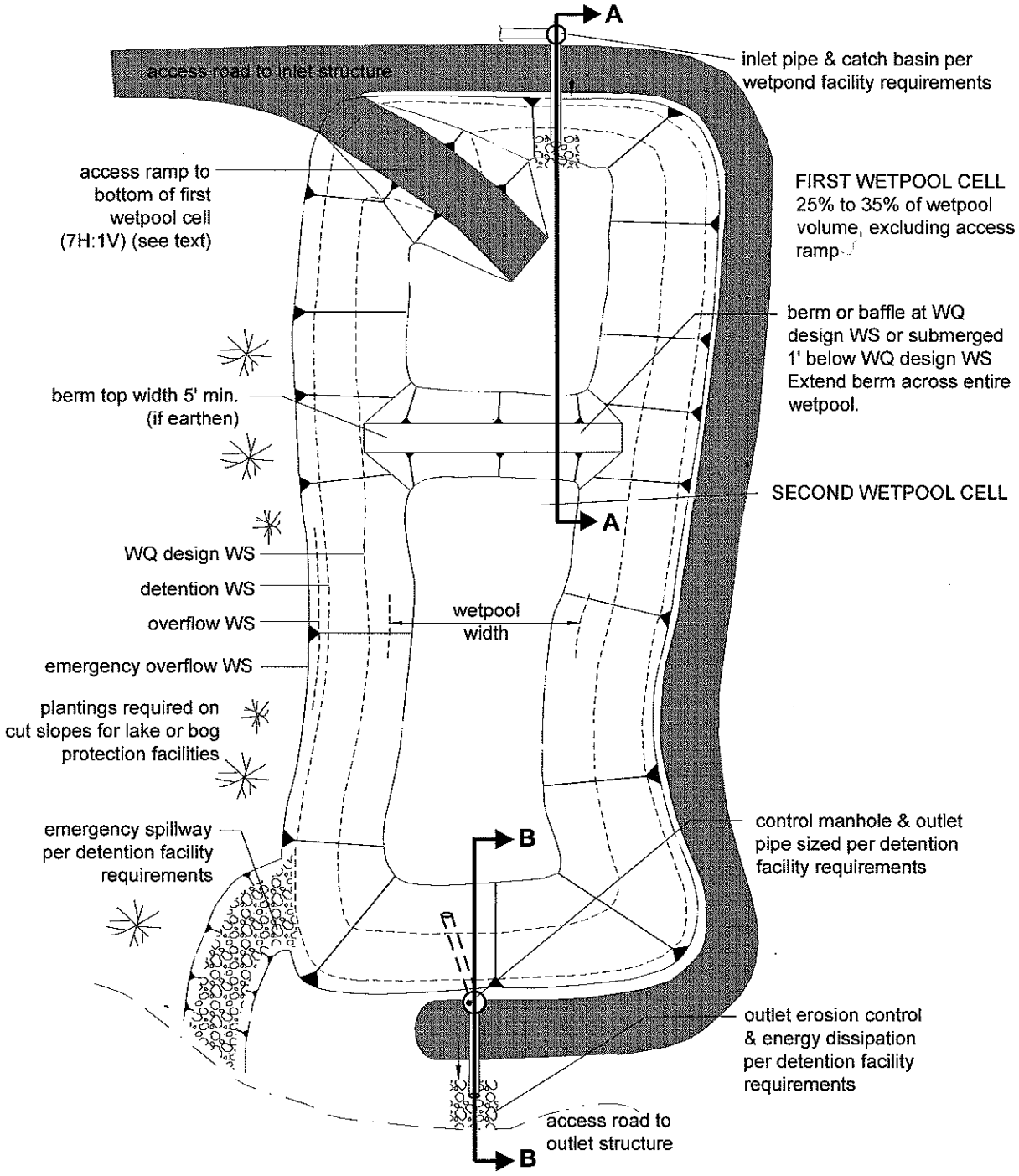
Miller Creek Greenway Concept Report

APPENDIX

D

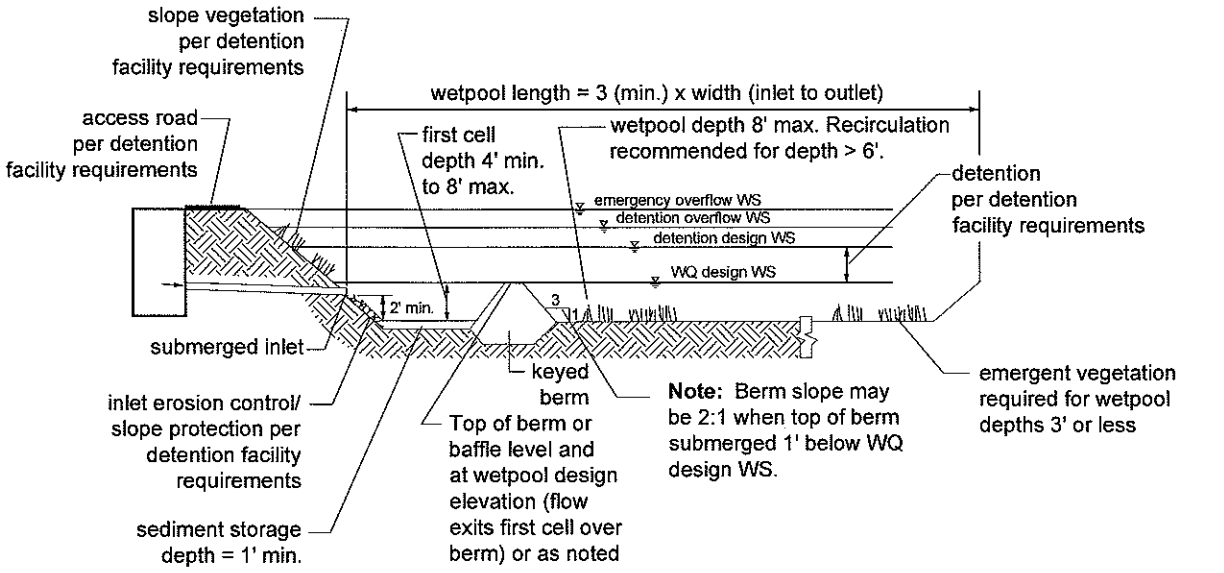
otak

FIGURE 6.4.4.A COMBINED DETENTION AND WETPOND

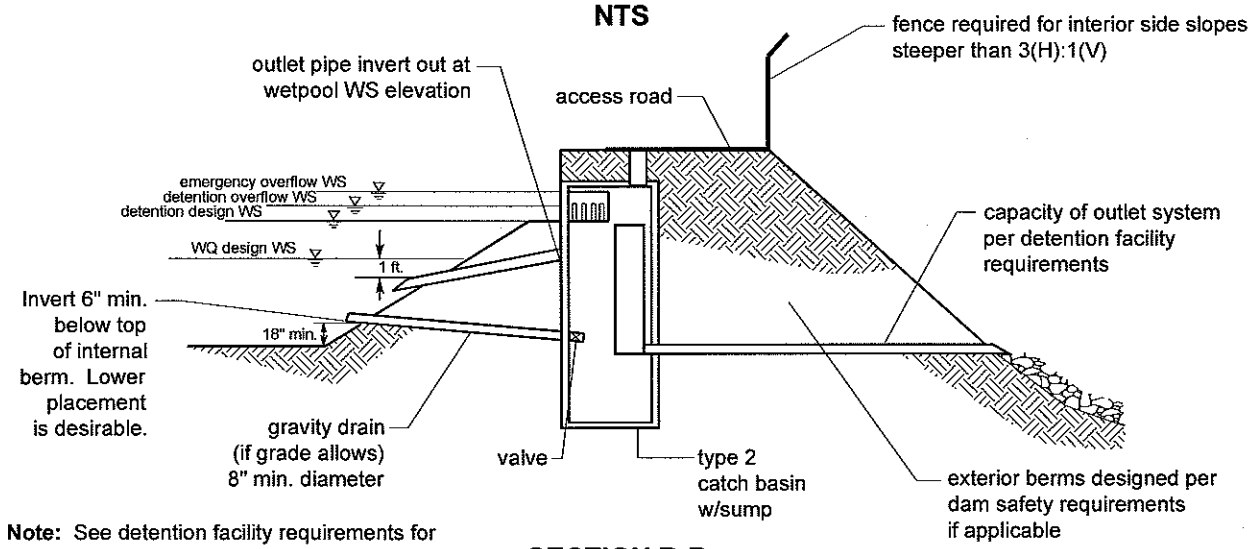


PLAN VIEW
NTS

FIGURE 6.4.4.A COMBINED DETENTION AND WETPOND (*CONTINUED*)



SECTION A-A
NTS



Note: See detention facility requirements for location, interior & exterior sideslopes, and setback requirements.

SECTION B-B
NTS

TABLE 6.1.2.A
PAIRED FACILITIES FOR ENHANCED BASIC TREATMENT TRAIN, OPTION 3

First Basic WQ Facility:	Second WQ Facility:
Biofiltration swale (Sections 6.3.1, 6.3.2, and 6.3.3)	Basic sand filter or sand filter vault (Section 6.5.2 or 6.5.3) or StormFilter with CSF (Section 6.5.5)
Filter strip (Sections 6.3.4 and 6.3.5)	Linear sand filter (Section 6.5.4) with no presettling cell needed
Linear sand filter (Section 6.5.4)	Filter strip (Sections 6.3.4 and 6.3.5)
Basic wetpond (Section 6.4.1)	Basic sand filter or sand filter vault (Section 6.5.2 or 6.5.3) or StormFilter with CSF (Section 6.5.5)
Wetvault (Section 6.4.2)	Basic sand filter or sand filter vault (Section 6.5.2 or 6.5.3) or StormFilter with CSF (Section 6.5.5)
Basic combined detention and wetpool facility (Section 6.4.4)	Basic sand filter or sand filter vault (Section 6.5.2 or 6.5.3) or StormFilter with CSF (Section 6.5.5)
Basic sand filter or sand filter vault (Sections 6.5.2 or 6.5.3). *A presettling cell is required if the sand filter is not preceded by a detention facility.*	StormFilter with CSF (Section 6.5.5)
StormFilter with ZPG (Section 6.5.5)	Basic sand filter or sand filter vault (Section 6.5.2 or 6.5.3) or StormFilter with CSF (Section 6.5.5)

Miller Creek Greenway Concept Report

APPENDIX

E

PLANNING LEVEL PROJECT COST

Facility		Total Cost
STORMWATER POND PR	$	2,440,000
STORMWATER POND #1	$	1,870,000
STORMWATER POND #2	$	1,090,000
STORMWATER POND #3	$	2,760,000
STORMWATER POND #4	$	730,000
STORMWATER VAULT PR	$	4,280,000
STORMWATER VAULT #1	$	7,330,000
STORMWATER VAULT #2	$	2,470,000
STORMWATER VAULT #3	$	9,200,000
STORMWATER VAULT #4	$	2,150,000

PLANNING LEVEL PROJECT COST

PROJECT: STORMWATER POND PR **CHECK BY:**
PROJECT ID: 31235
BY: JSA **DATE:** 11/24/2009

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	2.5	AC	$ 9,000	$ 23,000
2	POND EXCAVATION AND GRADING INCL. HAUL	53,000	CY	$ 10	$ 530,000
3	INLET AND OUTLET CONTROLS	1	LS	$ 100,000	$ 100,000
3	RETAINING WALL	11,000	SF	$ 30	$ 330,000
4	MISC POND ITEMS	1	LS	$ 6,000	$ 6,000
5	HMA, CL 1/2-IN PG	50	TON	$ 250	$ 13,000
6	ASPHALT TREATED BASE	90	TON	$ 250	$ 23,000
7	CRUSHED SURFACING BASE COURSE	60	TON	$ 45	$ 3,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	500	LF	$ 80	$ 40,000
9	MANHOLE 48 IN. DIAM.	5	EA	$ 2,500	$ 13,000
10	SHORING OR EXTRA EXCAVATION CLASS B	3000	LF	$ 1	$ 2,000
11	STRUCTURE EXCAVATION CLASS B INCL HAUL	540	CY	$ 10	$ 6,000
12	GRAVEL BORROW INCL. HAUL	100	CY	$ 15	$ 2,000
13	SAWCUTTING	1000	LF	$ 4	$ 4,000
14	DEWATERING	1	LS	$ 150,000	$ 150,000
				Subtotal Construction Elements	**$ 1,245,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 24,900
16	TRAFFIC CONTROL		2%	(see note 4)	$ 24,900
18	MOBILIZATION		5%		$ 62,300
17	CONTINGENCY		30%		$ 373,500
				Subtotal Ancillary Elements	**$ 485,600**
				Subtotal Conveyance Construction Elements	**$ 1,731,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 170,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 260,000
21	CONSTRUCTION MANAGEMENT		10%		$ 180,000
22	PERMITTING		5%		$ 90,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 700,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 2,431,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 2,440,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER POND #1** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	3.6	AC	$ 9,000	$ 33,000
2	POND EXCAVATION AND GRADING	33,000	CY	$ 10	$ 330,000
3	INLET AND OUTLET CONTROLS	1	LS	$ 100,000	$ 100,000
4	MISC POND ITEMS	1	LS	$ 6,000	$ 6,000
5	HMA, CL 1/2-IN PG	130	TON	$ 250	$ 33,000
6	ASPHALT TREATED BASE	250	TON	$ 250	$ 63,000
7	CRUSHED SURFACING BASE COURSE	170	TON	$ 45	$ 8,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	1500	LF	$ 80	$ 120,000
9	MANHOLE 48 IN. DIAM.	10	EA	$ 2,500	$ 25,000
10	SHORING OR EXTRA EXCAVATION CLASS B	8000	LF	$ 1	$ 4,000
11	STRUCTURE EXCAVATION CLASS B INCL HAUL	1600	CY	$ 10	$ 16,000
12	GRAVEL BORROW INCL. HAUL	280	CY	$ 15	$ 5,000
13	SAWCUTTING	3000	LF	$ 4	$ 12,000
14	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 955,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 19,100
16	TRAFFIC CONTROL		2%	(see note 4)	$ 19,100
18	MOBILIZATION		5%		$ 47,800
17	CONTINGENCY		30%		$ 286,500
				Subtotal Ancillary Elements	**$ 372,500**
				Subtotal Conveyance Construction Elements	**$ 1,328,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 130,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 200,000
21	CONSTRUCTION MANAGEMENT		10%		$ 140,000
22	PERMITTING		5%		$ 70,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 540,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 1,868,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 1,870,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER POND #2** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	2.2	AC	$ 9,000	$ 20,000
2	POND EXCAVATION AND GRADING	12,000	CY	$ 10	$ 120,000
3	INLET AND OUTLET CONTROLS	1	LS	$ 100,000	$ 100,000
4	MISC POND ITEMS	1	LS	$ 6,000	$ 6,000
5	HMA, CL 1/2-IN PG	50	TON	$ 250	$ 13,000
6	ASPHALT TREATED BASE	90	TON	$ 250	$ 23,000
7	CRUSHED SURFACING BASE COURSE	60	TON	$ 45	$ 3,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	500	LF	$ 80	$ 40,000
9	MANHOLE 48 IN. DIAM.	5	EA	$ 2,500	$ 13,000
10	SHORING OR EXTRA EXCAVATION CLASS B	3000	LF	$ 1	$ 2,000
11	STRUCTURE EXCAVATION CLASS B INCL HAUL	540	CY	$ 10	$ 6,000
12	GRAVEL BORROW INCL. HAUL	100	CY	$ 15	$ 2,000
13	SAWCUTTING	1000	LF	$ 4	$ 4,000
14	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 552,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 11,000
16	TRAFFIC CONTROL		2%	(see note 4)	$ 11,000
18	MOBILIZATION		5%		$ 27,600
17	CONTINGENCY		30%		$ 165,600
				Subtotal Ancillary Elements	**$ 215,200**
				Subtotal Conveyance Construction Elements	**$ 768,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 80,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 120,000
21	CONSTRUCTION MANAGEMENT		10%		$ 80,000
22	PERMITTING		5%		$ 40,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 320,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 1,088,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 1,090,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER POND #3** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	8.7	AC	$ 9,000	$ 79,000
2	POND EXCAVATION AND GRADING	54,000	CY	$ 10	$ 540,000
3	INLET AND OUTLET CONTROLS	1	LS	$ 100,000	$ 100,000
4	24" WATER MAIN REALIGNMENT	800	LF	$ 250	$ 200,000
5	MISC POND ITEMS	1	LS	$ 6,000	$ 6,000
6	HMA, CL 1/2-IN PG	130	TON	$ 250	$ 33,000
7	ASPHALT TREATED BASE	250	TON	$ 250	$ 63,000
8	CRUSHED SURFACING BASE COURSE	170	TON	$ 45	$ 8,000
9	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	1500	LF	$ 80	$ 120,000
10	MANHOLE 48 IN. DIAM.	10	EA	$ 2,500	$ 25,000
11	SHORING OR EXTRA EXCAVATION CLASS B	8000	LF	$ 1	$ 4,000
12	STRUCTURE EXCAVATION CLASS B INCL HAUL	1600	CY	$ 10	$ 16,000
13	GRAVEL BORROW INCL. HAUL	280	CY	$ 15	$ 5,000
14	SAWCUTTING	3000	LF	$ 4	$ 12,000
15	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 1,411,000**
Required Ancillary Items					
16	EROSION AND SEDIMENTATION CONTROL		2%		$ 28,200
17	TRAFFIC CONTROL		2%	(see note 4)	$ 28,200
19	MOBILIZATION		5%		$ 70,600
18	CONTINGENCY		30%		$ 423,300
				Subtotal Ancillary Elements	**$ 550,300**
				Subtotal Conveyance Construction Elements	**$ 1,962,000**
Tax/Engineering/Management/Permitting					
20	STATE SALES TAX		9.5%		$ 190,000
21	ENGINEERING/LEGAL/ADMIN		15%		$ 300,000
22	CONSTRUCTION MANAGEMENT		10%		$ 200,000
23	PERMITTING		5%		$ 100,000
24	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 790,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 2,752,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 2,760,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.
5. Land Acquisition unit costs are based on the Snohomish County Tax Assessor Web page

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER POND #4** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	1.5	AC	$ 9,000	$ 14,000
2	POND EXCAVATION AND GRADING	12,000	CY	$ 10	$ 120,000
3	INLET AND OUTLET CONTROLS	1	LS	$ 100,000	$ 100,000
4	MISC POND ITEMS	1	LS	$ 6,000	$ 6,000
5	HMA, CL 1/2-IN PG	20	TON	$ 250	$ 5,000
6	ASPHALT TREATED BASE	40	TON	$ 250	$ 10,000
7	CRUSHED SURFACING BASE COURSE	30	TON	$ 45	$ 2,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	200	LF	$ 80	$ 16,000
9	MANHOLE 48 IN. DIAM.	4	EA	$ 2,500	$ 10,000
10	SHORING OR EXTRA EXCAVATION CLASS B	1000	LF	$ 1	$ 1,000
11	STRUCTURE EXCAVATION CLASS B INCL HAUL	220	CY	$ 10	$ 3,000
12	GRAVEL BORROW INCL. HAUL	40	CY	$ 15	$ 1,000
13	SAWCUTTING	400	LF	$ 4	$ 2,000
14	DEWATERING	1	LS	$ 75,000	$ 75,000
				Subtotal Construction Elements	**$ 365,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 7,300
16	TRAFFIC CONTROL		2%	(see note 4)	$ 7,300
18	MOBILIZATION		5%		$ 18,300
17	CONTINGENCY		30%		$ 109,500
				Subtotal Ancillary Elements	**$ 142,400**
				Subtotal Conveyance Construction Elements	**$ 508,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 50,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 80,000
21	CONSTRUCTION MANAGEMENT		10%		$ 60,000
22	PERMITTING		5%		$ 30,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 220,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 728,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 730,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER VAULT PR** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	1.2	AC	$ 9,000	$ 11,000
2	DETENTION VAULT	12.2	AC-FT	$ 138,000	$ 1,684,000
3	WETVAULT	22,900	CF	$ 3	$ 69,000
4	STORMFILTER VAULT	1	LS	$ 125,000	$ 125,000
5	HMA, CL 1/2-IN PG	50	TON	$ 250	$ 13,000
6	ASPHALT TREATED BASE	90	TON	$ 250	$ 23,000
7	CRUSHED SURFACING BASE COURSE	60	TON	$ 45	$ 3,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	500	LF	$ 80	$ 40,000
9	MANHOLE 48 IN. DIAM.	5	EA	$ 2,500	$ 13,000
10	SHORING OR EXTRA EXCAVATION CLASS B	3000	LF	$ 1	$ 2,000
11	STRUCTURE EXCAVATION CLASS B INCL HAUL	540	CY	$ 10	$ 6,000
12	GRAVEL BORROW INCL. HAUL	100	CY	$ 15	$ 2,000
13	SAWCUTTING	1000	LF	$ 4	$ 4,000
14	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 2,195,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 43,900
16	TRAFFIC CONTROL		2%	(see note 4)	$ 43,900
18	MOBILIZATION		5%		$ 109,800
17	CONTINGENCY		30%		$ 658,500
				Subtotal Ancillary Elements	**$ 856,100**
				Subtotal Conveyance Construction Elements	**$ 3,052,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 290,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 460,000
21	CONSTRUCTION MANAGEMENT		10%		$ 310,000
22	PERMITTING		5%		$ 160,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 1,220,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 4,272,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 4,280,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER VAULT #1** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	2.1	AC	$ 9,000	$ 19,000
2	DETENTION VAULT	21.0	AC-FT	$ 138,000	$ 2,898,000
3	WETVAULT	49,300	CF	$ 3	$ 148,000
4	STORMFILTER VAULT	1	LS	$ 212,000	$ 212,000
5	HMA, CL 1/2-IN PG	130	TON	$ 250	$ 33,000
6	ASPHALT TREATED BASE	250	TON	$ 250	$ 63,000
7	CRUSHED SURFACING BASE COURSE	170	TON	$ 45	$ 8,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM	1500	LF	$ 80	$ 120,000
9	MANHOLE 48 IN. DIAM.	10	EA	$ 2,500	$ 25,000
10	SHORING OR EXTRA EXCAVATION CLASS B	8000	LF	$ 1	$ 4,000
11	STRUCTURE EXCAVATION CLASS B INCL HAU	1600	CY	$ 10	$ 16,000
12	GRAVEL BORROW INCL. HAUL	280	CY	$ 15	$ 5,000
13	SAWCUTTING	3000	LF	$ 4	$ 12,000
14	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 3,763,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 75,300
16	TRAFFIC CONTROL		2%	(see note 4)	$ 75,300
18	MOBILIZATION		5%		$ 188,200
17	CONTINGENCY		30%		$ 1,128,900
				Subtotal Ancillary Elements	**$ 1,467,700**
				Subtotal Conveyance Construction Elements	**$ 5,231,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 500,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 790,000
21	CONSTRUCTION MANAGEMENT		10%		$ 530,000
22	PERMITTING		5%		$ 270,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 2,090,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 7,321,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 7,330,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER VAULT #2** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	0.6	AC	$ 9,000	$ 6,000
2	DETENTION VAULT	6.0	AC-FT	$ 138,000	$ 828,000
3	WETVAULT	13,800	CF	$ 3	$ 42,000
4	STORMFILTER VAULT	1	LS	$ 80,000	$ 80,000
5	HMA, CL 1/2-IN PG	50	TON	$ 250	$ 13,000
6	ASPHALT TREATED BASE	90	TON	$ 250	$ 23,000
7	CRUSHED SURFACING BASE COURSE	60	TON	$ 45	$ 3,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM	500	LF	$ 80	$ 40,000
9	MANHOLE 48 IN. DIAM.	5	EA	$ 2,500	$ 13,000
10	SHORING OR EXTRA EXCAVATION CLASS B	3000	LF	$ 1	$ 2,000
11	STRUCTURE EXCAVATION CLASS B INCL HAU	540	CY	$ 10	$ 6,000
12	GRAVEL BORROW INCL. HAUL	100	CY	$ 15	$ 2,000
13	SAWCUTTING	1000	LF	$ 4	$ 4,000
14	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 1,262,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 25,200
16	TRAFFIC CONTROL		2%	(see note 4)	$ 25,200
18	MOBILIZATION		5%		$ 63,100
17	CONTINGENCY		30%		$ 378,600
				Subtotal Ancillary Elements	**$ 492,100**
				Subtotal Conveyance Construction Elements	**$ 1,755,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 170,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 270,000
21	CONSTRUCTION MANAGEMENT		10%		$ 180,000
22	PERMITTING		5%		$ 90,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 710,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 2,465,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 2,470,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: STORMWATER VAULT #3 **CHECK BY:**
PROJECT ID: 31235
BY: JSA **DATE:** 11/24/2009

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	2.6	AC	$ 9,000	$ 24,000
2	DETENTION VAULT	26.2	AC-FT	$ 138,000	$ 3,616,000
3	WETVAULT	44,000	CF	$ 3	$ 132,000
4	STORMFILTER VAULT	1	LS	$ 280,000	$ 280,000
5	24" WATER MAIN REALIGNMENT	800	LF	$ 250	$ 200,000
6	HMA, CL 1/2-IN PG	130	TON	$ 250	$ 33,000
7	ASPHALT TREATED BASE	250	TON	$ 250	$ 63,000
8	CRUSHED SURFACING BASE COURSE	170	TON	$ 45	$ 8,000
9	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM	1500	LF	$ 80	$ 120,000
10	MANHOLE 48 IN. DIAM.	10	EA	$ 2,500	$ 25,000
11	SHORING OR EXTRA EXCAVATION CLASS B	8000	LF	$ 1	$ 4,000
12	STRUCTURE EXCAVATION CLASS B INCL HAU	1600	CY	$ 10	$ 16,000
13	GRAVEL BORROW INCL. HAUL	280	CY	$ 15	$ 5,000
14	SAWCUTTING	3000	LF	$ 4	$ 12,000
15	DEWATERING	1	LS	$ 200,000	$ 200,000
				Subtotal Construction Elements	**$ 4,738,000**
Required Ancillary Items					
16	EROSION AND SEDIMENTATION CONTROL		2%		$ 94,800
17	TRAFFIC CONTROL		2%	(see note 4)	$ 94,800
19	MOBILIZATION		5%		$ 236,900
18	CONTINGENCY		30%		$ 1,421,400
				Subtotal Ancillary Elements	**$ 1,847,900**
				Subtotal Conveyance Construction Elements	**$ 6,586,000**
Tax/Engineering/Management/Permitting					
20	STATE SALES TAX		9.5%		$ 630,000
21	ENGINEERING/LEGAL/ADMIN		15%		$ 990,000
22	CONSTRUCTION MANAGEMENT		10%		$ 660,000
23	PERMITTING		5%		$ 330,000
24	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 2,610,000**
				Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting	**$ 9,196,000**
2009 Dollars				**Total Estimated Project Cost (Rounded)**	**$ 9,200,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PLANNING LEVEL PROJECT COST

PROJECT: **STORMWATER VAULT #4** **CHECK BY:**
PROJECT ID: **31235**
BY: **JSA** **DATE:** **11/24/2009**

ITEM NO.	ITEM	QUANTITY	UNIT	UNIT PRICE	AMOUNT
Construction Elements					
1	CLEARING AND GRUBBING	0.6	AC	$ 9,000	$ 6,000
2	DETENTION VAULT	6.4	AC-FT	$ 138,000	$ 884,000
3	WETVAULT	11,600	CF	$ 3	$ 35,000
4	STORMFILTER VAULT	1	LS	$ 50,000	$ 50,000
5	HMA, CL 1/2-IN PG	20	TON	$ 250	$ 5,000
6	ASPHALT TREATED BASE	40	TON	$ 250	$ 10,000
7	CRUSHED SURFACING BASE COURSE	30	TON	$ 45	$ 2,000
8	SCHEDULE A STORM SEWER PIPE 18 IN. DIAM.	200	LF	$ 80	$ 16,000
9	MANHOLE 48 IN. DIAM.	4	EA	$ 2,500	$ 10,000
10	SHORING OR EXTRA EXCAVATION CLASS B	1000	LF	$ 1	$ 1,000
11	STRUCTURE EXCAVATION CLASS B INCL HAUL	220	CY	$ 10	$ 3,000
12	GRAVEL BORROW INCL. HAUL	40	CY	$ 15	$ 1,000
13	SAWCUTTING	400	LF	$ 4	$ 2,000
14	DEWATERING	1	LS	$ 75,000	$ 75,000
			Subtotal Construction Elements		**$ 1,100,000**
Required Ancillary Items					
15	EROSION AND SEDIMENTATION CONTROL		2%		$ 22,000
16	TRAFFIC CONTROL		2%	(see note 4)	$ 22,000
18	MOBILIZATION		5%		$ 55,000
17	CONTINGENCY		30%		$ 330,000
			Subtotal Ancillary Elements		**$ 429,000**
		Subtotal Conveyance Construction Elements			**$ 1,529,000**
Tax/Engineering/Management/Permitting					
19	STATE SALES TAX		9.5%		$ 150,000
20	ENGINEERING/LEGAL/ADMIN		15%		$ 230,000
21	CONSTRUCTION MANAGEMENT		10%		$ 160,000
22	PERMITTING		5%		$ 80,000
23	EASEMENTS AND PROPERTY ACQUISTION		NOT INCLUDED		
				Subtotal	**$ 620,000**
	Subtotal Construction + Ancillary + Tax/Engineering/Management/Permitting				**$ 2,149,000**
2009 Dollars	**Total Estimated Project Cost (Rounded)**				**$ 2,150,000**

Notes:

1. The above cost opinion is in 2009 dollars and does not include future escalation, financing, or O&M costs.
2. The order-of-magnitude cost opinion has been prepared for guidance in project evaluation from the information available at the time of preparation and for the assumptions stated. The final costs of the project will depend on actual labor and material.
3. Increase percentage markup if work is in or immediately adjacent to flowing or standing water, steep slope, and/or other erosion-prone conditions.
4. Increase percentage markup if work is in or immediately adjacent to secondary, arterial, or other high-volume road or temporarily closes a roadway.

PROJECT: 31235 Burien NERA
DATE: 11/23/09

	PR	SW 1	SW 2	SW 3	SW 4
Excavation					
Total volume (cf)	1,421,586	869,561	306,710	1,444,348	320,654
Surface Area (sf)	110,244	156,939	96,014	377,969	66,298
Total Area (ac)	2.53	3.60	2.20	8.68	1.52
Total Excavation (cy):	**52,651**	**32,206**	**11,360**	**53,494**	**11,876**
Clearing and Grubbing					
Total Area (ac):	2.53	3.60	2.20	8.68	1.52
Pipe Excavation					
Length of new pipe:	500	1500	500	1500	200
Pipe dia (ID):	1.5	1.5	1.5	1.5	1.5
Pipe dia (OD) = 1.5*ID	2	2	2	2	2
Trench width = OD + 1.5'	4	4	4	4	4
Street repair width = trench width + 2'	6	6	6	6	6
Average depth to pipe invert:	5	5	5	5	5
Total Needed:	532	1597	532	1597	213
Length of pipe removal:	0	0	0	0	0
Pipe dia (ID):			0		
Pipe dia (OD) = 1.5*ID					
Trench width = OD + 1.5'					
Street repair width = trench width + 2'					
Average depth to pipe invert:					
Total Removal:					
Total Pipe Excavation (cy):	532	1597	532	1597	213
(New requirements - Removal)					
Pavement Repair					
Pipe/Culvert Span:	1.50	1.50	1.50	1.50	1.50
Total width:	6	6	6	6	6
Pavement Disturbance Width	6	6	6	6	6
Trench Length	500	1500	500	1500	200
TOTAL REMOVAL:	2875	8625	2875	8625	1150
	319	*958*	*319*	*958*	*128*
HMA (2" thick)					
	479	1438	479	1438	192
assume 2.05 ton/cy	37	110	37	110	15
Volume +10%	*41*	*121*	*41*	*121*	*17*
Asphalt Treated Base (4" thick)					
	958	2875	958	2875	383

	assume 2.05 ton/cy	73	218	73	218	29
	Volume + 10%	*80*	*240*	*80*	*240*	*32*
CSBC (3" thick)						
		719	2156	719	2156	288
	assume 1.85 ton/cy	49	148	49	148	20
	Volume +10%	*54*	*163*	*54*	*163*	*22*
Shoring						
	Trench depth x Trench length	*2,500*	*7,500*	*2,500*	*7,500*	*1,000*
Sawcutting						
	Two times the length of paved trench	*1000*	*3000*	*1000*	*3000*	*400*
Land Acquisition						
	Quantity					
	Cost = $3/SF					

Pond PR Average End area calc for addition excavation

Delta sta	area, ft^2	avg area, ft^2	Cumm Vol, ft^3
0	3539		
130	2465	3002	390260
137	1844	2154.5	685426.5
144	311	1077.5	840586.5

Pond 3 addition excavation		
70*(28*125)/2		
122500		

Criblock Wall

delta sta	height, ft	AVG HEIGHT, ft^2	
0	32	0	
130	28	30	3900
137	24	26	7462
144	24	24	10918