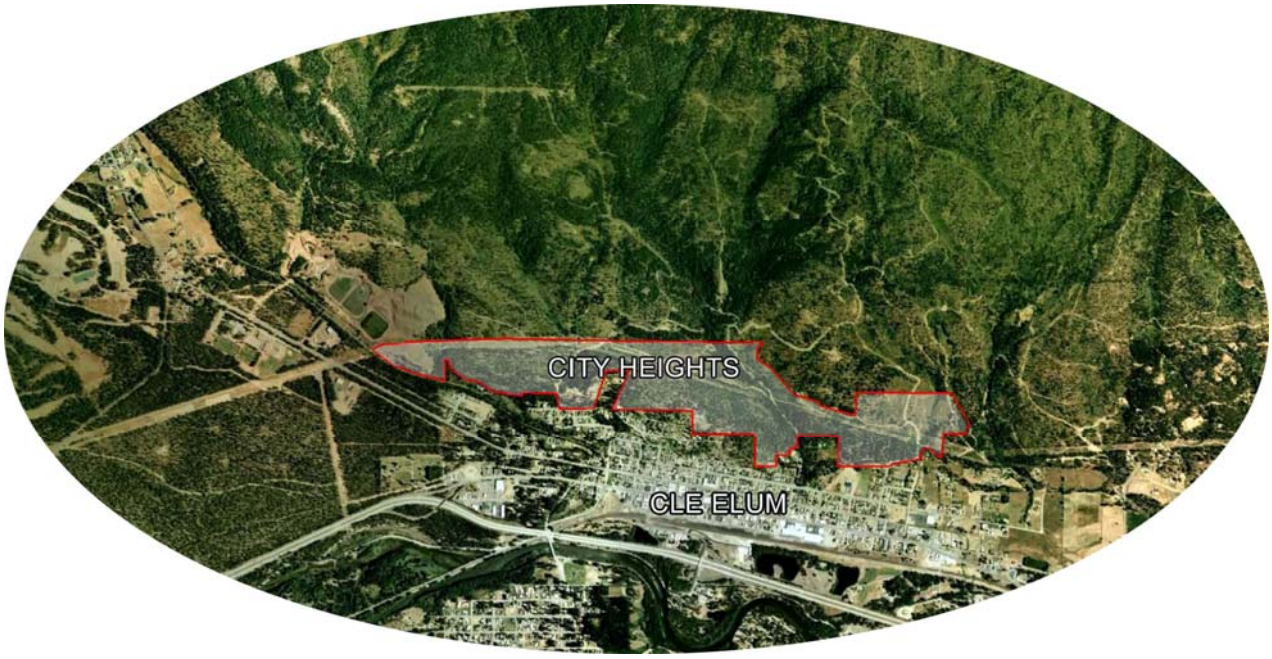
CITY HEIGHTS, CLE ELUM

GRADING, DRAINAGE, AND UTILITIES TECHNICAL ENGINEERING REPORT



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Encompass
ENGINEERING & SURVEYING
108 East 2nd Street
Cle Elum, WA 98922
Tel. 509.674.7433
Fax. 509.674.7419

Grading, Drainage and Utilities Technical Engineering Report

March 24, 2010

Prepared For:

Green Canyon, LLC/Highmark Resources, LLC/Cooper Pass, LLC
206 West 1st Street
Cle Elum, WA 98922
Tel: (509) 674-6828

Prepared By:

Encompass Engineering & Surveying
108 East 2nd Street
Cle Elum, WA 98922
Tel: (509) 674-7433
Fax: (509) 674-7419

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1. PROJECT OVERVIEW

This report documents existing site conditions and provides analysis and objectives of the proposed clearing and grading proposal, stormwater management and utility infrastructure options for the City Heights Planned Mixed-Use Development. Included in this report are calculations and analysis of projected impacts associated with four conceptual land use alternatives and the No Action Alternative, with discussion of proposed and other possible mitigation measures.

The 358-acre site of the City Heights Planned Mixed-Use Development is located within the urban growth area (UGA) north of the city limits of Cle Elum, in Kittitas County, Washington. The site is within an upland region above the Yakima River valley, on the south face of Cle Elum Ridge, bounded to the south by The Mine Heritage Trail, West 6th Street, West 5th Street, East Russ Street, North Montgomery Avenue, East 3rd Street, North Columbia Avenue, and West Cemetery Road, and to the north by undeveloped woodlands and former coal mine areas (see Figure 1.1).

1.1 Pre-Development Conditions

The City Heights site is located in an upland region above the Yakima River valley, on the south face of Cle Elum Ridge, approximately 0.7 mile north of the river. The project site lies on and above a 100-foot high slope oriented roughly parallel to the southern project site boundary that rises above the Yakima River flood plain. Topography within the project area is generally rolling in nature. Steep slopes present on the site are described in more detail in the Geological Hazards section of the *Preliminary Geology and Geotechnical Evaluation* (Aspect Consulting, LLC. 2009). Wetlands delineated on and adjacent to the project site are described in the *City Heights, City of Cle Elum, Critical Areas and Wildlife Habitat Report* (Sewall Wetland Consulting, Inc. 2009).

Historically, the project site area was used for coal mining. It is underlain in most places by underground coalmine workings 0 to 700 feet below ground surface (SubTerra, Inc. 2009). Mining began in the early 1890s and continued for approximately 60 years. During this period, at least three coal mines operated on portions of the project site, and approximately 19 million tons of coal was mined from a single, approximately 4- to 6-foot-thick coal seam. In the most recent history, the project site has been used primarily as open space for informal recreation, and for commercial timber production.

1.1.1 Geology and Soils

The City Heights site lies near the base of Cle Elum Ridge, on a limb of an asymmetric anticline in Tertiary-age sedimentary bedrock. Cle Elum Ridge, located within the upper Kittitas Valley, is one of several large synclinal structural basins within the Yakima Fold Belt. The presence of down-valley glacial deposits indicates that the entire site was glacially overridden. Based on previous studies, bedrock at the site is mapped as the non-marine sedimentary upper member of the Roslyn formation. Unconsolidated sediments, primarily consisting of bedrock residuum and glacial deposits, occupy most of the site. Bedrock residuum resulting from weathering of Roslyn Formation rocks overlies bedrock to varying depths. Glacial deposits up to 100 feet thick locally overly bedrock and bedrock residuum. Glacial deposits consisting of outwash, till and lacustrine are most evident in several low-gradient terraces that drape the lower elevations of

the bedrock slope. Other geologic units include minor alluvium occupying local drainage bottoms and artificial fill at the western end of the site. Several tectonic structures are present in the site vicinity. No faults are mapped or observed on the site. The *Preliminary Geology and Geotechnical Evaluation for Proposed City Heights Development, Cle Elum, Washington* (Aspect Consulting, LLC, 2009) provides additional information on site soils and geology.

The only existing utility on the site is the high-voltage electric transmission lines in the BPA and PSE easements that cross the northern and central portion of the property (see Figure 1.1).

1.2 Post-Development Conditions

Five conceptual land use alternatives are being evaluated in the City Heights Environmental Impact Statement (EIS). Appendix "A" shows conceptual land use plans for four development alternatives. The fifth alternative is No Action. Although each of the four development alternatives has a different allocation of uses, Alternatives 1, 2, and 3A would include:

- Residential neighborhoods with a mix of single-family detached homes, single-family attached dwelling units, and multi-family dwelling units
- Commercial areas
- Parks, recreational facilities, open space and trails (Alternative 3A would have only unimproved open space)
- Wetland areas to be preserved
- Roads and other possible public service sites
- Stormwater and utility infrastructure, including water, sewer, and franchise utilities.

Alternative 3B is envisioned to include all single-family detached homes; no commercial development; no improved parks, trails or open space; and rural utilities.

1.2.1 Alternative 1 – Preferred Alternative

The conceptual land use plan for the Preferred Alternative includes approximately 985 dwelling units of which approximately 70 percent would be single-family detached and 30 percent would be single–family attached units; approximately 20,000 square feet (SF) of neighborhood commercial development in two 10,000 SF locations on the site; approximately 155 acres of parks, open space, and public amenities, walking paths, hiking trails, and multi-use path/bike access; and onsite provisions for public services and utilities (e.g., water supply, wastewater collection, stormwater management facilities, electrical power and communications). The total estimated population of the post-development condition would be approximately 2,207 assuming all units were fully occupied. The total estimated student population in year-around dwelling units (d.u.) would be approximately 165. The project proponent estimates that 65 percent (approximately 640 d.u.) would be permanent occupancy, while 35 percent would be considered seasonal or second homes. Based on a City of Cle Elum request for the purpose of impact analysis, it is assumed that 90 percent of all dwelling units in any conceptual land use alternative would be permanently occupied, and 10 percent would be seasonal or second

homes.[1] Peak occupancy is anticipated during summer (Memorial Day through Labor Day), and during winter breaks (for any alternative).

Primary access to serve Alternative 1 would be provided across the Deneen property (to the west end of the development from SR 903), Summit View, Montgomery Avenue, and Columbia Avenue. The Deneen property access route would involve a bridge crossing of Crystal Creek and the Coal Mines Trail. Development under City land use regulations and development standards would be specified in a Development Agreement with the City. There would be one consistent set of Covenants, Conditions and Restrictions (CC&Rs) to be enforced by a Homeowner's Association.

1.2.2 Alternative 2 – Reduced Residential Density

The conceptual land use plan for the Reduced Residential Density Alternative includes approximately 875 dwelling units of which approximately 60 percent would be single-family detached and 40 percent would be are single–family attached units; approximately 40,000 square feet (SF) of neighborhood commercial development would occur in two 20,000 SF locations on the site; approximately 163 acres of open space would be preserved; one multi-use path would be provided; and onsite provisions would be made for other public services and utilities (e.g., water supply, wastewater collection, stormwater management facilities, electrical power and communications). There would be limited or no public amenities in the Alternative 2 development concept due to reduced resources compared to the Alternative 1 development concept. The total estimated population of the post-development condition would be approximately 1,943 assuming all units were fully occupied. The total estimated student population in year-around dwelling units (d.u.) would be approximately 111. The project proponent estimates that approximately 50 percent of homes in this alternative (approximately 440 d.u.) would be permanent occupancy, and 50 percent would be considered second homes (though for the purpose of impact analysis, it is assumed that these percentages would be 90 percent permanent occupancy and 10 percent seasonal occupancy).

Primary access to serve Alternative 2 would be provided from Alliance Road (to the west end of the development from SR 903), Summit View, Sixth Street, and Columbia Avenue. The Alliance Road route would involve an at-grade crossing of the Coal Mines Trail and an overcrossing of Crystal Creek. Both crossings already exist, and would need to be slightly widened. Montgomery Avenue (east end) would be used for emergency vehicle access only, with entrances at or near the powerline easements. Development under City land use regulations and development standards would be specified in a Development Agreement with the City. Similar to Alternative 1, there would be one consistent set of Covenants, Conditions and Restrictions (CC&Rs) to be enforced by a Homeowner's Association.

[1] For the purpose of impact analyses prepared for the EIS, the percentage of primary homes is higher (90 percent) than the project proponent's estimate described for each alternative in this section, due to the City's preference to anticipate the development of permanent-resident neighborhoods within City Heights.

1.2.3 Alternative 3A – No Annexation, Development within the County under Single Ownership

The conceptual land use plan for Alternative 3A would be essentially the same as Alternative 2, with approximately 875 dwelling units (d.u.) based on the 4 to 5 dwelling units per acre criteria in the Kittitas County Planned Unit Development (PUD) provisions. As with Alternative 2, Alternative 3A assumes approximately 60 percent single-family detached and 40 percent single–family attached units; and approximately 40,000 square feet (SF) of neighborhood commercial development in two 20,000 SF locations on the site. All open space (approximately 163 acres) would be unimproved in Alternative 3A, with no public amenities. There would be onsite provisions for public services and utilities (e.g., water supply, wastewater collection, stormwater management facilities, electrical power and communications). The total estimated population of the post-development condition would be approximately 1,943 assuming all units were fully occupied. The total estimated student population in year-around dwelling units would be approximately 111. The project proponent's estimate of permanent and seasonal occupancy with Alternative 3A is 50 / 50, although for the purpose of impact analysis, it is assumed that 90 percent of the dwelling units would be permanently occupied and 10 percent would be seasonal or second homes. Peak occupancy is anticipated during summer (Memorial Day through Labor Day), and during winter breaks (same for any alternative).

As with Alternative 2, primary access to Alternative 3A would be provided from Alliance Road (to the west end of the development from SR 903), Summit View, Sixth Street, and Columbia Avenue. The Alliance Road route would involve an at-grade crossing of the Coal Mines Trail and an overcrossing of Crystal Creek. Both of these crossings already exist but would need to be widened. Montgomery Avenue (east end) would be used for emergency vehicle access only, with entrances at or near the powerline easements. Development would be regulated by Kittitas County land use policies and development regulations. Given that Alternative 3A would also be developed under single ownership (like Alternative 1 or Alternative 2), there would be one consistent set of Covenants, Conditions and Restrictions (CC&Rs) to be enforced by a Homeowner's Association.

Sewage collection and treatment options to serve Alternative 3A would include on-site septic systems, an on-site Membrane Bioreactor (MBR) treatment plant, or connection to the City sewer system. Connection to the City's sewer system to serve Alternative 3A would need to be negotiated with and approved by the City of Cle Elum. It is not assured, since the site would be outside the City limits (though still within the City's Urban Growth Area). Water would be provided through individual exempt wells or community water systems through new water rights, and the site would be developed with a coordinated stormwater management system.

1.2.4 Alternative 3B – No Annexation, Development within the County under Multiple Ownerships

Under Alternative 3B, the property would be sold and developed in up to 17 individual parcels. There would be a possible rezone prior to sale to facilitate higher residential density than under existing zoning. Alternatively, some or most parcels would likely be developed under Kittitas County Planned Unit Development (PUD) regulations or Performance-based Cluster Plat criteria. It is estimated that the residential density under Alternative 3B would be approximately 500 lots. This alternative would not meet the objectives of the proposal or the urban residential density standards of the Washington State Growth Management Act.

Development would likely occur in a discontinuous pattern over a longer period of time if Alternative 3B were selected for implementation. Separate Covenants, Conditions and Restrictions (CC&Rs) might be developed for each parcel or group of parcels. It would be possible that there would be no CC&Rs for some parcels. The rezone of Tax Parcels 19165 or 493935 proposed under Alternative 1 or Alternative 2 would not be anticipated with Alternative 3B.

It is likely that site development in this scenario would consist of 100 percent single-family detached homes. There would be no open space, trail system, or public amenities, and no commercial development. The total estimated population with Alternative 3B would be approximately 1,150 assuming all units were fully occupied. Total estimated student population in year-around dwelling units (d.u.) would be approximately 68. The project proponent's estimate of permanent and seasonal occupancy with Alternative 3B is 50 / 50, although for the purpose of the impact analysis, it is assumed that 90 percent of the dwelling units would be permanently occupied, and 10 percent would be second homes. As with all other alternatives, it is assumed that peak occupancy would be anticipated during summer (Memorial Day through Labor Day), and during winter breaks.

There would be no guarantee of a coordinated road system with Alternative 3B. Road access or easements would be required to serve each parcel. Utilities would consist of on-site septic systems, with possible connection to the City sewer system, though less certain since the site would be outside the City limits. Water would be provided through individual exempt wells or community water systems through exempt wells or new water rights. There would be no coordinated stormwater management system.

1.2.5 Alternative 4 – No Action

If the City Heights Planned Mixed-Use Development did not proceed, there would be no need for the site preparation, stormwater management and utilities infrastructure described in this report until another development proposal was submitted at some future time. Based on the site zoning and Comprehensive Plan designation, it is presumed that the site would remain vacant and undeveloped until a Planned Mixed-Use Development could be successfully implemented. In the interim, there would be no developed utilities infrastructure on the property.

1.3 Phased Development

Northland Resources, LLC proposes to build-out the City Heights Planned Mixed-Use Development over a period of 6 to 12 years in response to market demand, and in response to the availability of public services and infrastructure required to accommodate this growth in the community. It is estimated that construction of the first phase could commence in 2011 with the first occupancy likely in 2012. At this rate, approximately 70 to 165 residential units per year would be built and made available for occupancy depending on the development alternative selected for implementation. The final determination of the phasing layout had not been conceptualized at the time of this writing. Full build-out is expected to be complete in the timeframe between 2018 and 2024.

Figure 1.1. Vicinity Map

Figure 1.2. Existing Site Conditions

Figure 1.3. Existing Site Conditions − Aerial Photograph

2. CLEARING AND GRADING PROPOSAL

This section describes potential earthwork, clearing and grading operations that would occur on-site to support the development; identifies potential impacts of the earthwork operations; and describes options to mitigate the following types of impacts:

- General earthwork activities for roadway construction
- General earthwork activities for utility construction
- General earthwork activities for stormwater facilities
- General earthwork activities to create suitable building/residential pads
- Clearing and grading in and around sensitive areas and slope protection
- Erosion and sediment control.

2.1 Existing Conditions

The existing 358-acre site has variable topography and landscape, shaped by the repeated advance and retreat of glaciers. This section describes existing topography, vegetation, soils and wetlands on the project site.

2.1.1 Topographic Relief

The City Heights site topography is generally rolling in nature, with slopes varying from 5 percent to 65 percent (see Figure 2.1). On-site slopes greater than 25 percent are primarily located in drainage courses and along the southern boundary; 60 percent slopes are primarily located in glacial deposits and residuum overlying bedrock on the west side of Greens Canyon (Deer Creek) and the east side of the unnamed canyon, west of proposed Development Area B; 35 percent slopes are primarily located in glacial deposits overlying bedrock and exposed bedrock along the southern boundary of the project site (south of proposed Development Area F3); and a near-vertical outcropping of weathered bedrock standing 15 to 20 feet in relief is located on the northern side of proposed Development Area E. Steep slopes were also observed in the coal waste pile (up to 60 percent) in proposed Development Area A, and in the waste rock pile (65 percent) in proposed Development Area D2. Aerial topographic surveys of the area indicate that ground surface elevations on the project site generally range from 2,000 feet above mean sea level (MSL) in the southern portions to 2,300 feet above MSL in the northern portions of the project site. Total relief is approximately 360 feet. Four north-to-south oriented drainage courses transect the property, creating local relief up to 200 feet.

Existing modifications to topography include grading, cuts, and fills that likely began with mining activities in the late 1800s or early 1900s. Mining activities resulted in substantial modification to topography, primarily from placement of uncontrolled fills involving mine waste located in portions of the western third of the site. Mine waste in uncontrolled fills consists of coal waste and waste rock. Underground mine workings on a portion of the site were determined to have subsided in the time since mining activities stopped. Subsequent modifications to topography include cut slopes and embankments related to road construction occurring in about 2003 (Aspect Consulting, LLC 2009).

2.1.2 Soils / Vegetation / Wetlands

Nine soil types are mapped on the site by the Natural Resources Conservation Service (NRCS) including soil units associated with mining activities. Site soils, most of which are classified as loam, are derived from the weathering of underlying parent material such as glacial drift and sedimentary bedrock, and are mixed with loess and volcanic ash. These soils typically extend from the surface to a depth of 3 to 5 feet. Teanaway loam, found on 10 percent to 25 percent slopes, is the most common soil type. The permeability of most soil types on the property is described as moderate to high, and the erosion hazard as moderate to severe, especially on most steep slopes along the southern site boundary and in drainage courses. Dystroxerepts soils, found on 45 percent to 65 percent south slopes, occur in the westernmost drainage course between proposed Development Areas A and B, and are listed by NRCS as presenting a severe to very severe erosion hazard. Soil units associated with mining activities are not evaluated by NRCS for erosion hazard and permeability. However, observation of the coal waste pile indicates erosion potential is likely moderate to severe, and permeability is likely low to moderate. Observation of the waste rock pile in proposed Development Area D indicates erosion potential is low and permeability is high (Aspect Consulting, LLC 2009).

The City Heights site is characterized as a mix of thinned forest area, open shrub and grassland areas. The majority of the site south of the BPA powerline easement is forested and dominated by a thinned overstory of Ponderosa pine and scattered Douglas fir, while the eastern end of site includes mostly shrub steppe plant species. Logging operations, dry soil conditions and climate have allowed shrubs to colonize and dominate this area. The understory within the forested area is variable from areas with scattered shrubs and a pine needle-covered forest floor understory, to the more open areas with a dense cover of shrubs and forbs.

There are six streams on the project site identified in the Department of Natural Resources Forest Practices Application Review System (DNR FPARS). Three streams are identified as Type F (equates to Type 3), and three streams are identified as Type N (equates to Type 4-5) streams. The Type F stream classification is described by DNR as streams and water bodies that are known to be used by fish; the Type N stream classification is described by DNR as streams that have flow year around or streams that do not have surface flow during at least some portion of the year, and do not meet the physical criteria to be used by fish. While most streams on the site are identified as Type N in their upstream reaches, Crystal Creek, Deer Creek, and the downstream/lower reaches of other streams, located mostly in the southern portions of the project site, are identified as Type F. Crystal Creek is located adjacent to the southwest corner of the project site, and Deer Creek is adjacent to Montgomery Avenue and Deer Creek Road (see Figure 2.2).

The National Wetland Inventory (NWI) and Kittitas County Mapsifter maps for the project site show no wetlands on or near the project site. However, a site-specific investigation conducted by Sewell Wetland Consulting, Inc. (2009) describes seven streams and seven wetlands on the project site:

- Stream A (#1) – an intermittent stream channel located on the extreme eastern side of the site. The stream is classified as Type N based on DNR FPARS. Based on City of Cle Elum and Kittitas County codes, this stream is classified as Type 4 stream requiring a 25-foot buffer and a 10 to 20-foot buffer measured from OHWM respectively.
- Stream AA (#2) – a small, apparently perennial flowing channel located north of the Senior Center along the edge of the City Heights site. The stream is classified as Type N

based on DNR FPARS. Based on City of Cle Elum and Kittitas County codes, this stream is classified as a Type 5 stream with no buffer requirement or a 15-foot building setback measured from OHWM, respectively.

- Stream B / Deer Creek (#3) – an apparent perennial flowing stream channel located along the west side of Montgomery Avenue / Deer Creek Road. The stream is classified as Type F based on DNR FPARS. Based on City of Cle Elum and Kittitas County codes, this stream is classified as a Type 3 stream with a 50-foot buffer requirement or a 20 to 50-foot buffer measured from OHWM, respectively.

- Stream BB (#4) – a short, perennial flowing ditched stream channel that is an outflow of an abandoned mine. The stream flows from the east of and under Montgomery Avenue/Deer Creek Road, and joins Deer Creek just upstream of Wetland A and the power lines (not shown on any maps). Based on City of Cle Elum and Kittitas County codes, this stream is classified as a Type 4 stream with a 25-foot buffer or a 10 to 20-foot buffer measured from OHWM, respectively.

- Stream C (#5) – an intermittent stream channel located within the middle of the project site. The stream has had substantial modifications/alterations as it passes through the site. Historically, this channel appears to have gone south from Wetland C and down through the ravine and stream channel near Stafford Avenue. The stream is classified as Type F based on DNR FPARS. Based on City of Cle Elum and Kittitas County codes, this stream is classified as a Type 4 stream with a 25-foot buffer or a 10 to 20-foot buffer measured from OHWM, respectively, as it is mostly dry in the summer time.

- Stream D / aka Tributary 1209555472010 (#6) – a tributary of Crystal Creek, identified in the Washington State Department of Fish and Wildlife (WDFW) Priority Habitat Maps as Stream LLID #1209555472010. The stream flows from north to the south of the project site before it connects to the Crystal Creek along the Coal Mine Trail just south of the site boundary. The stream is classified as Type F based on DNR FPARS. Based on City of Cle Elum and Kittitas County codes, this stream is classified as a Type 3 stream with a 50-foot buffer or a 20 to 50-foot buffer measured from OHWM, respectively.

- Stream E (#7) – a small, intermittent flowing channel located within a natural drainage way just west of Stream B (not shown on any maps). Based on City of Cle Elum and Kittitas County codes, this stream is classified as a Type 4 stream with a 25-foot buffer or a 10 to 20-foot buffer measured from OHWM, respectively.

- Wetland A (#1) – a small, riparian wetland located just upstream of the power line road crossing. The wetland is classified as PFO1C based on the US Fish and Wildlife Wetland Classification Method. Based on City of Cle Elum and Kittitas County codes (that utilize the 1991 Ecology Wetland Rating System), this wetland is classified as a Category 2 wetland requiring a 100-foot buffer or a 25 to 100-foot buffer (depending upon different considerations), respectively. Based on Ecology's 2004 Wetland Rating System for Eastern Washington, which has not yet been adopted by the City of Cle Elum or Kittitas County, the wetland is classified as Category 2.

- Wetland B (#2) – an emergent, scrub-shrub slope wetland located under the power lines in the Stream C riparian corridor, approximately 1 acre in size. Based on City of Cle Elum and Kittitas County codes, this wetland is classified as Category 2 requiring a 100-foot buffer or a 25 to 100-foot buffer, respectively. Based on Ecology's 2004 Wetland Rating System for Eastern Washington, the wetland is classified as Category 3.

- Wetland C (#3) – a forested wetland located in the Stream C riparian corridor. Based on City of Cle Elum and Kittitas County codes, this wetland is classified as Category 2 requiring a 100-foot buffer or a 25 to 100-foot buffer, respectively. Based on Ecology's 2004 Wetland Rating System for Eastern Washington, the wetland is classified as Category 3.
- Wetland E (#4) – an emergent, scrub-shrub slope wetland located under the power lines in the Stream D riparian corridor. Based on City of Cle Elum and Kittitas County codes, this wetland is classified as Category 2, requiring a 100-foot buffer or a 25 to 100-foot buffer, respectively. Based on Ecology's 2004 Wetland Rating System for Eastern Washington, the wetland is classified as Category 3.
- Wetland F (#5) – an off-site riparian forested wetland similar in character to Wetland E, but smaller in size. Based on City of Cle Elum and Kittitas County codes, this wetland is classified as Category 3, requiring 50-foot buffers.
- Wetland G (#6) – a potential off-site forested wetland located within a swale between the hillside and the Coal Mines Trail. Based on City of Cle Elum and Kittitas County codes, this wetland is classified as Category 3, requiring 50-foot buffers.
- Wetland H (#7) – an off-site, small, quaking aspen dominated wetland located south of Stream C along the west side of Summit View Road just north of its intersection with West 6th Street. Based on City of Cle Elum and Kittitas County codes, this wetland is classified as Category 3, requiring 50-foot buffers.

Streams, drainage courses, and wetlands on the property are described in more detail in a site-specific report prepared for the project: *City Heights, City of Cle Elum, Critical Areas and Wildlife Habitat Report* (Sewall Wetland Consulting, Inc. 2009).

2.1.3 Abandoned Mine Hazards

The *City Heights, Cle Elum, WA Coal Mine Hazards Risk Assessment* (SubTerra, Inc., 2009) prepared for the proposed action separates the project site into six (6) coal mine hazard areas (CMHA) and associates each development area of the Preferred Alternative with a CMHA. Recommendations are provided in Section 5 of that report to mitigate potential development hazards associated with the coal mine areas.

Abandoned mine hazards on the City Heights project site include abandoned shafts, portal entrances to inclines and adits, sinkholes that have formed above the mine workings, mine tailings or waste piles, and the potential for future subsidence over partially collapsed mine workings. Mitigation measures to address for the abandoned mine openings and remnant sink holes are described in the SubTerra, Inc. report in Section 4.5.

2.2 Proposed Developed Conditions

In order to complete development of City Heights Planned Mixed-Use Development, significant clearing of vegetation and grading would be required in all areas not designated as critical areas, sensitive areas, protected habitat, or permanent open space. It can be expected that approximately 25 to 125 acres of land will be cleared and graded at any given time for development purposes. As each of these areas is stabilized with either permanent or temporary methods, another 25 to 125 acres would be cleared.

Large volumes of earthwork are anticipated due to large areas of clearing and grading. Table 2.2.1 shows approximate earthwork volumes for each conceptual land use alternative, and percentages of export and import that would be anticipated. It is expected that most of the excavated on-site soils could be utilized for engineered fill. Based on the *Preliminary Geology and Geotechnical Evaluation for Proposed City Heights Development, Cle Elum,* Washington (Aspect Consulting, LLC. 2009), some of the materials found on-site may not be usable as structural fill due to their predominantly fine-grained and organic composition, such as the coal waste pile in proposed Development Area A. Other materials, such as a large waste rock pile located north of proposed Development Area D_2, may be acceptable as structural fill under favorable weather conditions and assuming appropriate workmanship is utilized. It will be necessary to segregate unsuitable material, such as coal waste, from the waste rock prior to using it as structural fill. More detailed geotechnical recommendations in regards to structural fill and utilization of on-site excavated soils will be provided during the design phase of the project.

Table 2.2.1. Estimated earthwork quantities for the conceptual land use alternatives.

Conceptual Land Use Alternative	Estimated Earthwork Quantities				
	Total Earthwork (CY)	Cut (% of Total)	Fill (% of Total)	Import (% of Fill)	Export (% of Cut)
Alternative 1	2,106,800	90	10	25	12
Alternative 2	1,917,200	91	9	20	11
Alternative 3A	1,917,200	91	9	20	11
Alternative 3B	1,538,000	75	25	10	7

Stormwater management facilities will be constructed early in the clearing process for use in the temporary erosion/sedimentation control system during site development. Fine sediments would then be removed, and they would be converted to permanent stormwater management facilities once the site is completely stabilized. Section 3 of this report describes in more detail proposed storm drainage and stormwater management facilities.

The clearing and grading activities would essentially be the same for site development of conceptual land use Alternatives 1, 2 or 3A. The clearing and grading activities for Alternative 3B would most likely be an uncoordinated effort, as described in more detail in Section 2.4.

2.3 Design Requirements

Clearing and grading activities will comply with applicable State and local regulations at the time of each phase of development. More restrictive measures may be identified in other City Heights Planned Mixed-Use Development technical reports, including:

- *City Heights, City of Cle Elum, Critical Areas and Wildlife Habitat Report* (Sewall Wetland Consulting, Inc. 2009)
- *Preliminary Geology and Geotechnical Evaluation for Proposed City Heights Development, Cle Elum, Washington* (Aspect Consulting, LLC, 2009)

- *Final Draft City Heights, Cle Elum, WA Abandoned Mine Lands (AML) Report* (Subterra, Inc., 2009).
- *City Heights, City of Cle Elum, Critical Areas and Wildlife Habitat Report* (Sewall Wetland Consulting, Inc. 2009).

Clearing and grading activities in areas located within Bonneville Power (BPA) and Puget Sound Energy (PSE) easement need be reviewed with these two entites prior to start of any construction operations.

2.4 Project Impacts

Potential construction and the post-development condition impacts would be similar for conceptual land use Alternatives 1, 2 or 3A. Alternative 3B would not have the opportunity for or the versatility of a coordinated construction project. Under Alternative 3B, there would be constraints on the availability of areas to stockpile soils, expand utilities, coordinate stormwater management facilities, and construction/site accessibility throughout the City Heights project site. Under the No Action Alternative (Alternative 4), there would be no development and thus no earthwork impacts, and present conditions of uncontrolled runoff would continue.

2.4.1 Potential Impacts During Construction

In order to complete development of the City Heights Planned Mixed-Use Development, significant clearing of vegetation and grading would be required in all areas not designated as critical areas, sensitive areas, protected habitat, permanent open space, or powerline corridors. Some slopes may be completely lowered to match surrounding grades.

Buffers for any protected area (including slopes) would be established, and guidelines would be created for work that could occur in the buffers, subject to restoration and/or enhancement requirements. Slope instability and erosion would be possible if clearing and grading occurred either on slopes, or close to the toe of slopes. Erosion from instabilities could contribute to sediment deposition in wetlands and streams if proper preventative measures are not implemented during construction.

Although no formal site plan had been proposed at the time this report was being prepared, it should be anticipated that the majority of the areas not designated as protected would be cleared as described in Section 2.2, and topography would be altered to some degree. Table 2.3.1 presents a range in areas that could be cleared and graded under the four conceptual land use alternatives.

Table 2.3.1. Clearing Estimates for four conceptual land use alternatives.

Conceptual Land Use Alternative	Estimated Clearing (acres)	Percentage of the Site to be Cleared
Alternative 1	204.3	57
Alternative 2	171.9	48
Alternative 3A	171.9	48
Alternative 3B	107.4	30

Stockpiling is a regular construction activity that will be implemented on the project site. Stumps, branches and other vegetative materials will be stockpiled for possible wood chipping, saved for use in landscaping, or disposed offsite. Although it is difficult to assess with any certainty approximate quantities of material given the varying conditions and number of trees throughout the property, it is likely that multiple stockpiles of wood debris approximately 30 feet high and 100 feet in diameter will be temporarily created in each area cleared. Once each phase of the development site is completely cleared, the material will be chipped, or otherwise disposed offsite. Excavators, stump pullers, bulldozers and off-road trucks are the types of machinery needed for this activity.

Topsoil is another material expected to be stockpiled during clearing and grading activities. Once clearing and vegetation removal has occurred, it can be assumed that roughly 6- to 12-inches of topsoil material may be scraped off the surface for future use. For each 1 acre area cleared, approximately 800 to 1,600 cubic yards of topsoil could be scraped from the site. This material can be reused in areas to be landscaped, moved to open space, or sold for off-site use by others. Temporary topsoil stockpiles could be as large as 30 feet high and 60 feet in diameter. Land scrapers, bulldozers and off-road trucks are the types of equipment typically used for this activity.

It may be necessary during clearing and grading to import fill material for road bedding and site grading purposes. Bulldozers, other earth-moving equipment and off-road trucks are the types of equipment that may be used for this activity.

Dust and noise are potential impacts that may occur during clearing and grading activities. Runoff from areas under construction will be controlled through a temporary stormwater management system.

2.4.2 Potential Developed-Condition Impacts

There would be no clearing and grading in the developed condition of the City Heights Planned Mixed-Use Development after all construction is complete.

Direct, permanent impacts (fill) to Wetlands B and C are likely with implementation of Alternative 1, 2, or 3A due to the proposal to widen Summit View Road under any of these alternatives. In addition, impacts to Wetland E are possible associated with proposed road construction in the powerline corridor to connect proposed Development Areas A and B under these alternatives. If the road crossings are built as conceptually shown, wetland buffer impacts would also occur at these crossings. Although it is not yet possible to specifically quantify areas of wetland impact, the applicant proposes that all fills would be the minimum necessary to construct the proposed road crossings: in the range of 2,000 to 6,000 sf total (for both road crossings described here). Wetland impacts and compensatory mitigation will be quantified at the time permit applications are prepared, and will be regulated by local, State, and Federal agencies with jurisdiction (Sewall Wetland Consulting, Inc. 2009). Impacts to streams and wetlands on the property are described in more detail in a site-specific report prepared for the project: *City Heights, City of Cle Elum, Critical Areas and Wildlife Habitat Report* (Sewall Wetland Consulting, Inc. 2009).

2.5 Mitigation Measures

2.5.1 Incorporated Features

All clearing and grading activities, including stockpiling, would be conducted in compliance with City of Cle Elum or Kittitas County regulations (depending on the alternative selected for implementation), as well as Washington State regulations. Best Management Practices (BMPs) for erosion/sedimentation control and construction stormwater management would be implemented consistent with the Department of Ecology 2004 *Stormwater Manual for Eastern Washington* (SWMEW), or more current regulations adopted by the local jurisdiction at the time of each phased development application. Water trucks could be filled from stormwater ponds located onsite, and would be used daily for dust control, as needed. Water trucks could also be filled from a local water source available/permitted through the City of Cle Elum. Additionally, exposed soils could be covered with a number of materials outlined in the SWMEW. Buffers would be established for protected areas (like slopes, streams and wetlands), and guidelines would be created for work that could occur within the buffers, subject to restoration and/or enhancement requirements.

Prior to any construction activity on the project site, a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit will be obtained and a Stormwater Pollution Prevention Plan (SWPPP) will be prepared, as described in more detail in Section 3.5 of this report.

The applicant would be required to comply with applicable regulations for work within stream channel buffers and steep slope buffers. Construction-related noise would be regulated by Chapter 173-60 of the Washington Administrative Code (WAC). Work hours would be limited to allowable hours provided under State and local laws. Subject to some restrictions on the duration of maximum allowable noise levels, Section 173-60-050 WAC exempts noise related to construction activity between the hours of 7:00 AM to 10:00 PM.

2.5.2 Applicable Regulations

Mitigation measures related to potential impacts during construction will comply with the Washington Department of Ecology (Ecology) 2004 *Stormwater Management Manual for Eastern Washington* and the requirements of the Construction Stormwater General Permit in regards to the Stormwater Pollution Prevention Plan and implementation of BMPs. Also, the project will comply with the City of Cle Elum or Kittitas County development regulations (whichever is applicable to the alternative selected for implementation). Also, the project will comply with regulations governing and obtain a Forest Practice Permit(s) from the Washington State Department of Natural Resources for any work associated with tree removal.

2.5.3 Other Recommended Mitigation Measures

More thorough geotechnical evaluations would be performed to characterize subsurface conditions and provide appropriate recommendations at the time of each phased development proposal to address erosion potential, slope stability, soil creep and other potential earth impacts.

2.6 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected during clearing and grading activities on the project site as long as proposed and required BMPs are properly implemented and maintained. However, this project will cause an increase in construction traffic within local neighborhoods.

Figure 2.1 – Existing Slope Conditions

Figure 2.2 – Existing Wetlands and Streams

3. STORM DRAINAGE

This section describes alternatives for the management and mitigation of stormwater generated within the City Heights Planned Mixed-Use Development, both during construction and in the developed condition of the project.

3.1 Pre-Development Condition

This section describes existing project site drainage conditions based on different existing features that impact stormwater runoff. A preliminary downstream analysis of the project site has been performed, and the results are presented below. The bulleted items that follow are descriptions of the downstream path to the Yakima River from the City Heights site:

- West Basin is the western most downstream basin that drains directly into Crystal Creek
- Summit View Basin begins at Summit View Road and heads southwest across private property and into Crystal Creek
- Sixth Street Basin begins on Sixth Street near the City of Cle Elum water tanks and heads west, then south and into Crystal Creek
- Peoh Basin begins at the north end of Peoh Street and heads south into the City's 2nd Street stormwater conveyance system
- Montgomery Basin begins at Montgomery Avenue and heads southeast across private lands and into the City's 2nd Street stormwater conveyance system
- Columbia Basin begins at the extension of Columbia Avenue (also known as Creekside Road) and heads south into the City's 2nd Street stormwater conveyance system.

Detailed descriptions of each downstream basin from the City Height's property to the Yakima River are provided in the Downstream Drainage System maps (Figures 3.1A and 3.1B, and the Off-Site Drainage System Analysis Tables in Appendix B). Crystal Creek is identified as Category 4A Water just north (upstream) of the most western end of the City Heights project site, based on the Department of Ecology Water Quality Assessment [303(d) list] for Washington. DOE studies have determined that pollutants such as fecal coliform, dissolved oxygen, chlorine, and ammonia are present in the water. DOE has therefore issued, and Environmental Protection Agency (EPA) has approved, Total Maximum Daily Load (TMDL) criteria for Crystal Creek. See Appendix B for more information on 303(d) list and TMDL criteria. Based on the design criteria and mitigation measures for stormwater and sewer, the proposed City Heights project will not adversely affect the existing water quality of Crystal Creek.

3.1.1 Project Watershed

The City Heights site is located in the northwest quadrant of the Upper Yakima River Watershed. The Upper Yakima River watershed, which is a part of the greater Yakima River watershed, drains an area 2,139 square miles in size. Elevations range from about 7,000 feet above sea level at the crest of the Cascade Mountains to about 1,000 feet above sea level at the confluence of the Yakima and Naches Rivers. This confluence also forms the upper boundary of the Lower Yakima River watershed. This watershed contains some of the most intensively irrigated lands in the United States. The Upper Yakima River watershed is predominantly forested (1,153 square miles) in its higher elevations, and contains 85,000 acres

of irrigated agriculture in its lower elevations. The majority of irrigated acreage drains to the tributaries of Wilson Creek, Manastash Creek, and Sorenson Creek. Below the outlet of the Lake Keechelus dam, the main tributaries to the Upper Yakima River are the Kachess River, Cle Elum River, and Teanaway River. There are many other smaller tributaries to the upper Yakima River.

3.1.2 Project Sub-Basin

There are no known basin studies produced for the watershed that includes the City Heights site. For the purpose of this report, the sub-basin for the proposed City Heights Planned Mixed-Use Development has been delineated based on USGS maps and other available information. The project site is within the sub-basin located on the north side of the City of Cle Elum, encompassing an area from the Town of Roslyn on the west, Cottage Avenue in the City of Cle Elum on the east, the top of Cle Elum Ridge on the north, 3rd Street and SR-903 within the City of Cle Elum on the south. This sub-basin is approximately 470 acres in size. Crystal Creek, multiple unnamed seasonal streams, and the City of Cle Elum stormwater management system are the principal surface water features within the sub-basin that includes the project site.

3.1.3 Site-Specific Drainage Basins

Based on preliminary findings, the majority of the City Heights property hydrology is split between four significant drainage basins. These basins directly affect Crystal Creek, several other seasonal streams, and irrigation ditches. These basins are strongly influenced by snow melt and recharge over the upland areas, including on the City Heights property. Encompass Engineering & Surveying (Encompass) analyzed the aerial topographic map prepared by Degross Aerial Mapping, Inc. (2009), and delineated five separate site-specific drainage basins. These areas are shown in Appendix C. The level of detail utilized for the delineation of the site-specific basins is appropriate for the preliminary storm drainage calculation and analysis for the entire project site. A more detailed analysis of the drainage basins is recommended for the construction design. The site-specific drainage basin descriptions are as follows:

Basin A:
Drainage Basin A is located in the western-most area of the project site, and consists of 822.91 acres of forest land, underlain with ashy and Teanaway loam soils. Only 84.64 acres of this basin is considered in the analysis, as the rest of the area will be by-passed via existing drainage routes. The analyzed area is located in the southern-most portion of the Drainage Basin A, closest to the City of Cle Elum, and limited to the proposed City Heights Planned Mixed-Use Development. Run-off from this basin contributes to the headwaters of Crystal Creek to the southwest.

Basin B:
Drainage Basin B is located east of Drainage Basin A, and consists of 379.44 acres of mixed forest land and pasture, with forest land being the predominant factor. Similar to Drainage Basin A, Drainage Basin B is underlain with ashy and Teanaway loam soils. Only 57.53 acres of this basin is considered in the analysis, as the rest of the area will be by-passed via existing drainage routes. The analyzed area is located in the southern-most portion of Drainage Basin B, closest to the City of Cle Elum, and limited to the proposed City Heights Planned Mixed-Use Development. Run-off from this basin enters the City of Cle Elum storm drainage system to the south.

Basin C:
Drainage Basin C is located east of Drainage Basin B, and consists of 1,174.10 acres of mixed forest land and pasture, with forest land being the predominant factor. Similar to Drainage Basins A and B, Drainage Basin C is underlain with ashy and Teanaway loam soils. Only 179.76 acres of this basin is considered in the analysis, as the rest of the area will be by-passed via existing drainage routes. The analyzed area is located in the southern-most portion of Drainage Basin C, closest to the City of Cle Elum, and limited to the proposed City Heights Planned Mixed-Use Development. Run-off from this basin enters the City of Cle Elum storm drainage system to the south.

Basin D:
Drainage Basin D is located east of Drainage Basin C, and consists of 317.75 acres of mixed forest land and pasture, with pasture being the predominant factor. Drainage Basin D is underlain with Teanaway loam soils. Only 29.78 acres of this basin is considered in the analysis, as the rest of the area will be by-passed via existing drainage routes. The analyzed area is located in the southern-most portion of Drainage Basin C, closest to the City of Cle Elum, and is limited to the proposed City Heights Planned Mixed-Use Development. Run-off from this basin enters the City of Cle Elum storm drainage system to the south.

Basin E:
Drainage Basin D is located east of the southeast portion of Drainage Basin D, and consists of 83.51 acres of pasture land. Similar to Drainage Basin D, Drainage Basin E is underlain with Teanaway loam soils. Only 6.29 acres of this basin is considered in the analysis, as the rest of the area will be by-passed via existing routes patterns. The analyzed area is located in the southern-most portion of Drainage Basin C, closest to the City of Cle Elum, and is limited to the proposed City Heights Planned Mixed-Use Development. Run-off from this basin enters the City of Cle Elum storm drainage system to the south.

As it can be seen in the above descriptions, large portions of each site-specific basin are located upstream of the proposed City Heights project site. These upstream basins are not considered in the hydrologic analysis, and they will be by-passed via existing drainage routes that dissect the project site. On the overall scale, the upstream basins discharge directly to these existing drainage routes. Only small portions of the upstream basins, located along the northern property line, may sheet flow onto the project site. These amounts would not adversely affect the intent of this analysis and could be either included in the final storm drainage calculations/analysis or by-passed via proposed rock-lined swales along the northern propserty line.

3.1.4 Hydrologic Characteristics

Runoff modeling for the proposed City Heights Planned Mixed-Use Development was done using the Santa Barbara Urban Hydrograph method version 4.21B accepted by the Department of Ecology (Ecology) as a proper simulation modeling program. As required by Ecology's 2004 *Stormwater Management Manual for Eastern Washington* (SWMMEW), the run-off analysis is performed for the 2-year and 25-year events. Due to existing flooding issues downstream of the project site, the 100-year storm event was also analyzed. The average annual precipitation in the site area for the 24-hour duration is 2 inches for the 2-year storm, 3.5 inches for the 25-year storm, and 4.75 inches for the 100-year storm events based on Ecology's Isopluvial Maps for Eastern Washington. In order to account for the rain-on-snow event, a water equivalent value is calculated based on the average daily snow depth for Cle Elum and 20 percent moisture content, which is added to the average annual precipitation for each storm event. The water

equivalent was calculated to be 1.34 inches. Thus, the revised average annual precipitation in the site area for the 24-hour duration is 3.34 inches for the 2-year storm, 4.84 inches for the 25-year storm, and 6.09 inches for the 100-year storm events.

3.1.5 Runoff / Infiltration / Groundwater

It is assumed that most of the 36 inches of average annual precipitation that falls on the project site is currently conveyed as seasonal temporary surface water in local streams and drainage courses, while some is lost to infiltration and evapotranspiration (i.e., the uptake and release of water through plants). In the Cle Elum area, groundwater generally occurs in two primary hydrogeologic units: unconsolidated alluvial and glacial sediments, and fractured bedrock. Coarse-grained portions of the unconsolidated deposits in the lower elevations can produce quantities of water sufficient for group domestic or municipal water supply. The fractured bedrock typically yields water sufficient only for single domestic or small group domestic use. Considering the project site elevations, the unconsolidated deposits throughout most of the property are generally unsaturated and groundwater occurrence is limited to the bedrock. Lower elevation portions of the project site (for example, the western end of the property or the bottom of the stream courses, and southern portions of the project site) may contain groundwater within the unconsolidated deposits. In some of these areas, groundwater is measured at 5-foot depth.

It is expected that groundwater flows generally south through the project site, discharging to the unconsolidated deposits in the Yakima River valley and ultimately to the Yakima River. Groundwater flow through bedrock likely occurs primarily through interconnected fractures and joints, with only minor flow occurring through the rock matrix.

Stormwater infiltration rates are primarily controlled by the permeability properties of near-surface soils and the depth to hydraulic barriers such as impermeable layers (like bedrock) and the groundwater table. Soils mapped by the Natural Resources Conservation Service (NRCS) indicate that the permeability of most natural soils on the project site is moderate to high, while Aspect Consulting, LLC (2009) states that the permeability of the coal waste pile (in proposed Development Area A) and waste rock pile (in proposed Development Area D_2) is characterized as low and high, respectively. Glacial deposits and residuum units likely facilitate relatively high infiltration rates. Areas of shallow bedrock and shallow groundwater limit deep infiltration.

The drainage analysis prepared by Encompass, performed with King County Hydrograph Program software, classifies the site soil conditions by Hydrologic Soil Group as “C” – Moderately High Runoff Potential, and “D” – High Runoff Potential. Even though permeability in some soils on the project site may be considered high to moderate and could therefore accommodate infiltration of stormwater and reduce the size of the detention pond, the stormwater infiltration analysis has not been performed or factored into the calculations of pond size. Infiltration capabilities of the project site soils should be investigated prior to the design phase, and infiltration for stormwater should be considered during that time when determining detention requirements.

3.2 Post-Development Condition

This section compares the storm drainage effects of the proposed City Heights Planned Mixed-Use Development with the Pre-Development Condition. Table 3.2.1 shows the approximate post-development impervious areas of the four conceptual land use alternatives. Final site design will identify smaller sub-basins, including offsite areas. For the purpose of estimating

impacts, the calculations included in this report are based on approximate typical land cover as determined by the project proponent, geotechnical reports, and State and local standards.

Table 3.2.1. City Heights projected impervious cover.

BASIN	Total Area (acres)	Projected Impervious Cover (acres)		
		Preferred Alternative	Alternative 2 or 3A	Alternative 3B
A	84.64	33.28	30.41	71.60
B	57.53	17.11	15.77	
C	179.76	55.61	50.84	
D	29.78	10.67	9.95	
E	6.29	2.80	2.5	
Total	**358.00**	**119.47**	**109.47**	**71.60**

For the purpose of understanding drainage characteristics and model inputs, a brief description of land use types is included below. (A more detailed description is provided in Section 1.2 of this report.) The housing/building densities of the alternatives, as well as the amount of open space to be preserved are important factors in determining the amount of impervious and pervious surfaces, both of which are significant inputs to stormwater drainage models. For more detailed information, refer to Appendix D of this report.

Stormwater management facilities will be created in areas most suitable for their use. If infiltration facilities are proposed in the design phases of the project, they will be created in areas with the required infiltration capacity.

3.2.1 Alternative 1 – Preferred Alternative

Residential neighborhoods are separated into three categories in the conceptual land use plan for Alternative 1: low density (5 dwelling units per acre), medium density (7 dwelling units per acre), and high density (9 dwelling units per acre). Utilizing *SWMMEW* Table 3.2.2.D, *Percent Impervious Coverage For Existing Residential Areas* (Ecology 2004), percent impervious areas for each residential category is calculated – 48 percent for low density, 56 percent for medium density, and 70 percent for high-density residential areas. Commercial areas are assumed to contain 85 percent impervious surfaces. Other impervious areas, including ponds/watercourses and the main roadway system, are assumed based on preliminary site layouts.

The Preferred Alternative would result in approximately 69 percent of the site being retained in open space in the form of natural areas, buffers, improved parks, and residential landscaping. Some parks and natural open space areas would provide both active and passive on-site recreational opportunities, like walking trails, wildlife viewing areas, and play toy areas.

In addition to landscape areas and traditional grass open space in the residential neighborhoods and commercial areas, the pervious areas of the site would include the open spaces areas of the PSE and BPA powerline easements and parks. High-quality natural forest areas would be preserved as natural open space in portions of the project site to maximize the benefit that they provide to the hydrologic cycle (see Figure A.1 in Appendix A).

Where development patterns and topography allow, small localized drainage facilities would be provided rather than fewer large facilities with large conveyance networks. This approach to stormwater management would be utilized in order to more closely mimic the pre-developed hydrology of the site.

3.2.2 Alternative 2 – Reduced Residential Density

The Reduced Residential Density Alternative has an approximately equivalent approach to the Preferred Alternative in terms of the type of development proposed, natural areas, buffers and parks to be retained in open space. This development pattern would be similar in character to the Preferred Alternative, but on a smaller scale. The Reduced Residential Density Alternative would result in approximately 71 percent of the site being retained in open space, natural areas, buffers, improved parks, and residential landscaping.

3.2.3 Alternative 3A – No Annexation, Development within the County under Single Ownership

Alternative 3A is the same conceptual land use plan as the Reduced Residential Density Alternative (Alternative 2), except that this alternative would be developed within the County rather than the City, and therefore would be required to comply with the County's stormwater management regulations. Both City and County regulations comply with requirements set forth in Ecology's 2004 *SWMMEW*.

3.2.4 Alternative 3B – No Annexation, Development within the County under Multiple Ownerships

Alternative 3B would result in development of approximately 500 lots under multiple ownerships either as PUD or Performance-based Cluster Plats. Even though the stormwater calculations for Alternative 3B would need to be performed separately for each development effort, the analysis of the stormwater management facility for the purposes of this report was performed assuming a single project. This alternative would be required to comply with the County's stormwater management regulations (see Section 3.2.3).

3.2.5 Alternative 4 – No Action

Under the No Action Alternative, it is assumed that the City Heights site would remain undeveloped, and therefore would not require stormwater management facilities. The natural depressions, vegetation, and hydrologically-rough landscape on the site at the present time allows large amounts of the on-site precipitation to infiltrate, evaporate or be transpired by existing vegetation.

3.3 Stormwater Management Standards

The Washington Department of Ecology (Ecology) 2004 *Stormwater Management Manual for Eastern Washington* (*SWMWW*) will be used for initial design guidance at the beginning of the proposed development as it includes the latest technology and best available science. If more current local and State manuals for guidance on stormwater management design are adopted by the City of Cle Elum, Kittitas County, and/or the State of Washington, these will be followed at the time of each site development application.

It is anticipated that some form of low impact development approach to stormwater management may be used depending on the conceptual land use alternative selected for implementation. Low impact development methods differ from traditional development in that they are applied at a smaller scale and are designed to more closely mimic pre-development hydrology by managing stormwater closer to its source in small drainage areas, rather than creating large stormwater facilities for entire drainage basins.

Techniques that retain natural land cover, minimize impervious surfaces, and maximize infiltration of stormwater should be used as to the extent practicable on the City Heights project site. Even though infiltration analysis has not been performed due to lack of groundwater information at the time of writing this report, and it will be considered in the design phase of the project, other representative methods for stormwater quality treatment are described below in Subsection 3.3.2.

3.3.1 Stormwater Quantity Control

As required by the Ecology's 2004 *SWMMEW*, Core Element #6 – Flow Control measures must be provided to protect downstream areas of a drainage basin from erosion and flooding due to increases in the rate and peak frequency of runoff from developed areas (*SWMMEW*, Section 2.2.6).

The flow control requirements in *SWMMEW*, Section 6.2.1, are used to calculate the size of proposed stormwater detention facilities that would provide a sufficient level of mitigation for the additional runoff from land developed under the City Heights conceptual land use alternatives. The design storm for determining both volumes and flow rates is the SCS Type IA 24-hour storm. To protect stream morphology, detention facilities are proposed throughout the project site, based on separate basin areas, to detain the post-development run-off associated with the proposed site improvements. The proposed stormwater management facilities will be designed to detain the post-development 2-year, 25-year and 100-year storm events. The run-off will be released at 50 percent of the pre-developed 2-year storm event, and 100 percent of the pre-developed 25-year and pre-developed 100-year storm events. Even though designing for the 100-year storm event is not required by *SWMMEW,* this storm event is analyzed in the City Heights Preliminary Engineering report in order to mitigate poor drainage conveyance capabilities of the area downstream from the project site and flooding issues that have emerged in recent years. A more detailed backwater study should be conducted in the final design phase of the project to analyze the downstream drainage conveyance facilities.

Runoff modeling for the proposed City Heights Planned Mixed-Use Development is based on the Santa Barbara Urban Hydrograph Method (SBUH), which was developed by the Santa Barbara County Flood Control and Water Conservation District, California. This method is accepted by the Department of Ecology as a proper simulation modeling program, and it is used to size stormwater control facilities to mitigate the effects of changing land cover due to development. The model converts the incremental runoff depths into instantaneous hydrographs which are then routed through an imaginary reservoir with a time delay equal to the basin time of concentration.

Drainage calculations using SBUH methodology have been performed for each of the five City Heights property drainage basins described earlier in this report section. For each basin, calculations were performed to determine both the total stormwater runoff for the pre-development and the post-development condition, and the required stormwater facility detention volume. Infiltration analysis has not been performed due to lack of groundwater information at

the time of writing this report. This analysis may be performed in the design phase of the project. However, it is certain that adequate stormwater management improvements can be located on the project site. This analysis assumes that infiltration was not available when calculating the stormwater detention volumes, which is a conservative approach.

The results of these calculations are shown below in Tables 3.3.1 and 3.3.2. While large detention facilities will most likely not be used as the primary means of stormwater management within the development, the analysis of the area required for these types of facilities is easier to quantify and gives a general analysis of stormwater requirements for a specific basin. During detailed design, sub-basins within these larger basins will dictate the number and actual size of stormwater management facilities.

Table 3.3.1. Estimated unmitigated stormwater runoff.

BASIN	Estimated Unmitigated Stormwater Runoff 100-year Event (cfs)[1]				
	Preferred Alternative[2]	Alternative 2 or 3A[2]	Alternative 3B[2]		No Action[3]
A	94.77	93.26	**Proposed**	**Existing**	71.81
B	61.51	60.80	373.55	289.38	52.49
C	197.31	194.94			150.58
D	34.02	33.69			29.08
E	7.33	7.18			6.14
Total	**394.94**	**389.87**	**373.55**	**289.38**	**310.10**

[1] Refer to Appendix D for detailed calculations for this and other storm events.
[2] Post-Development Runoff for shown storm event. The developed condition within each basin is not known so a total figure is provided instead of by basin.
[3] Pre-Development Runoff for shown storm event.

Table 3.3.2. Estimated required detention volume.

BASIN	Total Area (acres)	Estimated Required Detention Volume (cu ft)[1, 2]		
		Preferred Alternative	Alternative 2 or 3A	Alternative 3B
A	84.64	246,901	222,531	756,831
B	57.53	114,550	102,654	
C	179.76	321,144	314,573	
D	29.78	66,742	66,643	
E	6.29	14,525	14,314	
Total	**358.00**	**763,862**	**720,715**	**756,831**

[1] Refer to Appendix D for detailed calculations for this and other storm events.
[2] Volumes shown are for the 100-year storm event.

3.3.2 Stormwater Quality Control

As required by Ecology's 2004 *SWMMEW*, Core Element #5 – Runoff Treatment is required to reduce pollutant loads and concentrations in stormwater runoff using physical, biological, and chemical removal mechanisms to protect water quality so that beneficial uses of receiving waters are maintained and where applicable, restored (*SWMMEW*, Section 2.2.7). The most effective basic treatment BMPs remove about 80 percent of total suspended solids contained in the runoff treated, and a much smaller percentage of the dissolved pollutants. It may be necessary to provide additional treatment to remove oil, metals, and/or phosphorus from stormwater runoff.

Water quality treatment facilities are selected based on the types of treatment required, terrain configuration, and site layout. Based on these elements for the City Heights Planned Mixed-Use Development, it has been determined that the Biofiltration Treatment Facilities would be the most efficient method of treatment. For the purposes of this report, treatment facilities were analyzed based on a water quality design volume utilizing Method 1 based on Core Element #5 – Runoff Treatment (*SWMMEW*, Section 2.2.5). This method specifies that the water quality design volume is determined by calculating the volume of runoff for the post-development condition from the regional storm with a 6-month, 24-hour return frequency. However, the actual design of treatment facilities will be based on this or other acceptable methods specified in *SWMMEW*. Pre-treatment facilities may be required, and will be designed based on a water quality design flow rate utilizing the SCS Type IA 24-hour storm with a 25-year return frequency as a conveyance system located "on-line". It is possible that some areas with high permeability rates may be utilized for surface infiltration facilities, but this will be determined in the design phase of the project.

SBUH calculations in Table 3.3.3 (and in Appendix E) identify the water quality volumes that will require treatment prior to quantity control based on 0.5 inch of runoff from impervious surfaces. These volumes represent the entire basin area runoff in the developed condition that would require treatment measures for each land use alternative. The single facility sizes offer a convenient method for comparing differences between the alternatives; however in practice, multiple smaller facilities would be implemented across the on-site drainage basins.

Table 3.3.3. Estimated required volume for water quality treatment.

BASIN	Total Area (acres)	Estimated Required Volume for water quality treatment (ft^3)[1]		
		Preferred Alternative	Alternative 2 or 3A	Alternative 3B
A	84.64	131,248	119,797	419,479
B	57.53	74,172	74,172	
C	179.76	254,427	254,427	
D	29.78	46,179	46,179	
E	6.29	10,667	10,667	
Total	**358.00**	**516,693**	**505,242**	**419,479**

[1] Volume for water quality treatment based on 0.5 inches of runoff over the impervious surface approach.

Pre-treatment facilities sizing based on the water quality design flow rate will be determined in the design phase of the project.

3.4 Project Impacts

Impacts from any of the four conceptual land use alternatives would be similar in nature, as summarized in Tables 3.3.1 through 3.3.3. These tables show that there would be approximately a 2 percent difference in volume of runoff generated from full build-out of the alternatives, approximately a 3 percent difference in detention volume required, and less than 9 percent difference in required water quality treatment volume. There would be no alteration of stormwater runoff, infiltration, evaporation or transpiration if no development activity took place on the project site under the No Action Alternative (Alternative 4).

Potential construction and developed-condition impacts and mitigation measures would be similar for any of the four conceptual land use alternatives. There would be no change in stormwater runoff conditions from the project site if no development activity took place under the No Action Alternative. Currently, some of the site drainage patterns are relatively unaltered by human development. The existing on-site roads and a few associated culverts, as well as the culverts and storm drainage infrastructure located downstream of the project site, provide an adverse impact to site drainage at the present time due to their deterioration, improper installation, lack of maintenance, and under-sizing. For these reasons, the risk of existing flooding problems would continue with No Action on the project site.

3.4.1 Potential Impacts During Construction

Construction stormwater impacts associated with site development would be largely related to the potential for wind and water erosion of disturbed and exposed soils during earthwork activities such as trenching and pipe installation; excavation and grading for detention/retention/ infiltration and other drainage conveyance facilities; and other construction activities described in detail in Chapter 2 of this report. During construction, stormwater management measures described in Section 3.5 below would be implemented to limit or reduce the potential for sediment-laden water and windblown particles to leave the site.

The majority of the City Heights property hydrology is split between four significant drainage basins. These basins directly affect Crystal Creek, several other seasonal streams, and irrigation ditches. These basins are strongly influenced by snow melt and recharge over the upland areas, including the City Heights property. Sediment-laden water from exposed soils within City Heights could enter Crystal Creek and other existing drainage facilities or water courses, unless proper protective measures are taken during construction.

3.4.2 Potential Developed-Condition Impacts

Development of the project site would create a large amount of impervious surfaces and decrease the amount of pervious areas, thereby increasing the amount of surface water runoff. Existing drainage facilities downstream from the project site would not have enough capacity to convey increased volumes of runoff, thereby increasing the potential for worse conditions of downstream flooding. If surface water runoff from the site were not treated prior to release, this runoff could convey pollutants to receiving waters in the form of oil, grease, and heavy metals from the operation of motor vehicles; sediments, pesticides, fertilizers and pet wastes from landscaped areas. The proposal includes complying with all applicable regulations to construct

and maintain a stormwater management system that would avoid or minimize these potential impacts.

The amount of stormwater that actually would fall in the form of rain onto the site would be no different from existing conditions. What would differ is what happens to the stormwater once it comes into contact with the ground or vegetation. On an undeveloped site such as City Heights with a vast amount of vegetation, a measurable amount of rainfall that falls on the site never infiltrates into the groundwater system. Instead, a portion of precipitation runs off and enters natural drainage courses, some is intercepted by tree branches, and some evaporates back into the air. Section 3.2 of this report describes proposed developed conditions of the site under the four conceptual land use alternatives. Although each alternative would vary slightly in the amount of existing vegetation that would be replaced with permeable surfaces and landscaped areas, the overall impact on the drainage system from the entire proposed development would be essentially the same. By removing existing vegetation and replacing it with impermeable surfaces and landscaped areas with less transpiration characteristics than existing vegetation, the impact would be an increase in total runoff that enters the drainage system of the overall City Heights and surrounding basins.

Operational impacts from stormwater development would also constitute post-construction impacts, in the form of dealing with permanent water quantity and water quality control facilities and their associated maintenance requirements. Stormwater management facilities within City Heights would be owned and/or maintained by the Homeowner's Association (HOA) after construction is complete and lots are legally platted. Prior to that time, the property owner/developer would be responsible for maintenance of these facilities. Each stormwater management facility would need to be periodically observed and maintained to ensure design performance. The HOA would need to create a procedure for this observation and maintenance.

If the total volume of any detention pond exceeds 435,600 cubic feet with the water level at the embankment crest the pond may be subject to the State's Dam Safety Requirements.

3.5 Mitigation Measures

The entire City of Cle Elum and its Urban Growth Area are acknowledged as being located within a highly erosive area susceptible to frequent flooding. Many flooding events have occurred in recent years resulting from poorly maintained and deteriorated drainage patterns and undersized storm drainage systems. As such, it must be shown that proposed developments and associated construction activities would not adversely affect the downstream system in terms of erosion and sediment transport, conveyance capacity and water quality. The City Heights proposal would comply with the requirements of Ecology's 2004 *Stormwater Management Manual for Eastern Washington* to mitigate the impacts identified in Section 3.4 above. Temporary erosion/sedimentation control (ESC) facilities would be installed during construction. ESC measures would minimize soil erosion once the natural vegetative cover has been removed, and would minimize the occurrence of sediment from those same areas migrating into water bodies such as streams. Permanent stormwater management facilities would be created concurrent with residential and commercial development on the site, and technologies associated with sustainable designs would be implemented. An array of possible treatment methods to accomplish this goal is described in this section.

3.5.1 Incorporated Features

Potential construction and developed-condition impacts and mitigation measures would be similar for any of the conceptual land use alternatives. No stormwater management facilities would be installed with the No Action Alternative.

Prior to any construction activity on site, a National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit will be obtained. This permit will notify the appropriate authorities of construction activities that have the potential to discharge sediment laden water to waters of the State, so that regulatory agencies can observe such activities to make sure no such discharge occurs, and work with the contractor to implement effective in-place ESC measures.

Also before construction is permitted, a Stormwater Pollution Prevention Plan (SWPPP) will be prepared that provides guidance to the contractor on how to deal with varying degrees and types of runoff problems to prevent sediment-laden water and wind-blown particles from leaving the target area, as well as how to manage spills and accidents in the event that a spill were to occur. The target area would not be the entire City Heights site, but rather the smaller more specific area under construction at any given time. Multiple SWPPPs will be prepared over time as the site is developed. The SWPPP would address protection of abutting properties (developed sites, wetlands, steep slopes, drainage systems, etc.) from areas undergoing development, or areas being used to support construction, including but not limited to vehicle staging areas, stockpile areas, etc.

Mitigation measures related to potential impacts during construction would include implementation of proper construction Best Management Practices (BMPs) to convey, collect, treat and release construction stormwater runoff. These include, but are not limited to: limit of work/construction fence installation, utilization of vegetated or rip-rapped roadside ditches and check dams for conveyance, sedimentation ponds and or sediment traps for collection and treatment, silt fences or straw wattles for treatment, proper piping and outfall protection located inside of limit of work areas for release of construction stormwater runoff.

Mitigation measures related to potential developed-condition impacts would include implementation of properly designed and constructed drainage conveyance systems including, but not limited to, storm drainage pipes, catch basins and manholes, sediment filters, vegetative and/or rip-rapped swales and check dams, detention/retention facilities, control structures with oil-water separators, infiltration facilities (if groundwater levels allow), proper culvert design and installation to improve flow capabilities and fish passage, and proper pipe outfall/runoff discharge protection and energy dissipation. Flow control and channel stabilization measures in compliance with Ecology's 2004 *SWMMEW* standards will be implemented throughout the project site, especially near existing critical areas such as wetlands and streams (Stream D), to minimize erosion and sediment transport. Some Best Management Practices are listed below:

- BMP C102: Buffer Zones
- BMP C120: Temprary and Permanent Seeding
- BMP C122: Nets and Blankets
- BMP C124: Sodding
- BMP C200: Interceptor Dike and Swales

- BMP C202: Channel Lining
- BMP C207: Check Dams
- BMP C209: Outlet Protection
- BMP C234: Vegetated Strip
- BMP C235: Straw Wattles
- BMP F6.10: Detention Ponds
- BMP F6.21: Infiltration Ponds
- BMP F6.42: Full Dispersion
- BMP T5.10: Infiltration Ponds
- BMP T5.40: Biofiltration Swales
- BMP T5.50: Vegetated Filter Strip

Given that seasonal flooding occurs in the Crystal Creek basin and in other seasonal streams that flow through the site under existing conditions, the mitigation measures for the increased volume of stormwater and increased peak flows that would occur as a result of the City Heights Planned Mixed-Use development are described in previous sections of this report, based on examining the following strategies:

- Reduce the quantity of stormwater to be discharged
- Where possible, infiltrate stormwater in an area where recharge does not directly report to these basins
- Store stormwater during the wet season for use during the dry season and/or until the timing of recharge will have a minimal impact on these basins
- Improve and/or maintain the conveyance capacity of the City's stormwater conveyance infrastructure so that it can handle increased flows without an increase in flooding
- Develop on-site snow removal policies that will allow snow runoff to be properly detained and not by-pass the stormwater system.

3.5.2 Applicable Regulations

Mitigation measures related to potential impacts during construction will comply with Ecology's 2004 *SWMMEW* and the requirements of the NPDES Construction Stormwater General Permit in regards to the Stormwater Pollution Prevention Plan and implementation of BMPs.

Mitigation measures related to potential developed-condition impacts will comply with Ecology's 2004 *SWMMEW* in regards to the hydrologic analysis of pre-development and post-development conditions, quantity and quality control, and conveyance design; City of Cle Elum or Kittitas County standards (depending on the alternative selected for implementation) for underground drainage conveyance systems; U.S. Army Corps of Engineers Section 404 permit requirements (if applicable), and Washington State of Fish and Wildlife Hydraulic Project Approval (HPA) requirements for culvert design and installation or any work within existing creeks (especially Crystal Creek and Stream C).

3.5.3 Other Recommended Mitigation Measures

Infiltration capabilities of the project site soils should be investigated prior to the design phase, and infiltration for stormwater should be considered during that time when determining detention requirements.

Other possible recommended mitigation measures include, but are not limited to:

- Regional cooperation to design and construct improvements to the existing drainage conveyance facilities in terms of replacement, upgrade, repair and/or maintenance located downstream of the project site, including but not limited to City of Cle Elum stormwater conveyance infrastructure.
- Analysis and implementation of smaller localized sub-basins based on a more defined site plan, rather than implementation of large sub-basins
- Implementation of full or basic dispersion, based on King County's 2009 Surface Water Design Manual, for each phase of development in order to reduce, treat and/or slow down the post-development runoff.
- Where possible, infiltrate stormwater in an area where recharge does not directly report to these basins.
- Develop City-wide snow removal policies that will allow snow runoff to be properly detained and not by-pass the stormwater system.
- The City of Cle Elum could in the future provide a comprehensive stormwater management plan in order to construct, operate and maintain a regional stormwater management facility. No such plan currently exists.

3.6 Phased Development

As described in Section 1.3 of this report, the City Heights Planned Mixed-Use Development would be developed in phases over 6 to 12 years. The planning and approval process for the type of development will allow a creative approach to designing stormwater management systems that will be sustainable, efficient, and consistent with emerging technology and regulations. Treating stormwater in small facilities close to the source will simplify phased development of the site. Small on-site stormwater management facilities can be built as development occurs. Areas with poor soils and low infiltration rates can be identified and incorporated into planning for stormwater management facilities. All off-site improvements to the existing drainage patterns and storm drainage systems shall be performed as each phase progresses, depending on the extent of the impact each phase would have on the existing facilities.

Each phase of the project will have stormwater management facilities designed for that area of the site. However, there may be opportunities to create larger regional facilities to better utilize the land area within the property. Design and construction of larger regional facilities with the capacity to handle runoff from future phases of the development may optimize resource use and minimize impacts to critical areas. This option will be investigated more closely during the design phase of the project. Regardless, the stormwater management facilities will fully mitigate the impacts from the development of the site within the boundaries of the overall project.

3.7 Significant Unavoidable Adverse Impacts

Given that the proposal will comply with all applicable stormwater management regulations during construction and in the developed condition of the site, no significant unavoidable adverse storm drainage impacts would be anticipated. Further, while the *SWMMEW* requires detaining the 25-year storm event, this project proposes to detain the 100-year storm event based upon past flooding experiences in the area. Any storm and/or flood event beyond the 100-year storm event would be considered a significant unavoidable adverse impact.

Figure 3.1A – Downstream Drainage System (West Half)

Figure 3.1B – Downstream Drainage System (East Half)

Figure 3.2 – Upstream Storm Basin Map

4. WATER

For Alternatives 1 or 2, the City Heights project would connect into and utilize water system infrastructure owned by the City of Cle Elum. In those cases, water could be provided from the existing City of Cle Elum sources (described below) or from new groundwater wells on or near the City Heights site. For Alternatives 3A or 3B, the City of Cle Elum would provide water for that portion of the City Heights project already within the City limits (28 acres), but would not provide water service to the portion of the City Heights project that is being annexed (330 acres). For these alternatives, water would be supplied through an independent Group A water system(s).

The City of Cle Elum and Town of South Cle Elum have an integrated water system. While each community owns various system components (for example, the Yakima River sidebank intake structure, pump house, and the treatment facility are owned by the City of Cle Elum), the components are integrated into and operate as one water system. Cle Elum, and therefore this system, also provides water to the Suncadia Master Planned Resort (MPR) that lies outside the City boundaries.

There are several agreements between Cle Elum, South Cle Elum, and/or Trendwest (Suncadia) that affect management of the water system and the allocation of water and costs. Among those are the Water Supply System Project Development Agreement, the Agreement Relating to Water Delivery to Mountainstar Resort, the Agreement relating to Water Supply for Bullfrog Flats Urban Growth Area (UGA) − all dated June 19, 2001 (the "Water Agreements"). The Mountainstar Resort referenced above is now known as the Suncadia Resort.

Under Alternatives 1 or 2, water supply for the City Heights development would be provided by the City of Cle Elum. Since some of the City Heights property (approximately 28 acres) is already within the City limits of Cle Elum the City is required to provide water for the equivalent residential units (ERUs) that can be developed in that area. The number of ERUs allowable within this area (based on the minimum residential density allowed within the City limits of 4 dwelling units per acre) is 112. This number of ERUs is just an estimate; the actual number of ERUs for this area will be determined at a later time. Under any of the conceptual land use alternatives, any areas of the City Heights project within the City limits would be provided water by the City from its existing water system and supply.

Northland Resources has applied to the City of Cle Elum to annex the remaining approximately 330 acres of the City Heights site into the City. To address the increased demand on the City's water supply system from that portion of the project being annexed, the City's water policy allows for two options. The developer has the right to either contribute water to the City in sufficient quantity to serve the ERUs in the annexed area, or purchase water from the City's excess supply at the rate of $3,500 per ERU. Northland Resources could procure and transfer new water rights to the City sufficient to meet the expected annual demand for up to 875 Equivalent Residential Units (ERUs) within the development, and is in the process of seeking approvals from the Department of Ecology for such a transfer (as described below). Water required to service up to 110 additional ERUs under Alternative 1 (for a total of 985) would be provided from the City's existing water rights related to the property already within the City limits. Any shortfall in the amount of water rights that Northland Resources can transfer would need to be purchased by Northland from the City. Northland Resources anticipates that it may need to purchase water from the City to serve up to 250 ERUs. Final amounts, to be determined

after negotiations conclude with the Department of Ecology, will be included in the terms of a Development Agreement to be negotiated with the City.

Northland Resources is in the process of securing a new water right to serve up to 875 lots within the City Heights project and has filed the necessary applications with the Department of Ecology ("Ecology"). In order to accomplish this, Northland Resources proposes to place pre-1905 adjudicated irrigation water rights into a Trust Water Rights Program (in association with Washington Rivers Conservancy), and form a water bank with those water rights in accordance with Chapter 90.42 of the Revised Code of Washington (RCW). Once these rights are placed in the water bank, the bank will possess an approved quantity of consumptive acre-feet of water per year. This amount of water will be utilized to provide mitigation for a new water right application (as provided for under Chapters 90.03, 90.44 or 90.54 RCW) to serve the City Heights project. If required by Ecology, a specified quantity of water will be stored in summer months and would be released during the non-irrigation season to mitigate for the change in the time of use to winter months. Therefore, based on the mitigation supplied, the new water right is "water budget neutral"; that is, it will result in no net increase in water used, and no net loss of water in the basin.

To best integrate into the existing City of Cle Elum/Town of South Cle Elum water system, the new water right will likely specify the City's existing surface water intake on the Yakima River as the point of diversion, although use of multiple new groundwater supply wells to be developed on-site or nearby, to be operated by the City, may also be considered.

Once approved by Ecology, the new right brought by Northland Resources will for Alternatives 1 or 2 be transferred to the City of Cle Elum, and will serve as the transfer of water rights required by the City's Water Policy or, for Alternatives 3A or 3B, be utilized to supply one or more new Group A water systems to serve the project(s).

Alternatives 1 or 2

Under conceptual land use Alternatives 1 or 2, the goal of Northland Resources would be to transfer new water rights to the City that would provide sufficient water to serve all or most of the proposed residential and commercial development within City Heights. If there is any shortfall between the quantity of water available from the new right and the water necessary to serve the project within the annexed area, then Northland Resources will, in accordance with the City's Water Policy, purchase the amount of water from the City to cover the shortfall. At this time, it is anticipated that the new water right provided by Northland will be of sufficient quantity to serve most or all of the proposed project within the annexed area. It is possible that water to serve up to 250 ERUs would need to be purchased from the City. Ultimate resolution of this question is pending completion of the new right approval process with Ecology.

There are two possible options for the source of water to be placed into the system. One option is to utilize the existing sources within the Cle Elum water system, and the other option is to utilize withdrawals from groundwater wells, either on-site or nearby. These options are discussed in more detail in Sections 4.2.1 and 4.2.2, below.

It is anticipated that the City will supply water from its existing sources to any public space within the City Heights development that it owns or agrees to serve in the future, such as parks, street landscaping, open space and public amenities. Any private parks or amenities to be used only by City Heights residents would be separately metered and provided with water through the water transferred or purchased by Northland Resources.

Alternatives 3A and 3B

Under Alternative 3A or 3B, water supply for the City Heights development would be provided through individual water right permit-exempt wells or community systems operating with water right permits. Because the bedrock underlying the site produces relatively small quantities of water, it is expected that multiple wells, scattered throughout the site, would be required to meet the residential demands of either of these alternatives.

Water for Alternative 3B could be supplied through the water right or, given the potential for independent developments, some of the water could be supplied through the use of exempt groundwater wells.[1] The latter would depend on the status of Ecology's Emergency Rule that is currently in place that impacts exempt wells in the Upper Kittitas County area. On July 31, 2009, the Washington Department of Ecology adopted an emergency rule (Chapter 173-539A WAC) imposing a temporary moratorium on new permit-exempt wells in upper Kittitas County, including the Cle Elum area, pending completion of a groundwater study to evaluate impacts of exempt-wells on surface water flows in the Yakima River. Any property with a building permit issued after July 16, 2009 is subject to the rule. Under the rule, new permit-exempt wells are now required to be "water-budget-neutral." This rule may be modified in the future to remove the moratorium.

4.1 Pre-Development Condition

This section describes the existing City of Cle Elum water system infrastructure, including surface water supply sources and wells, storage facilities, and distribution pipelines, according to the 2006 *City of Cle Elum and Town of South Cle Elum Comprehensive Water Plan* (2006 Water Plan). See Figure 4.1 for a diagram of existing water system facilities.

4.1.1 Water Supply

The City's water system is has three sources, two for which the water rights are owned by the City of Cle Elum, and one owned by the Town of South Cle Elum. The City of Cle Elum has considerable reserve water rights available to serve future development that are not currently being used by existing customers or targeted for specific projected growth.

Yakima River Water Supply System (owned by the City of Cle Elum)

In 2004, a replacement intake structure was constructed in the south bank of the Yakima River, east of the South Cle Elum bridge. Two intake pipes in the intake structure convey water to a pumping station on top of the south bank dike in which there are three pumps with a capacity of 1,400 gallons per minute each. The system is designed to operate two pumps at a time with the third pump on standby. Raw water is conveyed across the Yakima River in two 18-inch diameter ductile iron pipes in a utility trench box constructed across the river bottom, on the downstream side of the South Cle Elum bridge. A 12-inch diameter pipe in the utility trench box conveys treated water back across the river to the Town of South Cle Elum.

[1] The Groundwater Permit Exemption (RCW 90.44.050) allows the users of small quantities of groundwater to construct wells and develop their water supplies without first obtaining a water right permit from Ecology. One groundwater exemption is allowed for any one project regardless of its size, provided that the cumulative total withdrawn from all wells together does not exceed 5,000 gallons per day.

Additional pumps are not scheduled to be added to the Yakima River source at this time. The third pump can be utilized at the Yakima River source during times of high use. There may also be the potential to increase the pumping capacity by increasing the size of the pumps at the Yakima River intake.

Cle Elum River Water Supply System (owned by the City of Cle Elum)

The Cle Elum River Water Supply System is not being used on a regular basis as a primary water supply system. It is intended to be used as a back up system to Yakima River Water Supply System. In the event the Yakima River water would reach unacceptable levels of certain water quality parameters (such as suspended sediments) to be used as a drinking water, the Cle Elum Water Supply System would be utilized until such time Yakima River water returns to acceptable drinking water quality levels.

A former sidebank diversion further upstream was converted in 2006 to a system of eight shallow (40 feet deep) groundwater wells between the old and new Bullfrog Road bridges. Each well is served by a 40-horse power pump system with transducers. A 12-inch ductile iron pipe, which changes to polyvinyl chloride pipe after the first 450 feet, supplies the water from the well field to the City's water treatment plant. Even though it was assumed in the 2006 Comprehensive Water Plan that each well would have the capacity to pump 350 gallons per minute, the actual capacities vary from well to well. Based on a conversation with the City staff, the pumps can be set to supply the desired 1,400 gallons per minute to the water treatment plant. This system was completed in 2009.

Well No. 1 and Well No. 7 (owned by the Town of South Cle Elum)

Well No. 1 and Well No. 7 are located at the Town of South Cle Elum Town Park, and operate as a well field. Well No. 1 produces 250 gallons per minute in the summer and 40 gallons per minute in the winter. Well No. 7 produces 150 gallons per minute in the summer and 30 gallons per minute in the winter. Both wells share a disinfection facility prior to entering the local distribution system. South Cle Elum well water is used in South Cle Elum, within their original distribution system, as a means to augment service to its customers. It is also integrated with the joint City of Cle Elum/Town of South Cle Elum water supply and distribution system.

4.1.2 Water Treatment

The Yakima River and Cle Elum River sources are pumped to the City's water treatment plant adjacent to SR 903, east of the Cle Elum-Roslyn Schools complex for filtration and chlorination prior to entering the distribution system. The treatment plant has an existing capacity of 4.0 million gallons per day (MGD). The treatment plant was completed in 2004, and was built to accommodate two additional treatment trains and booster pumps to increase the capacity to 8.0 MGD. In accordance with the 2006 Comprehensive Water Plan, the City of Cle Elum is scheduled to increase the treatment facility capacity to 6.0 MGD in 2016, and to 8.0 MGD in 2026. Existing agreements between the City of Cle Elum and Suncadia require the City to increase the treatment capacity at certain trigger points. A trigger point occurs when either water production exceeds 2.0 MGD for three or more days within a 12-month period, or when Suncadia has added 1,334 new residential (or equivalent residential unit [ERU]) water connections). Based on current water usage and projected water usage for the City Heights project, the water treatment facility could be capable of serving the water needs of the City Heights project through development of the first 300 to 400 ERUs. In the event a trigger point is

reached prior to that, it is the responsibility of the City of Cle Elum to construct an expansion to the water treatment plant.

Water from the South Cle Elum wells is treated independently and does not enter the City of Cle Elum water treatment facility; however, it is added to the Cle Elumwater system distribution system.

4.1.3 Water Storage

The integrated water system has five reservoirs serving three pressure zones (see Figure 4.1). Pressure zones correlate relative elevation to sea level. Pressure Zone 1 serves customers located between elevations 1,865 and 1,965 feet above mean sea level (msl). There are two existing tanks within this pressure zone with capacity of 100,000 gallons and 200,000 gallons. In addition, a 500,000-gallon storage facility is located between Zone 1 and Zone 2 that serves Zone 1. Therefore, the total storage capacity in Pressure Zone 1 is 800,000 gallons. Pressure Zone 2 serves customers located between elevations 1,965 and 2,080 above msl. There is one existing storage facility serving this pressure zone with a storage capacity of 500,000 gallons. Pressure Zone 3 serves customers located between elevations 2,080 and 2,200 above msl. There is one existing storage facility serving this pressure zone with a storage capacity of 1,400,000 gallons.

4.1.4 Water Distribution System

The City of Cle Elum water distribution lines (those with service connections to water users) consist of pipes ranging in size from 2-inch to 16 inches in diameter, with the majority of the pipe diameters being 4-inch, 6-inch, 8-inch and 12 inches in size. The City's transmission lines (those that do not have service lines connected directly to them) consist of pipe diameters ranging in size from 12-inch to 20 inches in diameter. The distribution and transmission lines total approximately 26 miles of pipe.

4.1.5 Water Service Area

Portions of the City Heights site are not included within the City of Cle Elum Retail Service Area and the Critical Water Supply Service Area boundaries (see Figure 4.2). The areas within the City Heigths project not included are directly adjacent to the existing boundaries of those areas. Prior to the start of any design or construction of the project, the City of Cle Elum's Retail Service Area and the Critical Water Supply Service Area boundaries would have to be updated to include the City Heights Planned Mixed-Use development. This process has commenced.

4.2 Post-Development Condition

Encompass Engineering used an average daily demand (ADD) of 254 gallons per day per residential connection to estimate the impacts of the City Heights Planned Mixed-Use Development. This average daily demand is based upon actual usage within the City of Cle Elum between 2001 and 2005 as shown in the 2006 Water Plan. In addition, this average daily demand was used to forecast future demands and available equivalent residential units (ERUs) for the water system to the year 2026. The 20-year population shown in the Water Plan is 10,485 for the City of Cle Elum. The City's existing population is approximately 1,835 (City of Cle Elum *Comprehensive Plan*: Housing Element [2007]). Commercial water usage was calculated in the 2006 Water Plan based on an ERU value of 6.2 for restaurants and 1.2 ERUs for general commercial. These values are based upon actual usage within the City of Cle Elum

between 2001 and 2005, and are used in the 2006 Water Plan to project future commercial water usage. As shown in the 2006 Water Plan, a 15 percent contingency is used for future water system demands due to unaccounted-for water (i.e., the difference between water production and metered water consumption between June 2004 and December 2005). In addition to system leakage, flushing, and fire suppression uses, there are several water services to municipal buildings within the City of Cle Elum and the Town of South Cle Elum for which the meters are not read.

Currently, it is assumed that convenience retail some small amount of professional office will comprise the commercial development in the City Heights project. Restaurant usage is the type of possible convenience retail that would result in the greatest use of water and therefore, we assumed it was the retail use of choice to be conservative in calculating water usage.

Encompass Engineering feels a more representative contingency of 7.5 percent for future uses within the City Heights Planned Mixed-Use development is appropriate for the following reasons:

- New infrastructure within the City Heights Planned Mixed-Use development will minimize water loss factors.
- All services within the City Heights Planned Mixed-Use development will be metered.
- Residential and commercial development within the City Heights Planned Mixed-Use development will utilize the latest technology in water features such as low-flow fixtures.

For Alternatives 1 or 2, Northland Resources proposes that water will be supplied by the City to the City Heights project by either extending the existing City of Cle Elum water system to the site, or by creating additional water sources (groundwater wells) for the City on or near the site and connecting these to the existing transmission system. If wells are used, the proposal is to treat the water from these sources independent of the City's existing water treatment plant. Some combination of these two options may also be utilized.

4.2.1 Extension of the City of Cle Elum Water System (to serve Alternative 1 or 2)

Under this option, the existing Cle Elum water sources would provide water to the City Heights project. While project phasing, and therefore phasing of the construction of any additions or improvements to the water system, is not certain at the time of this writing, a connection between the City Heights project and the main transmission line(s) from the water treatment facility or from an existing storage reservoir would need to be constructed at the commencement of the City Heights project, with any additional connections occurring over time if needed. A connection to the main Cle Elum transmission line (i.e., to existing sources of treated water) could occur at SR 903 near the west end of the City Heights site, or somewhere along the southern site boundary.

Due to changes in elevation within the development, a pressure zone above the existing Pressure Zone 3 would be created (Zone 4). Development would occur within the existing Pressure Zones 1 through 3 as well as in the new Zone 4. Transportation of water between zones would require pressure-reducing stations and booster station(s). In order to accommodate fire flow storage, standby storage, and equalizing storage, new reservoir(s) may also be required. Several different water main sizes will be utilized to serve the proposed residential neighborhoods and neighborhood commercial development.

The size and types of improvements to the existing Cle Elum water system as well as on-site water system improvements necessary to serve the phased development of the City Heights project will depend on the ultimate design of the developed residential and commercial uses. There are several optional design alternatives that if applied would impact the infrastructure necessary to serve City Heights. Water system design will be a coordinated effort between the City of Cle Elum and the developer of the City Heights project. Therefore, it cannot be said with certainty at this time the exact number or location of storage facilities or other potential improvements to the system or the timing of their construction. As an example, during the early phases of the City Heights project, one additional storage facility may need to be constructed on-site in Zone 2 or Zone 3 to provide service and to provide fire flow to the system. Alternatively, connections to existing tanks, such as the existing tank in Zone 3, could serve much of the development prior to a new tank being needed. This is especially true within Pressure Zone 2 with the installation of a pressure-reducing valve. If the design warrants, a pump system would be constructed to lift the water from lower zones to higher zones. Depending on the ultimate design of the water system and the conceptual land use alternative selected for implementation, additional storage facilities may need to be constructed on the site.

Project reports must be prepared to secure Washington State Department of Health ("DOH") approval of a newly constructed or improved water system. Such reports will be prepared corresponding to phased development within the City Heights Planned Mixed-Use development to determine specific improvements to the distribution system required to extend the City's system to serve the City Heights project. The 2006 Water Plan includes a hydraulic analysis of the entire water system. A hydraulic analysis is used to determine if the system meets the DOH requirements for peak hour demands and for fire suppression. It shows where there are system deficiencies hydraulically, such as if pipe sizes need to be increased. A hydraulic analysis of the demands of the City Heights Planned-Mixed Use development will be included in the project reports as the project is developed. The hydraulic analysis will be needed to determine whether portions of the City Heights Planned Mixed-Use development can be served by the existing water system including existing sources, storage facilities, water distribution and transmission lines.

4.2.2 New Water Sources and Treatment Facilities (to serve any of the four conceptual land use alternatives)

In lieu of providing equalizing storage and/or increasing the existing source capacity, existing wells on or near the City Heights site or new groundwater wells could be used to develop a Group A community water system. While water from these sources would be connected to the existing water distribution and storage system, there would not likely be a need for the water to be transported to/from the City's existing water treatment facility. The water system would be developed in accordance with DOH standards and specifications, and would be consistent with City of Cle Elum comprehensive plans, policies, and development standards. On-site storage facilities would be provided. The amount of storage required would be dependent upon the capacity of the source(s) serving the system (see section 4.2.1 above for explanation of design options).

This water would be treated on-site with treatment facilities that comply with DOH regulations for groundwater wells. The type of treatment would depend on the characteristics of water obtained from wells. Thereafter, the water could be integrated into the City of Cle Elum water system (to serve any of the four conceptual land use alternatives), or a separate community water system could be established to serve the City Heights project (Alternatives 3A or 3B).

4.3 Planned Mixed-Use Development Proposal

The main sources used to estimate the potable water requirements of the City Heights Planned Mixed-Use development are the City of Cle Elum 2006 Water Plan and the Washington Department of Health 2001 Water System Design Manual. A detailed breakdown of water system requirements for each of the conceptual land use alternatives is provided in Tables 4.3-1 through 4.3-4.

4.3.1 Alternative 1 – Preferred Alternative

The water supply average daily demand for the City Heights Preferred Alternative would be approximately 0.28 million gallons per day (MGD).

The largest water usage group would be the proposed 985 detached and attached single-family residential units with an average daily demand (ADD) of approximately 0.25 MGD. This value is based upon an average daily demand of 254 gallons per day per connection in accordance with projected usage calculations for the City of Cle Elum as shown in the 2006 Water Plan.

The average daily water demand to serve total commercial development under the Preferred Alternative (20,000 square feet) would be approximately 0.01 MGD. This is based upon the assumptions that approximately 10,000 square feet would consist of restaurant usage and approximately 10,000 square feet would consist general commercial space. Projected water usage by restaurants and general commercial tenants, as shown in the 2006 Water Plan, is 6.2 equivalent residential units (ERUs) for restaurants and 1.2 ERUs per connection for general commercial. Assuming five restaurant connections and seven general commercial connections, the water usage per square foot of commercial space would be approximately 0.5 gallon per day per square foot. Based on the above, the total average daily water demand to serve the entire City Heights project would be 0.26 MGD. With a 7.5 percent contingency applied for unaccounted water (i.e. leaks, system flushing, etc.), the total water supply average daily demand for the Preferred Alternative would be approximately 0.28 MGD

Fire flow demands will be based upon the required flow to a building in gallons per minute and duration in hours for commercial buildings. The maximum fire flow requirement in the City of Cle Elum is 480,000 gallons for a demand of 4,000 gallons per minute for a 2-hour duration. Residential fire flow requirements are 120,000 gallons for a demand of 1,000 gallons per minute for a 2-hour duration. Depending upon how development is phased and connected into the existing system, the City Heights Planned Mixed-Use Development may utilize the City's existing water storage facilities to meet fire flow requirements. Fire flow storage would be provided at the start of vertical construction of any residential or commercial structure, under any conceptual land use alternative. Additional facilities for fire flow may be required.

There would be approximately 1,025 ERUs (including the commercial-equivalent ERUs) with Alternative 1. A factor of 20 gallons per ERU is used to project operational storage requirements per the 2006 Water Plan, resulting in operational storage requirements of 20,500 gallons for Alternative 1.

The minimum standby storage requirements per the 2006 Water Plan are 200 gallons times the number of ERUs. With 1,025 ERUs in Alternative 1, the standby storage requirement is 205,000 gallons. "Nesting" of standby storage and fire suppression storage is allowed per the Department of Health (DOH) 2001 Water System Design Manual; in other words, it may not be

necessary to provide both standby storage and fire suppression storage. This determination will be at the discretion of the City or County Fire Marshal, depending on the alternative selected for implementation. Storage will be provided based upon the larger of the two requirements, not both. The City may not require either standby or fire suppression storage due to the capacity in the existing water storage facilities.

The minimum equalizing storage per the DOH 2001 Design Manual to meet the periodic demands placed on the system that exceed the production capacity is equal to 150 times the difference between the peak hour demand and the production capacity. Peak hour demands are provided in the City's 2006 Water Plan for residential, restaurants, and general commercial connections. These values are 1.3 gallons per minute (GPM) per residential connection. Restaurants have an ERU value of 3.5, and general commercial has an ERU value of 0.5. This results in a peak hour demand for the Preferred Alternative of 1,280.5 GPM for residential connections and 27.3 GPM (1.365 GPM/1,000 square feet) for commercial. Therefore, the total peak hour demand for Alternative 1 is 1,307.8 GPM. If the City Heights Planned Mixed-Use development did not increase the water system production capacity as mitigation, the maximum equalizing storage required for Alternative 1 would be 196,170 gallons. (This is the portion of storage that could be decreased if the source and treatment capacity were increased.)

Table 4.3.1. Alternative 1 water system requirements: the Preferred Alternative.

Usage Category	No. of Units	Persons per Unit	Population	Assumption	Total ADD[1] (gpd)	Total Annual (ac-ft)
Detached Single Family	690	2.4	1,656	254 gpd/ERU	175,260	196.3
Attached Single Family	295	2.4	708	254 gpd/ERU	74,930	83.9
Commercial	20,000[2]			0.5 gal/sq.ft.	10,000	11.2
Unaccounted for Water				7.5% contingency	19,514	21.9
Total					**279,704**	**313.3**

[1] Total Average Daily Demand
[2] Total square footage.

4.3.2 Alternative 2 – Reduced Residential Density

The average daily demand for the Reduced Residential Density Alternative would be approximately 0.26 million gallons per day (MGD).

The largest water usage group would be 875 detached and attached single-family residential units with an average daily demand (ADD) of approximately 0.22 MGD. This value is based

upon the same average daily demand of 254 GPD per ERU as previously described for the Preferred Alternative. The average daily water demand to serve total commercial development under Alternative 2 (40,000 square feet) would be approximately 0.02 MGD, based upon a usage factor of 0.5 gallon per day per square foot of commercial space. With a 7.5 percent contingency for unaccounted-for water (i.e. leaks, system flushing, etc.), the total average daily demand for the Reduced Residential Density Alternative would be 0.26 MGD. Fire flow requirements to serve Alternative 2 would be based on the fire flow parameters outlined in 4.3.1. Given the reduced ERU count in Alternative 2, operational storage requirements would be approximately 19,080 gallons.

With 954 ERUs in the Alternative 2 development concept, the standby storage requirement would be 190,800 gallons, with a total peak hour demand of 1,192 GPM. If the City Heights Planned Mixed-Use development did not increase the system production capacity as mitigation, the maximum equalizing storage under Alternative 2 would be 178,815 gallons.

Table 4.3.2. Alternative 2 water system requirements: Reduced Residential Density Alternative.

Usage Category	No. of Units	Persons per Unit	Population	Assumption	Total ADD[1] (gpd)	Total Annual (ac-ft)
Single Family Detached	525	2.4	1,260	254 gpd/ERU	133,350	149.4
Single Family Attached	350	2.4	840	254 gpd/ERU	88,900	99.6
Commercial	40,000[2]			0.5 gal/sq.ft.	20,000	22.4
Unaccounted for Water	-			7.5% contingency	18,169	20.4
Total					**260,419**	**291.7**

[1] Total Average Daily Demand
[2] Total square footage

4.3.3 Alternative 3A – No Annexation, Development within the County under Single Ownership

Alternative 3A is the same conceptual land use scenario as Alternative 2, with the difference being that Alternative 3A would be developed in the County rather within the City limits. Both the City of Cle Elum and Kittitas County utilize the same guidelines when designing water systems, but how those guidelines are applied may vary. We have assumed similar results would be reached by Kittitas County and therefore, the calculation of average daily water demand would be identical to that calculated above for Alternative 2: approximately 0.26 million gallons per day (MGD). Fire flow, standby storage and equalizing storage requirements would also be identical to Alternative 2.

Under Alternative 3A, a Group A community water system would be developed on the site in accordance with Department of Health standards and specifications. The system would also be required to be consistent with adopted Kittitas County comprehensive plans, policies, and development standards. Wells would be developed on or near the property to serve the project. Water treatment would be provided as required by the Department of Health depending on the water quality of the developed source(s). The amount of storage required would be dependent upon the capacity of the source(s) serving the Group A community water system.

Table 4.3.3. Alternative 3A water system requirements: No Annexation, Development within the County under Single Ownership.

Usage Category	No. of Units	Persons per Unit	Population	Assumption	Total ADD[1] (gpd)	Total Annual (ac-ft)
Single Family Detached	525	2.4	1,260	254 gpd/ERU	133,350	149.4
Single Family Attached	350	2.4	840	254 gpd/ERU	88,900	99.6
Commercial	40,000[2]			0.5 gal/sq.ft.	20,000	22.4
Unaccounted for Water	-			7.5% contingency	18,169	20.4
Total					**260,419**	**291.7**

[1] Total Average Daily Demand
[2] Total square footage

4.3.4 Alternative 3B – No Annexation, Development within the County under Multiple Ownerships

Under Alternative 3B, up to 17 individual developments could occur independently. The average daily water demand for Alternative 3B would be approximately 0.175 million gallons per day (MGD).

The water usage group would consist of approximately 500 single-family detached residential units. This value is based on an average daily demand of 350 gallons per day per connection, consistent with the Department of Health 2001 Water System Design Manual as it relates to non-municipal water systems.

Under Alternative 3B, multiple water systems with multiple ownerships would be developed on the site. Each individual system would be required to meet the requirements of the Department of Health (DOH) and Kittitas County. Water treatment would be provided in accordance with DOH requirements, depending on the water quality of the developed sources (i.e., wells). The

requirements of each individual water system would vary depending upon the number of connections and lot sizes being served.

Fire flow demands would be based upon on the 2006 International Fire Code and would be required to comply with Kittitas County requirements. If all the parcels were developed in an integrated manner, the maximum residential fire flow requirements of Alternative 3B would be 120,000 gallons for a demand of 1,000 gallons per minute for a 2-hour duration. However, it is likely that under this Alternative, independent Group A water systems would be developed and fire flow and storage requirements would be calculated on a project by project basis. Depending on the requirements of the County, fire flow may not be required. If it is required, additional storage requirements would depend on the capacity of the source(s) for the individual systems. If a source were developed to meet the peak hour demand for each individual system, additional storage would not be required in accordance with Department of Health requirements.

Table 4.3.4. Alternative 3B water system requirements: No Annexation, Development within the County under Multiple Ownerships.

Usage Category	No. of Units	Persons per Unit	Population	Assumption	Total ADD[1] (gpd)	Total Annual (ac-ft)
Single-Family Detached	500	2.4	1,200	350 gpd/ERU	175,000	196

[1] Total Average Daily Demand.

4.3.5 Public Spaces

Water demands for public spaces would vary depending on the type and quantity of uses and landscaping within those areas. For Alternative 1, the water demand for irrigation in those areas would be approximately 3,600 GPD (assuming six parks/public amenities at 600 gallons per day per park). For Alternative 2, fewer public spaces are provided and therefore the water demand for irrigation in those areas would be approximately 2,400 GPD. For Alternatives 3A or 3B, no public spaces would be provided, so there would be no water demand for irrigation of these areas.

4.3.6 Alternative 4 – No Action

There would be no water system requirements or demand to serve the undeveloped condition of the City Heights site under the No Action Alternative.

4.4 Design Requirements

Whether potable water for the proposed City Heights Planned Mixed-Use development provided by the City of Cle Elum (to serve Alternative 1 or 2) or through an independent on-site community water system (to serve Alternative 3A or 3B), such water will be supplied in accordance with applicable City of Cle Elum (Alternative 1 or 2) or Kittitas County (Alternative 3A or 3B) standards and specifications and DOH and other state regulations. Both the City of Cle Elum and Kittitas County Fire Marshal utilize the 2006 International Fire Code as a basis of their requirements. Fire suppression systems would be required to meet City of Cle Elum or

Kittitas County requirements (depending on the alternative selected for implementation), and DOH requirements for fire flow and pressure. Specific building designs will determine these requirements at the time building permits are applied for.

Under any of the four conceptual land use alternatives, new water system infrastructure will be required to serve the proposed development. Infrastructure could include new distribution mains, groundwater wells, increased source and treatment capacity at existing facilities, booster pumps, storage facilities, pressure-reducing valves and other standard water main appurtenances. All water-related infrastructure would be designed and constructed in accordance with applicable City or County requirements (depending on the alternative selected for implementation) at the time of building permit approvals, and State requirements.

Under Alternative 1 or 2, if water were delivered to the City Heights project from the water treatment plant, a water transmission line would need to be added from the plant that would run within the SR 903 (Washington State Department of Transportation ["WSDOT"]) right-of-way and which may run within Bonneville Power Association ("BPA") and/or Puget Sound Energy ("PSE") power line easements to reach the City Heights site. These entities would need to be consulted during the design phase, and an easement would be needed from WSDOT.

4.5 Project Impacts

As shown in Tables 4.3-1 through 4.3-4, the highest demand for water (0.28 MGD) would be generated by Alternative 1, the Preferred Alternative. The difference between Alternative 1 and Alternative 2 or 3A would be approximately 7 percent less water demand for Alternative 2 or 3A. The difference in water demand between Alternative 1 and Alternative 3B would be approximately 35 percent less for Alternative 3B.

Alternatives 1 or 2

The existing Cle Elum water system is not capable of distributing water to serve the City Heights project without infrastructure improvements, both off-site and on the City Heights property. New distribution and transmission lines would be needed, new storage capacity and additional treatment facility capacity may be needed to supply water to the City Heights project. Additional equipment at the source of withdrawal (pumps, etc) may also be necessary to withdraw the additional water, as well as lift stations, booster pumps, and related equipment. Actual impacts would depend upon whether the City water sources and water treatment facility were utilized to serve the City Heights project, or whether new sources of water (i.e., wells) and on-site treatment would be constructed to serve the development.

Alternatives 3A or 3B

Under Alternative 3A or 3B, the City would not provide water to the City Heights development. Water would be supplied with one or more Group A community water systems. New distribution and transmission lines would be needed, as well as new storage capacity and new treatment facilities to supply water to the City Heights project. Additional equipment at the source of withdrawal (wells and pumps) would also be necessary to withdraw the water, as well the potential need for lift stations, booster pumps, and related equipment. Actual impacts would depend on the ultimate design and the number of independent projects with 3B.

4.5.1 Potential Impacts During Construction

Alternatives 1 or 2

Construction of a new or expanded water system would be required throughout the City Heights Mixed-Use development within public rights-of-way or utility easements located under or adjacent to City streets or private roads within the development. Construction activities related to installation of the system would include construction-related traffic to deliver pipe and other material to the site; noise and dust during trenching, excavation, import/export of material; coordinating the installation of other underground utilities; possible temporary disruptions in service to some customers; backfilling, paving and/or overlay of existing streets; and possible disruptions to traffic due to temporary traffic lane closures or detours. Excavations would increase the potential for soil erosion to occur.

Alternatives 3A or 3B

Construction of a new or expanded water system would be required throughout the City Heights Mixed-Use development. Construction activities related to installation of the system would include construction-related traffic to deliver pipe and other material to the site; noise and dust during trenching, excavation, import/export of material; and backfilling. Excavations would increase the risk of soil erosion.

Alternative 4

Under the No Action Alternative, no water system would be installed on the site; therefore, there would be no utility construction impacts associated with this alternative.

4.5.2 Potential Developed-Condition Impacts

Alternatives 1 or 2

The water supply requirements of the City Heights Planned Mixed-Use development would increase the workload of City operations staff. Booster station(s), reservoir(s), pressure-reducing stations, and miles of water distribution mains to be constructed would require maintenance. Maintenance requirements and costs to the City would be expected to increase with the increase in water system facilities.

If a portion of the City Heights project were served through purchase of water from the City of Cle Elum, this would reduce the amount of water held in reserve by the City for future needs. Alternatively, the payment required to purchase the water would provide the City with the financial resources to secure new water rights and water sources to maintain these reserves if needed in the future. These funds could be used by the City to improve service throughout the system.

New reservoirs may be visible from parts of the community.

Alternatives 3A or 3B

The loss of a large potential customer base could result in a significant loss of revenue to the City due to the development of water systems and sources of supply separate from the City's water system. New reservoirs may be visible from parts of the community.

Alternative 4

Under the No Action Alternative, there would be no water system on the site; therefore, there would be no water system operational impacts associated with this alternative.

4.6 Mitigation Measures

4.6.1 Incorporated Features

The proposed development would incorporate low-flow faucets, toilets, and other similar fixtures to minimize domestic water supply requirements. Best management practices would be implemented to limit impacts from erosion during construction.

Alternatives 1 or 2

Water meters will be installed at each building, or at another connection point using water and pipe/meter sizes to be determined on the basis of domestic flow volumes and fire flow needs. Increased operating and maintenance costs accrued by the City would be recovered by utility rates paid by the actual users. All reasonable efforts will be made to locate new water reservoirs with minimal visual impacts.

It is typical that as developments occur within local communities, developers are responsible for the initial capital investment costs of infrastructure improvements to mitigate their impacts as part of project approval conditions. It is anticipated that an agreement will be created between the City of Cle Elum and the City Heights Planned Mixed-Use development providing that the costs of improvements required within the City of Cle Elum water system to serve City Heights and all on-site improvements required to supply water to City Heights will be paid by the project proponent and not directly by the City of Cle Elum. Payment could take the form of direct payment by the project proponent, through some form of City-sponsored financing such as a Local Improvement District sponsored by Cle Elum (completely paid for by the project proponent, not with City funds), or through grant money secured by the City of Cle Elum (with the costs of application and procurement funded by the project proponent and not the City).

Alternatives 3A or 3B

Under these alternatives, either a Satellite Management Agency would operate the system(s), or the developer or Homeowner's Association would become a certified operator. In the latter case, three employees would be required to manage the system. All reasonable efforts would be made to locate new water reservoirs with minimal visual impacts.

4.6.2 Applicable Regulations

Design and construction of all proposed water system improvements would comply with applicable local and State regulations. Depending on the alternative selected for implementation, these would include:

- Department of Ecology for new water right approvals and on-going monitoring if the approvals provide for such activities.
- Revised Code of Washington
- Washington Administrative Code
- City of Cle Elum Municipal Code, Standards and Specifications (Alternative 1 or 2)
- Kittitas County Standards and Specifications (Alternative 3A or 3B)
- Washington State Department of Health regulations.
- Washington State Department of Transportation regulations as they relate to construction within or across State route rights-of-way.

Water Rights

Surface water rights in Washington State are governed under Chapter 90.03 Revised Code of Washington (RCW), and groundwater rights are governed under Chapter 90.44 RCW. A new water right can be issued only if the Washington Department of Ecology (Ecology) determines that: 1) water is available for appropriation, 2) the appropriation would not impair other senior water rights, 3) the proposed use is a beneficial use, and 4) the appropriation would not be detrimental to the public interest. Due to historic water shortages, Ecology has determined that water is no longer available for appropriation in the Yakima Basin without mitigation of the effects on flows in the Yakima River.

In addition to the statutory requirements, water rights in the Upper Yakima Basin are managed based on forecasts of surface water quantities available to meet out-of-stream and in-stream needs in the Yakima Basin. These forecasts, referred to as Total Water Supply Available (TWSA), are performed by the U.S. Bureau of Reclamation on at least a monthly basis during the irrigation season (mid-April through mid-September), and are used to determine whether sufficient water is available to meet projected demands, including irrigation diversions and instream flow targets. All demands cannot be met in water-short years. Under the terms of a 1945 Consent Decree issued by the District Court of Eastern Washington, water rights with a priority date earlier than May 10, 1905 are not subject to regulation based on TWSA, while water rights with a May 10, 1905 or later priority date are subject to partial or full curtailment of water use in water-short years.

In order to receive a new water right in the Yakima Basin, the new appropriation must be “water-budget-neutral,” and therefore must include a plan for mitigating the consumptive use. One way to mitigate the proposed appropriation is by placing into the State’s Trust Water Right Program an existing water right with an equivalent amount of consumptive use (Chapter 173-539A WAC). Northland Resources currently controls several existing surface water rights for seasonal irrigation that it intends to transfer to the Trust Water Right Program to offset the consumptive use impacts of the requested new water right during the irrigation season. In addition, Northland also proposes to mitigate the consumptive use of water associated with the City Heights development during the non-irrigation period through release of stored water. The water rights held by Northland Resources all have pre-1905 priority dates, and therefore are not subject to curtailment under TWSA management. As a result, new water rights with consumptive use offset by the pre-1905 irrigation water rights would also not be subject to curtailment.

Alternative 3B that would involve development within the County could rely on water right permit-exempt wells, rather than a new water right, to provide water supply. Under Ecology's temporary moratorium on new permit-exempt wells in upper Kittitas County (Chapter 172-539A WAC), use of these wells would require a plan for mitigating the consumptive use, in order to remain "water-budget-neutral." Similar to the approach being pursued by Northland Resources to obtain a new water right, the consumptive use associated with one or more new permit-exempt wells to serve Alternative 3A or 3B would be mitigated by placing a pre-1905 water right with an equivalent amount of consumptive use in the Trust Water Right Program. The developer would be required to conduct additional hydrogeological analysis to confirm that wells developed to serve the City Heights project would not adversely affect the quantity of water available to existing downgradient wells within the area of influence.

4.6.3 Other Recommended Mitigation Measures

For any of the four conceptual land use alternatives, the project's Covenants, Codes and Restrictions could require homeowners to install only drought-tolerant landscaping to minimize water requirements to irrigate landscaping.

4.7 Phased Development

Phased construction of the water system may or may not coincide with phased development of the City Heights Planned Mixed-Use development. Hydraulic models will be provided with Project Reports as development occurs. These models will dictate the needs and locations of reservoir(s) for storage and/or pump stations. Project phasing may require additional storage facilities, lift stations, booster pumps, treatment facility upgrades, and transmission mains to be constructed in order to serve the development pods.

4.8 Significant Unavoidable Adverse Impacts

Alternatives 1 or 2

It may be necessary to upgrade and expand the City's water system to serve the full build-out condition of the City Heights Planned Mixed-Use Development. A Development Agreement or other form of development approval (depending on the conceptual land use alternative selected for implementation) will specify developer cost responsibilities to avoid adverse impacts to the City or existing water system customers. New users within City Heights will be required to pay connection fees and monthly service fees established by the City. For all of these reasons, there should be no significant unavoidable adverse impact to the operation and maintenance of the system, or to existing City water system customers.

There would be no net loss of water in the basin as a result of the water bank proposal because the water currently consumed would be transferred from one use (irrigation) to a different use (residential and neighborhood commercial development within the City Heights project). There would be no increase in the quantity of water used. The seasonal difference in use would be mitigated through storage and release of the stored amounts during winter months.

Alternatives 3A or 3B

If Alternative 3A or 3B is selected for implementation, additional hydrologeological analysis would be conducted to confirm that there would be no significant unavoidable adverse impacts to downgradient wells (of which there are none known at the time of this writing).

Figure 4.1 – Water System Map

Figure 4.2 – Critical Water Supply Service Area Boundary

Figure 4.3A – Conceptual On-Site Water Plan (West Half)

Figure 4.3B – Conceptual On-Site Water Plan (East Half)

5. SEWER

The existing wastewater collection and treatment system serves the City of Cle Elum (which includes the Bullfrog Urban Growth Area [UGA] properties), the Town of South Cle Elum, the City of Roslyln, and the Suncadia Resort (the "Sewer Parties"). The City of Roslyn also has an agreement with the City of Ronald to accept a portion of their wastewater. The Upper Kittitas County Regional Wastewater Treatment Facilities Project Agreement, Development Agreement and Service Agreement, as amended (the "Sewer Agreement"), guides the construction, use and operation of the Cle Elum wastewater collection and treatment system.

There is no formal comprehensive plan for the existing Cle Elum wastewater collection and treatment system; however, a Regional Sewerage Facilities Plan ("Facilities Plan") prepared by EarthTech (September 2002) was utilized as the basis for determining the needs and capacity of the existing system. The Facilities Plan was based on project-specific growth projections, and it allocated capacity to the Sewer Parties. It referenced future population growth and projected wastewater flows within a Regional Service Area that did not include the north Urban Growth Area in which the City Heights site is located (since this area had not yet been designated UGA at that time), but did include the portions of the site lying within the City limits (approximately 28 acres). Within those allocations, the Facilities Plan identified, along with existing customers in Cle Elum, approximately 215 residential units for unspecified future growth within the City of Cle Elum as well as 196 residential units within the Cle Elum City limits not served by City sewer service at that time. Based on the fact that a portion of the City Heights property (28 acres) is already within the Cle Elum City limits, and based on no significant growth in new residential units within the City limits since 2002, this report assumes for the purpose of this analysis that the 215 residential units allocated to Cle Elum for unspecified future growth could be allocated to the City Heights project. However, the number of connections allocated to each of the four Sewer Parties have been verified and it now appears that Cle Elum has fully-committed its wastewater treatment plant capacity.

This chapter summarizes an off-site wastewater collection and treatment system analysis prepared by ESM Consulting Engineers L.L.C. (ESM), and an on-site sanitary sewer analysis prepared by Encompass Engineering and Surveying (EES) for the City Heights Planned Mixed-Use Development. The off-site analysis includes an analysis of the City's existing sewage collection, treatment and reuse/discharge system identified in the Facilities Plan, calculation of the existing system use data, an estimate of the proposed wastewater collection and treatment requirements based on the City Heights conceptual land use alternatives, and impacts and mitigation measures for the potential effects of the City Heights development on the off-site wastewater collection and treatment system. Based on use data calculated by ESM, the on-site sanitary sewer system analysis formulates sewer system requirements to serve the City Heights project and evaluates the potential impacts of the on-site system on the existing City of Cle Elum wastewater collection and treatment system.

5.1 Pre-Development Condition

The City Heights project site has no existing sewage collection or treatment infrastructure. A portion of the City Heights property (approximately 28 acres) is within the City limits, and the entire south boundary of the site is contiguous with the City of Cle Elum incorporated area, in close proximity to the existing sewage collection system infrastructure.

5.1.1 Existing Collection System

Wastewater is currently collected in the City of Cle Elum sewer trunk line that initiates in the Suncadia Resort and runs east through the Bullfrog UGA, and then east along Second Street to the treatment plant located south of 1st Street East (SR 970) and north of Interstate 90, near the east end of the Cle Elum City limits (see Appendix E of this report). This trunk line generally ranges in size from 21 to 30 inches in diameter. A small portion leading to the headworks is 36 inches in diameter. There are two other trunk lines that ultimately connect to the Cle Elum sewer trunk line, one originating in Roslyn that runs adjacent to Crystal Creek to a point of connection near Stafford Avenue in Cle Elum, and another originating in South Cle Elum that extends eastward along the south side of the Burlington Northern Santa Fe railroad tracks to Owens Road (the access road to the sewer treatment plant) where it connects into the Cle Elum sewer trunk line headworks.

The Cle Elum sewer trunk line was designed for a build-out capacity of approximately 10.5 million gallons per day ("MGPD"), to meet seasonal high wastewater flows during the maximum month (March) of winter within the service area. A substantial amount of unused capacity is present within the existing Cle Elum sewer trunk line, since much of the development anticipated within the Suncadia Resort and the Bullfrog UGA (the "Suncadia Projects") has not yet occurred. Therefore, wastewater generated in the early phases of the City Heights project could be transported in the existing system if capacity could be allocated to the project. At some point in time, if all or a substantial part of the planned development within the Suncadia Projects is built and occupied, the existing Cle Elum sewer trunk line would not have the capacity to serve the City Heights project, assuming the levels of infiltration and inflow (I/I) allocated to the City of Cle Elum by the Facilities Plan are met or exceeded.[1]

5.1.2 Existing Treatment Facility

The Cle Elum wastewater treatment plant contains headworks, an influent pump station, two operating sequencing batch reactors (SBRs), an empty cell that would allow an additional SBR to be constructed, and an ultra-violet disinfection station. Since 2002, total monthly influent flows to the treatment plant have ranged from 7.652 million gallons (MG) to 78.169 MG. Flows vary depending on tourism, snow melt, rainfall, and I/I.

Based on Department of Ecology ("Ecology") regulations, there exist certain thresholds that, when exceeded, require additional capacity at the existing wastewater treatment plant to be considered and potentially constructed. When actual performance of the treatment facility reaches or exceeds 85 percent of any one of the design standards for a period of three consecutive months, Ecology will require the City to start studying and planning for treatment plant expansion, with the ultimate timing of expansion to be determined based on the results of this planning. Design standards that affect the treatment plant capacity decision include: monthly average flow (3.6 MGD), instantaneous peak flow (10.5 MGD), biological oxygen demand (BOD) influent loading (4,850lb/day), and total suspended solids (TSS) influent loading (3,750 lb/day).

[1] Infiltration and inflow ("I/I") can be the result of, among other things, stormwater connections to sewer lines (such as downspouts or sump pumps in basements), water entering the sewer system through manholes, and leaks in the collection system piping.

Depending on the pace of development within the Suncadia Properties and the timing of the construction of the additional treatment plant capacity required by Ecology (if any), the existing wastewater treatment facility could be capable of providing capacity for the early stages of the City Heights development. At some point in time, if all or a substantial quantity of the planned development within the Suncadia Properties is built and occupied, the existing treatment plant would not have the capacity to serve the City Heights project assuming the levels of I/I allocated to the City of Cle Elum in the Facilities Plan are met or exceeded. Within the Sewer Agreement, capacity is allocated to individual Sewer Parties, so although there may be overall capacity based on the current status of development of the Suncadia Properties, a particular Sewer Party (such as the City of Cle Elum) may or may not have capacity to allocate to the City Heights project.

The Facilities Plan made some general assumptions about the quantity of I/I within the City limits of Roslyn, Cle Elum, and South Cle Elum when determining the capacity of the treatment plant. Those estimates reflected higher than normal design standards for I/I due to combined sewer and storm drainage systems within the service area, and larger than average inflow within the existing conveyance system. It is possible that additional capacity could be created within the existing system by reducing the I/I in Cle Elum to levels below those assumed in the Facilities Plan.

5.1.3 Existing Outfall

The existing wastewater treatment plant outfall is a 24-inch diameter ductile iron pipe that extends west from the plant in Dalle Road, then south in a boring beneath Interstate 90, to a point of discharge in the center of the Yakima River secured by a rock drop (broad-crested weir). The outfall discharges Class A treated effluent from the SBR process.

The existing outfall was built extremely flat under low head conditions. When the Yakima River is experiencing high flows, the outfall pipe experiences a backwater condition.

5.2 Post-Development Condition

There are three potential methods of physically handling wastewater from the City Heights project. With any of the build alternatives, wastewater from the City Heights project could be incorporated into the existing Cle Elum wastewater collection and treatment system (“Public System”); however, for Alternatives 3A or 3B, the City would need to agree to provide sewer service to a project in the UGA but outside the City limits (except for the 28 acres of the City Heights property already within the City limits). For Alternatives 1, 2 or 3A, wastewater could be treated with an on-site Membrane Bioreactor (“MBR”) plant, with the treated effluent potentially utilized for seasonal on-site irrigation, and the remainder discharged to the Yakima River (“MBR System”). For Alternatives 3A or 3B, an additional option could be to treat wastewater within on-site sewage disposal systems.

Public System. The most efficient points of connection and means of serving the City Heights project from the existing Cle Elum wastewater collection and treatment system would be determined during final site design. There are six possibilities for delivering project wastewater to the Cle Elum wastewater treatment plant and treating the wastewater generated by the project. The first three options rely on utilization of the existing Cle Elum sewer trunk line in Second Street, while the others discuss alternative sewer trunk line locations.

- *The Borrow Option*. The City Heights project could be allowed to utilize the excess capacity in the sewer trunk line along Second Street and in the existing wastewater treatment facility during the early stages of development, after which one of the other options listed below would be implemented.

- *The Purchase Option*. Capacity within the existing collection system and wastewater treatment facility could be purchased from a party to the Sewer Agreement that would allow the existing trunk line along Second Street to be utilized.

- *The I/I Option*. Capacity within the existing collection system and wastewater treatment facility could be secured from a party to the Sewer Agreement by reducing the amount of actual I/I attributed to that party, thereby reducing flows that would create capacity to transport wastewater from the City Heights project within the Second Street trunk line.

- *The On-Site Option*. A sewer trunk line could be constructed on the City Heights site that would collect wastewater, exit the site from the east end (in or near Columbia Avenue), and independently tie into the existing wastewater treatment plant. This trunk line would require design, construction, and authorization to extend to the wastewater trunk line beneath SR 970 (a WSDOT right-of-way), the BNSF railroad line, Younger Ditch, and the City of Cle Elum Second Street storm drainage ditch. This option would also require making improvements to the treatment plant to increase capacity.

- *The Third Street Option*. A sewer trunk line could be constructed within the Third Street right-of-way to create additional collection capacity. This sewer trunk line would also extend to the existing treatment plant beneath SR 970 (a WSDOT right-of-way), the BNSF railroad line, Younger Ditch, and the City of Cle Elum Second Street storm drainage ditch. This option would also require making improvements to increase the treatment plant capacity.

- Some combination of the above options could be selected.

MBR System. In the case of a MBR System to serve Alternatives 1, 2 or 3A, one or more MBR facilities would be constructed. A collection system would transport the sewage from individual homes to a central processing plant on-site where the sewage would be filtered and treated. Effluent from that plant would then be transported either to on-site landscape irrigation uses or off-site to a point of discharge into the Yakima River (subject to obtaining all required permits and approvals for a new outfall to the river). When used to treat domestic wastewater, the MBR process produces effluent of “Class A” water quality standards, suitable for reuse in irrigation or other applications, or for discharge into waterways. Basically, sewage is transported to a bioreactor where bacteria remove much of the toxic elements and then the liquid is passed through a membrane. The resulting effluent is then suitable for various reuse applications, or suitable for discharge as with any other treatment facility. MBR effluent discharge would be at least seasonally necessary during winter months when landscape irrigation is not possible.

On-Site Sewage Disposal Systems. In the case of on-site sewage disposal systems to serve Alternative 3A or 3B, either individual (3B only) or community on-site sewage disposal systems would be constructed. These systems are self-contained and would not require any off-site improvements. Sewage would be transported to a filtering tank (or other means of filtering such as a sand pit) where the sewage would be treated. The effluent would then be transported to a drainfield, in which it would be discharged into the ground. In community systems, a collection

system of pipes would carry the effluent to a large drainfield, either via gravity or through a series of lift stations. The drainfield would consist of several distribution pipes, and would include a reserve field. Community on-site sewage disposal systems to serve Alternative 3A would require perpetual maintenance and management under the responsibility of a management system approved by Kittitas County.

5.3 The Planned Mixed-Use Development Proposal

This subsection compares the sanitary sewer effects of the proposed City Heights Planned Mixed-Use Development with the Pre-Development conditions in the Cle Elum wastewater collection and treatment system. Table 5.2.1 shows the post-development sanitary peak flows of the four City Heights land use Alternatives. The entire City Heights site is segregated into seven on-site sanitary sewer basins that may be combined by the use of on-site lift stations. Water demands in the table are consistent with the water demands of the project calculated in Section 4 of this report and are used as a basis for calculating sewer demand.

Table 5.3.1. Estimated City Heights project post-development peak hour flows.

	Estimated Peak Hour Flows (gpd)			
	Alternative 1	**Alternative 2**	**Alternative 3A**	**Alternative 3B**
Winter Peak Hour Flows	931,148	843,649	843,649	453,942
Summer Peak Hour Flows	856,656	776,157	776,157	417,627

Similar to the water supply requirements of the project as calculated in Section 4 of this report, the projected wastewater volume that would be generated by three of the four conceptual land use alternatives (Alternative 1, 2 or 3A) would differ by less than 10 percent, with Alternative 1 generating the greatest quantity of wastewater. The projected range of winter peak hour flow between the most demanding alternative (Alternative 1) and the least demanding alternative (Alternative 3B) for the City Heights project will be approximately 0.931 MGPD (Alternative 1) to 0.454 MGPD (Alternative 3B). This represents an 8.0 percent or a 4.3 percent increase, respectively, to the design flows used in the Facilities Plan for the trunk line and treatment plant (10.5 MGPD total capacity). Wastewater generated by Alternative 3B would be approximately 50 percent less than Alternative 1 if served by city sewer; however, given that Alternatives 3B (and 3A) assume development within the County and not the City, all but 28 acres would be served by individual or community on-site sewage disposal systems unless the City agreed to provide service outside the City limits.[2]

The Facilities Plan calculated wastewater flow based on a percentage of domestic water usage. It assumed that 80 percent of water delivered to each household or commercial structure would contribute to sewer flow. This assumes that 20 percent of potable water supply is not returned to the sewer system as a result of being consumed by cooking and other consumptive uses such as irrigation, and that some water will be lost to evaporation. The Facilities Plan used a factor of 100 gallons of water consumption per person per day for residential development, then applied

[2] The City of Cle Elum Comprehensive Plan: Capital Facilities Element does not presently include a policy regarding when and where urban services (such as sewer and water) would be available in the UGA if this property were to remain outside the City limits. For this reason, it cannot be assumed that the City would provide sewer service to Alternative 3A or 3B.

a factor of 80 percent to estimate average daily wastewater flow. To estimate the City Heights sewer demand, this report uses an updated water consumption factor (113.7 gallons per person per day), consistent with the Water section of this report, and consistent with actual usage per the City of Cle Elum Water Comprehensive Plan. Other assumptions include the following:

- Residential development is assumed to be 90% primary homes and 10% secondary homes[3]
- Secondary homes are assumed to be 50% occupied $= \frac{(90\% \times DU \times 100\%) + (10\% \times DU \times 50\%)}{DU} = 0.95\%$ occupancy
- Sewage generation is assumed to be 80% of total water usage
- Commercial development wastewater volume assumes 0.50 gallon per day (GPD) per square foot
- Consistent with the Facility Plan, winter I/I is assumed to be 25% of total sewage, and summer I/I is assumed to be 15% of total sewage (the Facilities Plan actually used 10% for this latter figure).
- Peak hour flow (PHF) is calculated by multiplying the average daily flow (ADF) by a peaking factor - $PHF = 3.5 \times ADF$.

For the purpose of understanding sanitary sewer demand and model inputs, a brief description of Land Use types is included below (refer to Preliminary Engineering Report Section 1.2 for a more detailed description). The housing/building densities of the conceptual land use alternatives are very important in determining the projected amount of sewer loading. More detailed sanitary sewer calculations are provided in Appendix E of this report.

5.3.1 Alternative 1 – Preferred Alternative

The City Heights Preferred Alternative includes 985 dwelling units and 20,000 square feet of neighborhood commercial development. This conceptual land use scenario would generate a total average daily wastewater flow of approximately 212,834 gallons per day (GPD), based on 80 percent of total water usage, and a Winter Peak Hour Flow of approximately 931,148 GPD. Residential use, based on the Facilities Plan factor of approximately 2.4 persons per residential dwelling unit, would generate average daily wastewater flow of approximately 204,818 GPD, and a Winter Peak Hour Flow of approximately 896,082 GPD. The average daily wastewater demand to serve total commercial development under the Preferred Alternative would be approximately 8,016 GPD, with a Winter Peak Hour Flow of approximately 35,066 GPD. The projected sanitary sewer demand includes rain-dependant I/I for summer and winter months.

5.3.2 Alternative 2 – Reduced Residential Density

The Alternative 2 conceptual land use plan includes 875 dwelling units and 40,000 sf of neighborhood commercial development. This conceptual land use scenario would generate a total average daily wastewater flow of approximately 192,834 GPD based on 80 percent of total water usage, and a Winter Peak Hour Flow of approximately 843,649 GPD. Residential use, based on the Facilities Plan factor of approximately 2.4 persons per residential dwelling unit,

[3] The percentage of primary homes used for the purpose of the sewer demand calculation is higher than the project proponent's estimate described in Preliminary Engineering Report Section 1.2, due to the City's preference to anticipate the development of permanent-resident neighborhoods within City Heights.

would generate average daily wastewater flow of approximately 176,803 GPD, and a Winter Peak Hour Flow of approximately 773,517 GPD. The average daily wastewater demand to serve total commercial development under Alternative 2 would be approximately 16,031 GPD, with a Winter Peak Hour Flow of 70,132 GPD. The projected sanitary sewer demand includes rain-dependant I/I for summer and winter months.

5.3.3 Alternative 3A – No Annexation, Development within the County under Single Ownership

Alternative 3A is the same conceptual land use scenario as Alternative 2, with the difference being that Alternative 3A would be developed in the County rather within the City limits. Therefore, the calculation of total average daily wastewater flows would be identical to those calculated above for Alternative 2. Under Alternative 3A, sewage treatment may occur through on-site sewage disposal systems rather than through connection to City sewer system, depending on the City's willingness to serve a project outside the City limits but within its UGA.[4]

5.3.4 Alternative 3B – No Annexation, Development within the County under Multiple Ownerships

Alternative 3B would generate a total average daily wastewater flow of approximately 103,758 GPD based on 80 percent of total water usage, with a Winter Peak Hour Flow of approximately 453,942 GPD. The entire flow estimate in this alternative is based on residential use only. For calculating the impact to the existing wastewater collection and treatment system, the projected sanitary sewer demand includes rain dependant I/I for summer and winter months. The I/I calculation remains applicable in the design of on-site sewage disposal systems as those systems also experience some level of I/I.

Sewage treatment under this alternative could be provided through on-site sewage disposal systems rather than through connection to the City sewer system.

5.3.5 Alternative 4 – No Action

Under the No Action Alternative, it is assumed that the City Heights site would remain undeveloped, and therefore would not require any sewage collection system infrastructure or capacity, or wastewater treatment plant capacity.

5.3.6 Construction Requirements

Public System. From an infrastructure standpoint, there are three potential required construction scenarios for collecting and transporting sewage from the City Heights site to the wastewater treatment facility: 1) extend connections from the site to the existing line within Second Street; 2) extend a connection or connections from the City Heights site to a new trunk line constructed in Third Street that includes a new connection to the wastewater treatment plant; or, 3) construct a new trunk line within the City Heights site that exits on its east end and extend a new connection to the treatment plant. In each of those cases, an on-site collection system would need to be constructed. Either the On-site Option or the Third Street Option would require that the new trunk line be designed and constructed to extend into the wastewater treatment plant,

[4] The City of Cle Elum Comprehensive Plan: Capital Facilities Element does not presently include a policy that would allow providing sewer service to the site if it remains outside the City limits.

beneath the WSDOT SR 970 right-of-way, the BNSF railroad line, Younger Ditch, and the City of Cle Elum Second Street storm drainage ditch.

In addition, it is likely, although not certain, that modifications to the existing treatment plant would be necessary to accommodate the wastewater flow of the City Heights project, perhaps immediately but almost certainly in the long-term unless unused capacity could be purchased on a permanent basis. If expansion of the treatment plant were necessary to serve any of the City Heights conceptual land use alternatives, the required upgrades could be as simple as adding additional screening at the effluent station, or may involve more substantial upgrades such as adding a third sequencing batch reactor (SBR) in an available cell, headworks modifications, and ultraviolet light disinfection system upgrades, among others. The outfall from the treatment plant to the Yakima River would potentially require the addition of an effluent pump station to maintain positive flow during periods of high water in the river.

This analysis anticipates that early phases of the City Heights project could be served by existing infrastructure assuming the City of Cle Elum has sufficient capacity under the Sewer Agreement to provide those services. Development of on-site and off-site sewer improvements would coincide with the City Heights phased construction period of 6 to 12 years. Depending on market conditions, the pace of the Suncadia Properties development, and the available capacity allocated to Cle Elum, there may be capacity within the existing collection system for all or part of the phased development of City Heights. The Cle Elum sewer trunk line and treatment plant are currently operating at less than peak efficiency due to unused capacity. Increasing flow in the sewer trunk line and to the wastewater treatment plant would increase operational efficiency.

MBR System. If an on-site MBR system were the selected method for treating and disposing of wastewater from the City Heights project under Alternative 1, 2 or 3A, an MBR treatment facility would be constructed on the site, along with an on-site collection system and a new trunk line and outfall to the Yakima River (subject to all applicable permits and approvals for a new outfall to the river).

On-Site Sewage Disposal Systems. If on-site sewage disposal systems were utilized to serve Alternative 3A or 3B, either individual or community drainfields would need to be constructed as would a collection system. All construction for this system would occur on the City Heights site.

5.4 Design Requirements

Public System. Under any of the conceptual land use alternatives, if sewer service were provided by the City of Cle Elum, the City Heights project would comply with applicable design standards set forth by the City of Cle Elum, the Washington State Department of Health (DOH), and the Washington Department of Ecology (Ecology). The City may be required to prepare and submit a Sewer Comprehensive Plan to these State agencies to address the addition of the new development to the existing regional sewer system. If the On-Site Option or the Third Street Option were selected, construction of a new trunk line from City Heights to the treatment facility would also require permits and approvals from several agencies, including the U.S. Army Corps of Engineers, Ecology, Washington Department of Fish and Wildlife (“WDFW”), Washington State Department of Transportation (“WSDOT”), the Burlington Northern Santa Fe (“BNSF”) Railroad, and City of Cle Elum.

MBR System. Construction of an on-site MBR System with an outfall discharge to the Yakima River to serve Alternative 1, 2 or 3A would be designed in accordance with the manufacturer's specifications and applicable State, Federal, and local regulations: DOH, Ecology, WDFW, WDNR, WSDOT, BNSF, the City of Cle Elum and the US Army Corps of Engineers.

On-Site Sewage Disposal Systems. If on-site sewage disposal systems were installed on the property under Alternative 3A or 3B, the City Heights project would be required to comply with Kittitas County, Kittitas County Department of Health and/or Washington State Department of Health and Ecology design standards and regulations for these systems.

5.5 Project Impacts

The potential sewage collection and treatment impacts of the City Heights project would depend on the method selected for providing service: a Public System, a MBR System, or on-site sewage disposal systems.

Public System. The City's wastewater collection and treatment system was designed for future growth within a defined area. If and when all of the previously planned developments took place, and if no improvements were made to the City of Cle Elum's infiltration/inflow (I/I), then the system would not have sufficient capacity to serve more than 215 residential units within the City Heights development. If a permanent transfer of capacity could not be arranged through the Borrow, Purchase, or I/I collection system Options described in Section 5.2, then, additional hydraulic, organic, and/or solids loading generated by City Heights would exceed the design capacity of the City's existing wastewater facilities, and system upgrades would be required to serve the development at some point in time. If capacity could be permanently transferred to City Heights through one of the collection system options, no impacts would occur to the City's system. In either event, additional piping would need to be constructed within City Heights (at the developer's expense) to bring the wastewater to the existing Cle Elum Second Street sewer trunk line. The capacity analysis of the existing downstream wastewater collection system shall be performed in the final phase of the design.

MBR System. If a MBR System were selected as the method of handling wastewater from the City Heights project, there would be no impacts to the existing Cle Elum wastewater collection and treatment system. Alternative 1, 2, or 3A would result in similar overall impacts for wastewater collection and treatment including those described in Section 5.5.1 and 5.5.2 below. The MBR System would not be utilized for Alternative 3B.

On-Site Sewage Disposal Systems. Under Alternative 3A or 3B, on-site sewage disposal systems may be constructed on the City Heights site. This would have no impact to the capacity or operation of the existing Cle Elum wastewater collection and treatment system. It would, however, result in a significant number of on-site sewage disposal systems being introduced on a hillside directly adjacent to the City limits. The potential impacts of on-site sewage disposal systems are discussed further in Sections 5.5.1 and 5.5.2 below.

5.5.1 Potential Impacts During Construction

Public System. Under the Borrow Option, there would be no off-site construction impacts in the early stages of the City Heights project, as wastewater flows would discharge to the existing Cle Elum sewer trunk line. Thereafter, one of the other collection system options would be implemented. Under the Purchase Option, if permanent capacity was purchased there would be no off-site collection system construction impacts associated with the City Heights project;

however, if permanent capacity was not purchased or the On-Site Option or Third Street Option were selected, an additional sewer trunk line would be required to extend an independent connection to the treatment plant crossing beneath the WSDOT right-of-way (SR 970), the BNSF railroad right-of-way, Younger irrigation ditch, and potentially the City of Cle Elum Second Street storm drainage ditch at the east end of town. Construction methods could include directional drilling or boring. If the I/I Option were selected, construction requirements could include the installation of additional stormwater trunk lines and modifications to existing stormwater systems, such as adding connections to existing stormwater conveyance systems and removing connections that transport stormwater to the wastewater collection system.

Regardless of the off-site collection system option selected for implementation, development of the City Heights project would require installation of an on-site sewage collection system and individual "hook-ups" to serve homes and neighborhood commercial development, and to connect to the City's wastewater collection and treatment system. The on-site conveyance system would be constructed within public rights-of-way or easements located under or adjacent to City streets or private roads within the development. In addition, construction of pipes from the site to the point of connection to the existing system would be required.

Construction activities related to the installation of wastewater conveyance mains both on-site and off-site would include construction-related traffic to deliver pipe and other material to the site; noise and dust during trenching, excavation, import/export of material; resolving conflicts with other underground utilities; possible temporary disruptions in service to some customers; backfilling, paving and/or overlay of existing streets; and possible disruptions to traffic due to temporary traffic lane closures or detours.

If expansion of the treatment plant were necessary under any of the sewer service options, the required upgrades could be as simple as adding additional screening at the effluent station, or it could involve more substantial upgrades as described in Section 5.3.6. Construction activities related to upgrading the treatment facility would include dust and noise during the construction phase, construction-related traffic to deliver materials to the treatment plant site at the end of Owens Road, and potential temporary short-term shutdowns (hours) of the treatment facility.

It would likely be necessary to modify the existing Cle Elum wastewater treatment plant outfall to accommodate the increased design flow from the City Heights development at some point in time, unless a permanent allocation of capacity occurred as a result of the Purchase Option or the I/I Option. The outfall would more than likely require the addition of an effluent pump station or modifications to an existing station to pressurize the flow to avoid the need to construct a second outfall.

MBR System. An MBR system would require both on-site and off-site construction. Impacts would be similar whether conceptual land use Alternative 1, 2 or 3A is selected for implementation. An on-site collection system would be needed as would an outfall to the Yakima River (subject to acquiring all applicable permits and approvals for a new outfall to the river). Construction activities related to the installation of the MBR System both on-site and off-site would include construction-related traffic to deliver pipe and other material to the site; noise and dust during trenching, excavation, import/export of material; resolving conflicts with other underground utilities; possible temporary disruptions in service to some customers; backfilling, paving and/or overlay of existing streets; and possible disruptions to traffic due to temporary traffic lane closures or detours. The construction impacts of the outfall to the river would depend on the design of this project component. In any event, it would require conveyance beneath SR 970 and Interstate 90 (WSDOT rights-of-way), and through the north levee of the river.

On-Site Sewage Disposal Systems. Under Alternative 3A or 3B, if on-site sewage disposal systems (OSDS) were utilized, the impacts during construction would be primarily focused on the City Heights site. Construction of the OSDS would require additional clearing and excavation. Construction activities related to the installation of OSDS would include construction-related traffic to deliver pipe and other material to the site; noise and dust during trenching, excavation, import/export of material and backfilling.

5.5.2 Potential Developed-Condition Impacts

Public System. Impacts of the on-site collection system and possible off-site components that would be constructed under some collection system options would involve routine inspection and maintenance of the system. These requirements would increase City staff time to provide these services. If the On-site Option were selected, maintenance and repair requirements over time may be higher compared to the other options due to the need for lift stations and other capital items to facilitate the operation of that system.

The Cle Elum wastewater treatment plant is currently underutilized, and therefore operates at less than optimal standards of efficiency. Adding the City Heights flows to the system would improve operational efficiency. Overall, however, upgrades to the treatment plant would increase maintenance responsibility for plant staff. This would likely eventually result in increases in operating costs and maintenance expenses.

If pumping modifications could be made to increase the capacity of the existing wastewater treatment plant outfall, developed condition impacts would likely be characterized by some increase in operation and maintenance costs.

MBR System. The MBR system would result in Class A reclaimed water being discharged to the Yakima River.

On-Site Sewage Disposal Systems. On-site sewage disposal systems to serve Alternative 3A or 3B could result in water quality issues (potential groundwater quality contamination and the migration of nutrients to streams and wetlands) over time as these systems deteriorate. Groundwater saturation attributable to these systems could affect slope stability if not properly designed, constructed, and maintained.

5.6 Mitigation Measures

5.6.1 Incorporated Features

Public System. Mitigation measures for the wastewater collection and treatment requirements of any of the development alternatives would be approximately the same, given the similar size of development and resulting impacts as described in Section 5.3. The Upper Kittitas County Regional Wastewater Treatment Facilities Project Agreement, Development Agreement and Service Agreement, as amended (the Service Agreement), guide the construction, use and operation of the Cle Elum wastewater collection and treatment system. In accordance with the Service Agreement, a Capital Recovery Charge is currently charged by the City of Cle Elum to all new ERUs utilizing the existing system. These funds are remitted to Suncadia. As noted above, the City of Cle Elum does not have any existing wastewater system capacity to allocate to the needs of the City Heights project; therefore, it is presently unclear how the project could be served by the City's wastewater collection system. Any costs associated with allocating

existing capacity in the wastewater collection and treatment system to the City Heights project would be imposed through the Development Agreement requiring the City Heights project to reimburse costs as lots were developed and "hooked up" to the City's infrastructure. If the Borrow, Purchase, or I/I collection system option were selected, existing capacity would be rented or purchased and the compensation would be negotiated between the parties.

In the event that collection and treatment system capacity could not be secured on a permanent basis under the Purchase or I/I Options, then the developer would be responsible for the initial capital investment costs of infrastructure improvements to mitigate City Heights impacts as part of project approval conditions. It is anticipated that an agreement will be created between the City of Cle Elum and the City Heights Planned Mixed-Use development providing that the costs of improvements required within the City of Cle Elum sewer system to serve the City Heights project and all on-site improvements required to supply service to City Heights paid for by the project proponent and not directly by the City of Cle Elum. Payment could take the form of direct payment by the project proponent, through some form of City-sponsored financing such as a Local Improvement District (completely paid for by the project proponent, not with City funds), or through grant money secured by the City of Cle Elum (with the costs of application and procurement funded by the project proponent, not the City). Under no circumstance would costs to provide sewer and water service be borne directly by the City of Cle Elum or its citizens.

Increased operating and maintenance costs accrued by the City would be recovered by utility rates paid by the actual users.

MBR System. A MBR system could be implemented to serve Alternative 1, 2 or 3A. Proper design and operation of a MBR plant would produce reclaimed water that would meet Class A water quality standards for possible seasonal reuse on-site for landscape irrigation, and for discharge to the Yakima River.

On-Site Sewage Disposal Systems. On-site sewage disposal systems could be implemented in Alternative 3A or Alternative 3B. As discussed in Section 5.6.2 below, if on-site sewage disposal systems are properly designed, installed, and maintained in accordance with applicable regulations, they would not be a source of impacts until they no longer functioned properly and required upgrade or replacement.

5.6.2 Applicable Regulations

Public System. Under any of the conceptual land use alternatives, modifications or additions to the existing wastewater collection and treatment system will be designed and constructed in accordance with the regulations discussed in section 5.4 above. Those regulations are designed to alleviate the impacts discussed in section 5.5 above.

MBR System. Under Alternative 1, 2 or 3A, a MBR System would be designed, constructed, and operated in accordance with standards for reclaimed water jointly developed by the Washington Department of Health and the Washington Department of Ecology. Within the State of Washington, the quality of reclaimed water must fully protect beneficial uses including public health and environmental water quality. These regulations are updated periodically in order to incorporate the latest protection standards.

On-Site Sewage Disposal Systems. If on-site sewage disposal systems (OSDS) were installed on the property under Alternative 3A or 3B, the City Heights project would be required to comply with the regulations for these systems by the entities discussed in Section 5.5 above. If OSDS

are properly designed, installed, and maintained in accordance with applicable regulations, they would not be a source of impacts until they no longer functioned properly and required upgrade or replacement.

5.6.3 Other Recommended Mitigation Measures

Construction contractors should be required to notify existing sewer system users well in advance of any temporary interruptions to service during construction of the City Heights connections to the Cle Elum sewer trunk line.

Because the existing wastewater collection and treatment system was sized for project-specific growth known at the time the Facilities Plan was created, any new development could potentially require significant system upgrades and improvements. It is possible that the Sewer Parties may want to consider a different treatment process at the plant to upgrade the technology from the Sequencing Batch Reactor (SBR) process. Newer processes could improve efficiency, capacity, and treatment while simultaneously lowering maintenance costs.

5.7 Phased Development

Public System. Depending on the City Heights phasing schedule, growth within the Regional Sewer Service Boundary, and the status of development agreements with Parties to the current sewer service agreement, City Heights may be able to use the existing Cle Elum Second Street sewer trunk line to convey wastewater flow to the treatment plant without constructing a new trunk line or upgrades to the treatment plant on a short-term basis. This would require reaching agreement to implement the Borrow, Purchase, or I/I collection system options. In this case, sewer service lines would be constructed from each phase of City Heights development to the Cle Elum sewer trunk line. If and when a new trunk line were necessary to convey sewage from the east end of the City Heights site (collection system On-Site Option or Third Street Option), this trunk line would need to be built in its entirety during one phase of construction. Flow monitoring at the wastewater treatment plant would indicate the appropriate time to begin installation of plant upgrades to increase capacity.

MBR or On-Site Sewage Disposal Systems. If a MBR system or on-site sewage disposal systems were selected as the sewage collection and treatment option, these systems would be constructed in phases corresponding to phased development of the site. With the MBR system, an outfall to the Yakima River would need to be constructed prior to the beginning of the operation of the system. The collection system could be constructed as lots were developed.

5.8 Significant Unavoidable Adverse Impacts

Public System. It may be necessary to upgrade and expand the City's wastewater collection and treatment system to serve the full build-out condition of the City Heights Planned Mixed-Use Development. A Development Agreement or other form of development approval (depending on the conceptual land use alternative selected for implementation) will specify developer cost responsibilities to avoid adverse impacts to the City or existing sewer system customers. New users within City Heights will be required to pay connection fees and monthly service fees established by the City. For all of these reasons, there should be no significant unavoidable adverse impact to the operation and maintenance of the system, or to existing City sewer system customers.

MBR or On-Site Sewage Disposal Systems. If the MBR system is properly designed and operated in accordance with the manufacturer's specifications and all applicable regulations, the MBR system would result in Class A reclaimed water for beneficial uses on the site, and for at least seasonal discharge to the Yakima River. Due to the quality of the effluent produced by the MBR process, this option should not result in a significant unavoidable adverse impact to the river. If on-site sewage disposal systems are properly designed, installed, and maintained in accordance with applicable regulations, they would not be a source of significant unavoidable adverse impacts.

REFERENCES

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APPENDICES

APPENDIX A

Conceptual Land Use Plans

A.1 Alternative 1 – Preferred Alternative

A.2 Alternative 2 – Reduced Residential Density

A.3 Alternative 3A – No Annexation, Development within the County under Single Ownership

A.4 Alternative 3B – No Annexation, Development within the County under Multiple Ownerships

APPENDIX B

Off-Site Drainage System / Downstream Analysis

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
	Basin:West		**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
A	**6-ft bottom**	**Abundant natural veg.**	**2%**	**0'**		
B	**4-ft bottom**	**Abundant natural veg.**	**2%**	**10°-150°**	**Some erosion & ponding from narrowing channel above**	
	4-ft bottom	**Abundant natural veg.**	**2%**	**200'-400'**	**Naturally flowing**	
C	**6-ft bottom**	**Abundant natural veg.**	**2%**	**400'**	**Crk hits coal mine eroding fill @ bend in crk. Crk then follows N. edge of trail**	
	5-ft bottom	**Abundant natural veg.**	**2%-3%**	**400'-700'**	**Naturally flowing**	
D		**Crystal Crk. Crosses trail @NE corner Cle Elum Pines**		**700'**	**Joins streams**	
	7-ft bottom	**Abundant natural veg.**	**3%**	**700'-850'**		
E	**8-ft bottom**		**3%**	**850'**	**Stream bends into fill for coal mine trail**	**Sloughing & erosion of fill**
	6-ft bottom		**3%**	**850'-950'**	**Naturally flowing**	
F	**8-ft bottom**		**3%**	**950'**	**Sloughing & erosion on edge trail**	
	6-ft bottom			**950'-1100'**	**Naturally flowing**	
G		**No evidence of flooding**		**1100"**	**Boulder in crk for riprap (recent)**	
H		**Some erosion of fill on trail**		**1200'-1250'**	**Boulder in crk for riprap (recent)**	
	6-ft bottom	**Abundant natural veg.**	**3%+**	**1250'-1450'**	**Naturally flowing**	
I		**Concrete Bridge w/5' cmp. CMP caved in some in center trail**	**3%**	**1450'**	**Flows under coal mine trail**	

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
	Basin:West		**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
I cont.		**Riprap on corner 30' below bridge no evidence of erosion**		**1475'**		
	8-ft bottom swale	**Abundent Nat. Veg.**	**3%-4%**	**1475'-1600'**	**Naturally flowing**	
J	**10-ft bottom swale**	**Abundent Nat. Veg.**	**3%-4%**	**1600'**	**Bend in crk. Erosion of bank, underwelling outside bend**	**Trees & Debris Jams**
	5-ft bottom swale	**Abundent Nat. Veg.**	**3%-4%**	**1600'-1750'**	**Naturally flowing**	
K	**5-ft bottom swale**	**Abundent Nat. Veg.**	**3%-4&**	**1750'-1850'**	**Naturally flowing**	**Minor erosion S bank flooding N gradual slope**
	5-ft bottom swale	**Abundent Nat. Veg.**		**1850'-2000'**	**Naturally flowing**	
L	**6-ft bottom swale**	**Abundent Nat. Veg.**	**3%-4%**	**2000'-2100'**	**Flood canal to N**	**Evident flooding man made burm S.**
M	**6-ft bottom swale**	**Abundent Nat. Veg.**	**3%-4%**	**2200'**	**Eroding N bank under mining**	
			3%-4%	**2200'-2450'**	**Naturally flowing, minor erosion, evidence flooding**	
N		**Bridge Across Driveway**	**3%-4%**	**2450'**		**No obstructions**
O				**2475'**	**18" iron pipe exposed x-ing crk**	
P	**Bridge crossing 2nd St.**	**20-ft concrete deck**	**2500'**			**No obstructions**
	7-ft bottom swale	**Abundent Nat. Veg.**	**2%-3%**	**2525%-2700%**	**Naturally flowing**	
Q	**Wood bridge deck**	**15-ft wood deck**	**2%**	**2700'**	**Naturally flowing**	**No obstructions**
		Natural veg.	**2%**	**2700'-2900'**	**Flowing w/ minor ponding, some erosion riprap & obstructions**	**Veg. in stream**

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

	Basin:West		**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
R	**Conc. Bridge x-ing 1st**	**20-ft concrete deck**		**2900"**	**Grass & Debris up stream causing ponding. Gravel & Debris under Bridge restriction flow**	
S	**Wooden walk bridge**			**2950"**		**Severe erosion on dirt bank supporting bridge**
	7-ft bottom swale	**Abundent veg. w/ some debris in flow**	**2%**	**3000'-3000'**	**Flowing with minor obstructions**	
T	**Wood deck bridge in alley**	**Debris & sed. Restricting flow (minor)**	**1%-2%**	**3200'**		
	8-ft bottom swale	**Abundent veg.**	**2%**	**3200'-3350'**	**Flowing with minor debris obstructions**	
	10-ft bottom swale	**Vegetated w/ minor debris in crk**	**1%**	**3350'-4300'**	**Some slack water & ponding debris jam 75' upstream bridge restricting flow**	**No erosion restricting flow**
	Conc. bridge x-ing S. Cle Elum way		**1%**	**4300'**		
U					**Slack water under bridge & downstream alder cluster up hill bridge no other obstructions**	
					18' cmp plastic corr.	
					Down side bridge heads west across into area w/ponding water & possible plugged culvert	
	12-ft bottom swale	**Vegetated slack water**		**4300'-4500'**	**No obstructions**	

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

	Basin:West		**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
V	**Bridge x-ing under RR tracks**	**10-ft x 7-ft concrete**		**4500'**	**No obstructions**	
					Slack water	
					***All stack water back to 4000 dist. From site appears to be caused by high water flows in Yakima River**	
	Final destination the flooding Yakima River			**4700'**		

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
Basin:Summit View			**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
A	**48" plastic culvert**	**Unobstructed**	**2%**	**0'**		
	Swale - 10t wide bottom	**Natural Veg.**	**3%**	**0'-100'**	**Flat bottom crk. Swale some debris not disrupting flow**	
B	**Old bridge x-ing**			**100'**	**Some debris, bridge & debris restrict flow another drainage enters uphill side bridge bearing NNW**	
C	**Stream - V-shape w/1:1 bank slopes**	**Natural veg. w/fallen trees & dirt in creek bottom**	**4%-5%**	**100'-350'**	**Mass erosion under cut banks. Steep enough gradient that debris does not restrict flow**	
D	**Sheet flow - 20-ft wide**	**Natural veg. w/quanity of new gravel deposits**	**3%-4%**	**350'-450'**	**Broad flat w/ gravel flooding to SE. crk to SW**	

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
Basin:Summit View			**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
	35-ft wide	**Vegetated swale w/debris**	**3%-4%**	**450'-600'**		
E	**N side driveway**	**Swale narrows & bends to follow drive**	**2%-3%**	**600"**	**35' swale to v-ditch some erosion in constricted bend**	
		Natural veg.	**3%**	**600'-700'**	**Debris in crk not likely to restrict flow**	
F	**30'-40' wide sheet flow**	**Natural veg.**	**3%**	**700'-950'**	**Broad sheet flow thru thick veg. & debris new deposits of sand & gravel**	
		Abundant nat. veg.		**950'-1100'**	**Heavy veg. no erosion & no apparent restrictions**	
		24" concrete culvert	**2%-3%**	**1100'**	**Erosion along bank where crk 90°s into culvert**	
G		**No obstruction in culvert**				
		Natural veg.	**1%-2%**	**1100'-1300'**	**Debris & veg. in ditch N apparent restrictions**	
		1300' is ~ 100' upstream culvert xing@NE Cle Elum Pines				

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin:6th Street			Sub.		Sub. Number:	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
A	**18" plastic corr. 8" cmp**		**3%**	**0'**	**Dead skunks in 18" pipe otherwise ok**	
	12" steel pipe					
	V-ditch	**Heavily veg.**	**3%**	**0'-200'**	**Debris in ditch that do no appear to restrict flow**	
	Sheet flow to v-ditch	**Heavily veg.**		**200'-300'**	**Debris in ditch that do no appear to restrict flow**	
B	**18" cone culvert**			**300'**		
					Main drainage starts 100' N 18" conc culvert @Base slag pile seeping out of bottom	
C	**Flat bottom crk**	**Heavily veg. w/debris**	**2%**	**0'-100'**	**Areas of ponding stagnent water**	
	18" conc. Culvert			**100'**	**Same as 300' above**	
D	**24" cmp other end 18"**		**2%**	**130'**	**Drops 2.5**	
	3-ft bottom swale	**Heavily veg.**	**2%**	**200'-600'**	**Naturally flowing thru veg.**	
	2-ft bottom swale	**Heavily veg.**	**2%**	**200'-600'**	**Naturally flowing thru veg. & debris**	

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
Basin: 6th Street			**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
E		**3-18" conc. Culv.**		**600'**	**N. plugged-S. unobstructed-middle 1/2 filled gravel**	
				630'	**Other end culverts under trail. All 3 partially blocked heavily veg.**	
	2-ft bottom	**Heavily Veg.**	**2%**	**630'-850'**	**Heavily veg. no restriction to water flow**	
F		**18" conc. w/1" plastic pipe/w trash rack**		**850'**	**Appears to have no obstructions**	**12" cmp enters up stream of 18" conc. Along w/1" plastic pipe in 18" conc.**
					No direction of flow from 18" conc. w/trash pack to 302 Stafford Rd.	
G	**24" cmp.**	**Partially filled w/ sed.**		**~1250'**	**Can't find other end culvert**	
	2-ft bottom	**Grass in ditch**	**2%**	**1250'-1375'**	**Grass in ditch no restriction**	
H	**24" cmp**	**Partially filled w/ sed.**		**1375'-1400'**		
	4-ft bottom	**Natural Veg.**	**2%**	**1400'-1475'**	**No restrictions**	
I	**2-24" conc.**			**1475"-1550"**	**No restrictions**	
	4-ft bottom	**Natural veg.**		**1550'-1600'**	**No restrictions Trib. 50' up from wooden bridge 2450**	
					Go to Basin: West, pg2	

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
	Basin: Peoh		**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
A	**18" Wooden @ culvert**	**Prop-Line Rd. x-ing**	**3%-4%**	**0-30**	**No obstructions in culvert**	
	2-3 ft bottom swale	**Heavy Veg. grass/shrubs**	**5%-6%**	**30'-100'**	**Naturally flowing**	
	10-20 ft bottom swale	**Heavey Veg. grass/shrubs**	**10%-15%**	**100'-230'**		
B	**Sheet flow thru alley**	**No culverts**		**230**	**Area of concern, 1 small cb nearby & no culverts**	
C	**CB SE of 90° bend in alley**	**6" ductile iron out to (s)**		**275**	**Grass around lid, not in best condtion to catch water, sed to bottom pipe**	
D	**CB SE 4th/4-s alley**	**18" plastic corr. In (N) &out (S)**		**415**	**CB in good working condition**	
E	**CB 3rd/Alley to N**	**18" Plastic Corr. In (N0 12" PVC out (S)**		**575**	**CB in good working condition**	
F	**CB 24" cmp stand pipe w/round CB lid**			**No pipes visible 4' down to H20/sediment**		

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2						
Basin: Montgomery			**Sub.**		**Sub. Number:**	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
A	**(1.) 36' cmp (2.) 30" cmp**		**1%**	**A-B ~ 350'**		**Under Montgomery Rd.**
B	**Fenced Stretched Across channel**		**1%-2%**	**B-C~ 100'**	**Possible flow Restriction**	
C	**Building built over channel**			**C-D ~50'**	**Wood Bracing not stable**	**Building set on ~4' concrete walls @ East + West edges of channel w/wooden braces in water @ mid span**
D	**Channel enters tunnel**			**D-E ~ 350'**		**Arched tunnel measuring 3.8' wide X 4.0'high w/concrete wind walls + concret armored bank**
E	**Man hole lid (no manhole)**			**E-F ~ 850'**		**Ring and lid set in gravel enclosing capped 6" ABX stub set vertically, directly over tunnell**
F	**Vault w/round lid**			**F-G ~ 200'**		**Hand made vault uneven shape connot see in-flow from north 36" concrete out flow heading east**

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin: Montgomery			Sub.		Sub. Number:	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
G	**Vault (Round lid)**	**Custom Vault odd-shaped**		**G-H ~ 250'**		**36" concrete in-flow from west cannot see out flow to east**
H	**Vault (Round lid)**	**Flowing West to East**		**H-I ~ 300'**		**Unable to see in flow or out flow**
I	**Vault (Round Lid)**	**Flowing West to East**		**I-J ~ 400'**		**Unable to see inflow or outflow**
J	**Out flow to swale**	**Outflow pipe is 44" wide by 48" high concrete arch pipe**				**Swale flows East**
K	**6' diameter cmp under paved st.**	**~ 60' long**	**1%**	**K-L ~ 100'**		**Ditch w/~36" homemade metal culvert enters swale @ W. end 6' culvert**
L	**5' tall X 6' wide cmp squash pipe under paved parking lot entry**	**~ 40' long**	**<1%**	**L-M ~ 120'**		
M	**Same description as "L"**		**<1%**	**M-N ~ 120'**		

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin: Montgomery			Sub.		Sub. Number:	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
N	**6' wide X 4' tall cmp squash pipe**	**~ 50' long running under paved st.**	**<1%**	**N-O ~ 400'**		**Partially silted @ E. end**
O	**Wire fence stretched across channel**		**<1%**	**O-P~ 75'**	**Possible flow restriction**	
P	**3' tall X 4' wide cmp squash pipe under farm crossing**		**<1%**	**P-Q ~ 125'**		**Pipe beat up & misshapen**
Q	**Fence stretched across channel**		**<1%**	**Q-R ~ 25'**		**Suspended above H20 no flow restriction**
R	**6' wide X 4' high cmp squash pipe**	**Under paved street**	**<1%**	**R-S ~ 175%**		**~30' long pipe**
S	**6' wide X 4' deep concrete box culvert**	**~ 55' long under SR970**		**S-T ~ 70'**		
T	**7' wide x 4' high concrete box culvert**	**~25' long**	**1%**	**T-U ~ 50'**		**Bottom partially silted**

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin: Montgomery			Sub.		Sub. Number:	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
U	**36"cmp culvert**	**~ 30' long under dirt rd.**	**1%**	**U-V ~ 70'**		
V	**36" cmp culvert**	**~20' long**	**1%**	**V-W ` 70'**		
W	**(2) 48' concrete culverts (side by side)**	**~40' running under RR tracks**	**2%**	**W-X ~ 50'**		
X	**48" cmp culvert**	**~20' long running under gravel rd.**	**1%**	**X-Y ~ 250'**		
Y	**36" diameter DIP suspended over H20**		**1%-2%**	**Y-Z ~1300'**		**Connects flowing ditch south to north. No flow restriction**
Z	**Wire fence suspended over channel**		**1%**	**Z-AA ~600'**		**No flow restrictions**
AA	**Bend in Stream**		**1%-2%**			
BB	**Creek feeds swamp**	**Swamp filled w/cat tails to N. of bend in stream**	**<1%**	**BB-CC ~1200'**		**Definite H20 detention area**
CC	**Bend in creek**		**1%**	**CC-DD ~ 550'**		
DD	**6' diameter concrete culvert**	**Flowing under overpass for freeway on ramp ~150' long culvert**	**2%**	**DD-EE ~ 1300'**		

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin: Montgomery			Sub.		Sub. Number:	
Symbol	**Drainage, Component Type, Name and Size**	**Drainage Component Description**	**Slope**	**Distance from site discharge**	**Existing Problems/Potential Problems**	**Oberservations of field inspector, resource reviewer, or resident**
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
EE	**Change in channel/ vegetation**	**Banks become more defined/channel becomes less defined**	**<1%**	**EE-FF ~ 600'**		
FF	**Pond inlet to stream**	**Swampy area connecting pond to stream definite flow from pond to stream**	**1%**	**FF-GG ~200'**	**Beaver dam + lodge @ Pond edge/Partial Dam in stream restricting flow**	
GG	**Stream meets Yakima River**	**Discernable channel downstream from "FF"**	**<1%**			**Beaver swamp lots of standing water & downed trees**

OFF-SITE ANALYSIS DRAINAGE SYSTEM TABLE SURFACE WATER DESIGN MANUAL, CORE REQUIREMENT #2

Basin:Columbia			Sub. #4		Sub. Number:	
Symbol	Drainage, Component Type, Name and Size	Drainage Component Description	Slope	Distance from site discharge	Existing Problems/Potential Problems	Oberservations of field inspector, resource reviewer, or resident
see map	Type: Sheet flow, swale, stream, channel, pipe, pond: Size: diameter, surface area	Dranage basin, vegetation, cover, depth, type of sensitive area, volume	%	1/4 ml = 1,320 ft.	Constrictions, under capacity, ponding, overtopping, flooding, habitat or organism destruction, scouring, bank sloughing, sedimentation, incision, other erosion	Tributary area, likelihood of problem overflow pathways, potential impacts
A	24" Black Plastic Corrugated Pipe	~ 40' long under gravel rd.	1%	A-B= ~ 140'		Channel splits for ~ 120'
B	18" cmp culvert under gravel DW		4%	B-C=~100'		Channel re-joins
C	30" cmp culvert	Under gravel rd.	3%	C-D ~250'		
D	24" cmp culvert	Under paved st.	3%-4%	D-E ~ 150'		
E	24" Black corrugated plastic pipe	~ 20' long buried in rip-rap & dirt	3%-4%	E-F ~ 125'		Pipe laid to protect SSMH @ W. Edge ditch from washout
F	Bend in channel 18" cone culvert	90° turn to E.	1%-2%	F-G ` 125'		Channel B joined by small ditch from W.
G	18" cone culvert	~ 55'	1%-2%	G-H ~ 225'		S. ~ 10' of culvert is 24" cmp sleeved over concrete
H	Homemade ~36" culvert under concrete SW	~ 10' long made of old fuel tank w/ends cut out	2%-3%	H-I ~15'		
I	Dumps into Montgomery Downstream		2%-3%			
		(See location "K" in Basin: Montgomery)				

APPENDIX C

Project Specific Sub-basins Map

APPENDIX D

Drainage Calculations

D.1 ALTERNATIVE 1 – PREFERRED ALTERNATIVE

Drainage Calculations

PREFERRED ALTERNATIVE

BASIN A

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	369.14	C	Woods (Fair Condition)	73
OPEN SPACE (SOUTH)	369.13	C	Woods (Poor Condition)	77
TOTAL PERVIOUS	738.27	N/A	N/A	75

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (WEST)	19.9	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	34.05	C	Woods (Mix Good & Fair Conditions)	72
OPEN SPACE (EAST)	30.69	C	Woods (Fair Condition)	73
TOTAL PERVIOUS	84.64	N/A	N/A	76

TOTAL AREA CHECK **822.91 ac.** **$CN_{WEIGHTED}$** **75**

BASIN A

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin A towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	84.64	acres	
Total area (w/upstream open space) =	822.91	acres	
Pervious area (w/o upstream open space) =	84.64	acres	76 CN
Pervious area (w/upstream open space) =	822.91	acres	75 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1763	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.0325	ft/ft	S_2 =	0.05	ft/ft	S_3 =	0.1	ft/ft
k_1 =	17		k_2 =	17		k_3 =	17	
V_1 =	3.06	fps	V_2 =	3.80	fps	V_3 =	5.38	fps
T_1 =	9.59	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 9.59 min

PREFERRED ALTERNATIVE

BASIN B

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	160.95	C	Woods (Fair Condition)	73
OPEN SPACE (SOUTH)	160.96	C	Woods (Poor Condition)	77
TOTAL PERVIOUS	321.91	N/A	N/A	75

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	15.95	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	26.66	C	Woods (Fair Condition)	77
OPEN SPACE (SOUTH)	14.92	C	Woods (Poor Condition)	73
TOTAL PERVIOUS	57.53	N/A	N/A	78

TOTAL AREA CHECK **379.44 ac.** **$CN_{WEIGHTED}$** **76**

BASIN B

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin B towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	57.53	acres	
Total area (w/upstream open space) =	379.44	acres	
Pervious area (w/o upstream open space) =	57.53	acres	78 CN
Pervious area (w/upstream open space) =	379.44	acres	76 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1007	ft	L_2 =	679	ft	L_3 =	0	ft
S_1 =	0.1	ft/ft	S_2 =	0.03	ft/ft	S_3 =	0.1	ft/ft
k_1 =	17		k_2 =	17		k_3 =	17	
V_1 =	5.38	fps	V_2 =	2.94	fps	V_3 =	5.38	fps
T_1 =	3.12	min.	T_2 =	3.84	min.	T_3 =	0.00	min.

Tc= 6.97 min

PREFERRED ALTERNATIVE

BASIN C

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	497.17	D	Woods (Fair Condition)	79
OPEN SPACE (SOUTH)	497.16	D	Pasture (Good Condition)	80
TOTAL PERVIOUS	994.33	N/A	N/A	79

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	76.07	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	0	C	Woods (Fair Condition)	77
OPEN SPACE (SOUTH)	103.69	D	Woods (Poor Condition)	73
TOTAL PERVIOUS	179.76	N/A	N/A	79

TOTAL AREA CHECK **1174.1 ac.** **$CN_{WEIGHTED}$** **79**

BASIN C

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin C towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	179.76	acres	
Total area (w/upstream open space) =	1174.10	acres	
Pervious area (w/o upstream open space) =	179.76	acres	79 CN
Pervious area (w/upstream open space) =	1174.10	acres	79 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	3626	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.045	ft/ft	S_2 =	0.16	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	17		k_3 =	0	
V_1 =	3.61	fps	V_2 =	6.80	fps	V_3 =	0.00	fps
T_1 =	16.76	min.	T_2 =	0.00	min.	T_3 =	0	min.

Tc= 16.76 min

PREFERRED ALTERNATIVE

BASIN D

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	143.98	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	143.99	D	Pasture/Range (Good Condition)	80
TOTAL PERVIOUS	287.97	N/A	N/A	80

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	22.53	D	Pasture/Range (Good Condition)	80
OPEN SPACE (CENTRAL)	0	D	Woods (Fair Condition)	79
OPEN SPACE (SOUTH)	7.25	D	Woods (Fair Condition)	79
TOTAL PERVIOUS	29.78	N/A	N/A	80

TOTAL AREA CHECK **317.75 ac.** **$CN_{WEIGHTED}$** **80**

BASIN D

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin D towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	29.78	acres	
Total area (w/upstream open space) =	317.75	acres	
Pervious area (w/o upstream open space) =	29.78	acres	80 CN
Pervious area (w/upstream open space) =	317.75	acres	80 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1190	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.13	ft/ft	S_2 =	0	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	0		k_3 =	0	
V_1 =	6.13	fps	V_2 =	0.00	fps	V_3 =	0.00	fps
T_1 =	3.24	min.	T_2 =	0	min.	T_3 =	0	min.

Tc= 3.24 min

PREFERRED ALTERNATIVE

BASIN E

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	38.61	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	38.61	D	Pasture/Range (Good Condition)	80
TOTAL PERVIOUS	77.22	N/A	N/A	80

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	0	D	Pasture/Range (Good Condition)	80
OPEN SPACE (CENTRAL)	6.29	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	0	D	Woods (Fair Condition)	79
TOTAL PERVIOUS	6.29	N/A	N/A	80

TOTAL AREA CHECK **83.51 ac.** **$CN_{WEIGHTED}$** **80**

BASIN E

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin E towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	6.29	acres	
Total area (w/upstream open space) =	83.51	acres	
Pervious area (w/o upstream open space) =	6.29	acres	80 CN
Pervious area (w/upstream open space) =	83.51	acres	80 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1792	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.08	ft/ft	S_2 =	0.13	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	17		k_3 =	0	
V_1 =	4.81	fps	V_2 =	6.13	fps	V_3 =	0.00	fps
T_1 =	6.21	min.	T_2 =	0.00	min.	T_3 =	0	min.

Tc= 6.21 min

PREFERRED ALTERNATIVE

CITY HEIGHTS BASIN BREAKDOWN

	BASIN A	BASIN B	BASIN C	BASIN D	BASIN E
UPSTREAM OPEN SPACE TOTAL AREA = 2419.7 Ac.	738.27	321.91	994.33	287.97	77.22
OPEN SPACE/BUFFER TOTAL AREA = 153.69 Ac.	33.48	28.46	79.24	11.93	0.58
PARKS TOTAL AREA = 4.5 Ac.	1.14	1.03	2.33	0	0
PONDS TOTAL AREA = 1.28 Ac.	0.4	0.88	0	0	0
ROADWAY TOTAL AREA = 27.33 Ac.	6.82	4.06	12.29	4.05	0.11
LOW DENSITY RESIDENTIAL (5.0 DU/GA) TOTAL AREA = 110.8 Ac.	14	9.6	67.8	13.8	5.6
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA) TOTAL AREA = 37.4 Ac.	8	13.5	15.9	0	0
HIGH DENSITY RESIDENTIAL (9.0 DU/GA) TOTAL AREA = 18.8 Ac.	18.8	0	0	0	0
COMMERCIAL TOTAL AREA = 4.2 Ac.	2	0	2.2	0	0
TOTAL W/O UPSTREAM OPEN SPACE **TOTAL AREA = 358.0 Ac.**	**84.64**	**57.53**	**179.76**	**29.78**	**6.29**
TOTAL W/UPSTREAM OPEN SPACE **TOTAL AREA = 2777.7 Ac.**	**822.91**	**379.44**	**1174.09**	**317.75**	**83.51**

BASIN A

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin A is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	84.64	acres	
Total area (w/upstream open space) =	822.91	acres	
Pervious area (w/o upstream open space) =	51.36	acres	78 CN
Pervious area (w/upstream open space) =	789.63	acres	75 CN
Impervious area =	33.28	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.05	ft/ft	S_3 =	0.1	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	3.80	fps	V_3 =	5.38	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min. assumed

PREFERRED ALTERNATIVE

BASIN A

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	14	48%	6.72	7.28
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	8	56%	4.48	3.52
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	18.8	70%	13.16	5.64
COMMERCIAL	2	85%	1.7	0.3
DEVELOPMENT TOTAL	42.8	N/A	26.06	16.74

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	738.27	C	Woods (Mix Fair & Poor Condition)	75
OPEN SPACE/BUFFER	33.48	C	Woods (Poor Condition)	77
PARKS	1.14	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	16.74	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	51.36	N/A	N/A	78
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	789.63	N/A	N/A	75

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0.4	C	Ponds and watercourses	100
ROADWAY	6.82	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	26.06	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	33.28	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **84.64** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **822.91** **ac.**

PREFERRED ALTERNATIVE

BASIN B

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin B is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	57.53	acres	
Total area (w/upstream open space) =	379.44	acres	
Pervious area (w/o upstream open space) =	40.42	acres	78 CN
Pervious area (w/upstream open space) =	362.33	acres	75 CN
Impervious area =	17.11	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.03	ft/ft	S_3 =	0.1	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	2.94	fps	V_3 =	5.38	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

PREFERRED ALTERNATIVE

BASIN B

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	9.6	48%	4.61	4.99
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	13.5	56%	7.56	5.94
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	0
COMMERCIAL	0	85%	0	0
DEVELOPMENT TOTAL	23.1	N/A	12.17	10.93

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	321.91	C	Woods (Mix Fair & Poor Condition)	75
OPEN SPACE/BUFFER	28.46	C	Woods (Poor Condition)	77
PARKS	1.03	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	10.93	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	40.42	N/A	N/A	78
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	362.33	N/A	N/A	75

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0.88	C	Ponds and watercourses	100
ROADWAY	4.06	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	12.17	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	17.11	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **57.53** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **379.44** **ac.**

BASIN C

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin C is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	179.76	acres	
Total area (w/upstream open space) =	1174.09	acres	
Pervious area (w/o upstream open space) =	124.15	acres	79 CN
Pervious area (w/upstream open space) =	1118.48	acres	79 CN
Impervious area =	55.61	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.045	ft/ft	S_3 =	0.16	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	3.61	fps	V_3 =	6.80	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

PREFERRED ALTERNATIVE

BASIN C

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	67.8	48%	32.54	35.26
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	15.9	56%	8.90	7.00
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	0
COMMERCIAL	2.2	85%	1.87	0.33
DEVELOPMENT TOTAL	85.9	N/A	43.32	42.58

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	994.33	D	Mix Woods (Fair C.) & Pasture (Good C.)	79
OPEN SPACE/BUFFER	79.24	D	Woods (Fair Condition)	79
PARKS	2.33	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	42.58	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	124.15	N/A	N/A	79
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	1118.48	N/A	N/A	79

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	12.29	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	43.32	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	55.61	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **179.76** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **1174.09** **ac.**

BASIN D

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin D is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	29.78	acres	
Total area (w/upstream open space) =	317.75	acres	
Pervious area (w/o upstream open space) =	19.11	acres	80 CN
Pervious area (w/upstream open space) =	307.08	acres	80 CN
Impervious area =	10.67	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0	ft/ft	S_3 =	0.13	ft/ft
k_1 =	0		k_2 =	0		k_3 =	17	
V_1 =	0.00	fps	V_2 =	0.00	fps	V_3 =	6.13	fps
T_1 =	0	min.	T_2 =	0	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

PREFERRED ALTERNATIVE

BASIN D

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	13.8	48%	6.62	7.18
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	0	56%	0	0
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	0
COMMERCIAL	0	85%	0	0
DEVELOPMENT TOTAL	13.8	N/A	6.62	7.18

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	287.97	D	Pasture/Range (Good Condition)	80
OPEN SPACE/BUFFER	11.93	D	Pasture/Range (Good Condition)	80
PARKS	0	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	7.18	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	19.11	N/A	N/A	80
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	307.08	N/A	N/A	80

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	4.05	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	6.62	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	10.67	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **29.78** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **317.75** **ac.**

BASIN E

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin E is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	6.29	acres	
Total area (w/upstream open space) =	83.51	acres	
Pervious area (w/o upstream open space) =	3.49	acres	79 CN
Pervious area (w/upstream open space) =	80.71	acres	79 CN
Impervious area =	2.80	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.13	ft/ft	S_3 =	0.13	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	6.13	fps	V_3 =	6.13	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

PREFERRED ALTERNATIVE

BASIN E

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	5.6	48%	2.69	2.91
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	0	56%	0	0
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	0
COMMERCIAL	0	85%	0	0
DEVELOPMENT TOTAL	5.6	N/A	2.69	2.91

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	77.22	D	Pasture/Range (Good Condition)	80
OPEN SPACE/BUFFER	0.58	D	Pasture/Range (Good Condition)	80
PARKS	0	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	2.91	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	3.49	N/A	N/A	79
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	80.71	N/A	N/A	80

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	0.11	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	2.69	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	2.80	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **6.29** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **83.51** **ac.**

PREFERRED ALTERNATIVE

2-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	51.36	33.28	10	3.34	8.00	601,387	38.56
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	3.34	8.00	384,193	20.07
3	Basin B (post)	57.53	78.00	98.00	40.42	17.11	10	3.34	8.00	377,909	23.56
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	3.34	8.00	287,540	15.90
5	Basin C (post)	179.76	79.00	98.00	124.15	55.61	10	3.34	8.00	1,030,960	61.01
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	3.34	8.03	941,429	47.15
7	Basin D (post)	29.78	80.00	98.00	19.11	10.67	10	3.34	8.00	211,594	13.57
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	3.34	8.00	163,278	9.46
9	Basin E (post)	6.29	79.00	98.00	3.49	2.80	10	3.34	8.00	46,560	3.02
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	3.34	8.00	34,487	2.00

PREFERRED ALTERNATIVE

25-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	51.36	33.28	10	4.84	8.00	1,019,420	67.97
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	4.84	8.00	738,703	44.64
3	Basin B (post)	57.53	78.00	98.00	40.42	17.11	10	4.84	8.00	655,883	43.18
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	4.84	8.00	538,043	33.40
5	Basin C (post)	179.76	79.00	98.00	124.15	55.61	10	4.84	8.00	1,856,044	119.10
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	4.84	8.00	1,738,611	97.49
7	Basin D (post)	29.78	80.00	98.00	19.11	10.67	10	4.84	8.00	358,676	23.92
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	4.84	8.00	297,683	18.91
9	Basin E (post)	6.29	79.00	98.00	3.49	2.80	10	4.84	8.00	78,016	5.23
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	4.84	8.00	62,875	3.99

PREFERRED ALTERNATIVE

100-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	51.36	33.28	10	6.09	8.00	1,381,057	93.10
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	6.09	8.00	1,062,416	67.44
3	Basin B (post)	57.53	78.00	98.00	40.42	17.11	10	6.09	8.00	898,639	60.18
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	6.09	8.00	764,024	49.35
5	Basin C (post)	179.76	79.00	98.00	124.15	55.61	10	6.09	8.00	2,587,829	170.71
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	6.09	8.00	2,453,585	143.45
7	Basin D (post)	29.78	80.00	98.00	19.11	10.67	10	6.09	8.00	485,916	32.76
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	6.09	8.00	417,548	27.37
9	Basin E (post)	6.29	79.00	98.00	3.49	2.80	10	6.09	8.00	105,107	7.10
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	6.09	8.00	88,193	5.78

Hydrograph Report

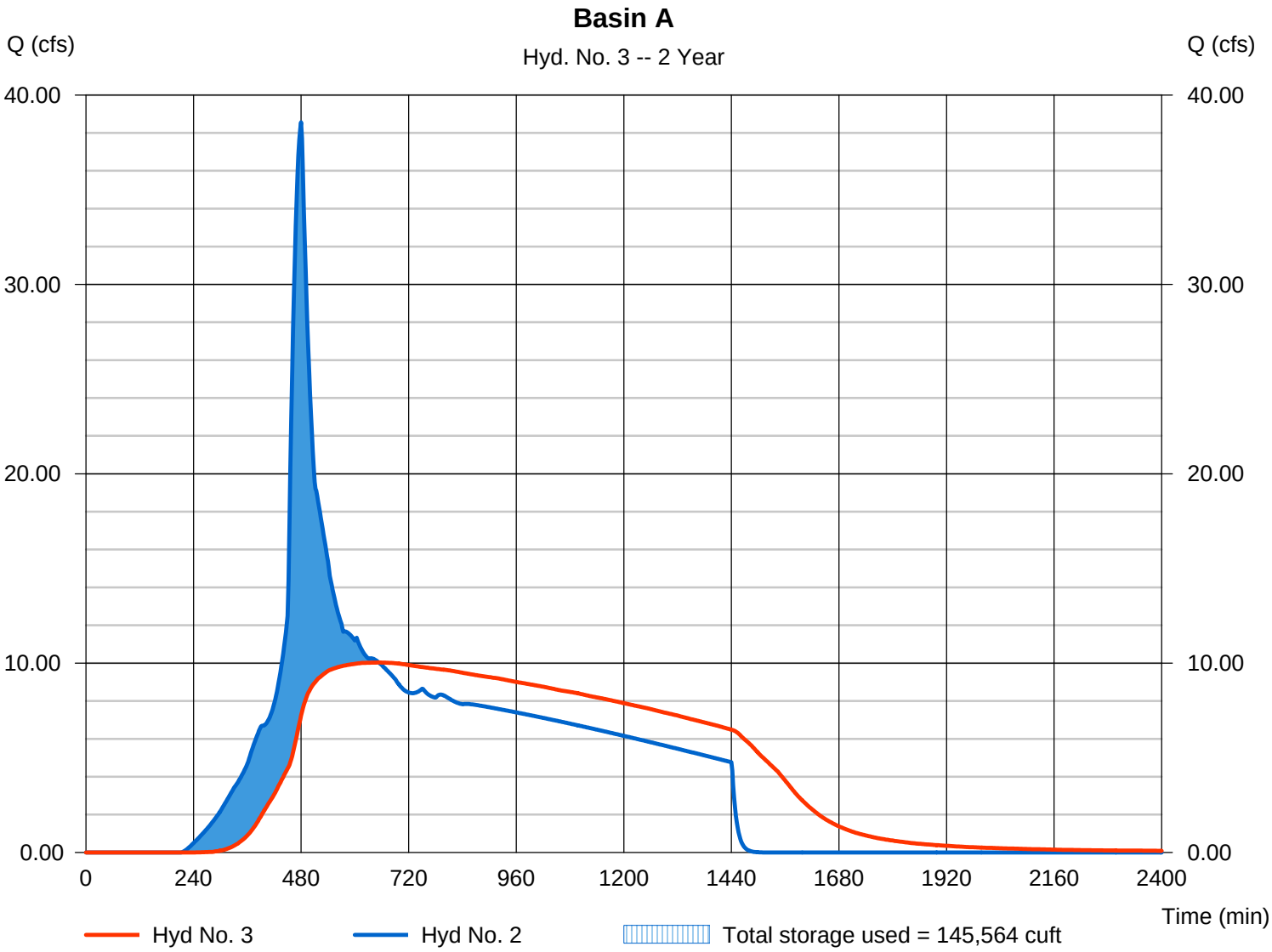
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	10.03 cfs
Storm frequency	=	2 yrs	Time to peak	=	654 min
Time interval	=	2 min	Hyd. volume	=	600,983 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	104.13 ft
Reservoir name	=	Pond A	Max. Storage	=	145,564 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond A

Pond Data

Trapezoid - Bottom L x W = 175.0 x 175.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	30,625	0	0
0.90	100.90	32,544	28,422	28,422
1.80	101.80	34,522	30,175	58,597
2.70	102.70	36,557	31,981	90,578
3.60	103.60	38,652	33,840	124,418
4.50	104.50	40,804	35,751	160,169
5.40	105.40	43,015	37,714	197,883
6.30	106.30	45,284	39,730	237,613
7.20	107.20	47,611	41,798	279,411
8.10	108.10	49,997	43,919	323,330
9.00	109.00	52,441	46,093	369,423

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	14.85	30.00	0.00
Span (in)	= 42.00	14.85	30.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.00	104.80	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	6.00	0.00	0.00
Crest El. (ft)	= 108.00	104.82	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	2,842	100.09	0.03 ic	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.032
0.18	5,684	100.18	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.126
0.27	8,527	100.27	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.284
0.36	11,369	100.36	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.491
0.45	14,211	100.45	0.75 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.752
0.54	17,053	100.54	1.08 ic	1.06 ic	0.00	---	0.00	0.00	---	---	---	---	1.060
0.63	19,895	100.63	1.42 ic	1.42 ic	0.00	---	0.00	0.00	---	---	---	---	1.418
0.72	22,737	100.72	1.80 ic	1.80 ic	0.00	---	0.00	0.00	---	---	---	---	1.801
0.81	25,580	100.81	2.25 ic	2.22 ic	0.00	---	0.00	0.00	---	---	---	---	2.219
0.90	28,422	100.90	2.63 ic	2.63 ic	0.00	---	0.00	0.00	---	---	---	---	2.628
0.99	31,439	100.99	3.17 ic	3.05 ic	0.00	---	0.00	0.00	---	---	---	---	3.048
1.08	34,457	101.08	3.60 ic	3.50 ic	0.00	---	0.00	0.00	---	---	---	---	3.499
1.17	37,474	101.17	3.89 ic	3.89 ic	0.00	---	0.00	0.00	---	---	---	---	3.892
1.26	40,492	101.26	4.32 ic	4.25 ic	0.00	---	0.00	0.00	---	---	---	---	4.250
1.35	43,509	101.35	4.58 ic	4.51 ic	0.00	---	0.00	0.00	---	---	---	---	4.508
1.44	46,527	101.44	4.84 ic	4.75 ic	0.00	---	0.00	0.00	---	---	---	---	4.752
1.53	49,544	101.53	5.12 ic	4.98 ic	0.00	---	0.00	0.00	---	---	---	---	4.984
1.62	52,562	101.62	5.41 ic	5.20 ic	0.00	---	0.00	0.00	---	---	---	---	5.204
1.71	55,579	101.71	5.45 ic	5.45 ic	0.00	---	0.00	0.00	---	---	---	---	5.449
1.80	58,597	101.80	5.71 ic	5.69 ic	0.00	---	0.00	0.00	---	---	---	---	5.686
1.89	61,795	101.89	6.01 ic	5.88 ic	0.00	---	0.00	0.00	---	---	---	---	5.879
1.98	64,993	101.98	6.08 ic	6.08 ic	0.00	---	0.00	0.00	---	---	---	---	6.078
2.07	68,191	102.07	6.33 ic	6.31 ic	0.00	---	0.00	0.00	---	---	---	---	6.309
2.16	71,389	102.16	6.66 ic	6.48 ic	0.00	---	0.00	0.00	---	---	---	---	6.482
2.25	74,588	102.25	6.69 ic	6.69 ic	0.00	---	0.00	0.00	---	---	---	---	6.688
2.34	77,786	102.34	6.99 ic	6.87 ic	0.00	---	0.00	0.00	---	---	---	---	6.873
2.43	80,984	102.43	7.05 ic	7.05 ic	0.00	---	0.00	0.00	---	---	---	---	7.052
2.52	84,182	102.52	7.34 ic	7.24 ic	0.00	---	0.00	0.00	---	---	---	---	7.243
2.61	87,380	102.61	7.41 ic	7.41 ic	0.00	---	0.00	0.00	---	---	---	---	7.408
2.70	90,578	102.70	7.70 ic	7.59 ic	0.00	---	0.00	0.00	---	---	---	---	7.594
2.79	93,962	102.79	7.76 ic	7.76 ic	0.00	---	0.00	0.00	---	---	---	---	7.757
2.88	97,346	102.88	8.07 ic	7.93 ic	0.00	---	0.00	0.00	---	---	---	---	7.929
2.97	100,730	102.97	8.10 ic	8.10 ic	0.00	---	0.00	0.00	---	---	---	---	8.100

Continues on next page...

Pond A

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	104,114	103.06	8.44 ic	8.25 ic	0.00	---	0.00	0.00	---	---	---	---	8.250
3.15	107,498	103.15	8.44 ic	8.43 ic	0.00	---	0.00	0.00	---	---	---	---	8.431
3.24	110,882	103.24	8.83 ic	8.56 ic	0.00	---	0.00	0.00	---	---	---	---	8.559
3.33	114,266	103.33	8.83 ic	8.73 ic	0.00	---	0.00	0.00	---	---	---	---	8.734
3.42	117,650	103.42	8.88 ic	8.88 ic	0.00	---	0.00	0.00	---	---	---	---	8.882
3.51	121,034	103.51	9.23 ic	9.03 ic	0.00	---	0.00	0.00	---	---	---	---	9.026
3.60	124,418	103.60	9.23 ic	9.19 ic	0.00	---	0.00	0.00	---	---	---	---	9.192
3.69	127,993	103.69	9.32 ic	9.32 ic	0.00	---	0.00	0.00	---	---	---	---	9.317
3.78	131,568	103.78	9.64 ic	9.47 ic	0.00	---	0.00	0.00	---	---	---	---	9.469
3.87	135,143	103.87	9.64 ic	9.63 ic	0.00	---	0.00	0.00	---	---	---	---	9.627
3.96	138,718	103.96	9.74 ic	9.74 ic	0.00	---	0.00	0.00	---	---	---	---	9.741
4.05	142,293	104.05	10.05 ic	9.89 ic	0.00	---	0.00	0.00	---	---	---	---	9.892
4.14	145,868	104.14	10.05 ic	10.04 ic	0.00	---	0.00	0.00	---	---	---	---	10.04
4.23	149,443	104.23	10.16 ic	10.16 ic	0.00	---	0.00	0.00	---	---	---	---	10.16
4.32	153,018	104.32	10.48 ic	10.30 ic	0.00	---	0.00	0.00	---	---	---	---	10.30
4.41	156,593	104.41	10.48 ic	10.44 ic	0.00	---	0.00	0.00	---	---	---	---	10.44
4.50	160,169	104.50	10.56 ic	10.56 ic	0.00	---	0.00	0.00	---	---	---	---	10.56
4.59	163,940	104.59	10.92 ic	10.69 ic	0.00	---	0.00	0.00	---	---	---	---	10.69
4.68	167,711	104.68	10.92 ic	10.83 ic	0.00	---	0.00	0.00	---	---	---	---	10.83
4.77	171,483	104.77	10.95 oc	10.95 ic	0.00	---	0.00	0.00	---	---	---	---	10.95
4.86	175,254	104.86	11.32 oc	11.06 ic	0.03 ic	---	0.00	0.16	---	---	---	---	11.25
4.95	179,026	104.95	12.45 oc	11.08 ic	0.17 ic	---	0.00	0.94	---	---	---	---	12.18
5.04	182,797	105.04	13.62 oc	11.10 ic	0.43 ic	---	0.00	2.06	---	---	---	---	13.58
5.13	186,568	105.13	15.62 oc	11.03 ic	0.78 ic	---	0.00	3.45	---	---	---	---	15.25
5.22	190,340	105.22	17.25 oc	10.98 ic	1.21 ic	---	0.00	5.05	---	---	---	---	17.25
5.31	194,111	105.31	19.73 oc	10.88 ic	1.77 ic	---	0.00	6.85	---	---	---	---	19.51
5.40	197,883	105.40	22.19 oc	10.77 ic	2.47 ic	---	0.00	8.83	---	---	---	---	22.06
5.49	201,856	105.49	24.99 oc	10.61 ic	3.18 ic	---	0.00	10.96	---	---	---	---	24.75
5.58	205,829	105.58	27.98 oc	10.42 ic	4.00 ic	---	0.00	13.24	---	---	---	---	27.66
5.67	209,802	105.67	31.00 oc	10.20 ic	4.92 ic	---	0.00	15.66	---	---	---	---	30.77
5.76	213,775	105.76	34.26 oc	9.89 ic	5.93 ic	---	0.00	18.21	---	---	---	---	34.03
5.85	217,748	105.85	37.28 oc	9.46 ic	6.86 ic	---	0.00	20.89	---	---	---	---	37.21
5.94	221,721	105.94	40.62 oc	8.90 ic	8.03 ic	---	0.00	23.68	---	---	---	---	40.61
6.03	225,694	106.03	44.53 oc	8.85 ic	9.08 ic	---	0.00	26.59	---	---	---	---	44.53
6.12	229,667	106.12	48.74 oc	8.76 ic	10.37 ic	---	0.00	29.61	---	---	---	---	48.74
6.21	233,640	106.21	53.08 oc	8.64 ic	11.70 ic	---	0.00	32.74	---	---	---	---	53.07
6.30	237,613	106.30	57.32 oc	8.49 ic	12.86 ic	---	0.00	35.97	---	---	---	---	57.32
6.39	241,792	106.39	61.83 oc	8.30 ic	14.23 ic	---	0.00	39.30	---	---	---	---	61.83
6.48	245,972	106.48	66.40 oc	8.06 ic	15.60 ic	---	0.00	42.73	---	---	---	---	66.39
6.57	250,152	106.57	70.99 oc	7.78 ic	16.96 ic	---	0.00	46.25	---	---	---	---	70.99
6.66	254,332	106.66	75.17 oc	7.51 ic	18.28 ic	---	0.00	49.38 s	---	---	---	---	75.17
6.75	258,512	106.75	78.77 oc	7.28 ic	19.56 ic	---	0.00	51.93 s	---	---	---	---	78.76
6.84	262,692	106.84	82.13 oc	7.04 ic	20.92 ic	---	0.00	54.17 s	---	---	---	---	82.13
6.93	266,871	106.93	85.21 oc	6.83 ic	22.18 ic	---	0.00	56.21 s	---	---	---	---	85.21
7.02	271,051	107.02	88.10 oc	6.61 ic	23.42 ic	---	0.00	58.07 s	---	---	---	---	88.10
7.11	275,231	107.11	90.78 oc	6.41 ic	24.56 ic	---	0.00	59.80 s	---	---	---	---	90.77
7.20	279,411	107.20	93.10 oc	6.25 ic	25.21 ic	---	0.00	61.63 s	---	---	---	---	93.10
7.29	283,803	107.29	95.02 oc	6.16 ic	25.12 ic	---	0.00	63.74 s	---	---	---	---	95.02
7.38	288,195	107.38	96.79 oc	6.08 ic	24.80 ic	---	0.00	65.91 s	---	---	---	---	96.79
7.47	292,587	107.47	98.52 oc	6.00 ic	24.48 ic	---	0.00	68.04 s	---	---	---	---	98.52
7.56	296,979	107.56	100.22 oc	5.92 ic	24.17 ic	---	0.00	70.12 s	---	---	---	---	100.21
7.65	301,371	107.65	101.87 oc	5.84 ic	23.85 ic	---	0.00	72.16 s	---	---	---	---	101.86
7.74	305,763	107.74	103.48 oc	5.77 ic	23.55 ic	---	0.00	74.16 s	---	---	---	---	103.48
7.83	310,154	107.83	104.80 ic	5.68 ic	23.17 ic	---	0.00	75.95 s	---	---	---	---	104.80
7.92	314,546	107.92	106.04 ic	5.58 ic	22.78 ic	---	0.00	77.67 s	---	---	---	---	106.03
8.01	318,938	108.01	107.25 ic	5.49 ic	22.40 ic	---	0.05	79.31 s	---	---	---	---	107.25
8.10	323,330	108.10	108.70 ic	5.32 ic	21.69 ic	---	1.65	80.04 s	---	---	---	---	108.70
8.19	327,939	108.19	110.26 ic	5.09 ic	20.78 ic	---	4.33	80.06 s	---	---	---	---	110.26
8.28	332,549	108.28	111.86 ic	4.84 ic	19.75 ic	---	7.75	79.52 s	---	---	---	---	111.85
8.37	337,158	108.37	113.44 ic	4.57 ic	18.64 ic	---	11.77	78.47 s	---	---	---	---	113.44
8.46	341,767	108.46	115.00 ic	4.28 ic	17.46 ic	---	16.31	76.95 s	---	---	---	---	115.00
8.55	346,377	108.55	116.48 ic	4.00 ic	16.32 ic	---	20.92 s	75.24 s	---	---	---	---	116.47
8.64	350,986	108.64	117.78 ic	3.77 ic	15.39 ic	---	24.61 s	74.00 s	---	---	---	---	117.78
8.73	355,595	108.73	118.99 ic	3.57 ic	14.58 ic	---	27.92 s	72.92 s	---	---	---	---	118.99
8.82	360,204	108.82	120.14 ic	3.39 ic	13.84 ic	---	30.97 s	71.94 s	---	---	---	---	120.14
8.91	364,814	108.91	121.23 ic	3.23 ic	13.16 ic	---	33.79 s	71.04 s	---	---	---	---	121.23
9.00	369,423	109.00	122.27 ic	3.07 ic	12.55 ic	---	36.44 s	70.21 s	---	---	---	---	122.27

...End

Hydrograph Report

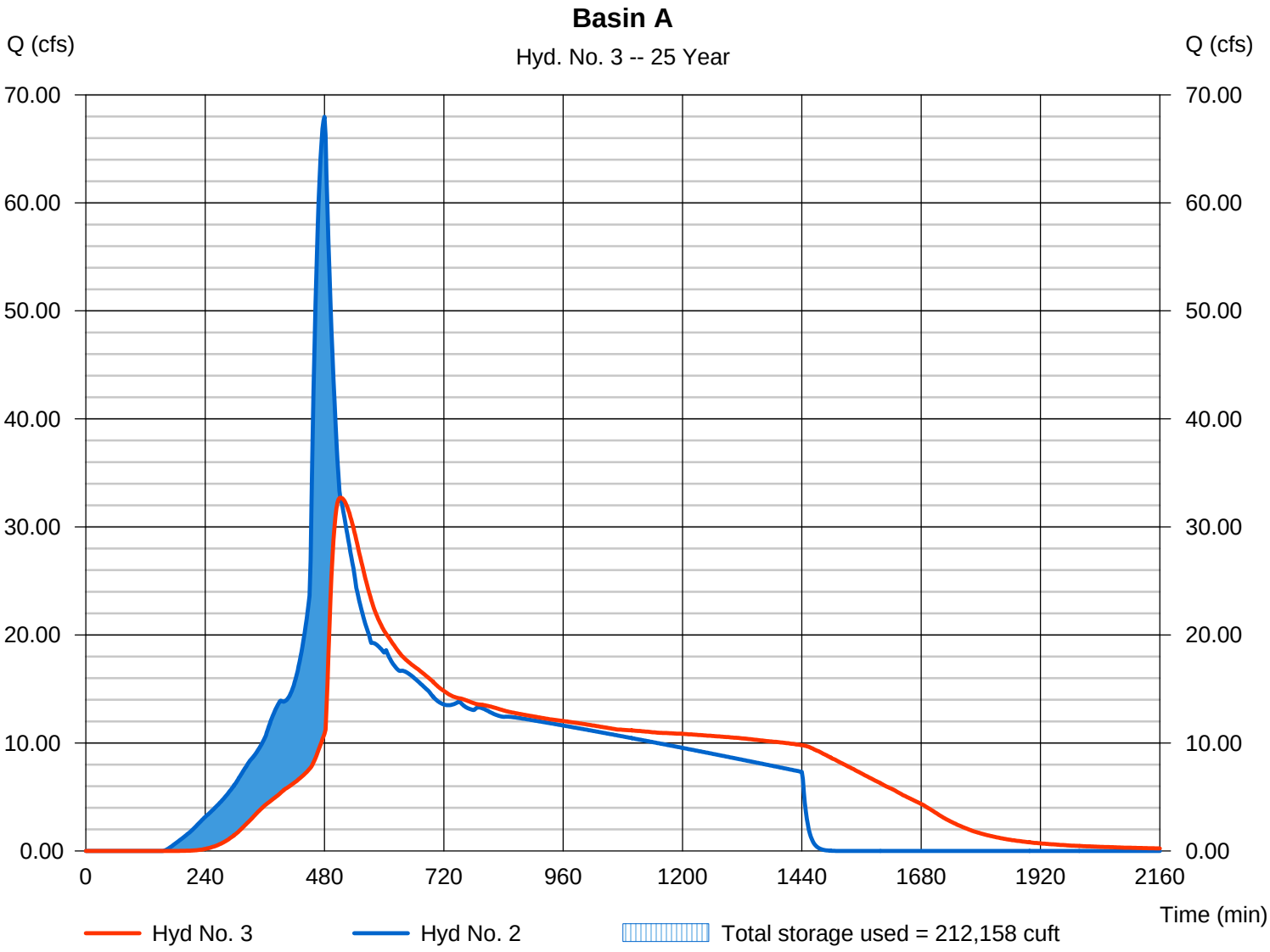
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	32.70 cfs
Storm frequency	=	25 yrs	Time to peak	=	512 min
Time interval	=	2 min	Hyd. volume	=	1,018,977 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	105.72 ft
Reservoir name	=	Pond A	Max. Storage	=	212,158 cuft

Storage Indication method used.



Hydrograph Report

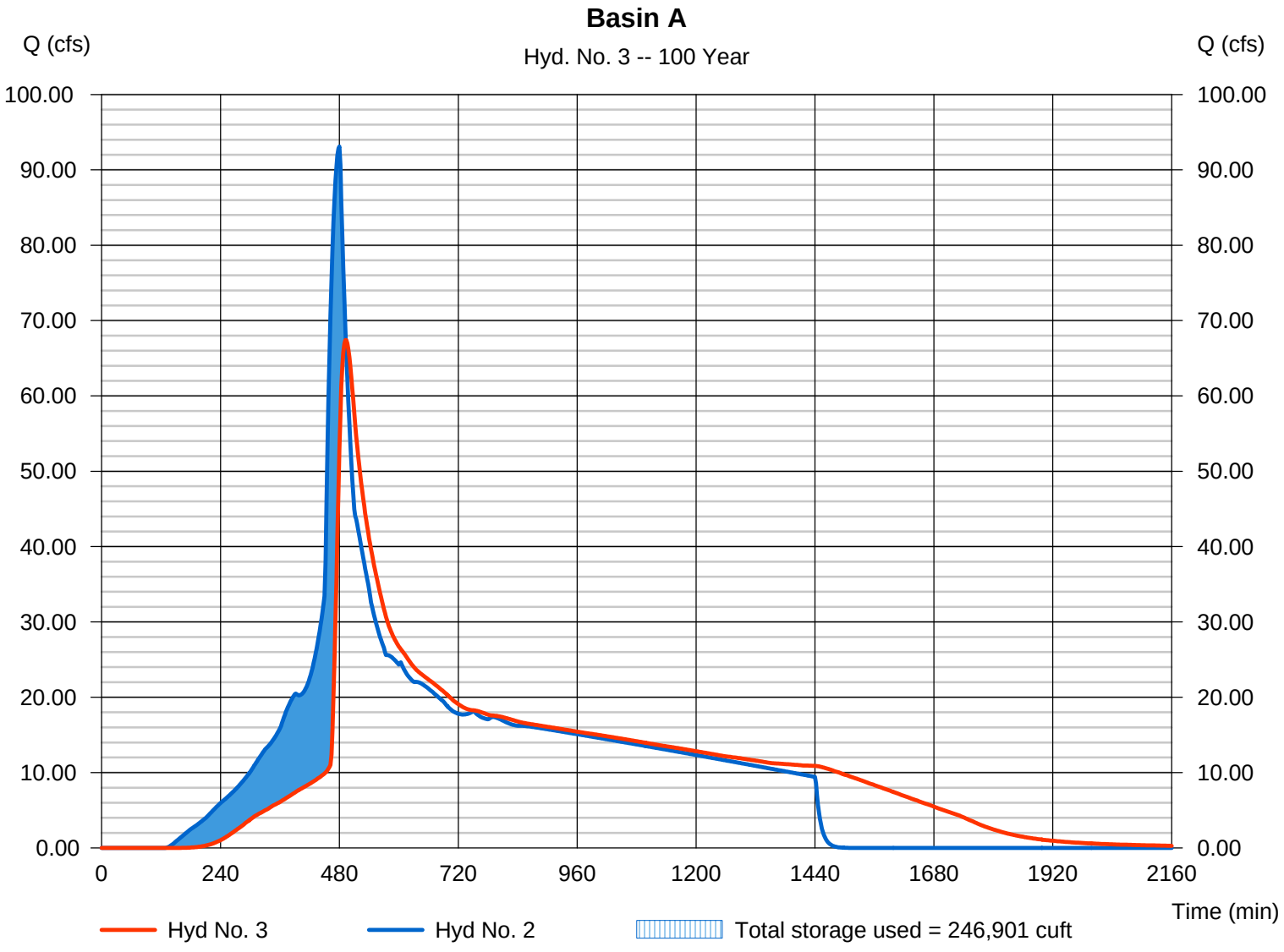
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	67.42 cfs
Storm frequency	=	100 yrs	Time to peak	=	492 min
Time interval	=	2 min	Hyd. volume	=	1,380,600 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	106.50 ft
Reservoir name	=	Pond A	Max. Storage	=	246,901 cuft

Storage Indication method used.



Hydrograph Report

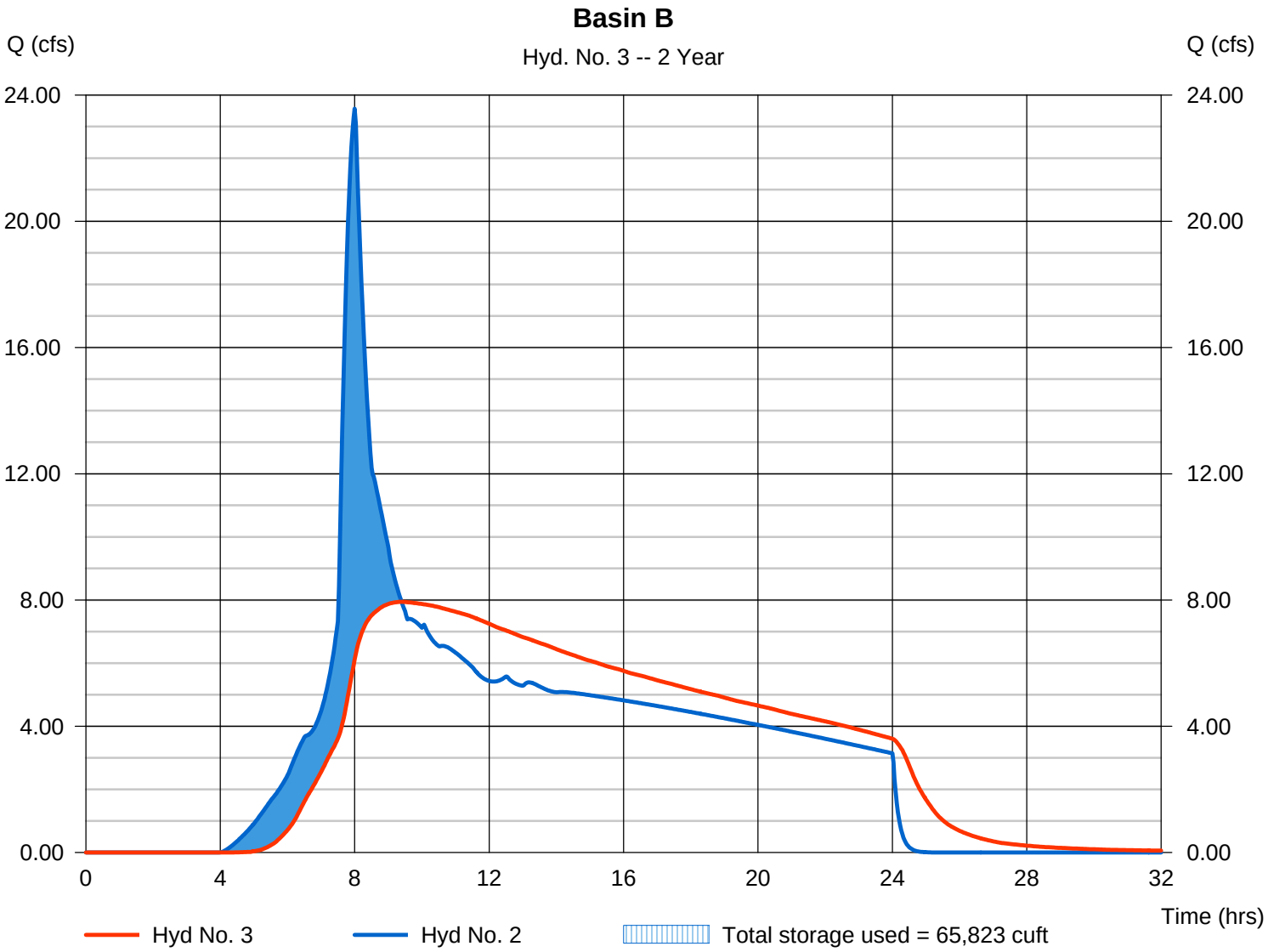
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	7.941 cfs
Storm frequency	=	2 yrs	Time to peak	=	9.40 hrs
Time interval	=	2 min	Hyd. volume	=	377,853 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	103.85 ft
Reservoir name	=	Pond B	Max. Storage	=	65,823 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond B

Pond Data

Trapezoid - Bottom L x W = 119.0 x 119.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 7.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	14,161	0	0
0.70	100.70	15,178	10,267	10,267
1.40	101.40	16,231	10,991	21,258
2.10	102.10	17,319	11,740	32,998
2.80	102.80	18,442	12,514	45,512
3.50	103.50	19,600	13,313	58,824
4.20	104.20	20,794	14,136	72,960
4.90	104.90	22,023	14,984	87,944
5.60	105.60	23,287	15,856	103,800
6.30	106.30	24,586	16,753	120,553
7.00	107.00	25,921	17,676	138,229

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	13.21	25.00	0.00
Span (in)	= 24.00	13.21	25.00	0.00
No. Barrels	= 2	1	1	0
Invert El. (ft)	= 100.00	100.01	103.90	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	4.00	0.00	0.00
Crest El. (ft)	= 107.00	104.50	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.07	1,027	100.07	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.019
0.14	2,053	100.14	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.078
0.21	3,080	100.21	0.19 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.182
0.28	4,107	100.28	0.33 ic	0.31 ic	0.00	---	0.00	0.00	---	---	---	---	0.308
0.35	5,133	100.35	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.491
0.42	6,160	100.42	0.69 ic	0.69 ic	0.00	---	0.00	0.00	---	---	---	---	0.687
0.49	7,187	100.49	0.90 ic	0.90 ic	0.00	---	0.00	0.00	---	---	---	---	0.903
0.56	8,213	100.56	1.19 ic	1.16 ic	0.00	---	0.00	0.00	---	---	---	---	1.159
0.63	9,240	100.63	1.47 ic	1.46 ic	0.00	---	0.00	0.00	---	---	---	---	1.458
0.70	10,267	100.70	1.78 ic	1.74 ic	0.00	---	0.00	0.00	---	---	---	---	1.741
0.77	11,366	100.77	2.03 ic	2.03 ic	0.00	---	0.00	0.00	---	---	---	---	2.032
0.84	12,465	100.84	2.39 ic	2.35 ic	0.00	---	0.00	0.00	---	---	---	---	2.352
0.91	13,564	100.91	2.68 ic	2.68 ic	0.00	---	0.00	0.00	---	---	---	---	2.675
0.98	14,663	100.98	2.98 ic	2.98 ic	0.00	---	0.00	0.00	---	---	---	---	2.984
1.05	15,762	101.05	3.29 ic	3.23 ic	0.00	---	0.00	0.00	---	---	---	---	3.234
1.12	16,861	101.12	3.45 ic	3.43 ic	0.00	---	0.00	0.00	---	---	---	---	3.428
1.19	17,960	101.19	3.64 ic	3.64 ic	0.00	---	0.00	0.00	---	---	---	---	3.636
1.26	19,060	101.26	3.82 ic	3.82 ic	0.00	---	0.00	0.00	---	---	---	---	3.818
1.33	20,159	101.33	3.98 ic	3.98 ic	0.00	---	0.00	0.00	---	---	---	---	3.983
1.40	21,258	101.40	4.17 ic	4.13 ic	0.00	---	0.00	0.00	---	---	---	---	4.128
1.47	22,432	101.47	4.36 ic	4.27 ic	0.00	---	0.00	0.00	---	---	---	---	4.267
1.54	23,606	101.54	4.41 ic	4.41 ic	0.00	---	0.00	0.00	---	---	---	---	4.405
1.61	24,780	101.61	4.56 ic	4.56 ic	0.00	---	0.00	0.00	---	---	---	---	4.562
1.68	25,954	101.68	4.76 ic	4.69 ic	0.00	---	0.00	0.00	---	---	---	---	4.691
1.75	27,128	101.75	4.96 ic	4.81 ic	0.00	---	0.00	0.00	---	---	---	---	4.813
1.82	28,302	101.82	4.96 ic	4.96 ic	0.00	---	0.00	0.00	---	---	---	---	4.963
1.89	29,476	101.89	5.17 ic	5.08 ic	0.00	---	0.00	0.00	---	---	---	---	5.079
1.96	30,650	101.96	5.21 ic	5.21 ic	0.00	---	0.00	0.00	---	---	---	---	5.206
2.03	31,824	102.03	5.39 ic	5.33 ic	0.00	---	0.00	0.00	---	---	---	---	5.332
2.10	32,998	102.10	5.44 ic	5.44 ic	0.00	---	0.00	0.00	---	---	---	---	5.442
2.17	34,249	102.17	5.61 ic	5.57 ic	0.00	---	0.00	0.00	---	---	---	---	5.573
2.24	35,501	102.24	5.84 ic	5.68 ic	0.00	---	0.00	0.00	---	---	---	---	5.675
2.31	36,752	102.31	5.84 ic	5.80 ic	0.00	---	0.00	0.00	---	---	---	---	5.803

Continues on next page...

Pond B

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.38	38,004	102.38	6.07 ic	5.90 ic	0.00	---	0.00	0.00	---	---	---	---	5.902
2.45	39,255	102.45	6.07 ic	6.03 ic	0.00	---	0.00	0.00	---	---	---	---	6.025
2.52	40,506	102.52	6.12 ic	6.12 ic	0.00	---	0.00	0.00	---	---	---	---	6.123
2.59	41,758	102.59	6.30 ic	6.24 ic	0.00	---	0.00	0.00	---	---	---	---	6.239
2.66	43,009	102.66	6.34 ic	6.34 ic	0.00	---	0.00	0.00	---	---	---	---	6.341
2.73	44,261	102.73	6.54 ic	6.45 ic	0.00	---	0.00	0.00	---	---	---	---	6.445
2.80	45,512	102.80	6.55 ic	6.55 ic	0.00	---	0.00	0.00	---	---	---	---	6.554
2.87	46,843	102.87	6.78 ic	6.65 ic	0.00	---	0.00	0.00	---	---	---	---	6.646
2.94	48,174	102.94	6.78 ic	6.76 ic	0.00	---	0.00	0.00	---	---	---	---	6.755
3.01	49,506	103.01	6.84 ic	6.84 ic	0.00	---	0.00	0.00	---	---	---	---	6.843
3.08	50,837	103.08	7.03 ic	6.95 ic	0.00	---	0.00	0.00	---	---	---	---	6.946
3.15	52,168	103.15	7.05 ic	7.05 ic	0.00	---	0.00	0.00	---	---	---	---	7.047
3.22	53,499	103.22	7.29 ic	7.13 ic	0.00	---	0.00	0.00	---	---	---	---	7.132
3.29	54,831	103.29	7.29 ic	7.23 ic	0.00	---	0.00	0.00	---	---	---	---	7.235
3.36	56,162	103.36	7.32 ic	7.32 ic	0.00	---	0.00	0.00	---	---	---	---	7.323
3.43	57,493	103.43	7.54 ic	7.41 ic	0.00	---	0.00	0.00	---	---	---	---	7.413
3.50	58,824	103.50	7.54 ic	7.51 ic	0.00	---	0.00	0.00	---	---	---	---	7.512
3.57	60,238	103.57	7.59 ic	7.59 ic	0.00	---	0.00	0.00	---	---	---	---	7.593
3.64	61,652	103.64	7.80 ic	7.68 ic	0.00	---	0.00	0.00	---	---	---	---	7.684
3.71	63,065	103.71	7.80 ic	7.78 ic	0.00	---	0.00	0.00	---	---	---	---	7.779
3.78	64,479	103.78	7.86 ic	7.86 ic	0.00	---	0.00	0.00	---	---	---	---	7.857
3.85	65,892	103.85	8.07 ic	7.95 ic	0.00	---	0.00	0.00	---	---	---	---	7.945
3.92	67,306	103.92	8.07 ic	8.04 ic	0.00 ic	---	0.00	0.00	---	---	---	---	8.040
3.99	68,719	103.99	8.34 ic	8.11 ic	0.05 ic	---	0.00	0.00	---	---	---	---	8.162
4.06	70,133	104.06	8.36 ic	8.19 ic	0.17 ic	---	0.00	0.00	---	---	---	---	8.359
4.13	71,547	104.13	8.62 ic	8.26 ic	0.35 ic	---	0.00	0.00	---	---	---	---	8.619
4.20	72,960	104.20	8.91 ic	8.33 ic	0.58 ic	---	0.00	0.00	---	---	---	---	8.908
4.27	74,459	104.27	9.45 ic	8.38 ic	0.87 ic	---	0.00	0.00	---	---	---	---	9.258
4.34	75,957	104.34	9.73 ic	8.45 ic	1.20 ic	---	0.00	0.00	---	---	---	---	9.648
4.41	77,455	104.41	10.09 ic	8.51 ic	1.58 ic	---	0.00	0.00	---	---	---	---	10.08
4.48	78,954	104.48	10.61 ic	8.57 ic	2.03 ic	---	0.00	0.00	---	---	---	---	10.59
4.55	80,452	104.55	11.28 oc	8.60 ic	2.54 ic	---	0.00	0.15	---	---	---	---	11.28
4.62	81,950	104.62	12.27 oc	8.61 ic	3.11 ic	---	0.00	0.55	---	---	---	---	12.27
4.69	83,449	104.69	13.49 oc	8.61 ic	3.64 ic	---	0.00	1.10	---	---	---	---	13.36
4.76	84,947	104.76	14.68 oc	8.60 ic	4.21 ic	---	0.00	1.77	---	---	---	---	14.58
4.83	86,445	104.83	16.03 oc	8.58 ic	4.93 ic	---	0.00	2.53	---	---	---	---	16.03
4.90	87,944	104.90	17.48 oc	8.54 ic	5.57 ic	---	0.00	3.37	---	---	---	---	17.48
4.97	89,529	104.97	19.08 oc	8.48 ic	6.24 ic	---	0.00	4.29	---	---	---	---	19.01
5.04	91,115	105.04	20.80 oc	8.37 ic	7.06 ic	---	0.00	5.29	---	---	---	---	20.71
5.11	92,701	105.11	22.16 oc	8.04 ic	7.77 ic	---	0.00	6.35	---	---	---	---	22.16
5.18	94,286	105.18	23.99 oc	8.02 ic	8.50 ic	---	0.00	7.47	---	---	---	---	23.99
5.25	95,872	105.25	25.98 oc	7.97 ic	9.35 ic	---	0.00	8.65	---	---	---	---	25.97
5.32	97,457	105.32	27.89 oc	7.92 ic	10.08 ic	---	0.00	9.89	---	---	---	---	27.89
5.39	99,043	105.39	29.94 oc	7.84 ic	10.92 ic	---	0.00	11.18	---	---	---	---	29.94
5.46	100,629	105.46	32.01 oc	7.75 ic	11.73 ic	---	0.00	12.53	---	---	---	---	32.01
5.53	102,214	105.53	34.08 oc	7.64 ic	12.52 ic	---	0.00	13.92	---	---	---	---	34.08
5.60	103,800	105.60	36.15 oc	7.52 ic	13.26 ic	---	0.00	15.37	---	---	---	---	36.15
5.67	105,475	105.67	38.28 oc	7.38 ic	14.04 ic	---	0.00	16.86	---	---	---	---	38.28
5.74	107,151	105.74	40.36 oc	7.23 ic	14.74 ic	---	0.00	18.39	---	---	---	---	40.36
5.81	108,826	105.81	42.45 oc	7.06 ic	15.42 ic	---	0.00	19.97	---	---	---	---	42.45
5.88	110,501	105.88	44.51 oc	6.87 ic	16.05 ic	---	0.00	21.59	---	---	---	---	44.51
5.95	112,177	105.95	46.50 oc	6.68 ic	16.56 ic	---	0.00	23.26	---	---	---	---	46.50
6.02	113,852	106.02	48.47 oc	6.47 ic	17.04 ic	---	0.00	24.96	---	---	---	---	48.47
6.09	115,527	106.09	50.52 oc	6.23 ic	17.59 ic	---	0.00	26.71	---	---	---	---	50.52
6.16	117,203	106.16	52.56 oc	5.96 ic	18.11 ic	---	0.00	28.49	---	---	---	---	52.56
6.23	118,878	106.23	54.30 oc	5.72 ic	18.63 ic	---	0.00	29.95 s	---	---	---	---	54.30
6.30	120,553	106.30	55.77 oc	5.53 ic	19.13 ic	---	0.00	31.11 s	---	---	---	---	55.77
6.37	122,321	106.37	56.95 oc	5.39 ic	19.31 ic	---	0.00	32.25 s	---	---	---	---	56.95
6.44	124,089	106.44	57.84 oc	5.31 ic	19.03 ic	---	0.00	33.50 s	---	---	---	---	57.84
6.51	125,856	106.51	58.70 oc	5.24 ic	18.75 ic	---	0.00	34.71 s	---	---	---	---	58.70
6.58	127,624	106.58	59.54 oc	5.16 ic	18.49 ic	---	0.00	35.89 s	---	---	---	---	59.54
6.65	129,391	106.65	60.36 oc	5.09 ic	18.23 ic	---	0.00	37.04 s	---	---	---	---	60.36
6.72	131,159	106.72	61.16 oc	5.02 ic	17.98 ic	---	0.00	38.16 s	---	---	---	---	61.15
6.79	132,926	106.79	61.93 oc	4.95 ic	17.73 ic	---	0.00	39.25 s	---	---	---	---	61.93
6.86	134,694	106.86	62.69 oc	4.88 ic	17.48 ic	---	0.00	40.32 s	---	---	---	---	62.69
6.93	136,461	106.93	63.43 oc	4.82 ic	17.25 ic	---	0.00	41.37 s	---	---	---	---	63.43
7.00	138,229	107.00	64.16 oc	4.75 ic	17.01 ic	---	0.00	42.39 s	---	---	---	---	64.16

...End

Hydrograph Report

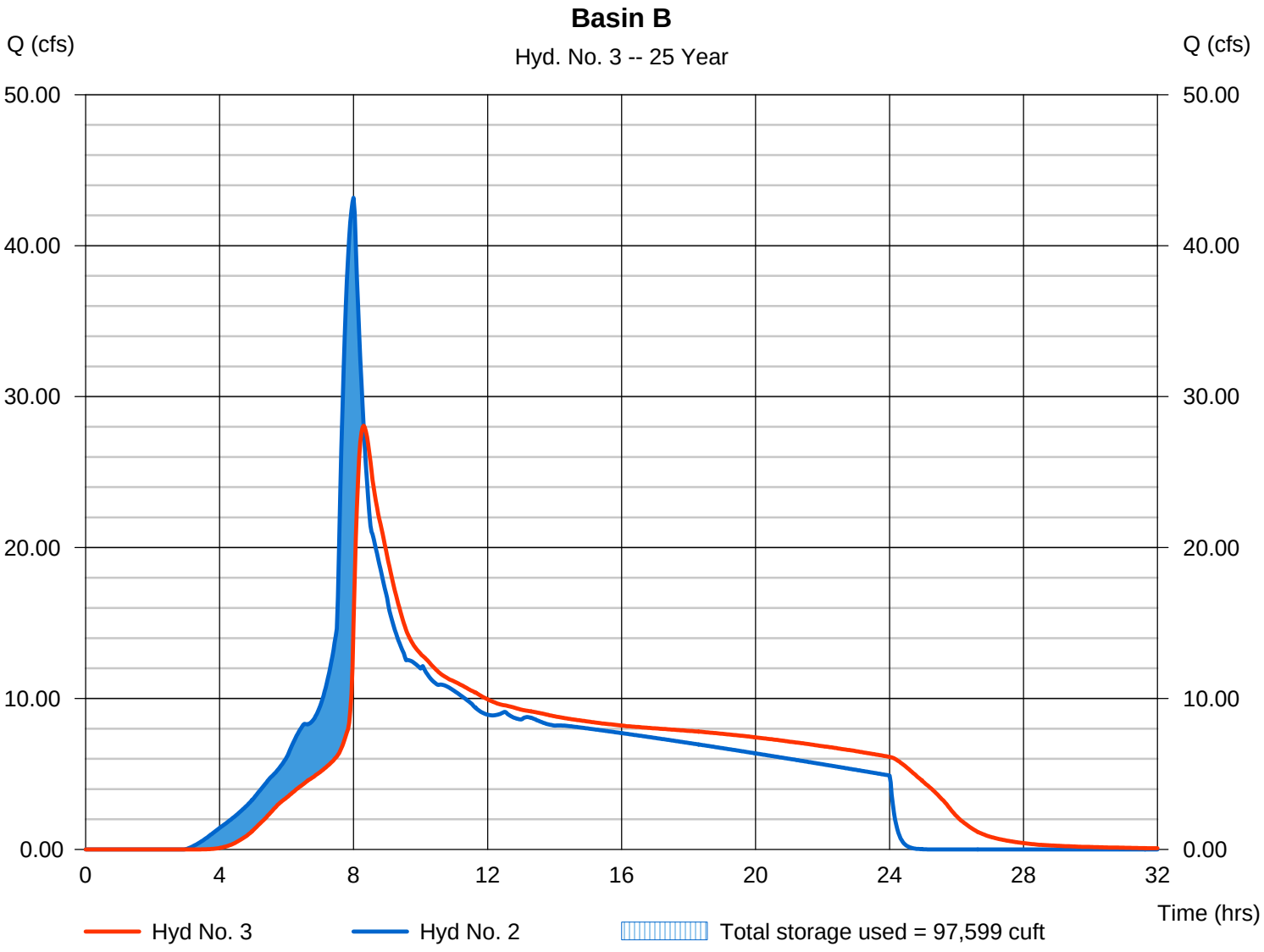
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	28.07 cfs
Storm frequency	=	25 yrs	Time to peak	=	8.30 hrs
Time interval	=	2 min	Hyd. volume	=	655,829 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	105.33 ft
Reservoir name	=	Pond B	Max. Storage	=	97,599 cuft

Storage Indication method used.



Hydrograph Report

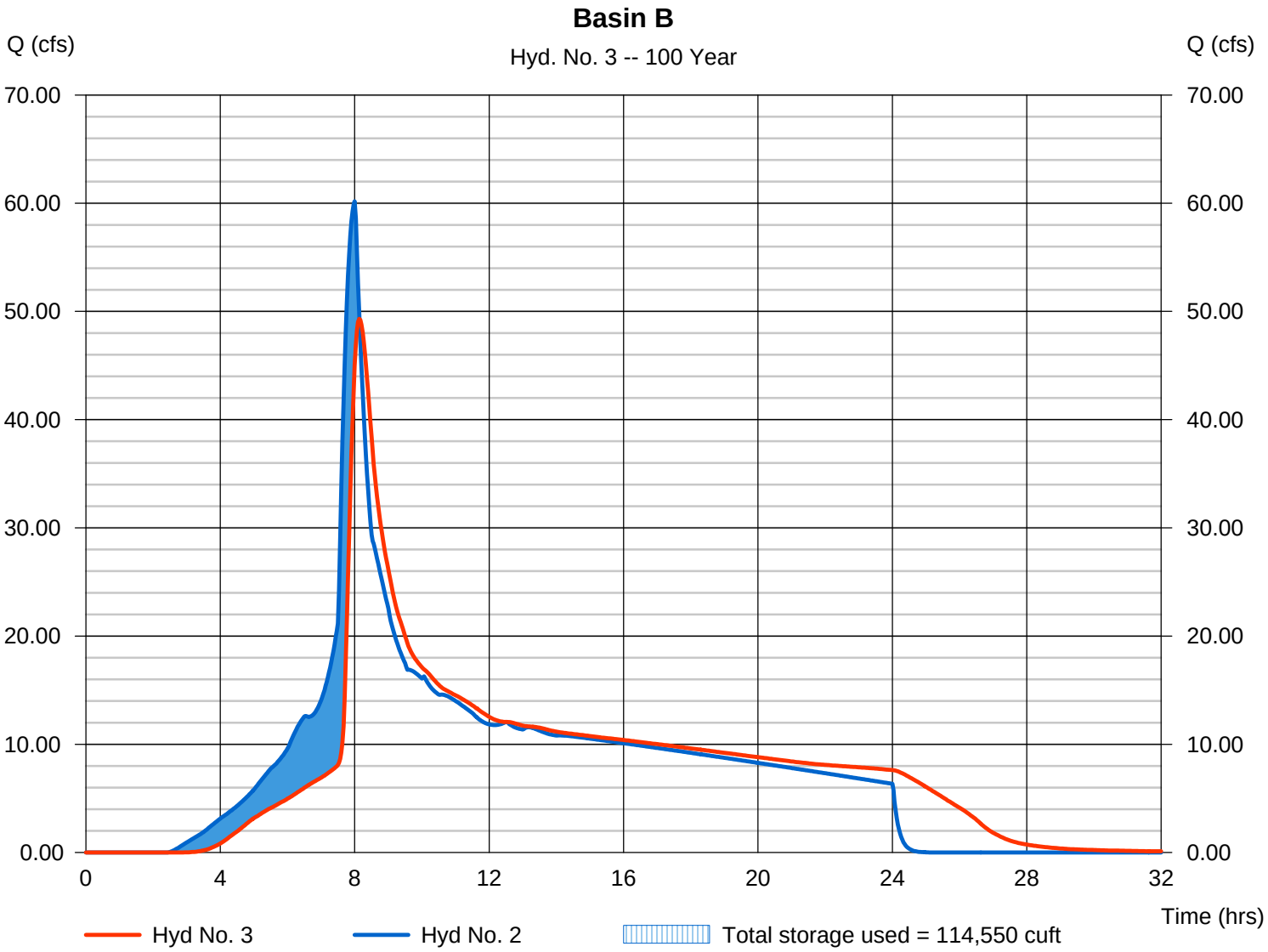
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	49.33 cfs
Storm frequency	=	100 yrs	Time to peak	=	8.13 hrs
Time interval	=	2 min	Hyd. volume	=	898,583 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	106.05 ft
Reservoir name	=	Pond B	Max. Storage	=	114,550 cuft

Storage Indication method used.



Hydrograph Report

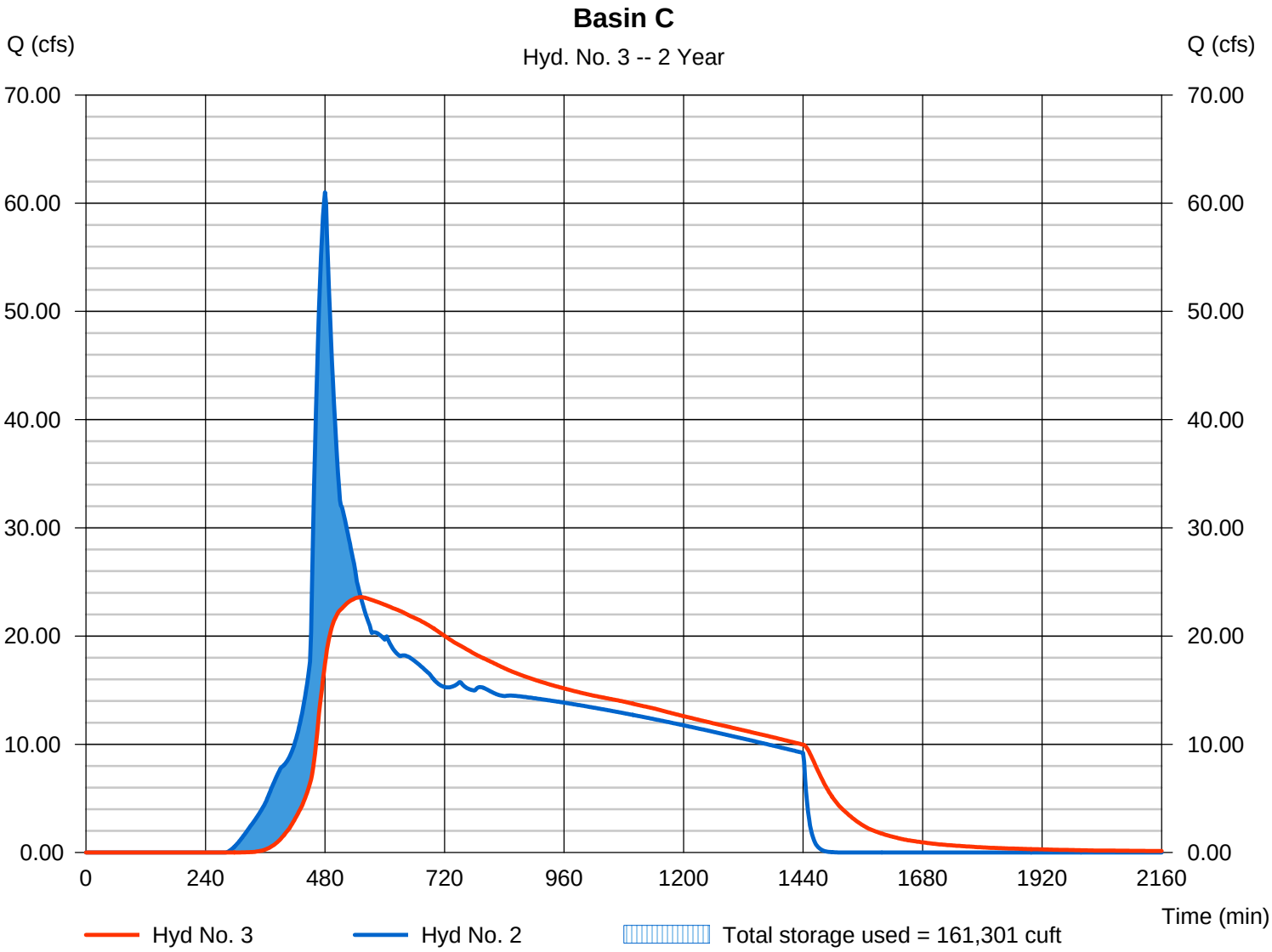
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	23.59 cfs
Storm frequency	=	2 yrs	Time to peak	=	552 min
Time interval	=	2 min	Hyd. volume	=	1,030,478 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	103.62 ft
Reservoir name	=	Pond C	Max. Storage	=	161,301 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond C

Pond Data

Trapezoid - Bottom L x W = 200.0 x 200.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	40,000	0	0
0.90	100.90	42,189	36,981	36,981
1.80	101.80	44,437	38,977	75,958
2.70	102.70	46,742	41,026	116,984
3.60	103.60	49,107	43,128	160,112
4.50	104.50	51,529	45,282	205,394
5.40	105.40	54,010	47,488	252,882
6.30	106.30	56,549	49,747	302,629
7.20	107.20	59,146	52,058	354,687
8.10	108.10	61,802	54,422	409,109
9.00	109.00	64,516	56,839	465,948

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	23.61	42.00	0.00
Span (in)	= 36.00	23.61	42.00	0.00
No. Barrels	= 3	1	1	0
Invert El. (ft)	= 100.00	100.01	103.50	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 37.70	28.00	0.00	0.00
Crest El. (ft)	= 108.00	105.83	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	3,698	100.09	0.05 ic	0.04 ic	0.00	---	0.00	0.00	---	---	---	---	0.041
0.18	7,396	100.18	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.179
0.27	11,094	100.27	0.46 ic	0.43 ic	0.00	---	0.00	0.00	---	---	---	---	0.428
0.36	14,792	100.36	0.77 ic	0.76 ic	0.00	---	0.00	0.00	---	---	---	---	0.757
0.45	18,490	100.45	1.22 ic	1.16 ic	0.00	---	0.00	0.00	---	---	---	---	1.160
0.54	22,188	100.54	1.67 ic	1.67 ic	0.00	---	0.00	0.00	---	---	---	---	1.667
0.63	25,887	100.63	2.21 ic	2.21 ic	0.00	---	0.00	0.00	---	---	---	---	2.209
0.72	29,585	100.72	2.91 ic	2.91 ic	0.00	---	0.00	0.00	---	---	---	---	2.913
0.81	33,283	100.81	3.66 ic	3.62 ic	0.00	---	0.00	0.00	---	---	---	---	3.621
0.90	36,981	100.90	4.30 ic	4.30 ic	0.00	---	0.00	0.00	---	---	---	---	4.299
0.99	40,878	100.99	5.29 ic	5.12 ic	0.00	---	0.00	0.00	---	---	---	---	5.124
1.08	44,776	101.08	6.06 ic	5.99 ic	0.00	---	0.00	0.00	---	---	---	---	5.994
1.17	48,674	101.17	6.90 ic	6.90 ic	0.00	---	0.00	0.00	---	---	---	---	6.896
1.26	52,572	101.26	7.82 ic	7.82 ic	0.00	---	0.00	0.00	---	---	---	---	7.815
1.35	56,469	101.35	8.81 ic	8.73 ic	0.00	---	0.00	0.00	---	---	---	---	8.735
1.44	60,367	101.44	9.89 ic	9.64 ic	0.00	---	0.00	0.00	---	---	---	---	9.640
1.53	64,265	101.53	11.04 ic	10.61 ic	0.00	---	0.00	0.00	---	---	---	---	10.61
1.62	68,163	101.62	11.64 ic	11.51 ic	0.00	---	0.00	0.00	---	---	---	---	11.51
1.71	72,060	101.71	12.40 ic	12.40 ic	0.00	---	0.00	0.00	---	---	---	---	12.40
1.80	75,958	101.80	13.58 ic	13.27 ic	0.00	---	0.00	0.00	---	---	---	---	13.27
1.89	80,061	101.89	14.27 ic	13.97 ic	0.00	---	0.00	0.00	---	---	---	---	13.97
1.98	84,163	101.98	14.98 ic	14.54 ic	0.00	---	0.00	0.00	---	---	---	---	14.54
2.07	88,266	102.07	15.71 ic	15.18 ic	0.00	---	0.00	0.00	---	---	---	---	15.18
2.16	92,368	102.16	15.81 ic	15.81 ic	0.00	---	0.00	0.00	---	---	---	---	15.81
2.25	96,471	102.25	16.46 ic	16.41 ic	0.00	---	0.00	0.00	---	---	---	---	16.41
2.34	100,574	102.34	17.23 ic	16.98 ic	0.00	---	0.00	0.00	---	---	---	---	16.98
2.43	104,676	102.43	18.02 ic	17.54 ic	0.00	---	0.00	0.00	---	---	---	---	17.54
2.52	108,779	102.52	18.08 ic	18.08 ic	0.00	---	0.00	0.00	---	---	---	---	18.08
2.61	112,882	102.61	18.83 ic	18.61 ic	0.00	---	0.00	0.00	---	---	---	---	18.61
2.70	116,984	102.70	19.66 ic	19.12 ic	0.00	---	0.00	0.00	---	---	---	---	19.12
2.79	121,297	102.79	19.66 ic	19.62 ic	0.00	---	0.00	0.00	---	---	---	---	19.62
2.88	125,610	102.88	20.52 ic	20.10 ic	0.00	---	0.00	0.00	---	---	---	---	20.10
2.97	129,923	102.97	20.58 ic	20.58 ic	0.00	---	0.00	0.00	---	---	---	---	20.58

Continues on next page...

Pond C

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	134,235	103.06	21.39 ic	21.04 ic	0.00	---	0.00	0.00	---	---	---	---	21.04
3.15	138,548	103.15	21.47 ic	21.47 ic	0.00	---	0.00	0.00	---	---	---	---	21.47
3.24	142,861	103.24	22.28 ic	21.84 ic	0.00	---	0.00	0.00	---	---	---	---	21.84
3.33	147,174	103.33	22.28 ic	22.27 ic	0.00	---	0.00	0.00	---	---	---	---	22.27
3.42	151,486	103.42	23.19 ic	22.60 ic	0.00	---	0.00	0.00	---	---	---	---	22.60
3.51	155,799	103.51	23.19 ic	23.02 ic	0.00 ic	---	0.00	0.00	---	---	---	---	23.02
3.60	160,112	103.60	23.43 ic	23.34 ic	0.09 ic	---	0.00	0.00	---	---	---	---	23.43
3.69	164,640	103.69	24.13 ic	23.74 ic	0.30 ic	---	0.00	0.00	---	---	---	---	24.05
3.78	169,168	103.78	25.08 ic	24.04 ic	0.67 ic	---	0.00	0.00	---	---	---	---	24.72
3.87	173,696	103.87	26.05 ic	24.34 ic	1.19 ic	---	0.00	0.00	---	---	---	---	25.53
3.96	178,225	103.96	27.04 ic	24.64 ic	1.80 ic	---	0.00	0.00	---	---	---	---	26.44
4.05	182,753	104.05	28.04 ic	24.93 ic	2.46 ic	---	0.00	0.00	---	---	---	---	27.38
4.14	187,281	104.14	28.97 oc	25.21 ic	3.40 ic	---	0.00	0.00	---	---	---	---	28.61
4.23	191,809	104.23	29.82 oc	25.47 ic	4.35 ic	---	0.00	0.00	---	---	---	---	29.82
4.32	196,337	104.32	31.54 oc	25.68 ic	5.43 ic	---	0.00	0.00	---	---	---	---	31.11
4.41	200,865	104.41	33.29 oc	25.86 ic	6.67 ic	---	0.00	0.00	---	---	---	---	32.53
4.50	205,394	104.50	34.17 oc	26.13 ic	7.78 ic	---	0.00	0.00	---	---	---	---	33.91
4.59	210,142	104.59	35.93 oc	26.31 ic	9.27 ic	---	0.00	0.00	---	---	---	---	35.58
4.68	214,891	104.68	37.71 oc	26.49 ic	10.58 ic	---	0.00	0.00	---	---	---	---	37.07
4.77	219,640	104.77	39.50 oc	26.66 ic	12.33 ic	---	0.00	0.00	---	---	---	---	38.99
4.86	224,389	104.86	41.29 oc	26.83 ic	13.84 ic	---	0.00	0.00	---	---	---	---	40.67
4.95	229,138	104.95	43.08 oc	27.00 ic	15.81 ic	---	0.00	0.00	---	---	---	---	42.81
5.04	233,886	105.04	44.86 oc	27.17 ic	17.49 ic	---	0.00	0.00	---	---	---	---	44.66
5.13	238,635	105.13	46.64 oc	27.34 ic	19.24 ic	---	0.00	0.00	---	---	---	---	46.58
5.22	243,384	105.22	49.27 oc	27.42 ic	21.05 ic	---	0.00	0.00	---	---	---	---	48.47
5.31	248,133	105.31	51.01 oc	27.59 ic	23.36 ic	---	0.00	0.00	---	---	---	---	50.94
5.40	252,882	105.40	53.57 oc	27.67 ic	25.28 ic	---	0.00	0.00	---	---	---	---	52.94
5.49	257,856	105.49	55.24 oc	27.84 ic	27.24 ic	---	0.00	0.00	---	---	---	---	55.07
5.58	262,831	105.58	57.69 oc	27.92 ic	29.68 ic	---	0.00	0.00	---	---	---	---	57.60
5.67	267,806	105.67	60.06 oc	28.01 ic	31.69 ic	---	0.00	0.00	---	---	---	---	59.70
5.76	272,780	105.76	62.34 oc	28.10 ic	33.71 ic	---	0.00	0.00	---	---	---	---	61.81
5.85	277,755	105.85	65.21 oc	28.12 ic	36.17 ic	---	0.00	0.26	---	---	---	---	64.55
5.94	282,730	105.94	69.75 oc	27.91 ic	38.17 ic	---	0.00	3.40	---	---	---	---	69.48
6.03	287,704	106.03	76.29 oc	27.33 ic	40.58 ic	---	0.00	8.34	---	---	---	---	76.24
6.12	292,679	106.12	83.21 oc	25.73 ic	42.92 ic	---	0.00	14.56	---	---	---	---	83.21
6.21	297,654	106.21	92.25 oc	25.60 ic	44.81 ic	---	0.00	21.84	---	---	---	---	92.25
6.30	302,629	106.30	102.41 oc	25.34 ic	47.02 ic	---	0.00	30.04	---	---	---	---	102.40
6.39	307,834	106.39	113.46 oc	24.94 ic	49.44 ic	---	0.00	39.07	---	---	---	---	113.46
6.48	313,040	106.48	124.72 oc	24.44 ic	51.41 ic	---	0.00	48.86	---	---	---	---	124.71
6.57	318,246	106.57	136.64 oc	23.78 ic	53.50 ic	---	0.00	59.35	---	---	---	---	136.64
6.66	323,452	106.66	148.87 oc	22.97 ic	55.40 ic	---	0.00	70.50	---	---	---	---	148.87
6.75	328,658	106.75	161.49 oc	21.96 ic	57.25 ic	---	0.00	82.28	---	---	---	---	161.49
6.84	333,864	106.84	174.33 oc	20.76 ic	58.93 ic	---	0.00	94.64	---	---	---	---	174.33
6.93	339,069	106.93	187.27 oc	19.32 ic	60.38 ic	---	0.00	107.57	---	---	---	---	187.27
7.02	344,275	107.02	196.90 oc	18.22 ic	57.65 ic	---	0.00	121.03	---	---	---	---	196.90
7.11	349,481	107.11	206.03 oc	17.05 ic	53.96 ic	---	0.00	135.02	---	---	---	---	206.03
7.20	354,687	107.20	213.72 oc	16.03 ic	50.73 ic	---	0.00	146.96 s	---	---	---	---	213.72
7.29	360,129	107.29	219.73 oc	15.28 ic	48.36 ic	---	0.00	156.07 s	---	---	---	---	219.72
7.38	365,571	107.38	225.06 oc	14.63 ic	46.29 ic	---	0.00	164.14 s	---	---	---	---	225.05
7.47	371,014	107.47	229.55 ic	14.00 ic	44.30 ic	---	0.00	171.25 s	---	---	---	---	229.54
7.56	376,456	107.56	233.31 ic	13.39 ic	42.39 ic	---	0.00	177.52 s	---	---	---	---	233.31
7.65	381,898	107.65	236.81 ic	12.84 ic	40.64 ic	---	0.00	183.32 s	---	---	---	---	236.80
7.74	387,340	107.74	240.09 ic	12.33 ic	39.02 ic	---	0.00	188.73 s	---	---	---	---	240.08
7.83	392,782	107.83	243.18 ic	11.86 ic	37.52 ic	---	0.00	193.80 s	---	---	---	---	243.18
7.92	398,225	107.92	246.12 ic	11.42 ic	36.13 ic	---	0.00	198.56 s	---	---	---	---	246.10
8.01	403,667	108.01	248.93 ic	11.00 ic	34.81 ic	---	0.12	202.99 s	---	---	---	---	248.92
8.10	409,109	108.10	252.00 ic	10.43 ic	32.99 ic	---	3.97	204.59 s	---	---	---	---	251.98
8.19	414,793	108.19	255.12 ic	9.77 ic	30.92 ic	---	10.40	204.03 s	---	---	---	---	255.11
8.28	420,477	108.28	258.18 ic	9.08 ic	28.74 ic	---	18.60	201.74 s	---	---	---	---	258.16
8.37	426,161	108.37	261.10 ic	8.40 ic	26.57 ic	---	27.85 s	198.28 s	---	---	---	---	261.10
8.46	431,845	108.46	263.74 ic	7.83 ic	24.78 ic	---	35.37 s	195.76 s	---	---	---	---	263.74
8.55	437,529	108.55	266.20 ic	7.33 ic	23.21 ic	---	42.04 s	193.58 s	---	---	---	---	266.17
8.64	443,212	108.64	268.53 ic	6.89 ic	21.82 ic	---	48.13 s	191.66 s	---	---	---	---	268.50
8.73	448,896	108.73	270.74 ic	6.50 ic	20.57 ic	---	53.75 s	189.91 s	---	---	---	---	270.72
8.82	454,580	108.82	272.87 ic	6.14 ic	19.44 ic	---	58.95 s	188.32 s	---	---	---	---	272.85
8.91	460,264	108.91	274.93 ic	5.82 ic	18.42 ic	---	63.80 s	186.87 s	---	---	---	---	274.91
9.00	465,948	109.00	276.92 ic	5.53 ic	17.49 ic	---	68.33 s	185.55 s	---	---	---	---	276.90

...End

Hydrograph Report

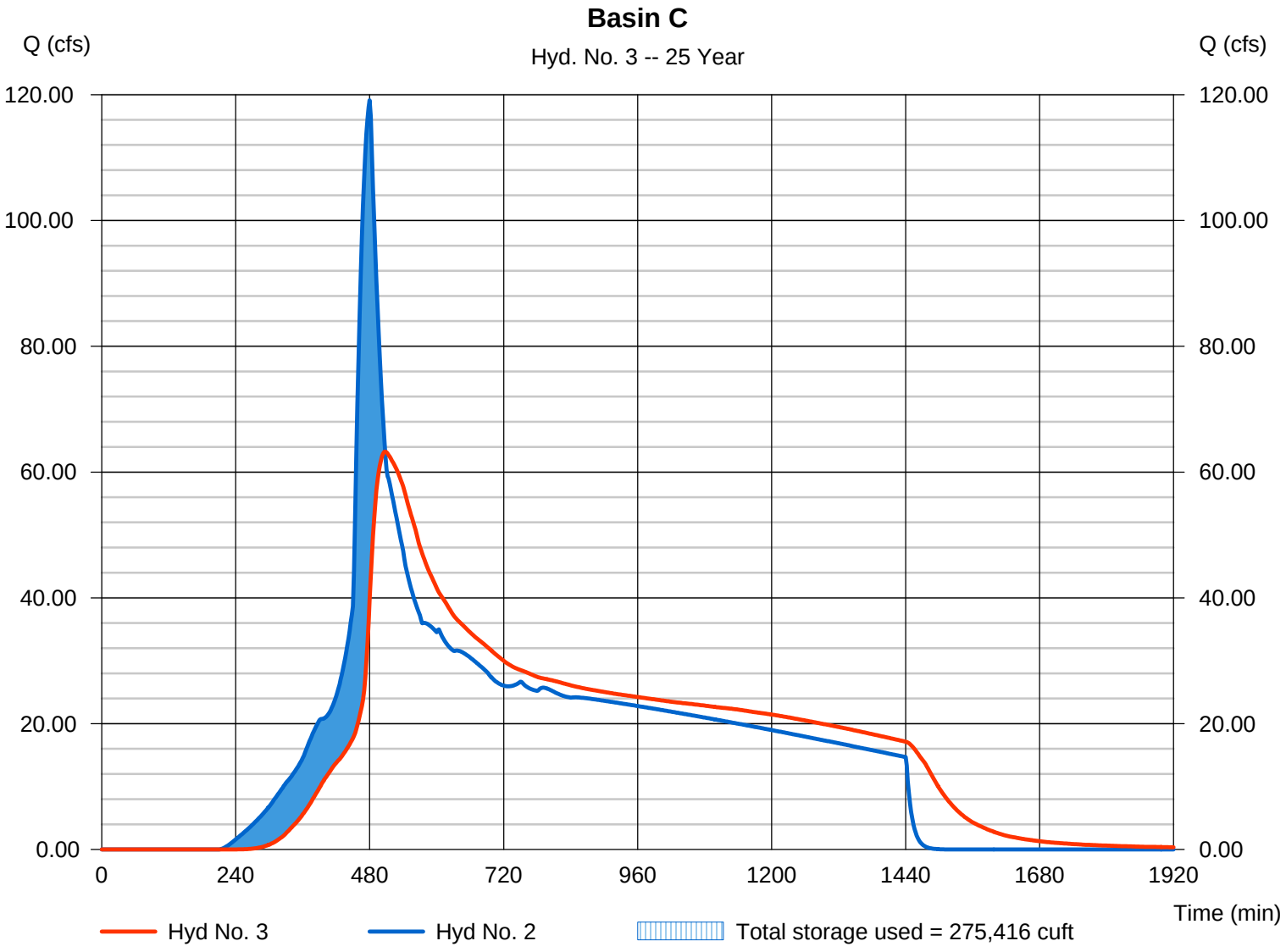
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	63.26 cfs
Storm frequency	=	25 yrs	Time to peak	=	508 min
Time interval	=	2 min	Hyd. volume	=	1,855,549 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	105.81 ft
Reservoir name	=	Pond C	Max. Storage	=	275,416 cuft

Storage Indication method used.



Hydrograph Report

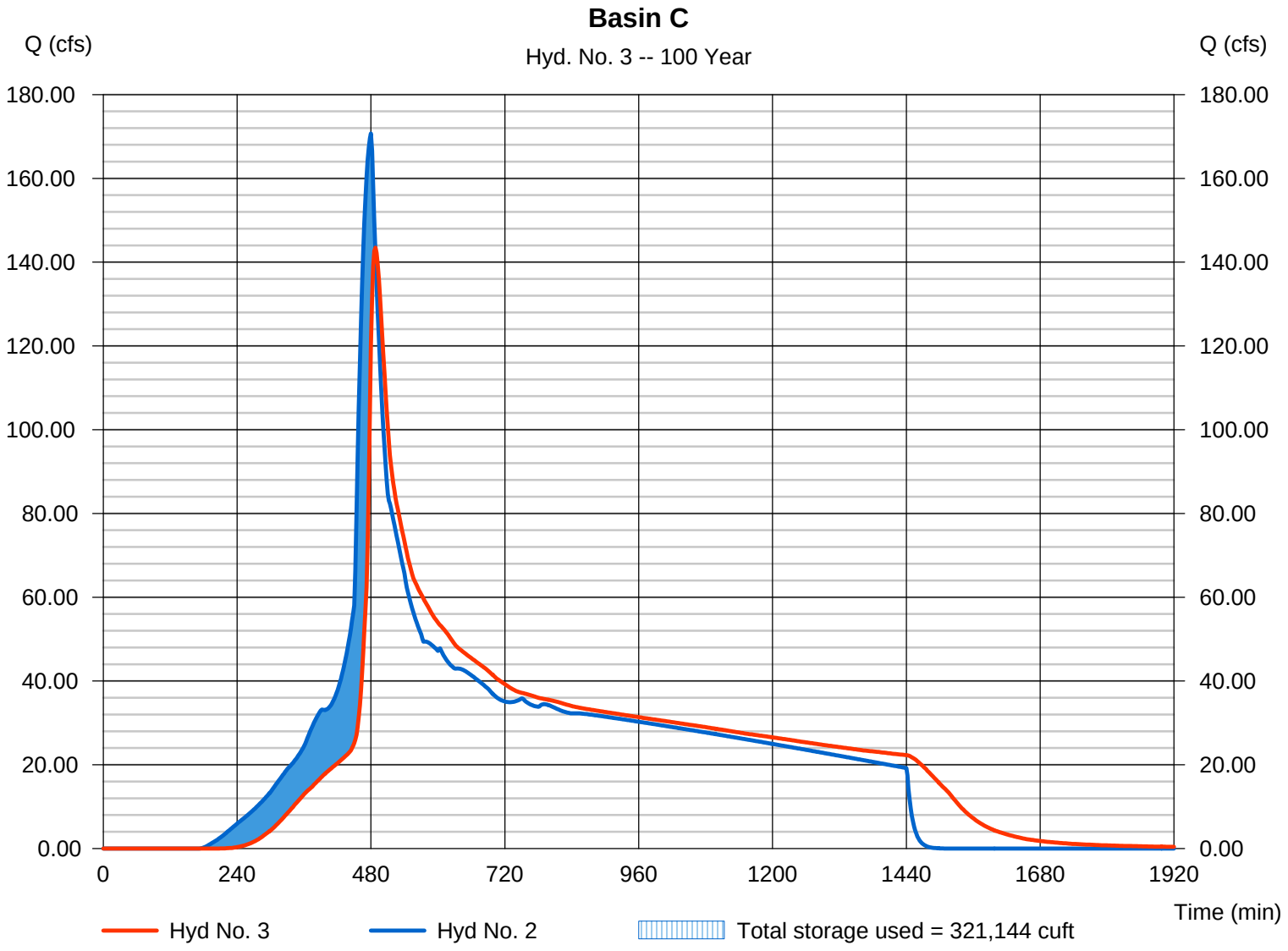
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	143.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	2,587,324 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	106.62 ft
Reservoir name	=	Pond C	Max. Storage	=	321,144 cuft

Storage Indication method used.



Hydrograph Report

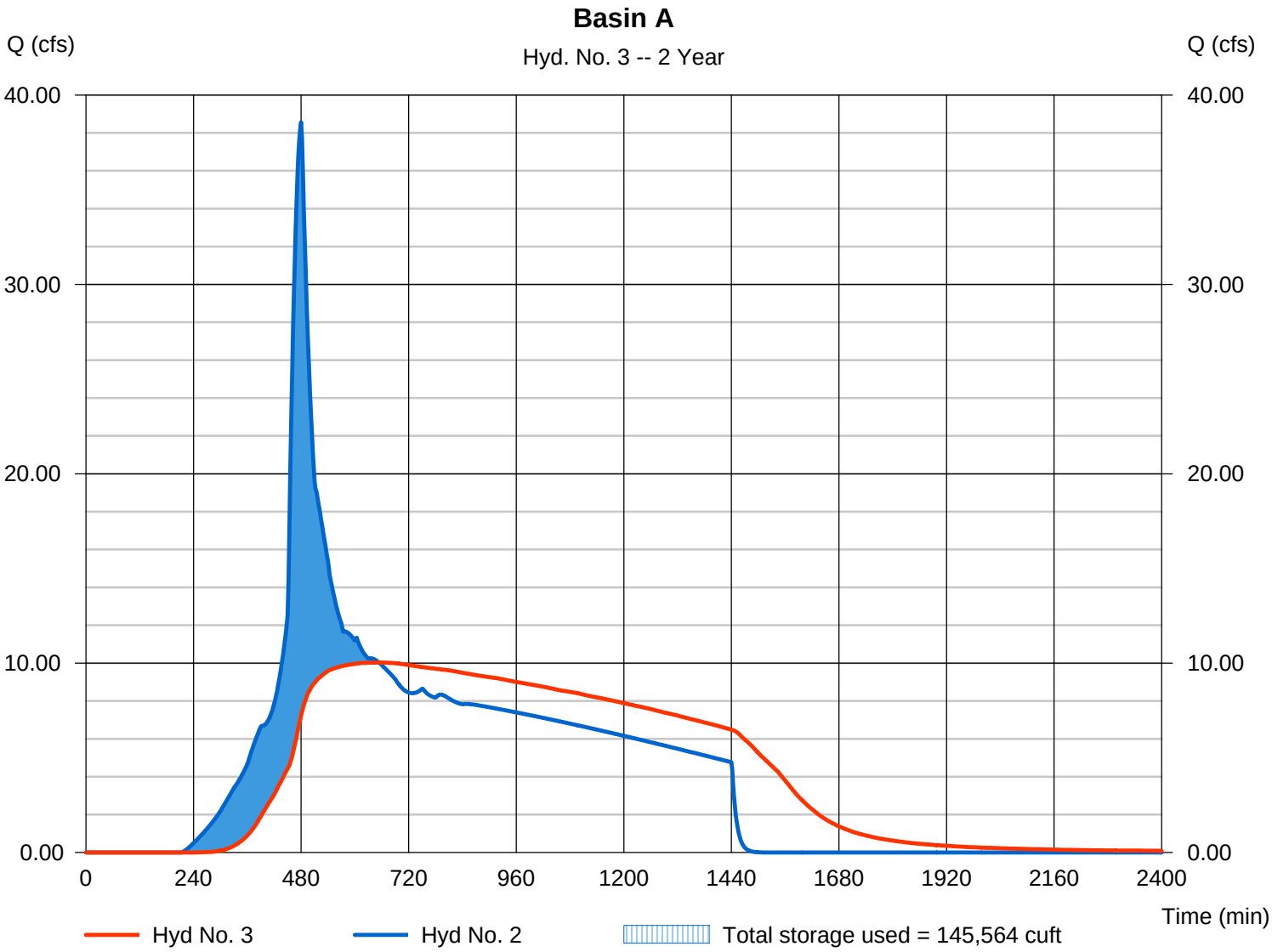
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	10.03 cfs
Storm frequency	=	2 yrs	Time to peak	=	654 min
Time interval	=	2 min	Hyd. volume	=	600,983 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	104.13 ft
Reservoir name	=	Pond A	Max. Storage	=	145,564 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond A

Pond Data

Trapezoid - Bottom L x W = 175.0 x 175.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	30,625	0	0
0.90	100.90	32,544	28,422	28,422
1.80	101.80	34,522	30,175	58,597
2.70	102.70	36,557	31,981	90,578
3.60	103.60	38,652	33,840	124,418
4.50	104.50	40,804	35,751	160,169
5.40	105.40	43,015	37,714	197,883
6.30	106.30	45,284	39,730	237,613
7.20	107.20	47,611	41,798	279,411
8.10	108.10	49,997	43,919	323,330
9.00	109.00	52,441	46,093	369,423

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	14.85	30.00	0.00
Span (in)	= 42.00	14.85	30.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.00	104.80	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	6.00	0.00	0.00
Crest El. (ft)	= 108.00	104.82	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	2,842	100.09	0.03 ic	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.032
0.18	5,684	100.18	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.126
0.27	8,527	100.27	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.284
0.36	11,369	100.36	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.491
0.45	14,211	100.45	0.75 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.752
0.54	17,053	100.54	1.08 ic	1.06 ic	0.00	---	0.00	0.00	---	---	---	---	1.060
0.63	19,895	100.63	1.42 ic	1.42 ic	0.00	---	0.00	0.00	---	---	---	---	1.418
0.72	22,737	100.72	1.80 ic	1.80 ic	0.00	---	0.00	0.00	---	---	---	---	1.801
0.81	25,580	100.81	2.25 ic	2.22 ic	0.00	---	0.00	0.00	---	---	---	---	2.219
0.90	28,422	100.90	2.63 ic	2.63 ic	0.00	---	0.00	0.00	---	---	---	---	2.628
0.99	31,439	100.99	3.17 ic	3.05 ic	0.00	---	0.00	0.00	---	---	---	---	3.048
1.08	34,457	101.08	3.60 ic	3.50 ic	0.00	---	0.00	0.00	---	---	---	---	3.499
1.17	37,474	101.17	3.89 ic	3.89 ic	0.00	---	0.00	0.00	---	---	---	---	3.892
1.26	40,492	101.26	4.32 ic	4.25 ic	0.00	---	0.00	0.00	---	---	---	---	4.250
1.35	43,509	101.35	4.58 ic	4.51 ic	0.00	---	0.00	0.00	---	---	---	---	4.508
1.44	46,527	101.44	4.84 ic	4.75 ic	0.00	---	0.00	0.00	---	---	---	---	4.752
1.53	49,544	101.53	5.12 ic	4.98 ic	0.00	---	0.00	0.00	---	---	---	---	4.984
1.62	52,562	101.62	5.41 ic	5.20 ic	0.00	---	0.00	0.00	---	---	---	---	5.204
1.71	55,579	101.71	5.45 ic	5.45 ic	0.00	---	0.00	0.00	---	---	---	---	5.449
1.80	58,597	101.80	5.71 ic	5.69 ic	0.00	---	0.00	0.00	---	---	---	---	5.686
1.89	61,795	101.89	6.01 ic	5.88 ic	0.00	---	0.00	0.00	---	---	---	---	5.879
1.98	64,993	101.98	6.08 ic	6.08 ic	0.00	---	0.00	0.00	---	---	---	---	6.078
2.07	68,191	102.07	6.33 ic	6.31 ic	0.00	---	0.00	0.00	---	---	---	---	6.309
2.16	71,389	102.16	6.66 ic	6.48 ic	0.00	---	0.00	0.00	---	---	---	---	6.482
2.25	74,588	102.25	6.69 ic	6.69 ic	0.00	---	0.00	0.00	---	---	---	---	6.688
2.34	77,786	102.34	6.99 ic	6.87 ic	0.00	---	0.00	0.00	---	---	---	---	6.873
2.43	80,984	102.43	7.05 ic	7.05 ic	0.00	---	0.00	0.00	---	---	---	---	7.052
2.52	84,182	102.52	7.34 ic	7.24 ic	0.00	---	0.00	0.00	---	---	---	---	7.243
2.61	87,380	102.61	7.41 ic	7.41 ic	0.00	---	0.00	0.00	---	---	---	---	7.408
2.70	90,578	102.70	7.70 ic	7.59 ic	0.00	---	0.00	0.00	---	---	---	---	7.594
2.79	93,962	102.79	7.76 ic	7.76 ic	0.00	---	0.00	0.00	---	---	---	---	7.757
2.88	97,346	102.88	8.07 ic	7.93 ic	0.00	---	0.00	0.00	---	---	---	---	7.929
2.97	100,730	102.97	8.10 ic	8.10 ic	0.00	---	0.00	0.00	---	---	---	---	8.100

Continues on next page...

Pond A

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	104,114	103.06	8.44 ic	8.25 ic	0.00	---	0.00	0.00	---	---	---	---	8.250
3.15	107,498	103.15	8.44 ic	8.43 ic	0.00	---	0.00	0.00	---	---	---	---	8.431
3.24	110,882	103.24	8.83 ic	8.56 ic	0.00	---	0.00	0.00	---	---	---	---	8.559
3.33	114,266	103.33	8.83 ic	8.73 ic	0.00	---	0.00	0.00	---	---	---	---	8.734
3.42	117,650	103.42	8.88 ic	8.88 ic	0.00	---	0.00	0.00	---	---	---	---	8.882
3.51	121,034	103.51	9.23 ic	9.03 ic	0.00	---	0.00	0.00	---	---	---	---	9.026
3.60	124,418	103.60	9.23 ic	9.19 ic	0.00	---	0.00	0.00	---	---	---	---	9.192
3.69	127,993	103.69	9.32 ic	9.32 ic	0.00	---	0.00	0.00	---	---	---	---	9.317
3.78	131,568	103.78	9.64 ic	9.47 ic	0.00	---	0.00	0.00	---	---	---	---	9.469
3.87	135,143	103.87	9.64 ic	9.63 ic	0.00	---	0.00	0.00	---	---	---	---	9.627
3.96	138,718	103.96	9.74 ic	9.74 ic	0.00	---	0.00	0.00	---	---	---	---	9.741
4.05	142,293	104.05	10.05 ic	9.89 ic	0.00	---	0.00	0.00	---	---	---	---	9.892
4.14	145,868	104.14	10.05 ic	10.04 ic	0.00	---	0.00	0.00	---	---	---	---	10.04
4.23	149,443	104.23	10.16 ic	10.16 ic	0.00	---	0.00	0.00	---	---	---	---	10.16
4.32	153,018	104.32	10.48 ic	10.30 ic	0.00	---	0.00	0.00	---	---	---	---	10.30
4.41	156,593	104.41	10.48 ic	10.44 ic	0.00	---	0.00	0.00	---	---	---	---	10.44
4.50	160,169	104.50	10.56 ic	10.56 ic	0.00	---	0.00	0.00	---	---	---	---	10.56
4.59	163,940	104.59	10.92 ic	10.69 ic	0.00	---	0.00	0.00	---	---	---	---	10.69
4.68	167,711	104.68	10.92 ic	10.83 ic	0.00	---	0.00	0.00	---	---	---	---	10.83
4.77	171,483	104.77	10.95 oc	10.95 ic	0.00	---	0.00	0.00	---	---	---	---	10.95
4.86	175,254	104.86	11.32 oc	11.06 ic	0.03 ic	---	0.00	0.16	---	---	---	---	11.25
4.95	179,026	104.95	12.45 oc	11.08 ic	0.17 ic	---	0.00	0.94	---	---	---	---	12.18
5.04	182,797	105.04	13.62 oc	11.10 ic	0.43 ic	---	0.00	2.06	---	---	---	---	13.58
5.13	186,568	105.13	15.62 oc	11.03 ic	0.78 ic	---	0.00	3.45	---	---	---	---	15.25
5.22	190,340	105.22	17.25 oc	10.98 ic	1.21 ic	---	0.00	5.05	---	---	---	---	17.25
5.31	194,111	105.31	19.73 oc	10.88 ic	1.77 ic	---	0.00	6.85	---	---	---	---	19.51
5.40	197,883	105.40	22.19 oc	10.77 ic	2.47 ic	---	0.00	8.83	---	---	---	---	22.06
5.49	201,856	105.49	24.99 oc	10.61 ic	3.18 ic	---	0.00	10.96	---	---	---	---	24.75
5.58	205,829	105.58	27.98 oc	10.42 ic	4.00 ic	---	0.00	13.24	---	---	---	---	27.66
5.67	209,802	105.67	31.00 oc	10.20 ic	4.92 ic	---	0.00	15.66	---	---	---	---	30.77
5.76	213,775	105.76	34.26 oc	9.89 ic	5.93 ic	---	0.00	18.21	---	---	---	---	34.03
5.85	217,748	105.85	37.28 oc	9.46 ic	6.86 ic	---	0.00	20.89	---	---	---	---	37.21
5.94	221,721	105.94	40.62 oc	8.90 ic	8.03 ic	---	0.00	23.68	---	---	---	---	40.61
6.03	225,694	106.03	44.53 oc	8.85 ic	9.08 ic	---	0.00	26.59	---	---	---	---	44.53
6.12	229,667	106.12	48.74 oc	8.76 ic	10.37 ic	---	0.00	29.61	---	---	---	---	48.74
6.21	233,640	106.21	53.08 oc	8.64 ic	11.70 ic	---	0.00	32.74	---	---	---	---	53.07
6.30	237,613	106.30	57.32 oc	8.49 ic	12.86 ic	---	0.00	35.97	---	---	---	---	57.32
6.39	241,792	106.39	61.83 oc	8.30 ic	14.23 ic	---	0.00	39.30	---	---	---	---	61.83
6.48	245,972	106.48	66.40 oc	8.06 ic	15.60 ic	---	0.00	42.73	---	---	---	---	66.39
6.57	250,152	106.57	70.99 oc	7.78 ic	16.96 ic	---	0.00	46.25	---	---	---	---	70.99
6.66	254,332	106.66	75.17 oc	7.51 ic	18.28 ic	---	0.00	49.38 s	---	---	---	---	75.17
6.75	258,512	106.75	78.77 oc	7.28 ic	19.56 ic	---	0.00	51.93 s	---	---	---	---	78.76
6.84	262,692	106.84	82.13 oc	7.04 ic	20.92 ic	---	0.00	54.17 s	---	---	---	---	82.13
6.93	266,871	106.93	85.21 oc	6.83 ic	22.18 ic	---	0.00	56.21 s	---	---	---	---	85.21
7.02	271,051	107.02	88.10 oc	6.61 ic	23.42 ic	---	0.00	58.07 s	---	---	---	---	88.10
7.11	275,231	107.11	90.78 oc	6.41 ic	24.56 ic	---	0.00	59.80 s	---	---	---	---	90.77
7.20	279,411	107.20	93.10 oc	6.25 ic	25.21 ic	---	0.00	61.63 s	---	---	---	---	93.10
7.29	283,803	107.29	95.02 oc	6.16 ic	25.12 ic	---	0.00	63.74 s	---	---	---	---	95.02
7.38	288,195	107.38	96.79 oc	6.08 ic	24.80 ic	---	0.00	65.91 s	---	---	---	---	96.79
7.47	292,587	107.47	98.52 oc	6.00 ic	24.48 ic	---	0.00	68.04 s	---	---	---	---	98.52
7.56	296,979	107.56	100.22 oc	5.92 ic	24.17 ic	---	0.00	70.12 s	---	---	---	---	100.21
7.65	301,371	107.65	101.87 oc	5.84 ic	23.85 ic	---	0.00	72.16 s	---	---	---	---	101.86
7.74	305,763	107.74	103.48 oc	5.77 ic	23.55 ic	---	0.00	74.16 s	---	---	---	---	103.48
7.83	310,154	107.83	104.80 ic	5.68 ic	23.17 ic	---	0.00	75.95 s	---	---	---	---	104.80
7.92	314,546	107.92	106.04 ic	5.58 ic	22.78 ic	---	0.00	77.67 s	---	---	---	---	106.03
8.01	318,938	108.01	107.25 ic	5.49 ic	22.40 ic	---	0.05	79.31 s	---	---	---	---	107.25
8.10	323,330	108.10	108.70 ic	5.32 ic	21.69 ic	---	1.65	80.04 s	---	---	---	---	108.70
8.19	327,939	108.19	110.26 ic	5.09 ic	20.78 ic	---	4.33	80.06 s	---	---	---	---	110.26
8.28	332,549	108.28	111.86 ic	4.84 ic	19.75 ic	---	7.75	79.52 s	---	---	---	---	111.85
8.37	337,158	108.37	113.44 ic	4.57 ic	18.64 ic	---	11.77	78.47 s	---	---	---	---	113.44
8.46	341,767	108.46	115.00 ic	4.28 ic	17.46 ic	---	16.31	76.95 s	---	---	---	---	115.00
8.55	346,377	108.55	116.48 ic	4.00 ic	16.32 ic	---	20.92 s	75.24 s	---	---	---	---	116.47
8.64	350,986	108.64	117.78 ic	3.77 ic	15.39 ic	---	24.61 s	74.00 s	---	---	---	---	117.78
8.73	355,595	108.73	118.99 ic	3.57 ic	14.58 ic	---	27.92 s	72.92 s	---	---	---	---	118.99
8.82	360,204	108.82	120.14 ic	3.39 ic	13.84 ic	---	30.97 s	71.94 s	---	---	---	---	120.14
8.91	364,814	108.91	121.23 ic	3.23 ic	13.16 ic	---	33.79 s	71.04 s	---	---	---	---	121.23
9.00	369,423	109.00	122.27 ic	3.07 ic	12.55 ic	---	36.44 s	70.21 s	---	---	---	---	122.27

...End

Hydrograph Report

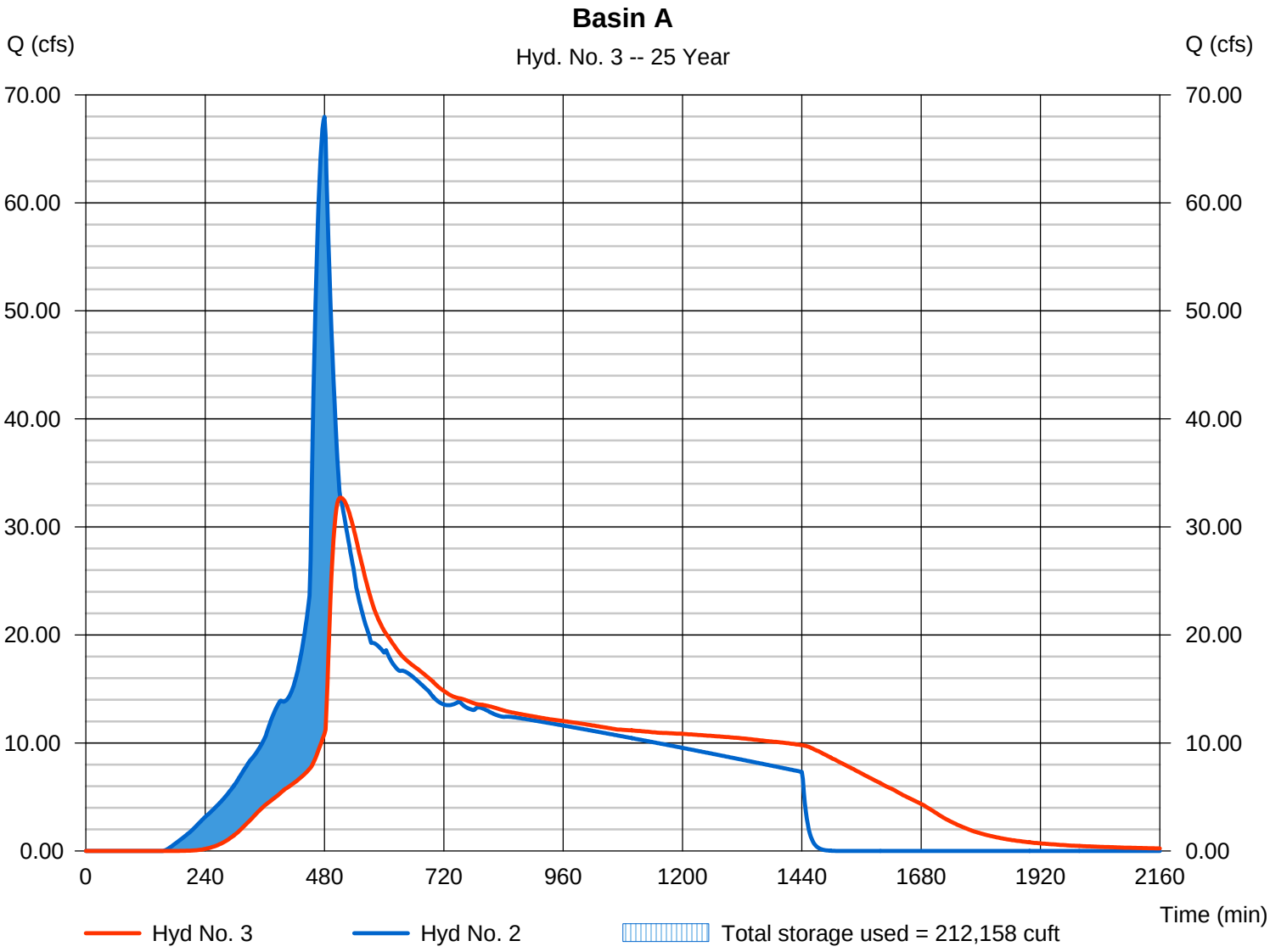
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	32.70 cfs
Storm frequency	=	25 yrs	Time to peak	=	512 min
Time interval	=	2 min	Hyd. volume	=	1,018,977 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	105.72 ft
Reservoir name	=	Pond A	Max. Storage	=	212,158 cuft

Storage Indication method used.



Hydrograph Report

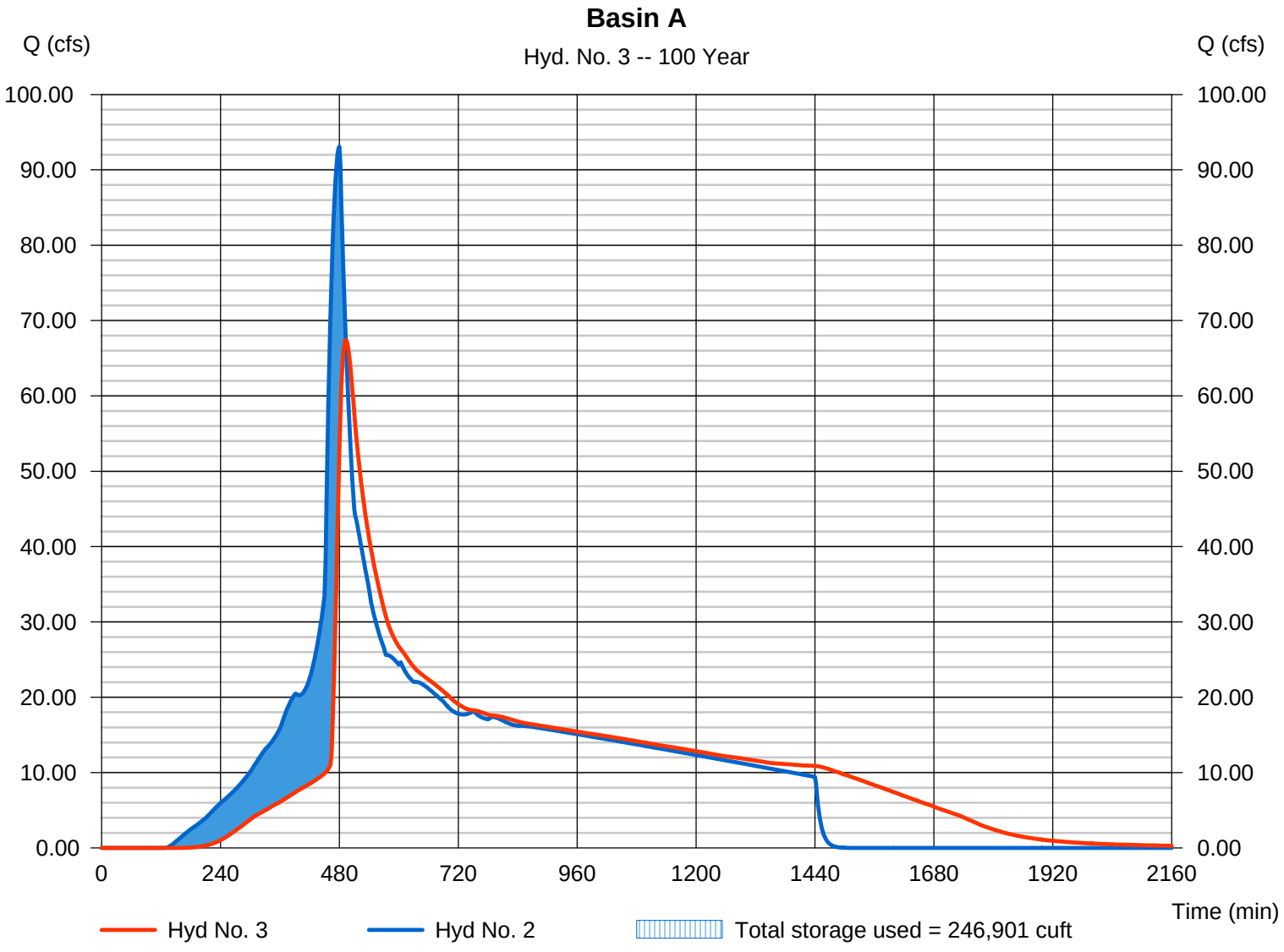
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	67.42 cfs
Storm frequency	=	100 yrs	Time to peak	=	492 min
Time interval	=	2 min	Hyd. volume	=	1,380,600 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	106.50 ft
Reservoir name	=	Pond A	Max. Storage	=	246,901 cuft

Storage Indication method used.



Hydrograph Report

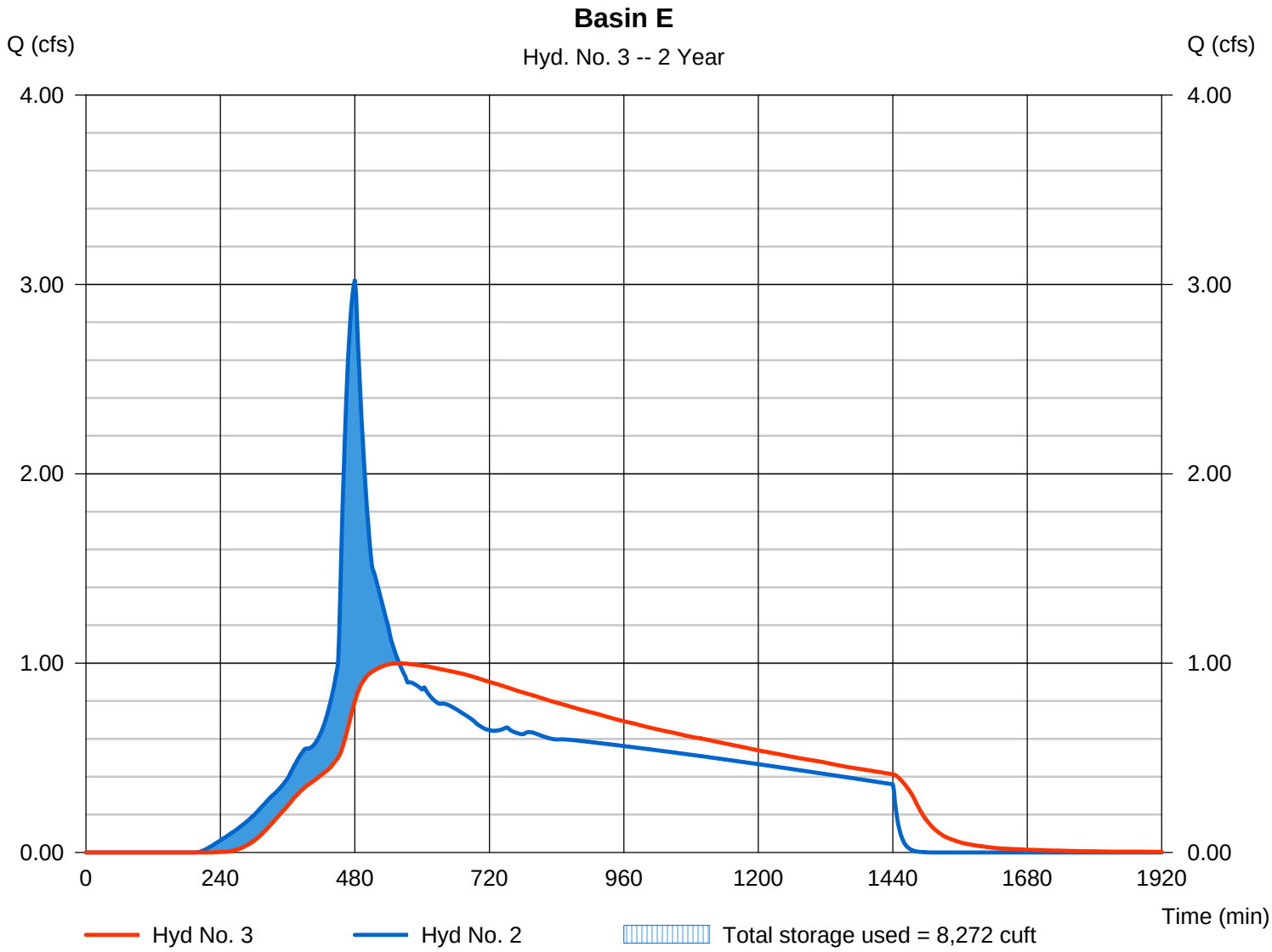
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	0.999 cfs
Storm frequency	=	2 yrs	Time to peak	=	560 min
Time interval	=	2 min	Hyd. volume	=	46,532 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	102.49 ft
Reservoir name	=	Pond E	Max. Storage	=	8,272 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond E

Pond Data

Trapezoid - Bottom L x W = 50.0 x 50.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	2,500	0	0
0.50	100.50	2,809	1,327	1,327
1.00	101.00	3,136	1,486	2,812
1.50	101.50	3,481	1,653	4,465
2.00	102.00	3,844	1,830	6,296
2.50	102.50	4,225	2,016	8,312
3.00	103.00	4,624	2,211	10,524
3.50	103.50	5,041	2,416	12,939
4.00	104.00	5,476	2,628	15,568
4.50	104.50	5,929	2,850	18,418
5.00	105.00	6,400	3,081	21,500

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	5.13	9.00	0.00
Span (in)	= 24.00	5.13	9.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	102.50	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	2.00	0.00	0.00
Crest El. (ft)	= 104.00	103.27	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.05	133	100.05	0.00 ic	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	0.005
0.10	265	100.10	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.022
0.15	398	100.15	0.05 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.050
0.20	531	100.20	0.09 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.086
0.25	663	100.25	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.133
0.30	796	100.30	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.184
0.35	929	100.35	0.24 ic	0.24 ic	0.00	---	0.00	0.00	---	---	---	---	0.236
0.40	1,061	100.40	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.289
0.45	1,194	100.45	0.33 ic	0.33 ic	0.00	---	0.00	0.00	---	---	---	---	0.325
0.50	1,327	100.50	0.35 ic	0.35 ic	0.00	---	0.00	0.00	---	---	---	---	0.354
0.55	1,475	100.55	0.38 ic	0.38 ic	0.00	---	0.00	0.00	---	---	---	---	0.382
0.60	1,624	100.60	0.41 ic	0.41 ic	0.00	---	0.00	0.00	---	---	---	---	0.409
0.65	1,772	100.65	0.44 ic	0.43 ic	0.00	---	0.00	0.00	---	---	---	---	0.431
0.70	1,921	100.70	0.48 ic	0.45 ic	0.00	---	0.00	0.00	---	---	---	---	0.453
0.75	2,069	100.75	0.48 ic	0.48 ic	0.00	---	0.00	0.00	---	---	---	---	0.478
0.80	2,218	100.80	0.52 ic	0.50 ic	0.00	---	0.00	0.00	---	---	---	---	0.497
0.85	2,366	100.85	0.52 ic	0.52 ic	0.00	---	0.00	0.00	---	---	---	---	0.519
0.90	2,515	100.90	0.56 ic	0.54 ic	0.00	---	0.00	0.00	---	---	---	---	0.538
0.95	2,663	100.95	0.56 ic	0.56 ic	0.00	---	0.00	0.00	---	---	---	---	0.559
1.00	2,812	101.00	0.60 ic	0.58 ic	0.00	---	0.00	0.00	---	---	---	---	0.576
1.05	2,977	101.05	0.60 ic	0.60 ic	0.00	---	0.00	0.00	---	---	---	---	0.597
1.10	3,143	101.10	0.64 ic	0.61 ic	0.00	---	0.00	0.00	---	---	---	---	0.612
1.15	3,308	101.15	0.64 ic	0.63 ic	0.00	---	0.00	0.00	---	---	---	---	0.631
1.20	3,473	101.20	0.65 ic	0.65 ic	0.00	---	0.00	0.00	---	---	---	---	0.647
1.25	3,639	101.25	0.69 ic	0.66 ic	0.00	---	0.00	0.00	---	---	---	---	0.664
1.30	3,804	101.30	0.69 ic	0.68 ic	0.00	---	0.00	0.00	---	---	---	---	0.682
1.35	3,969	101.35	0.70 ic	0.70 ic	0.00	---	0.00	0.00	---	---	---	---	0.696
1.40	4,135	101.40	0.73 ic	0.71 ic	0.00	---	0.00	0.00	---	---	---	---	0.712
1.45	4,300	101.45	0.73 ic	0.73 ic	0.00	---	0.00	0.00	---	---	---	---	0.728
1.50	4,465	101.50	0.74 ic	0.74 ic	0.00	---	0.00	0.00	---	---	---	---	0.742
1.55	4,649	101.55	0.78 ic	0.76 ic	0.00	---	0.00	0.00	---	---	---	---	0.757
1.60	4,832	101.60	0.78 ic	0.77 ic	0.00	---	0.00	0.00	---	---	---	---	0.772
1.65	5,015	101.65	0.79 ic	0.79 ic	0.00	---	0.00	0.00	---	---	---	---	0.787

Continues on next page...

Pond E

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.70	5,198	101.70	0.84 ic	0.80 ic	0.00	---	0.00	0.00	---	---	---	---	0.799
1.75	5,381	101.75	0.84 ic	0.81 ic	0.00	---	0.00	0.00	---	---	---	---	0.814
1.80	5,564	101.80	0.84 ic	0.83 ic	0.00	---	0.00	0.00	---	---	---	---	0.829
1.85	5,747	101.85	0.84 ic	0.84 ic	0.00	---	0.00	0.00	---	---	---	---	0.841
1.90	5,930	101.90	0.89 ic	0.85 ic	0.00	---	0.00	0.00	---	---	---	---	0.853
1.95	6,113	101.95	0.89 ic	0.87 ic	0.00	---	0.00	0.00	---	---	---	---	0.867
2.00	6,296	102.00	0.89 ic	0.88 ic	0.00	---	0.00	0.00	---	---	---	---	0.881
2.05	6,498	102.05	0.89 ic	0.89 ic	0.00	---	0.00	0.00	---	---	---	---	0.893
2.10	6,699	102.10	0.95 ic	0.90 ic	0.00	---	0.00	0.00	---	---	---	---	0.904
2.15	6,901	102.15	0.95 ic	0.92 ic	0.00	---	0.00	0.00	---	---	---	---	0.918
2.20	7,103	102.20	0.95 ic	0.93 ic	0.00	---	0.00	0.00	---	---	---	---	0.930
2.25	7,304	102.25	0.95 ic	0.94 ic	0.00	---	0.00	0.00	---	---	---	---	0.943
2.30	7,506	102.30	0.95 ic	0.95 ic	0.00	---	0.00	0.00	---	---	---	---	0.954
2.35	7,708	102.35	1.00 ic	0.97 ic	0.00	---	0.00	0.00	---	---	---	---	0.965
2.40	7,909	102.40	1.00 ic	0.98 ic	0.00	---	0.00	0.00	---	---	---	---	0.977
2.45	8,111	102.45	1.00 ic	0.99 ic	0.00	---	0.00	0.00	---	---	---	---	0.990
2.50	8,312	102.50	1.00 ic	1.00 ic	0.00	---	0.00	0.00	---	---	---	---	1.002
2.55	8,534	102.55	1.02 ic	1.01 ic	0.01 ic	---	0.00	0.00	---	---	---	---	1.021
2.60	8,755	102.60	1.07 ic	1.02 ic	0.04 ic	---	0.00	0.00	---	---	---	---	1.061
2.65	8,976	102.65	1.13 ic	1.03 ic	0.09 ic	---	0.00	0.00	---	---	---	---	1.117
2.70	9,197	102.70	1.20 ic	1.04 ic	0.15 ic	---	0.00	0.00	---	---	---	---	1.188
2.75	9,418	102.75	1.27 ic	1.05 ic	0.22 ic	---	0.00	0.00	---	---	---	---	1.270
2.80	9,639	102.80	1.41 ic	1.05 ic	0.31 ic	---	0.00	0.00	---	---	---	---	1.367
2.85	9,861	102.85	1.48 ic	1.06 ic	0.41 ic	---	0.00	0.00	---	---	---	---	1.471
2.90	10,082	102.90	1.64 ic	1.07 ic	0.52 ic	---	0.00	0.00	---	---	---	---	1.590
2.95	10,303	102.95	1.73 ic	1.07 ic	0.63 ic	---	0.00	0.00	---	---	---	---	1.708
3.00	10,524	103.00	1.90 ic	1.08 ic	0.76 ic	---	0.00	0.00	---	---	---	---	1.836
3.05	10,766	103.05	1.99 ic	1.09 ic	0.88 ic	---	0.00	0.00	---	---	---	---	1.965
3.10	11,007	103.10	2.09 ic	1.09 ic	1.00 ic	---	0.00	0.00	---	---	---	---	2.093
3.15	11,249	103.15	2.28 ic	1.10 ic	1.12 ic	---	0.00	0.00	---	---	---	---	2.220
3.20	11,490	103.20	2.38 ic	1.11 ic	1.22 ic	---	0.00	0.00	---	---	---	---	2.331
3.25	11,732	103.25	2.48 ic	1.11 ic	1.30 ic	---	0.00	0.00	---	---	---	---	2.417
3.30	11,973	103.30	2.59 ic	1.12 ic	1.39 ic	---	0.00	0.03	---	---	---	---	2.544
3.35	12,215	103.35	2.81 ic	1.13 ic	1.47 ic	---	0.00	0.15	---	---	---	---	2.744
3.40	12,456	103.40	3.03 ic	1.13 ic	1.54 ic	---	0.00	0.31	---	---	---	---	2.984
3.45	12,698	103.45	3.27 ic	1.14 ic	1.61 ic	---	0.00	0.51	---	---	---	---	3.257
3.50	12,939	103.50	3.64 ic	1.14 ic	1.68 ic	---	0.00	0.73	---	---	---	---	3.552
3.55	13,202	103.55	3.90 ic	1.14 ic	1.75 ic	---	0.00	0.99	---	---	---	---	3.874
3.60	13,465	103.60	4.30 ic	1.14 ic	1.81 ic	---	0.00	1.26	---	---	---	---	4.214
3.65	13,728	103.65	4.58 ic	1.14 ic	1.87 ic	---	0.00	1.56	---	---	---	---	4.577
3.70	13,991	103.70	5.01 ic	1.15 ic	1.93 ic	---	0.00	1.88	---	---	---	---	4.955
3.75	14,254	103.75	5.46 ic	1.15 ic	1.99 ic	---	0.00	2.21	---	---	---	---	5.350
3.80	14,517	103.80	5.76 oc	1.15 ic	2.05 ic	---	0.00	2.57	---	---	---	---	5.765
3.85	14,779	103.85	6.26 oc	1.15 ic	2.10 ic	---	0.00	2.94	---	---	---	---	6.189
3.90	15,042	103.90	6.75 oc	1.14 ic	2.15 ic	---	0.00	3.33	---	---	---	---	6.628
3.95	15,305	103.95	7.10 oc	1.15 ic	2.21 ic	---	0.00	3.73	---	---	---	---	7.085
4.00	15,568	104.00	7.57 oc	1.14 ic	2.26 ic	---	0.00	4.15	---	---	---	---	7.553
4.05	15,853	104.05	8.33 oc	1.13 ic	2.31 ic	---	0.23	4.59	---	---	---	---	8.259
4.10	16,138	104.10	9.20 oc	1.12 ic	2.35 ic	---	0.66	5.04	---	---	---	---	9.167
4.15	16,423	104.15	10.23 oc	1.09 ic	2.40 ic	---	1.22	5.50	---	---	---	---	10.20
4.20	16,708	104.20	11.31 oc	1.01 ic	2.45 ic	---	1.87	5.97	---	---	---	---	11.31
4.25	16,993	104.25	12.56 oc	0.99 ic	2.49 ic	---	2.61	6.46	---	---	---	---	12.56
4.30	17,278	104.30	13.91 oc	0.97 ic	2.54 ic	---	3.44	6.96	---	---	---	---	13.91
4.35	17,563	104.35	15.33 oc	0.94 ic	2.58 ic	---	4.33	7.48	---	---	---	---	15.33
4.40	17,848	104.40	16.82 oc	0.90 ic	2.63 ic	---	5.29	8.00	---	---	---	---	16.81
4.45	18,133	104.45	18.31 oc	0.85 ic	2.61 ic	---	6.31	8.54	---	---	---	---	18.31
4.50	18,418	104.50	19.73 oc	0.80 ic	2.45 ic	---	7.39	9.09	---	---	---	---	19.72
4.55	18,727	104.55	21.06 oc	0.74 ic	2.27 ic	---	8.53	9.51 s	---	---	---	---	21.06
4.60	19,035	104.60	22.19 oc	0.69 ic	2.11 ic	---	9.72	9.67 s	---	---	---	---	22.18
4.65	19,343	104.65	23.21 oc	0.63 ic	1.94 ic	---	10.96	9.67 s	---	---	---	---	23.21
4.70	19,651	104.70	24.14 oc	0.58 ic	1.77 ic	---	12.25 s	9.54 s	---	---	---	---	24.14
4.75	19,959	104.75	24.81 oc	0.54 ic	1.65 ic	---	13.12 s	9.49 s	---	---	---	---	24.80
4.80	20,267	104.80	25.35 oc	0.51 ic	1.56 ic	---	13.81 s	9.48 s	---	---	---	---	25.35
4.85	20,576	104.85	25.83 oc	0.48 ic	1.48 ic	---	14.40 s	9.47 s	---	---	---	---	25.83
4.90	20,884	104.90	26.26 oc	0.46 ic	1.40 ic	---	14.93 s	9.47 s	---	---	---	---	26.26
4.95	21,192	104.95	26.66 oc	0.43 ic	1.34 ic	---	15.41 s	9.47 s	---	---	---	---	26.66
5.00	21,500	105.00	27.02 oc	0.41 ic	1.28 ic	---	15.86 s	9.47 s	---	---	---	---	27.02

...End

Hydrograph Report

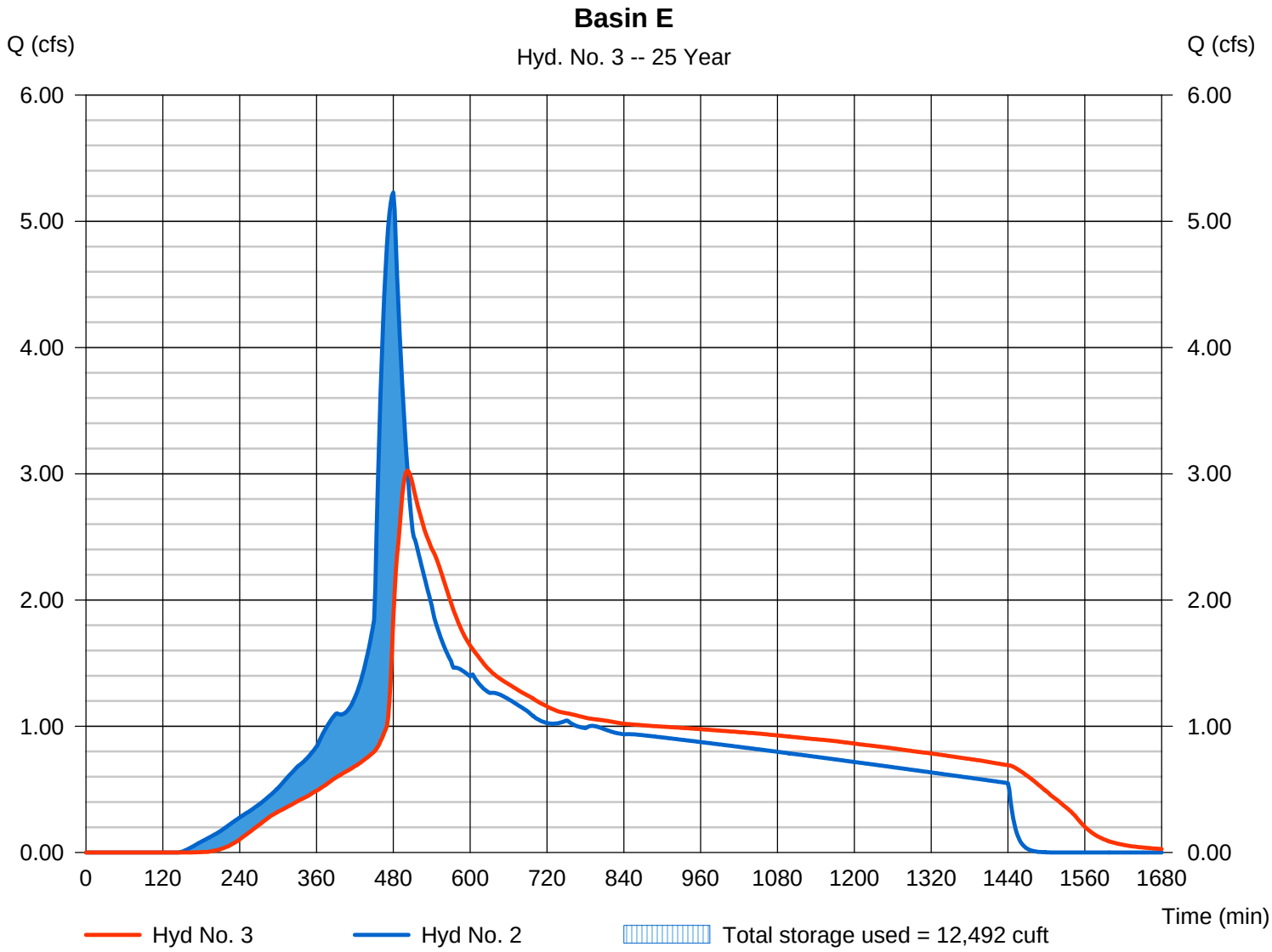
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	3.024 cfs
Storm frequency	=	25 yrs	Time to peak	=	502 min
Time interval	=	2 min	Hyd. volume	=	77,988 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	103.41 ft
Reservoir name	=	Pond E	Max. Storage	=	12,492 cuft

Storage Indication method used.



Hydrograph Report

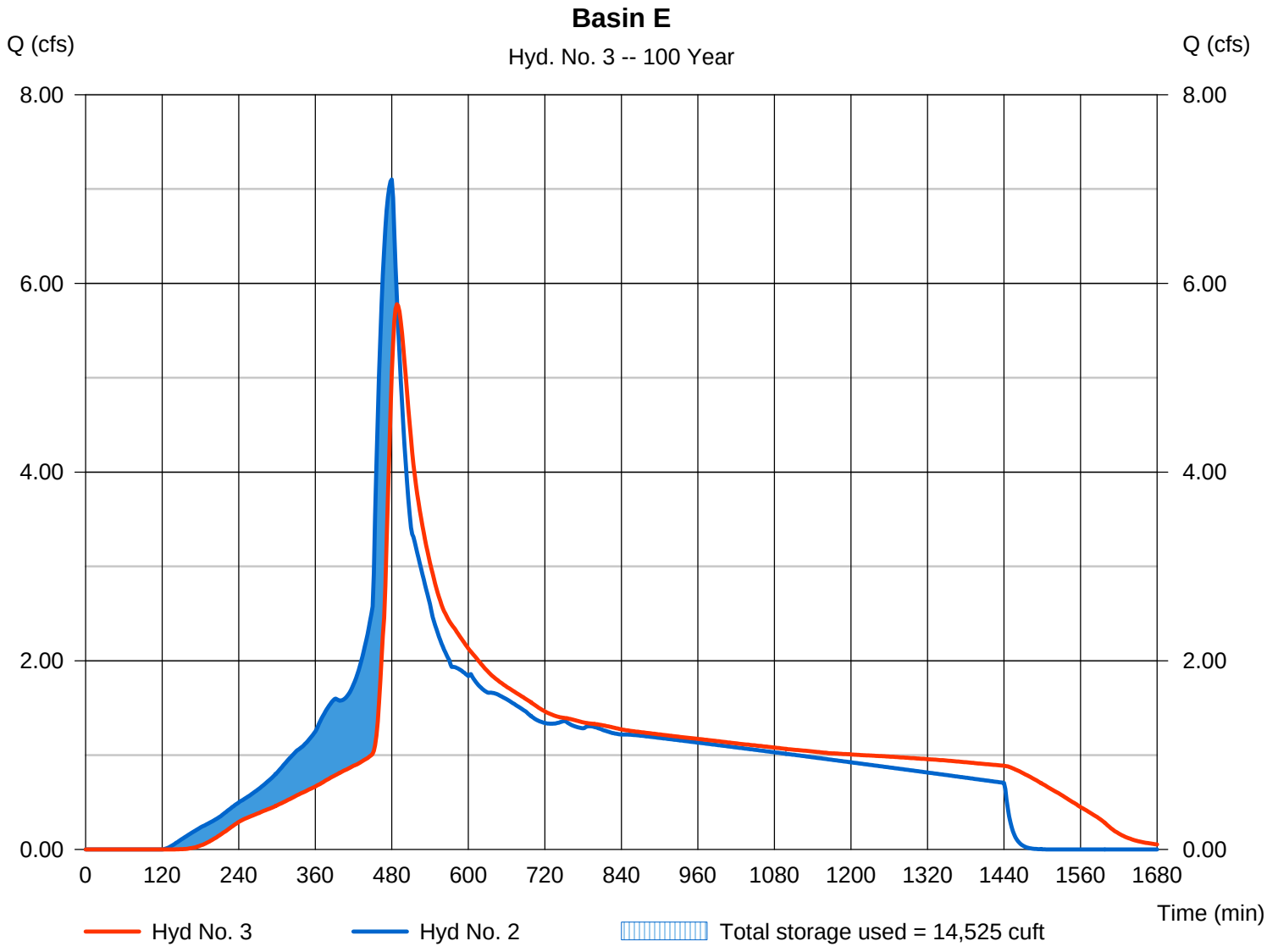
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	5.778 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	105,080 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	103.80 ft
Reservoir name	=	Pond E	Max. Storage	=	14,525 cuft

Storage Indication method used.



D.2 ALTERNATIVE 2 – REDUCED RESIDENTIAL DENSITY

Drainage Calculations

ALTERNATIVE 2 and 3A

BASIN A

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	369.14	C	Woods (Fair Condition)	73
OPEN SPACE (SOUTH)	369.13	C	Woods (Poor Condition)	77
TOTAL PERVIOUS	738.27	N/A	N/A	75

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (WEST)	19.9	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	34.05	C	Woods (Mix Good & Fair Conditions)	72
OPEN SPACE (EAST)	30.69	C	Woods (Fair Condition)	73
TOTAL PERVIOUS	84.64	N/A	N/A	76

TOTAL AREA CHECK **822.91 ac.** **$CN_{WEIGHTED}$** **75**

ALTERNATIVE 2 and 3A

BASIN A

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin A towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	84.64	acres	
Total area (w/upstream open space) =	822.91	acres	
Pervious area (w/o upstream open space) =	84.64	acres	76 CN
Pervious area (w/upstream open space) =	822.91	acres	75 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1763	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.0325	ft/ft	S_2 =	0.05	ft/ft	S_3 =	0.1	ft/ft
k_1 =	17		k_2 =	17		k_3 =	17	
V_1 =	3.06	fps	V_2 =	3.80	fps	V_3 =	5.38	fps
T_1 =	9.59	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 9.59 min

ALTERNATIVE 2 and 3A

BASIN B

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	160.95	C	Woods (Fair Condition)	73
OPEN SPACE (SOUTH)	160.96	C	Woods (Poor Condition)	77
TOTAL PERVIOUS	321.91	N/A	N/A	75

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	15.95	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	26.66	C	Woods (Fair Condition)	77
OPEN SPACE (SOUTH)	14.92	C	Woods (Poor Condition)	73
TOTAL PERVIOUS	57.53	N/A	N/A	78

TOTAL AREA CHECK **379.44 ac.** **$CN_{WEIGHTED}$** **76**

BASIN B

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin B towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	57.53	acres	
Total area (w/upstream open space) =	379.44	acres	
Pervious area (w/o upstream open space) =	57.53	acres	78 CN
Pervious area (w/upstream open space) =	379.44	acres	76 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1007	ft	L_2 =	679	ft	L_3 =	0	ft
S_1 =	0.1	ft/ft	S_2 =	0.03	ft/ft	S_3 =	0.1	ft/ft
k_1 =	17		k_2 =	17		k_3 =	17	
V_1 =	5.38	fps	V_2 =	2.94	fps	V_3 =	5.38	fps
T_1 =	3.12	min.	T_2 =	3.84	min.	T_3 =	0.00	min.

Tc= 6.97 min

ALTERNATIVE 2 and 3A

BASIN C

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	497.17	D	Woods (Fair Condition)	79
OPEN SPACE (SOUTH)	497.16	D	Pasture (Good Condition)	80
TOTAL PERVIOUS	994.33	N/A	N/A	79

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	76.07	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	0	C	Woods (Fair Condition)	77
OPEN SPACE (SOUTH)	103.69	D	Woods (Poor Condition)	73
TOTAL PERVIOUS	179.76	N/A	N/A	79

TOTAL AREA CHECK **1174.1 ac.** $CN_{WEIGHTED}$ **79**

BASIN C

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin C towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	179.76	acres	
Total area (w/upstream open space) =	1174.10	acres	
Pervious area (w/o upstream open space) =	179.76	acres	79 CN
Pervious area (w/upstream open space) =	1174.10	acres	79 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	3626	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.045	ft/ft	S_2 =	0.16	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	17		k_3 =	0	
V_1 =	3.61	fps	V_2 =	6.80	fps	V_3 =	0.00	fps
T_1 =	16.76	min.	T_2 =	0.00	min.	T_3 =	0	min.

Tc= 16.76 min

ALTERNATIVE 2 and 3A

BASIN D

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	143.98	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	143.99	D	Pasture/Range (Good Condition)	80
TOTAL PERVIOUS	287.97	N/A	N/A	80

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	22.53	D	Pasture/Range (Good Condition)	80
OPEN SPACE (CENTRAL)	0	D	Woods (Fair Condition)	79
OPEN SPACE (SOUTH)	7.25	D	Woods (Fair Condition)	79
TOTAL PERVIOUS	29.78	N/A	N/A	80

TOTAL AREA CHECK **317.75 ac.** **$CN_{WEIGHTED}$** **80**

BASIN D

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin D towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	29.78	acres	
Total area (w/upstream open space) =	317.75	acres	
Pervious area (w/o upstream open space) =	29.78	acres	80 CN
Pervious area (w/upstream open space) =	317.75	acres	80 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1190	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.13	ft/ft	S_2 =	0	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	0		k_3 =	0	
V_1 =	6.13	fps	V_2 =	0.00	fps	V_3 =	0.00	fps
T_1 =	3.24	min.	T_2 =	0	min.	T_3 =	0	min.

Tc= 3.24 min

ALTERNATIVE 2 and 3A

BASIN E

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	38.61	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	38.61	D	Pasture/Range (Good Condition)	80
TOTAL PERVIOUS	77.22	N/A	N/A	80

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	0	D	Pasture/Range (Good Condition)	80
OPEN SPACE (CENTRAL)	6.29	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	0	D	Woods (Fair Condition)	79
TOTAL PERVIOUS	6.29	N/A	N/A	80

TOTAL AREA CHECK **83.51** **ac.** **$CN_{WEIGHTED}$** **80**

BASIN E

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin E towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	6.29	acres	
Total area (w/upstream open space) =	83.51	acres	
Pervious area (w/o upstream open space) =	6.29	acres	80 CN
Pervious area (w/upstream open space) =	83.51	acres	80 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1792	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.08	ft/ft	S_2 =	0.13	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	17		k_3 =	0	
V_1 =	4.81	fps	V_2 =	6.13	fps	V_3 =	0.00	fps
T_1 =	6.21	min.	T_2 =	0.00	min.	T_3 =	0	min.

Tc= 6.21 min

ALTERNATIVE 2 and 3A

BASIN A

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	14	48%	6.72	11%	5.98	8.02
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	8	56%	4.48	11%	3.99	4.01
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	18.8	70%	13.16	11%	11.71	7.09
COMMERCIAL	2	85%	1.7	11%	1.51	0.49
DEVELOPMENT TOTAL	42.8	N/A	26.06	11%	23.19	19.61

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	738.27	C	Woods (Mix Fair & Poor Condition)	75
OPEN SPACE/BUFFER	33.48	C	Woods (Poor Condition)	77
PARKS	1.14	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	19.61	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	54.2266	N/A	N/A	78
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	792.497	N/A	N/A	75

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0.4	C	Ponds and watercourses	100
ROADWAY	6.82	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	23.19	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	30.41	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **84.64** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **822.91** **ac.**

ALTERNATIVE 2 and 3A

BASIN A

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin A is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	84.64	acres	
Total area (w/upstream open space) =	822.91	acres	
Pervious area (w/o upstream open space) =	54.23	acres	78 CN
Pervious area (w/upstream open space) =	792.50	acres	75 CN
Impervious area =	30.41	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.05	ft/ft	S_3 =	0.1	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	3.80	fps	V_3 =	5.38	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min. assumed

ALTERNATIVE 2 and 3A

BASIN B

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	9.6	48%	4.61	11%	4.10	5.50
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	13.5	56%	7.56	11%	6.73	6.77
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0.00	11%	0.00	0.00
COMMERCIAL	0	85%	0.00	11%	0.00	0.00
DEVELOPMENT TOTAL	23.1	N/A	12.17	11%	10.83	12.27

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	321.91	C	Woods (Mix Fair & Poor Condition)	75
OPEN SPACE/BUFFER	28.46	C	Woods (Poor Condition)	77
PARKS	1.03	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	12.27	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	41.76	N/A	N/A	78
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	363.67	N/A	N/A	75

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0.88	C	Ponds and watercourses	100
ROADWAY	4.06	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	10.83	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	15.77	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **57.53** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **379.44** **ac.**

BASIN B

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin B is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	57.53	acres	
Total area (w/upstream open space) =	379.44	acres	
Pervious area (w/o upstream open space) =	41.76	acres	78 CN
Pervious area (w/upstream open space) =	363.67	acres	75 CN
Impervious area =	15.77	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.03	ft/ft	S_3 =	0.1	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	2.94	fps	V_3 =	5.38	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

BASIN C

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	67.8	48%	32.54	11%	28.96	38.84
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	15.9	56%	8.90	11%	7.92	7.98
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	11%	0.00	0.00
COMMERCIAL	2.2	85%	1.87	11%	1.66	0.54
DEVELOPMENT TOTAL	85.9	N/A	43.32	11%	38.55	47.35

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	994.33	D	Mix Woods (Fair C.) & Pasture (Good C.)	79
OPEN SPACE/BUFFER	79.24	D	Woods (Fair Condition)	79
PARKS	2.33	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	47.35	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	128.92	N/A	N/A	79
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	1123.25	N/A	N/A	79

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	12.29	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	38.55	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	50.84	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **179.76** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **1174.09** **ac.**

BASIN C

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin C is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	179.76	acres	
Total area (w/upstream open space) =	1174.09	acres	
Pervious area (w/o upstream open space) =	128.92	acres	79 CN
Pervious area (w/upstream open space) =	1123.25	acres	79 CN
Impervious area =	50.84	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.045	ft/ft	S_3 =	0.16	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	3.61	fps	V_3 =	6.80	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

BASIN D

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	13.8	48%	6.62	11%	5.90	7.90
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	0	56%	0	11%	0.00	0.00
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	11%	0.00	0.00
COMMERCIAL	0	85%	0	11%	0.00	0.00
DEVELOPMENT TOTAL	13.8	N/A	6.62	11%	5.90	7.90

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	287.97	D	Pasture/Range (Good Condition)	80
OPEN SPACE/BUFFER	11.93	D	Pasture/Range (Good Condition)	80
PARKS	0	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	7.90	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	19.83	N/A	N/A	80
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	307.80	N/A	N/A	80

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	4.05	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	5.90	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	9.95	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **29.78** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **317.75** **ac.**

ALTERNATIVE 2 and 3A

BASIN D

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin D is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	29.78	acres	
Total area (w/upstream open space) =	317.75	acres	
Pervious area (w/o upstream open space) =	19.83	acres	80 CN
Pervious area (w/upstream open space) =	307.80	acres	80 CN
Impervious area =	9.95	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0	ft/ft	S_3 =	0.13	ft/ft
k_1 =	0		k_2 =	0		k_3 =	17	
V_1 =	0.00	fps	V_2 =	0.00	fps	V_3 =	6.13	fps
T_1 =	0	min.	T_2 =	0	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

BASIN E

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	5.6	48%	2.69	11%	2.39	3.21
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	0	56%	0	11%	0.00	0.00
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	11%	0.00	0.00
COMMERCIAL	0	85%	0	11%	0.00	0.00
DEVELOPMENT TOTAL	5.6	N/A	2.69	11%	2.39	3.21

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	77.22	D	Pasture/Range (Good Condition)	80
OPEN SPACE/BUFFER	0.58	D	Pasture/Range (Good Condition)	80
PARKS	0	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	3.21	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	3.79	N/A	N/A	79
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	81.01	N/A	N/A	80

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	0.11	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	2.39	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	2.50	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **6.29** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **83.51** **ac.**

BASIN E

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin E is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	6.29	acres	
Total area (w/upstream open space) =	83.51	acres	
Pervious area (w/o upstream open space) =	3.79	acres	79 CN
Pervious area (w/upstream open space) =	81.01	acres	80 CN
Impervious area =	2.50	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.13	ft/ft	S_3 =	0.13	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	6.13	fps	V_3 =	6.13	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

2-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	54.23	30.41	10	3.34	8.00	576,919	36.50
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	3.34	8.00	384,193	20.07
3	Basin B (post)	57.53	78.00	98.00	41.76	15.77	10	3.34	8.00	360,197	22.10
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	3.34	8.00	287,540	15.90
5	Basin C (post)	179.76	79.00	98.00	128.92	50.84	10	3.34	8.00	1,030,960	61.01
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	3.34	8.03	941,429	47.15
7	Basin D (post)	29.78	80.00	98.00	19.83	9.95	10	3.34	8.00	211,594	13.57
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	3.34	8.00	163,278	9.46
9	Basin E (post)	6.29	79.00	98.00	3.79	2.50	10	3.34	8.00	46,560	3.02
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	3.34	8.00	34,487	2.00

ALTERNATIVE 2 and 3A

25-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	54.23	30.41	10	4.84	8.00	989,470	65.58
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	4.84	8.00	738,703	44.64
3	Basin B (post)	57.53	78.00	98.00	41.76	15.77	10	4.84	8.00	632,705	41.33
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	4.84	8.00	538,043	33.40
5	Basin C (post)	179.76	79.00	98.00	128.92	50.84	10	4.84	8.00	1,856,044	119.10
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	4.84	8.00	1,738,611	97.49
7	Basin D (post)	29.78	80.00	98.00	19.83	9.95	10	4.84	8.00	358,676	23.92
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	4.84	8.00	297,683	18.91
9	Basin E (post)	6.29	79.00	98.00	3.79	2.50	10	4.84	8.00	78,016	5.23
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	4.84	8.00	62,875	3.99

ALTERNATIVE 2 and 3A

100-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	54.23	30.41	10	6.09	8.00	1,348,024	90.60
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	6.09	8.00	1,062,416	67.44
3	Basin B (post)	57.53	78.00	98.00	41.76	15.77	10	6.09	8.00	871,876	58.13
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	6.09	8.00	764,024	49.35
5	Basin C (post)	179.76	79.00	98.00	128.92	50.84	10	6.09	8.00	2,587,829	170.71
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	6.09	8.00	2,453,585	143.45
7	Basin D (post)	29.78	80.00	98.00	19.83	9.95	10	6.09	8.00	485,916	32.76
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	6.09	8.00	417,548	27.37
9	Basin E (post)	6.29	79.00	98.00	3.79	2.50	10	6.09	8.00	105,107	7.10
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	6.09	8.00	88,193	5.78

Hydrograph Report

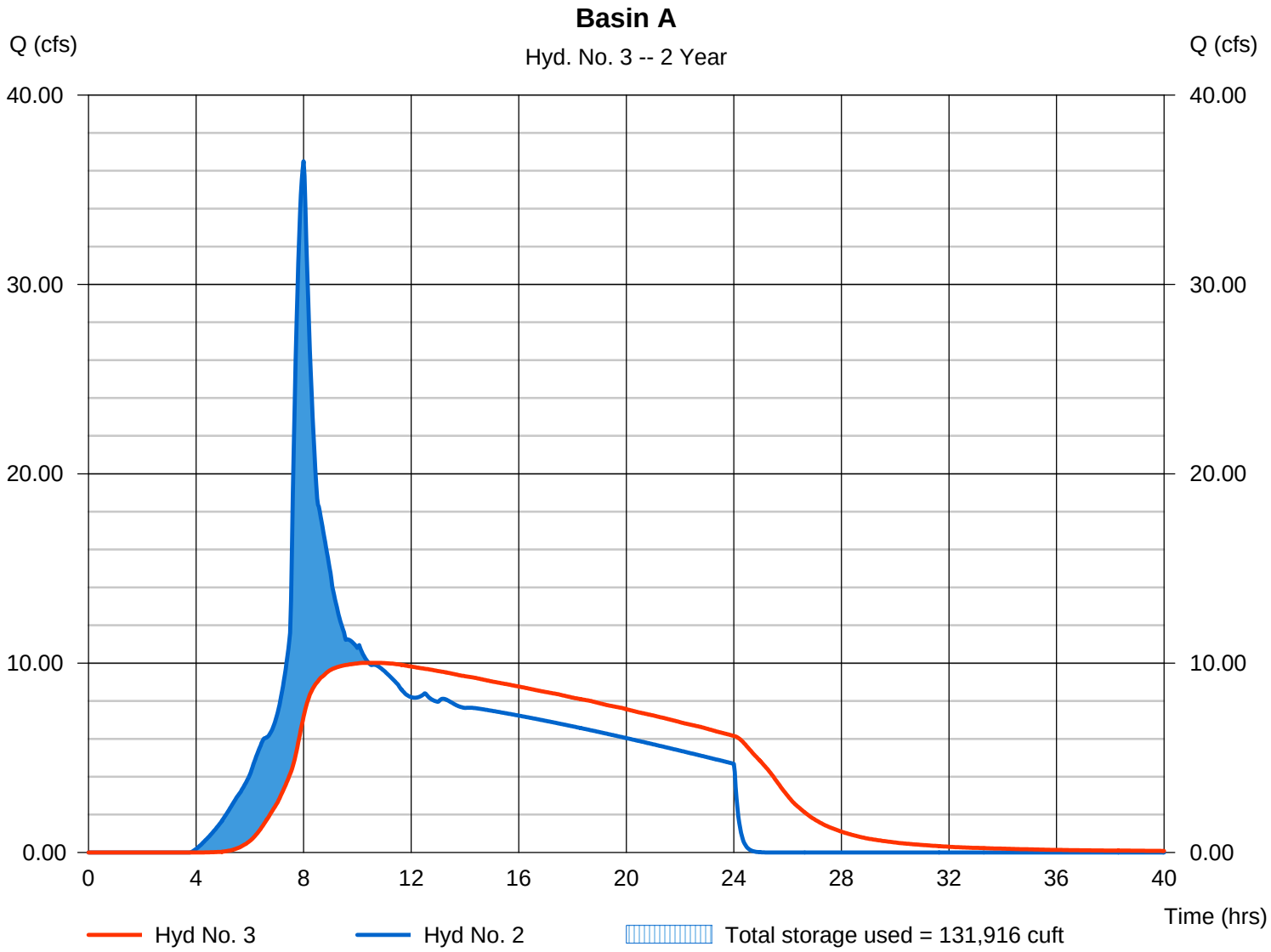
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	10.02 cfs
Storm frequency	=	2 yrs	Time to peak	=	10.43 hrs
Time interval	=	2 min	Hyd. volume	=	576,489 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	103.79 ft
Reservoir name	=	Pond A	Max. Storage	=	131,916 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond A

Pond Data

Trapezoid - Bottom L x W = 175.0 x 175.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	30,625	0	0
0.90	100.90	32,544	28,422	28,422
1.80	101.80	34,522	30,175	58,597
2.70	102.70	36,557	31,981	90,578
3.60	103.60	38,652	33,840	124,418
4.50	104.50	40,804	35,751	160,169
5.40	105.40	43,015	37,714	197,883
6.30	106.30	45,284	39,730	237,613
7.20	107.20	47,611	41,798	279,411
8.10	108.10	49,997	43,919	323,330
9.00	109.00	52,441	46,093	369,423

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	15.30	30.00	0.00
Span (in)	= 42.00	15.30	30.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	104.28	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	6.00	0.00	0.00
Crest El. (ft)	= 108.00	104.20	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	2,842	100.09	0.03 ic	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.031
0.18	5,684	100.18	0.12 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.124
0.27	8,527	100.27	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.276
0.36	11,369	100.36	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.489
0.45	14,211	100.45	0.75 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.745
0.54	17,053	100.54	1.08 ic	1.07 ic	0.00	---	0.00	0.00	---	---	---	---	1.072
0.63	19,895	100.63	1.42 ic	1.42 ic	0.00	---	0.00	0.00	---	---	---	---	1.419
0.72	22,737	100.72	1.81 ic	1.81 ic	0.00	---	0.00	0.00	---	---	---	---	1.808
0.81	25,580	100.81	2.25 ic	2.23 ic	0.00	---	0.00	0.00	---	---	---	---	2.233
0.90	28,422	100.90	2.63 ic	2.63 ic	0.00	---	0.00	0.00	---	---	---	---	2.635
0.99	31,439	100.99	3.17 ic	3.13 ic	0.00	---	0.00	0.00	---	---	---	---	3.135
1.08	34,457	101.08	3.60 ic	3.60 ic	0.00	---	0.00	0.00	---	---	---	---	3.598
1.17	37,474	101.17	4.07 ic	4.04 ic	0.00	---	0.00	0.00	---	---	---	---	4.040
1.26	40,492	101.26	4.58 ic	4.40 ic	0.00	---	0.00	0.00	---	---	---	---	4.399
1.35	43,509	101.35	4.84 ic	4.70 ic	0.00	---	0.00	0.00	---	---	---	---	4.696
1.44	46,527	101.44	5.12 ic	4.96 ic	0.00	---	0.00	0.00	---	---	---	---	4.958
1.53	49,544	101.53	5.41 ic	5.21 ic	0.00	---	0.00	0.00	---	---	---	---	5.207
1.62	52,562	101.62	5.47 ic	5.47 ic	0.00	---	0.00	0.00	---	---	---	---	5.465
1.71	55,579	101.71	5.73 ic	5.73 ic	0.00	---	0.00	0.00	---	---	---	---	5.727
1.80	58,597	101.80	6.01 ic	5.96 ic	0.00	---	0.00	0.00	---	---	---	---	5.962
1.89	61,795	101.89	6.33 ic	6.17 ic	0.00	---	0.00	0.00	---	---	---	---	6.168
1.98	64,993	101.98	6.39 ic	6.39 ic	0.00	---	0.00	0.00	---	---	---	---	6.389
2.07	68,191	102.07	6.66 ic	6.63 ic	0.00	---	0.00	0.00	---	---	---	---	6.629
2.16	71,389	102.16	6.99 ic	6.81 ic	0.00	---	0.00	0.00	---	---	---	---	6.814
2.25	74,588	102.25	7.03 ic	7.03 ic	0.00	---	0.00	0.00	---	---	---	---	7.032
2.34	77,786	102.34	7.34 ic	7.23 ic	0.00	---	0.00	0.00	---	---	---	---	7.232
2.43	80,984	102.43	7.41 ic	7.41 ic	0.00	---	0.00	0.00	---	---	---	---	7.414
2.52	84,182	102.52	7.70 ic	7.63 ic	0.00	---	0.00	0.00	---	---	---	---	7.628
2.61	87,380	102.61	7.79 ic	7.79 ic	0.00	---	0.00	0.00	---	---	---	---	7.790
2.70	90,578	102.70	8.07 ic	8.00 ic	0.00	---	0.00	0.00	---	---	---	---	8.003
2.79	93,962	102.79	8.16 ic	8.16 ic	0.00	---	0.00	0.00	---	---	---	---	8.159
2.88	97,346	102.88	8.44 ic	8.36 ic	0.00	---	0.00	0.00	---	---	---	---	8.361
2.97	100,730	102.97	8.52 ic	8.52 ic	0.00	---	0.00	0.00	---	---	---	---	8.520

Continues on next page...

Pond A

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	104,114	103.06	8.83 ic	8.70 ic	0.00	---	0.00	0.00	---	---	---	---	8.704
3.15	107,498	103.15	8.87 ic	8.87 ic	0.00	---	0.00	0.00	---	---	---	---	8.875
3.24	110,882	103.24	9.23 ic	9.03 ic	0.00	---	0.00	0.00	---	---	---	---	9.033
3.33	114,266	103.33	9.23 ic	9.22 ic	0.00	---	0.00	0.00	---	---	---	---	9.220
3.42	117,650	103.42	9.64 ic	9.35 ic	0.00	---	0.00	0.00	---	---	---	---	9.351
3.51	121,034	103.51	9.64 ic	9.53 ic	0.00	---	0.00	0.00	---	---	---	---	9.531
3.60	124,418	103.60	9.69 ic	9.69 ic	0.00	---	0.00	0.00	---	---	---	---	9.685
3.69	127,993	103.69	10.05 ic	9.83 ic	0.00	---	0.00	0.00	---	---	---	---	9.832
3.78	131,568	103.78	10.05 ic	10.00 ic	0.00	---	0.00	0.00	---	---	---	---	10.00
3.87	135,143	103.87	10.14 ic	10.14 ic	0.00	---	0.00	0.00	---	---	---	---	10.14
3.96	138,718	103.96	10.48 ic	10.29 ic	0.00	---	0.00	0.00	---	---	---	---	10.29
4.05	142,293	104.05	10.48 ic	10.45 ic	0.00	---	0.00	0.00	---	---	---	---	10.45
4.14	145,868	104.14	10.58 ic	10.58 ic	0.00	---	0.00	0.00	---	---	---	---	10.58
4.23	149,443	104.23	10.92 ic	10.73 ic	0.00	---	0.00	0.10	---	---	---	---	10.83
4.32	153,018	104.32	11.69 oc	10.80 ic	0.01 ic	---	0.00	0.83	---	---	---	---	11.64
4.41	156,593	104.41	12.84 oc	10.79 ic	0.13 ic	---	0.00	1.92	---	---	---	---	12.84
4.50	160,169	104.50	14.41 oc	10.77 ic	0.35 ic	---	0.00	3.28	---	---	---	---	14.41
4.59	163,940	104.59	16.43 oc	10.70 ic	0.67 ic	---	0.00	4.87	---	---	---	---	16.24
4.68	167,711	104.68	18.49 oc	10.62 ic	1.13 ic	---	0.00	6.64	---	---	---	---	18.39
4.77	171,483	104.77	20.97 oc	10.49 ic	1.66 ic	---	0.00	8.60	---	---	---	---	20.75
4.86	175,254	104.86	23.40 oc	10.35 ic	2.24 ic	---	0.00	10.71	---	---	---	---	23.30
4.95	179,026	104.95	26.14 oc	10.14 ic	3.03 ic	---	0.00	12.98	---	---	---	---	26.14
5.04	182,797	105.04	29.38 oc	9.90 ic	3.82 ic	---	0.00	15.38	---	---	---	---	29.11
5.13	186,568	105.13	32.47 oc	9.61 ic	4.72 ic	---	0.00	17.92	---	---	---	---	32.25
5.22	190,340	105.22	35.52 oc	9.22 ic	5.72 ic	---	0.00	20.58	---	---	---	---	35.52
5.31	194,111	105.31	38.24 oc	8.24 ic	6.63 ic	---	0.00	23.36	---	---	---	---	38.24
5.40	197,883	105.40	42.24 oc	8.19 ic	7.79 ic	---	0.00	26.26	---	---	---	---	42.24
5.49	201,856	105.49	46.21 oc	8.11 ic	8.82 ic	---	0.00	29.27	---	---	---	---	46.21
5.58	205,829	105.58	50.48 oc	7.99 ic	10.10 ic	---	0.00	32.39	---	---	---	---	50.48
5.67	209,802	105.67	54.85 oc	7.82 ic	11.42 ic	---	0.00	35.61	---	---	---	---	54.85
5.76	213,775	105.76	59.10 oc	7.62 ic	12.58 ic	---	0.00	38.90 s	---	---	---	---	59.10
5.85	217,748	105.85	63.06 oc	7.42 ic	13.95 ic	---	0.00	41.69 s	---	---	---	---	63.06
5.94	221,721	105.94	66.71 oc	7.23 ic	15.32 ic	---	0.00	44.16 s	---	---	---	---	66.71
6.03	225,694	106.03	70.13 oc	7.03 ic	16.68 ic	---	0.00	46.42 s	---	---	---	---	70.13
6.12	229,667	106.12	73.35 oc	6.84 ic	18.01 ic	---	0.00	48.50 s	---	---	---	---	73.34
6.21	233,640	106.21	76.37 oc	6.65 ic	19.30 ic	---	0.00	50.42 s	---	---	---	---	76.37
6.30	237,613	106.30	79.28 oc	6.45 ic	20.67 ic	---	0.00	52.16 s	---	---	---	---	79.28
6.39	241,792	106.39	81.94 oc	6.27 ic	21.80 ic	---	0.00	53.86 s	---	---	---	---	81.93
6.48	245,972	106.48	84.10 oc	6.16 ic	22.09 ic	---	0.00	55.84 s	---	---	---	---	84.10
6.57	250,152	106.57	86.19 oc	6.06 ic	22.38 ic	---	0.00	57.76 s	---	---	---	---	86.19
6.66	254,332	106.66	88.16 oc	5.96 ic	22.52 ic	---	0.00	59.68 s	---	---	---	---	88.16
6.75	258,512	106.75	90.04 oc	5.87 ic	22.55 ic	---	0.00	61.61 s	---	---	---	---	90.03
6.84	262,692	106.84	91.78 oc	5.81 ic	22.33 ic	---	0.00	63.64 s	---	---	---	---	91.77
6.93	266,871	106.93	93.47 oc	5.74 ic	22.08 ic	---	0.00	65.64 s	---	---	---	---	93.46
7.02	271,051	107.02	95.12 oc	5.68 ic	21.83 ic	---	0.00	67.61 s	---	---	---	---	95.12
7.11	275,231	107.11	96.75 oc	5.62 ic	21.59 ic	---	0.00	69.54 s	---	---	---	---	96.75
7.20	279,411	107.20	98.34 oc	5.55 ic	21.35 ic	---	0.00	71.44 s	---	---	---	---	98.34
7.29	283,803	107.29	99.90 oc	5.49 ic	21.10 ic	---	0.00	73.31 s	---	---	---	---	99.90
7.38	288,195	107.38	101.44 oc	5.43 ic	20.87 ic	---	0.00	75.14 s	---	---	---	---	101.44
7.47	292,587	107.47	102.94 oc	5.37 ic	20.63 ic	---	0.00	76.94 s	---	---	---	---	102.94
7.56	296,979	107.56	104.27 ic	5.30 ic	20.36 ic	---	0.00	78.61 s	---	---	---	---	104.27
7.65	301,371	107.65	105.42 ic	5.22 ic	20.06 ic	---	0.00	80.14 s	---	---	---	---	105.42
7.74	305,763	107.74	106.54 ic	5.14 ic	19.76 ic	---	0.00	81.64 s	---	---	---	---	106.54
7.83	310,154	107.83	107.65 ic	5.06 ic	19.47 ic	---	0.00	83.11 s	---	---	---	---	107.64
7.92	314,546	107.92	108.73 ic	4.99 ic	19.19 ic	---	0.00	84.55 s	---	---	---	---	108.73
8.01	318,938	108.01	109.81 ic	4.92 ic	18.91 ic	---	0.05	85.93 s	---	---	---	---	109.81
8.10	323,330	108.10	111.05 ic	4.77 ic	18.34 ic	---	1.65	86.28 s	---	---	---	---	111.04
8.19	327,939	108.19	112.37 ic	4.58 ic	17.60 ic	---	4.33	85.86 s	---	---	---	---	112.37
8.28	332,549	108.28	113.72 ic	4.36 ic	16.75 ic	---	7.75	84.87 s	---	---	---	---	113.72
8.37	337,158	108.37	115.07 ic	4.11 ic	15.82 ic	---	11.77	83.37 s	---	---	---	---	115.07
8.46	341,767	108.46	116.38 ic	3.87 ic	14.89 ic	---	15.99 s	81.61 s	---	---	---	---	116.37
8.55	346,377	108.55	117.57 ic	3.67 ic	14.12 ic	---	19.49 s	80.28 s	---	---	---	---	117.57
8.64	350,986	108.64	118.70 ic	3.49 ic	13.43 ic	---	22.69 s	79.08 s	---	---	---	---	118.69
8.73	355,595	108.73	119.78 ic	3.33 ic	12.80 ic	---	25.67 s	77.98 s	---	---	---	---	119.77
8.82	360,204	108.82	120.81 ic	3.18 ic	12.21 ic	---	28.45 s	76.95 s	---	---	---	---	120.80
8.91	364,814	108.91	121.81 ic	3.04 ic	11.68 ic	---	31.08 s	76.00 s	---	---	---	---	121.80
9.00	369,423	109.00	122.78 ic	2.91 ic	11.18 ic	---	33.56 s	75.12 s	---	---	---	---	122.77

...End

Hydrograph Report

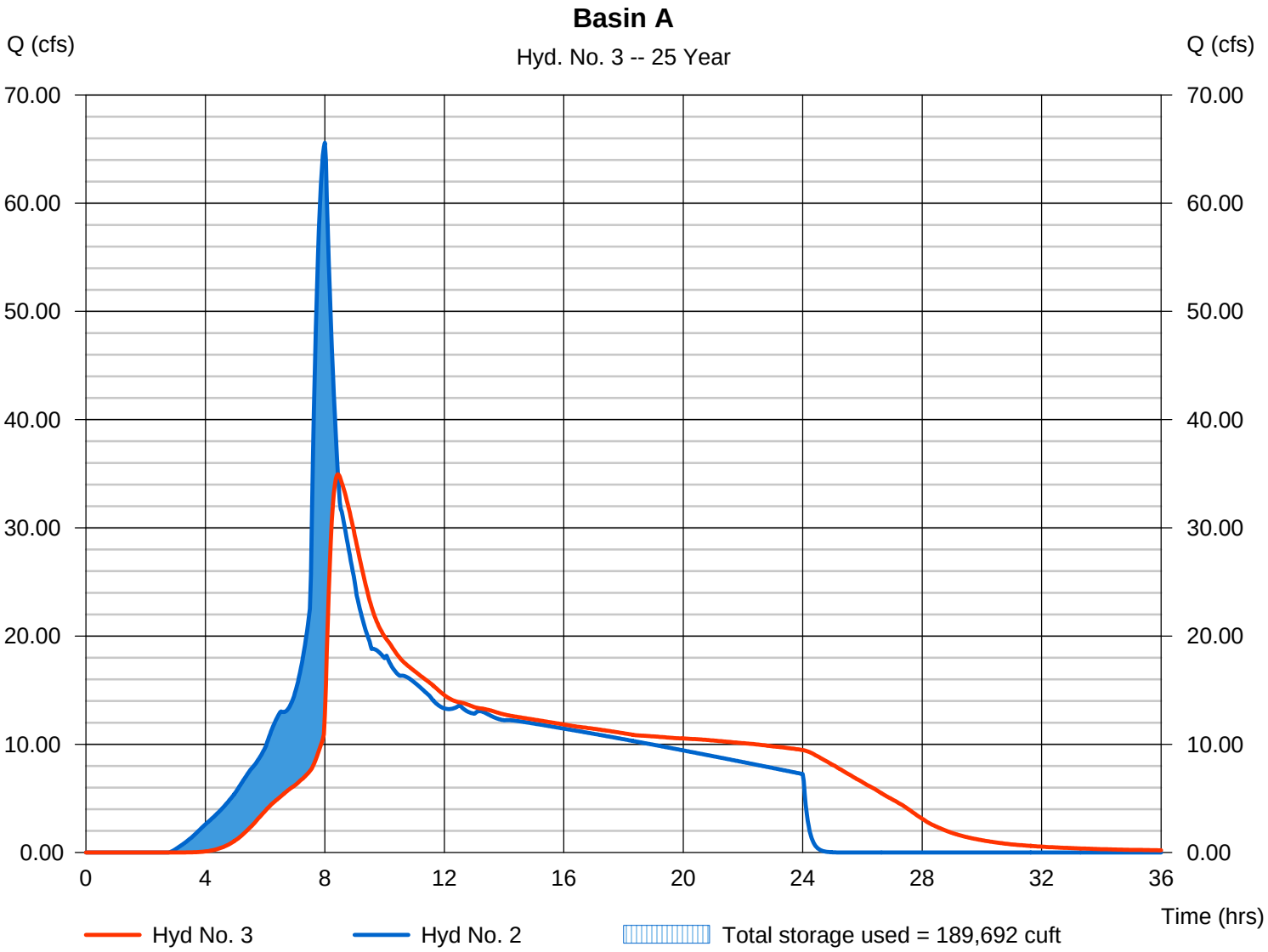
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	34.95 cfs
Storm frequency	=	25 yrs	Time to peak	=	8.43 hrs
Time interval	=	2 min	Hyd. volume	=	989,004 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	105.20 ft
Reservoir name	=	Pond A	Max. Storage	=	189,692 cuft

Storage Indication method used.



Hydrograph Report

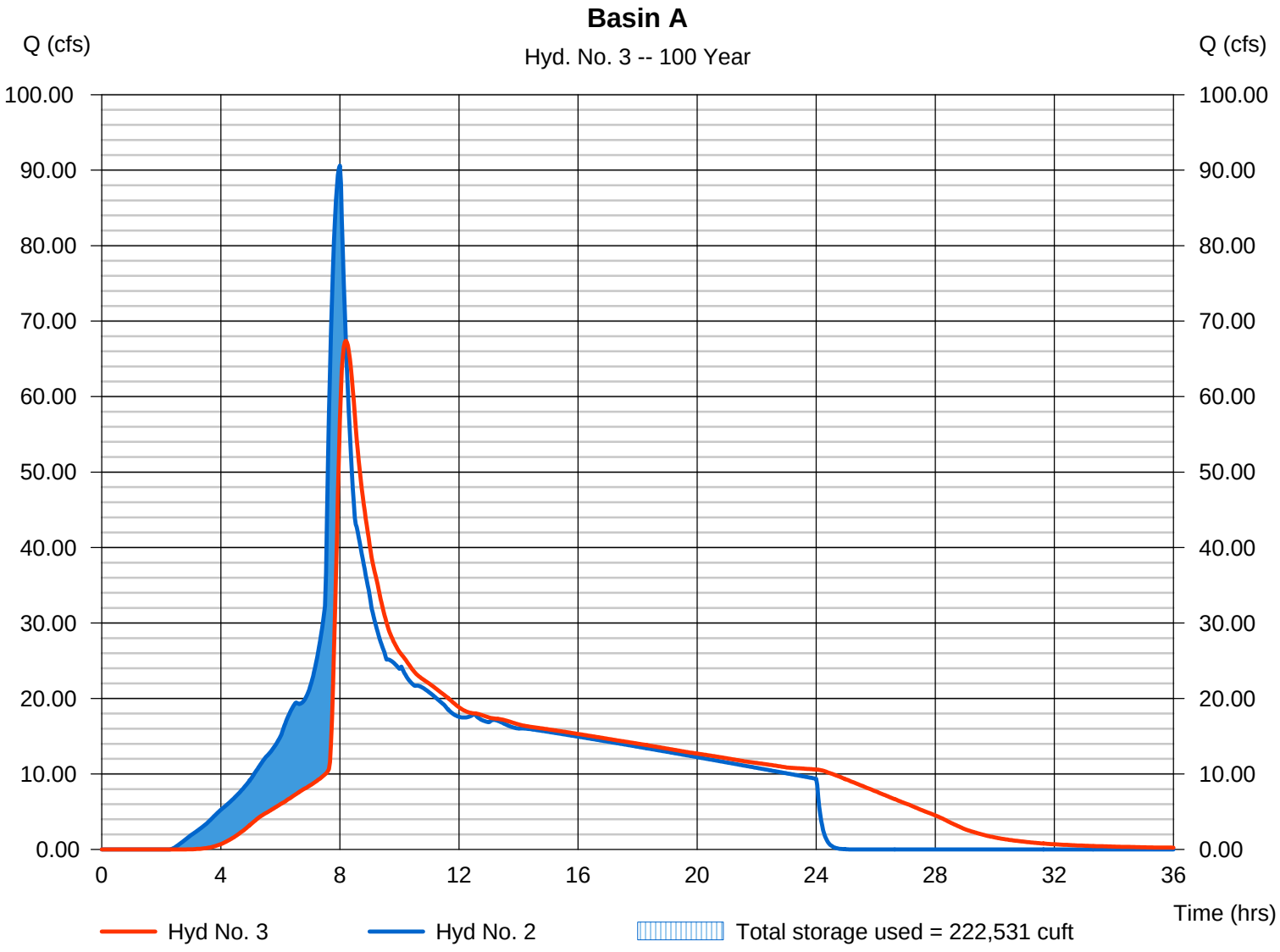
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	67.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	8.20 hrs
Time interval	=	2 min	Hyd. volume	=	1,347,542 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	105.96 ft
Reservoir name	=	Pond A	Max. Storage	=	222,531 cuft

Storage Indication method used.



Hydrograph Report

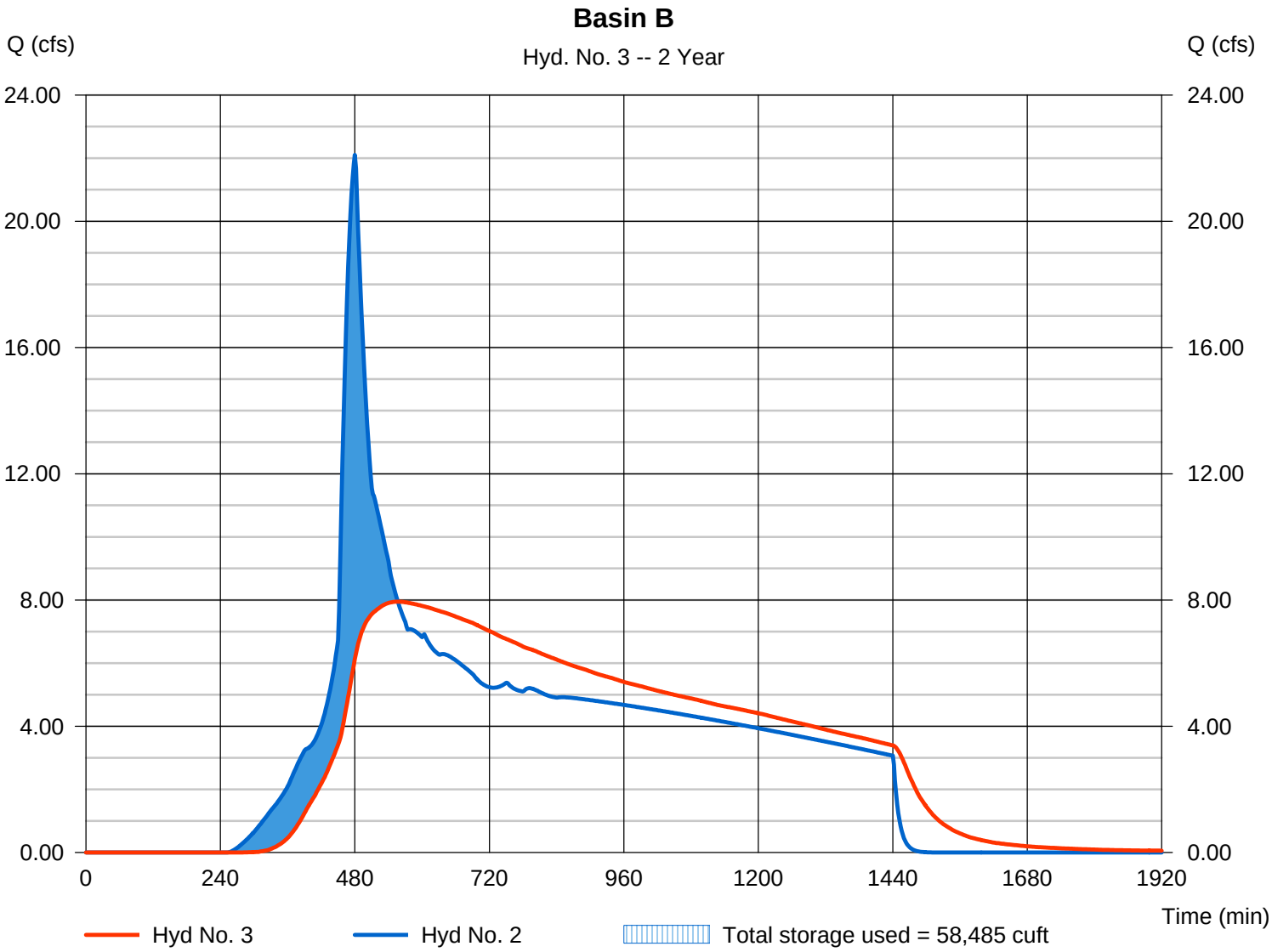
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	7.946 cfs
Storm frequency	=	2 yrs	Time to peak	=	556 min
Time interval	=	2 min	Hyd. volume	=	360,137 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	103.48 ft
Reservoir name	=	Pond B	Max. Storage	=	58,485 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond B

Pond Data

Trapezoid - Bottom L x W = 119.0 x 119.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 7.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	14,161	0	0
0.70	100.70	15,178	10,267	10,267
1.40	101.40	16,231	10,991	21,258
2.10	102.10	17,319	11,740	32,998
2.80	102.80	18,442	12,514	45,512
3.50	103.50	19,600	13,313	58,824
4.20	104.20	20,794	14,136	72,960
4.90	104.90	22,023	14,984	87,944
5.60	105.60	23,287	15,856	103,800
6.30	106.30	24,586	16,753	120,553
7.00	107.00	25,921	17,676	138,229

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 28.00	13.60	26.50	0.00
Span (in)	= 28.00	13.60	26.50	0.00
No. Barrels	= 2	1	1	0
Invert El. (ft)	= 100.01	100.01	103.60	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	3.85	0.00	0.00
Crest El. (ft)	= 107.00	104.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.07	1,027	100.07	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.017
0.14	2,053	100.14	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.075
0.21	3,080	100.21	0.19 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.179
0.28	4,107	100.28	0.31 ic	0.31 ic	0.00	---	0.00	0.00	---	---	---	---	0.312
0.35	5,133	100.35	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.487
0.42	6,160	100.42	0.72 ic	0.70 ic	0.00	---	0.00	0.00	---	---	---	---	0.702
0.49	7,187	100.49	0.94 ic	0.94 ic	0.00	---	0.00	0.00	---	---	---	---	0.941
0.56	8,213	100.56	1.21 ic	1.21 ic	0.00	---	0.00	0.00	---	---	---	---	1.206
0.63	9,240	100.63	1.52 ic	1.49 ic	0.00	---	0.00	0.00	---	---	---	---	1.493
0.70	10,267	100.70	1.77 ic	1.77 ic	0.00	---	0.00	0.00	---	---	---	---	1.773
0.77	11,366	100.77	2.16 ic	2.11 ic	0.00	---	0.00	0.00	---	---	---	---	2.113
0.84	12,465	100.84	2.46 ic	2.44 ic	0.00	---	0.00	0.00	---	---	---	---	2.437
0.91	13,564	100.91	2.79 ic	2.79 ic	0.00	---	0.00	0.00	---	---	---	---	2.786
0.98	14,663	100.98	3.14 ic	3.09 ic	0.00	---	0.00	0.00	---	---	---	---	3.092
1.05	15,762	101.05	3.37 ic	3.37 ic	0.00	---	0.00	0.00	---	---	---	---	3.366
1.12	16,861	101.12	3.72 ic	3.60 ic	0.00	---	0.00	0.00	---	---	---	---	3.602
1.19	17,960	101.19	3.93 ic	3.80 ic	0.00	---	0.00	0.00	---	---	---	---	3.804
1.26	19,060	101.26	4.14 ic	4.01 ic	0.00	---	0.00	0.00	---	---	---	---	4.015
1.33	20,159	101.33	4.20 ic	4.20 ic	0.00	---	0.00	0.00	---	---	---	---	4.198
1.40	21,258	101.40	4.38 ic	4.38 ic	0.00	---	0.00	0.00	---	---	---	---	4.379
1.47	22,432	101.47	4.59 ic	4.53 ic	0.00	---	0.00	0.00	---	---	---	---	4.533
1.54	23,606	101.54	4.83 ic	4.67 ic	0.00	---	0.00	0.00	---	---	---	---	4.672
1.61	24,780	101.61	4.84 ic	4.84 ic	0.00	---	0.00	0.00	---	---	---	---	4.840
1.68	25,954	101.68	5.08 ic	4.97 ic	0.00	---	0.00	0.00	---	---	---	---	4.975
1.75	27,128	101.75	5.12 ic	5.12 ic	0.00	---	0.00	0.00	---	---	---	---	5.115
1.82	28,302	101.82	5.33 ic	5.26 ic	0.00	---	0.00	0.00	---	---	---	---	5.260
1.89	29,476	101.89	5.38 ic	5.38 ic	0.00	---	0.00	0.00	---	---	---	---	5.385
1.96	30,650	101.96	5.59 ic	5.53 ic	0.00	---	0.00	0.00	---	---	---	---	5.530
2.03	31,824	102.03	5.65 ic	5.65 ic	0.00	---	0.00	0.00	---	---	---	---	5.648
2.10	32,998	102.10	5.85 ic	5.79 ic	0.00	---	0.00	0.00	---	---	---	---	5.788
2.17	34,249	102.17	5.91 ic	5.90 ic	0.00	---	0.00	0.00	---	---	---	---	5.905
2.24	35,501	102.24	6.13 ic	6.03 ic	0.00	---	0.00	0.00	---	---	---	---	6.034
2.31	36,752	102.31	6.16 ic	6.16 ic	0.00	---	0.00	0.00	---	---	---	---	6.157

Continues on next page...

Pond B

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.38	38,004	102.38	6.41 ic	6.27 ic	0.00	---	0.00	0.00	---	---	---	---	6.270
2.45	39,255	102.45	6.41 ic	6.40 ic	0.00	---	0.00	0.00	---	---	---	---	6.400
2.52	40,506	102.52	6.70 ic	6.50 ic	0.00	---	0.00	0.00	---	---	---	---	6.497
2.59	41,758	102.59	6.70 ic	6.62 ic	0.00	---	0.00	0.00	---	---	---	---	6.623
2.66	43,009	102.66	6.73 ic	6.73 ic	0.00	---	0.00	0.00	---	---	---	---	6.733
2.73	44,261	102.73	6.99 ic	6.84 ic	0.00	---	0.00	0.00	---	---	---	---	6.839
2.80	45,512	102.80	6.99 ic	6.96 ic	0.00	---	0.00	0.00	---	---	---	---	6.959
2.87	46,843	102.87	7.05 ic	7.05 ic	0.00	---	0.00	0.00	---	---	---	---	7.055
2.94	48,174	102.94	7.30 ic	7.16 ic	0.00	---	0.00	0.00	---	---	---	---	7.164
3.01	49,506	103.01	7.30 ic	7.28 ic	0.00	---	0.00	0.00	---	---	---	---	7.278
3.08	50,837	103.08	7.37 ic	7.37 ic	0.00	---	0.00	0.00	---	---	---	---	7.367
3.15	52,168	103.15	7.61 ic	7.47 ic	0.00	---	0.00	0.00	---	---	---	---	7.475
3.22	53,499	103.22	7.61 ic	7.58 ic	0.00	---	0.00	0.00	---	---	---	---	7.584
3.29	54,831	103.29	7.67 ic	7.67 ic	0.00	---	0.00	0.00	---	---	---	---	7.672
3.36	56,162	103.36	7.92 ic	7.77 ic	0.00	---	0.00	0.00	---	---	---	---	7.773
3.43	57,493	103.43	7.92 ic	7.88 ic	0.00	---	0.00	0.00	---	---	---	---	7.878
3.50	58,824	103.50	7.97 ic	7.97 ic	0.00	---	0.00	0.00	---	---	---	---	7.969
3.57	60,238	103.57	8.25 ic	8.06 ic	0.00	---	0.00	0.00	---	---	---	---	8.060
3.64	61,652	103.64	8.25 ic	8.16 ic	0.01 ic	---	0.00	0.00	---	---	---	---	8.174
3.71	63,065	103.71	8.32 ic	8.24 ic	0.08 ic	---	0.00	0.00	---	---	---	---	8.324
3.78	64,479	103.78	8.58 ic	8.34 ic	0.22 ic	---	0.00	0.00	---	---	---	---	8.552
3.85	65,892	103.85	8.92 ic	8.41 ic	0.42 ic	---	0.00	0.00	---	---	---	---	8.826
3.92	67,306	103.92	9.26 ic	8.48 ic	0.67 ic	---	0.00	0.00	---	---	---	---	9.154
3.99	68,719	103.99	9.62 ic	8.56 ic	1.01 ic	---	0.00	0.00	---	---	---	---	9.563
4.06	70,133	104.06	10.34 ic	8.60 ic	1.37 ic	---	0.00	0.19	---	---	---	---	10.16
4.13	71,547	104.13	11.09 ic	8.65 ic	1.81 ic	---	0.00	0.60	---	---	---	---	11.06
4.20	72,960	104.20	12.26 ic	8.67 ic	2.23 ic	---	0.00	1.15	---	---	---	---	12.05
4.27	74,459	104.27	13.47 ic	8.69 ic	2.80 ic	---	0.00	1.80	---	---	---	---	13.29
4.34	75,957	104.34	14.64 oc	8.71 ic	3.34 ic	---	0.00	2.54	---	---	---	---	14.59
4.41	77,455	104.41	16.03 oc	8.71 ic	3.92 ic	---	0.00	3.37	---	---	---	---	15.99
4.48	78,954	104.48	17.76 oc	8.68 ic	4.55 ic	---	0.00	4.26	---	---	---	---	17.49
4.55	80,452	104.55	19.46 oc	8.65 ic	5.34 ic	---	0.00	5.23	---	---	---	---	19.22
4.62	81,950	104.62	21.11 oc	8.62 ic	6.06 ic	---	0.00	6.26	---	---	---	---	20.94
4.69	83,449	104.69	22.98 oc	8.58 ic	6.81 ic	---	0.00	7.35	---	---	---	---	22.73
4.76	84,947	104.76	24.71 oc	8.53 ic	7.58 ic	---	0.00	8.49	---	---	---	---	24.61
4.83	86,445	104.83	26.73 oc	8.45 ic	8.38 ic	---	0.00	9.69	---	---	---	---	26.53
4.90	87,944	104.90	28.58 oc	8.36 ic	9.20 ic	---	0.00	10.95	---	---	---	---	28.51
4.97	89,529	104.97	30.55 oc	8.20 ic	10.02 ic	---	0.00	12.25	---	---	---	---	30.47
5.04	91,115	105.04	32.34 oc	7.89 ic	10.85 ic	---	0.00	13.60	---	---	---	---	32.34
5.11	92,701	105.11	34.55 oc	7.88 ic	11.68 ic	---	0.00	14.99	---	---	---	---	34.55
5.18	94,286	105.18	36.92 oc	7.85 ic	12.63 ic	---	0.00	16.43	---	---	---	---	36.92
5.25	95,872	105.25	39.17 oc	7.82 ic	13.43 ic	---	0.00	17.92	---	---	---	---	39.17
5.32	97,457	105.32	41.54 oc	7.77 ic	14.33 ic	---	0.00	19.44	---	---	---	---	41.54
5.39	99,043	105.39	43.91 oc	7.71 ic	15.18 ic	---	0.00	21.01	---	---	---	---	43.91
5.46	100,629	105.46	46.25 oc	7.65 ic	15.99 ic	---	0.00	22.62	---	---	---	---	46.25
5.53	102,214	105.53	48.64 oc	7.57 ic	16.81 ic	---	0.00	24.26	---	---	---	---	48.64
5.60	103,800	105.60	51.04 oc	7.48 ic	17.61 ic	---	0.00	25.95	---	---	---	---	51.03
5.67	105,475	105.67	53.34 oc	7.39 ic	18.28 ic	---	0.00	27.67	---	---	---	---	53.34
5.74	107,151	105.74	55.63 oc	7.29 ic	18.91 ic	---	0.00	29.43	---	---	---	---	55.63
5.81	108,826	105.81	57.80 oc	7.19 ic	19.39 ic	---	0.00	31.22	---	---	---	---	57.80
5.88	110,501	105.88	60.11 oc	7.06 ic	20.00 ic	---	0.00	33.05	---	---	---	---	60.11
5.95	112,177	105.95	62.42 oc	6.93 ic	20.58 ic	---	0.00	34.91	---	---	---	---	62.42
6.02	113,852	106.02	64.66 oc	6.79 ic	21.15 ic	---	0.00	36.72 s	---	---	---	---	64.66
6.09	115,527	106.09	66.65 oc	6.67 ic	21.71 ic	---	0.00	38.27 s	---	---	---	---	66.65
6.16	117,203	106.16	68.51 oc	6.55 ic	22.25 ic	---	0.00	39.71 s	---	---	---	---	68.51
6.23	118,878	106.23	70.28 oc	6.44 ic	22.78 ic	---	0.00	41.06 s	---	---	---	---	70.28
6.30	120,553	106.30	71.97 oc	6.34 ic	23.29 ic	---	0.00	42.34 s	---	---	---	---	71.97
6.37	122,321	106.37	73.54 oc	6.24 ic	23.70 ic	---	0.00	43.60 s	---	---	---	---	73.53
6.44	124,089	106.44	74.73 oc	6.20 ic	23.52 ic	---	0.00	45.01 s	---	---	---	---	74.73
6.51	125,856	106.51	75.90 oc	6.15 ic	23.35 ic	---	0.00	46.40 s	---	---	---	---	75.90
6.58	127,624	106.58	77.05 oc	6.10 ic	23.18 ic	---	0.00	47.77 s	---	---	---	---	77.05
6.65	129,391	106.65	78.18 oc	6.06 ic	23.00 ic	---	0.00	49.12 s	---	---	---	---	78.18
6.72	131,159	106.72	79.30 oc	6.01 ic	22.83 ic	---	0.00	50.45 s	---	---	---	---	79.30
6.79	132,926	106.79	80.40 oc	5.97 ic	22.66 ic	---	0.00	51.77 s	---	---	---	---	80.40
6.86	134,694	106.86	81.48 oc	5.92 ic	22.48 ic	---	0.00	53.07 s	---	---	---	---	81.47
6.93	136,461	106.93	82.54 oc	5.88 ic	22.31 ic	---	0.00	54.35 s	---	---	---	---	82.54
7.00	138,229	107.00	83.59 oc	5.83 ic	22.14 ic	---	0.00	55.61 s	---	---	---	---	83.58

...End

Hydrograph Report

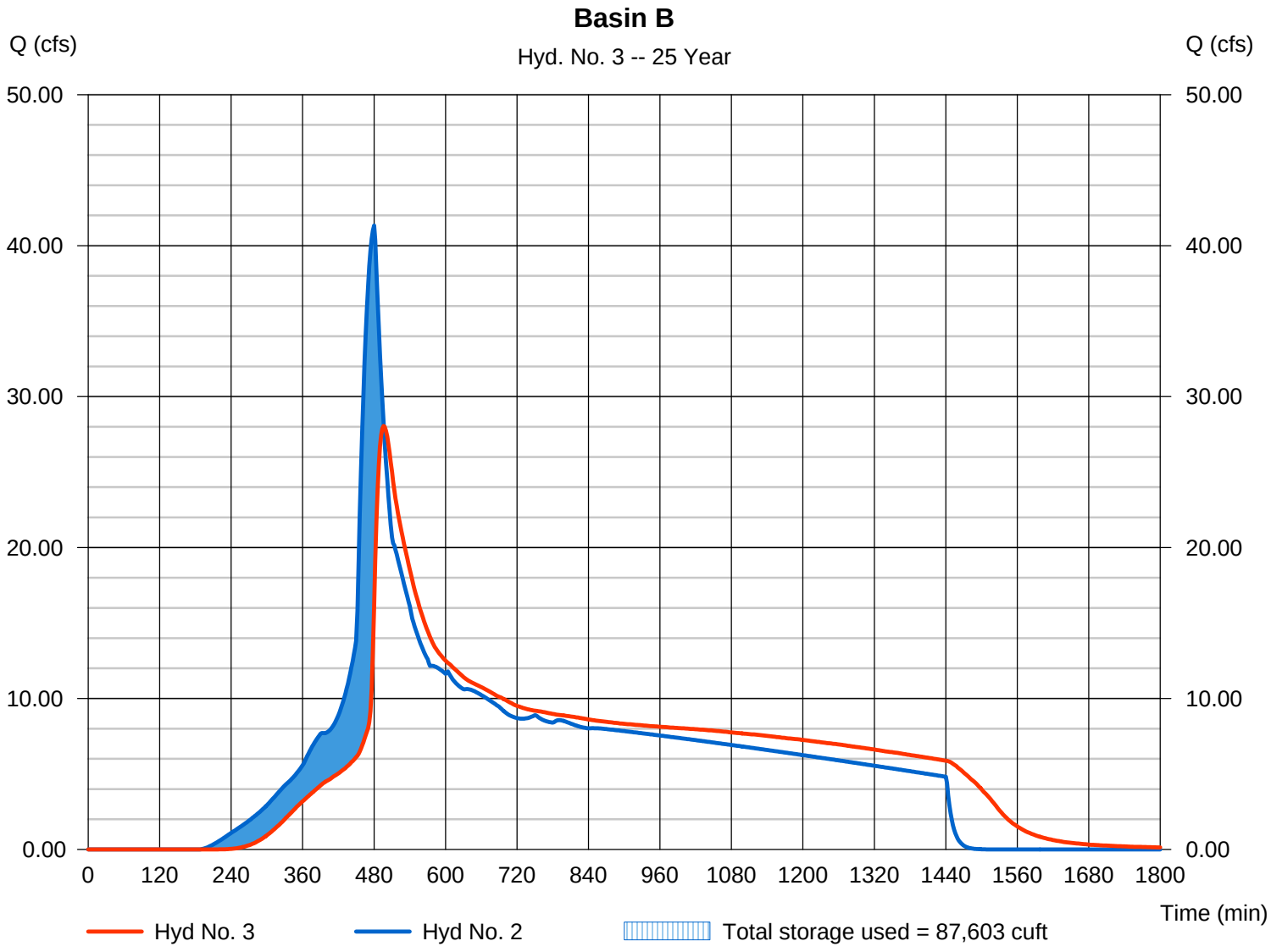
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	28.06 cfs
Storm frequency	=	25 yrs	Time to peak	=	496 min
Time interval	=	2 min	Hyd. volume	=	632,645 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	104.88 ft
Reservoir name	=	Pond B	Max. Storage	=	87,603 cuft

Storage Indication method used.



Hydrograph Report

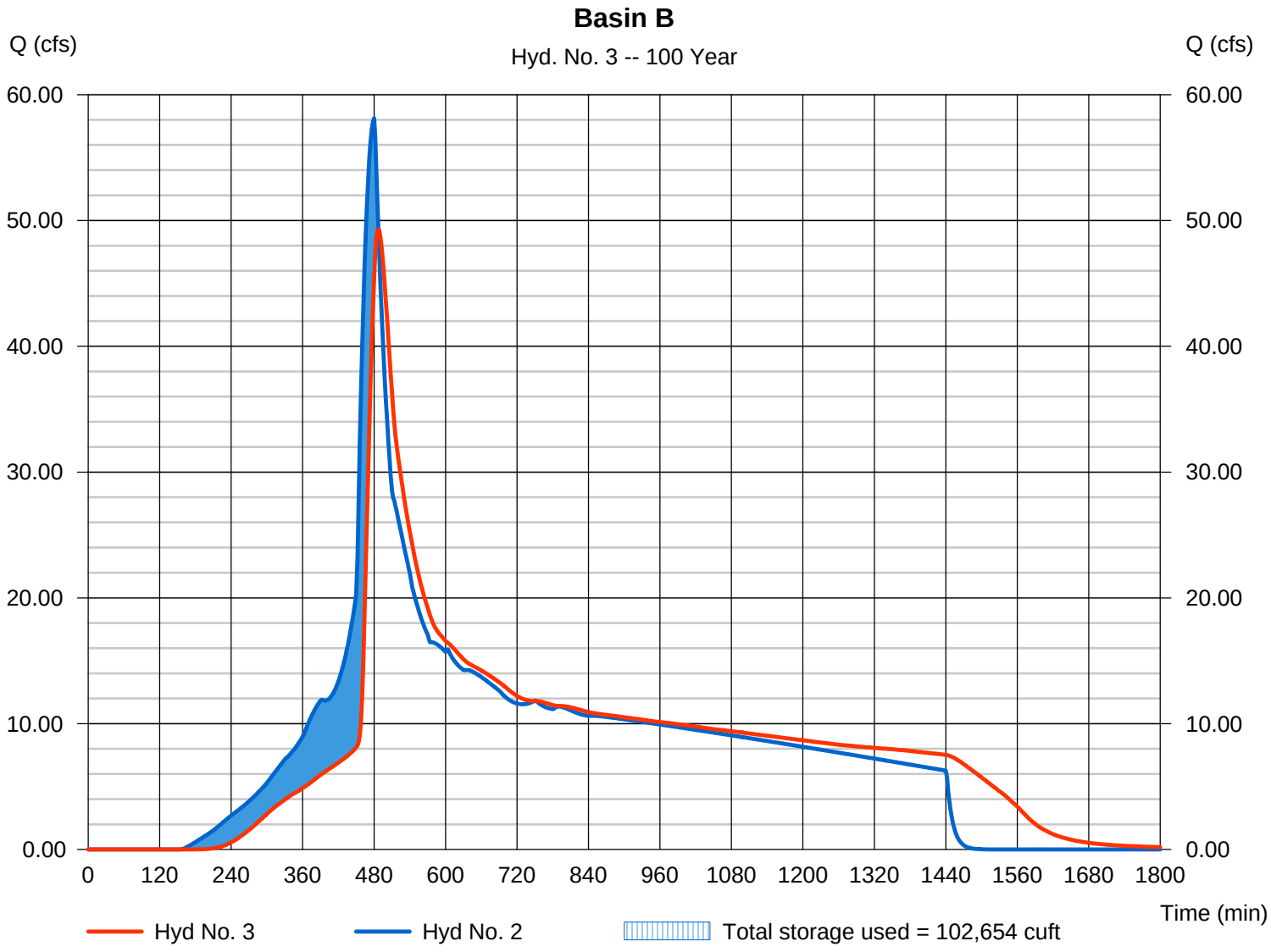
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	49.30 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	871,816 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	105.55 ft
Reservoir name	=	Pond B	Max. Storage	=	102,654 cuft

Storage Indication method used.



Hydrograph Report

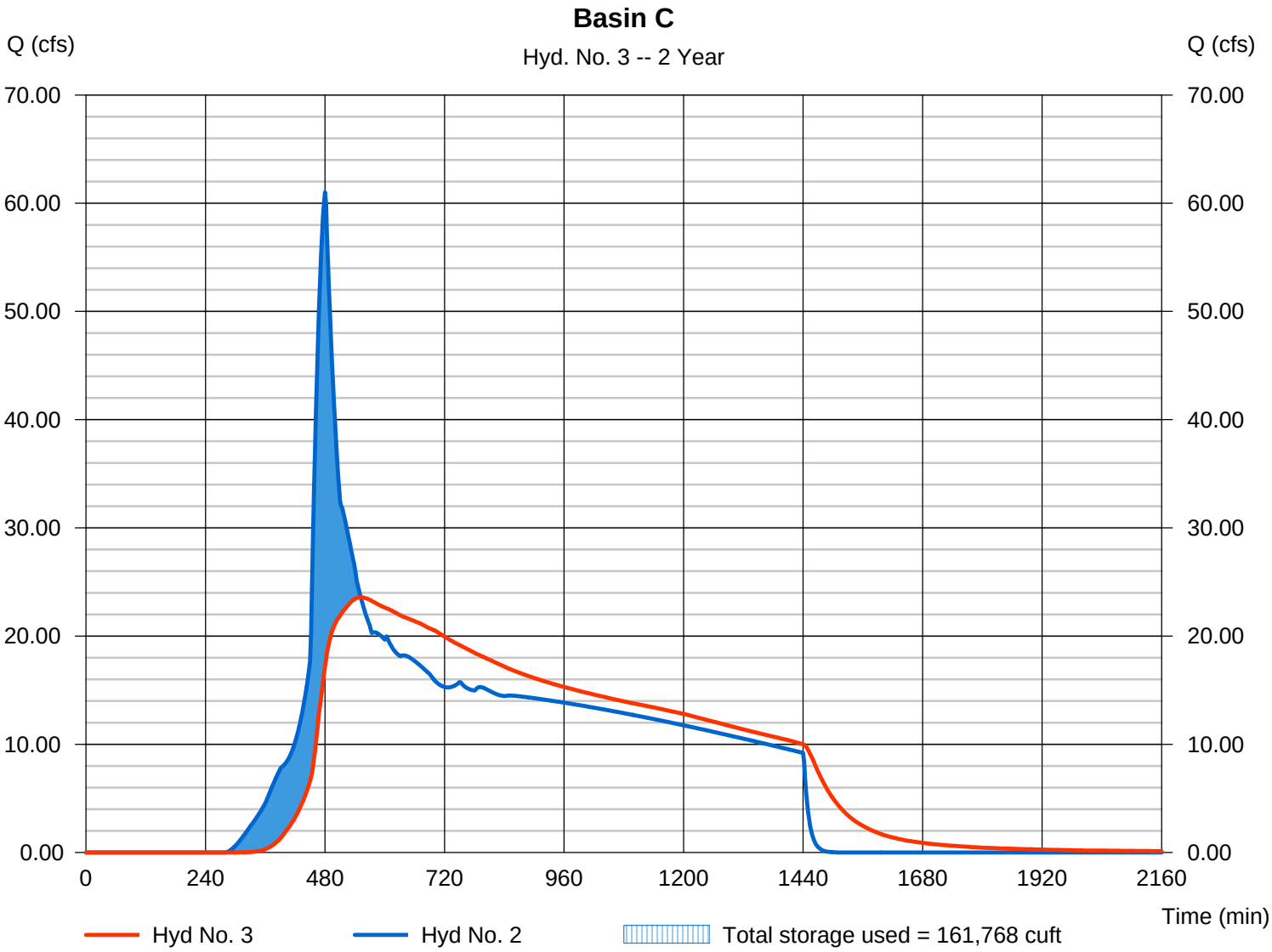
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	23.58 cfs
Storm frequency	=	2 yrs	Time to peak	=	552 min
Time interval	=	2 min	Hyd. volume	=	1,030,614 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	103.79 ft
Reservoir name	=	Pond C	Max. Storage	=	161,768 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond C

Pond Data

Trapezoid - Bottom L x W = 195.0 x 195.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	38,025	0	0
0.90	100.90	40,160	35,179	35,179
1.80	101.80	42,354	37,127	72,306
2.70	102.70	44,605	39,127	111,433
3.60	103.60	46,916	41,180	152,613
4.50	104.50	49,284	43,285	195,899
5.40	105.40	51,711	45,443	241,342
6.30	106.30	54,196	47,654	288,995
7.20	107.20	56,739	49,916	338,912
8.10	108.10	59,341	52,232	391,143
9.00	109.00	62,001	54,600	445,743

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	22.95	42.00	0.00
Span (in)	= 36.00	22.95	42.00	0.00
No. Barrels	= 3	1	1	0
Invert El. (ft)	= 100.00	100.01	103.50	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 37.70	21.50	0.00	0.00
Crest El. (ft)	= 108.00	105.84	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	3,518	100.09	0.05 ic	0.04 ic	0.00	---	0.00	0.00	---	---	---	---	0.043
0.18	7,036	100.18	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.182
0.27	10,554	100.27	0.46 ic	0.43 ic	0.00	---	0.00	0.00	---	---	---	---	0.429
0.36	14,072	100.36	0.77 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.750
0.45	17,589	100.45	1.22 ic	1.14 ic	0.00	---	0.00	0.00	---	---	---	---	1.142
0.54	21,107	100.54	1.66 ic	1.63 ic	0.00	---	0.00	0.00	---	---	---	---	1.632
0.63	24,625	100.63	2.22 ic	2.22 ic	0.00	---	0.00	0.00	---	---	---	---	2.222
0.72	28,143	100.72	2.87 ic	2.83 ic	0.00	---	0.00	0.00	---	---	---	---	2.829
0.81	31,661	100.81	3.66 ic	3.51 ic	0.00	---	0.00	0.00	---	---	---	---	3.506
0.90	35,179	100.90	4.27 ic	4.24 ic	0.00	---	0.00	0.00	---	---	---	---	4.245
0.99	38,892	100.99	5.29 ic	5.03 ic	0.00	---	0.00	0.00	---	---	---	---	5.035
1.08	42,604	101.08	6.06 ic	5.86 ic	0.00	---	0.00	0.00	---	---	---	---	5.864
1.17	46,317	101.17	6.90 ic	6.72 ic	0.00	---	0.00	0.00	---	---	---	---	6.718
1.26	50,030	101.26	7.82 ic	7.58 ic	0.00	---	0.00	0.00	---	---	---	---	7.584
1.35	53,742	101.35	8.81 ic	8.54 ic	0.00	---	0.00	0.00	---	---	---	---	8.541
1.44	57,455	101.44	9.38 ic	9.38 ic	0.00	---	0.00	0.00	---	---	---	---	9.380
1.53	61,168	101.53	10.45 ic	10.34 ic	0.00	---	0.00	0.00	---	---	---	---	10.34
1.62	64,880	101.62	11.16 ic	11.15 ic	0.00	---	0.00	0.00	---	---	---	---	11.15
1.71	68,593	101.71	12.27 ic	11.99 ic	0.00	---	0.00	0.00	---	---	---	---	11.99
1.80	72,306	101.80	12.92 ic	12.75 ic	0.00	---	0.00	0.00	---	---	---	---	12.75
1.89	76,219	101.89	13.58 ic	13.37 ic	0.00	---	0.00	0.00	---	---	---	---	13.37
1.98	80,131	101.98	14.27 ic	13.93 ic	0.00	---	0.00	0.00	---	---	---	---	13.93
2.07	84,044	102.07	14.98 ic	14.53 ic	0.00	---	0.00	0.00	---	---	---	---	14.53
2.16	87,957	102.16	15.11 ic	15.11 ic	0.00	---	0.00	0.00	---	---	---	---	15.11
2.25	91,869	102.25	15.71 ic	15.67 ic	0.00	---	0.00	0.00	---	---	---	---	15.67
2.34	95,782	102.34	16.46 ic	16.21 ic	0.00	---	0.00	0.00	---	---	---	---	16.21
2.43	99,695	102.43	17.23 ic	16.73 ic	0.00	---	0.00	0.00	---	---	---	---	16.73
2.52	103,608	102.52	17.24 ic	17.24 ic	0.00	---	0.00	0.00	---	---	---	---	17.24
2.61	107,520	102.61	18.02 ic	17.73 ic	0.00	---	0.00	0.00	---	---	---	---	17.73
2.70	111,433	102.70	18.21 ic	18.21 ic	0.00	---	0.00	0.00	---	---	---	---	18.21
2.79	115,551	102.79	18.83 ic	18.68 ic	0.00	---	0.00	0.00	---	---	---	---	18.68
2.88	119,669	102.88	19.66 ic	19.13 ic	0.00	---	0.00	0.00	---	---	---	---	19.13
2.97	123,787	102.97	19.66 ic	19.58 ic	0.00	---	0.00	0.00	---	---	---	---	19.58

Continues on next page...

Pond C

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	127,905	103.06	20.52 ic	19.99 ic	0.00	---	0.00	0.00	---	---	---	---	19.99
3.15	132,023	103.15	20.52 ic	20.42 ic	0.00	---	0.00	0.00	---	---	---	---	20.42
3.24	136,141	103.24	20.74 ic	20.74 ic	0.00	---	0.00	0.00	---	---	---	---	20.74
3.33	140,259	103.33	21.39 ic	21.15 ic	0.00	---	0.00	0.00	---	---	---	---	21.15
3.42	144,377	103.42	21.50 ic	21.50 ic	0.00	---	0.00	0.00	---	---	---	---	21.50
3.51	148,495	103.51	22.28 ic	21.85 ic	0.00 ic	---	0.00	0.00	---	---	---	---	21.85
3.60	152,613	103.60	22.32 ic	22.23 ic	0.09 ic	---	0.00	0.00	---	---	---	---	22.32
3.69	156,942	103.69	23.19 ic	22.53 ic	0.30 ic	---	0.00	0.00	---	---	---	---	22.83
3.78	161,270	103.78	24.13 ic	22.81 ic	0.67 ic	---	0.00	0.00	---	---	---	---	23.49
3.87	165,599	103.87	24.31 ic	23.12 ic	1.19 ic	---	0.00	0.00	---	---	---	---	24.31
3.96	169,927	103.96	25.22 ic	23.41 ic	1.80 ic	---	0.00	0.00	---	---	---	---	25.22
4.05	174,256	104.05	26.16 ic	23.70 ic	2.46 ic	---	0.00	0.00	---	---	---	---	26.16
4.14	178,584	104.14	28.04 ic	23.92 ic	3.40 ic	---	0.00	0.00	---	---	---	---	27.31
4.23	182,913	104.23	28.97 oc	24.18 ic	4.35 ic	---	0.00	0.00	---	---	---	---	28.53
4.32	187,241	104.32	29.82 oc	24.39 ic	5.43 ic	---	0.00	0.00	---	---	---	---	29.82
4.41	191,570	104.41	31.54 oc	24.62 ic	6.67 ic	---	0.00	0.00	---	---	---	---	31.28
4.50	195,899	104.50	33.29 oc	24.78 ic	7.78 ic	---	0.00	0.00	---	---	---	---	32.56
4.59	200,443	104.59	35.05 oc	24.95 ic	9.27 ic	---	0.00	0.00	---	---	---	---	34.22
4.68	204,987	104.68	35.93 oc	25.20 ic	10.58 ic	---	0.00	0.00	---	---	---	---	35.79
4.77	209,532	104.77	37.71 oc	25.37 ic	12.33 ic	---	0.00	0.00	---	---	---	---	37.70
4.86	214,076	104.86	39.50 oc	25.53 ic	13.84 ic	---	0.00	0.00	---	---	---	---	39.37
4.95	218,620	104.95	42.18 oc	25.60 ic	15.81 ic	---	0.00	0.00	---	---	---	---	41.41
5.04	223,164	105.04	43.97 oc	25.76 ic	17.49 ic	---	0.00	0.00	---	---	---	---	43.25
5.13	227,709	105.13	45.75 oc	25.92 ic	19.24 ic	---	0.00	0.00	---	---	---	---	45.16
5.22	232,253	105.22	47.52 oc	26.08 ic	21.05 ic	---	0.00	0.00	---	---	---	---	47.13
5.31	236,797	105.31	50.14 oc	26.15 ic	23.36 ic	---	0.00	0.00	---	---	---	---	49.51
5.40	241,342	105.40	51.87 oc	26.31 ic	25.28 ic	---	0.00	0.00	---	---	---	---	51.59
5.49	246,107	105.49	54.41 oc	26.39 ic	27.24 ic	---	0.00	0.00	---	---	---	---	53.62
5.58	250,872	105.58	56.88 oc	26.46 ic	29.68 ic	---	0.00	0.00	---	---	---	---	56.14
5.67	255,638	105.67	58.49 oc	26.63 ic	31.69 ic	---	0.00	0.00	---	---	---	---	58.31
5.76	260,403	105.76	60.83 oc	26.71 ic	33.71 ic	---	0.00	0.00	---	---	---	---	60.42
5.85	265,169	105.85	63.07 oc	26.80 ic	36.17 ic	---	0.00	0.07	---	---	---	---	63.04
5.94	269,934	105.94	67.24 oc	26.67 ic	38.17 ic	---	0.00	2.26	---	---	---	---	67.10
6.03	274,699	106.03	73.09 oc	26.28 ic	40.58 ic	---	0.00	5.93	---	---	---	---	72.78
6.12	279,465	106.12	79.30 oc	25.63 ic	42.92 ic	---	0.00	10.61	---	---	---	---	79.16
6.21	284,230	106.21	85.48 oc	24.55 ic	44.81 ic	---	0.00	16.11	---	---	---	---	85.47
6.30	288,995	106.30	93.81 oc	24.45 ic	47.02 ic	---	0.00	22.34	---	---	---	---	93.81
6.39	293,987	106.39	102.92 oc	24.27 ic	49.44 ic	---	0.00	29.20	---	---	---	---	102.91
6.48	298,979	106.48	112.09 oc	24.02 ic	51.41 ic	---	0.00	36.66	---	---	---	---	112.09
6.57	303,970	106.57	121.84 oc	23.68 ic	53.50 ic	---	0.00	44.65	---	---	---	---	121.84
6.66	308,962	106.66	131.82 oc	23.26 ic	55.40 ic	---	0.00	53.16	---	---	---	---	131.82
6.75	313,953	106.75	142.14 oc	22.73 ic	57.25 ic	---	0.00	62.15	---	---	---	---	142.13
6.84	318,945	106.84	152.63 oc	22.11 ic	58.93 ic	---	0.00	71.59	---	---	---	---	152.63
6.93	323,937	106.93	163.23 oc	21.37 ic	60.38 ic	---	0.00	81.47	---	---	---	---	163.23
7.02	328,928	107.02	173.92 oc	20.52 ic	61.62 ic	---	0.00	91.77	---	---	---	---	173.91
7.11	333,920	107.11	185.12 oc	19.48 ic	63.17 ic	---	0.00	102.46	---	---	---	---	185.12
7.20	338,912	107.20	194.37 oc	18.58 ic	62.23 ic	---	0.00	113.55	---	---	---	---	194.36
7.29	344,135	107.29	202.34 oc	17.78 ic	59.55 ic	---	0.00	125.01	---	---	---	---	202.33
7.38	349,358	107.38	210.14 oc	16.92 ic	56.65 ic	---	0.00	136.57 s	---	---	---	---	210.14
7.47	354,581	107.47	216.32 oc	16.27 ic	54.49 ic	---	0.00	145.56 s	---	---	---	---	216.32
7.56	359,804	107.56	221.78 oc	15.71 ic	52.63 ic	---	0.00	153.43 s	---	---	---	---	221.77
7.65	365,027	107.65	226.78 oc	15.21 ic	50.93 ic	---	0.00	160.64 s	---	---	---	---	226.78
7.74	370,251	107.74	230.86 ic	14.68 ic	49.17 ic	---	0.00	167.01 s	---	---	---	---	230.86
7.83	375,474	107.83	234.56 ic	14.18 ic	47.50 ic	---	0.00	172.87 s	---	---	---	---	234.55
7.92	380,697	107.92	238.04 ic	13.72 ic	45.94 ic	---	0.00	178.37 s	---	---	---	---	238.03
8.01	385,920	108.01	241.35 ic	13.27 ic	44.45 ic	---	0.12	183.49 s	---	---	---	---	241.35
8.10	391,143	108.10	245.13 ic	12.64 ic	42.33 ic	---	3.97	186.18 s	---	---	---	---	245.12
8.19	396,603	108.19	249.03 ic	11.90 ic	39.85 ic	---	10.40	186.88 s	---	---	---	---	249.02
8.28	402,063	108.28	252.87 ic	11.11 ic	37.21 ic	---	18.60	185.94 s	---	---	---	---	252.85
8.37	407,523	108.37	256.57 ic	10.30 ic	34.49 ic	---	28.25	183.53 s	---	---	---	---	256.56
8.46	412,983	108.46	260.10 ic	9.47 ic	31.73 ic	---	39.17	179.73 s	---	---	---	---	260.09
8.55	418,443	108.55	263.21 ic	8.78 ic	29.41 ic	---	48.36 s	176.63 s	---	---	---	---	263.19
8.64	423,903	108.64	265.99 ic	8.21 ic	27.49 ic	---	55.98 s	174.29 s	---	---	---	---	265.96
8.73	429,363	108.73	268.56 ic	7.70 ic	25.80 ic	---	62.80 s	172.26 s	---	---	---	---	268.55
8.82	434,823	108.82	270.98 ic	7.25 ic	24.28 ic	---	69.01 s	170.41 s	---	---	---	---	270.95
8.91	440,283	108.91	273.28 ic	6.85 ic	22.93 ic	---	74.73 s	168.75 s	---	---	---	---	273.26
9.00	445,743	109.00	275.47 ic	6.48 ic	21.70 ic	---	80.03 s	167.25 s	---	---	---	---	275.46

...End

Hydrograph Report

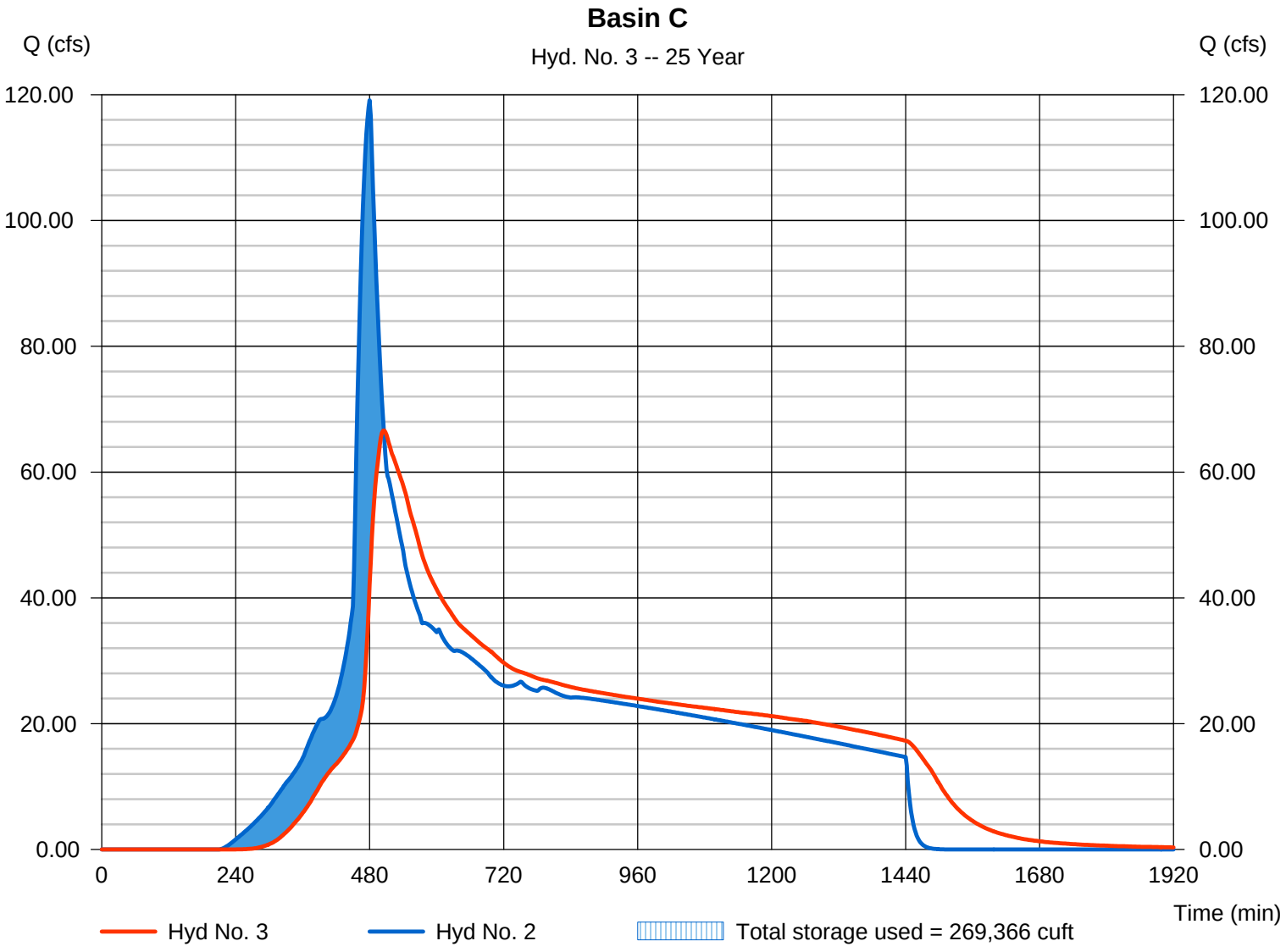
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	66.62 cfs
Storm frequency	=	25 yrs	Time to peak	=	506 min
Time interval	=	2 min	Hyd. volume	=	1,855,684 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	105.93 ft
Reservoir name	=	Pond C	Max. Storage	=	269,366 cuft

Storage Indication method used.



Hydrograph Report

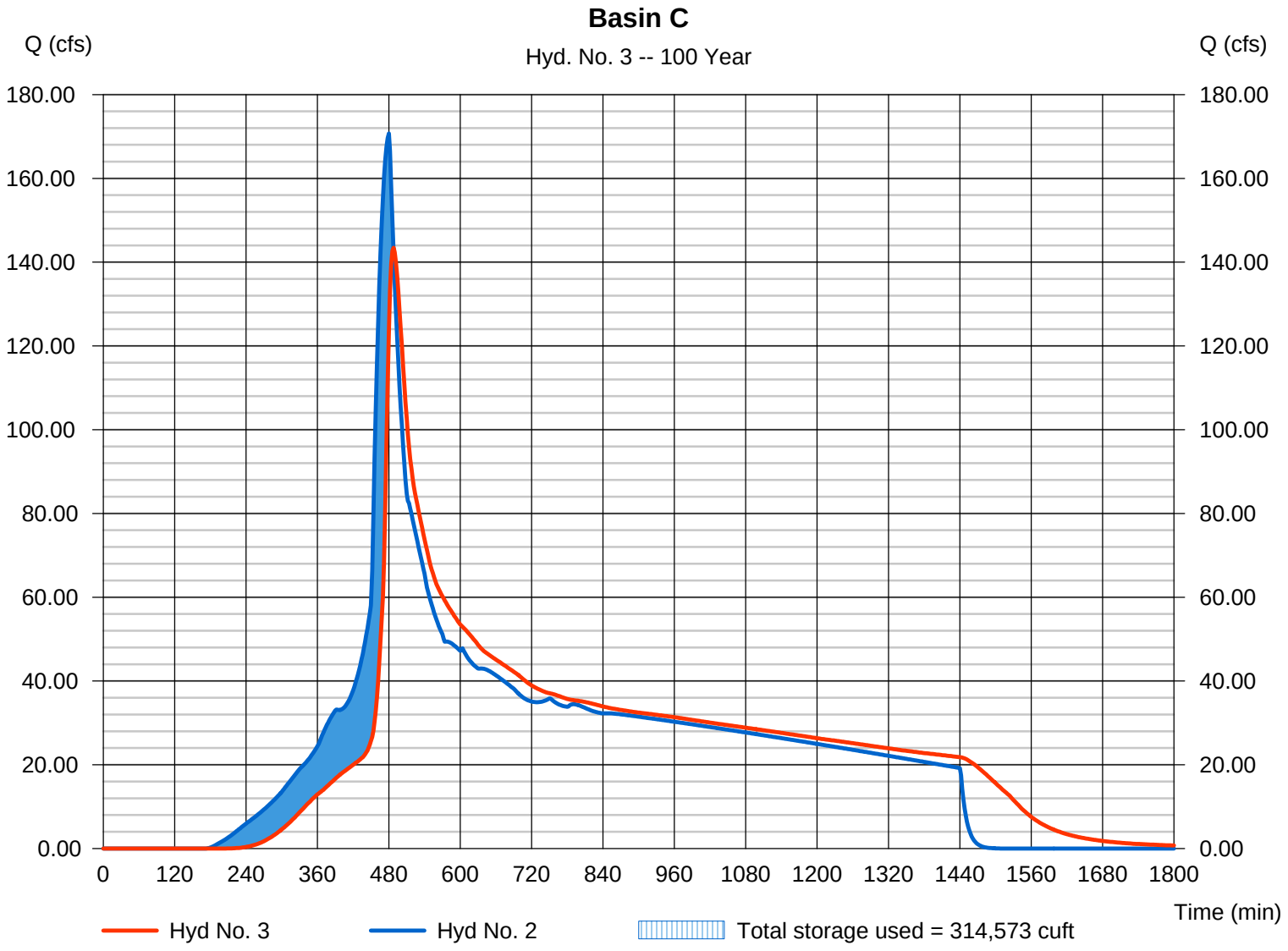
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	143.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	2,587,459 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	106.76 ft
Reservoir name	=	Pond C	Max. Storage	=	314,573 cuft

Storage Indication method used.



Hydrograph Report

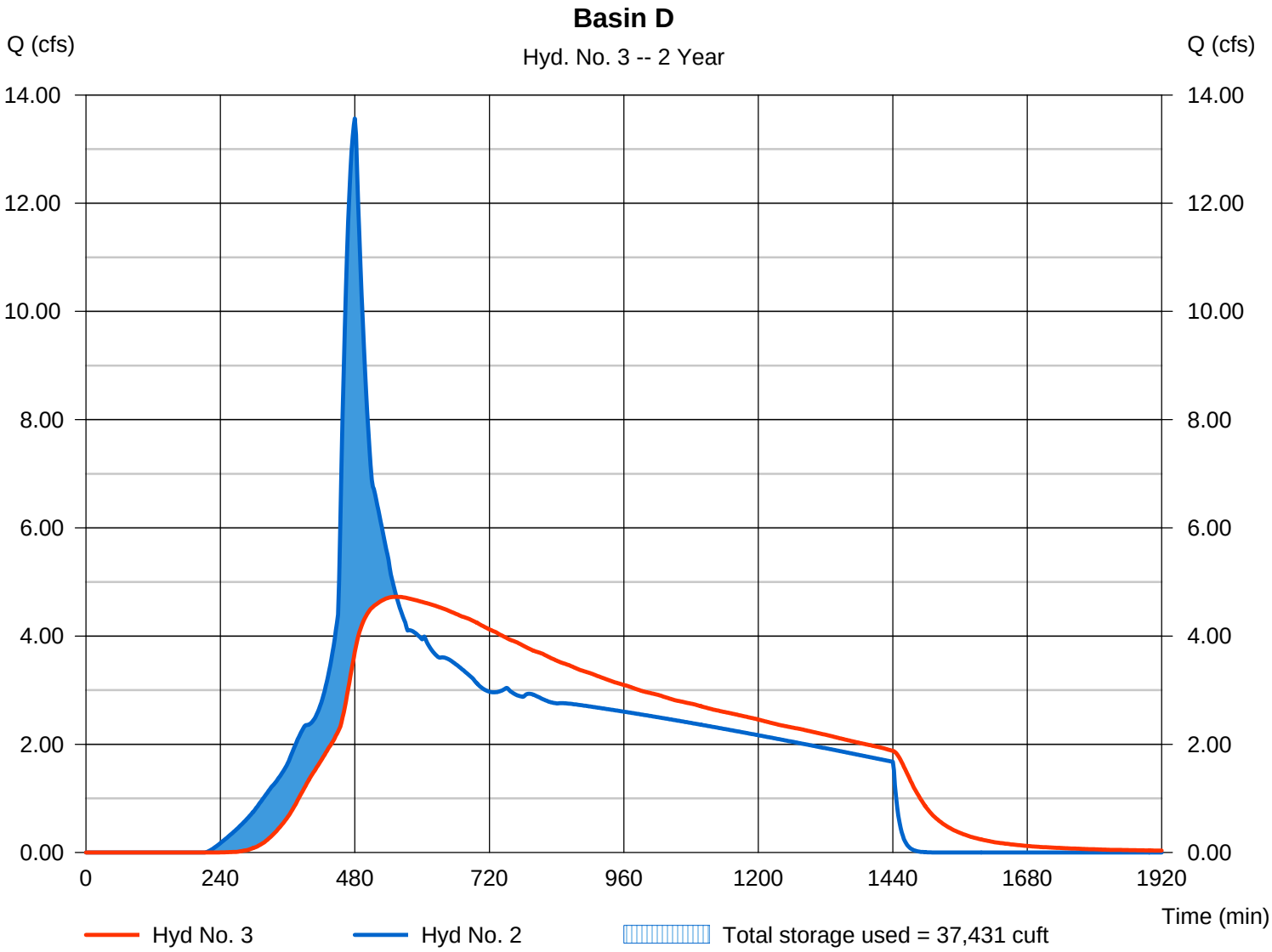
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin D

Hydrograph type	=	Reservoir	Peak discharge	=	4.726 cfs
Storm frequency	=	2 yrs	Time to peak	=	554 min
Time interval	=	2 min	Hyd. volume	=	211,538 cuft
Inflow hyd. No.	=	2 - Basin D - Post	Max. Elevation	=	103.12 ft
Reservoir name	=	Pond D	Max. Storage	=	37,431 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond D

Pond Data

Trapezoid - Bottom L x W = 100.0 x 100.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 6.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	10,000	0	0
0.60	100.60	10,733	6,219	6,219
1.20	101.20	11,492	6,666	12,885
1.80	101.80	12,277	7,129	20,014
2.40	102.40	13,087	7,608	27,622
3.00	103.00	13,924	8,102	35,724
3.60	103.60	14,787	8,612	44,336
4.20	104.20	15,675	9,137	53,473
4.80	104.80	16,589	9,678	63,151
5.40	105.40	17,530	10,234	73,386
6.00	106.00	18,496	10,806	84,192

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	10.87	21.30	0.00
Span (in)	= 36.00	10.87	21.30	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	103.56	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	4.50	0.00	0.00
Crest El. (ft)	= 106.00	104.05	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.06	622	100.06	0.01 ic	0.01 ic	0.00	---	0.00	0.00	---	---	---	---	0.011
0.12	1,244	100.12	0.05 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.048
0.18	1,866	100.18	0.11 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.108
0.24	2,487	100.24	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.188
0.30	3,109	100.30	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.292
0.36	3,731	100.36	0.41 ic	0.41 ic	0.00	---	0.00	0.00	---	---	---	---	0.412
0.42	4,353	100.42	0.55 ic	0.55 ic	0.00	---	0.00	0.00	---	---	---	---	0.547
0.48	4,975	100.48	0.74 ic	0.70 ic	0.00	---	0.00	0.00	---	---	---	---	0.697
0.54	5,597	100.54	0.88 ic	0.87 ic	0.00	---	0.00	0.00	---	---	---	---	0.867
0.60	6,219	100.60	1.05 ic	1.05 ic	0.00	---	0.00	0.00	---	---	---	---	1.046
0.66	6,885	100.66	1.23 ic	1.23 ic	0.00	---	0.00	0.00	---	---	---	---	1.229
0.72	7,552	100.72	1.42 ic	1.42 ic	0.00	---	0.00	0.00	---	---	---	---	1.424
0.78	8,218	100.78	1.64 ic	1.61 ic	0.00	---	0.00	0.00	---	---	---	---	1.605
0.84	8,885	100.84	1.78 ic	1.78 ic	0.00	---	0.00	0.00	---	---	---	---	1.782
0.90	9,552	100.90	2.02 ic	1.94 ic	0.00	---	0.00	0.00	---	---	---	---	1.936
0.96	10,218	100.96	2.05 ic	2.05 ic	0.00	---	0.00	0.00	---	---	---	---	2.051
1.02	10,885	101.02	2.17 ic	2.17 ic	0.00	---	0.00	0.00	---	---	---	---	2.169
1.08	11,552	101.08	2.30 ic	2.27 ic	0.00	---	0.00	0.00	---	---	---	---	2.272
1.14	12,218	101.14	2.45 ic	2.36 ic	0.00	---	0.00	0.00	---	---	---	---	2.358
1.20	12,885	101.20	2.47 ic	2.47 ic	0.00	---	0.00	0.00	---	---	---	---	2.465
1.26	13,598	101.26	2.61 ic	2.56 ic	0.00	---	0.00	0.00	---	---	---	---	2.557
1.32	14,311	101.32	2.64 ic	2.64 ic	0.00	---	0.00	0.00	---	---	---	---	2.641
1.38	15,024	101.38	2.77 ic	2.74 ic	0.00	---	0.00	0.00	---	---	---	---	2.741
1.44	15,736	101.44	2.81 ic	2.81 ic	0.00	---	0.00	0.00	---	---	---	---	2.812
1.50	16,449	101.50	2.94 ic	2.91 ic	0.00	---	0.00	0.00	---	---	---	---	2.913
1.56	17,162	101.56	2.98 ic	2.98 ic	0.00	---	0.00	0.00	---	---	---	---	2.981
1.62	17,875	101.62	3.11 ic	3.08 ic	0.00	---	0.00	0.00	---	---	---	---	3.075
1.68	18,588	101.68	3.15 ic	3.15 ic	0.00	---	0.00	0.00	---	---	---	---	3.147
1.74	19,301	101.74	3.30 ic	3.23 ic	0.00	---	0.00	0.00	---	---	---	---	3.229
1.80	20,014	101.80	3.31 ic	3.31 ic	0.00	---	0.00	0.00	---	---	---	---	3.309
1.86	20,775	101.86	3.48 ic	3.38 ic	0.00	---	0.00	0.00	---	---	---	---	3.375
1.92	21,536	101.92	3.48 ic	3.46 ic	0.00	---	0.00	0.00	---	---	---	---	3.460
1.98	22,296	101.98	3.52 ic	3.52 ic	0.00	---	0.00	0.00	---	---	---	---	3.522

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Pond D

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.04	23,057	102.04	3.68 ic	3.60 ic	0.00	---	0.00	0.00	---	---	---	---	3.597
2.10	23,818	102.10	3.68 ic	3.68 ic	0.00	---	0.00	0.00	---	---	---	---	3.676
2.16	24,579	102.16	3.73 ic	3.73 ic	0.00	---	0.00	0.00	---	---	---	---	3.729
2.22	25,340	102.22	3.88 ic	3.80 ic	0.00	---	0.00	0.00	---	---	---	---	3.805
2.28	26,100	102.28	3.88 ic	3.88 ic	0.00	---	0.00	0.00	---	---	---	---	3.880
2.34	26,861	102.34	3.93 ic	3.93 ic	0.00	---	0.00	0.00	---	---	---	---	3.931
2.40	27,622	102.40	4.09 ic	4.00 ic	0.00	---	0.00	0.00	---	---	---	---	4.002
2.46	28,432	102.46	4.09 ic	4.07 ic	0.00	---	0.00	0.00	---	---	---	---	4.073
2.52	29,242	102.52	4.13 ic	4.13 ic	0.00	---	0.00	0.00	---	---	---	---	4.127
2.58	30,053	102.58	4.31 ic	4.19 ic	0.00	---	0.00	0.00	---	---	---	---	4.189
2.64	30,863	102.64	4.31 ic	4.26 ic	0.00	---	0.00	0.00	---	---	---	---	4.258
2.70	31,673	102.70	4.32 ic	4.32 ic	0.00	---	0.00	0.00	---	---	---	---	4.319
2.76	32,483	102.76	4.53 ic	4.37 ic	0.00	---	0.00	0.00	---	---	---	---	4.369
2.82	33,293	102.82	4.53 ic	4.43 ic	0.00	---	0.00	0.00	---	---	---	---	4.434
2.88	34,104	102.88	4.53 ic	4.50 ic	0.00	---	0.00	0.00	---	---	---	---	4.499
2.94	34,914	102.94	4.55 ic	4.55 ic	0.00	---	0.00	0.00	---	---	---	---	4.553
3.00	35,724	103.00	4.76 ic	4.60 ic	0.00	---	0.00	0.00	---	---	---	---	4.604
3.06	36,585	103.06	4.76 ic	4.67 ic	0.00	---	0.00	0.00	---	---	---	---	4.666
3.12	37,446	103.12	4.76 ic	4.73 ic	0.00	---	0.00	0.00	---	---	---	---	4.728
3.18	38,308	103.18	4.78 ic	4.78 ic	0.00	---	0.00	0.00	---	---	---	---	4.780
3.24	39,169	103.24	4.99 ic	4.83 ic	0.00	---	0.00	0.00	---	---	---	---	4.827
3.30	40,030	103.30	4.99 ic	4.89 ic	0.00	---	0.00	0.00	---	---	---	---	4.887
3.36	40,891	103.36	4.99 ic	4.95 ic	0.00	---	0.00	0.00	---	---	---	---	4.946
3.42	41,752	103.42	5.00 ic	5.00 ic	0.00	---	0.00	0.00	---	---	---	---	5.001
3.48	42,613	103.48	5.04 ic	5.04 ic	0.00	---	0.00	0.00	---	---	---	---	5.045
3.54	43,475	103.54	5.24 ic	5.10 ic	0.00	---	0.00	0.00	---	---	---	---	5.098
3.60	44,336	103.60	5.24 ic	5.15 ic	0.01 ic	---	0.00	0.00	---	---	---	---	5.165
3.66	45,250	103.66	5.26 ic	5.20 ic	0.06 ic	---	0.00	0.00	---	---	---	---	5.264
3.72	46,163	103.72	5.49 ic	5.25 ic	0.15 ic	---	0.00	0.00	---	---	---	---	5.398
3.78	47,077	103.78	5.74 ic	5.28 ic	0.28 ic	---	0.00	0.00	---	---	---	---	5.566
3.84	47,991	103.84	5.80 ic	5.32 ic	0.48 ic	---	0.00	0.00	---	---	---	---	5.796
3.90	48,904	103.90	6.03 ic	5.36 ic	0.67 ic	---	0.00	0.00	---	---	---	---	6.031
3.96	49,818	103.96	6.30 ic	5.40 ic	0.90 ic	---	0.00	0.00	---	---	---	---	6.299
4.02	50,732	104.02	6.84 ic	5.42 ic	1.22 ic	---	0.00	0.00	---	---	---	---	6.638
4.08	51,646	104.08	7.13 ic	5.45 ic	1.49 ic	---	0.00	0.08	---	---	---	---	7.022
4.14	52,559	104.14	7.73 ic	5.47 ic	1.85 ic	---	0.00	0.40	---	---	---	---	7.722
4.20	53,473	104.20	8.68 ic	5.46 ic	2.25 ic	---	0.00	0.87	---	---	---	---	8.580
4.26	54,441	104.26	9.66 oc	5.45 ic	2.62 ic	---	0.00	1.44	---	---	---	---	9.514
4.32	55,409	104.32	10.80 oc	5.42 ic	3.02 ic	---	0.00	2.10	---	---	---	---	10.54
4.38	56,376	104.38	11.98 oc	5.39 ic	3.51 ic	---	0.00	2.84	---	---	---	---	11.74
4.44	57,344	104.44	13.17 oc	5.36 ic	3.95 ic	---	0.00	3.65	---	---	---	---	12.96
4.50	58,312	104.50	14.36 oc	5.33 ic	4.41 ic	---	0.00	4.52	---	---	---	---	14.27
4.56	59,280	104.56	15.84 oc	5.28 ic	4.97 ic	---	0.00	5.46	---	---	---	---	15.70
4.62	60,248	104.62	17.29 oc	5.23 ic	5.45 ic	---	0.00	6.45	---	---	---	---	17.12
4.68	61,215	104.68	18.69 oc	5.18 ic	5.94 ic	---	0.00	7.49	---	---	---	---	18.61
4.74	62,183	104.74	20.28 oc	5.11 ic	6.51 ic	---	0.00	8.59	---	---	---	---	20.21
4.80	63,151	104.80	21.97 oc	5.02 ic	7.08 ic	---	0.00	9.73	---	---	---	---	21.83
4.86	64,175	104.86	23.45 oc	4.94 ic	7.56 ic	---	0.00	10.92	---	---	---	---	23.42
4.92	65,198	104.92	25.15 oc	4.82 ic	8.10 ic	---	0.00	12.16	---	---	---	---	25.07
4.98	66,221	104.98	26.75 oc	4.64 ic	8.61 ic	---	0.00	13.44	---	---	---	---	26.69
5.04	67,245	105.04	28.29 oc	4.37 ic	9.16 ic	---	0.00	14.76	---	---	---	---	28.29
5.10	68,268	105.10	30.14 oc	4.36 ic	9.65 ic	---	0.00	16.12	---	---	---	---	30.14
5.16	69,292	105.16	32.00 oc	4.34 ic	10.14 ic	---	0.00	17.52	---	---	---	---	32.00
5.22	70,315	105.22	33.85 oc	4.31 ic	10.58 ic	---	0.00	18.96	---	---	---	---	33.85
5.28	71,339	105.28	35.67 oc	4.28 ic	10.95 ic	---	0.00	20.44	---	---	---	---	35.67
5.34	72,362	105.34	37.46 oc	4.25 ic	11.25 ic	---	0.00	21.95	---	---	---	---	37.45
5.40	73,386	105.40	39.33 oc	4.20 ic	11.63 ic	---	0.00	23.50	---	---	---	---	39.33
5.46	74,466	105.46	41.23 oc	4.15 ic	11.99 ic	---	0.00	25.09	---	---	---	---	41.22
5.52	75,547	105.52	43.14 oc	4.09 ic	12.34 ic	---	0.00	26.71	---	---	---	---	43.13
5.58	76,627	105.58	45.06 oc	4.02 ic	12.68 ic	---	0.00	28.36	---	---	---	---	45.06
5.64	77,708	105.64	47.00 oc	3.94 ic	13.01 ic	---	0.00	30.04	---	---	---	---	47.00
5.70	78,789	105.70	48.80 oc	3.87 ic	13.33 ic	---	0.00	31.60 s	---	---	---	---	48.80
5.76	79,869	105.76	50.43 oc	3.81 ic	13.65 ic	---	0.00	32.97 s	---	---	---	---	50.43
5.82	80,950	105.82	51.96 oc	3.75 ic	13.96 ic	---	0.00	34.26 s	---	---	---	---	51.96
5.88	82,031	105.88	53.37 oc	3.69 ic	14.17 ic	---	0.00	35.50 s	---	---	---	---	53.37
5.94	83,111	105.94	54.51 oc	3.66 ic	14.05 ic	---	0.00	36.81 s	---	---	---	---	54.51
6.00	84,192	106.00	55.63 oc	3.63 ic	13.92 ic	---	0.00	38.08 s	---	---	---	---	55.63

...End

Hydrograph Report

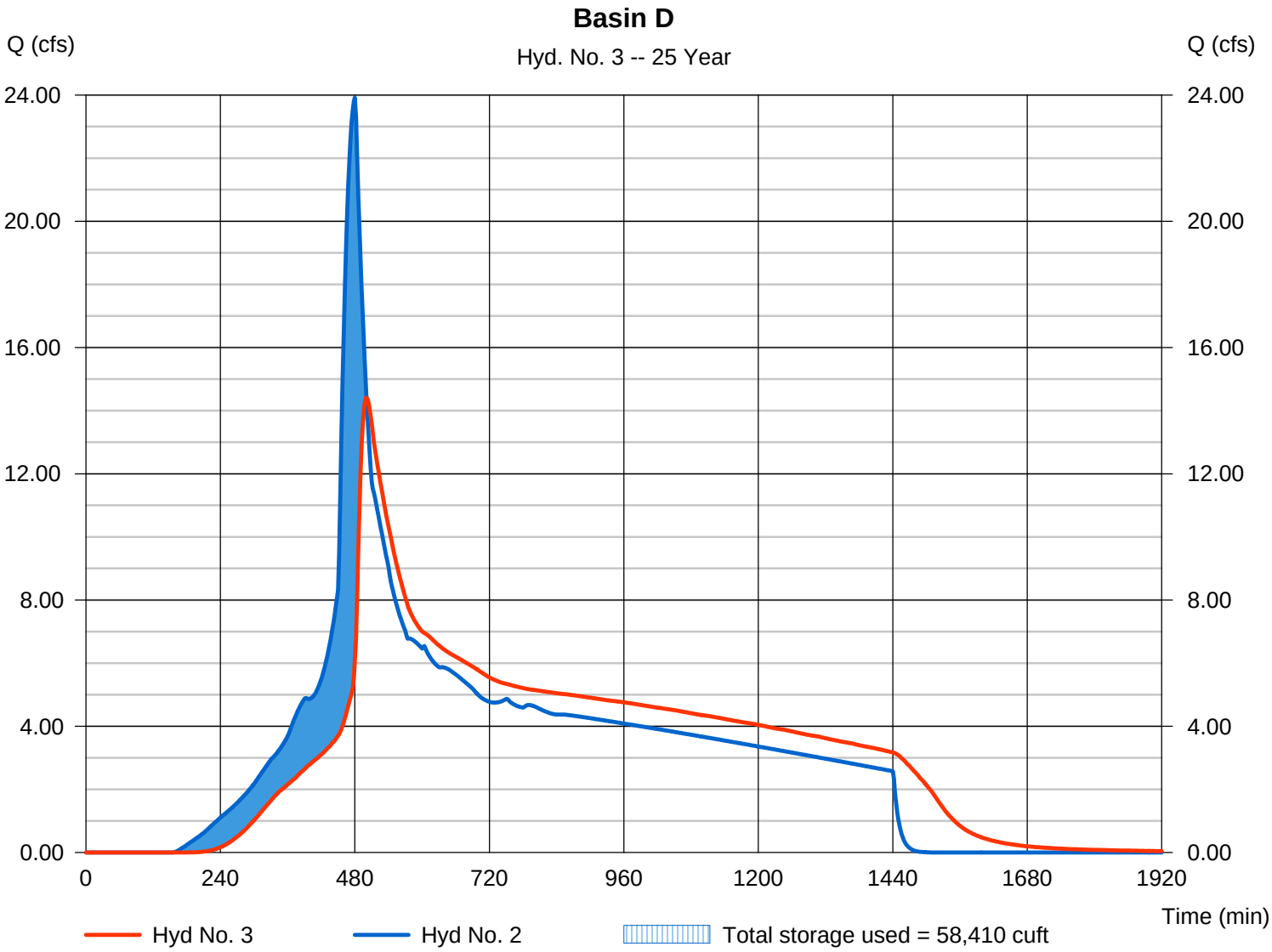
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin D

Hydrograph type	=	Reservoir	Peak discharge	=	14.41 cfs
Storm frequency	=	25 yrs	Time to peak	=	500 min
Time interval	=	2 min	Hyd. volume	=	358,620 cuft
Inflow hyd. No.	=	2 - Basin D - Post	Max. Elevation	=	104.51 ft
Reservoir name	=	Pond D	Max. Storage	=	58,410 cuft

Storage Indication method used.



Hydrograph Report

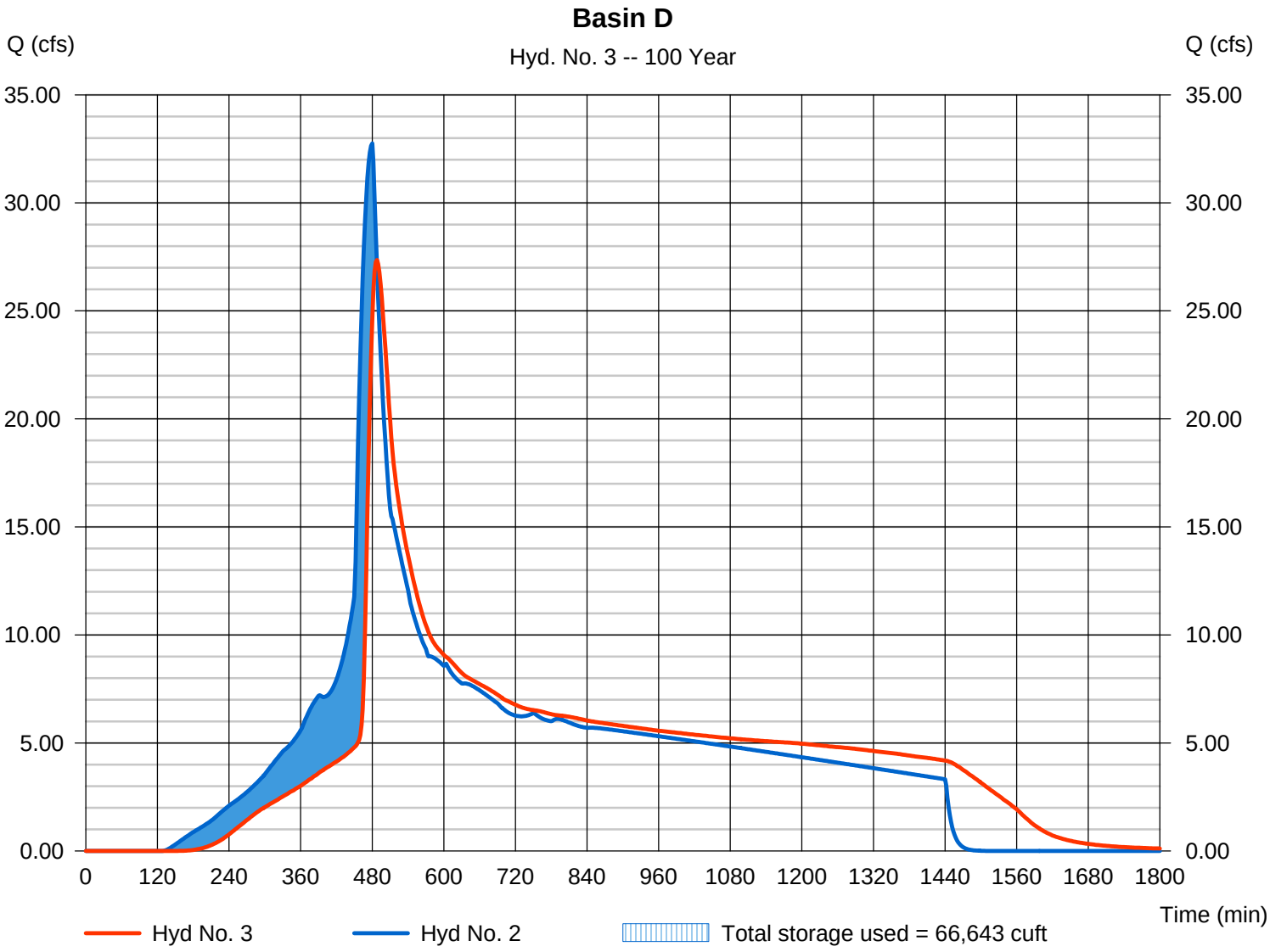
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin D

Hydrograph type	=	Reservoir	Peak discharge	=	27.35 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	485,860 cuft
Inflow hyd. No.	=	2 - Basin D - Post	Max. Elevation	=	105.01 ft
Reservoir name	=	Pond D	Max. Storage	=	66,643 cuft

Storage Indication method used.



Hydrograph Report

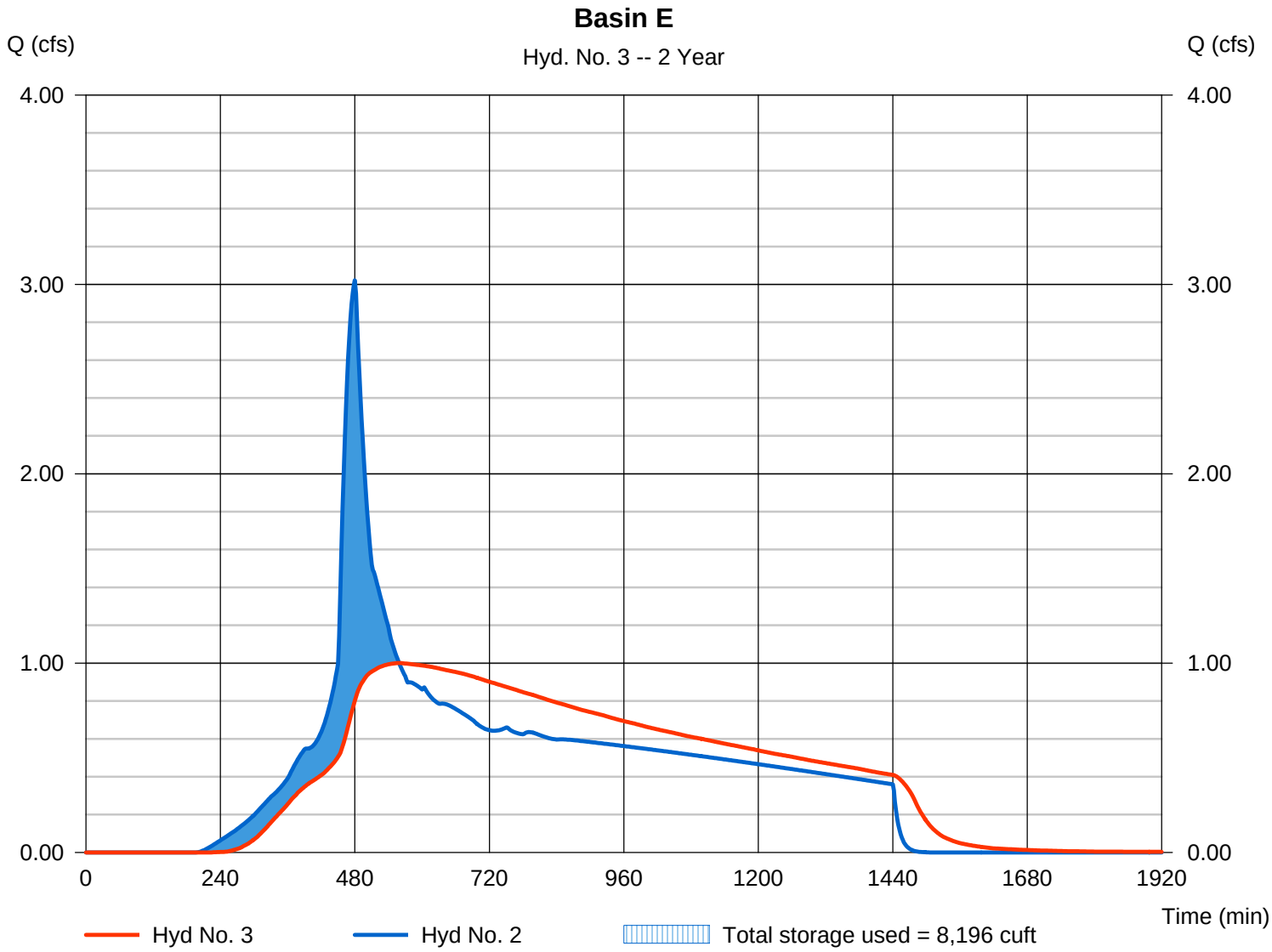
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	1.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	558 min
Time interval	=	2 min	Hyd. volume	=	46,534 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	102.61 ft
Reservoir name	=	Pond E	Max. Storage	=	8,196 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond E

Pond Data

Trapezoid - Bottom L x W = 48.0 x 48.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	2,304	0	0
0.50	100.50	2,601	1,226	1,226
1.00	101.00	2,916	1,379	2,604
1.50	101.50	3,249	1,540	4,144
2.00	102.00	3,600	1,711	5,856
2.50	102.50	3,969	1,891	7,747
3.00	103.00	4,356	2,080	9,828
3.50	103.50	4,761	2,278	12,106
4.00	104.00	5,184	2,485	14,592
4.50	104.50	5,625	2,701	17,293
5.00	105.00	6,084	2,926	20,220

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	5.06	9.00	0.00
Span (in)	= 24.00	5.06	9.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	102.60	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	2.00	0.00	0.00
Crest El. (ft)	= 104.00	103.41	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.05	123	100.05	0.00 ic	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	0.005
0.10	245	100.10	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.022
0.15	368	100.15	0.05 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.050
0.20	490	100.20	0.09 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.086
0.25	613	100.25	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.132
0.30	735	100.30	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.182
0.35	858	100.35	0.24 ic	0.23 ic	0.00	---	0.00	0.00	---	---	---	---	0.232
0.40	980	100.40	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.283
0.45	1,103	100.45	0.32 ic	0.32 ic	0.00	---	0.00	0.00	---	---	---	---	0.321
0.50	1,226	100.50	0.35 ic	0.35 ic	0.00	---	0.00	0.00	---	---	---	---	0.349
0.55	1,363	100.55	0.38 ic	0.37 ic	0.00	---	0.00	0.00	---	---	---	---	0.375
0.60	1,501	100.60	0.41 ic	0.40 ic	0.00	---	0.00	0.00	---	---	---	---	0.398
0.65	1,639	100.65	0.44 ic	0.42 ic	0.00	---	0.00	0.00	---	---	---	---	0.420
0.70	1,777	100.70	0.44 ic	0.44 ic	0.00	---	0.00	0.00	---	---	---	---	0.445
0.75	1,915	100.75	0.48 ic	0.47 ic	0.00	---	0.00	0.00	---	---	---	---	0.465
0.80	2,053	100.80	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.485
0.85	2,190	100.85	0.52 ic	0.51 ic	0.00	---	0.00	0.00	---	---	---	---	0.507
0.90	2,328	100.90	0.52 ic	0.52 ic	0.00	---	0.00	0.00	---	---	---	---	0.524
0.95	2,466	100.95	0.56 ic	0.54 ic	0.00	---	0.00	0.00	---	---	---	---	0.545
1.00	2,604	101.00	0.56 ic	0.56 ic	0.00	---	0.00	0.00	---	---	---	---	0.562
1.05	2,758	101.05	0.60 ic	0.58 ic	0.00	---	0.00	0.00	---	---	---	---	0.581
1.10	2,912	101.10	0.60 ic	0.60 ic	0.00	---	0.00	0.00	---	---	---	---	0.599
1.15	3,066	101.15	0.64 ic	0.61 ic	0.00	---	0.00	0.00	---	---	---	---	0.614
1.20	3,220	101.20	0.64 ic	0.63 ic	0.00	---	0.00	0.00	---	---	---	---	0.632
1.25	3,374	101.25	0.65 ic	0.65 ic	0.00	---	0.00	0.00	---	---	---	---	0.647
1.30	3,528	101.30	0.69 ic	0.66 ic	0.00	---	0.00	0.00	---	---	---	---	0.663
1.35	3,682	101.35	0.69 ic	0.68 ic	0.00	---	0.00	0.00	---	---	---	---	0.680
1.40	3,836	101.40	0.69 ic	0.69 ic	0.00	---	0.00	0.00	---	---	---	---	0.694
1.45	3,990	101.45	0.73 ic	0.71 ic	0.00	---	0.00	0.00	---	---	---	---	0.709
1.50	4,144	101.50	0.73 ic	0.72 ic	0.00	---	0.00	0.00	---	---	---	---	0.725
1.55	4,316	101.55	0.74 ic	0.74 ic	0.00	---	0.00	0.00	---	---	---	---	0.738
1.60	4,487	101.60	0.78 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.751
1.65	4,658	101.65	0.78 ic	0.77 ic	0.00	---	0.00	0.00	---	---	---	---	0.766

Continues on next page...

Pond E

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.70	4,829	101.70	0.78 ic	0.78 ic	0.00	---	0.00	0.00	---	---	---	---	0.781
1.75	5,000	101.75	0.79 ic	0.79 ic	0.00	---	0.00	0.00	---	---	---	---	0.793
1.80	5,171	101.80	0.84 ic	0.81 ic	0.00	---	0.00	0.00	---	---	---	---	0.806
1.85	5,343	101.85	0.84 ic	0.82 ic	0.00	---	0.00	0.00	---	---	---	---	0.820
1.90	5,514	101.90	0.84 ic	0.83 ic	0.00	---	0.00	0.00	---	---	---	---	0.834
1.95	5,685	101.95	0.84 ic	0.84 ic	0.00	---	0.00	0.00	---	---	---	---	0.845
2.00	5,856	102.00	0.89 ic	0.86 ic	0.00	---	0.00	0.00	---	---	---	---	0.857
2.05	6,045	102.05	0.89 ic	0.87 ic	0.00	---	0.00	0.00	---	---	---	---	0.870
2.10	6,234	102.10	0.89 ic	0.88 ic	0.00	---	0.00	0.00	---	---	---	---	0.883
2.15	6,423	102.15	0.89 ic	0.89 ic	0.00	---	0.00	0.00	---	---	---	---	0.895
2.20	6,613	102.20	0.95 ic	0.91 ic	0.00	---	0.00	0.00	---	---	---	---	0.905
2.25	6,802	102.25	0.95 ic	0.92 ic	0.00	---	0.00	0.00	---	---	---	---	0.918
2.30	6,991	102.30	0.95 ic	0.93 ic	0.00	---	0.00	0.00	---	---	---	---	0.930
2.35	7,180	102.35	0.95 ic	0.94 ic	0.00	---	0.00	0.00	---	---	---	---	0.942
2.40	7,369	102.40	0.95 ic	0.95 ic	0.00	---	0.00	0.00	---	---	---	---	0.953
2.45	7,558	102.45	1.01 ic	0.96 ic	0.00	---	0.00	0.00	---	---	---	---	0.963
2.50	7,747	102.50	1.01 ic	0.97 ic	0.00	---	0.00	0.00	---	---	---	---	0.974
2.55	7,956	102.55	1.01 ic	0.99 ic	0.00	---	0.00	0.00	---	---	---	---	0.986
2.60	8,164	102.60	1.01 ic	1.00 ic	0.00 ic	---	0.00	0.00	---	---	---	---	0.997
2.65	8,372	102.65	1.02 ic	1.01 ic	0.01 ic	---	0.00	0.00	---	---	---	---	1.017
2.70	8,580	102.70	1.07 ic	1.02 ic	0.04 ic	---	0.00	0.00	---	---	---	---	1.055
2.75	8,788	102.75	1.13 ic	1.03 ic	0.09 ic	---	0.00	0.00	---	---	---	---	1.112
2.80	8,996	102.80	1.20 ic	1.03 ic	0.15 ic	---	0.00	0.00	---	---	---	---	1.182
2.85	9,204	102.85	1.27 ic	1.04 ic	0.22 ic	---	0.00	0.00	---	---	---	---	1.265
2.90	9,412	102.90	1.41 ic	1.05 ic	0.31 ic	---	0.00	0.00	---	---	---	---	1.361
2.95	9,620	102.95	1.48 ic	1.05 ic	0.41 ic	---	0.00	0.00	---	---	---	---	1.464
3.00	9,828	103.00	1.58 ic	1.06 ic	0.52 ic	---	0.00	0.00	---	---	---	---	1.582
3.05	10,056	103.05	1.73 ic	1.07 ic	0.63 ic	---	0.00	0.00	---	---	---	---	1.701
3.10	10,284	103.10	1.83 ic	1.07 ic	0.76 ic	---	0.00	0.00	---	---	---	---	1.829
3.15	10,512	103.15	1.99 ic	1.08 ic	0.88 ic	---	0.00	0.00	---	---	---	---	1.956
3.20	10,739	103.20	2.09 ic	1.09 ic	1.00 ic	---	0.00	0.00	---	---	---	---	2.086
3.25	10,967	103.25	2.28 ic	1.09 ic	1.12 ic	---	0.00	0.00	---	---	---	---	2.211
3.30	11,195	103.30	2.38 ic	1.10 ic	1.22 ic	---	0.00	0.00	---	---	---	---	2.321
3.35	11,423	103.35	2.48 ic	1.11 ic	1.30 ic	---	0.00	0.00	---	---	---	---	2.408
3.40	11,651	103.40	2.50 ic	1.11 ic	1.39 ic	---	0.00	0.00	---	---	---	---	2.500
3.45	11,879	103.45	2.70 ic	1.12 ic	1.47 ic	---	0.00	0.05	---	---	---	---	2.639
3.50	12,106	103.50	2.92 ic	1.12 ic	1.54 ic	---	0.00	0.18	---	---	---	---	2.845
3.55	12,355	103.55	3.15 ic	1.13 ic	1.61 ic	---	0.00	0.35	---	---	---	---	3.089
3.60	12,604	103.60	3.39 ic	1.13 ic	1.68 ic	---	0.00	0.55	---	---	---	---	3.365
3.65	12,852	103.65	3.66 ic	1.13 ic	1.75 ic	---	0.00	0.78	---	---	---	---	3.664
3.70	13,101	103.70	4.03 ic	1.14 ic	1.81 ic	---	0.00	1.04	---	---	---	---	3.987
3.75	13,349	103.75	4.33 ic	1.14 ic	1.87 ic	---	0.00	1.32	---	---	---	---	4.331
3.80	13,598	103.80	4.72 ic	1.14 ic	1.93 ic	---	0.00	1.62	---	---	---	---	4.695
3.85	13,846	103.85	5.16 ic	1.14 ic	1.99 ic	---	0.00	1.94	---	---	---	---	5.075
3.90	14,095	103.90	5.47 ic	1.14 ic	2.05 ic	---	0.00	2.28	---	---	---	---	5.474
3.95	14,343	103.95	5.89 oc	1.15 ic	2.10 ic	---	0.00	2.64	---	---	---	---	5.889
4.00	14,592	104.00	6.38 oc	1.14 ic	2.15 ic	---	0.00	3.02	---	---	---	---	6.315
4.05	14,862	104.05	6.99 oc	1.14 ic	2.21 ic	---	0.23	3.41	---	---	---	---	6.986
4.10	15,132	104.10	7.91 oc	1.12 ic	2.26 ic	---	0.66	3.82	---	---	---	---	7.858
4.15	15,402	104.15	8.93 oc	1.10 ic	2.31 ic	---	1.22	4.24	---	---	---	---	8.864
4.20	15,673	104.20	9.98 oc	1.08 ic	2.35 ic	---	1.87	4.68	---	---	---	---	9.980
4.25	15,943	104.25	11.15 oc	1.00 ic	2.40 ic	---	2.61	5.13	---	---	---	---	11.14
4.30	16,213	104.30	12.46 oc	0.98 ic	2.45 ic	---	3.44	5.59	---	---	---	---	12.46
4.35	16,483	104.35	13.85 oc	0.96 ic	2.49 ic	---	4.33	6.07	---	---	---	---	13.85
4.40	16,753	104.40	15.32 oc	0.92 ic	2.54 ic	---	5.29	6.56	---	---	---	---	15.32
4.45	17,023	104.45	16.84 oc	0.88 ic	2.58 ic	---	6.31	7.06	---	---	---	---	16.84
4.50	17,293	104.50	18.43 oc	0.83 ic	2.63 ic	---	7.39	7.58	---	---	---	---	18.43
4.55	17,586	104.55	19.89 oc	0.78 ic	2.47 ic	---	8.53	8.11	---	---	---	---	19.89
4.60	17,879	104.60	21.33 oc	0.72 ic	2.27 ic	---	9.72	8.62 s	---	---	---	---	21.33
4.65	18,171	104.65	22.53 oc	0.66 ic	2.09 ic	---	10.96	8.82 s	---	---	---	---	22.53
4.70	18,464	104.70	23.59 oc	0.60 ic	1.91 ic	---	12.25	8.83 s	---	---	---	---	23.59
4.75	18,757	104.75	24.47 oc	0.55 ic	1.75 ic	---	13.42 s	8.75 s	---	---	---	---	24.47
4.80	19,049	104.80	25.09 oc	0.52 ic	1.64 ic	---	14.17 s	8.76 s	---	---	---	---	25.09
4.85	19,342	104.85	25.62 oc	0.49 ic	1.55 ic	---	14.80 s	8.79 s	---	---	---	---	25.62
4.90	19,635	104.90	26.08 oc	0.46 ic	1.46 ic	---	15.35 s	8.81 s	---	---	---	---	26.08
4.95	19,927	104.95	26.51 oc	0.44 ic	1.39 ic	---	15.84 s	8.83 s	---	---	---	---	26.51
5.00	20,220	105.00	26.90 oc	0.42 ic	1.33 ic	---	16.29 s	8.85 s	---	---	---	---	26.89

...End

Hydrograph Report

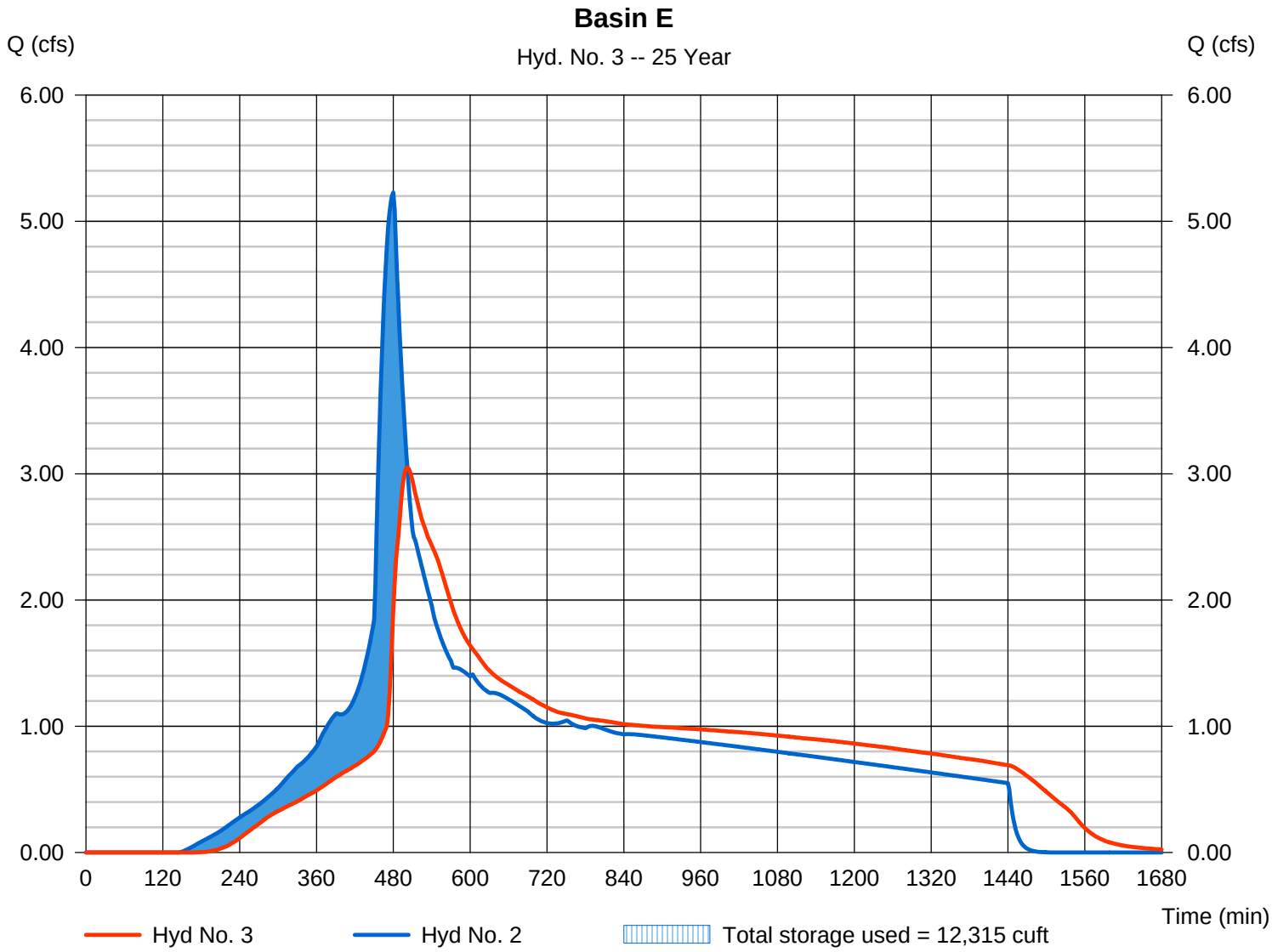
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	3.050 cfs
Storm frequency	=	25 yrs	Time to peak	=	502 min
Time interval	=	2 min	Hyd. volume	=	77,989 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	103.54 ft
Reservoir name	=	Pond E	Max. Storage	=	12,315 cuft

Storage Indication method used.



Hydrograph Report

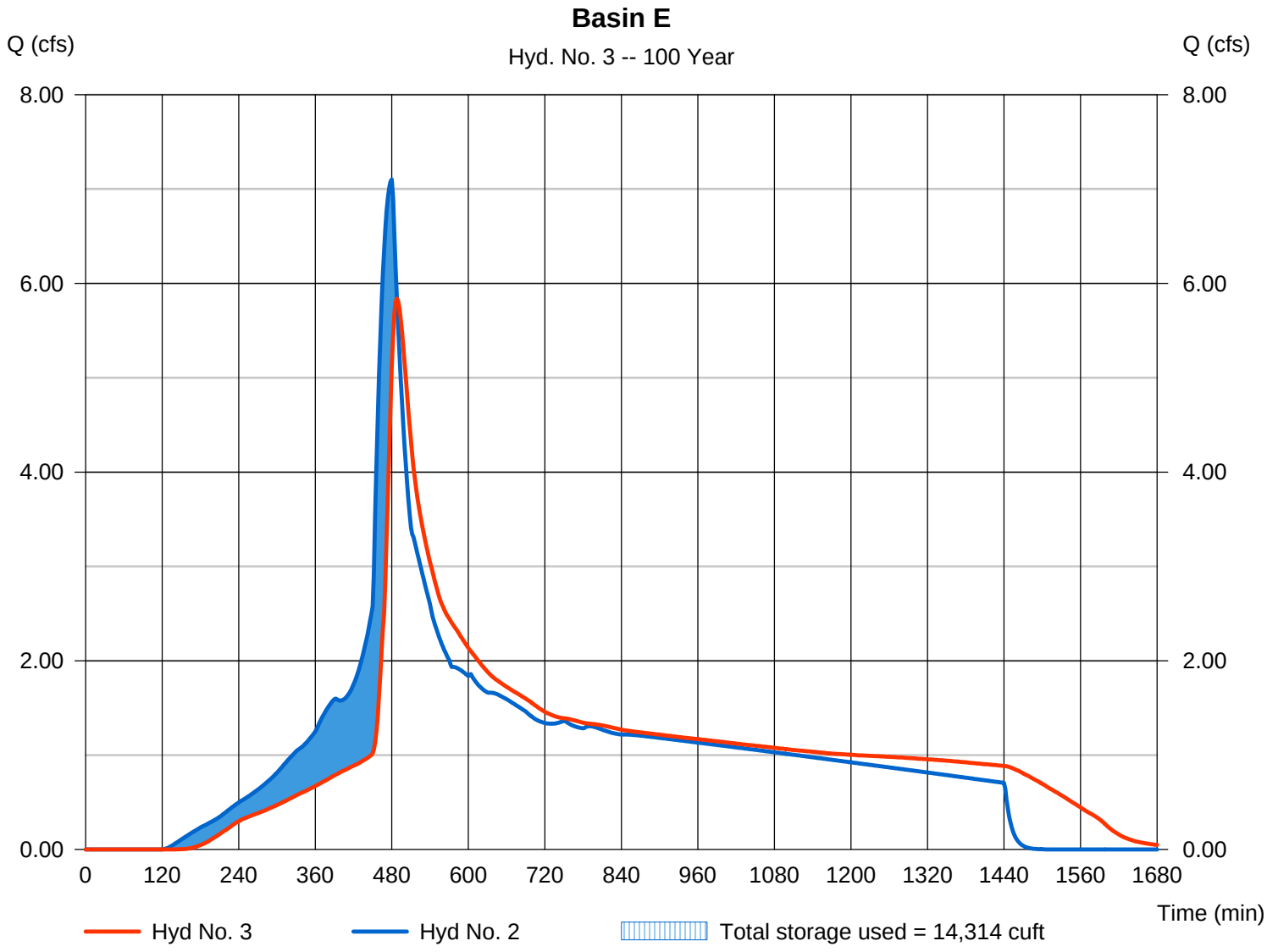
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	5.839 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	105,081 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	103.94 ft
Reservoir name	=	Pond E	Max. Storage	=	14,314 cuft

Storage Indication method used.



D.3 ALTERNATIVE 3A – NO ANNEXATION, DEVELOPMENT WITHIN THE COUNTY UNDER SINGLE OWNERSHIP

Drainage Calculations

ALTERNATIVE 2 and 3A

BASIN A

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	369.14	C	Woods (Fair Condition)	73
OPEN SPACE (SOUTH)	369.13	C	Woods (Poor Condition)	77
TOTAL PERVIOUS	738.27	N/A	N/A	75

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (WEST)	19.9	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	34.05	C	Woods (Mix Good & Fair Conditions)	72
OPEN SPACE (EAST)	30.69	C	Woods (Fair Condition)	73
TOTAL PERVIOUS	84.64	N/A	N/A	76

TOTAL AREA CHECK **822.91 ac.** **$CN_{WEIGHTED}$** **75**

ALTERNATIVE 2 and 3A

BASIN A

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin A towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	84.64	acres	
Total area (w/upstream open space) =	822.91	acres	
Pervious area (w/o upstream open space) =	84.64	acres	76 CN
Pervious area (w/upstream open space) =	822.91	acres	75 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1763	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.0325	ft/ft	S_2 =	0.05	ft/ft	S_3 =	0.1	ft/ft
k_1 =	17		k_2 =	17		k_3 =	17	
V_1 =	3.06	fps	V_2 =	3.80	fps	V_3 =	5.38	fps
T_1 =	9.59	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 9.59 min

ALTERNATIVE 2 and 3A

BASIN B

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	160.95	C	Woods (Fair Condition)	73
OPEN SPACE (SOUTH)	160.96	C	Woods (Poor Condition)	77
TOTAL PERVIOUS	321.91	N/A	N/A	75

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	15.95	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	26.66	C	Woods (Fair Condition)	77
OPEN SPACE (SOUTH)	14.92	C	Woods (Poor Condition)	73
TOTAL PERVIOUS	57.53	N/A	N/A	78

TOTAL AREA CHECK **379.44 ac.** **$CN_{WEIGHTED}$** **76**

BASIN B

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin B towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	57.53	acres	
Total area (w/upstream open space) =	379.44	acres	
Pervious area (w/o upstream open space) =	57.53	acres	78 CN
Pervious area (w/upstream open space) =	379.44	acres	76 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1007	ft	L_2 =	679	ft	L_3 =	0	ft
S_1 =	0.1	ft/ft	S_2 =	0.03	ft/ft	S_3 =	0.1	ft/ft
k_1 =	17		k_2 =	17		k_3 =	17	
V_1 =	5.38	fps	V_2 =	2.94	fps	V_3 =	5.38	fps
T_1 =	3.12	min.	T_2 =	3.84	min.	T_3 =	0.00	min.

Tc= 6.97 min

ALTERNATIVE 2 and 3A

BASIN C

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	497.17	D	Woods (Fair Condition)	79
OPEN SPACE (SOUTH)	497.16	D	Pasture (Good Condition)	80
TOTAL PERVIOUS	994.33	N/A	N/A	79

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	76.07	C	Pasture (Poor Condition)	86
OPEN SPACE (CENTRAL)	0	C	Woods (Fair Condition)	77
OPEN SPACE (SOUTH)	103.69	D	Woods (Poor Condition)	73
TOTAL PERVIOUS	179.76	N/A	N/A	79

TOTAL AREA CHECK **1174.1 ac.** $CN_{WEIGHTED}$ **79**

BASIN C

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin C towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	179.76	acres	
Total area (w/upstream open space) =	1174.10	acres	
Pervious area (w/o upstream open space) =	179.76	acres	79 CN
Pervious area (w/upstream open space) =	1174.10	acres	79 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	3626	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.045	ft/ft	S_2 =	0.16	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	17		k_3 =	0	
V_1 =	3.61	fps	V_2 =	6.80	fps	V_3 =	0.00	fps
T_1 =	16.76	min.	T_2 =	0.00	min.	T_3 =	0	min.

Tc= 16.76 min

ALTERNATIVE 2 and 3A

BASIN D

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	143.98	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	143.99	D	Pasture/Range (Good Condition)	80
TOTAL PERVIOUS	287.97	N/A	N/A	80

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	22.53	D	Pasture/Range (Good Condition)	80
OPEN SPACE (CENTRAL)	0	D	Woods (Fair Condition)	79
OPEN SPACE (SOUTH)	7.25	D	Woods (Fair Condition)	79
TOTAL PERVIOUS	29.78	N/A	N/A	80

TOTAL AREA CHECK **317.75 ac.** **$CN_{WEIGHTED}$** **80**

BASIN D

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin D towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	29.78	acres	
Total area (w/upstream open space) =	317.75	acres	
Pervious area (w/o upstream open space) =	29.78	acres	80 CN
Pervious area (w/upstream open space) =	317.75	acres	80 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1190	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.13	ft/ft	S_2 =	0	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	0		k_3 =	0	
V_1 =	6.13	fps	V_2 =	0.00	fps	V_3 =	0.00	fps
T_1 =	3.24	min.	T_2 =	0	min.	T_3 =	0	min.

Tc= 3.24 min

ALTERNATIVE 2 and 3A

BASIN E

UPSTREAM OPEN SPACE

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	38.61	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	38.61	D	Pasture/Range (Good Condition)	80
TOTAL PERVIOUS	77.22	N/A	N/A	80

DEVELOPMENT

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
OPEN SPACE (NORTH)	0	D	Pasture/Range (Good Condition)	80
OPEN SPACE (CENTRAL)	6.29	D	Pasture/Range (Good Condition)	80
OPEN SPACE (SOUTH)	0	D	Woods (Fair Condition)	79
TOTAL PERVIOUS	6.29	N/A	N/A	80

TOTAL AREA CHECK **83.51** **ac.** **$CN_{WEIGHTED}$** **80**

BASIN E

PRE-DEVELOPMENT CONDITIONS

Under the existing conditions the runoff will begin flowing as Open Channel Flow from the top of the mountain at the north end of Basin E towards the southerly portion of the City Heights project.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	6.29	acres	
Total area (w/upstream open space) =	83.51	acres	
Pervious area (w/o upstream open space) =	6.29	acres	80 CN
Pervious area (w/upstream open space) =	83.51	acres	80 CN
Impervious area =	0.00	acres	0 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	1792	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0.08	ft/ft	S_2 =	0.13	ft/ft	S_3 =	0	ft/ft
k_1 =	17		k_2 =	17		k_3 =	0	
V_1 =	4.81	fps	V_2 =	6.13	fps	V_3 =	0.00	fps
T_1 =	6.21	min.	T_2 =	0.00	min.	T_3 =	0	min.

Tc= 6.21 min

ALTERNATIVE 2 and 3A

BASIN A

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	14	48%	6.72	11%	5.98	8.02
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	8	56%	4.48	11%	3.99	4.01
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	18.8	70%	13.16	11%	11.71	7.09
COMMERCIAL	2	85%	1.7	11%	1.51	0.49
DEVELOPMENT TOTAL	42.8	N/A	26.06	11%	23.19	19.61

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	738.27	C	Woods (Mix Fair & Poor Condition)	75
OPEN SPACE/BUFFER	33.48	C	Woods (Poor Condition)	77
PARKS	1.14	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	19.61	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	54.2266	N/A	N/A	78
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	792.497	N/A	N/A	75

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0.4	C	Ponds and watercourses	100
ROADWAY	6.82	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	23.19	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	30.41	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **84.64** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **822.91** **ac.**

ALTERNATIVE 2 and 3A

BASIN A

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin A is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	84.64	acres	
Total area (w/upstream open space) =	822.91	acres	
Pervious area (w/o upstream open space) =	54.23	acres	78 CN
Pervious area (w/upstream open space) =	792.50	acres	75 CN
Impervious area =	30.41	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.05	ft/ft	S_3 =	0.1	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	3.80	fps	V_3 =	5.38	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min. assumed

ALTERNATIVE 2 and 3A

BASIN B

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	9.6	48%	4.61	11%	4.10	5.50
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	13.5	56%	7.56	11%	6.73	6.77
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0.00	11%	0.00	0.00
COMMERCIAL	0	85%	0.00	11%	0.00	0.00
DEVELOPMENT TOTAL	23.1	N/A	12.17	11%	10.83	12.27

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	321.91	C	Woods (Mix Fair & Poor Condition)	75
OPEN SPACE/BUFFER	28.46	C	Woods (Poor Condition)	77
PARKS	1.03	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	12.27	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	41.76	N/A	N/A	78
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	363.67	N/A	N/A	75

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0.88	C	Ponds and watercourses	100
ROADWAY	4.06	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	10.83	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	15.77	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **57.53** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **379.44** **ac.**

BASIN B

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin B is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	57.53	acres	
Total area (w/upstream open space) =	379.44	acres	
Pervious area (w/o upstream open space) =	41.76	acres	78 CN
Pervious area (w/upstream open space) =	363.67	acres	75 CN
Impervious area =	15.77	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.03	ft/ft	S_3 =	0.1	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	2.94	fps	V_3 =	5.38	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

BASIN C

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	67.8	48%	32.54	11%	28.96	38.84
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	15.9	56%	8.90	11%	7.92	7.98
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	11%	0.00	0.00
COMMERCIAL	2.2	85%	1.87	11%	1.66	0.54
DEVELOPMENT TOTAL	85.9	N/A	43.32	11%	38.55	47.35

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	994.33	D	Mix Woods (Fair C.) & Pasture (Good C.)	79
OPEN SPACE/BUFFER	79.24	D	Woods (Fair Condition)	79
PARKS	2.33	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	47.35	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	128.92	N/A	N/A	79
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	1123.25	N/A	N/A	79

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	12.29	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	38.55	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	50.84	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **179.76** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **1174.09** **ac.**

BASIN C

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin C is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	179.76	acres	
Total area (w/upstream open space) =	1174.09	acres	
Pervious area (w/o upstream open space) =	128.92	acres	79 CN
Pervious area (w/upstream open space) =	1123.25	acres	79 CN
Impervious area =	50.84	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.045	ft/ft	S_3 =	0.16	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	3.61	fps	V_3 =	6.80	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

BASIN D

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	13.8	48%	6.62	11%	5.90	7.90
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	0	56%	0	11%	0.00	0.00
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	11%	0.00	0.00
COMMERCIAL	0	85%	0	11%	0.00	0.00
DEVELOPMENT TOTAL	13.8	N/A	6.62	11%	5.90	7.90

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	287.97	D	Pasture/Range (Good Condition)	80
OPEN SPACE/BUFFER	11.93	D	Pasture/Range (Good Condition)	80
PARKS	0	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	7.90	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	19.83	N/A	N/A	80
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	307.80	N/A	N/A	80

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	4.05	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	5.90	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	9.95	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **29.78** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **317.75** **ac.**

ALTERNATIVE 2 and 3A

BASIN D

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin D is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	29.78	acres	
Total area (w/upstream open space) =	317.75	acres	
Pervious area (w/o upstream open space) =	19.83	acres	80 CN
Pervious area (w/upstream open space) =	307.80	acres	80 CN
Impervious area =	9.95	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0	ft/ft	S_3 =	0.13	ft/ft
k_1 =	0		k_2 =	0		k_3 =	17	
V_1 =	0.00	fps	V_2 =	0.00	fps	V_3 =	6.13	fps
T_1 =	0	min.	T_2 =	0	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

BASIN E

DEVELOPMENT AREA BREAKDOWN	AREA (acres)	% Impervious*	Alternatve 1 Impervious Area (acres)	% Difference from Alternative 1	IMPERVIOUS AREA (acres)	PERVIOUS AREA (acres)
LOW DENSITY RESIDENTIAL (5.0 DU/GA)	5.6	48%	2.69	11%	2.39	3.21
MEDIUM DENSITY RESIDENTIAL (7.0 DU/GA)	0	56%	0	11%	0.00	0.00
HIGH DENSITY RESIDENTIAL (9.0 DU/GA)	0	70%	0	11%	0.00	0.00
COMMERCIAL	0	85%	0	11%	0.00	0.00
DEVELOPMENT TOTAL	5.6	N/A	2.69	11%	2.39	3.21

PERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
UPSTREAM OPEN SPACE	77.22	D	Pasture/Range (Good Condition)	80
OPEN SPACE/BUFFER	0.58	D	Pasture/Range (Good Condition)	80
PARKS	0	C	Parks, Lawns (Fair Condition)	79
DEVELOPMENT TOTAL	3.21	C	Lawns (Fair Condition)	79
TOTAL PERVIOUS (W/O UPSTREAM OPEN SPACE)	3.79	N/A	N/A	79
TOTAL PERVIOUS (W/UPSTREAM OPEN SPACE)	81.01	N/A	N/A	80

IMPERVIOUS AREAS

AREA	AREA (acres)	HYDROLOGIC SOIL GROUP	DESCRIPTION	CN
PONDS	0	C	Ponds and watercourses	100
ROADWAY	0.11	C	Paved roads and shoulders	98
DEVELOPMENT TOTAL	2.39	C	Rooftops, driveways, paths	98
TOTAL IMPERVIOUS	2.50	N/A	N/A	98

TOTAL AREA CHECK (W/O UPSTREAM OPEN SPACE) **6.29** **ac**

TOTAL AREA CHECK (W/UPSTREAM OPEN SPACE) **83.51** **ac.**

BASIN E

POST-DEVELOPMENT CONDITIONS

The post-development run-off flow path for Basin E is not clearly defined at this time. It is assumed that the post development time of concentation for City Heights project is 10 minutes.

The Soil Survey of Kittitas County Area, Washington identifies the soil in this area as a Type "D" soil.

CALCULATE TIME OF CONCENTRATION

Total area (w/o upstream open space) =	6.29	acres	
Total area (w/upstream open space) =	83.51	acres	
Pervious area (w/o upstream open space) =	3.79	acres	79 CN
Pervious area (w/upstream open space) =	81.01	acres	80 CN
Impervious area =	2.50	acres	98 CN

Calculate Time of Concentration assuming Open Channel Flow approach:

$$V = k\sqrt{S_o} \qquad T_t = \frac{L}{60V}$$

L_1 =	0	ft	L_2 =	0	ft	L_3 =	0	ft
S_1 =	0	ft/ft	S_2 =	0.13	ft/ft	S_3 =	0.13	ft/ft
k_1 =	0		k_2 =	17		k_3 =	17	
V_1 =	0.00	fps	V_2 =	6.13	fps	V_3 =	6.13	fps
T_1 =	0	min.	T_2 =	0.00	min.	T_3 =	0.00	min.

Tc= 10.00 min. assumed

Tc= 10.00 min.

ALTERNATIVE 2 and 3A

2-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	54.23	30.41	10	3.34	8.00	576,919	36.50
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	3.34	8.00	384,193	20.07
3	Basin B (post)	57.53	78.00	98.00	41.76	15.77	10	3.34	8.00	360,197	22.10
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	3.34	8.00	287,540	15.90
5	Basin C (post)	179.76	79.00	98.00	128.92	50.84	10	3.34	8.00	1,030,960	61.01
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	3.34	8.03	941,429	47.15
7	Basin D (post)	29.78	80.00	98.00	19.83	9.95	10	3.34	8.00	211,594	13.57
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	3.34	8.00	163,278	9.46
9	Basin E (post)	6.29	79.00	98.00	3.79	2.50	10	3.34	8.00	46,560	3.02
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	3.34	8.00	34,487	2.00

ALTERNATIVE 2 and 3A

25-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	54.23	30.41	10	4.84	8.00	989,470	65.58
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	4.84	8.00	738,703	44.64
3	Basin B (post)	57.53	78.00	98.00	41.76	15.77	10	4.84	8.00	632,705	41.33
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	4.84	8.00	538,043	33.40
5	Basin C (post)	179.76	79.00	98.00	128.92	50.84	10	4.84	8.00	1,856,044	119.10
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	4.84	8.00	1,738,611	97.49
7	Basin D (post)	29.78	80.00	98.00	19.83	9.95	10	4.84	8.00	358,676	23.92
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	4.84	8.00	297,683	18.91
9	Basin E (post)	6.29	79.00	98.00	3.79	2.50	10	4.84	8.00	78,016	5.23
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	4.84	8.00	62,875	3.99

ALTERNATIVE 2 and 3A

100-YEAR, 24-HOUR STORM

No.	Element ID	Total Area (acres)	CN Pervious	CN Impervious	Pervious Area (acres)	Impervious Area (acres)	Tc (minutes)	Total Precipitation (inches)	Time Peak (hours)	Volume (ft^3)	Peak Runoff (cfs)
1	Basin A (post)	84.64	78.00	98.00	54.23	30.41	10	6.09	8.00	1,348,024	90.60
2	Basin A (pre)	84.64	76.00	98.00	84.64	0.00	10	6.09	8.00	1,062,416	67.44
3	Basin B (post)	57.53	78.00	98.00	41.76	15.77	10	6.09	8.00	871,876	58.13
4	Basin B (pre)	57.53	78.00	98.00	57.53	0.00	10	6.09	8.00	764,024	49.35
5	Basin C (post)	179.76	79.00	98.00	128.92	50.84	10	6.09	8.00	2,587,829	170.71
6	Basin C (pre)	179.76	79.00	98.00	179.76	0.00	16.76	6.09	8.00	2,453,585	143.45
7	Basin D (post)	29.78	80.00	98.00	19.83	9.95	10	6.09	8.00	485,916	32.76
8	Basin D (pre)	29.78	80.00	98.00	29.78	0.00	10	6.09	8.00	417,548	27.37
9	Basin E (post)	6.29	79.00	98.00	3.79	2.50	10	6.09	8.00	105,107	7.10
10	Basin E (pre)	6.29	80.00	98.00	6.29	0.00	10	6.09	8.00	88,193	5.78

Hydrograph Report

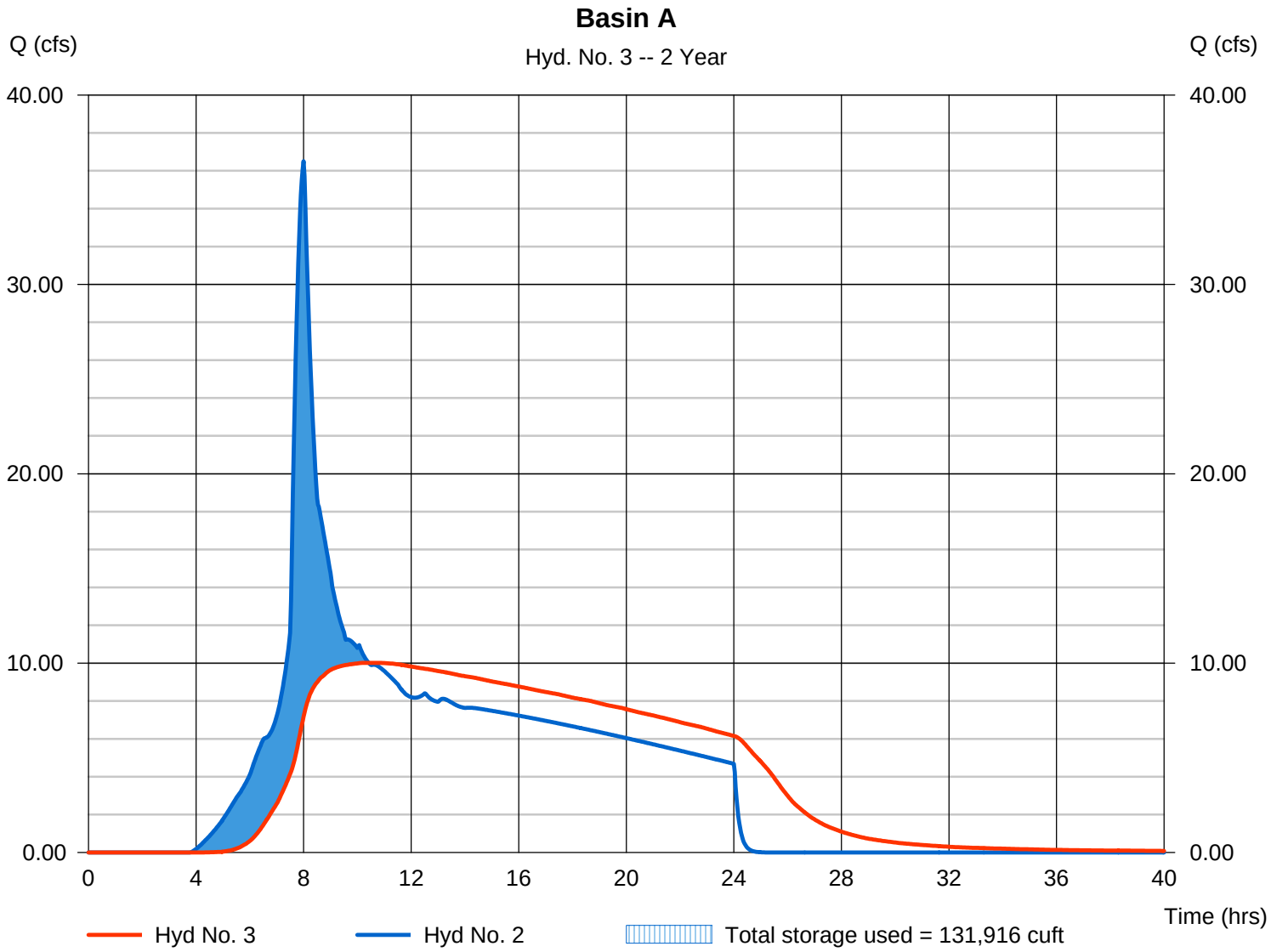
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	10.02 cfs
Storm frequency	=	2 yrs	Time to peak	=	10.43 hrs
Time interval	=	2 min	Hyd. volume	=	576,489 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	103.79 ft
Reservoir name	=	Pond A	Max. Storage	=	131,916 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond A

Pond Data

Trapezoid - Bottom L x W = 175.0 x 175.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	30,625	0	0
0.90	100.90	32,544	28,422	28,422
1.80	101.80	34,522	30,175	58,597
2.70	102.70	36,557	31,981	90,578
3.60	103.60	38,652	33,840	124,418
4.50	104.50	40,804	35,751	160,169
5.40	105.40	43,015	37,714	197,883
6.30	106.30	45,284	39,730	237,613
7.20	107.20	47,611	41,798	279,411
8.10	108.10	49,997	43,919	323,330
9.00	109.00	52,441	46,093	369,423

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 42.00	15.30	30.00	0.00
Span (in)	= 42.00	15.30	30.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	104.28	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	6.00	0.00	0.00
Crest El. (ft)	= 108.00	104.20	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	2,842	100.09	0.03 ic	0.03 ic	0.00	---	0.00	0.00	---	---	---	---	0.031
0.18	5,684	100.18	0.12 ic	0.12 ic	0.00	---	0.00	0.00	---	---	---	---	0.124
0.27	8,527	100.27	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.276
0.36	11,369	100.36	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.489
0.45	14,211	100.45	0.75 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.745
0.54	17,053	100.54	1.08 ic	1.07 ic	0.00	---	0.00	0.00	---	---	---	---	1.072
0.63	19,895	100.63	1.42 ic	1.42 ic	0.00	---	0.00	0.00	---	---	---	---	1.419
0.72	22,737	100.72	1.81 ic	1.81 ic	0.00	---	0.00	0.00	---	---	---	---	1.808
0.81	25,580	100.81	2.25 ic	2.23 ic	0.00	---	0.00	0.00	---	---	---	---	2.233
0.90	28,422	100.90	2.63 ic	2.63 ic	0.00	---	0.00	0.00	---	---	---	---	2.635
0.99	31,439	100.99	3.17 ic	3.13 ic	0.00	---	0.00	0.00	---	---	---	---	3.135
1.08	34,457	101.08	3.60 ic	3.60 ic	0.00	---	0.00	0.00	---	---	---	---	3.598
1.17	37,474	101.17	4.07 ic	4.04 ic	0.00	---	0.00	0.00	---	---	---	---	4.040
1.26	40,492	101.26	4.58 ic	4.40 ic	0.00	---	0.00	0.00	---	---	---	---	4.399
1.35	43,509	101.35	4.84 ic	4.70 ic	0.00	---	0.00	0.00	---	---	---	---	4.696
1.44	46,527	101.44	5.12 ic	4.96 ic	0.00	---	0.00	0.00	---	---	---	---	4.958
1.53	49,544	101.53	5.41 ic	5.21 ic	0.00	---	0.00	0.00	---	---	---	---	5.207
1.62	52,562	101.62	5.47 ic	5.47 ic	0.00	---	0.00	0.00	---	---	---	---	5.465
1.71	55,579	101.71	5.73 ic	5.73 ic	0.00	---	0.00	0.00	---	---	---	---	5.727
1.80	58,597	101.80	6.01 ic	5.96 ic	0.00	---	0.00	0.00	---	---	---	---	5.962
1.89	61,795	101.89	6.33 ic	6.17 ic	0.00	---	0.00	0.00	---	---	---	---	6.168
1.98	64,993	101.98	6.39 ic	6.39 ic	0.00	---	0.00	0.00	---	---	---	---	6.389
2.07	68,191	102.07	6.66 ic	6.63 ic	0.00	---	0.00	0.00	---	---	---	---	6.629
2.16	71,389	102.16	6.99 ic	6.81 ic	0.00	---	0.00	0.00	---	---	---	---	6.814
2.25	74,588	102.25	7.03 ic	7.03 ic	0.00	---	0.00	0.00	---	---	---	---	7.032
2.34	77,786	102.34	7.34 ic	7.23 ic	0.00	---	0.00	0.00	---	---	---	---	7.232
2.43	80,984	102.43	7.41 ic	7.41 ic	0.00	---	0.00	0.00	---	---	---	---	7.414
2.52	84,182	102.52	7.70 ic	7.63 ic	0.00	---	0.00	0.00	---	---	---	---	7.628
2.61	87,380	102.61	7.79 ic	7.79 ic	0.00	---	0.00	0.00	---	---	---	---	7.790
2.70	90,578	102.70	8.07 ic	8.00 ic	0.00	---	0.00	0.00	---	---	---	---	8.003
2.79	93,962	102.79	8.16 ic	8.16 ic	0.00	---	0.00	0.00	---	---	---	---	8.159
2.88	97,346	102.88	8.44 ic	8.36 ic	0.00	---	0.00	0.00	---	---	---	---	8.361
2.97	100,730	102.97	8.52 ic	8.52 ic	0.00	---	0.00	0.00	---	---	---	---	8.520

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Pond A

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	104,114	103.06	8.83 ic	8.70 ic	0.00	---	0.00	0.00	---	---	---	---	8.704
3.15	107,498	103.15	8.87 ic	8.87 ic	0.00	---	0.00	0.00	---	---	---	---	8.875
3.24	110,882	103.24	9.23 ic	9.03 ic	0.00	---	0.00	0.00	---	---	---	---	9.033
3.33	114,266	103.33	9.23 ic	9.22 ic	0.00	---	0.00	0.00	---	---	---	---	9.220
3.42	117,650	103.42	9.64 ic	9.35 ic	0.00	---	0.00	0.00	---	---	---	---	9.351
3.51	121,034	103.51	9.64 ic	9.53 ic	0.00	---	0.00	0.00	---	---	---	---	9.531
3.60	124,418	103.60	9.69 ic	9.69 ic	0.00	---	0.00	0.00	---	---	---	---	9.685
3.69	127,993	103.69	10.05 ic	9.83 ic	0.00	---	0.00	0.00	---	---	---	---	9.832
3.78	131,568	103.78	10.05 ic	10.00 ic	0.00	---	0.00	0.00	---	---	---	---	10.00
3.87	135,143	103.87	10.14 ic	10.14 ic	0.00	---	0.00	0.00	---	---	---	---	10.14
3.96	138,718	103.96	10.48 ic	10.29 ic	0.00	---	0.00	0.00	---	---	---	---	10.29
4.05	142,293	104.05	10.48 ic	10.45 ic	0.00	---	0.00	0.00	---	---	---	---	10.45
4.14	145,868	104.14	10.58 ic	10.58 ic	0.00	---	0.00	0.00	---	---	---	---	10.58
4.23	149,443	104.23	10.92 ic	10.73 ic	0.00	---	0.00	0.10	---	---	---	---	10.83
4.32	153,018	104.32	11.69 oc	10.80 ic	0.01 ic	---	0.00	0.83	---	---	---	---	11.64
4.41	156,593	104.41	12.84 oc	10.79 ic	0.13 ic	---	0.00	1.92	---	---	---	---	12.84
4.50	160,169	104.50	14.41 oc	10.77 ic	0.35 ic	---	0.00	3.28	---	---	---	---	14.41
4.59	163,940	104.59	16.43 oc	10.70 ic	0.67 ic	---	0.00	4.87	---	---	---	---	16.24
4.68	167,711	104.68	18.49 oc	10.62 ic	1.13 ic	---	0.00	6.64	---	---	---	---	18.39
4.77	171,483	104.77	20.97 oc	10.49 ic	1.66 ic	---	0.00	8.60	---	---	---	---	20.75
4.86	175,254	104.86	23.40 oc	10.35 ic	2.24 ic	---	0.00	10.71	---	---	---	---	23.30
4.95	179,026	104.95	26.14 oc	10.14 ic	3.03 ic	---	0.00	12.98	---	---	---	---	26.14
5.04	182,797	105.04	29.38 oc	9.90 ic	3.82 ic	---	0.00	15.38	---	---	---	---	29.11
5.13	186,568	105.13	32.47 oc	9.61 ic	4.72 ic	---	0.00	17.92	---	---	---	---	32.25
5.22	190,340	105.22	35.52 oc	9.22 ic	5.72 ic	---	0.00	20.58	---	---	---	---	35.52
5.31	194,111	105.31	38.24 oc	8.24 ic	6.63 ic	---	0.00	23.36	---	---	---	---	38.24
5.40	197,883	105.40	42.24 oc	8.19 ic	7.79 ic	---	0.00	26.26	---	---	---	---	42.24
5.49	201,856	105.49	46.21 oc	8.11 ic	8.82 ic	---	0.00	29.27	---	---	---	---	46.21
5.58	205,829	105.58	50.48 oc	7.99 ic	10.10 ic	---	0.00	32.39	---	---	---	---	50.48
5.67	209,802	105.67	54.85 oc	7.82 ic	11.42 ic	---	0.00	35.61	---	---	---	---	54.85
5.76	213,775	105.76	59.10 oc	7.62 ic	12.58 ic	---	0.00	38.90 s	---	---	---	---	59.10
5.85	217,748	105.85	63.06 oc	7.42 ic	13.95 ic	---	0.00	41.69 s	---	---	---	---	63.06
5.94	221,721	105.94	66.71 oc	7.23 ic	15.32 ic	---	0.00	44.16 s	---	---	---	---	66.71
6.03	225,694	106.03	70.13 oc	7.03 ic	16.68 ic	---	0.00	46.42 s	---	---	---	---	70.13
6.12	229,667	106.12	73.35 oc	6.84 ic	18.01 ic	---	0.00	48.50 s	---	---	---	---	73.34
6.21	233,640	106.21	76.37 oc	6.65 ic	19.30 ic	---	0.00	50.42 s	---	---	---	---	76.37
6.30	237,613	106.30	79.28 oc	6.45 ic	20.67 ic	---	0.00	52.16 s	---	---	---	---	79.28
6.39	241,792	106.39	81.94 oc	6.27 ic	21.80 ic	---	0.00	53.86 s	---	---	---	---	81.93
6.48	245,972	106.48	84.10 oc	6.16 ic	22.09 ic	---	0.00	55.84 s	---	---	---	---	84.10
6.57	250,152	106.57	86.19 oc	6.06 ic	22.38 ic	---	0.00	57.76 s	---	---	---	---	86.19
6.66	254,332	106.66	88.16 oc	5.96 ic	22.52 ic	---	0.00	59.68 s	---	---	---	---	88.16
6.75	258,512	106.75	90.04 oc	5.87 ic	22.55 ic	---	0.00	61.61 s	---	---	---	---	90.03
6.84	262,692	106.84	91.78 oc	5.81 ic	22.33 ic	---	0.00	63.64 s	---	---	---	---	91.77
6.93	266,871	106.93	93.47 oc	5.74 ic	22.08 ic	---	0.00	65.64 s	---	---	---	---	93.46
7.02	271,051	107.02	95.12 oc	5.68 ic	21.83 ic	---	0.00	67.61 s	---	---	---	---	95.12
7.11	275,231	107.11	96.75 oc	5.62 ic	21.59 ic	---	0.00	69.54 s	---	---	---	---	96.75
7.20	279,411	107.20	98.34 oc	5.55 ic	21.35 ic	---	0.00	71.44 s	---	---	---	---	98.34
7.29	283,803	107.29	99.90 oc	5.49 ic	21.10 ic	---	0.00	73.31 s	---	---	---	---	99.90
7.38	288,195	107.38	101.44 oc	5.43 ic	20.87 ic	---	0.00	75.14 s	---	---	---	---	101.44
7.47	292,587	107.47	102.94 oc	5.37 ic	20.63 ic	---	0.00	76.94 s	---	---	---	---	102.94
7.56	296,979	107.56	104.27 ic	5.30 ic	20.36 ic	---	0.00	78.61 s	---	---	---	---	104.27
7.65	301,371	107.65	105.42 ic	5.22 ic	20.06 ic	---	0.00	80.14 s	---	---	---	---	105.42
7.74	305,763	107.74	106.54 ic	5.14 ic	19.76 ic	---	0.00	81.64 s	---	---	---	---	106.54
7.83	310,154	107.83	107.65 ic	5.06 ic	19.47 ic	---	0.00	83.11 s	---	---	---	---	107.64
7.92	314,546	107.92	108.73 ic	4.99 ic	19.19 ic	---	0.00	84.55 s	---	---	---	---	108.73
8.01	318,938	108.01	109.81 ic	4.92 ic	18.91 ic	---	0.05	85.93 s	---	---	---	---	109.81
8.10	323,330	108.10	111.05 ic	4.77 ic	18.34 ic	---	1.65	86.28 s	---	---	---	---	111.04
8.19	327,939	108.19	112.37 ic	4.58 ic	17.60 ic	---	4.33	85.86 s	---	---	---	---	112.37
8.28	332,549	108.28	113.72 ic	4.36 ic	16.75 ic	---	7.75	84.87 s	---	---	---	---	113.72
8.37	337,158	108.37	115.07 ic	4.11 ic	15.82 ic	---	11.77	83.37 s	---	---	---	---	115.07
8.46	341,767	108.46	116.38 ic	3.87 ic	14.89 ic	---	15.99 s	81.61 s	---	---	---	---	116.37
8.55	346,377	108.55	117.57 ic	3.67 ic	14.12 ic	---	19.49 s	80.28 s	---	---	---	---	117.57
8.64	350,986	108.64	118.70 ic	3.49 ic	13.43 ic	---	22.69 s	79.08 s	---	---	---	---	118.69
8.73	355,595	108.73	119.78 ic	3.33 ic	12.80 ic	---	25.67 s	77.98 s	---	---	---	---	119.77
8.82	360,204	108.82	120.81 ic	3.18 ic	12.21 ic	---	28.45 s	76.95 s	---	---	---	---	120.80
8.91	364,814	108.91	121.81 ic	3.04 ic	11.68 ic	---	31.08 s	76.00 s	---	---	---	---	121.80
9.00	369,423	109.00	122.78 ic	2.91 ic	11.18 ic	---	33.56 s	75.12 s	---	---	---	---	122.77

...End

Hydrograph Report

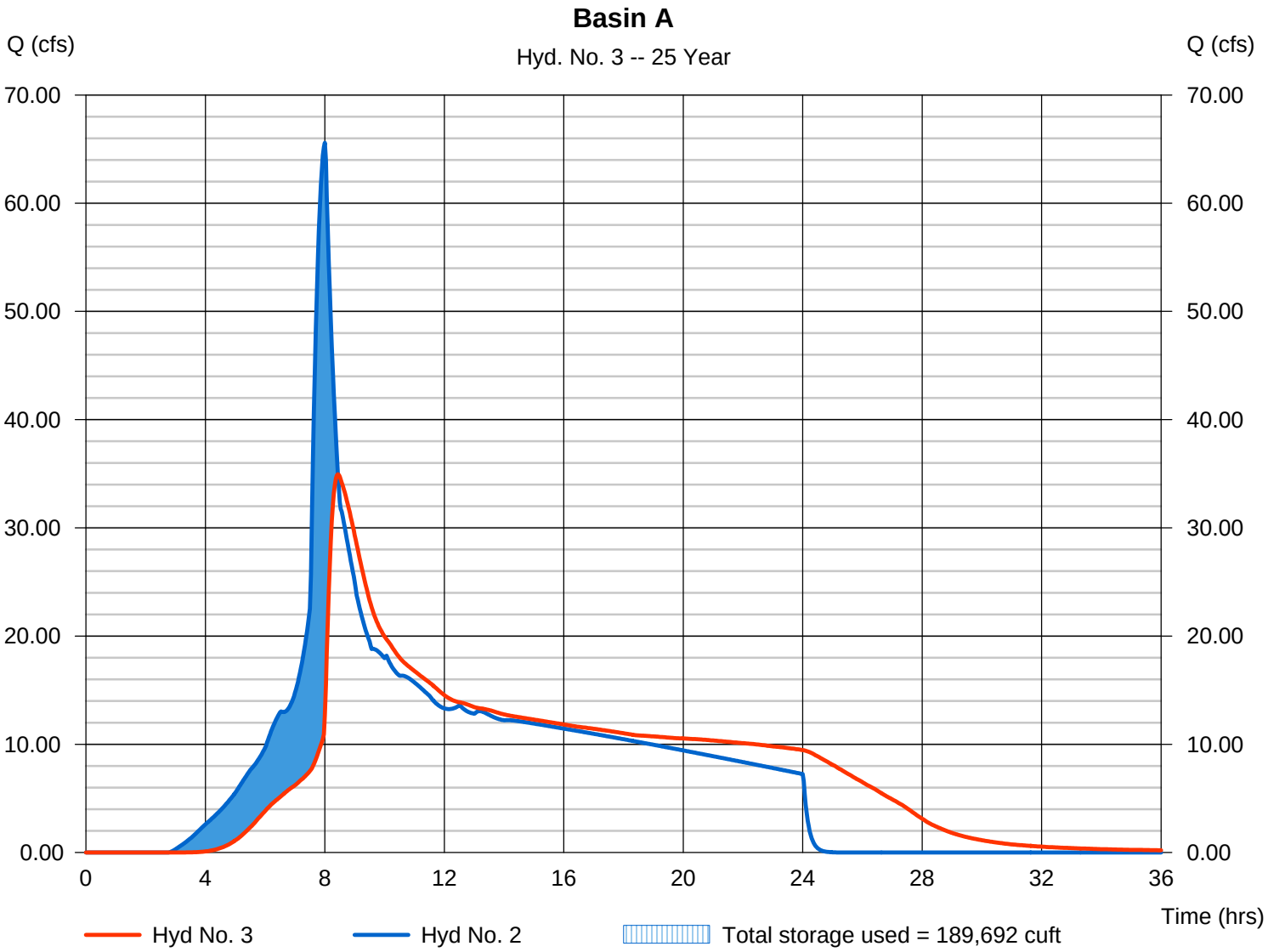
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	34.95 cfs
Storm frequency	=	25 yrs	Time to peak	=	8.43 hrs
Time interval	=	2 min	Hyd. volume	=	989,004 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	105.20 ft
Reservoir name	=	Pond A	Max. Storage	=	189,692 cuft

Storage Indication method used.



Hydrograph Report

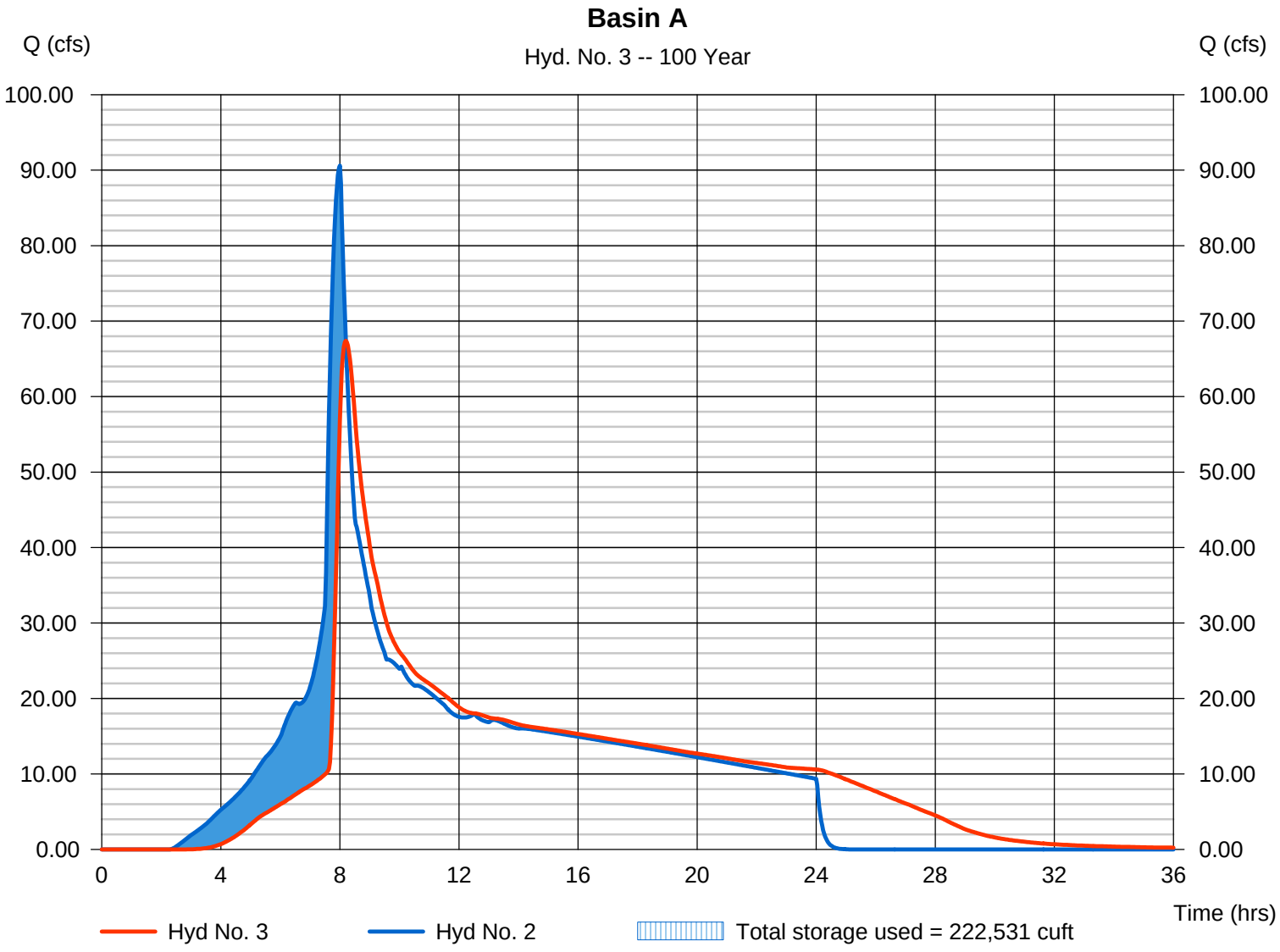
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin A

Hydrograph type	=	Reservoir	Peak discharge	=	67.41 cfs
Storm frequency	=	100 yrs	Time to peak	=	8.20 hrs
Time interval	=	2 min	Hyd. volume	=	1,347,542 cuft
Inflow hyd. No.	=	2 - Basin A - Post	Max. Elevation	=	105.96 ft
Reservoir name	=	Pond A	Max. Storage	=	222,531 cuft

Storage Indication method used.



Hydrograph Report

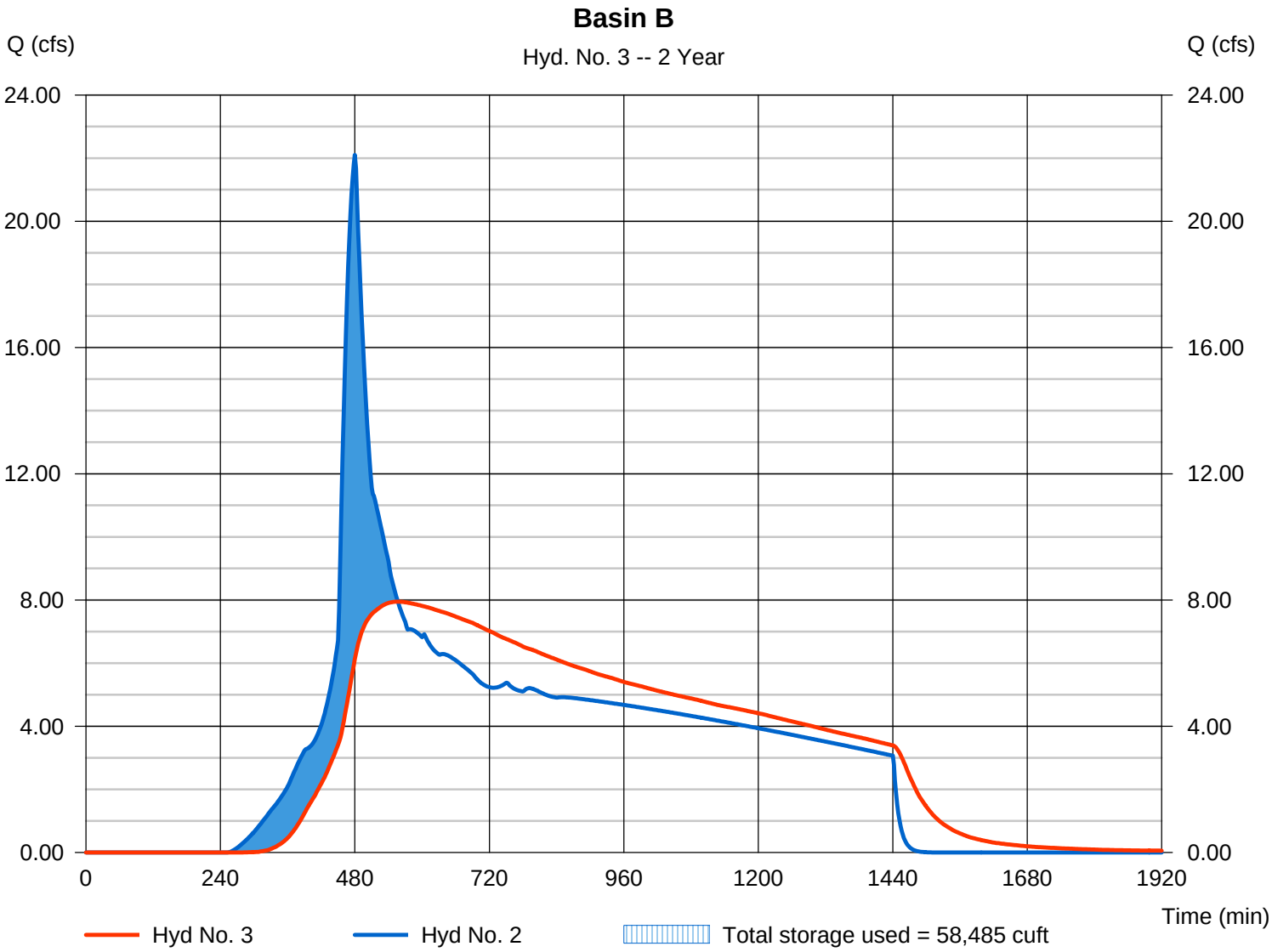
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	7.946 cfs
Storm frequency	=	2 yrs	Time to peak	=	556 min
Time interval	=	2 min	Hyd. volume	=	360,137 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	103.48 ft
Reservoir name	=	Pond B	Max. Storage	=	58,485 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond B

Pond Data

Trapezoid - Bottom L x W = 119.0 x 119.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 7.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	14,161	0	0
0.70	100.70	15,178	10,267	10,267
1.40	101.40	16,231	10,991	21,258
2.10	102.10	17,319	11,740	32,998
2.80	102.80	18,442	12,514	45,512
3.50	103.50	19,600	13,313	58,824
4.20	104.20	20,794	14,136	72,960
4.90	104.90	22,023	14,984	87,944
5.60	105.60	23,287	15,856	103,800
6.30	106.30	24,586	16,753	120,553
7.00	107.00	25,921	17,676	138,229

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 28.00	13.60	26.50	0.00
Span (in)	= 28.00	13.60	26.50	0.00
No. Barrels	= 2	1	1	0
Invert El. (ft)	= 100.01	100.01	103.60	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	3.85	0.00	0.00
Crest El. (ft)	= 107.00	104.00	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.07	1,027	100.07	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.017
0.14	2,053	100.14	0.08 ic	0.08 ic	0.00	---	0.00	0.00	---	---	---	---	0.075
0.21	3,080	100.21	0.19 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.179
0.28	4,107	100.28	0.31 ic	0.31 ic	0.00	---	0.00	0.00	---	---	---	---	0.312
0.35	5,133	100.35	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.487
0.42	6,160	100.42	0.72 ic	0.70 ic	0.00	---	0.00	0.00	---	---	---	---	0.702
0.49	7,187	100.49	0.94 ic	0.94 ic	0.00	---	0.00	0.00	---	---	---	---	0.941
0.56	8,213	100.56	1.21 ic	1.21 ic	0.00	---	0.00	0.00	---	---	---	---	1.206
0.63	9,240	100.63	1.52 ic	1.49 ic	0.00	---	0.00	0.00	---	---	---	---	1.493
0.70	10,267	100.70	1.77 ic	1.77 ic	0.00	---	0.00	0.00	---	---	---	---	1.773
0.77	11,366	100.77	2.16 ic	2.11 ic	0.00	---	0.00	0.00	---	---	---	---	2.113
0.84	12,465	100.84	2.46 ic	2.44 ic	0.00	---	0.00	0.00	---	---	---	---	2.437
0.91	13,564	100.91	2.79 ic	2.79 ic	0.00	---	0.00	0.00	---	---	---	---	2.786
0.98	14,663	100.98	3.14 ic	3.09 ic	0.00	---	0.00	0.00	---	---	---	---	3.092
1.05	15,762	101.05	3.37 ic	3.37 ic	0.00	---	0.00	0.00	---	---	---	---	3.366
1.12	16,861	101.12	3.72 ic	3.60 ic	0.00	---	0.00	0.00	---	---	---	---	3.602
1.19	17,960	101.19	3.93 ic	3.80 ic	0.00	---	0.00	0.00	---	---	---	---	3.804
1.26	19,060	101.26	4.14 ic	4.01 ic	0.00	---	0.00	0.00	---	---	---	---	4.015
1.33	20,159	101.33	4.20 ic	4.20 ic	0.00	---	0.00	0.00	---	---	---	---	4.198
1.40	21,258	101.40	4.38 ic	4.38 ic	0.00	---	0.00	0.00	---	---	---	---	4.379
1.47	22,432	101.47	4.59 ic	4.53 ic	0.00	---	0.00	0.00	---	---	---	---	4.533
1.54	23,606	101.54	4.83 ic	4.67 ic	0.00	---	0.00	0.00	---	---	---	---	4.672
1.61	24,780	101.61	4.84 ic	4.84 ic	0.00	---	0.00	0.00	---	---	---	---	4.840
1.68	25,954	101.68	5.08 ic	4.97 ic	0.00	---	0.00	0.00	---	---	---	---	4.975
1.75	27,128	101.75	5.12 ic	5.12 ic	0.00	---	0.00	0.00	---	---	---	---	5.115
1.82	28,302	101.82	5.33 ic	5.26 ic	0.00	---	0.00	0.00	---	---	---	---	5.260
1.89	29,476	101.89	5.38 ic	5.38 ic	0.00	---	0.00	0.00	---	---	---	---	5.385
1.96	30,650	101.96	5.59 ic	5.53 ic	0.00	---	0.00	0.00	---	---	---	---	5.530
2.03	31,824	102.03	5.65 ic	5.65 ic	0.00	---	0.00	0.00	---	---	---	---	5.648
2.10	32,998	102.10	5.85 ic	5.79 ic	0.00	---	0.00	0.00	---	---	---	---	5.788
2.17	34,249	102.17	5.91 ic	5.90 ic	0.00	---	0.00	0.00	---	---	---	---	5.905
2.24	35,501	102.24	6.13 ic	6.03 ic	0.00	---	0.00	0.00	---	---	---	---	6.034
2.31	36,752	102.31	6.16 ic	6.16 ic	0.00	---	0.00	0.00	---	---	---	---	6.157

Continues on next page...

Pond B

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.38	38,004	102.38	6.41 ic	6.27 ic	0.00	---	0.00	0.00	---	---	---	---	6.270
2.45	39,255	102.45	6.41 ic	6.40 ic	0.00	---	0.00	0.00	---	---	---	---	6.400
2.52	40,506	102.52	6.70 ic	6.50 ic	0.00	---	0.00	0.00	---	---	---	---	6.497
2.59	41,758	102.59	6.70 ic	6.62 ic	0.00	---	0.00	0.00	---	---	---	---	6.623
2.66	43,009	102.66	6.73 ic	6.73 ic	0.00	---	0.00	0.00	---	---	---	---	6.733
2.73	44,261	102.73	6.99 ic	6.84 ic	0.00	---	0.00	0.00	---	---	---	---	6.839
2.80	45,512	102.80	6.99 ic	6.96 ic	0.00	---	0.00	0.00	---	---	---	---	6.959
2.87	46,843	102.87	7.05 ic	7.05 ic	0.00	---	0.00	0.00	---	---	---	---	7.055
2.94	48,174	102.94	7.30 ic	7.16 ic	0.00	---	0.00	0.00	---	---	---	---	7.164
3.01	49,506	103.01	7.30 ic	7.28 ic	0.00	---	0.00	0.00	---	---	---	---	7.278
3.08	50,837	103.08	7.37 ic	7.37 ic	0.00	---	0.00	0.00	---	---	---	---	7.367
3.15	52,168	103.15	7.61 ic	7.47 ic	0.00	---	0.00	0.00	---	---	---	---	7.475
3.22	53,499	103.22	7.61 ic	7.58 ic	0.00	---	0.00	0.00	---	---	---	---	7.584
3.29	54,831	103.29	7.67 ic	7.67 ic	0.00	---	0.00	0.00	---	---	---	---	7.672
3.36	56,162	103.36	7.92 ic	7.77 ic	0.00	---	0.00	0.00	---	---	---	---	7.773
3.43	57,493	103.43	7.92 ic	7.88 ic	0.00	---	0.00	0.00	---	---	---	---	7.878
3.50	58,824	103.50	7.97 ic	7.97 ic	0.00	---	0.00	0.00	---	---	---	---	7.969
3.57	60,238	103.57	8.25 ic	8.06 ic	0.00	---	0.00	0.00	---	---	---	---	8.060
3.64	61,652	103.64	8.25 ic	8.16 ic	0.01 ic	---	0.00	0.00	---	---	---	---	8.174
3.71	63,065	103.71	8.32 ic	8.24 ic	0.08 ic	---	0.00	0.00	---	---	---	---	8.324
3.78	64,479	103.78	8.58 ic	8.34 ic	0.22 ic	---	0.00	0.00	---	---	---	---	8.552
3.85	65,892	103.85	8.92 ic	8.41 ic	0.42 ic	---	0.00	0.00	---	---	---	---	8.826
3.92	67,306	103.92	9.26 ic	8.48 ic	0.67 ic	---	0.00	0.00	---	---	---	---	9.154
3.99	68,719	103.99	9.62 ic	8.56 ic	1.01 ic	---	0.00	0.00	---	---	---	---	9.563
4.06	70,133	104.06	10.34 ic	8.60 ic	1.37 ic	---	0.00	0.19	---	---	---	---	10.16
4.13	71,547	104.13	11.09 ic	8.65 ic	1.81 ic	---	0.00	0.60	---	---	---	---	11.06
4.20	72,960	104.20	12.26 ic	8.67 ic	2.23 ic	---	0.00	1.15	---	---	---	---	12.05
4.27	74,459	104.27	13.47 ic	8.69 ic	2.80 ic	---	0.00	1.80	---	---	---	---	13.29
4.34	75,957	104.34	14.64 oc	8.71 ic	3.34 ic	---	0.00	2.54	---	---	---	---	14.59
4.41	77,455	104.41	16.03 oc	8.71 ic	3.92 ic	---	0.00	3.37	---	---	---	---	15.99
4.48	78,954	104.48	17.76 oc	8.68 ic	4.55 ic	---	0.00	4.26	---	---	---	---	17.49
4.55	80,452	104.55	19.46 oc	8.65 ic	5.34 ic	---	0.00	5.23	---	---	---	---	19.22
4.62	81,950	104.62	21.11 oc	8.62 ic	6.06 ic	---	0.00	6.26	---	---	---	---	20.94
4.69	83,449	104.69	22.98 oc	8.58 ic	6.81 ic	---	0.00	7.35	---	---	---	---	22.73
4.76	84,947	104.76	24.71 oc	8.53 ic	7.58 ic	---	0.00	8.49	---	---	---	---	24.61
4.83	86,445	104.83	26.73 oc	8.45 ic	8.38 ic	---	0.00	9.69	---	---	---	---	26.53
4.90	87,944	104.90	28.58 oc	8.36 ic	9.20 ic	---	0.00	10.95	---	---	---	---	28.51
4.97	89,529	104.97	30.55 oc	8.20 ic	10.02 ic	---	0.00	12.25	---	---	---	---	30.47
5.04	91,115	105.04	32.34 oc	7.89 ic	10.85 ic	---	0.00	13.60	---	---	---	---	32.34
5.11	92,701	105.11	34.55 oc	7.88 ic	11.68 ic	---	0.00	14.99	---	---	---	---	34.55
5.18	94,286	105.18	36.92 oc	7.85 ic	12.63 ic	---	0.00	16.43	---	---	---	---	36.92
5.25	95,872	105.25	39.17 oc	7.82 ic	13.43 ic	---	0.00	17.92	---	---	---	---	39.17
5.32	97,457	105.32	41.54 oc	7.77 ic	14.33 ic	---	0.00	19.44	---	---	---	---	41.54
5.39	99,043	105.39	43.91 oc	7.71 ic	15.18 ic	---	0.00	21.01	---	---	---	---	43.91
5.46	100,629	105.46	46.25 oc	7.65 ic	15.99 ic	---	0.00	22.62	---	---	---	---	46.25
5.53	102,214	105.53	48.64 oc	7.57 ic	16.81 ic	---	0.00	24.26	---	---	---	---	48.64
5.60	103,800	105.60	51.04 oc	7.48 ic	17.61 ic	---	0.00	25.95	---	---	---	---	51.03
5.67	105,475	105.67	53.34 oc	7.39 ic	18.28 ic	---	0.00	27.67	---	---	---	---	53.34
5.74	107,151	105.74	55.63 oc	7.29 ic	18.91 ic	---	0.00	29.43	---	---	---	---	55.63
5.81	108,826	105.81	57.80 oc	7.19 ic	19.39 ic	---	0.00	31.22	---	---	---	---	57.80
5.88	110,501	105.88	60.11 oc	7.06 ic	20.00 ic	---	0.00	33.05	---	---	---	---	60.11
5.95	112,177	105.95	62.42 oc	6.93 ic	20.58 ic	---	0.00	34.91	---	---	---	---	62.42
6.02	113,852	106.02	64.66 oc	6.79 ic	21.15 ic	---	0.00	36.72 s	---	---	---	---	64.66
6.09	115,527	106.09	66.65 oc	6.67 ic	21.71 ic	---	0.00	38.27 s	---	---	---	---	66.65
6.16	117,203	106.16	68.51 oc	6.55 ic	22.25 ic	---	0.00	39.71 s	---	---	---	---	68.51
6.23	118,878	106.23	70.28 oc	6.44 ic	22.78 ic	---	0.00	41.06 s	---	---	---	---	70.28
6.30	120,553	106.30	71.97 oc	6.34 ic	23.29 ic	---	0.00	42.34 s	---	---	---	---	71.97
6.37	122,321	106.37	73.54 oc	6.24 ic	23.70 ic	---	0.00	43.60 s	---	---	---	---	73.53
6.44	124,089	106.44	74.73 oc	6.20 ic	23.52 ic	---	0.00	45.01 s	---	---	---	---	74.73
6.51	125,856	106.51	75.90 oc	6.15 ic	23.35 ic	---	0.00	46.40 s	---	---	---	---	75.90
6.58	127,624	106.58	77.05 oc	6.10 ic	23.18 ic	---	0.00	47.77 s	---	---	---	---	77.05
6.65	129,391	106.65	78.18 oc	6.06 ic	23.00 ic	---	0.00	49.12 s	---	---	---	---	78.18
6.72	131,159	106.72	79.30 oc	6.01 ic	22.83 ic	---	0.00	50.45 s	---	---	---	---	79.30
6.79	132,926	106.79	80.40 oc	5.97 ic	22.66 ic	---	0.00	51.77 s	---	---	---	---	80.40
6.86	134,694	106.86	81.48 oc	5.92 ic	22.48 ic	---	0.00	53.07 s	---	---	---	---	81.47
6.93	136,461	106.93	82.54 oc	5.88 ic	22.31 ic	---	0.00	54.35 s	---	---	---	---	82.54
7.00	138,229	107.00	83.59 oc	5.83 ic	22.14 ic	---	0.00	55.61 s	---	---	---	---	83.58

...End

Hydrograph Report

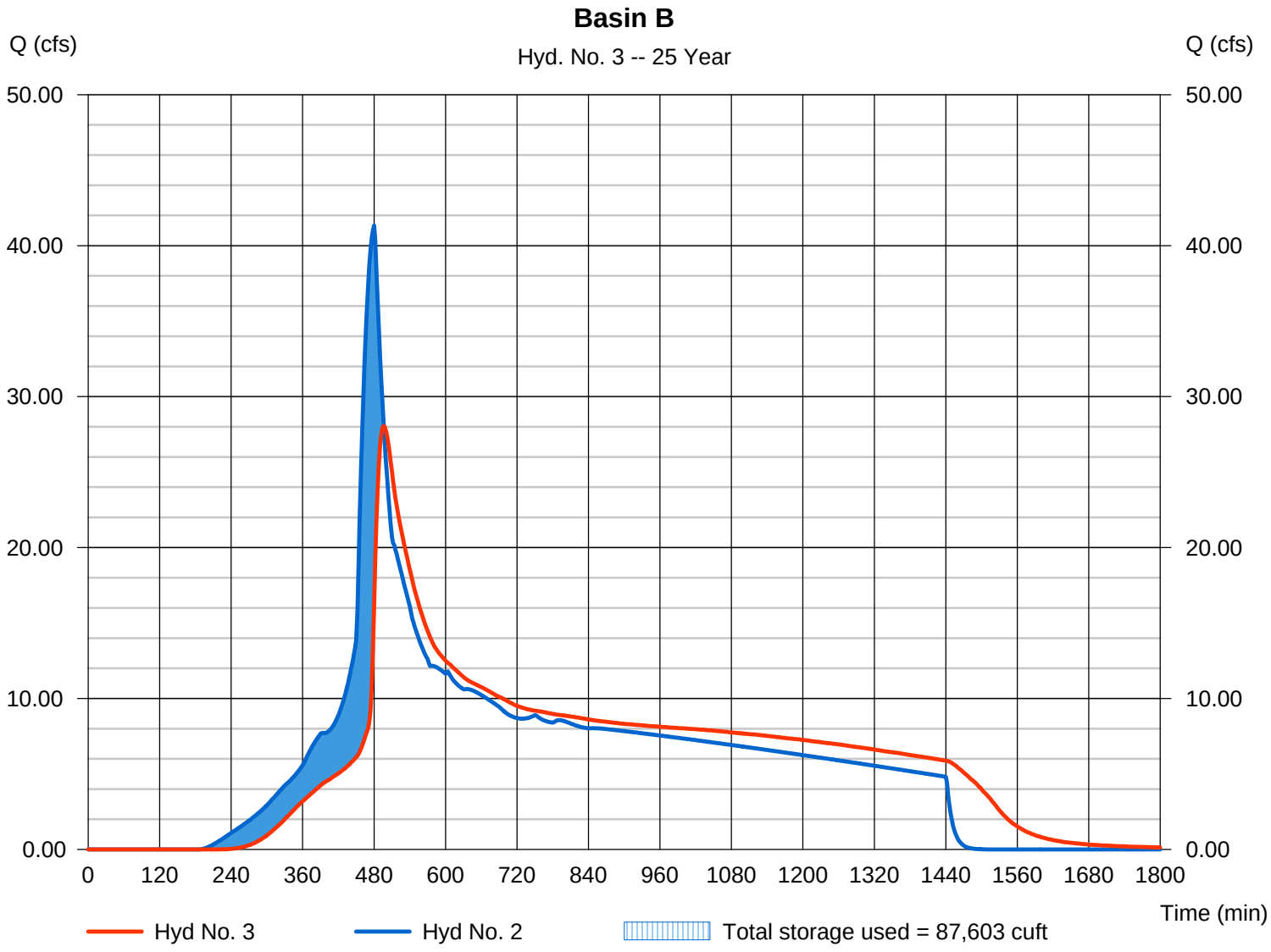
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	28.06 cfs
Storm frequency	=	25 yrs	Time to peak	=	496 min
Time interval	=	2 min	Hyd. volume	=	632,645 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	104.88 ft
Reservoir name	=	Pond B	Max. Storage	=	87,603 cuft

Storage Indication method used.



Hydrograph Report

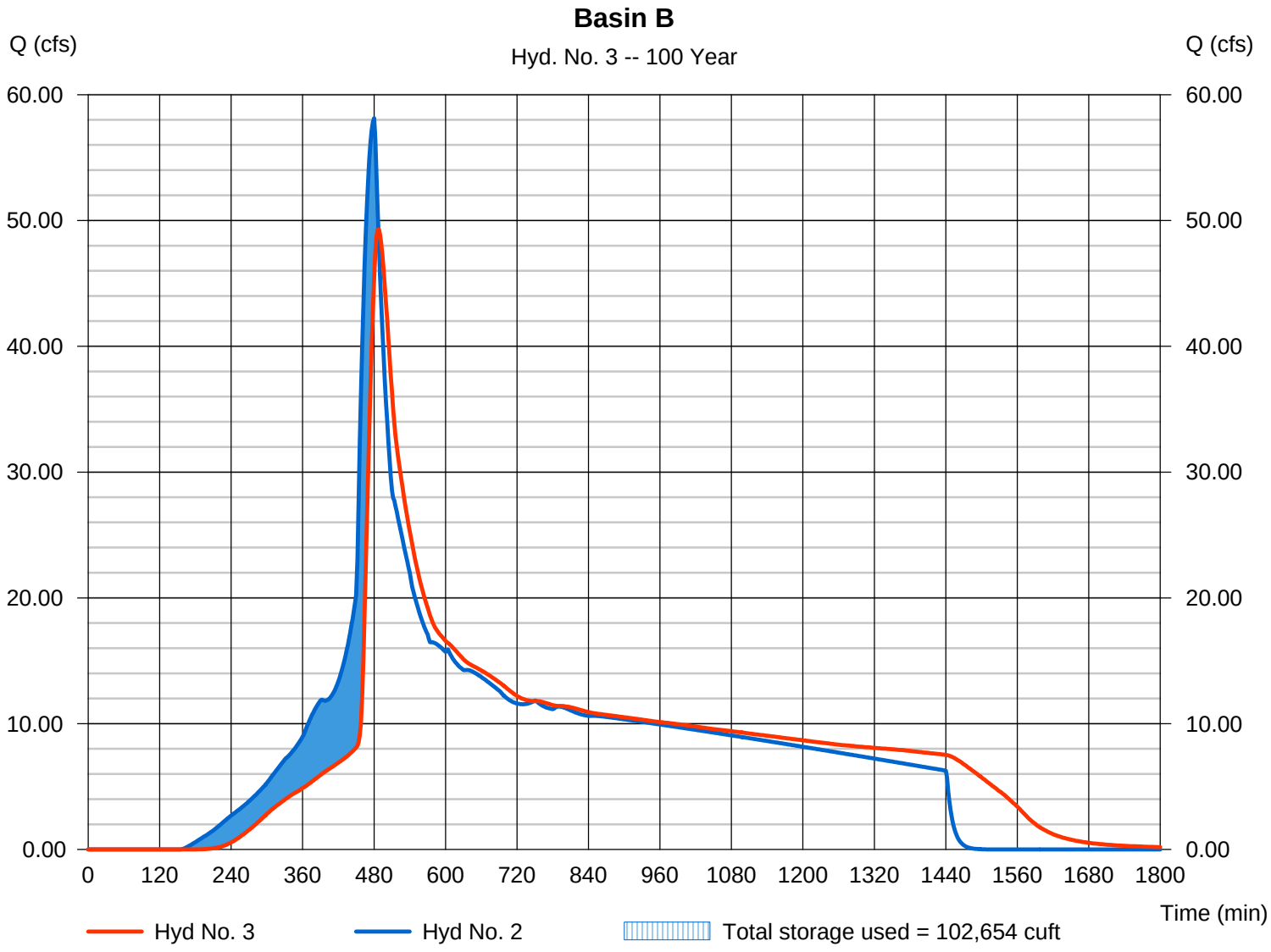
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin B

Hydrograph type	=	Reservoir	Peak discharge	=	49.30 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	871,816 cuft
Inflow hyd. No.	=	2 - Basin B - Post	Max. Elevation	=	105.55 ft
Reservoir name	=	Pond B	Max. Storage	=	102,654 cuft

Storage Indication method used.



Hydrograph Report

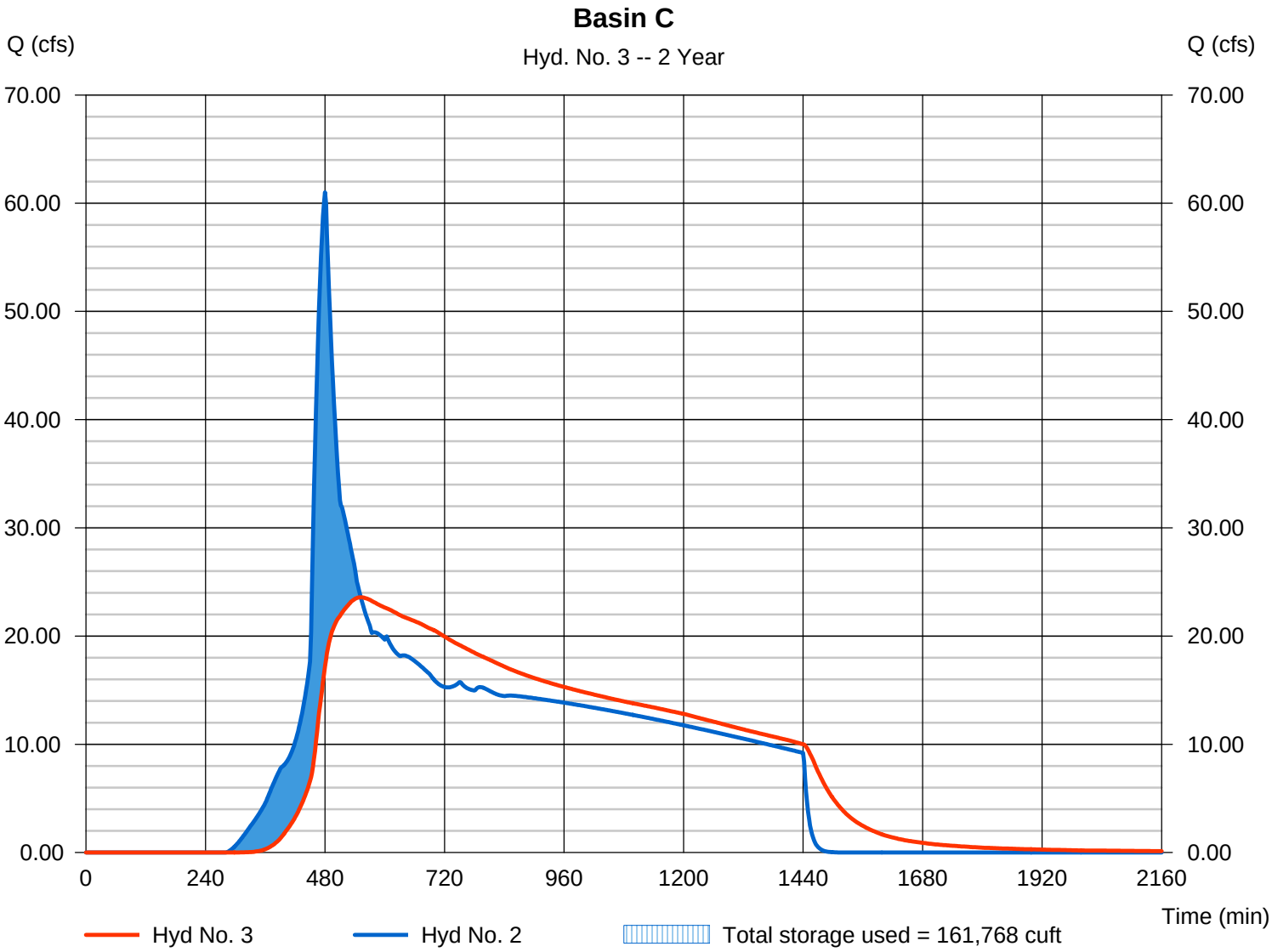
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	23.58 cfs
Storm frequency	=	2 yrs	Time to peak	=	552 min
Time interval	=	2 min	Hyd. volume	=	1,030,614 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	103.79 ft
Reservoir name	=	Pond C	Max. Storage	=	161,768 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond C

Pond Data

Trapezoid - Bottom L x W = 195.0 x 195.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 9.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	38,025	0	0
0.90	100.90	40,160	35,179	35,179
1.80	101.80	42,354	37,127	72,306
2.70	102.70	44,605	39,127	111,433
3.60	103.60	46,916	41,180	152,613
4.50	104.50	49,284	43,285	195,899
5.40	105.40	51,711	45,443	241,342
6.30	106.30	54,196	47,654	288,995
7.20	107.20	56,739	49,916	338,912
8.10	108.10	59,341	52,232	391,143
9.00	109.00	62,001	54,600	445,743

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	22.95	42.00	0.00
Span (in)	= 36.00	22.95	42.00	0.00
No. Barrels	= 3	1	1	0
Invert El. (ft)	= 100.00	100.01	103.50	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 37.70	21.50	0.00	0.00
Crest El. (ft)	= 108.00	105.84	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.09	3,518	100.09	0.05 ic	0.04 ic	0.00	---	0.00	0.00	---	---	---	---	0.043
0.18	7,036	100.18	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.182
0.27	10,554	100.27	0.46 ic	0.43 ic	0.00	---	0.00	0.00	---	---	---	---	0.429
0.36	14,072	100.36	0.77 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.750
0.45	17,589	100.45	1.22 ic	1.14 ic	0.00	---	0.00	0.00	---	---	---	---	1.142
0.54	21,107	100.54	1.66 ic	1.63 ic	0.00	---	0.00	0.00	---	---	---	---	1.632
0.63	24,625	100.63	2.22 ic	2.22 ic	0.00	---	0.00	0.00	---	---	---	---	2.222
0.72	28,143	100.72	2.87 ic	2.83 ic	0.00	---	0.00	0.00	---	---	---	---	2.829
0.81	31,661	100.81	3.66 ic	3.51 ic	0.00	---	0.00	0.00	---	---	---	---	3.506
0.90	35,179	100.90	4.27 ic	4.24 ic	0.00	---	0.00	0.00	---	---	---	---	4.245
0.99	38,892	100.99	5.29 ic	5.03 ic	0.00	---	0.00	0.00	---	---	---	---	5.035
1.08	42,604	101.08	6.06 ic	5.86 ic	0.00	---	0.00	0.00	---	---	---	---	5.864
1.17	46,317	101.17	6.90 ic	6.72 ic	0.00	---	0.00	0.00	---	---	---	---	6.718
1.26	50,030	101.26	7.82 ic	7.58 ic	0.00	---	0.00	0.00	---	---	---	---	7.584
1.35	53,742	101.35	8.81 ic	8.54 ic	0.00	---	0.00	0.00	---	---	---	---	8.541
1.44	57,455	101.44	9.38 ic	9.38 ic	0.00	---	0.00	0.00	---	---	---	---	9.380
1.53	61,168	101.53	10.45 ic	10.34 ic	0.00	---	0.00	0.00	---	---	---	---	10.34
1.62	64,880	101.62	11.16 ic	11.15 ic	0.00	---	0.00	0.00	---	---	---	---	11.15
1.71	68,593	101.71	12.27 ic	11.99 ic	0.00	---	0.00	0.00	---	---	---	---	11.99
1.80	72,306	101.80	12.92 ic	12.75 ic	0.00	---	0.00	0.00	---	---	---	---	12.75
1.89	76,219	101.89	13.58 ic	13.37 ic	0.00	---	0.00	0.00	---	---	---	---	13.37
1.98	80,131	101.98	14.27 ic	13.93 ic	0.00	---	0.00	0.00	---	---	---	---	13.93
2.07	84,044	102.07	14.98 ic	14.53 ic	0.00	---	0.00	0.00	---	---	---	---	14.53
2.16	87,957	102.16	15.11 ic	15.11 ic	0.00	---	0.00	0.00	---	---	---	---	15.11
2.25	91,869	102.25	15.71 ic	15.67 ic	0.00	---	0.00	0.00	---	---	---	---	15.67
2.34	95,782	102.34	16.46 ic	16.21 ic	0.00	---	0.00	0.00	---	---	---	---	16.21
2.43	99,695	102.43	17.23 ic	16.73 ic	0.00	---	0.00	0.00	---	---	---	---	16.73
2.52	103,608	102.52	17.24 ic	17.24 ic	0.00	---	0.00	0.00	---	---	---	---	17.24
2.61	107,520	102.61	18.02 ic	17.73 ic	0.00	---	0.00	0.00	---	---	---	---	17.73
2.70	111,433	102.70	18.21 ic	18.21 ic	0.00	---	0.00	0.00	---	---	---	---	18.21
2.79	115,551	102.79	18.83 ic	18.68 ic	0.00	---	0.00	0.00	---	---	---	---	18.68
2.88	119,669	102.88	19.66 ic	19.13 ic	0.00	---	0.00	0.00	---	---	---	---	19.13
2.97	123,787	102.97	19.66 ic	19.58 ic	0.00	---	0.00	0.00	---	---	---	---	19.58

Continues on next page...

Pond C

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
3.06	127,905	103.06	20.52 ic	19.99 ic	0.00	---	0.00	0.00	---	---	---	---	19.99
3.15	132,023	103.15	20.52 ic	20.42 ic	0.00	---	0.00	0.00	---	---	---	---	20.42
3.24	136,141	103.24	20.74 ic	20.74 ic	0.00	---	0.00	0.00	---	---	---	---	20.74
3.33	140,259	103.33	21.39 ic	21.15 ic	0.00	---	0.00	0.00	---	---	---	---	21.15
3.42	144,377	103.42	21.50 ic	21.50 ic	0.00	---	0.00	0.00	---	---	---	---	21.50
3.51	148,495	103.51	22.28 ic	21.85 ic	0.00 ic	---	0.00	0.00	---	---	---	---	21.85
3.60	152,613	103.60	22.32 ic	22.23 ic	0.09 ic	---	0.00	0.00	---	---	---	---	22.32
3.69	156,942	103.69	23.19 ic	22.53 ic	0.30 ic	---	0.00	0.00	---	---	---	---	22.83
3.78	161,270	103.78	24.13 ic	22.81 ic	0.67 ic	---	0.00	0.00	---	---	---	---	23.49
3.87	165,599	103.87	24.31 ic	23.12 ic	1.19 ic	---	0.00	0.00	---	---	---	---	24.31
3.96	169,927	103.96	25.22 ic	23.41 ic	1.80 ic	---	0.00	0.00	---	---	---	---	25.22
4.05	174,256	104.05	26.16 ic	23.70 ic	2.46 ic	---	0.00	0.00	---	---	---	---	26.16
4.14	178,584	104.14	28.04 ic	23.92 ic	3.40 ic	---	0.00	0.00	---	---	---	---	27.31
4.23	182,913	104.23	28.97 oc	24.18 ic	4.35 ic	---	0.00	0.00	---	---	---	---	28.53
4.32	187,241	104.32	29.82 oc	24.39 ic	5.43 ic	---	0.00	0.00	---	---	---	---	29.82
4.41	191,570	104.41	31.54 oc	24.62 ic	6.67 ic	---	0.00	0.00	---	---	---	---	31.28
4.50	195,899	104.50	33.29 oc	24.78 ic	7.78 ic	---	0.00	0.00	---	---	---	---	32.56
4.59	200,443	104.59	35.05 oc	24.95 ic	9.27 ic	---	0.00	0.00	---	---	---	---	34.22
4.68	204,987	104.68	35.93 oc	25.20 ic	10.58 ic	---	0.00	0.00	---	---	---	---	35.79
4.77	209,532	104.77	37.71 oc	25.37 ic	12.33 ic	---	0.00	0.00	---	---	---	---	37.70
4.86	214,076	104.86	39.50 oc	25.53 ic	13.84 ic	---	0.00	0.00	---	---	---	---	39.37
4.95	218,620	104.95	42.18 oc	25.60 ic	15.81 ic	---	0.00	0.00	---	---	---	---	41.41
5.04	223,164	105.04	43.97 oc	25.76 ic	17.49 ic	---	0.00	0.00	---	---	---	---	43.25
5.13	227,709	105.13	45.75 oc	25.92 ic	19.24 ic	---	0.00	0.00	---	---	---	---	45.16
5.22	232,253	105.22	47.52 oc	26.08 ic	21.05 ic	---	0.00	0.00	---	---	---	---	47.13
5.31	236,797	105.31	50.14 oc	26.15 ic	23.36 ic	---	0.00	0.00	---	---	---	---	49.51
5.40	241,342	105.40	51.87 oc	26.31 ic	25.28 ic	---	0.00	0.00	---	---	---	---	51.59
5.49	246,107	105.49	54.41 oc	26.39 ic	27.24 ic	---	0.00	0.00	---	---	---	---	53.62
5.58	250,872	105.58	56.88 oc	26.46 ic	29.68 ic	---	0.00	0.00	---	---	---	---	56.14
5.67	255,638	105.67	58.49 oc	26.63 ic	31.69 ic	---	0.00	0.00	---	---	---	---	58.31
5.76	260,403	105.76	60.83 oc	26.71 ic	33.71 ic	---	0.00	0.00	---	---	---	---	60.42
5.85	265,169	105.85	63.07 oc	26.80 ic	36.17 ic	---	0.00	0.07	---	---	---	---	63.04
5.94	269,934	105.94	67.24 oc	26.67 ic	38.17 ic	---	0.00	2.26	---	---	---	---	67.10
6.03	274,699	106.03	73.09 oc	26.28 ic	40.58 ic	---	0.00	5.93	---	---	---	---	72.78
6.12	279,465	106.12	79.30 oc	25.63 ic	42.92 ic	---	0.00	10.61	---	---	---	---	79.16
6.21	284,230	106.21	85.48 oc	24.55 ic	44.81 ic	---	0.00	16.11	---	---	---	---	85.47
6.30	288,995	106.30	93.81 oc	24.45 ic	47.02 ic	---	0.00	22.34	---	---	---	---	93.81
6.39	293,987	106.39	102.92 oc	24.27 ic	49.44 ic	---	0.00	29.20	---	---	---	---	102.91
6.48	298,979	106.48	112.09 oc	24.02 ic	51.41 ic	---	0.00	36.66	---	---	---	---	112.09
6.57	303,970	106.57	121.84 oc	23.68 ic	53.50 ic	---	0.00	44.65	---	---	---	---	121.84
6.66	308,962	106.66	131.82 oc	23.26 ic	55.40 ic	---	0.00	53.16	---	---	---	---	131.82
6.75	313,953	106.75	142.14 oc	22.73 ic	57.25 ic	---	0.00	62.15	---	---	---	---	142.13
6.84	318,945	106.84	152.63 oc	22.11 ic	58.93 ic	---	0.00	71.59	---	---	---	---	152.63
6.93	323,937	106.93	163.23 oc	21.37 ic	60.38 ic	---	0.00	81.47	---	---	---	---	163.23
7.02	328,928	107.02	173.92 oc	20.52 ic	61.62 ic	---	0.00	91.77	---	---	---	---	173.91
7.11	333,920	107.11	185.12 oc	19.48 ic	63.17 ic	---	0.00	102.46	---	---	---	---	185.12
7.20	338,912	107.20	194.37 oc	18.58 ic	62.23 ic	---	0.00	113.55	---	---	---	---	194.36
7.29	344,135	107.29	202.34 oc	17.78 ic	59.55 ic	---	0.00	125.01	---	---	---	---	202.33
7.38	349,358	107.38	210.14 oc	16.92 ic	56.65 ic	---	0.00	136.57 s	---	---	---	---	210.14
7.47	354,581	107.47	216.32 oc	16.27 ic	54.49 ic	---	0.00	145.56 s	---	---	---	---	216.32
7.56	359,804	107.56	221.78 oc	15.71 ic	52.63 ic	---	0.00	153.43 s	---	---	---	---	221.77
7.65	365,027	107.65	226.78 oc	15.21 ic	50.93 ic	---	0.00	160.64 s	---	---	---	---	226.78
7.74	370,251	107.74	230.86 ic	14.68 ic	49.17 ic	---	0.00	167.01 s	---	---	---	---	230.86
7.83	375,474	107.83	234.56 ic	14.18 ic	47.50 ic	---	0.00	172.87 s	---	---	---	---	234.55
7.92	380,697	107.92	238.04 ic	13.72 ic	45.94 ic	---	0.00	178.37 s	---	---	---	---	238.03
8.01	385,920	108.01	241.35 ic	13.27 ic	44.45 ic	---	0.12	183.49 s	---	---	---	---	241.35
8.10	391,143	108.10	245.13 ic	12.64 ic	42.33 ic	---	3.97	186.18 s	---	---	---	---	245.12
8.19	396,603	108.19	249.03 ic	11.90 ic	39.85 ic	---	10.40	186.88 s	---	---	---	---	249.02
8.28	402,063	108.28	252.87 ic	11.11 ic	37.21 ic	---	18.60	185.94 s	---	---	---	---	252.85
8.37	407,523	108.37	256.57 ic	10.30 ic	34.49 ic	---	28.25	183.53 s	---	---	---	---	256.56
8.46	412,983	108.46	260.10 ic	9.47 ic	31.73 ic	---	39.17	179.73 s	---	---	---	---	260.09
8.55	418,443	108.55	263.21 ic	8.78 ic	29.41 ic	---	48.36 s	176.63 s	---	---	---	---	263.19
8.64	423,903	108.64	265.99 ic	8.21 ic	27.49 ic	---	55.98 s	174.29 s	---	---	---	---	265.96
8.73	429,363	108.73	268.56 ic	7.70 ic	25.80 ic	---	62.80 s	172.26 s	---	---	---	---	268.55
8.82	434,823	108.82	270.98 ic	7.25 ic	24.28 ic	---	69.01 s	170.41 s	---	---	---	---	270.95
8.91	440,283	108.91	273.28 ic	6.85 ic	22.93 ic	---	74.73 s	168.75 s	---	---	---	---	273.26
9.00	445,743	109.00	275.47 ic	6.48 ic	21.70 ic	---	80.03 s	167.25 s	---	---	---	---	275.46

...End

Hydrograph Report

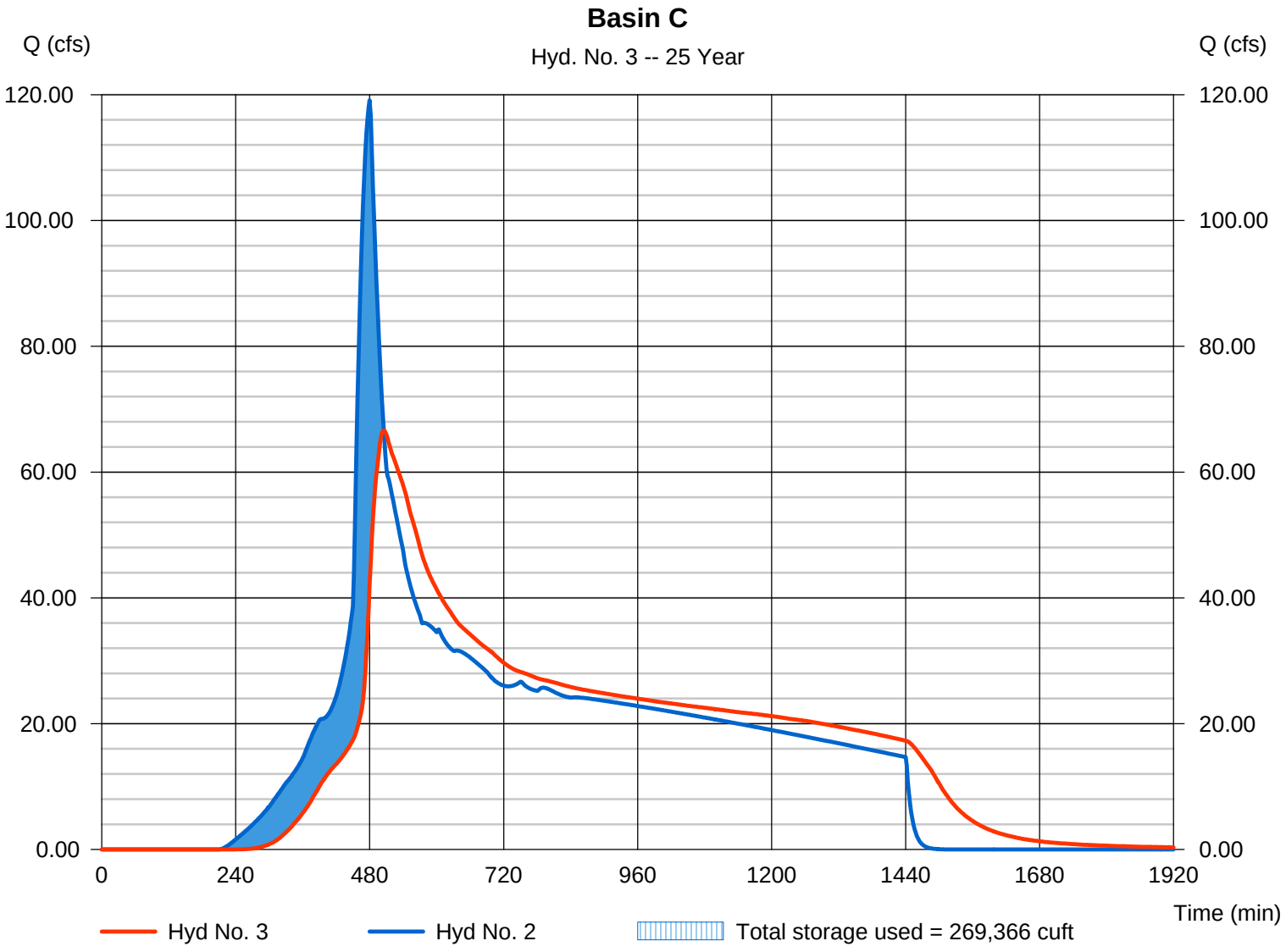
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	66.62 cfs
Storm frequency	=	25 yrs	Time to peak	=	506 min
Time interval	=	2 min	Hyd. volume	=	1,855,684 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	105.93 ft
Reservoir name	=	Pond C	Max. Storage	=	269,366 cuft

Storage Indication method used.



Hydrograph Report

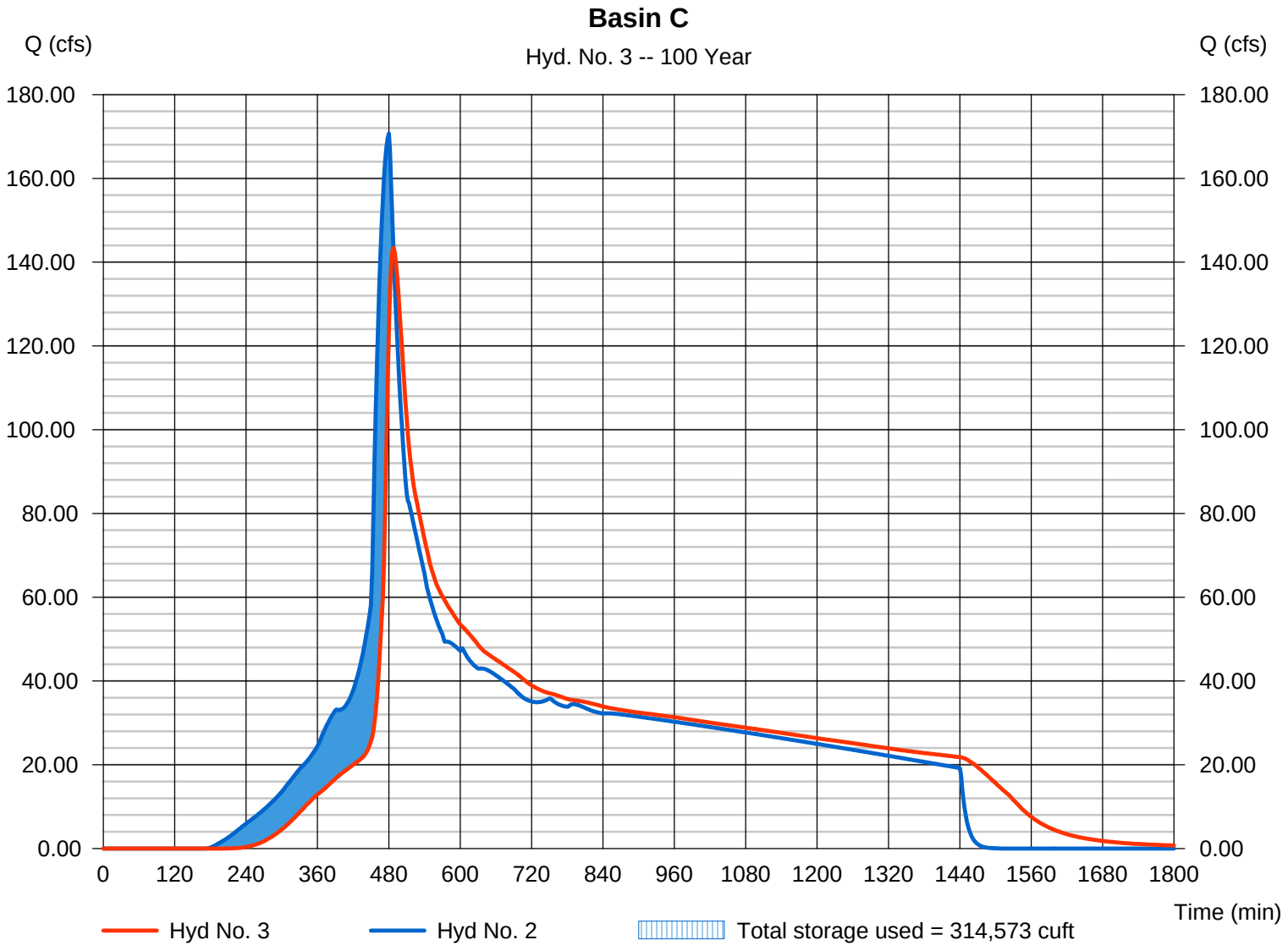
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin C

Hydrograph type	=	Reservoir	Peak discharge	=	143.44 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	2,587,459 cuft
Inflow hyd. No.	=	2 - Basin C - Post	Max. Elevation	=	106.76 ft
Reservoir name	=	Pond C	Max. Storage	=	314,573 cuft

Storage Indication method used.



Hydrograph Report

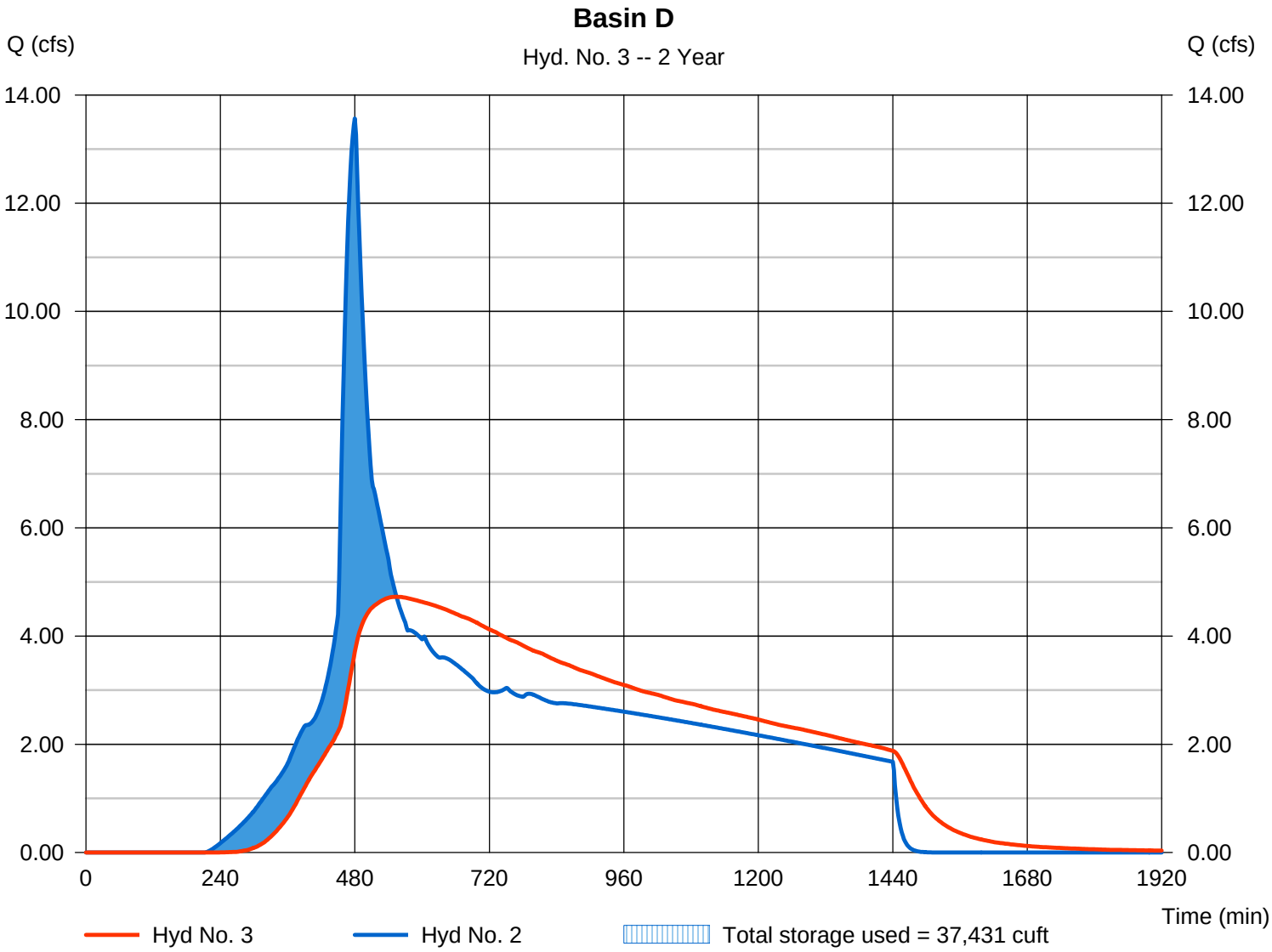
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin D

Hydrograph type	=	Reservoir	Peak discharge	=	4.726 cfs
Storm frequency	=	2 yrs	Time to peak	=	554 min
Time interval	=	2 min	Hyd. volume	=	211,538 cuft
Inflow hyd. No.	=	2 - Basin D - Post	Max. Elevation	=	103.12 ft
Reservoir name	=	Pond D	Max. Storage	=	37,431 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond D

Pond Data

Trapezoid - Bottom L x W = 100.0 x 100.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 6.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	10,000	0	0
0.60	100.60	10,733	6,219	6,219
1.20	101.20	11,492	6,666	12,885
1.80	101.80	12,277	7,129	20,014
2.40	102.40	13,087	7,608	27,622
3.00	103.00	13,924	8,102	35,724
3.60	103.60	14,787	8,612	44,336
4.20	104.20	15,675	9,137	53,473
4.80	104.80	16,589	9,678	63,151
5.40	105.40	17,530	10,234	73,386
6.00	106.00	18,496	10,806	84,192

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 36.00	10.87	21.30	0.00
Span (in)	= 36.00	10.87	21.30	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	103.56	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 15.70	4.50	0.00	0.00
Crest El. (ft)	= 106.00	104.05	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.06	622	100.06	0.01 ic	0.01 ic	0.00	---	0.00	0.00	---	---	---	---	0.011
0.12	1,244	100.12	0.05 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.048
0.18	1,866	100.18	0.11 ic	0.11 ic	0.00	---	0.00	0.00	---	---	---	---	0.108
0.24	2,487	100.24	0.20 ic	0.19 ic	0.00	---	0.00	0.00	---	---	---	---	0.188
0.30	3,109	100.30	0.29 ic	0.29 ic	0.00	---	0.00	0.00	---	---	---	---	0.292
0.36	3,731	100.36	0.41 ic	0.41 ic	0.00	---	0.00	0.00	---	---	---	---	0.412
0.42	4,353	100.42	0.55 ic	0.55 ic	0.00	---	0.00	0.00	---	---	---	---	0.547
0.48	4,975	100.48	0.74 ic	0.70 ic	0.00	---	0.00	0.00	---	---	---	---	0.697
0.54	5,597	100.54	0.88 ic	0.87 ic	0.00	---	0.00	0.00	---	---	---	---	0.867
0.60	6,219	100.60	1.05 ic	1.05 ic	0.00	---	0.00	0.00	---	---	---	---	1.046
0.66	6,885	100.66	1.23 ic	1.23 ic	0.00	---	0.00	0.00	---	---	---	---	1.229
0.72	7,552	100.72	1.42 ic	1.42 ic	0.00	---	0.00	0.00	---	---	---	---	1.424
0.78	8,218	100.78	1.64 ic	1.61 ic	0.00	---	0.00	0.00	---	---	---	---	1.605
0.84	8,885	100.84	1.78 ic	1.78 ic	0.00	---	0.00	0.00	---	---	---	---	1.782
0.90	9,552	100.90	2.02 ic	1.94 ic	0.00	---	0.00	0.00	---	---	---	---	1.936
0.96	10,218	100.96	2.05 ic	2.05 ic	0.00	---	0.00	0.00	---	---	---	---	2.051
1.02	10,885	101.02	2.17 ic	2.17 ic	0.00	---	0.00	0.00	---	---	---	---	2.169
1.08	11,552	101.08	2.30 ic	2.27 ic	0.00	---	0.00	0.00	---	---	---	---	2.272
1.14	12,218	101.14	2.45 ic	2.36 ic	0.00	---	0.00	0.00	---	---	---	---	2.358
1.20	12,885	101.20	2.47 ic	2.47 ic	0.00	---	0.00	0.00	---	---	---	---	2.465
1.26	13,598	101.26	2.61 ic	2.56 ic	0.00	---	0.00	0.00	---	---	---	---	2.557
1.32	14,311	101.32	2.64 ic	2.64 ic	0.00	---	0.00	0.00	---	---	---	---	2.641
1.38	15,024	101.38	2.77 ic	2.74 ic	0.00	---	0.00	0.00	---	---	---	---	2.741
1.44	15,736	101.44	2.81 ic	2.81 ic	0.00	---	0.00	0.00	---	---	---	---	2.812
1.50	16,449	101.50	2.94 ic	2.91 ic	0.00	---	0.00	0.00	---	---	---	---	2.913
1.56	17,162	101.56	2.98 ic	2.98 ic	0.00	---	0.00	0.00	---	---	---	---	2.981
1.62	17,875	101.62	3.11 ic	3.08 ic	0.00	---	0.00	0.00	---	---	---	---	3.075
1.68	18,588	101.68	3.15 ic	3.15 ic	0.00	---	0.00	0.00	---	---	---	---	3.147
1.74	19,301	101.74	3.30 ic	3.23 ic	0.00	---	0.00	0.00	---	---	---	---	3.229
1.80	20,014	101.80	3.31 ic	3.31 ic	0.00	---	0.00	0.00	---	---	---	---	3.309
1.86	20,775	101.86	3.48 ic	3.38 ic	0.00	---	0.00	0.00	---	---	---	---	3.375
1.92	21,536	101.92	3.48 ic	3.46 ic	0.00	---	0.00	0.00	---	---	---	---	3.460
1.98	22,296	101.98	3.52 ic	3.52 ic	0.00	---	0.00	0.00	---	---	---	---	3.522

Continues on next page...

Pond D

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
2.04	23,057	102.04	3.68 ic	3.60 ic	0.00	---	0.00	0.00	---	---	---	---	3.597
2.10	23,818	102.10	3.68 ic	3.68 ic	0.00	---	0.00	0.00	---	---	---	---	3.676
2.16	24,579	102.16	3.73 ic	3.73 ic	0.00	---	0.00	0.00	---	---	---	---	3.729
2.22	25,340	102.22	3.88 ic	3.80 ic	0.00	---	0.00	0.00	---	---	---	---	3.805
2.28	26,100	102.28	3.88 ic	3.88 ic	0.00	---	0.00	0.00	---	---	---	---	3.880
2.34	26,861	102.34	3.93 ic	3.93 ic	0.00	---	0.00	0.00	---	---	---	---	3.931
2.40	27,622	102.40	4.09 ic	4.00 ic	0.00	---	0.00	0.00	---	---	---	---	4.002
2.46	28,432	102.46	4.09 ic	4.07 ic	0.00	---	0.00	0.00	---	---	---	---	4.073
2.52	29,242	102.52	4.13 ic	4.13 ic	0.00	---	0.00	0.00	---	---	---	---	4.127
2.58	30,053	102.58	4.31 ic	4.19 ic	0.00	---	0.00	0.00	---	---	---	---	4.189
2.64	30,863	102.64	4.31 ic	4.26 ic	0.00	---	0.00	0.00	---	---	---	---	4.258
2.70	31,673	102.70	4.32 ic	4.32 ic	0.00	---	0.00	0.00	---	---	---	---	4.319
2.76	32,483	102.76	4.53 ic	4.37 ic	0.00	---	0.00	0.00	---	---	---	---	4.369
2.82	33,293	102.82	4.53 ic	4.43 ic	0.00	---	0.00	0.00	---	---	---	---	4.434
2.88	34,104	102.88	4.53 ic	4.50 ic	0.00	---	0.00	0.00	---	---	---	---	4.499
2.94	34,914	102.94	4.55 ic	4.55 ic	0.00	---	0.00	0.00	---	---	---	---	4.553
3.00	35,724	103.00	4.76 ic	4.60 ic	0.00	---	0.00	0.00	---	---	---	---	4.604
3.06	36,585	103.06	4.76 ic	4.67 ic	0.00	---	0.00	0.00	---	---	---	---	4.666
3.12	37,446	103.12	4.76 ic	4.73 ic	0.00	---	0.00	0.00	---	---	---	---	4.728
3.18	38,308	103.18	4.78 ic	4.78 ic	0.00	---	0.00	0.00	---	---	---	---	4.780
3.24	39,169	103.24	4.99 ic	4.83 ic	0.00	---	0.00	0.00	---	---	---	---	4.827
3.30	40,030	103.30	4.99 ic	4.89 ic	0.00	---	0.00	0.00	---	---	---	---	4.887
3.36	40,891	103.36	4.99 ic	4.95 ic	0.00	---	0.00	0.00	---	---	---	---	4.946
3.42	41,752	103.42	5.00 ic	5.00 ic	0.00	---	0.00	0.00	---	---	---	---	5.001
3.48	42,613	103.48	5.04 ic	5.04 ic	0.00	---	0.00	0.00	---	---	---	---	5.045
3.54	43,475	103.54	5.24 ic	5.10 ic	0.00	---	0.00	0.00	---	---	---	---	5.098
3.60	44,336	103.60	5.24 ic	5.15 ic	0.01 ic	---	0.00	0.00	---	---	---	---	5.165
3.66	45,250	103.66	5.26 ic	5.20 ic	0.06 ic	---	0.00	0.00	---	---	---	---	5.264
3.72	46,163	103.72	5.49 ic	5.25 ic	0.15 ic	---	0.00	0.00	---	---	---	---	5.398
3.78	47,077	103.78	5.74 ic	5.28 ic	0.28 ic	---	0.00	0.00	---	---	---	---	5.566
3.84	47,991	103.84	5.80 ic	5.32 ic	0.48 ic	---	0.00	0.00	---	---	---	---	5.796
3.90	48,904	103.90	6.03 ic	5.36 ic	0.67 ic	---	0.00	0.00	---	---	---	---	6.031
3.96	49,818	103.96	6.30 ic	5.40 ic	0.90 ic	---	0.00	0.00	---	---	---	---	6.299
4.02	50,732	104.02	6.84 ic	5.42 ic	1.22 ic	---	0.00	0.00	---	---	---	---	6.638
4.08	51,646	104.08	7.13 ic	5.45 ic	1.49 ic	---	0.00	0.08	---	---	---	---	7.022
4.14	52,559	104.14	7.73 ic	5.47 ic	1.85 ic	---	0.00	0.40	---	---	---	---	7.722
4.20	53,473	104.20	8.68 ic	5.46 ic	2.25 ic	---	0.00	0.87	---	---	---	---	8.580
4.26	54,441	104.26	9.66 oc	5.45 ic	2.62 ic	---	0.00	1.44	---	---	---	---	9.514
4.32	55,409	104.32	10.80 oc	5.42 ic	3.02 ic	---	0.00	2.10	---	---	---	---	10.54
4.38	56,376	104.38	11.98 oc	5.39 ic	3.51 ic	---	0.00	2.84	---	---	---	---	11.74
4.44	57,344	104.44	13.17 oc	5.36 ic	3.95 ic	---	0.00	3.65	---	---	---	---	12.96
4.50	58,312	104.50	14.36 oc	5.33 ic	4.41 ic	---	0.00	4.52	---	---	---	---	14.27
4.56	59,280	104.56	15.84 oc	5.28 ic	4.97 ic	---	0.00	5.46	---	---	---	---	15.70
4.62	60,248	104.62	17.29 oc	5.23 ic	5.45 ic	---	0.00	6.45	---	---	---	---	17.12
4.68	61,215	104.68	18.69 oc	5.18 ic	5.94 ic	---	0.00	7.49	---	---	---	---	18.61
4.74	62,183	104.74	20.28 oc	5.11 ic	6.51 ic	---	0.00	8.59	---	---	---	---	20.21
4.80	63,151	104.80	21.97 oc	5.02 ic	7.08 ic	---	0.00	9.73	---	---	---	---	21.83
4.86	64,175	104.86	23.45 oc	4.94 ic	7.56 ic	---	0.00	10.92	---	---	---	---	23.42
4.92	65,198	104.92	25.15 oc	4.82 ic	8.10 ic	---	0.00	12.16	---	---	---	---	25.07
4.98	66,221	104.98	26.75 oc	4.64 ic	8.61 ic	---	0.00	13.44	---	---	---	---	26.69
5.04	67,245	105.04	28.29 oc	4.37 ic	9.16 ic	---	0.00	14.76	---	---	---	---	28.29
5.10	68,268	105.10	30.14 oc	4.36 ic	9.65 ic	---	0.00	16.12	---	---	---	---	30.14
5.16	69,292	105.16	32.00 oc	4.34 ic	10.14 ic	---	0.00	17.52	---	---	---	---	32.00
5.22	70,315	105.22	33.85 oc	4.31 ic	10.58 ic	---	0.00	18.96	---	---	---	---	33.85
5.28	71,339	105.28	35.67 oc	4.28 ic	10.95 ic	---	0.00	20.44	---	---	---	---	35.67
5.34	72,362	105.34	37.46 oc	4.25 ic	11.25 ic	---	0.00	21.95	---	---	---	---	37.45
5.40	73,386	105.40	39.33 oc	4.20 ic	11.63 ic	---	0.00	23.50	---	---	---	---	39.33
5.46	74,466	105.46	41.23 oc	4.15 ic	11.99 ic	---	0.00	25.09	---	---	---	---	41.22
5.52	75,547	105.52	43.14 oc	4.09 ic	12.34 ic	---	0.00	26.71	---	---	---	---	43.13
5.58	76,627	105.58	45.06 oc	4.02 ic	12.68 ic	---	0.00	28.36	---	---	---	---	45.06
5.64	77,708	105.64	47.00 oc	3.94 ic	13.01 ic	---	0.00	30.04	---	---	---	---	47.00
5.70	78,789	105.70	48.80 oc	3.87 ic	13.33 ic	---	0.00	31.60 s	---	---	---	---	48.80
5.76	79,869	105.76	50.43 oc	3.81 ic	13.65 ic	---	0.00	32.97 s	---	---	---	---	50.43
5.82	80,950	105.82	51.96 oc	3.75 ic	13.96 ic	---	0.00	34.26 s	---	---	---	---	51.96
5.88	82,031	105.88	53.37 oc	3.69 ic	14.17 ic	---	0.00	35.50 s	---	---	---	---	53.37
5.94	83,111	105.94	54.51 oc	3.66 ic	14.05 ic	---	0.00	36.81 s	---	---	---	---	54.51
6.00	84,192	106.00	55.63 oc	3.63 ic	13.92 ic	---	0.00	38.08 s	---	---	---	---	55.63

...End

Hydrograph Report

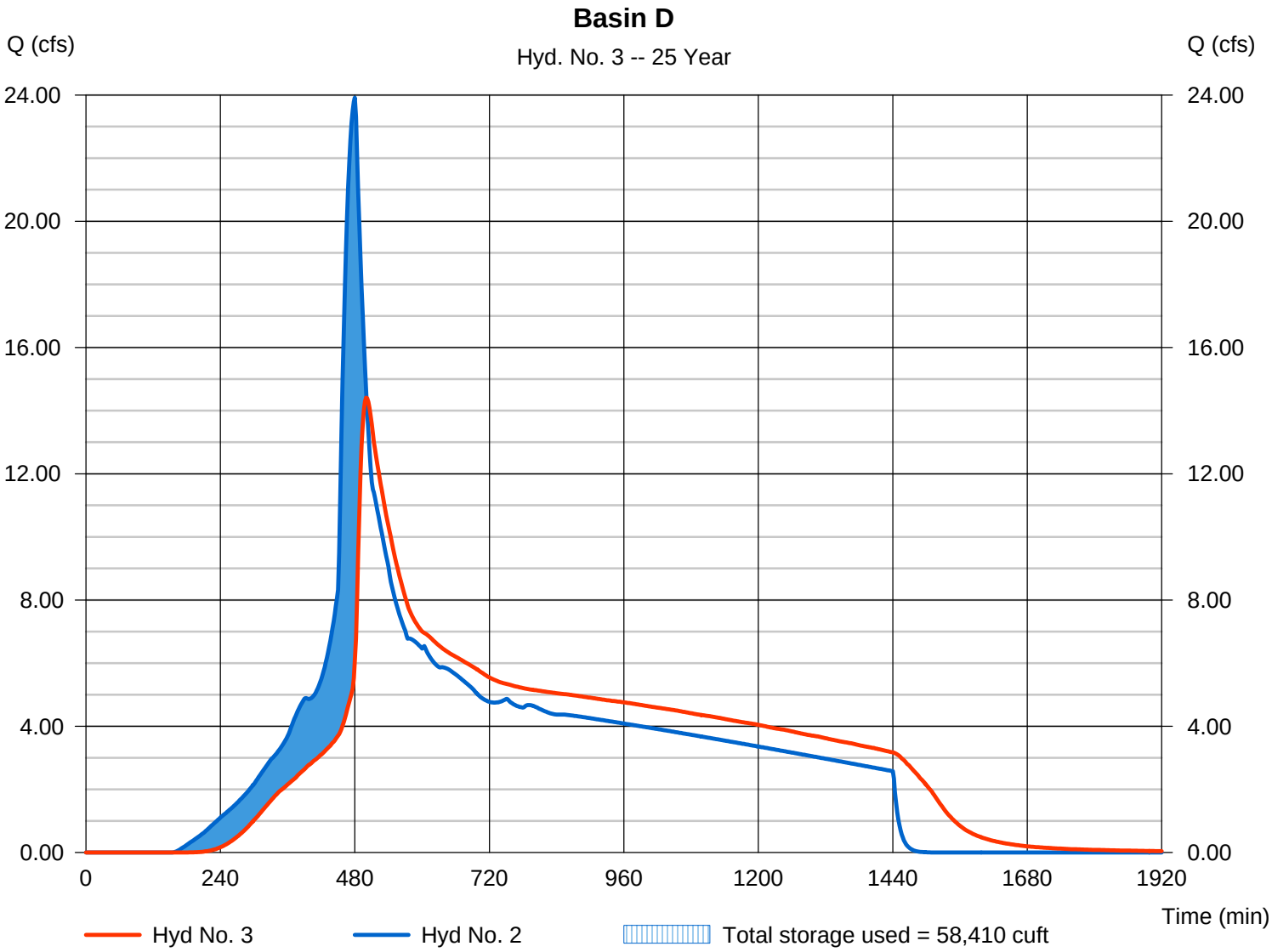
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin D

Hydrograph type	=	Reservoir	Peak discharge	=	14.41 cfs
Storm frequency	=	25 yrs	Time to peak	=	500 min
Time interval	=	2 min	Hyd. volume	=	358,620 cuft
Inflow hyd. No.	=	2 - Basin D - Post	Max. Elevation	=	104.51 ft
Reservoir name	=	Pond D	Max. Storage	=	58,410 cuft

Storage Indication method used.



Hydrograph Report

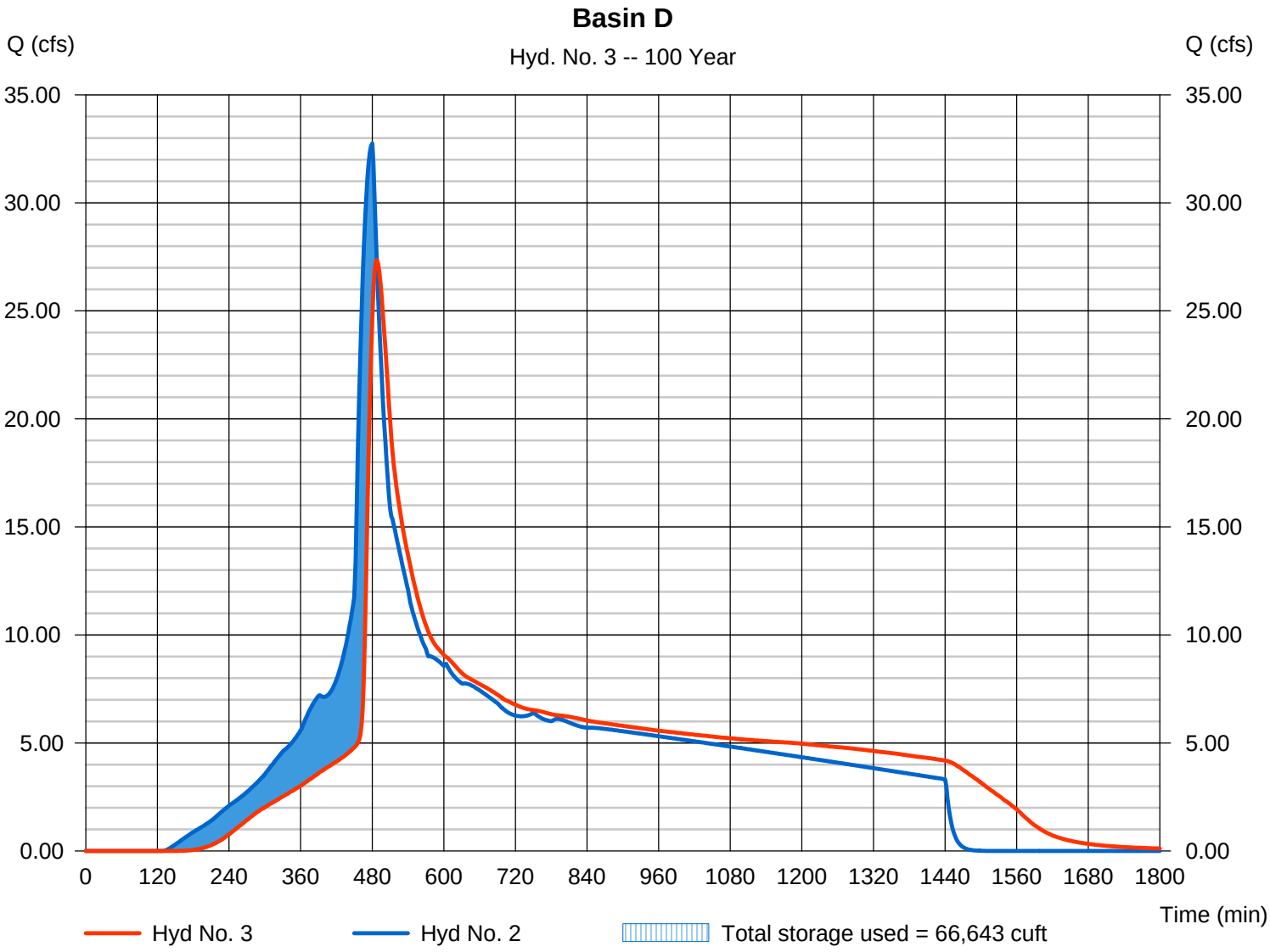
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin D

Hydrograph type	=	Reservoir	Peak discharge	=	27.35 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	485,860 cuft
Inflow hyd. No.	=	2 - Basin D - Post	Max. Elevation	=	105.01 ft
Reservoir name	=	Pond D	Max. Storage	=	66,643 cuft

Storage Indication method used.



Hydrograph Report

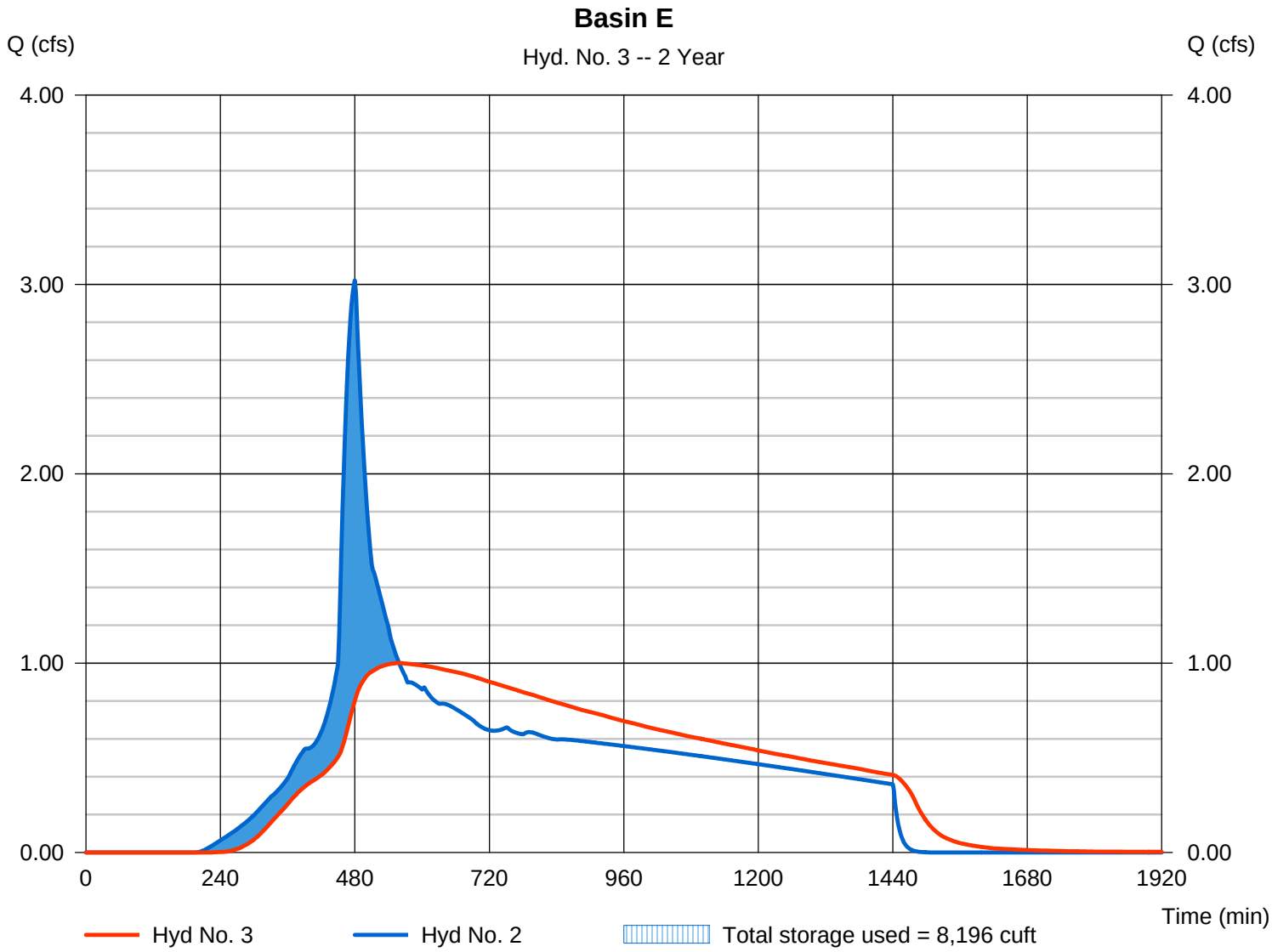
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	1.000 cfs
Storm frequency	=	2 yrs	Time to peak	=	558 min
Time interval	=	2 min	Hyd. volume	=	46,534 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	102.61 ft
Reservoir name	=	Pond E	Max. Storage	=	8,196 cuft

Storage Indication method used.



Pond Report

Pond No. 1 - Pond E

Pond Data

Trapezoid - Bottom L x W = 48.0 x 48.0 ft, Side slope = 3.00:1, Bottom elev. = 100.00 ft, Depth = 5.00 ft

Stage / Storage Table

Stage (ft)	Elevation (ft)	Contour area (sqft)	Incr. Storage (cuft)	Total storage (cuft)
0.00	100.00	2,304	0	0
0.50	100.50	2,601	1,226	1,226
1.00	101.00	2,916	1,379	2,604
1.50	101.50	3,249	1,540	4,144
2.00	102.00	3,600	1,711	5,856
2.50	102.50	3,969	1,891	7,747
3.00	103.00	4,356	2,080	9,828
3.50	103.50	4,761	2,278	12,106
4.00	104.00	5,184	2,485	14,592
4.50	104.50	5,625	2,701	17,293
5.00	105.00	6,084	2,926	20,220

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (in)	= 24.00	5.06	9.00	0.00
Span (in)	= 24.00	5.06	9.00	0.00
No. Barrels	= 1	1	1	0
Invert El. (ft)	= 100.00	100.01	102.60	0.00
Length (ft)	= 100.00	0.00	0.00	0.00
Slope (%)	= 0.50	0.00	0.00	n/a
N-Value	= .013	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	Yes	Yes	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (ft)	= 6.28	2.00	0.00	0.00
Crest El. (ft)	= 104.00	103.41	0.00	0.00
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Riser	Rect	---	---
Multi-Stage	= Yes	Yes	No	No

Exfil.(in/hr) = 0.000 (by Wet area)

TW Elev. (ft) = 0.00

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
0.00	0	100.00	0.00	0.00	0.00	---	0.00	0.00	---	---	---	---	0.000
0.05	123	100.05	0.00 ic	0.00 ic	0.00	---	0.00	0.00	---	---	---	---	0.005
0.10	245	100.10	0.02 ic	0.02 ic	0.00	---	0.00	0.00	---	---	---	---	0.022
0.15	368	100.15	0.05 ic	0.05 ic	0.00	---	0.00	0.00	---	---	---	---	0.050
0.20	490	100.20	0.09 ic	0.09 ic	0.00	---	0.00	0.00	---	---	---	---	0.086
0.25	613	100.25	0.13 ic	0.13 ic	0.00	---	0.00	0.00	---	---	---	---	0.132
0.30	735	100.30	0.18 ic	0.18 ic	0.00	---	0.00	0.00	---	---	---	---	0.182
0.35	858	100.35	0.24 ic	0.23 ic	0.00	---	0.00	0.00	---	---	---	---	0.232
0.40	980	100.40	0.29 ic	0.28 ic	0.00	---	0.00	0.00	---	---	---	---	0.283
0.45	1,103	100.45	0.32 ic	0.32 ic	0.00	---	0.00	0.00	---	---	---	---	0.321
0.50	1,226	100.50	0.35 ic	0.35 ic	0.00	---	0.00	0.00	---	---	---	---	0.349
0.55	1,363	100.55	0.38 ic	0.37 ic	0.00	---	0.00	0.00	---	---	---	---	0.375
0.60	1,501	100.60	0.41 ic	0.40 ic	0.00	---	0.00	0.00	---	---	---	---	0.398
0.65	1,639	100.65	0.44 ic	0.42 ic	0.00	---	0.00	0.00	---	---	---	---	0.420
0.70	1,777	100.70	0.44 ic	0.44 ic	0.00	---	0.00	0.00	---	---	---	---	0.445
0.75	1,915	100.75	0.48 ic	0.47 ic	0.00	---	0.00	0.00	---	---	---	---	0.465
0.80	2,053	100.80	0.49 ic	0.49 ic	0.00	---	0.00	0.00	---	---	---	---	0.485
0.85	2,190	100.85	0.52 ic	0.51 ic	0.00	---	0.00	0.00	---	---	---	---	0.507
0.90	2,328	100.90	0.52 ic	0.52 ic	0.00	---	0.00	0.00	---	---	---	---	0.524
0.95	2,466	100.95	0.56 ic	0.54 ic	0.00	---	0.00	0.00	---	---	---	---	0.545
1.00	2,604	101.00	0.56 ic	0.56 ic	0.00	---	0.00	0.00	---	---	---	---	0.562
1.05	2,758	101.05	0.60 ic	0.58 ic	0.00	---	0.00	0.00	---	---	---	---	0.581
1.10	2,912	101.10	0.60 ic	0.60 ic	0.00	---	0.00	0.00	---	---	---	---	0.599
1.15	3,066	101.15	0.64 ic	0.61 ic	0.00	---	0.00	0.00	---	---	---	---	0.614
1.20	3,220	101.20	0.64 ic	0.63 ic	0.00	---	0.00	0.00	---	---	---	---	0.632
1.25	3,374	101.25	0.65 ic	0.65 ic	0.00	---	0.00	0.00	---	---	---	---	0.647
1.30	3,528	101.30	0.69 ic	0.66 ic	0.00	---	0.00	0.00	---	---	---	---	0.663
1.35	3,682	101.35	0.69 ic	0.68 ic	0.00	---	0.00	0.00	---	---	---	---	0.680
1.40	3,836	101.40	0.69 ic	0.69 ic	0.00	---	0.00	0.00	---	---	---	---	0.694
1.45	3,990	101.45	0.73 ic	0.71 ic	0.00	---	0.00	0.00	---	---	---	---	0.709
1.50	4,144	101.50	0.73 ic	0.72 ic	0.00	---	0.00	0.00	---	---	---	---	0.725
1.55	4,316	101.55	0.74 ic	0.74 ic	0.00	---	0.00	0.00	---	---	---	---	0.738
1.60	4,487	101.60	0.78 ic	0.75 ic	0.00	---	0.00	0.00	---	---	---	---	0.751
1.65	4,658	101.65	0.78 ic	0.77 ic	0.00	---	0.00	0.00	---	---	---	---	0.766

Continues on next page...

Pond E

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	PrfRsr cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Exfil cfs	User cfs	Total cfs
1.70	4,829	101.70	0.78 ic	0.78 ic	0.00	---	0.00	0.00	---	---	---	---	0.781
1.75	5,000	101.75	0.79 ic	0.79 ic	0.00	---	0.00	0.00	---	---	---	---	0.793
1.80	5,171	101.80	0.84 ic	0.81 ic	0.00	---	0.00	0.00	---	---	---	---	0.806
1.85	5,343	101.85	0.84 ic	0.82 ic	0.00	---	0.00	0.00	---	---	---	---	0.820
1.90	5,514	101.90	0.84 ic	0.83 ic	0.00	---	0.00	0.00	---	---	---	---	0.834
1.95	5,685	101.95	0.84 ic	0.84 ic	0.00	---	0.00	0.00	---	---	---	---	0.845
2.00	5,856	102.00	0.89 ic	0.86 ic	0.00	---	0.00	0.00	---	---	---	---	0.857
2.05	6,045	102.05	0.89 ic	0.87 ic	0.00	---	0.00	0.00	---	---	---	---	0.870
2.10	6,234	102.10	0.89 ic	0.88 ic	0.00	---	0.00	0.00	---	---	---	---	0.883
2.15	6,423	102.15	0.89 ic	0.89 ic	0.00	---	0.00	0.00	---	---	---	---	0.895
2.20	6,613	102.20	0.95 ic	0.91 ic	0.00	---	0.00	0.00	---	---	---	---	0.905
2.25	6,802	102.25	0.95 ic	0.92 ic	0.00	---	0.00	0.00	---	---	---	---	0.918
2.30	6,991	102.30	0.95 ic	0.93 ic	0.00	---	0.00	0.00	---	---	---	---	0.930
2.35	7,180	102.35	0.95 ic	0.94 ic	0.00	---	0.00	0.00	---	---	---	---	0.942
2.40	7,369	102.40	0.95 ic	0.95 ic	0.00	---	0.00	0.00	---	---	---	---	0.953
2.45	7,558	102.45	1.01 ic	0.96 ic	0.00	---	0.00	0.00	---	---	---	---	0.963
2.50	7,747	102.50	1.01 ic	0.97 ic	0.00	---	0.00	0.00	---	---	---	---	0.974
2.55	7,956	102.55	1.01 ic	0.99 ic	0.00	---	0.00	0.00	---	---	---	---	0.986
2.60	8,164	102.60	1.01 ic	1.00 ic	0.00 ic	---	0.00	0.00	---	---	---	---	0.997
2.65	8,372	102.65	1.02 ic	1.01 ic	0.01 ic	---	0.00	0.00	---	---	---	---	1.017
2.70	8,580	102.70	1.07 ic	1.02 ic	0.04 ic	---	0.00	0.00	---	---	---	---	1.055
2.75	8,788	102.75	1.13 ic	1.03 ic	0.09 ic	---	0.00	0.00	---	---	---	---	1.112
2.80	8,996	102.80	1.20 ic	1.03 ic	0.15 ic	---	0.00	0.00	---	---	---	---	1.182
2.85	9,204	102.85	1.27 ic	1.04 ic	0.22 ic	---	0.00	0.00	---	---	---	---	1.265
2.90	9,412	102.90	1.41 ic	1.05 ic	0.31 ic	---	0.00	0.00	---	---	---	---	1.361
2.95	9,620	102.95	1.48 ic	1.05 ic	0.41 ic	---	0.00	0.00	---	---	---	---	1.464
3.00	9,828	103.00	1.58 ic	1.06 ic	0.52 ic	---	0.00	0.00	---	---	---	---	1.582
3.05	10,056	103.05	1.73 ic	1.07 ic	0.63 ic	---	0.00	0.00	---	---	---	---	1.701
3.10	10,284	103.10	1.83 ic	1.07 ic	0.76 ic	---	0.00	0.00	---	---	---	---	1.829
3.15	10,512	103.15	1.99 ic	1.08 ic	0.88 ic	---	0.00	0.00	---	---	---	---	1.956
3.20	10,739	103.20	2.09 ic	1.09 ic	1.00 ic	---	0.00	0.00	---	---	---	---	2.086
3.25	10,967	103.25	2.28 ic	1.09 ic	1.12 ic	---	0.00	0.00	---	---	---	---	2.211
3.30	11,195	103.30	2.38 ic	1.10 ic	1.22 ic	---	0.00	0.00	---	---	---	---	2.321
3.35	11,423	103.35	2.48 ic	1.11 ic	1.30 ic	---	0.00	0.00	---	---	---	---	2.408
3.40	11,651	103.40	2.50 ic	1.11 ic	1.39 ic	---	0.00	0.00	---	---	---	---	2.500
3.45	11,879	103.45	2.70 ic	1.12 ic	1.47 ic	---	0.00	0.05	---	---	---	---	2.639
3.50	12,106	103.50	2.92 ic	1.12 ic	1.54 ic	---	0.00	0.18	---	---	---	---	2.845
3.55	12,355	103.55	3.15 ic	1.13 ic	1.61 ic	---	0.00	0.35	---	---	---	---	3.089
3.60	12,604	103.60	3.39 ic	1.13 ic	1.68 ic	---	0.00	0.55	---	---	---	---	3.365
3.65	12,852	103.65	3.66 ic	1.13 ic	1.75 ic	---	0.00	0.78	---	---	---	---	3.664
3.70	13,101	103.70	4.03 ic	1.14 ic	1.81 ic	---	0.00	1.04	---	---	---	---	3.987
3.75	13,349	103.75	4.33 ic	1.14 ic	1.87 ic	---	0.00	1.32	---	---	---	---	4.331
3.80	13,598	103.80	4.72 ic	1.14 ic	1.93 ic	---	0.00	1.62	---	---	---	---	4.695
3.85	13,846	103.85	5.16 ic	1.14 ic	1.99 ic	---	0.00	1.94	---	---	---	---	5.075
3.90	14,095	103.90	5.47 ic	1.14 ic	2.05 ic	---	0.00	2.28	---	---	---	---	5.474
3.95	14,343	103.95	5.89 oc	1.15 ic	2.10 ic	---	0.00	2.64	---	---	---	---	5.889
4.00	14,592	104.00	6.38 oc	1.14 ic	2.15 ic	---	0.00	3.02	---	---	---	---	6.315
4.05	14,862	104.05	6.99 oc	1.14 ic	2.21 ic	---	0.23	3.41	---	---	---	---	6.986
4.10	15,132	104.10	7.91 oc	1.12 ic	2.26 ic	---	0.66	3.82	---	---	---	---	7.858
4.15	15,402	104.15	8.93 oc	1.10 ic	2.31 ic	---	1.22	4.24	---	---	---	---	8.864
4.20	15,673	104.20	9.98 oc	1.08 ic	2.35 ic	---	1.87	4.68	---	---	---	---	9.980
4.25	15,943	104.25	11.15 oc	1.00 ic	2.40 ic	---	2.61	5.13	---	---	---	---	11.14
4.30	16,213	104.30	12.46 oc	0.98 ic	2.45 ic	---	3.44	5.59	---	---	---	---	12.46
4.35	16,483	104.35	13.85 oc	0.96 ic	2.49 ic	---	4.33	6.07	---	---	---	---	13.85
4.40	16,753	104.40	15.32 oc	0.92 ic	2.54 ic	---	5.29	6.56	---	---	---	---	15.32
4.45	17,023	104.45	16.84 oc	0.88 ic	2.58 ic	---	6.31	7.06	---	---	---	---	16.84
4.50	17,293	104.50	18.43 oc	0.83 ic	2.63 ic	---	7.39	7.58	---	---	---	---	18.43
4.55	17,586	104.55	19.89 oc	0.78 ic	2.47 ic	---	8.53	8.11	---	---	---	---	19.89
4.60	17,879	104.60	21.33 oc	0.72 ic	2.27 ic	---	9.72	8.62 s	---	---	---	---	21.33
4.65	18,171	104.65	22.53 oc	0.66 ic	2.09 ic	---	10.96	8.82 s	---	---	---	---	22.53
4.70	18,464	104.70	23.59 oc	0.60 ic	1.91 ic	---	12.25	8.83 s	---	---	---	---	23.59
4.75	18,757	104.75	24.47 oc	0.55 ic	1.75 ic	---	13.42 s	8.75 s	---	---	---	---	24.47
4.80	19,049	104.80	25.09 oc	0.52 ic	1.64 ic	---	14.17 s	8.76 s	---	---	---	---	25.09
4.85	19,342	104.85	25.62 oc	0.49 ic	1.55 ic	---	14.80 s	8.79 s	---	---	---	---	25.62
4.90	19,635	104.90	26.08 oc	0.46 ic	1.46 ic	---	15.35 s	8.81 s	---	---	---	---	26.08
4.95	19,927	104.95	26.51 oc	0.44 ic	1.39 ic	---	15.84 s	8.83 s	---	---	---	---	26.51
5.00	20,220	105.00	26.90 oc	0.42 ic	1.33 ic	---	16.29 s	8.85 s	---	---	---	---	26.89

...End

Hydrograph Report

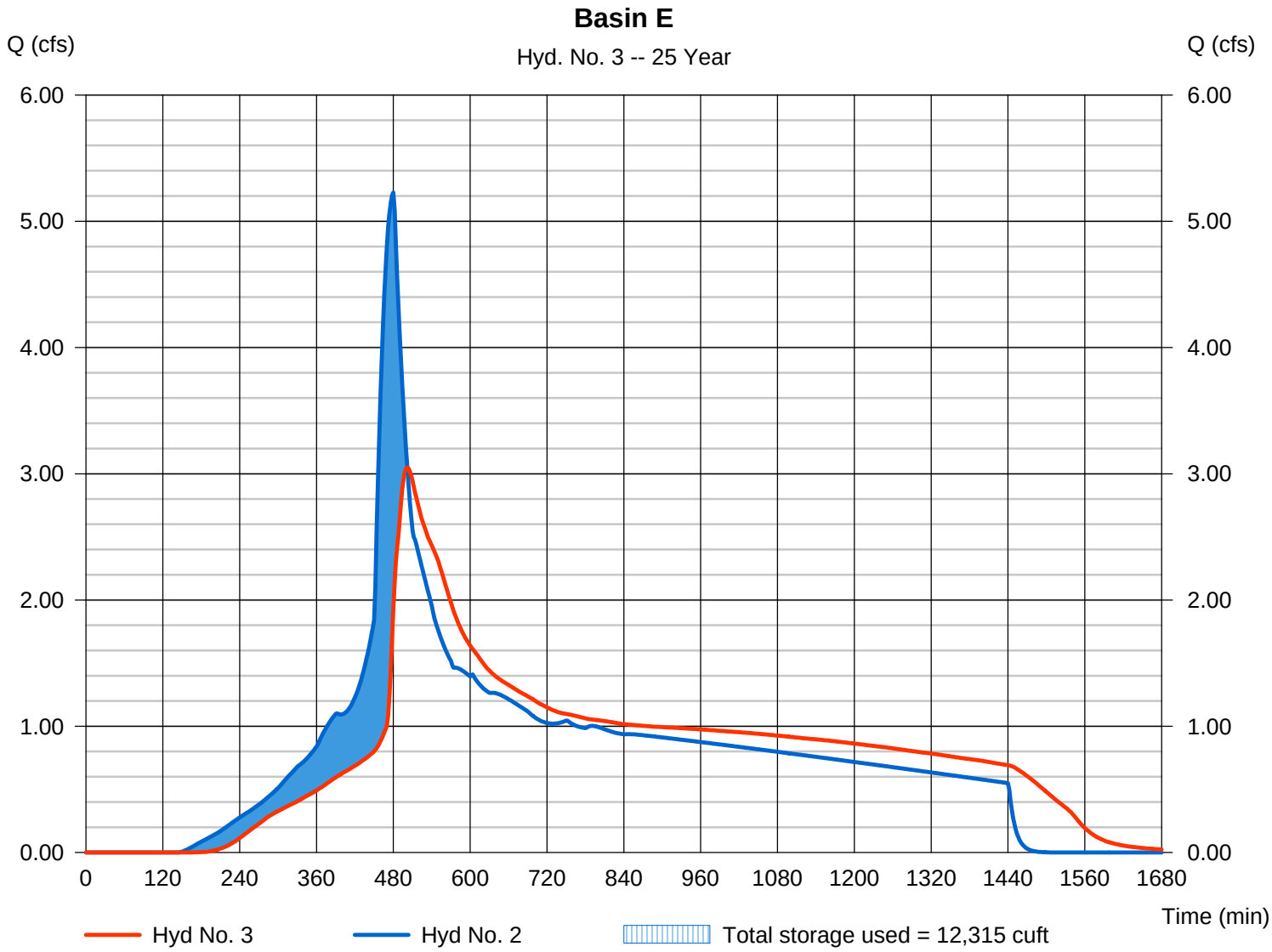
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	3.050 cfs
Storm frequency	=	25 yrs	Time to peak	=	502 min
Time interval	=	2 min	Hyd. volume	=	77,989 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	103.54 ft
Reservoir name	=	Pond E	Max. Storage	=	12,315 cuft

Storage Indication method used.



Hydrograph Report

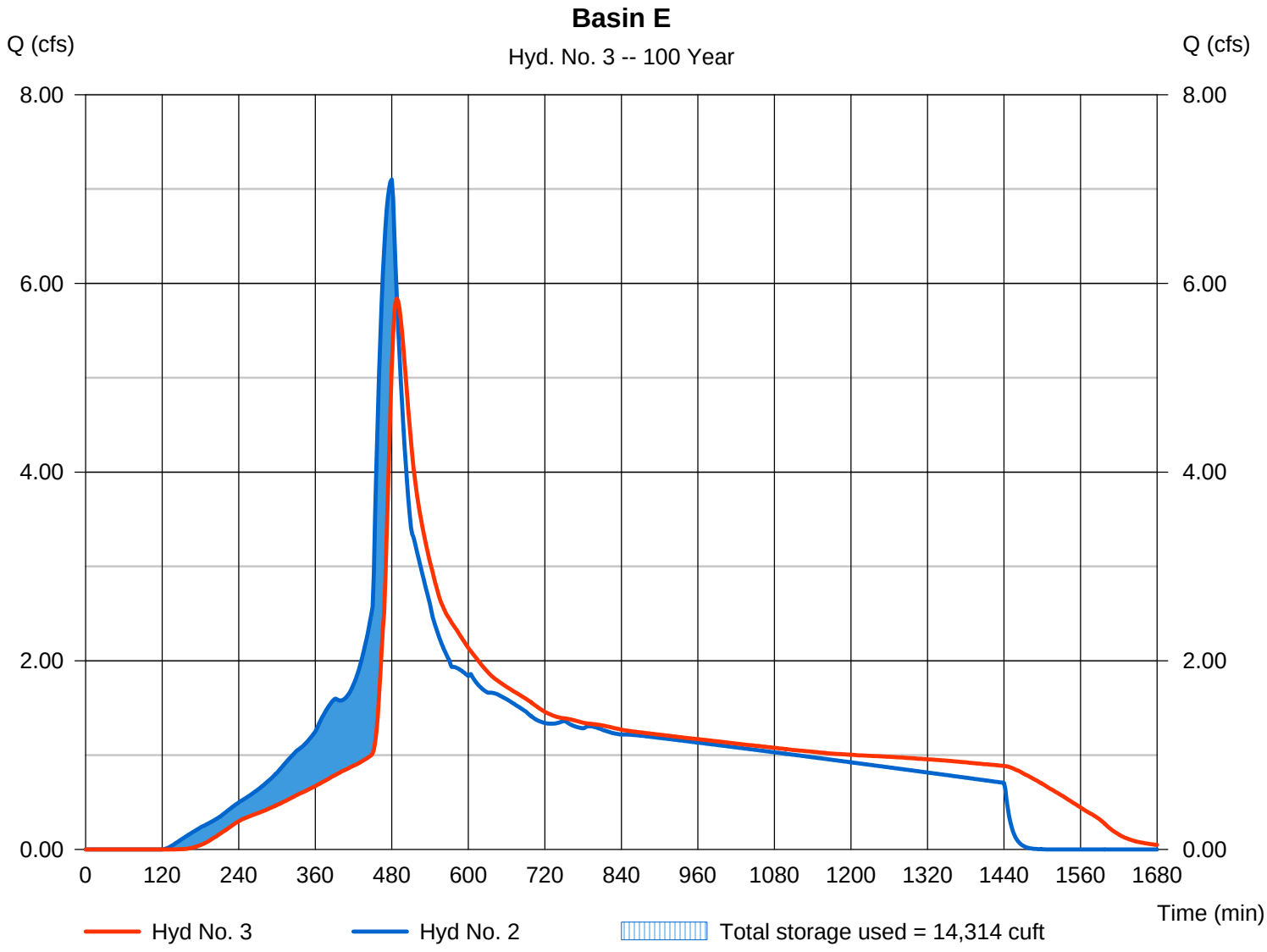
Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2009 by Autodesk, Inc. v6.066 Monday, Nov 23, 2009

Hyd. No. 3

Basin E

Hydrograph type	=	Reservoir	Peak discharge	=	5.839 cfs
Storm frequency	=	100 yrs	Time to peak	=	488 min
Time interval	=	2 min	Hyd. volume	=	105,081 cuft
Inflow hyd. No.	=	2 - Basin E - Post	Max. Elevation	=	103.94 ft
Reservoir name	=	Pond E	Max. Storage	=	14,314 cuft

Storage Indication method used.



D.4 ALTERNATIVE 3B – NO ANNEXATION, DEVELOPMENT WITHIN THE COUNTY UNDER MULTIPLE OWNERSHIPS

Drainage Calculations

APPENDIX E

Sanitary Sewer Calculations and Maps

E.1 ALTERNATIVE 1 – PREFERRED ALTERNATIVE

SanitarySewer Calculations

E.2 ALTERNATIVE 2 – REDUCED RESIDENTIAL DENSITY

Sanitary Sewer Calculations

E.3 ALTERNATIVE 3A – NO ANNEXATION, DEVELOPMENT WITHIN THE COUNTY UNDER SINGLE OWNERSHIP

Sanitary Sewer Calculations

E.4 ALTERNATIVE 3B – NO ANNEXATION, DEVELOPMENT WITHIN THE COUNTY UNDER MULTIPLE OWNERSHIPS

Sanitary Sewer Calculations