Stormwater Technical Report

New Whatcom Redevelopment
Port of Bellingham

Prepared for:
Port of Bellingham, Washington
1801 Roeder Avenue
Bellingham, WA 98225

Prepared by:
David Evans and Associates, Inc.
119 Grand Avenue, Suite D
Bellingham, WA 98225

December, 2007

Stormwater Technical Report
New Whatcom Redevelopment

Summary

This report describes the stormwater impacts of the three Action Alternatives and the No Action Alternative for the proposed 216.3 acre New Whatcom Redevelopment site. The report is intended to support the New Whatcom Environmental Impact Statement. Land uses in all of the proposed action alternatives include residential, light industrial, commercial, and office uses, with alternatives defined by varying densities of each use. This report specifically addresses stormwater flow rates and volumes, the conveyance systems, and outfalls. Stormwater quality will be addressed in a separate report.

The site's ten redevelopment areas currently have nine identified outfalls into the Whatcom Waterway and Bellingham Bay[1] - see Figures 1A and 1B. The City maintains a single outfall at the west end of C Street in Area 1 that drains stormwater runoff from approximately 25% of the area (outfall 1 of the nine existing outfalls). Two additional outfalls, the Bornstein Seafoods discharge into the I and J Waterway and the Bellingham Marine Industries outfall into the Whatcom Waterway, have been identified through their Industrial General Stormwater Permits; however, their exact locations are uncertain. The remaining Area 1 runoff either drains to Georgia Pacific's Aerated Stabilization Basin (ASB), sheet flows into the adjacent waterways, infiltrates, or evaporates. The C Street outfall also receives offsite runoff from areas beyond Area 1. Stormwater runoff from the Georgia Pacific's operation area (Areas 2, 3, 4, 5, and 8) is collected though a series of ditches, culverts, and underground pipes, and is combined with GP's industrial wastewater. The combined effluent is pumped under the waterway to the ASB, where it is treated and pumped approximately 8,000 feet into Bellingham Bay. Area 6 (Puget Sound Energy's Encogen facility) and Area 7 drain toward Cornwall Avenue and discharge at the outfall at the west end of this street (outfall 8). Area 9 (the Bellingham Shipping Terminal) has three outfalls 5, 6 and 7). Area 10 does not have any outfalls and runoff either sheet flows into the bay, infiltrates, or evaporates.

The City has four other outfalls in the redevelopment area where offsite runoff is conveyed through the site and discharged into the waterway and bay[2]. Central Street and Chestnut Street outfalls (outfalls 2 and 3) discharge in the northeast corner of Area 2, the Laurel Street outfall (outfall 4) discharges at the boundary of Areas 3 and 4, and the Cedar Street outfall (outfall 9) discharges at the northeast corner of Area 10. These outfalls will remain in place and continue to operate independently of the redevelopment area stormwater systems.

[1] City of Bellingham and Port of Bellingham utility drawings
[2] ibid

Under all the redevelopment scenarios the ASB is assumed to be taken out of service during the site's soil remediation phase which will take place prior to redevelopment[3]. Stormwater pump stations may be used temporarily during the transition from the termination of the ASB to the permanent system. The permanent system is assumed to be a gravity draining system with small pump stations, if utilized at all, used only for small localized area that will discharge into the gravity system. To achieve this gravity drainage system, the placement of fill will be required to provide the gradient for runoff to sheet flow to a stormwater conveyance system.

Under all the alternative options, the developed site is estimated to have eight new outfall structures. Three of these outfalls will be for Area 1. New outfalls will also be located in Area 2, at the boundary between Areas 3 and 4 (next to the existing Laurel Street outfall), in Area 4, and two in Area 9 (next to the existing Cornwall Street outfall and replacing the existing outfall at the north end of the area). Runoff from Area 10 is assumed to either sheet flow into the bay or will be collected and released through dispersion trenches located above the ordinary high water elevation.

Based on a review of the proposed alternatives and the stormwater infrastructure, the impacts of the 2016 partial build-out and 2026 full build-out on the utility infrastructure will be typical for a development of this size. No unavoidable adverse impacts to the stormwater or utility systems will occur under the proposed action alternatives.

[3] New Whatcom Redevelopment Project Draft EIS, Chapter 2, December 2007

Table of Contents

List of Figures

List of Tables

1.0 INTRODUCTION

This report describes the stormwater impacts of the three Action Alternatives and the No Action Alternative for the proposed New Whatcom Redevelopment. Stormwater impacts onsite and in the areas adjacent to the site are addressed. The report is intended to support the New Whatcom Environmental Impact Statement.

The New Whatcom project site includes approximately 216.3 acres of contiguous waterfront property in central Bellingham and adjacent aquatic area. The site lies within the City of Bellingham's Central Business District Neighborhood Planning area and the site is generally bounded by Bellingham Bay to the west, and Roeder Avenue and State Street to the north and east. The Central Business District Neighborhood is generally bounded by the Columbia and Lettered Streets neighborhoods to the north, the Sunnyland and York neighborhoods to the east, and Cornwall Avenue and the Sehome and South Hill neighborhoods to the south.

For descriptive purposes, the New Whatcom site has been divided into 10 redevelopment areas, as illustrated in Figures 1A and 1B. A true north and "project north" have been designated to simplify descriptions of cardinal directions onsite.

2.0 AFFECTED ENVIRONMENT

2.1 HYDROLOGIC SETTING

The New Whatcom project site is located on Bellingham Bay along the Whatcom Waterway. The site is relatively flat with the existing perimeter ground surface along Bellingham Bay and the Whatcom Waterway ranging between elevations 12 ft. to 15 ft. (City of Bellingham Datum) with internal areas ranging between elevation 10 ft. and 27 ft. Flood information obtained from the Federal Emergency Management Agency (FEMA) indicates the site is not identified as being in a floodway or floodplain. The base flood elevation at the mouth of Whatcom Creek of 8 feet [National Geodetic Vertical Datum 1929 (NGVD 29)], a conservatively high 100-year flood elevation, correlates to 13.7 ft. in City of Bellingham datum and 11.93 ft. in NAVD88 datum. Accordingly, small portions of the site not protected by a perimeter wharf/bulkhead or berm (such as in portions of Areas 1, 8, 9, and 10) may currently be subject to flood hazards. See Figures 2A and 2B for the existing site topographical map.

The more developed areas of the site generally contain stormwater collection and conveyance systems with outfall structures that discharge directly into Bellingham Bay or the Whatcom Waterway, or into Bellingham Bay via a pipe that extends out to the bay from the Aerated Stabilization Basin (ASB). More undeveloped areas, or areas with minimal infrastructure systems, such as portions of Areas 1, 8 and 10, have limited stormwater collection and conveyance systems In these areas stormwater runoff either infiltrates, evaporates, or sheet flows into the waterway and bay.

Since the site is bounded by city roads with stormwater collection systems and railroad berms with interceptor ditches, very little offsite runoff sheet flows onto or across the site[4]. Existing stormwater pipes do convey runoff from offsite basins through the site. See Section 2.6 for a more detailed discussion of the existing site conditions.

2.2 DEVELOPMENT AREA REQUIREMENTS BASED ON EXISTING SOIL CONDITIONS

Soil and groundwater contamination is known to exist in portions of the site. The report *Environmental Protection Standards, Georgia Pacific Properties*, September 22, 2004 discusses development requirements based on soil conditions (also see Section 3.5, Environmental Health, of the Draft EIS for more information). With the exception of Area 7, the eastern portion of Area 2, and small isolated areas in Areas 1 and 5, groundwater contamination is suspected precluding the introduction of additional water through infiltration of stormwater runoff. Based on these conditions, no stormwater infiltration is assumed for the redeveloped site.

2.3 REGULATORY OVERVIEW

The following is an overview of the regulatory requirements that presently pertain to the site.

2.3.1 National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated With Industrial Activities, State of Washington, Department of Ecology (DOE)

Facilities conducting industrial activities that discharge stormwater to a surface waterbody or to a municipal storm sewer system are required to obtain coverage under this statewide permit. New and existing facilities that do not already have permit coverage must submit Ecology's Industrial Stormwater General Permit Application for Coverage to obtain coverage for their site. Under this permit all facilities are required to conduct quarterly monitoring and, under certain conditions, sampling of stormwater. Records of this monitoring and sampling must be forwarded to the DOE. A Stormwater Pollution Prevention Plan (SWPPP) specifically developed for each facility must also be prepared. The SWPPP must include the Best Management Practices (BMPs) necessary to provide all known, available and reasonable methods of prevention, control, and treatment (AKART). It must also include any additional BMPs as necessary to comply with state water quality standards. New facilities must have a SWPPP developed and implemented before beginning operation.

2.3.2 National Pollutant Discharge Elimination System (NPDES) and State Waste Discharge General Permit for Stormwater Discharges Associated With Construction Activity, State of Washington, Department of Ecology

Construction activities that involve clearing, grading and/or excavation which result in the disturbance of one or more acres and which discharge stormwater to surface waters of the state are required to obtain coverage under this statewide permit. Clearing, grading and/or

[4] Review of City of Bellingham and Port of Bellingham record drawings by David Evans and Associates, Inc., August, 2007

excavation on sites smaller than one acre which are part of a larger common plan of development, are also required to obtain coverage if the common plan of development will ultimately disturb one acre or more, and it discharges stormwater to surface waters of the state. The DOE may also require permit coverage if they determine the project to be a significant contributor of pollutants to waters of the state. The NPDES permit requires public notification of future activities, the preparation and implementation of a SWPPP, and monitoring and sampling of stormwater runoff leaving the site.

2.3.3 City of Bellingham Municipal Code

The City of Bellingham has implemented *Stormwater Management Ordinance* No. 2006-05-047, May 2006 and the *Stormwater Management Handbook,* September 1995 for identifying stormwater management requirements for development inside the city limits. The City's regulations require the implementation of the latest Washington State Department of Ecology stormwater management manual for water quality treatment of stormwater runoff. The *2005 Stormwater Management Manual for Western Washington* (WDOE Manual) is used to design the construction phase and permanent water quality treatment facilities for future projects.

Future projects that contain land disturbing activities greater than 10,000 square feet must follow the Large Development requirements. These requirements include compliance with Minimum Requirements #1 through #10 and the preparation of a stormwater site plan, as outlined in the ordinance.

2.4 DESIGN CRITERIA

The following design criteria presently apply to the stormwater management of the project site's stormwater runoff:

- As discussed in the WDOE Manual, Volume I, Section 2.5.7 *Minimum Requirement #7: Flow Control,* stormwater detention requirements apply to projects that discharge site runoff offsite into fresh water bodies, or into conveyance systems connected to fresh water bodies. Since project development at this site will result in stormwater being discharged directly into Bellingham Bay, a salt water body, no detention for runoff is required.

- As discussed in the WDOE Manual, Volume V, Section 3.4 *Enhanced Treatment,* industrial sites that discharge directly (or indirectly through a municipal storm sewer system) to Basic Treatment Receiving Waters such as a saltwater body (see Appendix V-A) require only basic treatment for runoff, not enhanced treatment. See the *New Whatcom Redevelopment Project Water Quality Technical Report*, December 2007, prepared by A.C. Kindig & Co. for a discussion of the water quality component of the project's stormwater management.

- In accordance with the WDOE Manual, the site's hydrologic analysis was performed using the Western Washington Hydrologic Model (WWHM2), a continuous simulation hydrologic model developed by the WDOE.

2.5 STORMWATER SYSTEM ASSUMPTIONS

The following assumptions were used for purposes of this analysis and will be used in designing the specific stormwater management system for the site. These assumptions may be reconsidered at the time of future site redevelopment based on specific design, engineering and economic factors.

- Existing conveyance pipes that pass offsite runoff through the site to outfall structures will remain in operation and will be independent of the onsite conveyance and discharge systems.

- The long term stormwater conveyance system for the site is assumed to be based on a gravity flow system. Pump stations may be used to support temporary systems, but ultimately they will not likely be used except to enable drainage in small isolated areas where gravity drainage is not practical. The site will be filled to create a gradient that will enable a gravity flow system to the bay. Due to the existing soil contamination, a minimum of two feet of fill is assumed for most areas of the site[5]. To limit the depth of utility excavations, the outfall discharge elevation is assumed to be 11.0 feet, one foot above the approximate ordinary high water elevation.

- The number of stormwater outfall locations shall be minimized to reduce potential impacts to fish and habitat.

2.6 EXISTING SITE CONDITIONS

2.6.1 Aerated Stabilization Basin (ASB)

Stormwater runoff from the existing Georgia Pacific's operation area (Areas 2, 3, 4, 5, and 8) is collected though a series of ditches, culverts, and underground pipes, and combined with GP's industrial wastewater. The combined effluent discharges to a pump station located at the north end of the vacated West Laurel Street right-of-way (see Figure 1A). The pump station discharges into four 30-inch diameter pipes that extend under the waterway approximately 700 feet into the ASB. Effluent from the ASB is pumped through a 60-inch diameter pipe for 8,000 feet into Bellingham Bay. The last 2,000 feet of this pipe is a diffuser.

Discharge to the ASB will be terminated for planned remediation and redevelopment as a marina, in coordination with proposed upland redevelopment of the site. The removal of the ASB will require that the effluent from the 73.5 acre area that includes Areas 2, 3, 4, 5, and 8 (the GP operations site), the 13 acre GP Tissue Warehouse in Area 1, and the Encogen facility in Area 6 discharge via an alternative method. The removal of the ASB would require two steps. First, industrial wastewater and industrial stormwater runoff from those portions of the site that discharge to the ASB would need to be terminated, and Ecology

[5] Email communication with Mark Larsen, Anchor Environmental, May 07, 2007

would need to concur that the industrial discharge and the need for industrial discharge coverage under the NPDES program were both terminated. Second, an alternative routing of stormwater runoff from the site to an existing or new onsite stormwater treatment system would be needed.

2.6.2 Onsite Flow

Redevelopment Area 1

This 51.3 acre area is bounded by the I & J Waterway to the north, Roeder Avenue to the east, the Whatcom Waterway to the south, and the ASB to the west. Road right-of-ways are not developed to City standards with Hilton Street, C Street, and the portion of F Street that leads to the GP Tissue Warehouse partially paved. Curb and gutter systems on these streets extend less than 50 feet west of the Roeder Avenue intersection. Runoff from the intersections is conveyed south along Roeder Avenue and discharged into a 3.5-foot by 9-foot concrete box culvert in C Street. This culvert was the discharge structure for the former City wastewater treatment facility located approximately 750 feet north of Roeder Avenue[6]. This facility is now a fish hatchery. This culvert discharges at the west end of C Street – see Figure 1B. Three C Street stormwater conveyance pipes have been identified that tie into this culvert.

The GP Tissue Warehouse and surrounding paved area (approximaely13 acres of impervious surface) has a stormwater collection system that gravity drains directly to the ASB. Stormwater runoff from the warehouse is estimated at 4.90 cubic feet per second (cfs) for a 2-year design storm event and 8.95 cfs for a 25-year design storm event.[7]

When the ASB closes, the existing stormwater collection system, for that portion of Area 1 that discharges to the ASB, will need to be reconfigured to allow stormwater discharge to a new location. Prior to connecting to the new discharge location, runoff from pollution generating surfaces (streets and parking areas) will likely be routed to a water quality treatment facility. Roof runoff could be directed to bypass the treatment facility to minimize the treatment facility's size. New conveyance pipe from the warehouse to the C Street storm system will be required. See the *New Whatcom Redevelopment Project Water Quality Technical Report*, September 2007, prepared by A.C. Kindig & Co. for a discussion of the water quality treatment component of this redevelopment area's stormwater management.

The remaining potions of Area 1 are undeveloped and stormwater runoff from these areas either sheet flows into the bay, infiltrates, or evaporates.

Redevelopment Areas 2, 3, 4, 5, and 8

The 73.5 acre area that includes Redevelopment Areas 2, 3, 4, 5, and 8 comprises the existing GP operations site. Stormwater runoff in these areas is collected though a series of ditches, culverts, and underground pipes, and combines with GP's industrial wastewater system. Due to the number of cross connections between the stormwater and the industrial wastewater systems, the limits of each system are unclear. See Figure 1A for the layout of the combined systems. The combined effluent of these two systems is pumped to a large pump station

[6] Email communication with Geoffrey Smyth, City of Bellingham Public Works Superintendent

[7] GP Tissue Warehouse, Stormwater Analysis, David Evans and Associates, Inc. August 27, 1999.

located at the north end of the West Laurel Street right-of-way. This pump station discharges into the ASB.

The closure of the ASB could require the installation of one or more of the new outfalls ultimately planned to accommodate redevelopment. Temporary measures that may be implemented during this interim phase prior to the construction of new outfalls could include the following:

- The existing ditches, culverts, underground pipes, and small pump stations could remain in operation directing runoff to the main pump station at the north end of the vacated West Laurel Street right-of-way. Runoff could then be pumped to a new treatment facility where, after treatment, it will either gravity drain or be pumped to an existing outfall.
- Runoff from areas that are, or will remain, pollution generating surfaces will be treated through small localized facilities. After treatment runoff could be pumped to existing conveyance systems (West Laurel Street, Cornwall Avenue, or BST systems) and discharge through existing outfalls.

Redevelopment Area 6

Redevelopment Area 6 consists of the existing 6.5 acre Puget Sound Energy (PSE) Encogen facility. The site consists of buildings, equipment, storage tanks, and an electrical switchyard and is primarily hardscape. The site's stormwater collection system consists of manholes, conveyance pipe, and concrete swales along the north and south perimeter of the site. The system discharges in the southwest corner of the site into the Cornwall Avenue stormwater system – see Figure 1A. The 1991 stormwater analysis performed by Ebasco Services Inc. estimates the 10-year design storm event discharge at 15.31 cfs (based on a Rational Method analysis). The facility operates under its own set of permits for discharging stormwater off site.

Presently, the industrial wastewater from the Encogen facility is pumped to the ASB for treatment and disposal. The termination of the ASB will require the re-routing of the Encogen's wastewater to the City's sanitary sewer system or other facility subject to applicable permits.

Redevelopment Area 7

This 9.5-acre redevelopment area is bordered by Cornwall Avenue to the north, the bluff area to the east, the existing Burlington Railroad spur area to the south, and other New Whatcom site area to the west. This site is entirely impervious surface and consists of gravel laydown areas, an asphalt parking lot, a 48,000 square foot building, and the City of Bellingham's Oak Street sanitary sewer pump station. The stormwater infrastructure in this area is limited (see Figure 1A) with few conveyance pipes connecting to the Cornwall Avenue storm system.

The off-site railroad spur south of Area 7 contains a series of catch basins and conveyance pipes that collects runoff and conveys it through the area. The east half of the spur drains to the West Laurel Street offsite storm system. The west half drains to the Cornwall Street system. Although Area 7 is at the base of a bluff, the raised railroad spur prevents offsite

flows from the bluff from traveling north onto the site. The bluff runoff appears to pond at the base of the spur where it infiltrates and evaporates.

Redevelopment Area 9

Redevelopment Area 9 consists of the existing 21.3 acre Bellingham Shipping Terminal (BST). The Area is essentially 100% impervious with small landscaped areas at the offices along Cornwall Avenue and along the bay embankment on the west side of the site. This Area contains four stormwater outfall locations:

1. A 24-inch diameter culvert at the west end of Cornwall Avenue discharging west into the bay.
2. A 12-inch diameter culvert approximately 125 ft. north of the Cornwall Avenue culvert discharging west into the bay.
3. A 12-inch diameter culvert at the north end of the BST discharging north into the waterway.
4. A 12-inch diameter culvert in the northeast corner of the BST discharging east into the waterway. A second pipe of unknown size also discharges 50 ft. north of the nearby 12-inch culvert.

See Figure 1A for the layout of the existing stormwater system in this Area.

Redevelopment Area 10

This 18.17 acre developed site contains no known stormwater infrastructure – see Figure 1B. This site contains seven structures totaling 64,625 sq. ft. The R.G. Haley Corporation owns 11.4 acres of this area which was formerly the site of an industrial wood treatment facility[8]. The site also contains the 3.4 acre abandoned Cornwall Avenue Landfill[9]. A small pocket beach located near the terminus of Cornwall Avenue is used as an informal recreational area.

2.6.3 Offsite Flow

Nine existing outfalls have been identified in the existing New Whatcom Redevelopment Area – see Figures 1A and 1B. Outfalls 2, 3, and 9 convey runoff from offsite areas that passes through the site without combining with onsite runoff. The remaining outfalls receive a portion of their runoff from the redevelopment areas. Outfalls 5, 6, and 7 receive their entire runoff from Redevelopment Area 9.

2.6.4 Outfalls

Outfall 1

This outfall consists of a 3.5 foot by 9-foot concrete box culvert that discharges at the west end of C Street and is the only known outfall structure in Redevelopment Area 1. The extent of the stormwater basin that contributes to this structure is unknown. Portions of Roeder Avenue stormwater conveyance system are known to connect to this culvert, as do areas east of Roeder Avenue.

This outfall also acts as the discharge point for the City's C Street Combined Sewer Overflow (CSO). In the unusual event of a severe rainfall, the CSO can release wastewater

[8] New Whatcom Redevelopment Project Preliminary Draft EIS, Chapter 2, September 2007
[9] ibid

directly to the bay. If the influent rate at the City's Oak Street Station exceeds the station's hydraulic lift capacity of 58-60 million gallons per day (MGD), a sanitary sewer overflow can occur[10]. In accordance with the City's NPDES permit with the Washington Department of Ecology, the City is allowed one spill per year.

Outfall 2

This outfall is identified as a 22-inch diameter concrete pipe that discharges into the waterway at the southwest corner of the Central Avenue and Roeder Avenue intersection. This culvert was part of the City's water system but was converted to stormwater drainage. From the outfall, the culvert extends east offsite under the railroad tracks and south along the east side of the tracks. The extent of the stormwater basin that contributes to this outfall is unknown.

Outfall 3

This outfall is identified as an eight-inch diameter PVC pipe that discharges into the waterway at the southwest corner of the Central Avenue and Roeder Avenue intersection, adjacent to Outfall 2. Runoff to this outfall comes from the Roeder Avenue bridge between Central Avenue and Bay Street, with an approximate 0.7 acre contributory basin. The bridge was constructed in 1988[11].

Outfall 4

This outfall is known as the Laurel Street Outfall and is located at the north end of the vacated Laurel Street right-of-way. The culvert discharges approximately 5 feet below the ordinary high water mark. This outfall discharges the runoff from a 96 acre basin above the bluff south of Redevelopment Area 7[12]. Runoff from the Cornwall Avenue – Laurel Street intersection and the east half of the railroad berm in Redevelopment Area 7 also discharge into this system. In 1996, the section of pipe from Cornwall Avenue to the outfall was replaced with a 24-inch diameter high density polyethylene (HDPE) pipe. Based on the pipes dimensions and installation slope of 0.4%, the pipe can convey a 14.5 cfs flow under gravity conditions, equivalent to an estimated two-year design storm event for the 96 acre basin[13]. The 25-year design storm event is estimated at 39.8 cfs[14].

Outfall 5

This outfall is identified as a 12-inch diameter pipe located at the north end of the BST. This outfall collects the roof runoff from the 45,652 square foot Shipping Terminal Warehouse #1 and the surrounding paved area.

Outfall 6

This outfall is identified as a 12-inch diameter pipe located at the northeast corner of the BST. This outfall collects the runoff from the eastern half of the BST. A second pipe of unknown size located along the south side of Warehouse #2 also discharges 50 ft. north of the nearby 12-inch culvert.

[10] Email communication with Geoffrey Smyth, City of Bellingham Public Works Superintendent
[11] City of Bellingham record drawings
[12] Information from Bill Reilly, City of Bellingham, June 21, 2007
[13] Stormwater Analysis, David Evans and Associates, Inc. June 21, 2007
[14] Ibid.

Outfall 7
This outfall provides the discharge for stormwater collected off the paved parking area on the north side of the Port of Bellingham maintenance building in the southwest corner of Area 9. The 12-inch diameter PVC pipe discharges below the ordinary highwater mark west of the west of the building.

Outfall 8
This outfall is identified as a 24-inch diameter polyethylene (ADS) pipe that discharges into the bay at the west end of Cornwall Avenue approximately six feet below the ordinary highwater mark. The previous outfall pipe was replaced in 1991 by the City. Stormwater runoff from Cornwall Avenue west of Laurel Street, the Encogen facility in Area 6, Area 7 west of Laurel, and the western half of the railroad spur south of Area 7, discharge into this outfall system.

Outfall 9
This outfall is known as the Cedar Street Outfall and is located at the north end of the vacated Cedar Street right-of-way approximately 500 ft. west of the end of Cornwall Avenue. This 30-inch diameter culvert, installed in 1961, discharges north into the bay. The extent of the outfall's contributing basin is unknown. Based on a review of the site topographical map and City GIS information, the basin is believed to extend to the Western Washington University campus with a contributing basin exceeding 40 acres.

Two additional outfalls in Area 1, the Bornstein Seafoods outfall into the I and J Waterway and the Bellingham Marine Industries outfall into the Whatcom Waterway, have been identified through their Industrial General Stormwater Permits. Since these are private systems, the exact location and contributing areas of these two outfalls have not been specifically determined.

3.0 IMPACTS

3.1 CONSTRUCTION IMPACTS

Construction of Alternatives 1 through 3 and the No Actions Alternative has the potential to impact stormwater management on the site. Section 15.42.060 of the City's *Stormwater Management Ordinance* No. 2006-05-047, includes the requirements for developing and redeveloping sites. (For projects such as this that do not require detention, the City requirements are the same as the DOE Manual.) Projects that create or add more than 5,000 square feet, or more, of new, replaced, or new plus replaced impervious surface must comply with the following 10 Minimum Requirements.

1. Preparation of a Stormwater Site Plan (SSP): This includes an engineering report that addresses Minimum Requirements 2-10 along with an analysis that supports the SSP and the Construction Stormwater Pollution Prevention Plan.

2. Construction Stormwater Pollution Prevention Plan (SWPPP): This plan includes a narrative that describes the following 12 elements and Best Management Practices (BMPs) that will be utilized to mitigate the construction impacts:
    a. Mark Clearing Limits
    b. Establish Construction Access
    c. Control Flow Rates
    d. Install Sediment Controls
    e. Stabilize Soils
    f. Protect Slopes
    g. Protect Drain Inlets
    h. Stabilize Channels and Outlets
    i. Control Pollutants
    j. Control De-Watering
    k. Maintain BMPs
    l. Manage the Project
3. Source Control of Pollution
4. Preservation of Natural Drainage Systems and Outfalls
5. On-site Stormwater Management
6. Runoff Treatment
7. Flow Control
8. Wetlands Protection
9. Basin/Watershed Planning
10. Operation and Maintenance

Runoff generated during construction would be collected and routed to applicable stormwater quality treatment facilities designed to ensure that significant impacts to adjacent waterways does not occur. Best management practices would be utilized to prevent erosion and sedimentation impacts. Construction activities shall be performed in accordance with the SSP and the SWPPP. Should construction activities result in stormwater discharges offsite, coverage under the DOE's Construction NPDES permit would also be required. See the *New Whatcom Redevelopment Project Water Quality Technical Report*, December 2007, prepared by A.C. Kindig & Co. for a discussion of the BMPs utilized to mitigate impacts to runoff water quality.

3.2 OPERATION IMPACTS

3.2.1 Site Grading

As stated in Section 2.5, *Stormwater System Assumptions*, the long-term stormwater conveyance system is assumed to be based on a gravity flow system. The site is assumed to be filled to create a gradient that will enable a gravity flow system to the bay. A slope of 0.3 % was assumed for the storm conveyance pipe to estimate the required amount of site fill and to determine the limits of the drainage basins for each outfall. Due to soil contamination in various portions of the site, a minimum of a two foot soil cap is assumed in Redevelopment Areas 2, 3, 4, 8 and 9. (Areas furthest away from the outfall structures may have a greater depth of fill (3 to 6 feet) that would result in the gradient for a gravity flow storm system.)

Utility trenching to install the stormwater conveyance system will also be affected by the soil contamination. In some areas utility trenches may need to be pre-excavated and backfilled with clean material. To minimize the impact of the ground disturbance and soil remediation, the storm pipe trench excavation depth is assumed to be as shallow as possible. Outfall discharge elevations are assumed at 11.0 feet, one foot above the approximate ordinary high water elevation.

Utility corridors are assumed to follow the future road alignment. This is especially true for the stormwater system since roads and parking will be the major creator of pollution generating surfaces, which will require collection and treatment prior to discharging offsite. As the stormwater conveyance pipe elevation rises as the pipe gets further inland from the outfall, the road surface elevation, based on a minimum of two feet of pipe cover, would also rise. Areas adjacent to the roads would also be filled to enable gravity flow into the road stormwater conveyance system. As part of the construction and utility design and permit process in the future, assumptions used in the EIS may be re-evaluated and the stormwater conveyance system may be refined to meet any additional design criteria elements.

3.2.2 Outfalls and Stormwater Infrastructure

The number and location of the new outfall structures is based on the redevelopment road layouts and the goal to minimize the number of outfalls and the amount of fill added to grade the site. Figures 2A and 2B show the existing site topography. Assuming a ground gradient of 0.3% and a maximum fill of 1.5 feet at the boundary of adjacent drainage basins, the outfall structure spacing is estimated at a maximum interval of 1,000 ft. The location of the outfalls was chosen based on this interval spacing, the proximity to an existing outfall, the proximity to the proposed road system, and the goal to minimize impacts to fish and their habitat.

Associated with each outfall is a stormwater main that extends from the outfall through the contributing basin. This main will typically be constructed within, or alongside a primary road. Lateral storm lines will collect runoff in the basin from both sides of the main. The length of the main and the distance to the end of the furthest lateral controls the amount of fill added to the site.

Based on these criteria, eight outfalls, and their associated drainage basins, were identified for Areas 1-9, see Figures 3, 4, and 5. The number and location of the outfalls is the same for Alternatives 1-3 and the No Action Alternative. The only difference between the Alternatives is the size of the contributing basin and the estimated discharge rate at each outfall. Alternatives 1 and 2 both assume the existing railroad tracks in Areas 5 and 8 will be relocated to the south side of Area 7 and have similar internal road configurations. There is no significant difference between their assumed stormwater conveyance system and subsequently future discussion will address these alternatives together. The relocation of the railroad tracks allows two drainage basins discharging north into the waterway (Basins B and C) to extend further south to Cornwall Avenue optimizing the efficiency of these conveyance systems.

Alternative 3 assumes the existing railroad tracks in Areas 5 and 8 will not be relocated. The existing tracks will remain at their current elevation and the area on both sides of the tracks will be raised to provide the gradient for the new stormwater systems. The drainage basins for Alternative 3 are defined such that they do not cross the tracks. This results in reduced areas for Basins B and C that drain north to the waterway and an increase in basin area for the Cornwall Avenue system (Basin E).

The No Action Alternative assumes that site will be developed as it is currently zoned for industrial use. The same stormwater system as Alternative 3 is assumed to minimize the number of outfall structures. Individual development projects may chose to fill their site to obtain a gravity draining system or pump their stormwater to a treatment facility and discharge to the storm conveyance main connected to the outfall structure. Future criteria for utility infrastructure for the No Action Alternative will be developed during the permit process.

For all alternatives, runoff from Area 10 will not be routed to an outfall structure. Runoff is assumed to either sheet flow into the bay or will be collected and released though dispersion trenches located above the ordinary high water elevation.

3.2.3 Hydrology and Outfall Flow Rates

As part of this EIS, Redevelopment Area data sheets were developed by Collins Woerman that estimate the type of redevelopment and the associated ground cover in each redevelopment area for each Alternative. Based on the ground cover distribution, the amount of pervious area (landscaping), impervious pollution generating surfaces (roads and parking), and impervious non-pollution generating surfaces (buildings) was calculated. Tables 1, 2, and 3 provide a summary of the ground cover distribution for each redevelopment area for Alternatives 1 and 3 and the No Action Alternative, respectively. Flow rates for each redevelopment area were estimated using the WDOE Manual's continuous hydrological model WWHM. Tables 1, 2, and 3 also provide flow rates and stormwater treatment volumes for each redevelopment area for Alternatives 1 and 3 and the No Action Alternative, respectively. (Results for Alternative 2 are similar to Alternative 1 due to similar basin size and conveyance system configuration. Alternative 2 will have slightly lower flow rates because of its less dense redevelopment; therefore flows were not modeled for Alternative 2.)

Each outfall structure flow rate was estimated by correlating the flow rates for each redevelopment area with the percentage of land area in each outfall's basin. Tables 4, 5, and 6 provide the breakdown of land area in each redevelopment area in each outfall basin and the flow rates and volumes at each outfall for Alternatives 1 and 3 and the No Action Alternative, respectively. Outfalls will be designed to accommodate the design storm flow rates to prevent any conveyance problems, localized flooding, and scouring of the waterway and bay.

3.3 ALTERNATIVE 1 (HIGHER DENSITY ALTERNATIVE) AND ALTERNATIVE 2 (MEDIUM DENSITY ALTERNATIVE)

2016

It is assumed that the permanent stormwater system will be in place in all areas by 2016. Site development in 2016 will have less impervious area than the 2026 condition with correspondingly smaller runoff flow rates and water quality treatment volumes. Therefore this analysis focuses on the 2026 buildout period.

The Encogen plant is assumed to remain in operation in 2016 with stormwater runoff management remaining under the present operating conditions.

3.3.1 Area 1

The permanent stormwater system for this area is based on the three roads (C Street, H Street, and Hilton Street) that divide the site. A new outfall is proposed at the west end of each road; Outfall F on C Street, Outfall G on F Street, and Outfall H on Hilton Street – see Figure 3. The site will be graded to enable the runoff from the east side of the site to gravity drain west to the outfalls. Figure 6 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall, respectively.

3.3.2 Area 2

Stormwater runoff from this area is divided into Drainage Basins A and B. The site will be graded to enable the runoff from the majority of the area to gravity drain east and north to Outfall A, with the smaller western portion graded to drain west to Outfall B (the Laurel Street outfall) – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.3 Area 3

Stormwater runoff from this area is in Drainage Basin B. The site will be graded to enable the runoff to gravity drain west to Laurel Street and Outfall B (the Laurel Street outfall) – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.4 Area 4

Stormwater runoff from this area is divided into Drainage Basins B and C. The site will be graded to enable the runoff from the majority of the area to gravity drain east to Laurel Street and north to Outfall B, with the smaller western portion graded to drain west to Outfall C – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.5 Area 5

With the relocation of the railroad tracks, stormwater runoff from Area 5 is assumed to be conveyed north and split into Drainage Basins A and B. The site will be graded to enable the runoff from the majority of the area to gravity drain toward Laurel Street and north to Outfall B. The northeastern corner of the area will be graded to enable the runoff to drain north to

Commercial Street where it will be routed to Outfall A – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.6 Area 6

Like Area 5, the removal of the railroad tracks will enable a portion of this area to drain north. Stormwater runoff from this area will be split into Drainage Basins C and E. The site will be graded to enable the runoff from the eastern portion of the area to gravity drain north to Outfall C. The western portion of the site will be graded to drain south to a new Cornwall Avenue storm main. This main will discharge at Outfall E – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.7 Area 7

Stormwater runoff from this area will be split into Drainage Basins B and E. Without the railroad tracks, the eastern portion of this area can be more efficiently graded to the Laurel Street storm system and north to Outfall B. The western two-thirds will be graded north and captured by the new Cornwall Avenue conveyance pipe and routed west to Outfall E – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.8 Area 8

Area 8 contains contaminated soils. Therefore to avoid major soil excavations this area is assumed to be built up to construct the storm system at existing grade with final grade a minimum of two to three feet higher. Stormwater runoff from this area will be split into Drainage Basins B, C, and E. Without the railroad tracks, the southern portion of this area can be more efficiently graded to Outfall C and a small portion to the Laurel Street storm system and north to Outfall B. The southwest corner of the area will be graded south, captured by the new Cornwall Avenue conveyance pipe, and routed west to Outfall E – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.9 Area 9

As this area is redeveloped and stormwater treatment is provided for runoff, it is assumed that a new stormwater conveyance system will be installed. This new system will consolidate the existing Outfalls 5 and 6 (see Figure 1A) into a new structure at Outfall 5 (Outfall D). Outfall 7 will be eliminated and runoff from the southern portion of the area will be redirected south to the new Cornwall Avenue system and routed to Outfall E – see Figure 4. Figure 7 provides a potential grading plan based on the assumed drainage system. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.3.10 Area 10

Runoff from Area 10 will not be routed to an outfall structure. Runoff is assumed to either sheet flow into the bay or will be collected and released though dispersion trenches located above the ordinary high water elevation – see Figure 3 for the storm plan and Figure 6 for the assumed grading plan. Tables 1 and 4 provide a breakdown of the redevelopment area ground cover and flow rates for this area.

3.4 ALTERNATIVE 3 (LOWER DENSITY ALTERNATIVE)

2016

As discussed in Section 3.3, the same assumptions for the infrastructure at 2016 apply to Alternative 3. Therefore it is assumed that the permanent system will be in place in all areas by 2016. The Encogen plant is assumed to remain in operation in 2016 with stormwater runoff management remaining under the present operating conditions.

3.4.1 Areas 1, 2, 3, 4, 9, and 10

The assumed conveyance system, drainage basin configuration, and outfall location for these areas remains unchanged with the Alternative 1 system. The only stormwater related differences between these alternatives in these areas is the ground cover condition. Alternative 3 has a different distribution of pervious, pollution generating surfaces, and non-pollution generating surfaces based on its lower density development. The stormwater runoff rates and volumes differ from the Alternative 1 results based on this varying distribution.

Figures 3 and 5 show the stormwater conveyance system and outfall locations for Alternative 3. Tables 2 and 5 provide a breakdown of each redevelopment area's ground cover and flow rates at each outfall, respectively. Figures 7 and 8 provide a potential grading plan based on the assumed drainage system.

3.4.2 Area 5

Without the relocation of the railroad tracks, stormwater runoff from Area 5 is assumed to be conveyed south into Drainage Basins E. This area will be graded to enable the runoff to gravity drain toward Cornwall Avenue and its new conveyance system – see Figure 5. Figure 8 provides a potential grading plan based on the assumed drainage system. Tables 2 and 5 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.4.3 Area 6

As in the existing condition, the railroad tracks define the boundary between basins. The runoff on the north side of the track will continue to flow north and the south side runoff will continue to flow south. Stormwater runoff from this area is in Drainage Basin E. The site will be graded to enable the area to gravity drain south and west to Outfall E – see Figure 5. Figure 8 provides a potential grading plan based on the assumed drainage system. Tables 2 and 5 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.4.4 Area 7

Stormwater runoff from this area is in Drainage Basin E. The area will be graded to slope north and runoff will be captured by the new Cornwall Avenue conveyance pipe and routed west to Outfall E – see Figure 5. Figure 8 provides a potential grading plan based on the assumed drainage system. Tables 2 and 5 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.4.5 Area 8

Stormwater runoff from this area is divided into Drainage Basins C and E. The site will be graded such that the majority of the runoff will drain north to Outfall C. The southwest corner of the area will be graded south, with flows captured by the new Cornwall Avenue conveyance pipe and routed west to Outfall E – see Figure 5. Figure 8 provides a potential grading plan based on the assumed drainage system. Tables 2 and 5 provide a breakdown of the redevelopment area ground cover and flow rates at each outfall.

3.5 NO ACTION ALTERNATIVE

As discussed in Section 3.2.2, the No Action Alternative assumes that the site will be redeveloped as it is currently zoned for industrial use. A centralized stormwater system similar to Alternative 3 is assumed with the same drainage basin configuration and outfall locations. The only stormwater related differences between these alternatives is the assumed ground cover condition. Alternative 3 has a different distribution of pervious, pollution generating surfaces, and non- pollution generating surfaces based on its lower density development than the No Action Alternative. The stormwater runoff rates and volumes differ from the Alternative 3 results based on this varying distribution.

Figures 3 and 5, shared with Alternative 3, show the stormwater conveyance system and outfall locations for the No Action Alternative. Tables 3 and 6 provide a breakdown of each redevelopment area's ground cover and flow rates at each outfall, respectively. Figures 6 and 8, shared with Alternative 3, provide a potential grading plan based on the assumed drainage system.

3.6 INDIRECT/CUMULATIVE IMPACTS

None anticipated.

4.0 MITIGATION MEASURES

Construction Impacts:

- A specific stormwater design plan will be prepared for each future redevelopment project that addresses the 10 Minimum Requirements for construction.
- A Stormwater Pollution Prevention Plan (SWPPP) will be prepared and implemented as required by the NPDES permit and would be updated as warranted. The plan will contain specific best management practices for each construction season.

- Water quality degradation from erosion and sedimentation and the release of pollutants during construction will be minimized through the use of BMPs. Construction BMPs could include the use of silt fencing, barrier berms, plastic covering for exposed ground, sediment traps, check dams and temporary detention basins. To ensure effectiveness of the construction BMPs, regular maintenance would be performed as required.
- Additional BMPs could include cleaning heavy equipment, trucks and tires before they are allowed to drive off-site. Regular preventative maintenance of vehicles would be conducted to minimize leaks of fuel, oil, grease, hydraulic fluid, and other hydrocarbons during construction. Appropriate construction BMPs for the construction projects would be determined based on final engineering plans and would comply with the City of Bellingham's Drainage Ordinance, stormwater management standards and other regulatory requirements. This would include preparation of a Temporary Erosion and Control Plan (TESCP) that would be put in place prior to construction.

Operational Impacts

- Impacts from operation would be mitigated by implementing an appropriate combination of stormwater management measures and BMPs. These would include stormwater management facilities that would safely route runoff to receiving waters without creating additional erosion or sedimentation. These facilities would also use oil/water separators to trap potential pollutants.
- Design of proposed stormwater drainage system and facilities including conveyance and outfall structure sizing, will comply with all City of Bellingham's Drainage Ordinance and design standards and the DOE Manual.
- A Stormwater Operation and Maintenance Plan will be provided.

5.0 SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS

- None anticipated.

6.0 REFERENCES

Drawings

Burlington Northern Railroad Co., City of Bellingham, To Accommodate A New Car Cleaning Facility Rearrange Trackage, Sheets 1-5, August 20, 1991

City of Bellingham, Waterfront Development Project, Sheet 1/1, January 19, 2006

City of Bellingham, Record Drawing, Laurel Street Storm Sewer, Sheet 1/1, March 18, 1996

City of Bellingham, Hill Section Storm Sewer, Sheets 2 & 11, February 20, 1963

City of Bellingham, Industrial Water Supply Pipeline Phase II: Woburn Street to Georgia-Pacific, Site Plan, Georgia-Pacific Connection, Straam Engineers, Inc., Sheet 1/1, April 4, 1980

City of Bellingham, Industrial Water Supply Pipeline Phase II, Straam Engineers, Inc., Sheets B-0, B-1, B-2, B-10, February 1981

City of Bellingham, Record Drawing, Roeder Avenue South Connector, Tudor Engineering Company, Sheets C-3 and C-7, November 7, 1988

Encogen Northwest, L.P., Approved Drawings, Cornwall Storm Replacement, Storm Drain Plan and Profile, Ebasco Services Incorporated, Sheets 1 and 2, August 24, 1992

Federal Emergency Management Agency (FEMA) flood insurance rate maps for Bellingham, Map Numbers 53073C 1651D and 53073C 1213D, January 16, 2004

Georgia – Pacific Corporation, Approved Drawing, "C" Street Sanitary Sewer Extension, For Aeration Compressor Bldg., Sheet B-5106, January 2, 1979

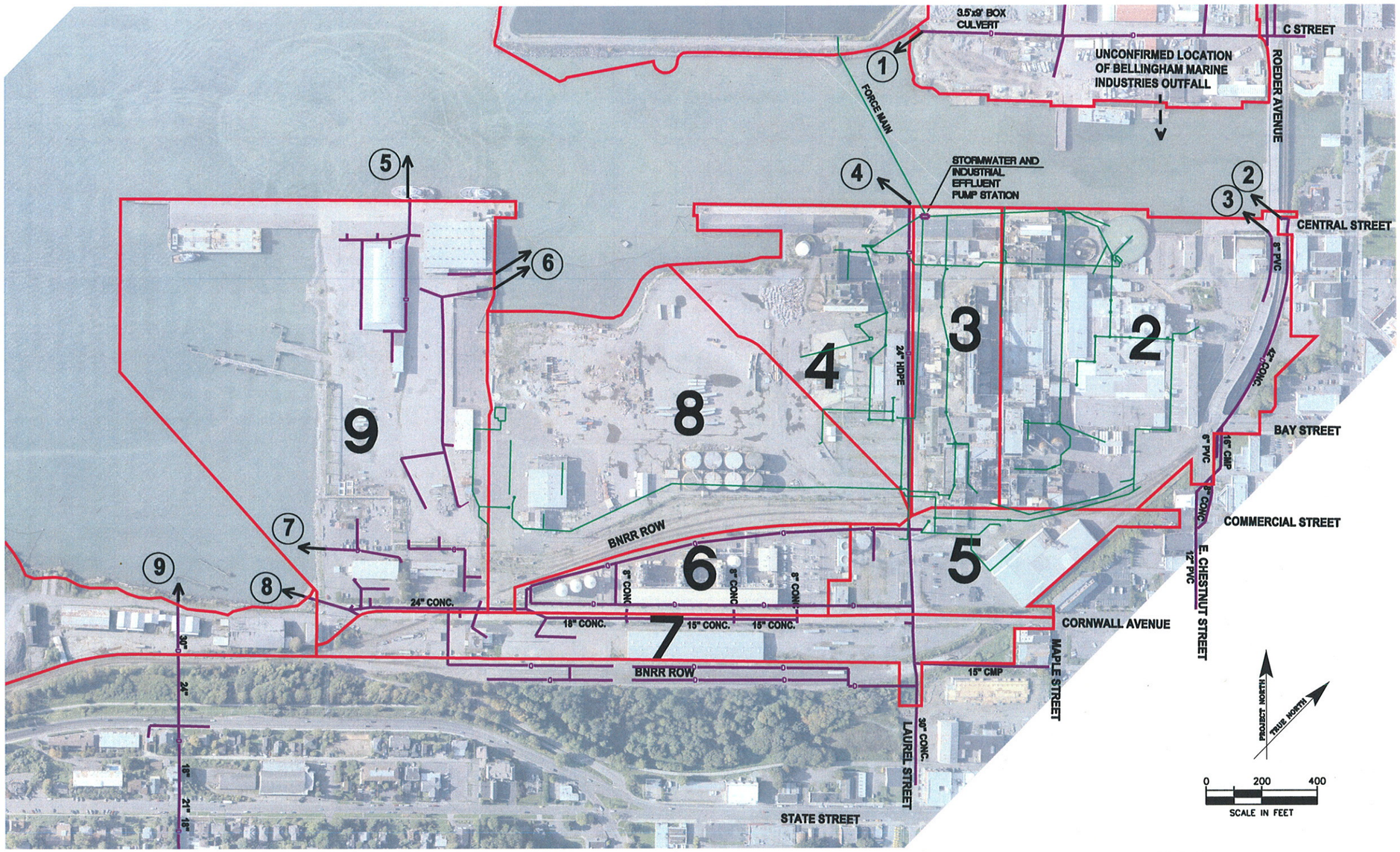
Georgia Pacific-Tissue Warehouse, Record Drawings, Civil Improvements Storm Drainage Plan, David Evans and Associates, Inc., Sheet C6.0, February 8, 2000

Western Washington University, Storm Drainage Profiles, Utilities Extension, James B. Notkin & Assoc., Sheets 2 and 3, July 28, 1961

Calculations

Encogen Northwest, L.P., Calculations, Grading and Drainage Design, Ebasco Services Incorporated, Sheet 1/1, August 6, 1991

Encogen Northwest, L.P., Calculations, Sheet 1/1, October 29, 1991



LEGEND

- STORM DRAIN LINE
- REDEVELOPMENT AREA BOUNDARY
- (2) OUTFALL STRUCTURE
- COMBINED STORM AND WASTEWATER LINES

NO.	REVISIONS:	APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

EXISTING STORM SYSTEM AREAS 2-9

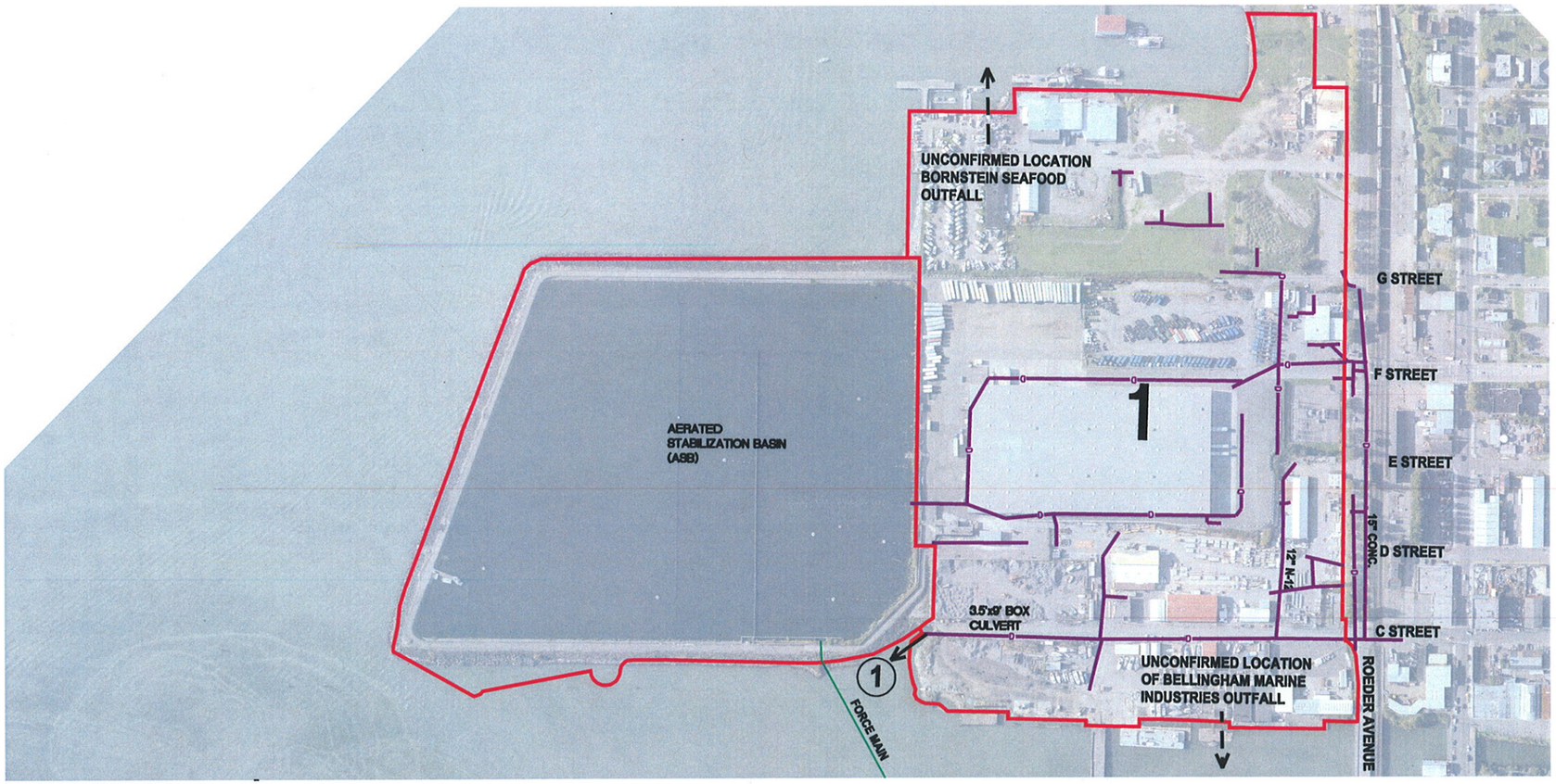
PROJECT NUMBER: CWOE0002

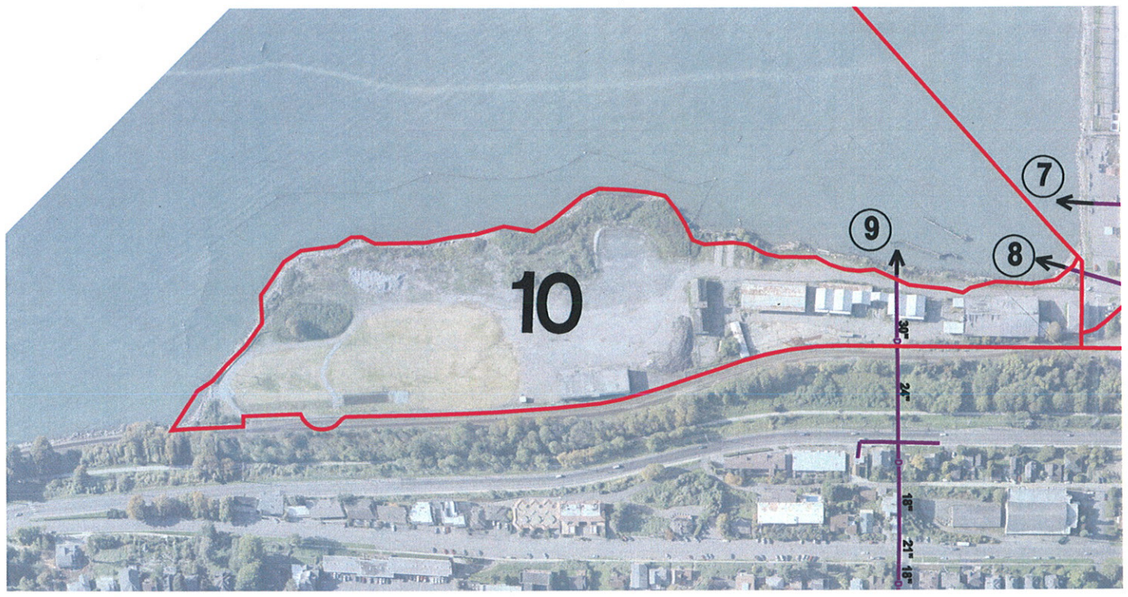
DATE: 12-07-07
DESIGN: MJD
DRAWN: HJC
CHECKED:

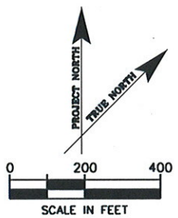
SCALE: AS NOTED

SHEET NO. 1A

OF







LEGEND

- STORM DRAIN LINE
- REDEVELOPMENT AREA BOUNDARY
- (2) OUTFALL STRUCTURE

NO. REVISIONS: APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

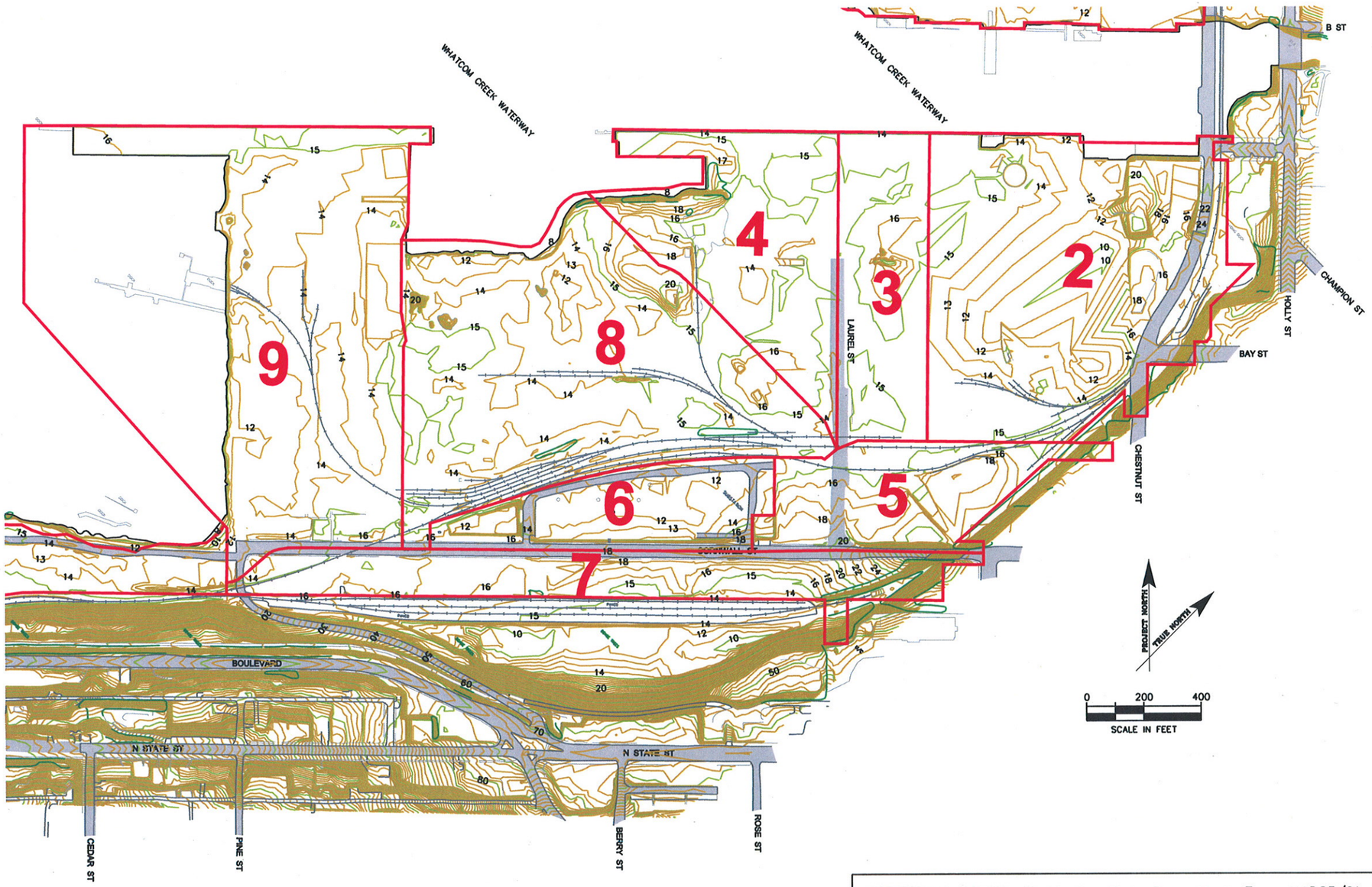
EXISTING STORM SYSTEM AREAS 1 AND 10

PROJECT NUMBER: CWOE0002

DATE: 12-07-07
DESIGN: MJO
DRAWN: MJO/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO. 1B OF



HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)
	For City of Bellingham Datum, add 1.72 feet
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet

NO. REVISIONS: APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

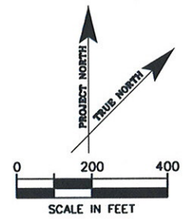
EXISTING TOPOGRAPHY
REDEVELOPMENT AREAS 2-9

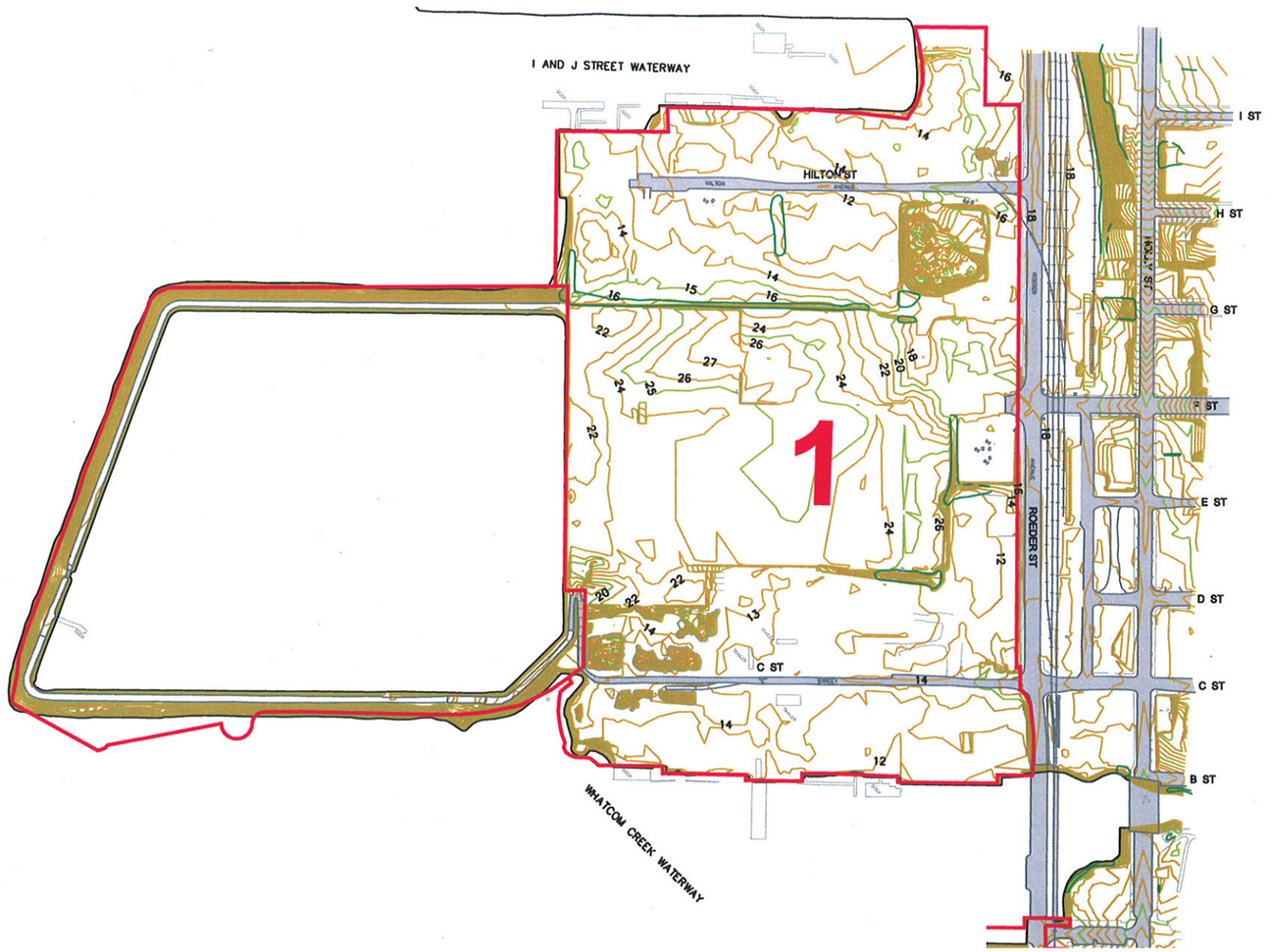
PROJECT NUMBER: CWOE0002

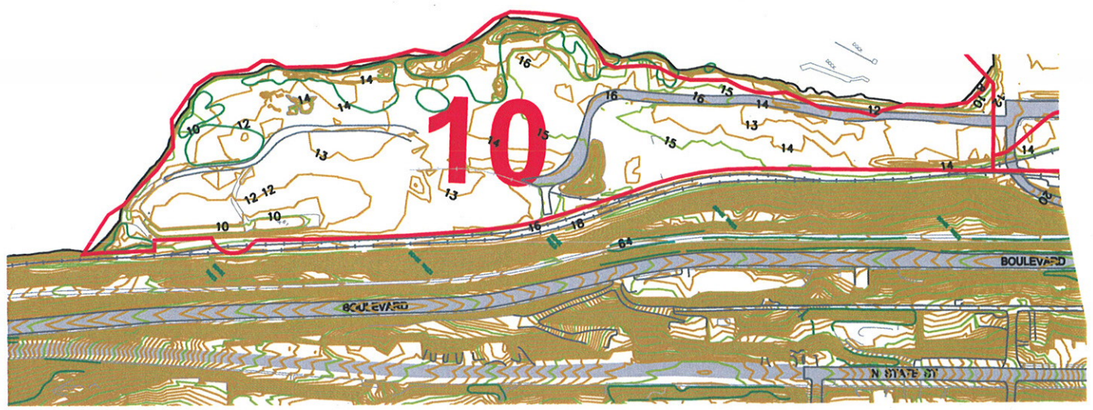
DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA
CHECKED:

SCALE: 1"= 200'

SHEET NO. 2A OF







HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet	
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)	
	For City of Bellingham Datum, add 1.72 feet	
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet	

NO.	REVISIONS:	APP'D.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

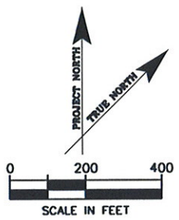
EXISTING TOPOGRAPHY
REDEVELOPMENT AREAS 1 AND 10

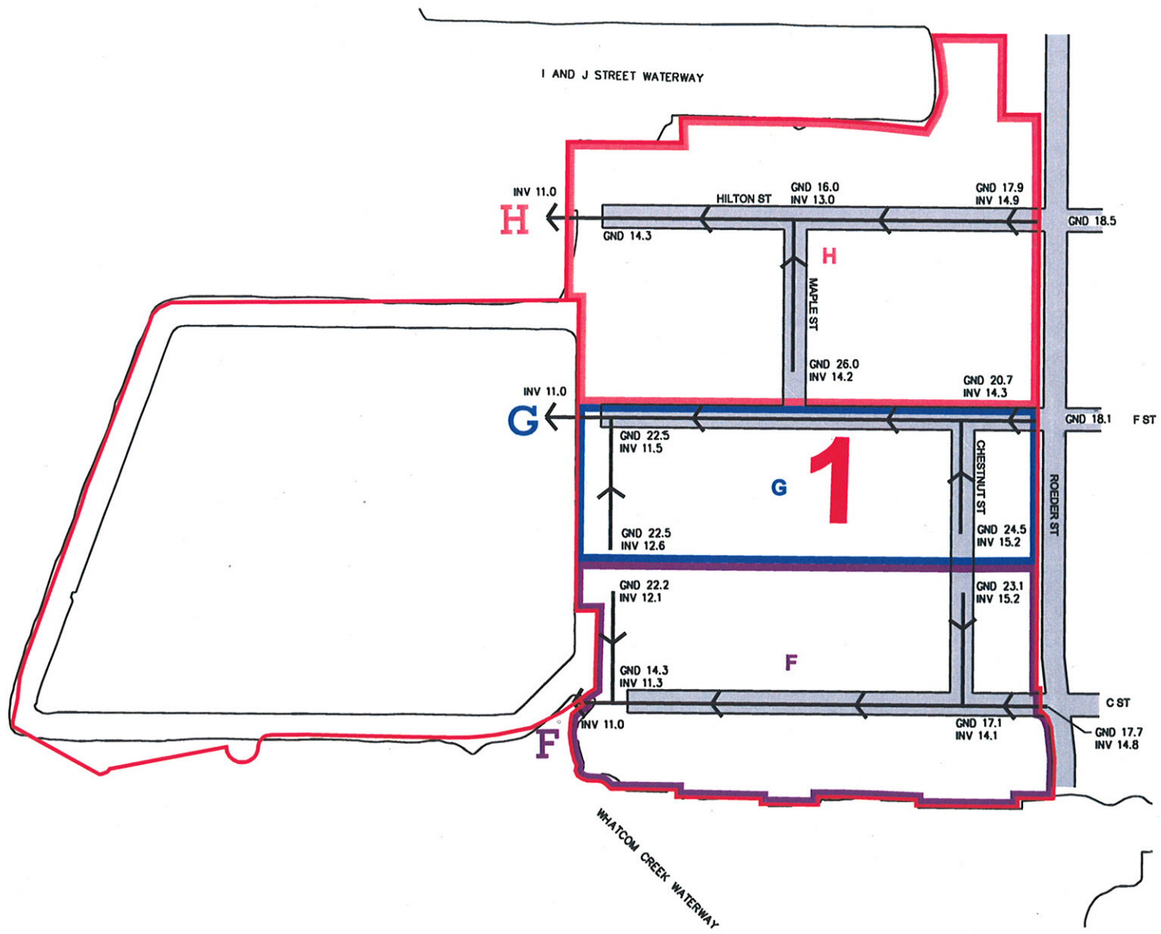
PROJECT NUMBER: CWOE0002

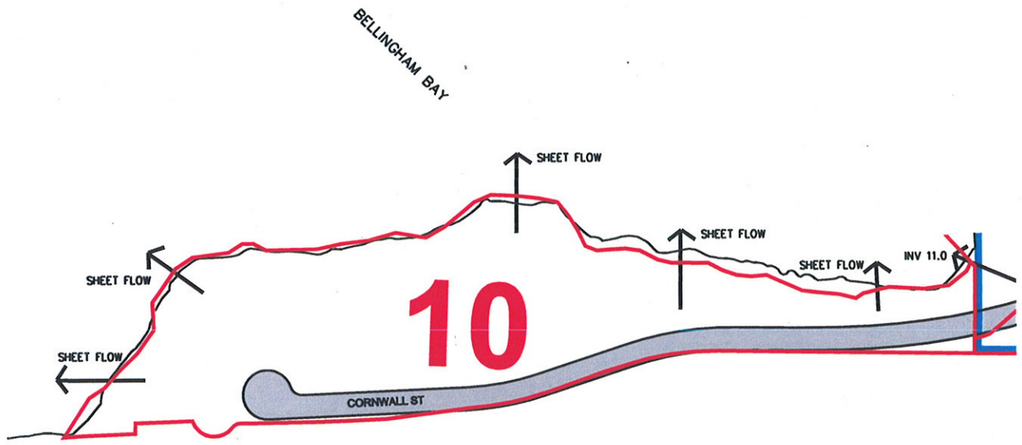
DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO.
2B
OF







GND XX.X FUTURE GROUND ELEVATION
INV XX.X PIPE INVERT ELEVATION BASED ON PIPES AT 0.3% SLOPE

HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)
	For City of Bellingham Datum, add 1.72 feet
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet

NO. REVISIONS: APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

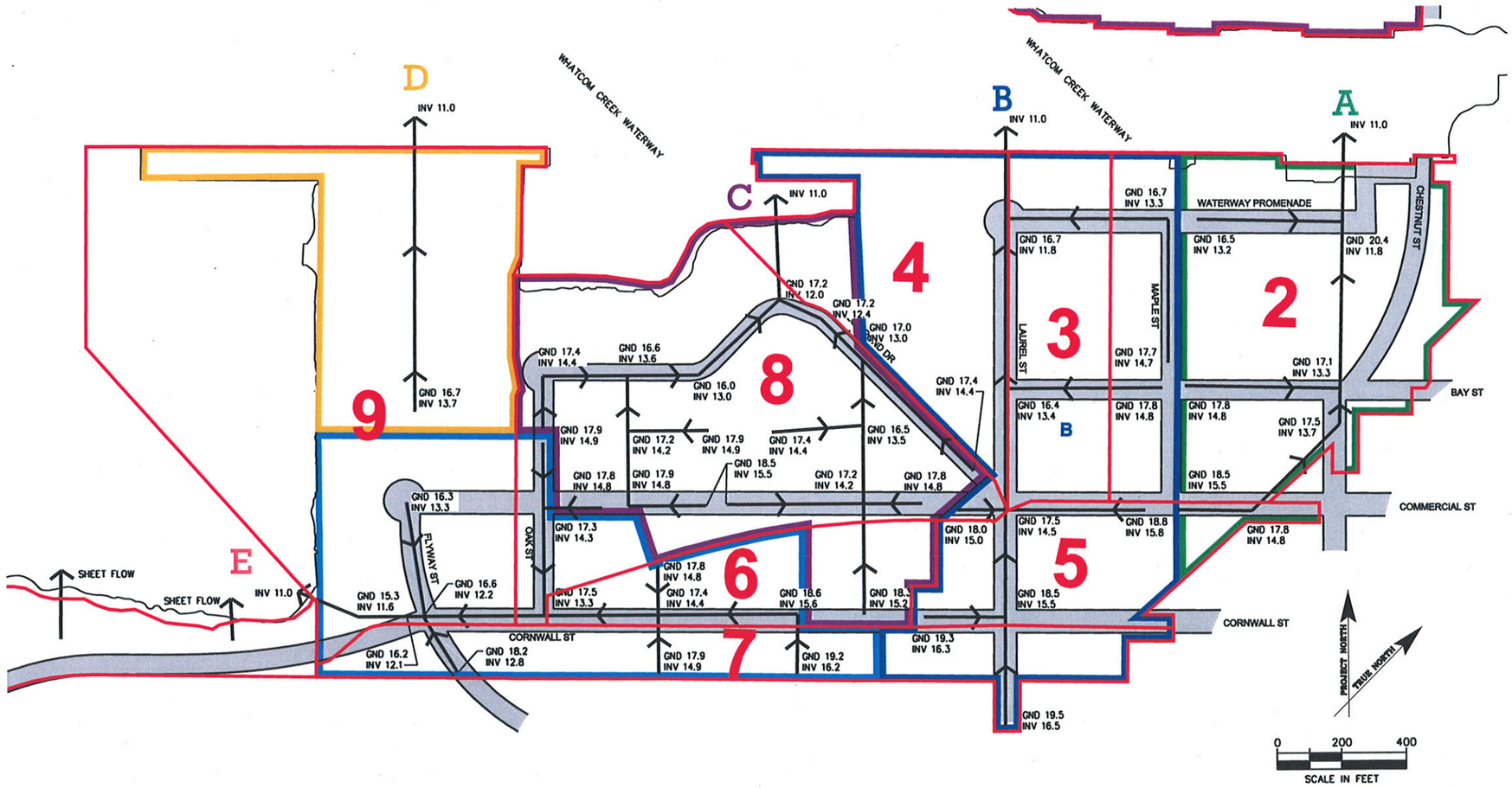
CONCEPTUAL STORM DRAIN PLAN - AREAS 1 & 10
ALTERNATIVES 1 - 3, NO ACTION ALTERNATIVE

PROJECT NUMBER: CWOE0002

DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO. 3 OF



GND XX.X FUTURE GROUND ELEVATION
INV XX.X PIPE INVERT ELEVATION BASED ON PIPES AT 0.3% SLOPE

HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)
	For City of Bellingham Datum, add 1.72 feet
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet

NO. REVISIONS: APPD.

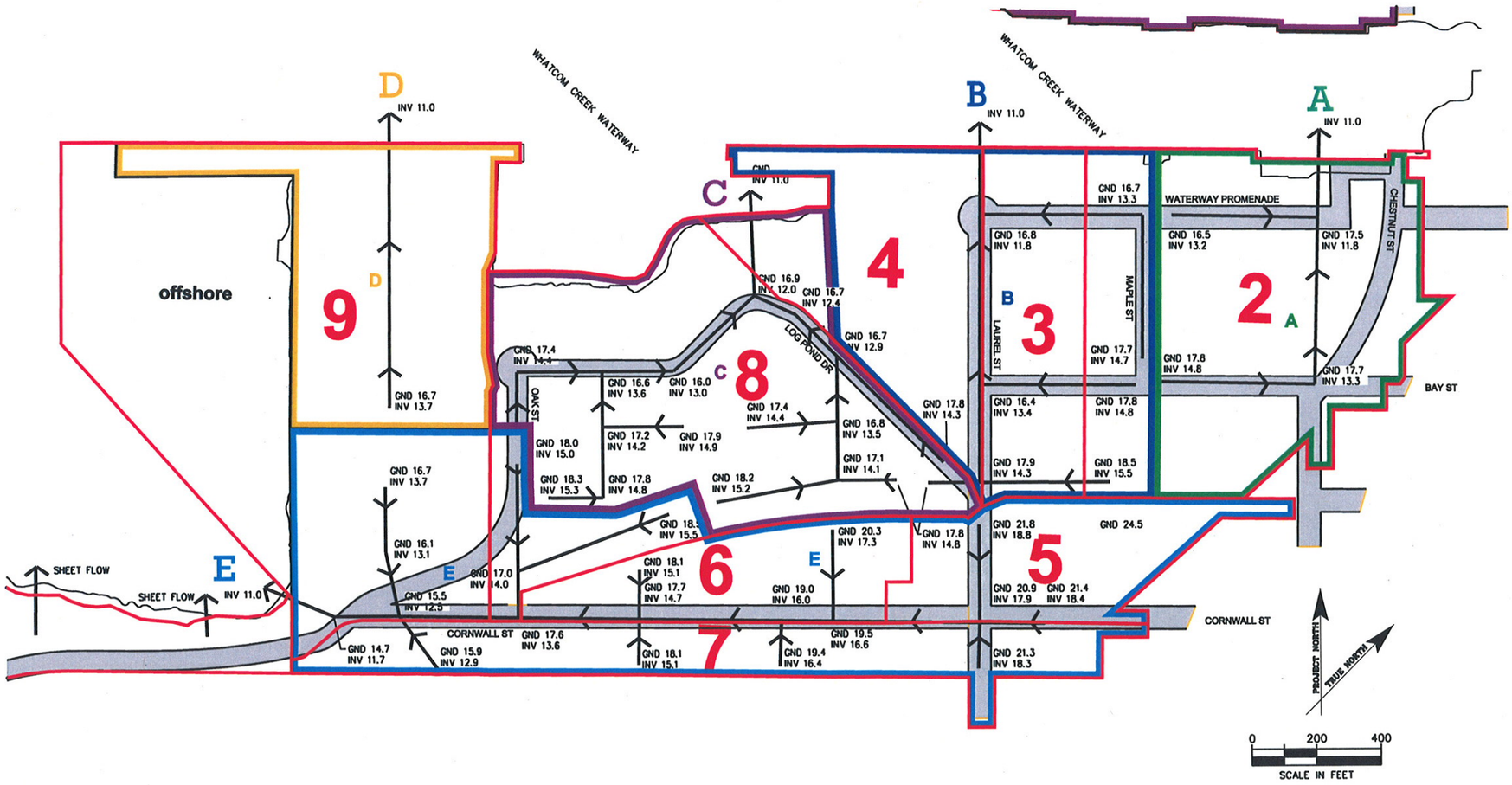
DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

CONCEPTUAL STORM DRAIN PLAN - AREAS 2-9
ALTERNATIVES 1 AND 2

PROJECT NUMBER: CWOE0002
DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:
SCALE: 1"= 200'
SHEET NO. 4
OF



GND XX.X FUTURE GROUND ELEVATION
INV XX.X PIPE INVERT ELEVATION BASED ON PIPES AT 0.3% SLOPE

HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)
	For City of Bellingham Datum, add 1.72 feet
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet

NO. REVISIONS: APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

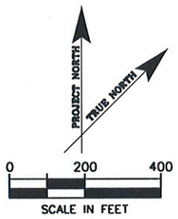
CONCEPTUAL STORM DRAIN PLAN - AREAS 2-9
ALTERNATIVE 3, NO ACTION ALTERNATIVE

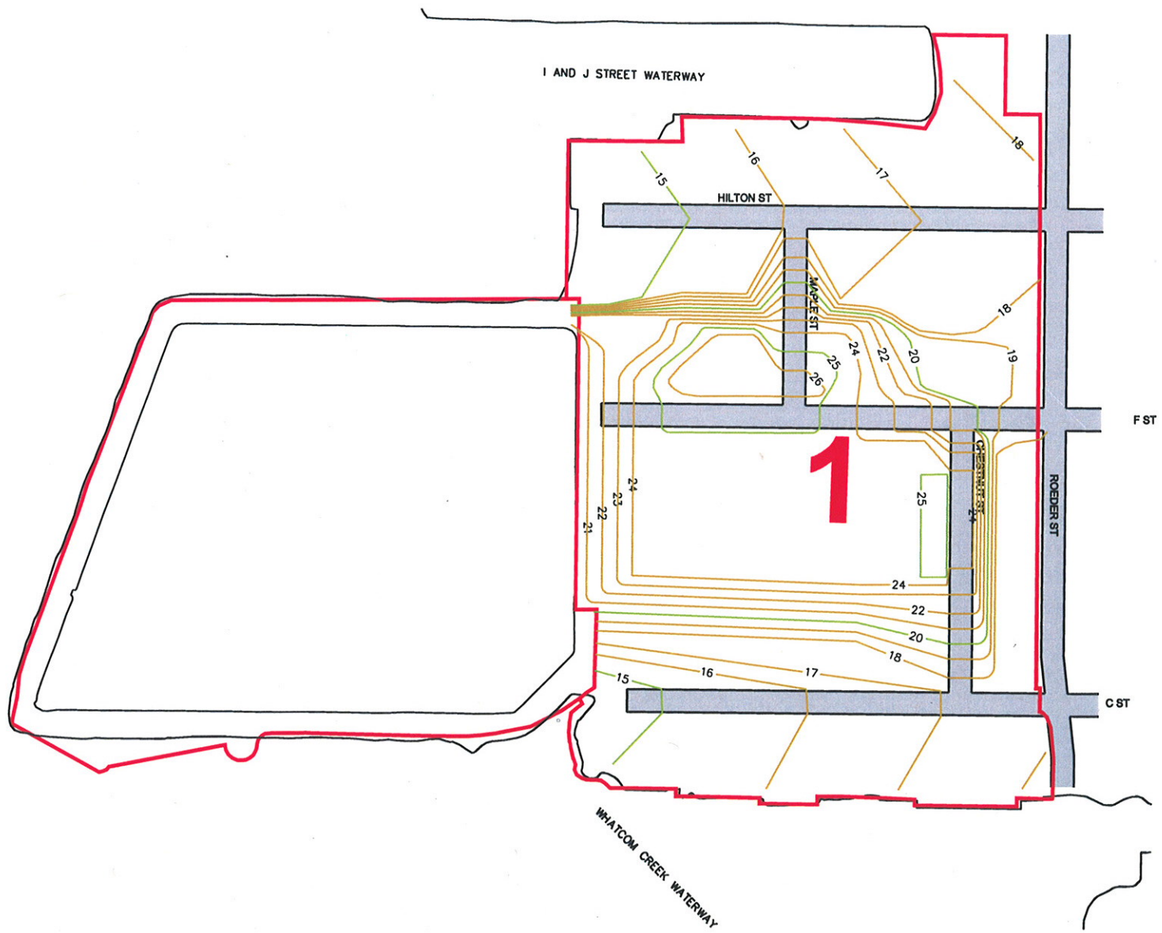
PROJECT NUMBER: CWOE0002

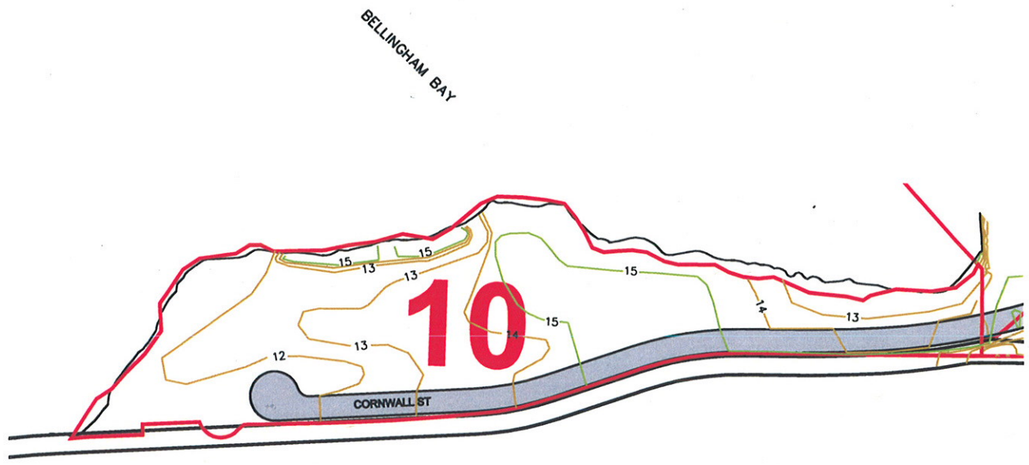
DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO. 5 OF







HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet	
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)	
	For City of Bellingham Datum, add 1.72 feet	
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet	

NO.	REVISIONS:	APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

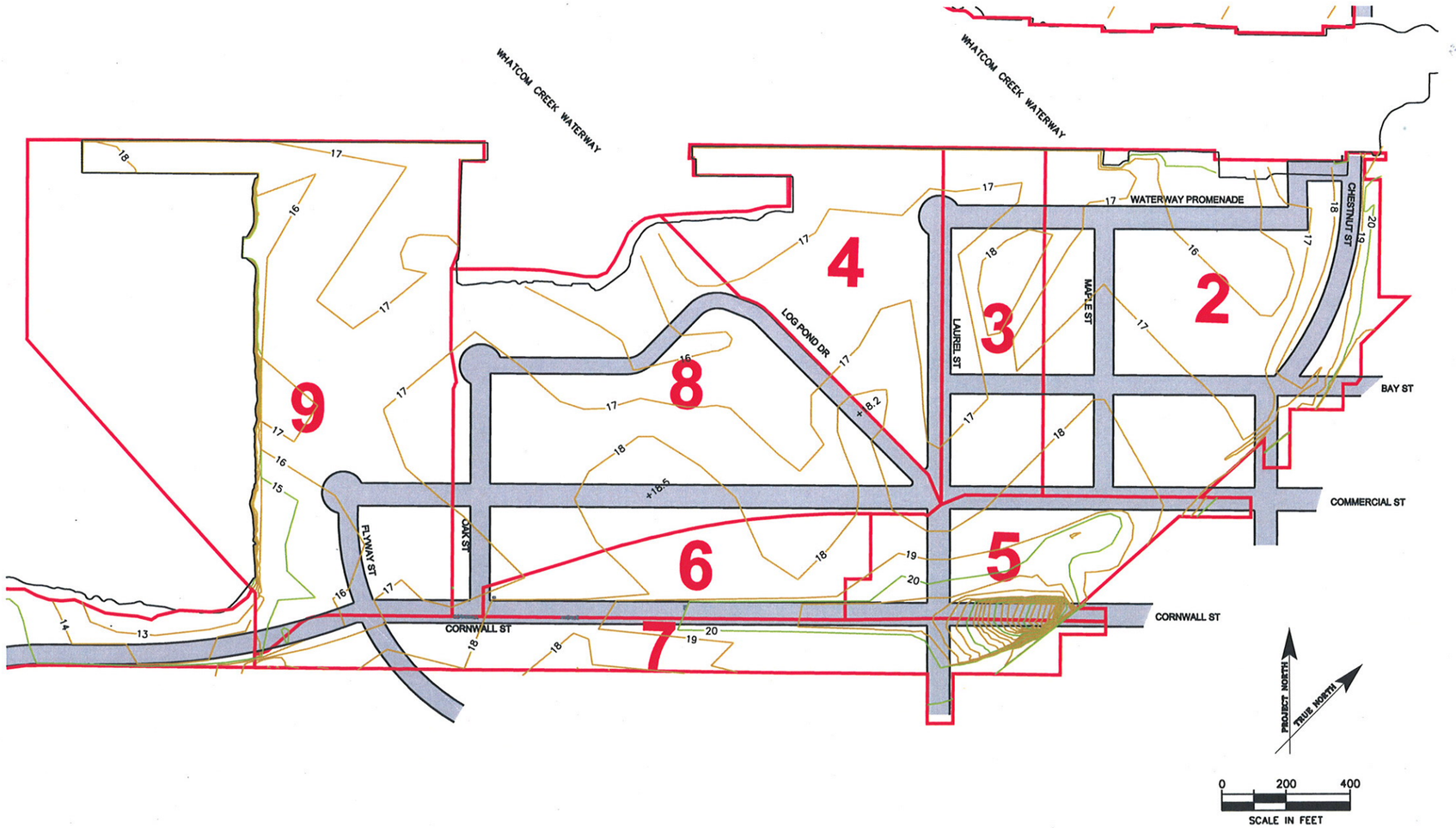
CONCEPTUAL GRADING PLAN - AREAS 1 & 10
ALTERNATIVES 1 - 3, NO ACTION ALTERNATIVE

PROJECT NUMBER: CWOE0002

DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO. 6 OF



HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet	
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)	
	For City of Bellingham Datum, add 1.72 feet	
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet	

NO. REVISIONS: APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

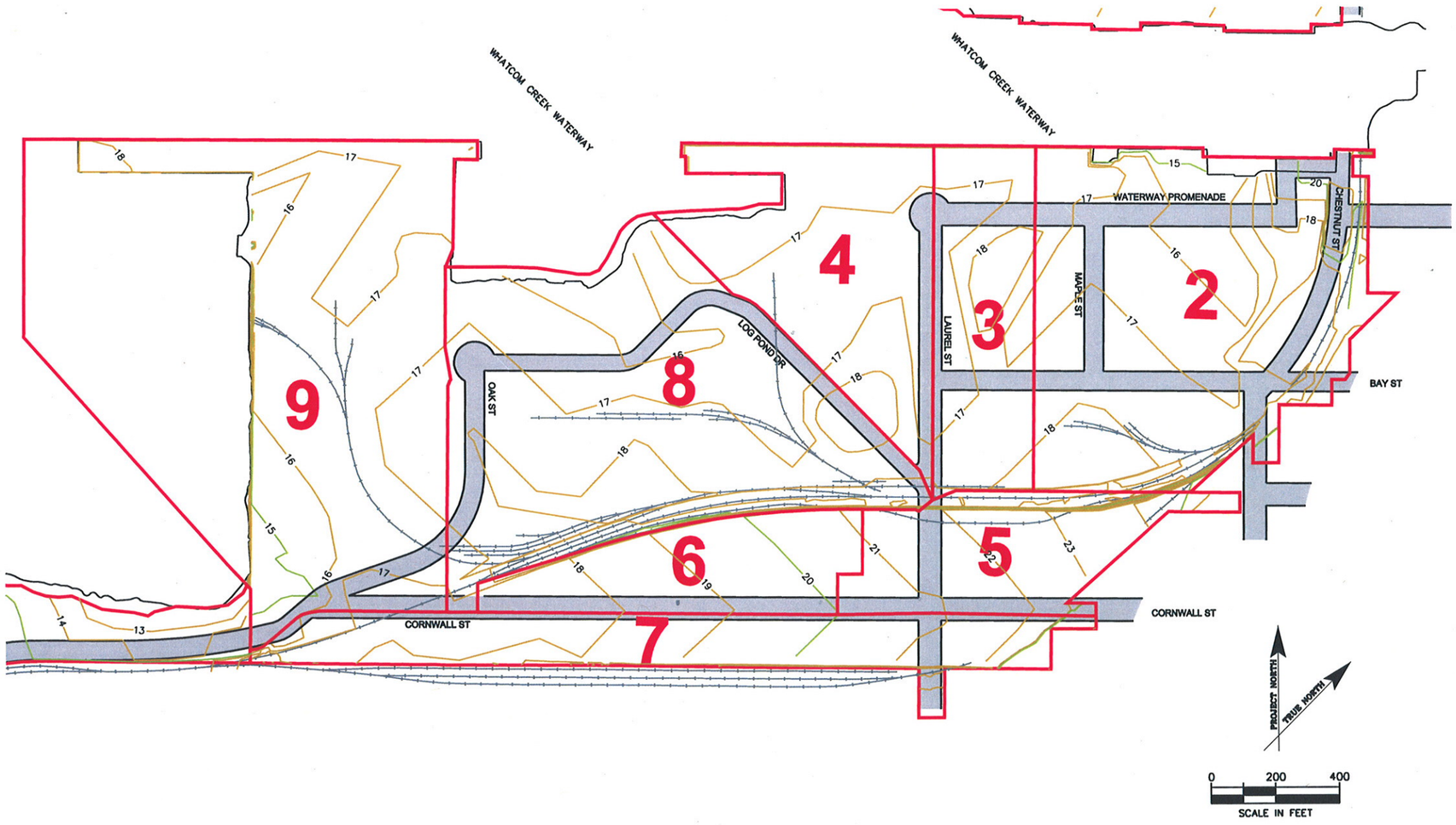
CONCEPTUAL GRADING PLAN - AREAS 2-9
ALTERNATIVES 1 AND 2

PROJECT NUMBER: CWOE0002

DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO. 7 OF



HORIZONTAL DATUM:	Washington State Plane North Zone, NAD83/91, US Feet	
VERTICAL DATUM:	North American Vertical Datum 1988 (NAVD88)	
	For City of Bellingham Datum, add 1.72 feet	
	For NGVD 1929 Datum (FEMA), subtract 3.93 feet	

NO.	REVISIONS:	APPD.

DAVID EVANS AND ASSOCIATES INC.
119 Grand Avenue, Suite D
Bellingham Washington 98225
Phone: 360.647.7151
Fax: 360.647.7160

PORT OF BELLINGHAM
BELLINGHAM, WA

NEW WHATCOM REDEVELOPMENT

CONCEPTUAL GRADING PLAN - AREAS 2-9
ALTERNATIVE 3, NO ACTION ALTERNATIVE

PROJECT NUMBER: CWOE0002

DATE: 12-07-07
DESIGN: MJD
DRAWN: JXWA/HJC
CHECKED:

SCALE: 1"= 200'

SHEET NO. 8 OF