Appendix L:
Hydrology and Water Quality Supporting Information

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L.1 - Hydrology Report

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PRELIMINARY HYDROLOGY CALCULATIONS

FOR

EBS BARTON ROAD WAREHOUSES
BARTON ROAD AND SOUTH TERRACE AVENUE
COLTON, CALIFORNIA

PREPARED FOR

HAGAR PACIFIC PROPERTIES – N.B.
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DECEMBER 13, 2018
REVISED JANUARY 28, 2019
REVISED JUNE 25, 2019
REVISED AUGUST 6, 2019
REVISED OCTOBER 11, 2019

JOB NO. 3711

PREPARED BY

THIENES ENGINEERING
14349 FIRESTONE BLVD.
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PRELIMINARY HYDROLOGY CALCULATIONS

FOR

EBS BARTON ROAD WAREHOUSES

PREPARED BY RICKY HWA
UNDER THE SUPERVISION OF

REINHARD STENZEL DATE:
R.C.E. 56155
EXP. 12/31/20

INTRODUCTION

A: PROJECT LOCATION

The project site is located on the north and south sides of Barton Road, east of La Cadena Drive, west of Grand Terrace Road in the City of Colton, California. Please see next page for vicinity map.

B: STUDY PURPOSE

The purpose of this study is to determine the 25-year and 100-year existing and proposed condition peak flow rates from the project site.

C: PROJECT STAFF:

Thienes Engineering staff involved in this study include:

Reinhard Stenzel
Brian Weil
Ricky Hwa

Last Update:12/6/18
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"VICINITY MAP"

FOR

BARTON RD. AND TERRACE AVE.
COLTON, CA

DISCUSSION

The project site encompasses approximately 47.75 acres, with 28.30 acres on the north side of Barton Road and 19.45 acres on the south side. Proposed improvements to the site include two commercial type buildings (one on each side of Barton Road). There will be truck yards on the east and west sides of the northerly Building 1, and a truck yard on the east side of the southerly Building 2. Vehicle parking lots will be adjacent to the north and south sides of the proposed buildings. Landscape areas will be adjacent to street frontages and scattered throughout the site. A master plan storm drain will be constructed in La Cadena Drive south of De Berry Street to convey onsite and nearby offsite runoffs to an existing County maintained channel approximately 3,000 feet south of De Berry Street. Within the existing De Berry Street corridor, a cul-de-sac will be constructed near Building 2's southeast corner as the new terminus of De Berry Street, and a new private access road will connect De Berry Street to the existing commercial development south of Building 2. Finally, the portion of Terrace Avenue south of Barton Road and bisecting the Building 2 site will be vacated to allow for the construction of Building 2.

Master Plan Hydrology

Per the "Report on the San Bernardino County Comprehensive Storm Drain Plan – Project No. 3 Volume II", the project site is tabled to the proposed (unconstructed) storm drain Line "B" in La Cadena Drive, which drains southerly to the existing storm drain Line "A" approximately 3,000 feet south of De Berry Street, then drains westerly via approximately 4,000 feet of dirt channel and 6,000 feet of concrete channel, ultimately discharging to the Santa Ana River.

The portion of the unconstructed storm drain Line "B" south of De Berry Street, and a proposed lateral in De Berry Street between La Cadena Drive and the project site's southwest corner, will be constructed as part of the project site improvements.

The County master plan storm drain system was designed for 25-year storm events. Proposed condition 100-year site discharge will be limited to existing condition 25-year runoff, with the difference to be temporarily detained onsite.

Please see Appendix "A" for the County Comprehensive Storm Drain Plan, as-built storm drain plans and other pertinent reference materials.

Existing Condition

Building 1 site, north of Barton Road:

The Building 1 site is currently developed with three warehouse type buildings, several truck yards (between the warehouse buildings), and a vehicle parking lot (southwest corner of site). The site generally drains westerly to Terrace Avenue, then further west via a street

catch basin and a 36-inch C.M.P. outletting to a dirt channel within the westerly railroad easement. The dirt channel – located east of the railroad tracks – drains northerly and daylights to Vivienda Avenue, then drains further north and crosses under the railroad via an underpass, then continues northerly in another dirt channel west of the railroad tracks, and finally discharges to the Santa Ana River via a 36-inch storm drain connection. See Appendix "A" for offsite drainage exhibit from project site to Santa Ana River.

The northerly truck yard and north portion of the larger building (Nodes 100-110, 8.25 acres) drain to catch basins in the truck yard. Runoff is then conveyed westerly via an 18-inch storm drain and discharged to Terrace Avenue via a parkway culvert, then southerly to the above mentioned street catch basin tributary to the westerly railroad and, ultimately, the Santa Ana River. The existing condition 25-year and 100-year peak flow rates from the north portion of the Building 1 site are approximately 23.6 cfs and 30.1 cfs, respectively.

The south portion of the larger building, the westerly and southerly truck yards, and the north half of the southerly building (Nodes 120-136, 14.25 acres) drain to catch basins in the truck yards. Runoff is then conveyed westerly via another 18-inch storm drain to the back of the same street catch basin. The existing condition 25-year and 100-year peak flow rates from the middle portion of the Building 1 site are approximately 38.7 cfs and 48.8 cfs, respectively.

The west half of the smaller westerly building (Nodes 140-141, 0.60 acres) drains westerly via another parkway culvert to Terrace Avenue, then northerly to the same street catch basin. The existing condition 25-year and 100-year peak flow rates from the west half of the westerly building are approximately 2.3 cfs and 2.9 cfs, respectively.

The southwest parking lot and southerly entry driveway (Nodes 150-151, 2.05 acres) drain to a catch basin at the parking lot's southwest corner. The catch basin is tributary to Terrace Avenue via a 6-inch storm drain. Runoff is then conveyed northerly to the same street catch basin. The existing condition 25-year and 100-year peak flow rates from the southwest corner of the Building 1 site are approximately 5.4 cfs and 6.8 cfs, respectively.

The south half of the southerly building (Nodes 160-161, 1.30 acres) drains southerly to Barton Road via roof drains. Runoff is then conveyed westerly to Terrace Avenue, then northerly to the same street catch basin in Terrace Avenue. The existing condition 25-year and 100-year peak flow rates from the south half of the southerly building are approximately 4.3 cfs and 5.5 cfs, respectively.

The north-easterly dirt lot within Southern California Edison's easement (Nodes 170-171, 1.85 acres) surface drains easterly to a dirt channel within another railroad easement adjacent to the site's easterly property line. This dirt channel also drains northerly, then easterly across the railroad easement via a 36-inch storm drain discharging to a dirt lot. The dirt channel continues northerly to a detention basin, which discharges northerly to the Santa Ana River via a 48-inch storm drain connection. The existing condition 25-year and 100-year peak flow rates from the north-easterly dirt lot are approximately 3.7 cfs and 5.2 cfs, respectively (also depicted on offsite drainage exhibit in Appenidx "A").

The total existing condition 25-year and 100-year peak flow rates from the Building 1 site (28.30 acres total) are approximately 78.0 cfs and 99.3 cfs, respectively.

The following table is a summary of existing condition 25-year and 100-year discharges from all areas within the Building 1 site, all of which are tributary to the Santa Ana River.

Building 1 Site Areas	Q25-Ex.	Q100-Ex.
Nodes 100-110	23.6 cfs	30.1 cfs
Nodes 120-136	38.7 cfs	48.8 cfs
Nodes 140-141	2.3 cfs	2.9 cfs
Nodes 150-151	5.4 cfs	6.8 cfs
Nodes 160-161	4.3 cfs	5.5 cfs
Nodes 170-171	3.7 cfs	5.2 cfs
Total	78.0 cfs	99.3 cfs

Offsite flow from south half of Barton Road fronting Building 2 site:

Runoff from the south half of Barton Road surface flows to Terrace Avenue, then southerly along street curbs in Terrace Avenue (and entering the Building 2 site) to a riser inlet, which drains westerly via a storm drain to the dirt channel within the westerly railroad easement. As discussed above for the Building 1 site, this dirt channel drains northerly and discharges to the Santa Ana River. The respective existing condition 25-year and 100-year peak flow rates from the south half of Barton Road are 2.4 cfs and 3.1 cfs for the portion east of Terrace Avenue (Nodes 200-201, 0.85 acres) and 1.0 cfs and 1.3 cfs for the portion west of Terrace Avenue (Nodes 220-221, 0.30 acres).

Offsite flow from easterly railroad fronting Building 2 site and offsite lots further east:

Runoff from the easterly railroad easement between Barton Road and De Berry Street, plus runoff from offsite lots east of the railroad easement and south of Barton Road (Nodes 250-255, 15.20 acres), are also tributary to the Building 2 site. These offsite flows surface drain southerly within the easterly railroad easement, then westerly along street curbs in De Berry Street, then northerly along street curbs in Terrace Avenue (and entering the Building 2 site). Runoff is then intercepted by the same riser inlet (same manner as offsite run-on from Barton Road) and conveyed via a storm drain to the dirt channel within the westerly railroad easement. The existing condition 25-year and 100-year peak flow rates from the easterly offsite areas are approximately 27.2 cfs and 35.1 cfs, respectively.

Building 2 site, south of Barton Road:

The northeast portion of the Building 2 site is an open grass lot. The remainder of the site is developed with two warehouse type buildings (southeast corner of site), truck yards (southwest corner of site), and vehicle parking lots (north of warehouse buildings and truck yards). The southerly portion of Terrace Avenue bisects the Building 2 site. A majority of the site drains to Terrace Avenue via surface flows and parkway culverts, then southerly to

the same riser inlet near the south end of Terrace Avenue, then westerly – along with offsite flows from Barton Road, easterly railroad and easterly offsite lots – via a 36-inch storm drain outletting to the dirt channel within the westerly railroad easement. The respective existing condition 25-year and 100-year peak flow rates from the majority of the Building 2 site (17.45 acres out of 33.80 acres total from Nodes 200-256) are 19.8 cfs and 26.8 cfs (excluding 2.4 cfs/3.1 cfs from Nodes 200-201 in the easterly portion of Barton Road, 1.0 cfs/1.3 cfs from Nodes 220-221 in the westerly portion of Barton Road, and 27.2 cfs/35.1 cfs from Nodes 250-255 in the easterly railroad easement and easterly offsite lots).

Runoff from the southwest corner of the Building 2 site (Nodes 300-301, 2.00 acres) drains southerly to a concrete channel, then westerly to the same dirt channel within the westerly railroad easement. The existing condition 25-year and 100-year peak flow rates from the Building 2 site's southwest corner are 5.8 cfs and 7.3 cfs, respectively. Runoff from the Building 2 site's westerly landscape (Nodes 310-311, 0.25 acres) surface drains to the westerly railroad easement. The existing condition 25-year and 100-year peak flow rates from the westerly landscape are 0.9 cfs and 1.2 cfs, respectively.

The total existing condition 25-year and 100-year peak flow rates from the Building 2 site (19.45 acres excluding tributary offsite areas) are 26.5 cfs and 35.3 cfs, respectively.

The following table is a summary of existing condition 25-year and 100-year discharges from all areas within the Building 2 site, all of which are tributary to the Santa Ana River.

Building 2 Site Areas	Q25-Ex.	Q100-Ex.
Nodes 210-256	19.8 cfs	26.8 cfs
Nodes 300-301	5.8 cfs	7.3 cfs
Nodes 310-311	0.9 cfs	1.2 cfs
Total	26.5 cfs	35.3 cfs

See Appendix "B" for existing condition hydrology calculations and Appendix "F" for existing condition hydrology map.

Proposed Condition

Overall project site:

Proposed condition runoff from the Building 1 site will be conveyed southerly via a proposed storm drain system. This storm drain will continue southerly and accept runoff from the south half of Barton Road via a proposed street catch basin and lateral. The storm drain will then continue further south into – and accepting onsite runoff from – the Building 2 site, then westerly in De Berry Street. Offsite runoffs from the easterly railroad easement and adjacent easterly offsite lots are tributary to the proposed 48-inch storm drain in De Berry Street via a C.M.P. riser within the railroad easement immediately north of De Berry Street. Runoff from the proposed De Berry Street cul-de-sac and the private access road will be accepted into the proposed 48-inch storm drain via proposed curb opening catch

basins and laterals on each side of the access road. The storm drain will then continue west across the westerly railroad easement to La Cadena Drive, where the proposed County master plan storm drain Line "B" will convey all tributary runoffs to the existing master plan storm drain Line "A" approximately 3,000 feet south of De Berry Street, or approximately 400 feet south of Maryknoll Drive – and ultimately to the Santa Ana River.

Building 1 site, north of Barton Road:

The east half of Building 1, the easterly truck yard and north-easterly parking lot (Nodes 100-121, 12.40 acres) drain to catch basins in the truck yard and parking lot. Runoff is then conveyed southerly (to Node 163) via a proposed 18-inch H.D.P.E. private storm drain. The proposed condition 25-year and 100-year peak flow rates from the east half of the Building 1 site are approximately 34.7 cfs and 44.2 cfs, respectively.

The west half of Building 1, the westerly truck yard and southerly parking lot (Nodes 130-162, 13.20 acres) drain to catch basins in the truck yard and parking lot. Runoff is then conveyed southerly (to Node 163) via another proposed 18-inch HDPE private storm drain. The proposed condition 25-year and 100-year peak flow rates from the west half of the Building 1 site are approximately 34.7 cfs and 44.0 cfs, respectively.

The total proposed condition 25-year and 100-year peak flow rates from the Building 1 site, tributary to the proposed private storm drain system, are approximately 69.2 cfs and 87.8 cfs, respectively. As discussed above, the proposed storm drain will continue southerly and accept runoffs from Barton Road, the proposed Building 2 site, the easterly offsite lots and De Berry Street.

For the remainder of the Building 1 site not tributary to the proposed private storm drain system, the existing north-easterly dirt lot (Nodes 170-171, 1.50 acres, Q25=3.0 cfs, Q100=4.2 cfs) will continue to surface drain easterly to the dirt channel within the easterly railroad easement. The southerly landscape and entry driveway (Nodes 180-181, 0.55 acres, Q25=1.9 cfs, Q100=2.5 cfs) will surface drain southerly to Barton Road, then westerly to Terrace Avenue, then northerly to the existing street catch basin tributary to the dirt channel within the westerly railroad easement. The south-westerly landscape (Nodes 190-191, 0.25 acres, Q25=0.8 cfs, Q100=1.1 cfs) will surface drain westerly to Terrace Avenue, then, similarly, northerly to the existing street catch basin tributary to the westerly railroad easement. Runoff from the north-westerly landscape (Nodes 195-196, 0.45 acres, Q25=1.5 cfs, Q100=2.0 cfs) will be intercepted by a proposed area drain, then conveyed westerly via the existing 18-inch R.C.P. to the same existing street catch basin.

The total proposed condition 25-year and 100-year peak flow rates from the entire Building 1 site – all of which are ultimately tributary to the Santa Ana River via the dirt channel within the westerly railroad easement – are 76.4 cfs (Q25=69.2 cfs + 3.0 cfs + 1.9 cfs + 0.8 + 1.5 cfs) and 97.6 cfs (Q100=87.8 cfs + 4.2 cfs + 2.5 cfs + 1.1 + 2.0 cfs), respectively. Onsite detention in the truck yards east and west of Building 1 will be utilized to reduce proposed condition 100-year discharge from the Building 1 site to below existing condition 25-year discharge (78.0 cfs).

The following table is a summary of proposed condition 25-year and 100-year discharges from all areas within the Building 1 site, all of which are tributary to the Santa Ana River.

Building 1 Site Areas	Q25-Prop.	Q100-Prop.
Nodes 100-163	69.2 cfs	87.8 cfs
Nodes 170-171	3.0 cfs	4.2 cfs
Nodes 180-181	1.9 cfs	2.5 cfs
Nodes 190-191	0.8 cfs	1.1 cfs
Nodes 195-196	1.5 cfs	2.0 cfs
Total	76.4 cfs	97.6 cfs

Building 2 site, south of Barton Road:

The north half of Building 2, the north-westerly drive aisle, northerly parking lot, the northerly portion of Building 2's truck yard (Nodes 210-234, 13.00 acres total) plus tributary northerly offsite landscapes fronting Barton Road (0.55 acres total) drain to catch basins in the parking lot and truck yard. Runoff is then conveyed southerly via a proposed private storm drain to catch basins at the south end of the truck yard (at Node 252). These southerly catch basins also accept runoff from the southerly end of Building 2, the south-westerly drive aisle, southerly parking lot and the south end of Building 2's truck yard (Nodes 240-252, 5.70 acres) via surface flow and another private storm drain. All runoffs are then conveyed easterly via a lateral to the proposed public storm drain traversing southerly through the Building 2 site, continuing south to the 48-inch De Berry Street storm drain, and west to the master plan storm drain in La Cadena Drive. The proposed condition 25-year and 100-year peak flow rates from the Building 2 site discharging via the proposed private storm drain system are approximately 46.7 cfs and 59.4 cfs, respectively.

For the remainder of the Building 2 site not tributary to the proposed private storm drain system, the landscape area adjacent to Building 2's westerly property line (Nodes 260-261, 0.20 acres, Q25=0.7 cfs, Q100=0.9 cfs) surface flows westerly to the dirt channel within the westerly railroad easement. For the access driveway south of Building 2, between the new De Berry Street cul-de-sac and the existing southerly commercial development, runoffs will be intercepted by curb opening catch basins on each side of the access road, at Nodes 322 and 332, which drain to the proposed 48-inch De Berry Street storm drain. These curb opening catch basins also accept runoffs from the De Berry Street cul-de-sac surface flowing to the access road. The proposed condition runoffs to the northerly catch basin, with 0.35 acres tributary from Nodes 320-322, are 0.7 cfs (Q25) and 1.4 cfs (Q100), with 0.5 cfs (Q25) and 0.7 cfs (Q100) from the access road plus 0.6 cfs (Q25) and 0.7 cfs (Q100) from the cul-de-sac. The proposed condition runoffs to the southerly catch basin, with 0.45 acres tributary from Nodes 330-332, are 1.4 cfs (Q25) and 1.7 cfs (Q100), with 0.9 cfs (Q25) and 1.0 cfs (Q100) from the access road plus 0.5 cfs (Q25) and 0.7 cfs (Q100) from the cul-de-sac. Lastly, runoff from the westerly end of the access road, west of the proposed curb opening catch basins (Nodes 340-341, 0.30 acres, Q25=1.0 cfs, Q100=1.2 cfs), drains westerly to the existing concrete channel, which discharges to the existing dirt

channel within the westerly railroad easement, in a manner consistent with existing condition drainage in this area.

The total proposed condition 25-year peak flow rate from the entire Building 2 site – all of which is ultimately tributary to the Santa Ana River – is 49.8 cfs (Q25=46.7 cfs from Node 252 + 0.7 cfs from Node 261 + 0.5 cfs from onsite portion at Node 322 + 0.9 cfs from onsite portion at Node 332 + 1.0 cfs from Node 341). The total proposed condition 100-year peak flow rate from the entire Building 2 site is 63.2 cfs (Q100=59.4 cfs from Node 252 + 0.9 cfs from Node 261 + 0.7 cfs from onsite portion at Node 322 + 1.0 cfs from onsite portion at Node 332 + 1.2 cfs from Node 341). Onsite detention in the truck yard east of Building 2 will be utilized to reduce proposed condition 100-year discharge from the Building 2 site to below existing condition 25-year discharge (26.5 cfs).

The following table is a summary of proposed condition 25-year and 100-year discharges from all areas within the Building 2 site, all of which are tributary to the Santa Ana River.

Building 2 Site Areas	Q25-Prop.	Q100-Prop.
Nodes 200-252	46.7 cfs	59.4 cfs
Nodes 260-261	0.7 cfs	0.9 cfs
Nodes 321-322	0.5 cfs	0.7 cfs
Nodes 331-332	0.9 cfs	1.0 cfs
Nodes 340-341	1.0 cfs	1.2 cfs
Total	49.8 cfs	63.2 cfs

Offsite flow from easterly railroad fronting Building 2 site and offsite lots further east:

Under proposed condition, runoff from the easterly railroad easement between Barton Road and De Berry Street, plus runoff from offsite lots east of the railroad easement and south of Barton Road (Nodes 300-304, 14.75 acres, Q25=26.9 cfs, Q100=34.7 cfs), will continue to surface drain southerly within the easterly railroad easement. These offsite flows will be intercepted by a proposed C.M.P. riser at the south end of the railroad easement (at Node 304) and conveyed westerly via the proposed 48-inch De Berry Street storm drain.

Offsite flow from south half of Barton Road fronting Building 2 site:

The south half of Barton Road – from the westerly property line of the Building 2 site to approximately 400 feet east of the easterly railroad easement (nodes 310-312, 0.95 acres, Q25=1.9 cfs, Q100=2.5 cfs) – will drain westerly to a proposed street catch basin and 18-inch lateral, then southerly via the proposed public storm drain traversing through the Building 2 site and draining to the proposed 48-inch De Berry Street storm drain.

See Appendix "B" for proposed condition hydrology calculations and Appendix “F” for proposed condition hydrology map.

Detention Analysis

As previously mentioned, onsite detention in the truck yards east and west of Building 1, plus the truck yard east of Building 2, will be utilized to reduce proposed condition 100-year onsite runoffs to below existing condition 25-year discharges. Offsite runoffs will be allowed to discharge undetained.

Proposed condition 100-year runoff (44.2 cfs) from the east half of the Building 1 site (Nodes 100-121) can be temporarily detained in Building 1's easterly truck yard at a depth of 1.18ft (954.69 W.S.E.), with 5.6 cfs discharging from the truck yard via the proposed private storm drain system. Similarly, proposed condition 100-year runoff (44.0 cfs) from the west half of the Building 1 site (Nodes 130-162) can be temporarily detained in Building 1's westerly truck yard at a depth of 1.23ft (953.92 W.S.E.), with 5.7 cfs discharging from the truck yard via the proposed private storm drain system. Runoffs from the north-easterly dirt lot (Q100=4.2 cfs from Nodes 170-171), southerly landscape (Q100=2.5 cfs from Nodes 180-181), south-westerly landscape (Q100=1.1 cfs from Nodes 190-191), and north-westerly landscape (Q100=2.0 cfs from Nodes 195-196) will discharge undetained. With onsite detention, proposed condition 100-year discharge from the entire Building 1 site will be 21.1 cfs (5.6 cfs + 5.7 cfs + 4.2 cfs + 2.5 cfs + 1.1 cfs + 2.0 cfs), which is significantly less than the existing condition 25-year discharge (78.0 cfs) from the Building 1 site.

The following table is a summary of proposed condition 100-year discharges, pre-detention and post-detention, from all areas within the Building 1 site.

Building 1 Site Areas	Q100 Pre-Detention	Q100 Post-Detention
Nodes 100-121	87.8 cfs	5.6 cfs
Nodes 130-162		5.7 cfs
Nodes 170-171	4.2 cfs	4.2 cfs
Nodes 180-181	2.5 cfs	2.5 cfs
Nodes 190-191	1.1 cfs	1.1 cfs
Nodes 195-196	2.0 cfs	2.0 cfs
Total	97.6 cfs	21.1 cfs

Proposed condition 100-year runoff (59.4 cfs) from the Building 2 site (Nodes 200-252) can be temporarily detained in the Building 2 truck yard at a depth of 1.18 ft (944.90 W.S.E.), with 5.6 cfs discharging from the truck yard via the proposed storm drain system. Runoff from the westerly landscape (Q100=0.9 cfs from Nodes 260-261), the southerly access road (Q100=0.7 cfs from Nodes 321-322 + 1.0 cfs from Nodes 331-332), and the area to the west (Q100=1.2 cfs from Nodes 340-341) will discharge undetained. With onsite detention, proposed condition 100-year discharge from the entire Building 2 site will be 9.4 cfs (5.6 cfs + 0.9 cfs + 0.7 cfs + 1.0 cfs + 1.2 cfs), which is significantly less than the existing condition 25-year discharge (26.5 cfs) from the Building 2 site.

The following table is a summary of proposed condition 100-year discharges, pre-detention and post-detention, from all areas within the Building 2 site.

Building 2 Site Areas	Q100 Pre-Detention	Q100 Post-Detention
Nodes 200-252	59.4 cfs	5.6 cfs
Nodes 260-261	0.9 cfs	0.9 cfs
Nodes 321-322	0.7 cfs	0.7 cfs
Nodes 331-332	1.0 cfs	1.0 cfs
Nodes 340-341	1.2 cfs	1.2 cfs
Total	63.2 cfs	9.4 cfs

With proposed condition 100-year onsite discharge being significantly less than existing condition 25-year discharge, proposed site improvements will not negatively impact existing downstream drainage facilities. Onsite storm drain pipe sizes and hydraulics will be confirmed during the project site's final design phase to limit the proposed condition 100-year site discharge to below the existing condition 25-year discharge.

See Appendix "C" for detention analysis.

Summary

The following table is a summary of discharges from the Building 1 and Building 2 sites, pertaining to the existing condition 25-year and 100-year events, proposed condition 25-year and 100-year events, plus post-detention discharges in the proposed condition 100-year event.

Site	Q25-Ex.	Q100-Ex.	Q25-Prop.	Q100-Prop.	Q100-Prop. with Detention
Building 1	78.0 cfs	99.3 cfs	76.4 cfs	97.6 cfs	21.1 cfs
Building 2	26.5 cfs	35.3 cfs	49.8 cfs	63.2 cfs	9.4 cfs

Methodology

Hydrology calculations were computed using San Bernardino County Rational Method program (by AES Software). The soil type is "B" for a majority of the site and "C" at the southeast corner of the southerly Building 2 site per the San Bernardino County Hydrology Manual. See Appendix "A" for reference materials. The San Bernardino County Flood Routing Analysis program (also by AES Software) was used for detention calculations.

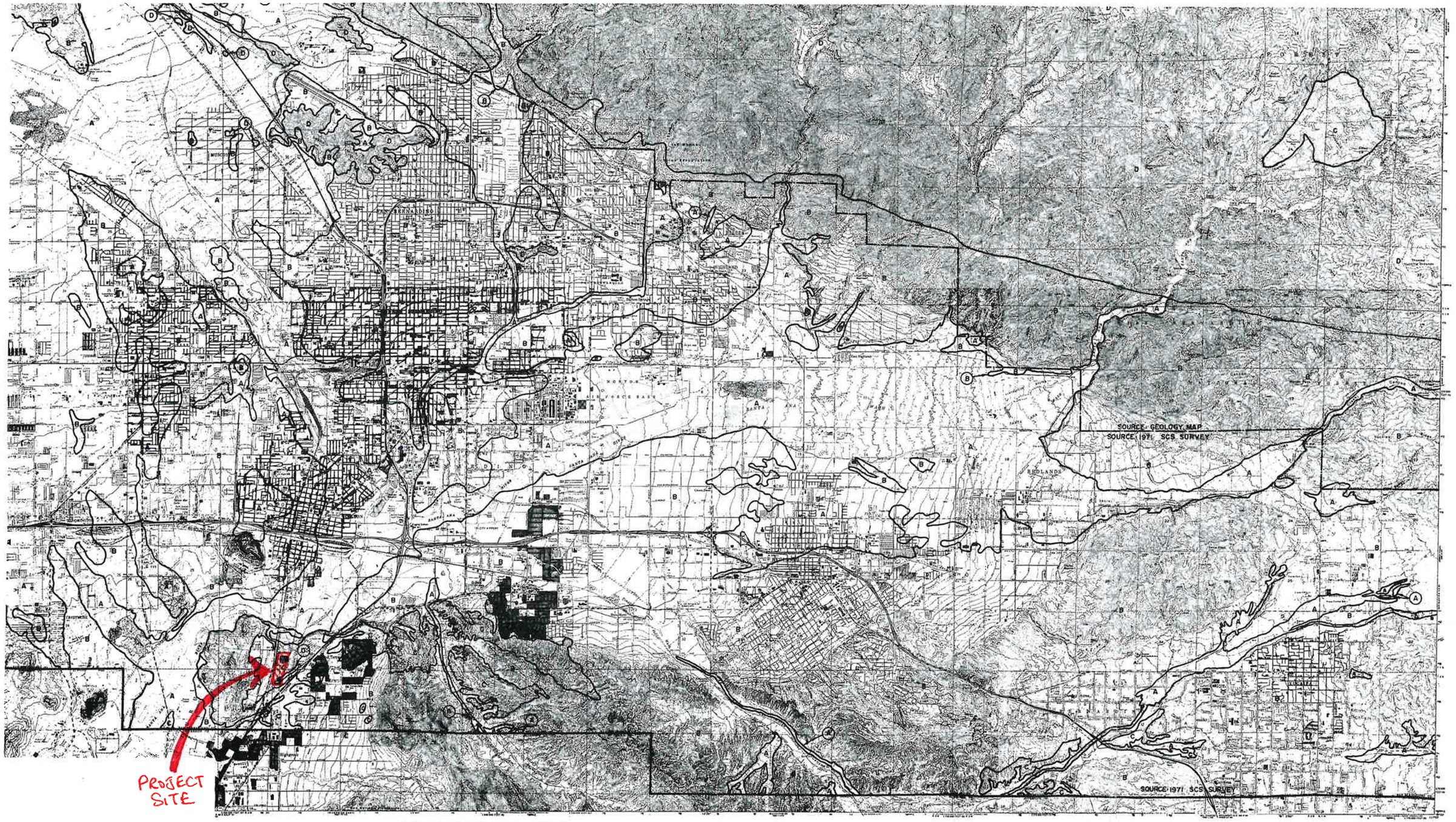
WSPG was used for hydraulic calculations for the proposed public storm drain through the Building 2 site and in De Berry Street, and the proposed master plan storm drain in La Cadena Drive. The control hydraulic grade line at the start (Station 10+00) of the Master Plan Storm Drain Line "B" in La Cadena Drive, approximately 400 feet south of Maryknoll

Drive, is taken at elevation 900.00, which is the approximate street surface elevation in the east half of La Cadena Drive, where the existing Master Plan Storm Drain Line "A" (which the proposed Line "B" is tributary to) spans across. See Appendix "D" for hydraulic calculations, Appendix "E" for B.M.P. calculations, and Appendix "F" for conceptual storm drain plans.

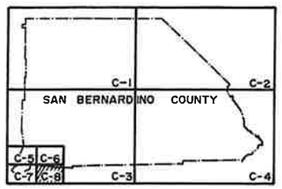
APPENDIX	DESCRIPTION
A	REFERENCE MATERIALS
B	HYDROLOGY CALCULATIONS
C	DETENTION ANALYSIS
D	HYDRAULIC CALCULATIONS
E	B.M.P. CALCULATIONS
F	HYDROLOGY MAP

APPENDIX A

REFERENCE MATERIALS



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL



INDEX MAP

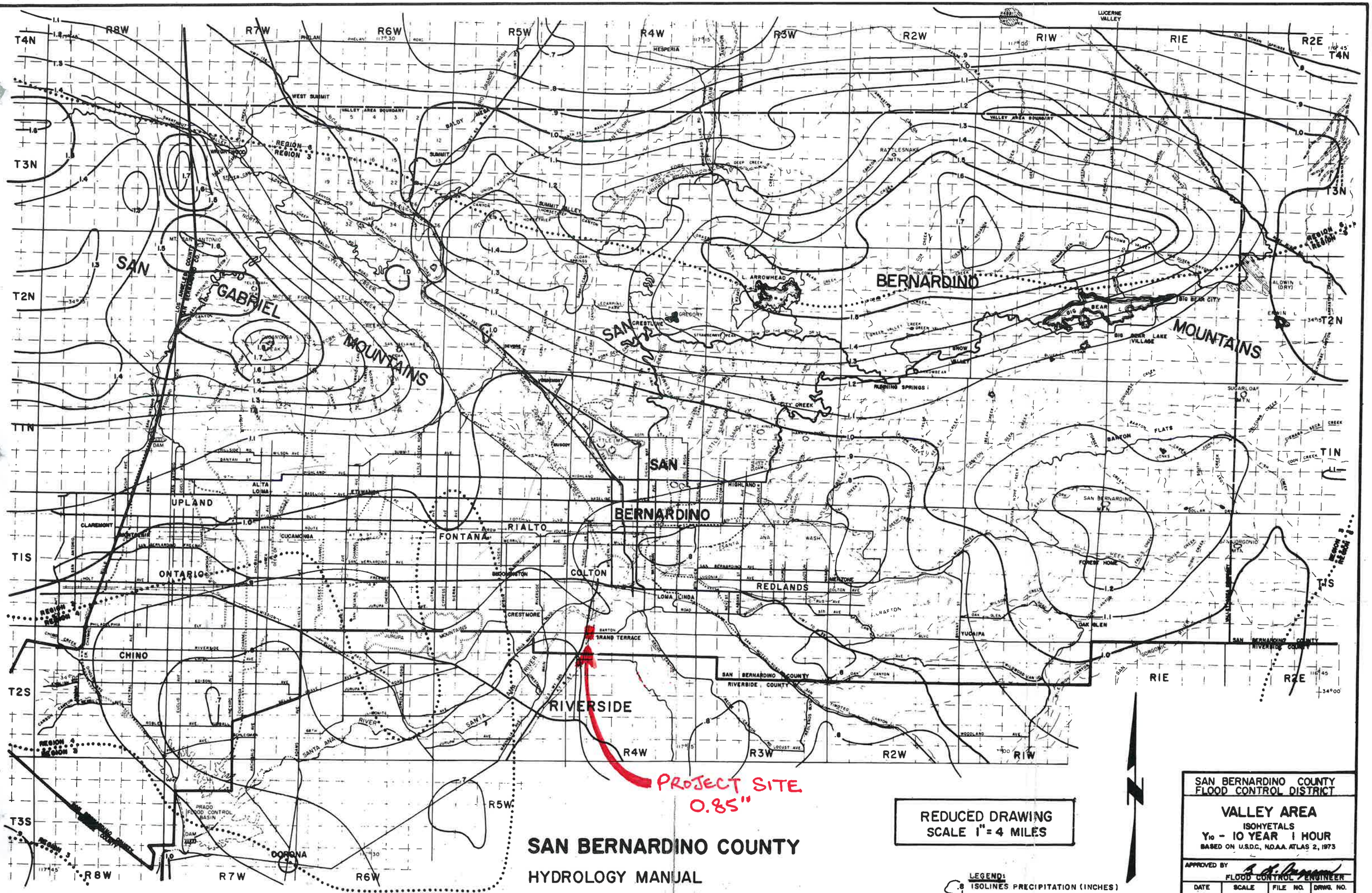
LEGEND
SOIL GROUP BOUNDARY
A SOIL GROUP DESIGNATION
BOUNDARY OF INDICATED SOURCE

SCALE 1:48,000

SCALE REDUCED BY 1/2

HYDROLOGIC SOILS GROUP MAP
FOR
SOUTHWEST-D AREA

FIGURE C-10



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

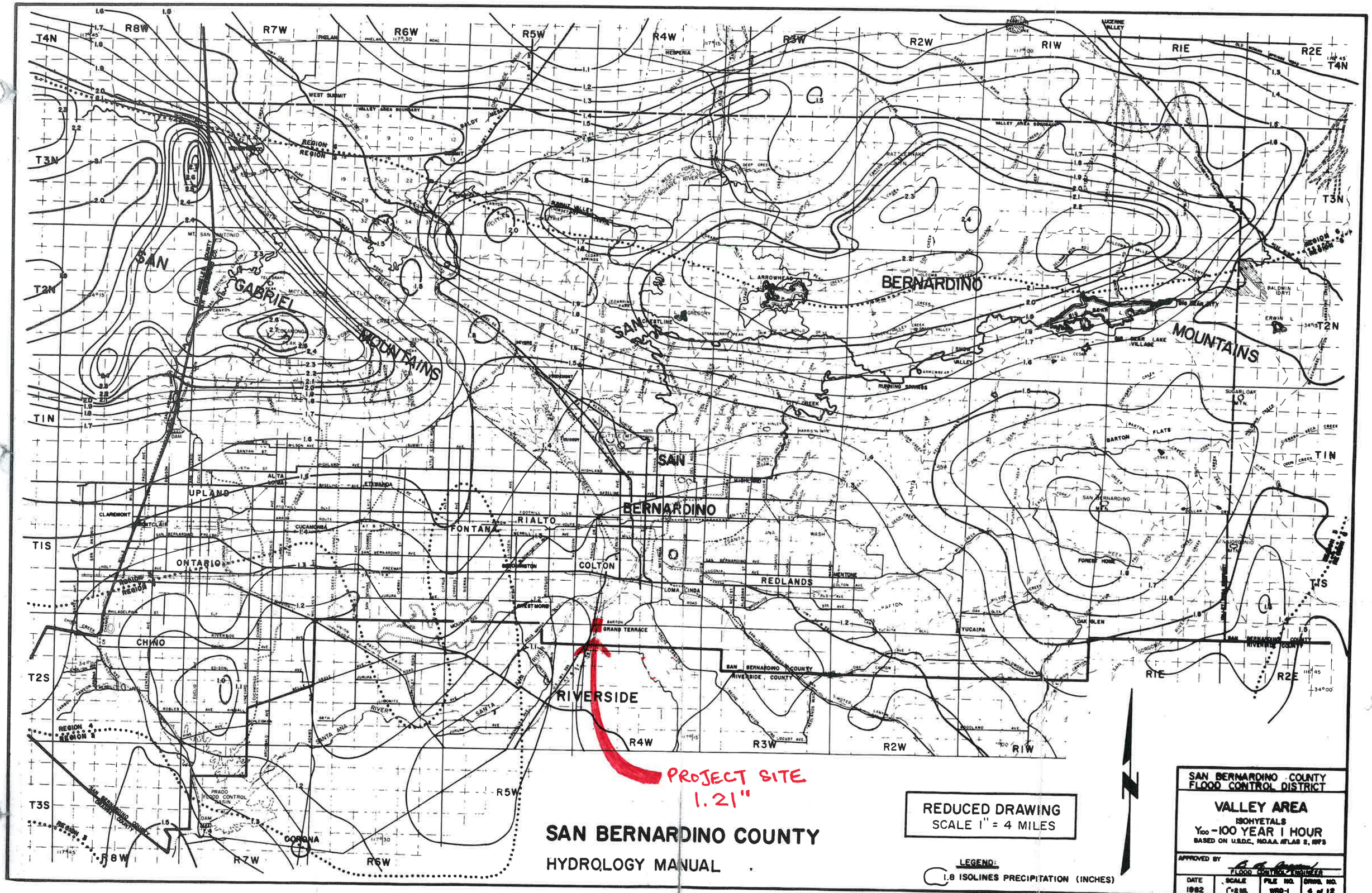
LEGEND:
.8 ISOLINES PRECIPITATION (INCHES)

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

VALLEY AREA
ISOHYETALS
Y_{10} - 10 YEAR 1 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973

APPROVED BY _____
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2 MI.	WRD-1	3 of 12



SAN BERNARDINO COUNTY
HYDROLOGY MANUAL

REDUCED DRAWING
SCALE 1" = 4 MILES

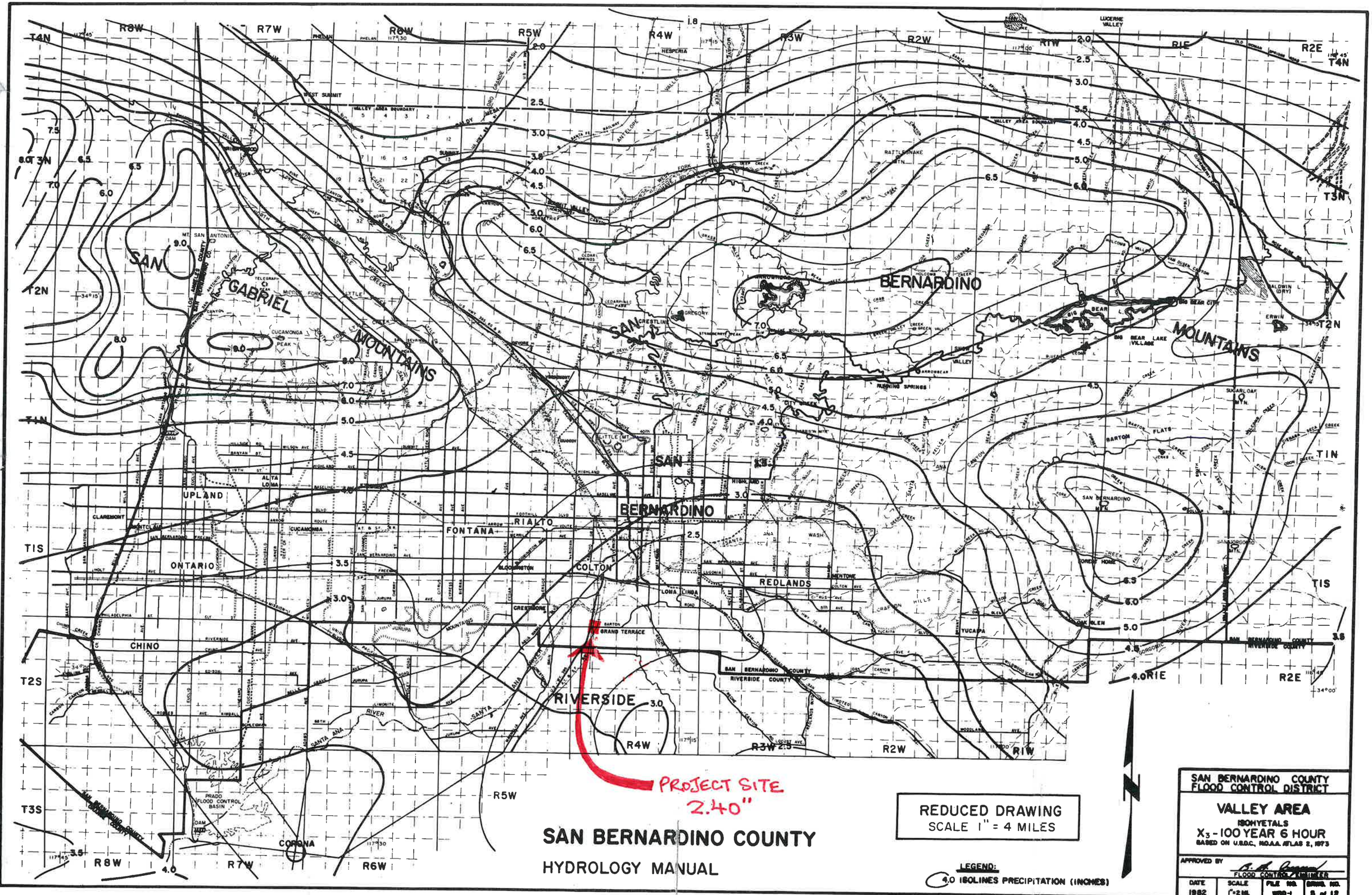
LEGEND:
1.8 ISOLINES PRECIPITATION (INCHES)

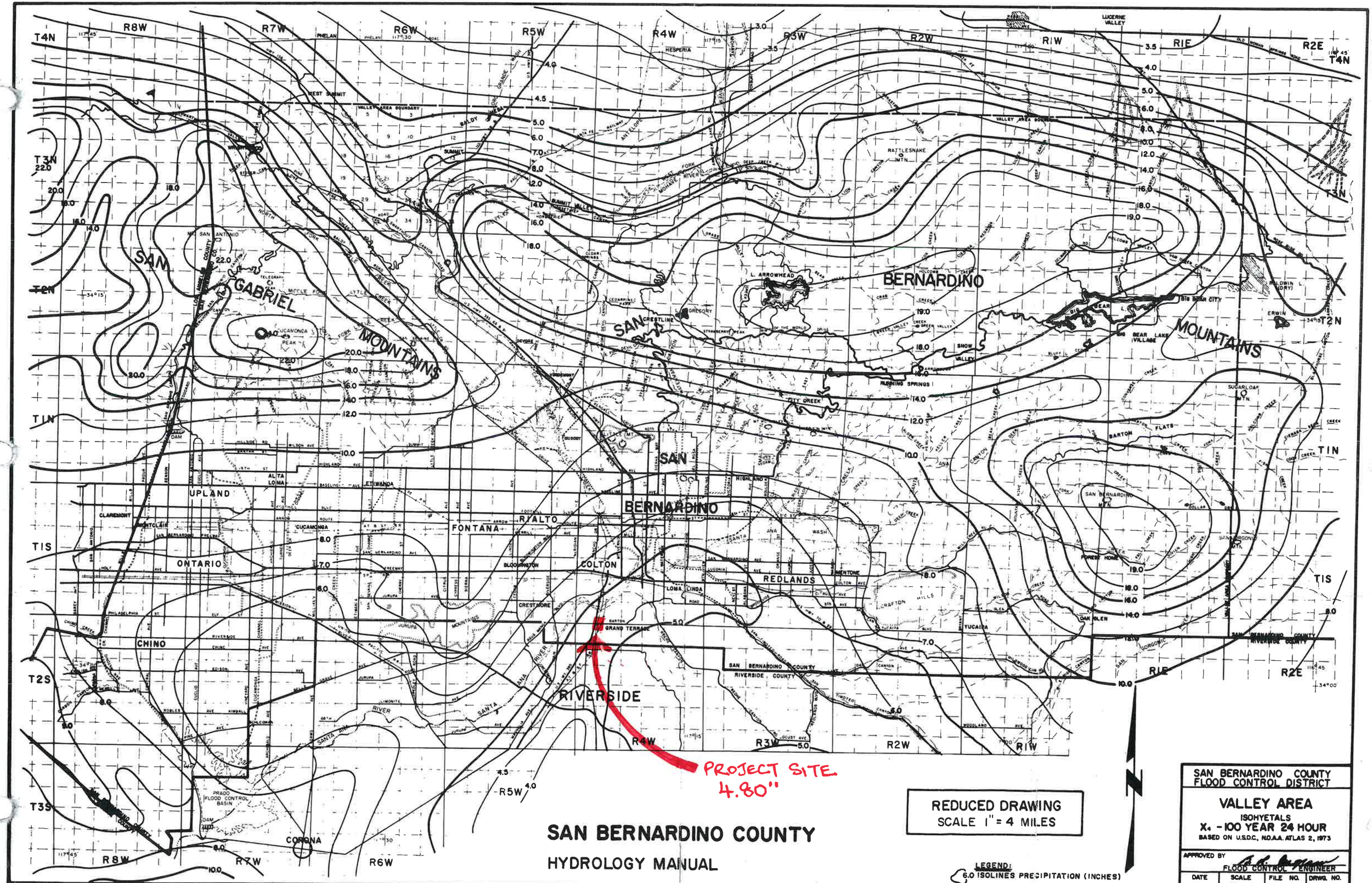
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

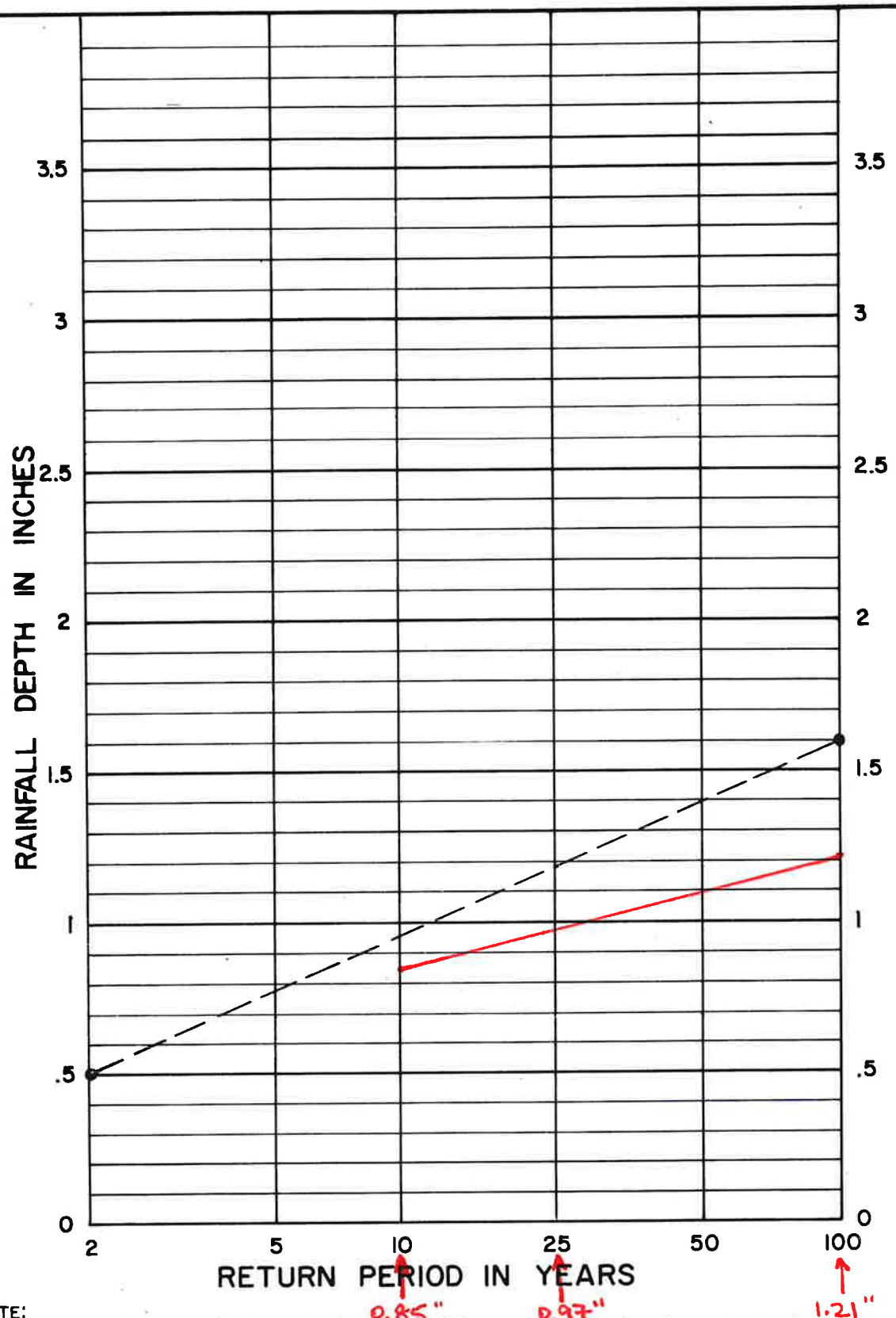
VALLEY AREA
ISOHYETALS
Y_{100} - 100 YEAR 1 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973

APPROVED BY _____
FLOOD CONTROL ENGINEER

DATE	SCALE	FILE NO.	DRWG. NO.
1982	1"=2 MI.	WRD-1	4 of 12


R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E
T4N
T3N
T2N
T1N
T1S
T2S
T3S
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
UPLAND
ONTARIO
CHINO
CLAREMONT
ALTA LOMA
CUCAMONGA
FONTANA
RIALTO
COLTON
SAN BERNARDINO
REDLANDS
LOMA LINDA
GRAND TERRACE
RIVERSIDE
CORONA
YUCAIPA
CRESTLINE
LAKE ARROWHEAD
RUNNING SPRINGS
BIG BEAR LAKE
BIG BEAR CITY
SUGARLOAF MTN.
PRADO FLOOD CONTROL BASIN
SAN BERNARDINO COUNTY
RIVERSIDE COUNTY
PROJECT SITE
2.40"
SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
4.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X3 - 100 YEAR 6 HOUR
BASED ON U.S.D.C., NOAA ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2 MI.
FILE NO. WRD-1
DRWG. NO. 5 of 12


SAN BERNARDINO COUNTY
HYDROLOGY MANUAL
PROJECT SITE
4.80"
REDUCED DRAWING
SCALE 1" = 4 MILES
LEGEND:
6.0 ISOLINES PRECIPITATION (INCHES)
SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT
VALLEY AREA
ISOHYETALS
X₆ - 100 YEAR 24 HOUR
BASED ON U.S.D.C., N.O.A.A. ATLAS 2, 1973
APPROVED BY
FLOOD CONTROL ENGINEER
DATE 1982
SCALE 1"=2MI.
FILE NO. WRD-1
DRWG. NO. 6 of 12
SAN GABRIEL MOUNTAINS
SAN BERNARDINO MOUNTAINS
BERNARDINO
RIVERSIDE
UPLAND
ONTARIO
CHINO
RIALTO
FONTANA
COLTON
REDLANDS
CORONA
BIG BEAR CITY
BIG BEAR LAKE
L. ARROWHEAD
L. GREGORY
L. BALDWIN (DRY)
SUGARLOAF MTN.
RATTLESNAKE MTN.
SAN BERNARDINO MTN.
T4N
T3N
T2N
T1N
T1S
T2S
T3S
R8W
R7W
R6W
R5W
R4W
R3W
R2W
R1W
R1E
R2E



NOTE:

1. For intermediate return periods plot 2-year and 100-year one hour values from maps, then connect points and read value for desired return period. For example given 2-year one hour = .50" and 100-year one hour = 1.60", 25-year one hour = 1.18"

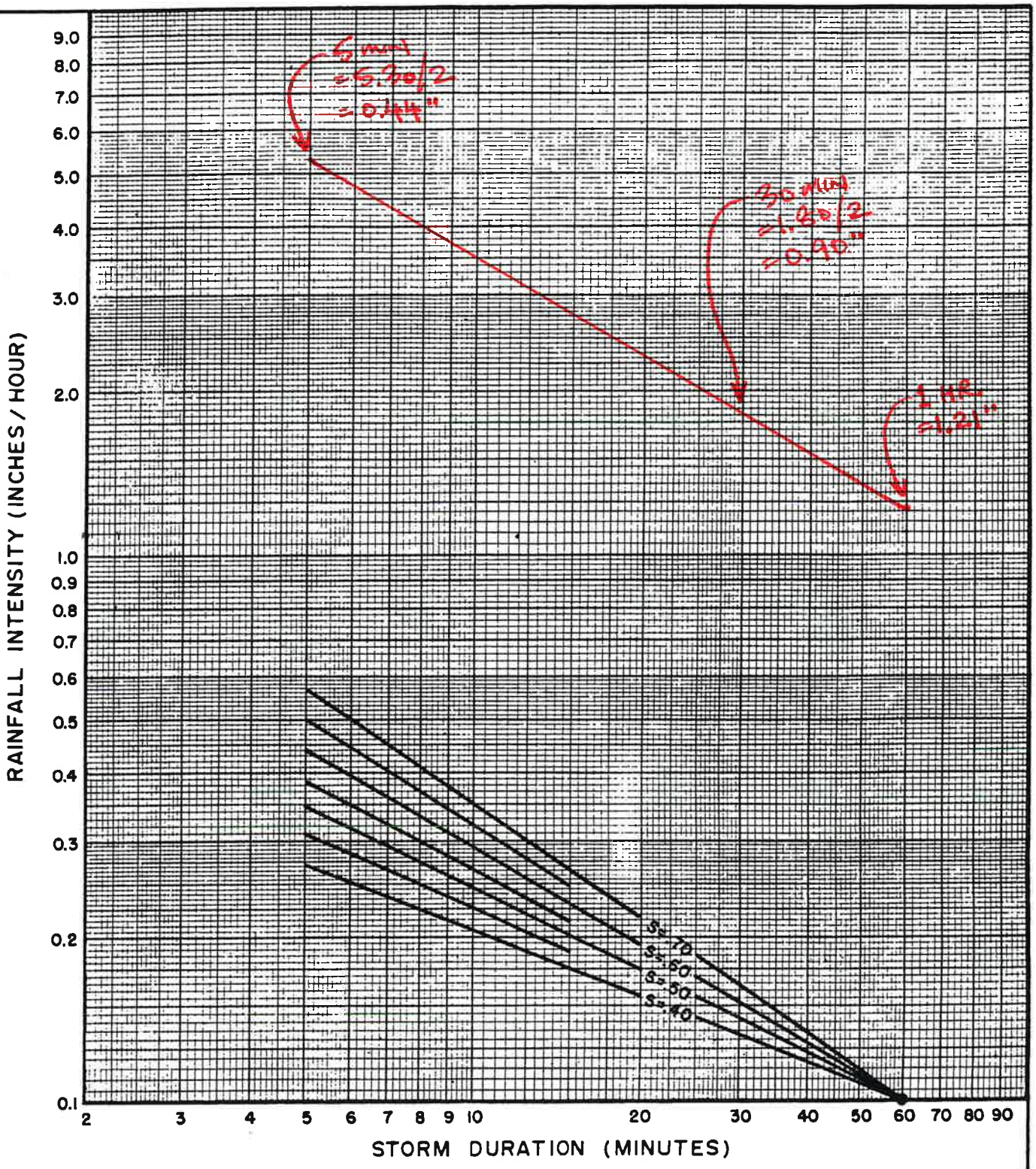
Reference: NOAA Atlas 2, Volume XI-California, 1973.

RCFC & WCD

HYDROLOGY MANUAL

RAINFALL DEPTH VERSUS RETURN PERIOD FOR PARTIAL DURATION SERIES

PLATE D-4.5



DESIGN STORM FREQUENCY = 100 YEARS

ONE HOUR POINT RAINFALL = 1.21 INCHES

LOG-LOG SLOPE = 0.60

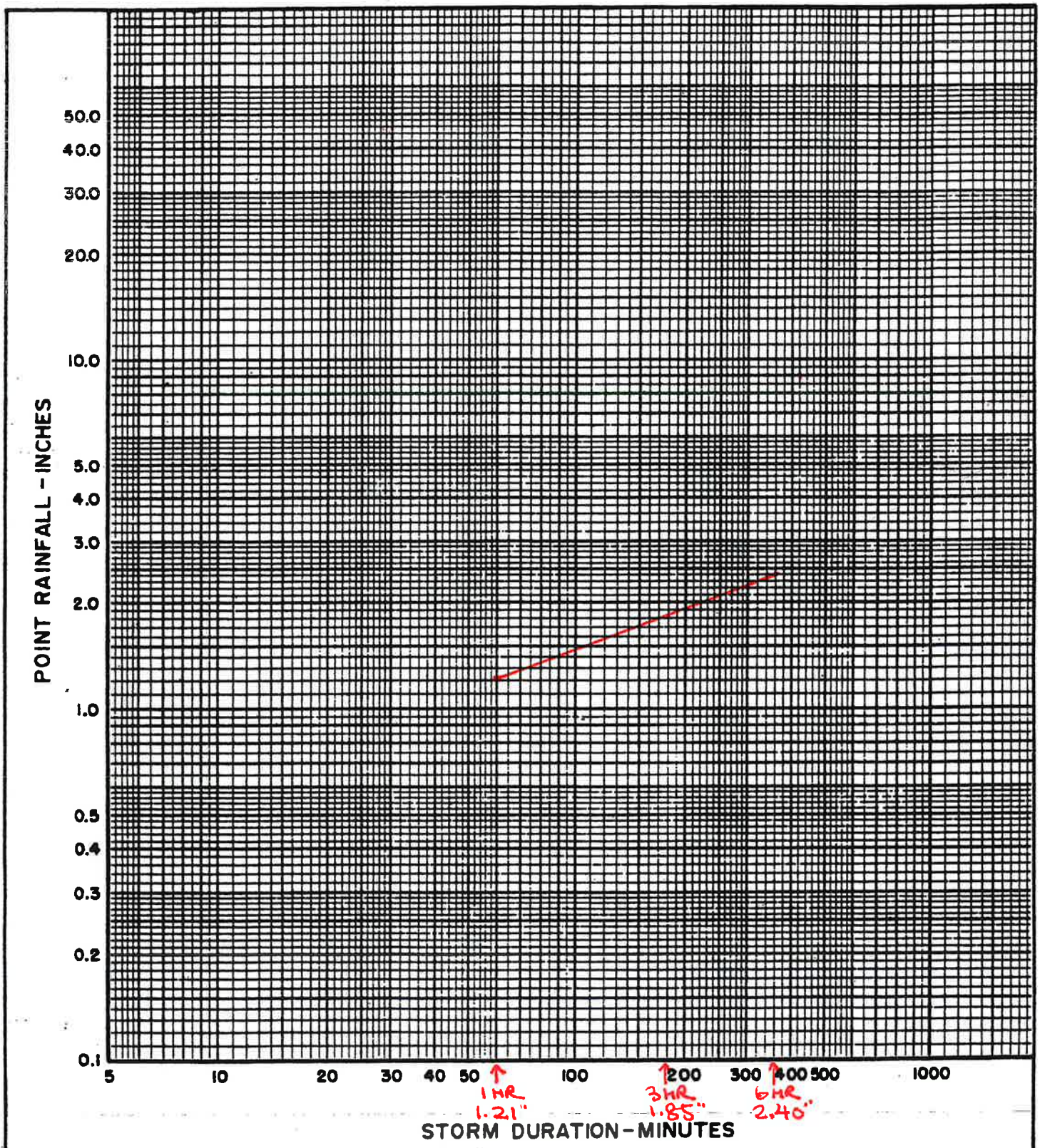
PROJECT LOCATION = BARTON ROAD, COLTON

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

INTENSITY - DURATION CURVES CALCULATION SHEET

FIGURE D-3



PROJECT LOCATION BARTON ROAD, COLTON

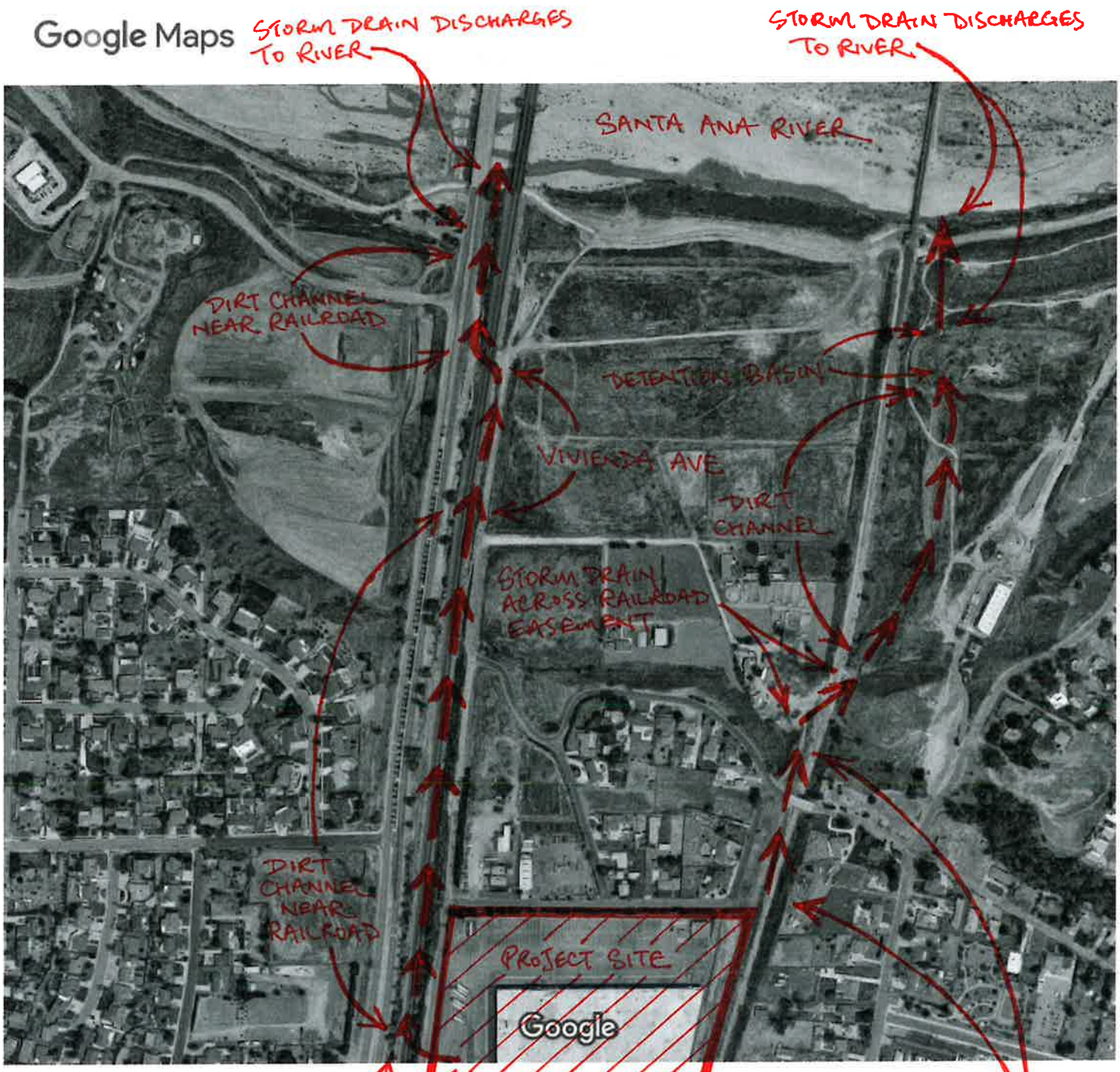
NOTES 100-YEAR

SAN BERNARDINO COUNTY

HYDROLOGY MANUAL

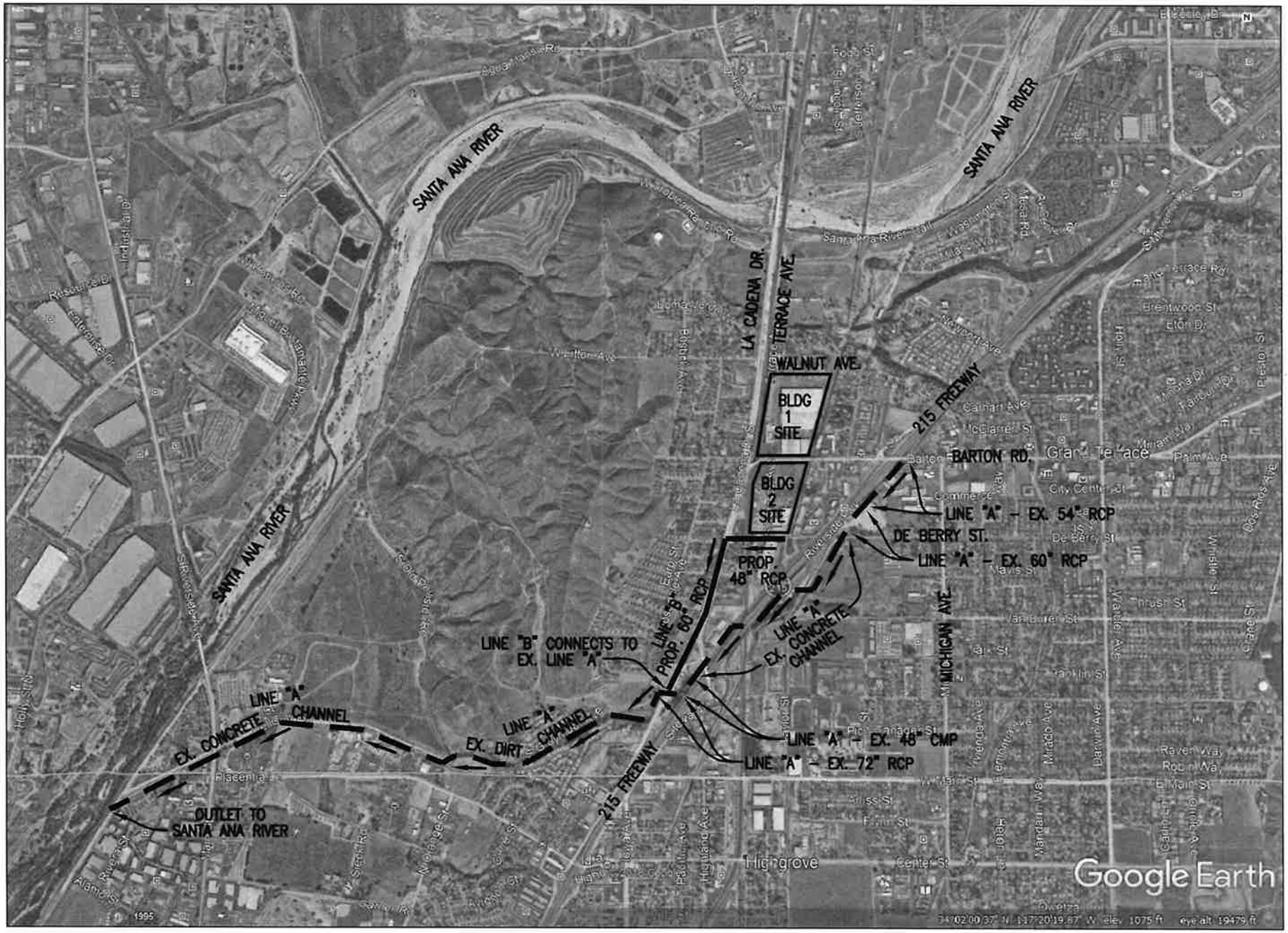
AREA - AVERAGED MASS RAINFALL PLOTTING SHEET

FIGURE E-8



OFFSITE DRAINAGE EXHIBIT

FROM PROJECT SITE TO SANTA ANA RIVER



MASTER PLAN STORM DRAIN EXHIBIT

REPORT ON THE

SAN BERNARDINO COUNTY

COMPREHENSIVE STORM DRAIN PLAN

PROJECT NO. 3

VOLUME II

Storm Drain Systems, Plans,
Profiles and Cost Estimates

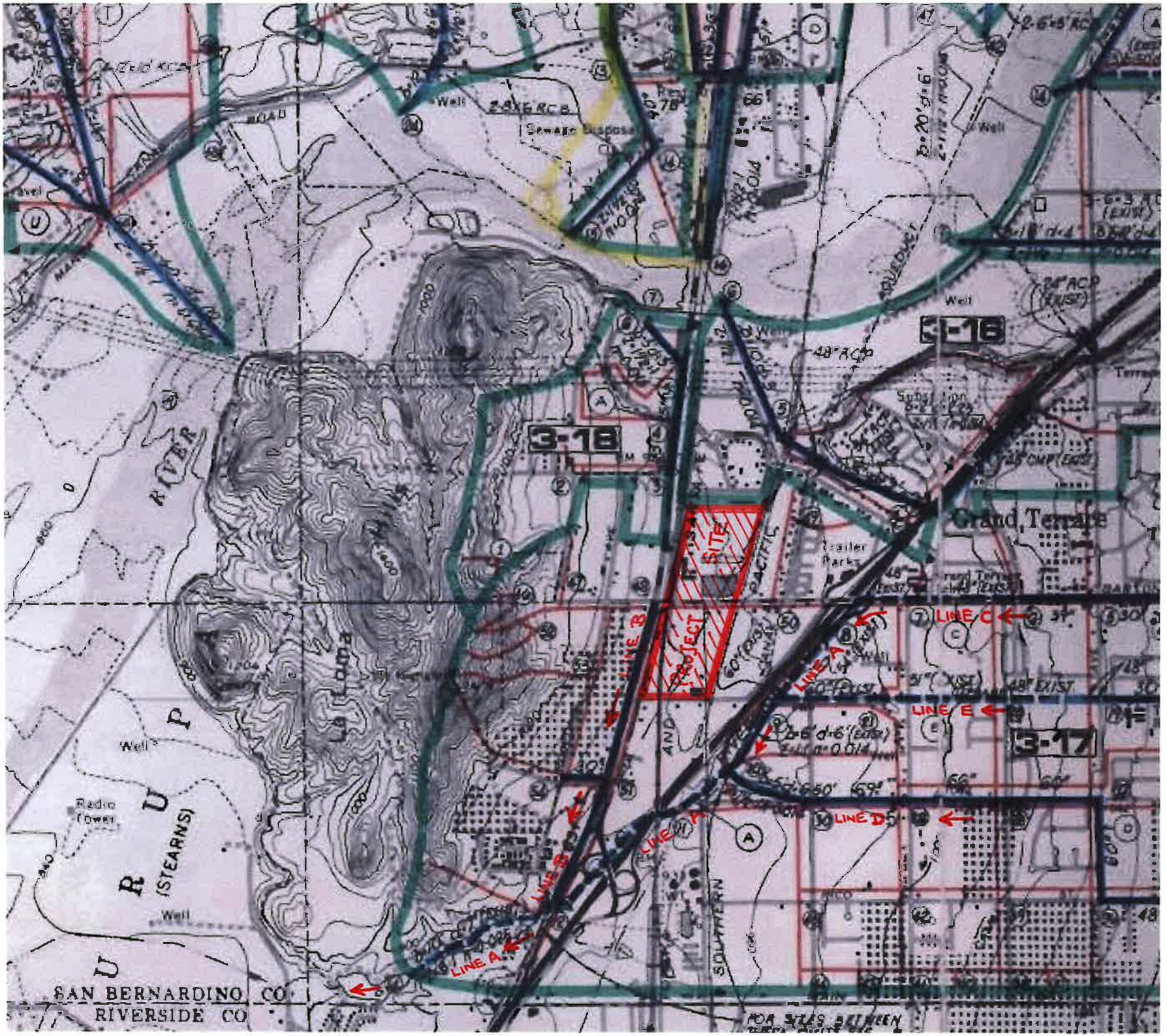
Prepared for

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

By

VERPET ENGINEERING COMPANY
6824 Melrose Avenue
Los Angeles, California

May 1973


PROJECT SITE
LINE A
LINE B
LINE C
LINE D
LINE E
3-16
3-17
3-18
Grand Terrace
SAN BERNARDINO CO.
RIVERSIDE CO.
N

Project 3-17

The system is partially existing and known as the Grand Terrace storm drain.

LINE A

The main line originates at Barton Road, runs along the southeast side of the Riverside Freeway and then crosses the freeway at the vicinity of the A.T. and S.F. Railway; it thence proceeds crossing the La Cadena Avenue interchange and La Cadena Avenue and following the natural watercourse alignment it terminates at the City of Riverside reservoir south of La Loma Hills and by the San Bernardino-Riverside County line.

It comprises an existing pipe conduit between Barton Road and Debarry Street, which was found adequate, an existing concrete lined channel and several closed conduit culverts at the various crossings between Debarry Street and La Cadena Avenue, which for the most part are to be further improved, and an existing rock rip-rap channel between La Cadena Avenue and the Riverside reservoir, which needs no further improvement.

The design frequency used for the entire system including tributaries was 25-year.

The four major tributary drains of the system are as follows:

LINE C → a. an existing pipe conduit in Barton Road between the main line and Canal Street had to be extended further upstream to the branch-off point of Barton Road and Palm Avenue.

LINE E → b. an existing storm drain in Debarry Street between the main line and 140 feet west of Mount Vernon Avenue was also extended upstream to approximately 1,400 feet east of Mount Vernon Avenue.

LINE D → c. a proposed pipe conduit originating 330 feet south of Pico Street in a future stree, 1,400 feet east of Mount Vernon Avenue runs northerly to Pico Street, westerly in Pico Street, northerly in Mount Vernon Avenue to Van Buren Street and thence westerly in Van Buren Street to approximately 1,320 feet west of Michigan Avenue; it thence continues as an open channel along the natural watercourse to the main line.

LINE B → d. a proposed pipe conduit in La Cadena Avenue from Palm Avenue

southerly to the crossing with the main line of the system; a short 30" RCP line runs in an existing street 2,640 feet south of Palm Avenue from Rosedale Avenue to La Cadena Avenue.

An easement must be acquired for the channel portion of the Van Buren tributary.

The Gage Canal, a City of Riverside public utility, will cross the proposed extension in Barton Road with a 54" RCP at approximately 1,100 feet west of Mount Vernon Avenue, is presently crossing the existing Debarry tributary and will also cross with a 60" RCP the proposed Van Buren storm drain at 900 feet west of Mount Vernon Avenue.

Other minor utility interference should be recognized in final design.

Project 3-18

The proposed system consists of a single line designed for a 25-year frequency.

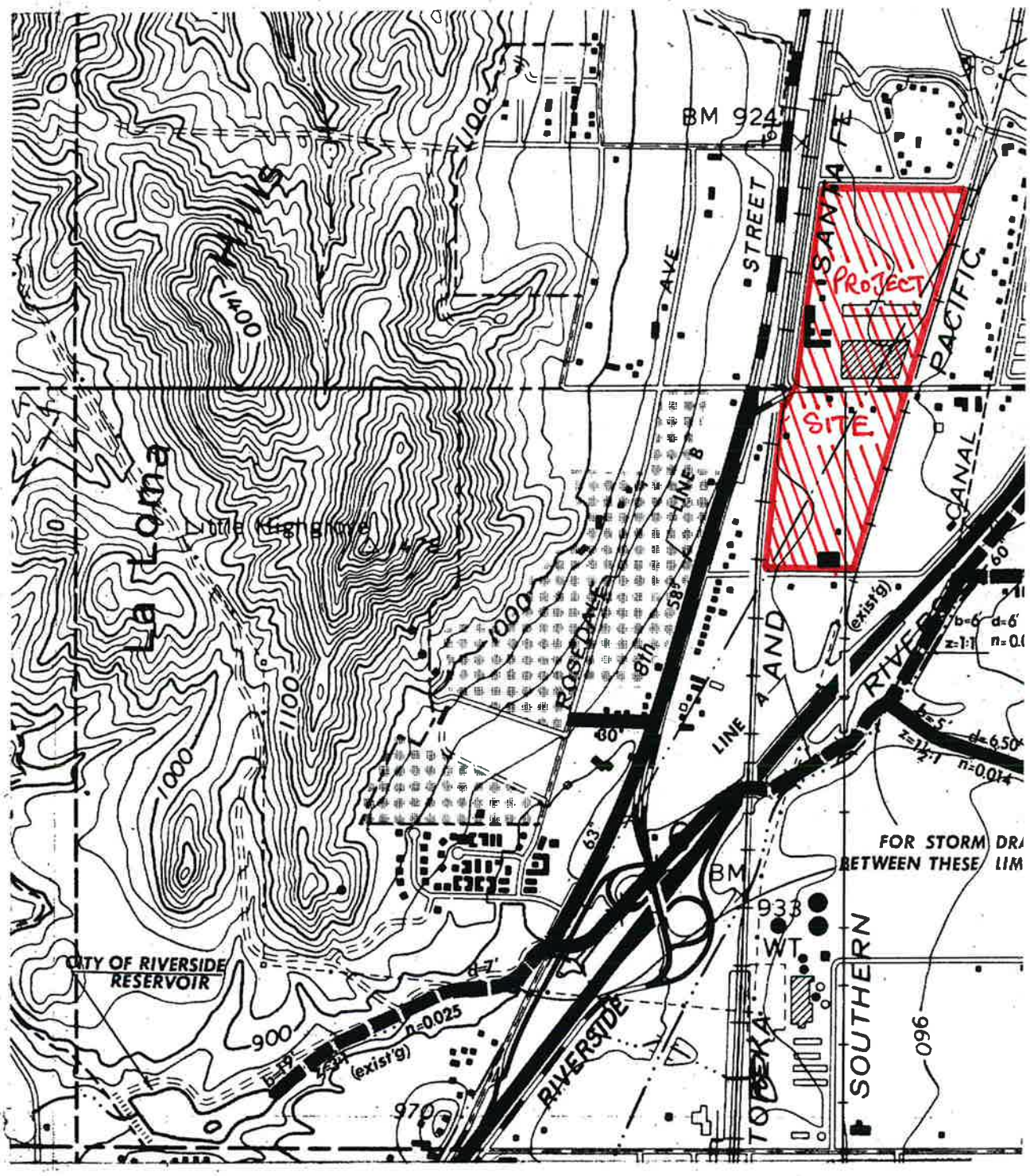
It runs in La Cadena Avenue from Litton Avenue to a point 1,450 feet to the north, thence northwesterly along the natural watercourse to its crossing with the road adjacent to the Santa Ana River and finally to its point of discharge at the river.

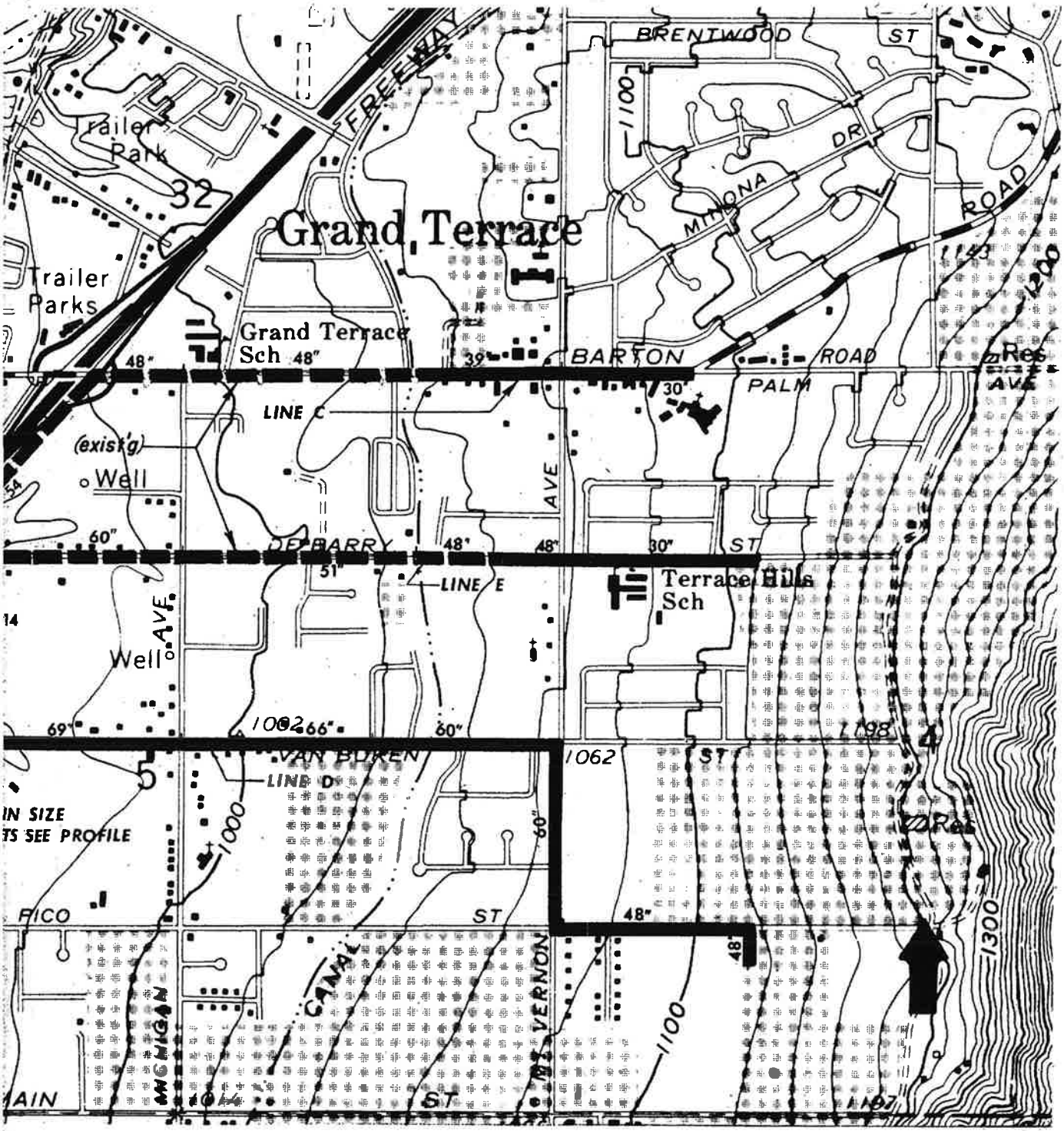
An entrance headwall will be required at the upstream end of the open channel, probably on the La Cadena Avenue right of way line, where the pipe conduit ends.

A pipe or box culvert crossing at approximately 100 feet upstream from the river should be also part of the final design.

An easement for the open channel must be acquired prior to its construction.

No major utility interference is anticipated.


PROJECT
SITE
BM 924
AVE
STREET
SANTA FE
PACIFIC
CANAL
La Loma
Little Highgrove
1400
1100
1000
1100
ROSEDALE
8th
LINE
AND
RIVE
(exist'g)
b=6'
d=6'
z=1:1
n=0.0
b=5'
d=6.50'
z=1½:1
n=0.014
FOR STORM DRA
BETWEEN THESE LIM
63'
BM
938
WT
CITY OF RIVERSIDE
RESERVOIR
900
970
n=0.025
(exist'g)
RIVERSIDE
SOUTHERN
960



PROPOSED STORM DRAIN
EXISTING STORM DRAIN

SAN BERNARDINO COUNTY
FLOOD CONTROL DISTRICT

DATE
MAY 1973

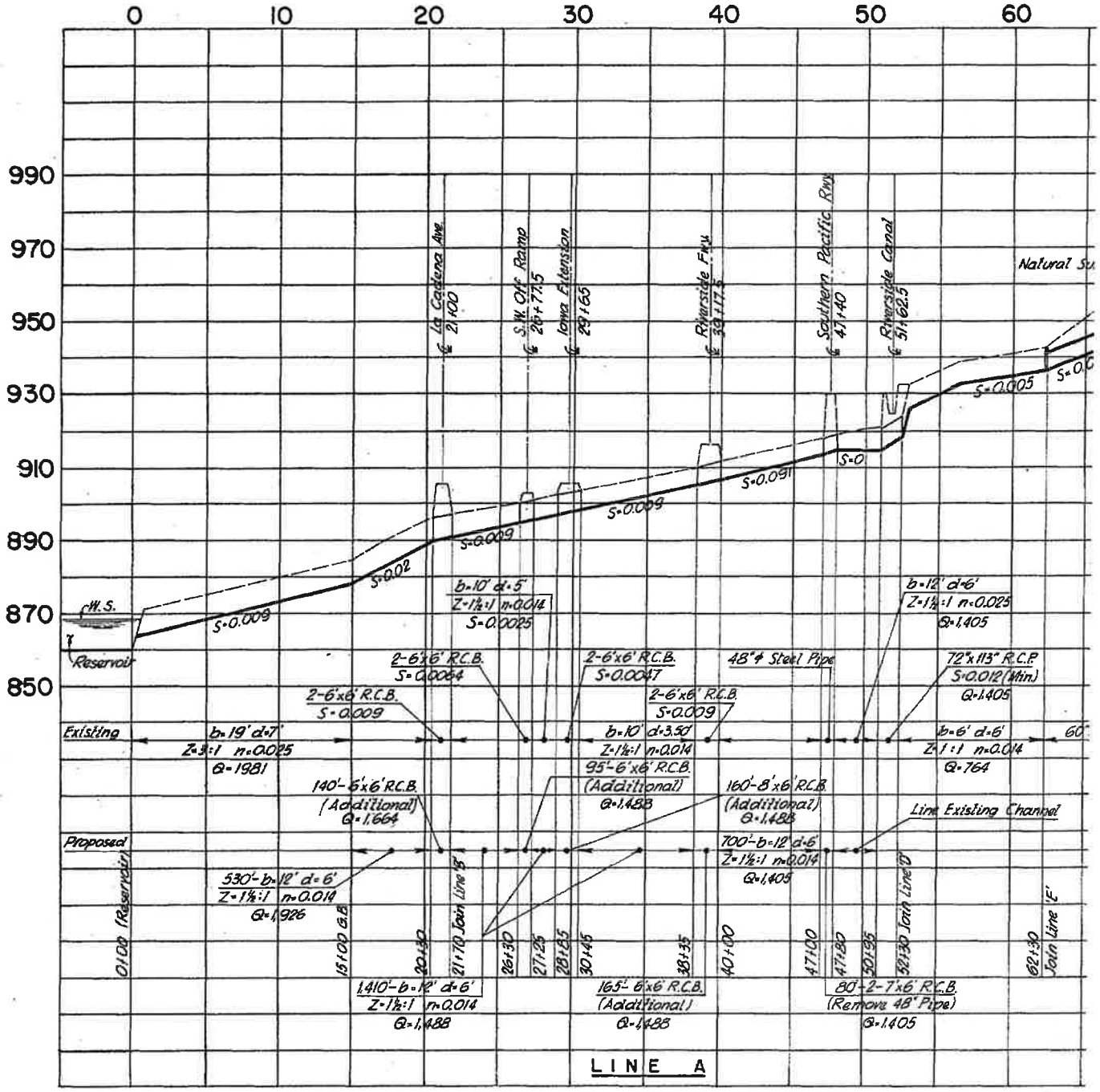
COMPREHENSIVE STORM DRAIN PLAN

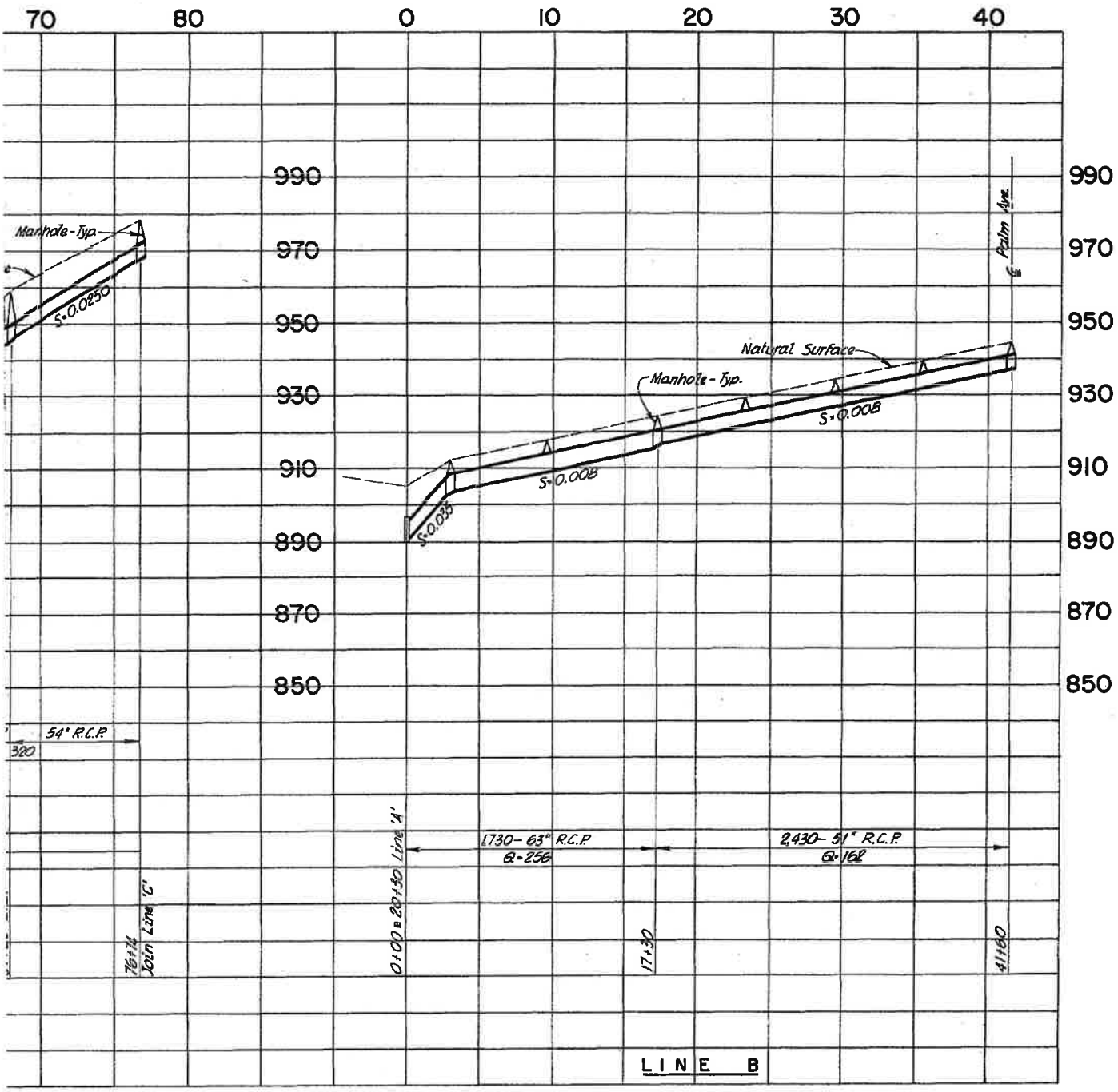
SCALE 1"=1000'

PROJECT NO. 3-17

SHEET
1 OF 4

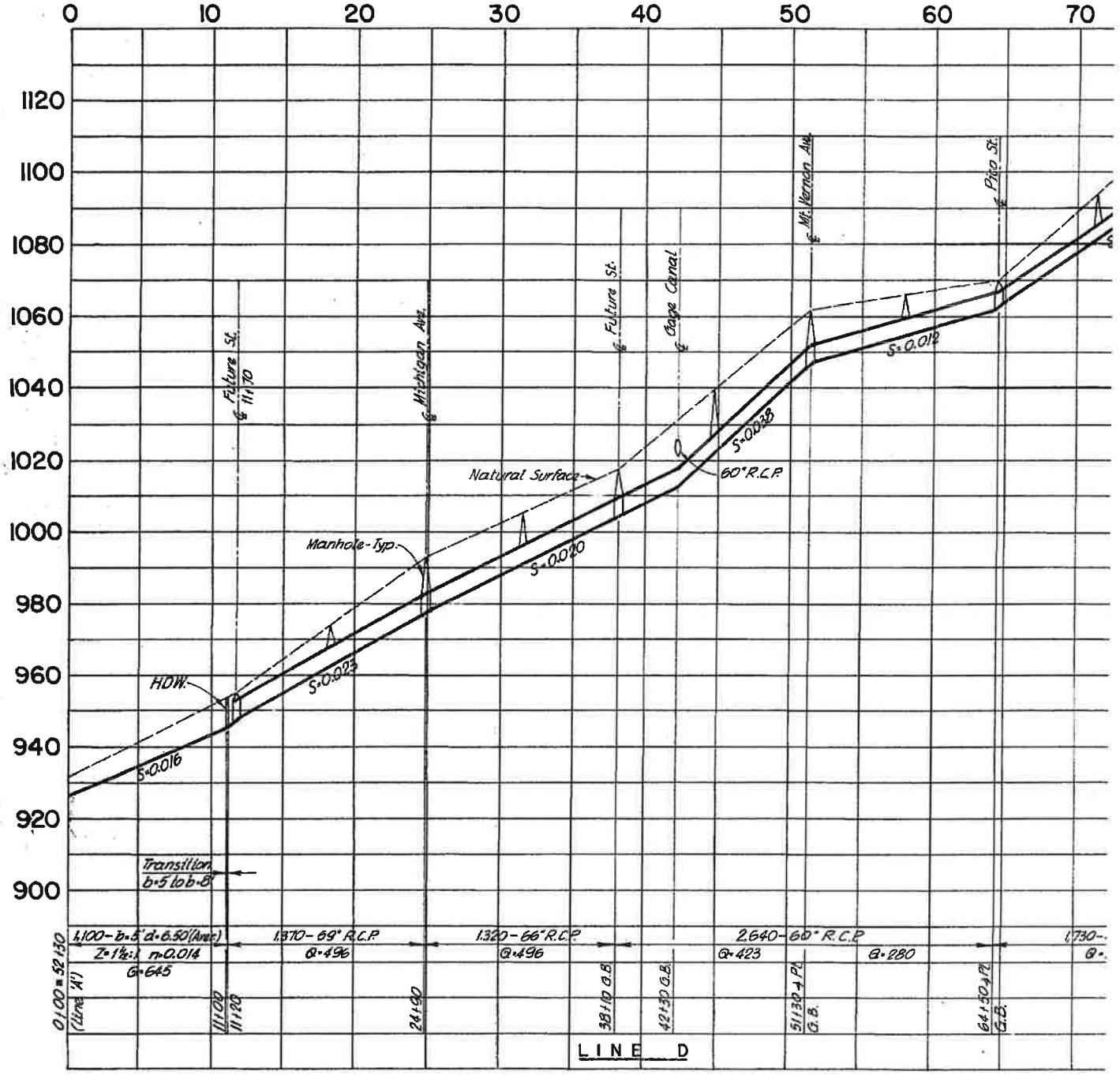
PHONE
931 8167
VERPET ENGINEERING CO.
6824 MELROSE AVE. LOS ANGELES, CALIFORNIA 90038

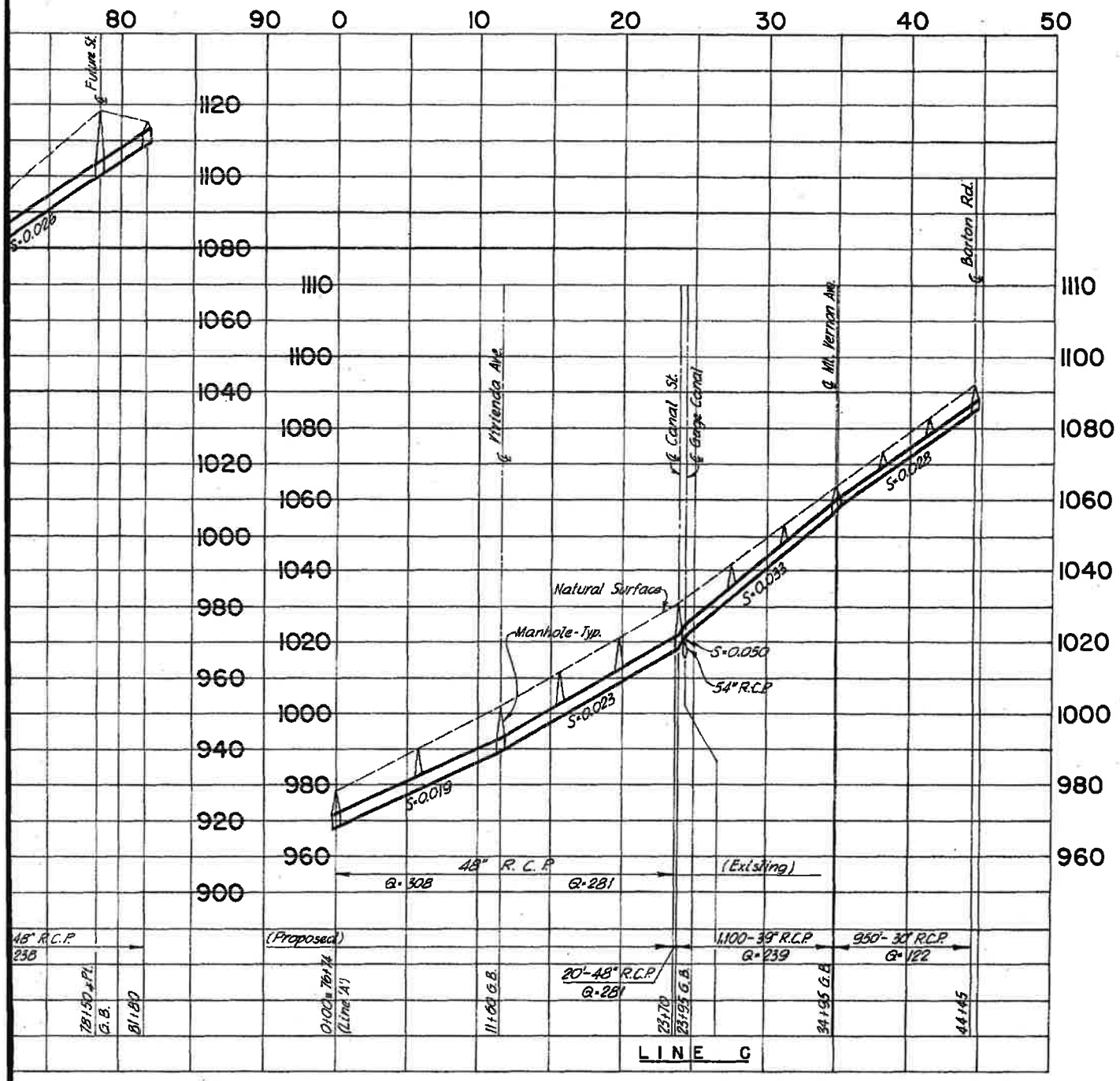

0
10
20
30
40
50
60
990
970
950
930
910
890
870
850
La Cadena Ave
℄ 21+00
S.W. Off Ramp
℄ 26+77.5
Iowa Extension
℄ 29+65
Riverside Fwy
℄ 39+17.5
Southern Pacific Rwy
℄ 47+40
Riverside Canal
℄ 51+62.5
Natural Su
S=0.005
S=0.0
S=0.091
S=0
S=0.009
S=0.009
S=0.002
S=0.009
W.S.
Reservoir
b=10' d=5'
Z=1½:1 n=0.014
S=0.0025
2-6'x6' R.C.B.
S=0.0064
2-6'x6' R.C.B.
S=0.0047
48"ϕ Steel Pipe
b=12' d=6'
Z=1½:1 n=0.025
Q=1,405
72"x113" R.C.P.
S=0.012 (Min.)
Q=1,405
2-6'x6' R.C.B.
S=0.009
2-6'x6' R.C.B.
S=0.009
Existing
b=19' d=7'
Z=3:1 n=0.025
Q=1981
b=10' d=3.50
Z=1½:1 n=0.014
b=6' d=6'
Z=1:1 n=0.014
Q=764
95'-6'x6' R.C.B.
(Additional)
Q=1,488
140'-6'x6' R.C.B.
(Additional)
Q=1,664
160'-8'x6' R.C.B.
(Additional)
Q=1,488
Line Existing Channel
Proposed
700'-b=12' d=6'
Z=1½:1 n=0.014
Q=1,405
530'-b=10' d=6'
Z=1½:1 n=0.014
Q=1,926
01+00 (Reservoir)
15+00 C.B.
20+30
21+70 Join Line 'B'
26+30
27+25
28+85
30+45
38+35
40+00
47+00
47+80
50+95
52+30 Join Line 'D'
62+30
Join Line 'E'
1,410'-b=12' d=6'
Z=1½:1 n=0.014
Q=1,488
165'-6'x6' R.C.B.
(Additional)
Q=1,488
80'-2-7'x6' R.C.B.
(Remove 48" Pipe)
Q=1,405
LINE A



SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT	DATE MAY 1973
COMPREHENSIVE STORM DRAIN PLAN PROJECT NO. 3-17	HORIZ 1"=1000' VERT. 1"=40'
	SHEET 2 OF 4

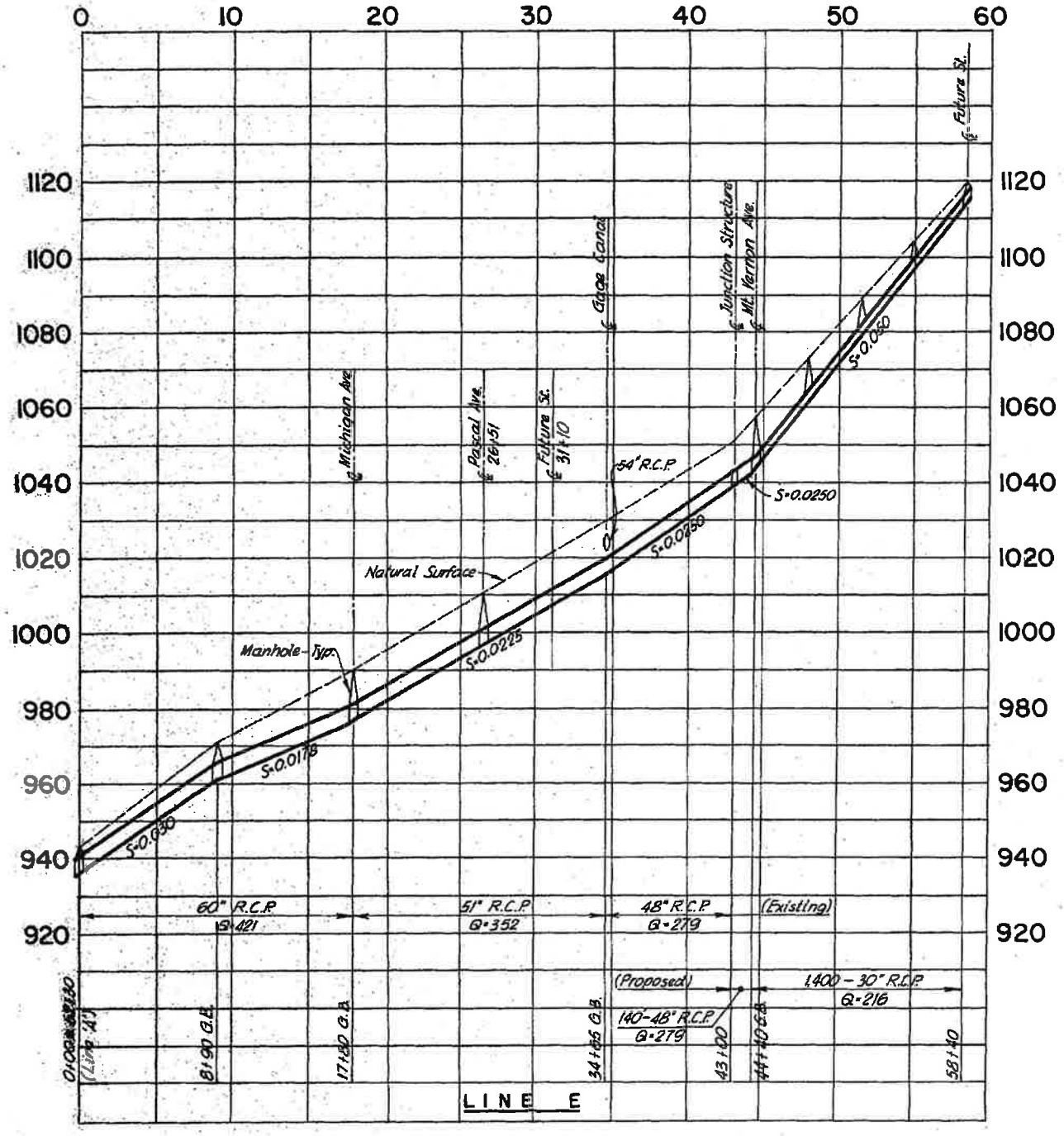
PHONE
681-8167
VERPET ENGINEERING CO.
8824 MELROSE AVE. LOS ANGELES, CALIFORNIA 90038


0
10
20
30
40
50
60
70
1120
1100
1080
1060
1040
1020
1000
980
960
940
920
900
Future St.
℄ 111.70
℄ Michigan Ave.
℄ Future St.
℄ Cage Canal
℄ Mt. Vernon Ave.
℄ Pitt St.
Natural Surface
Manhole-Typ.
HDW.
S=0.016
S=0.023
S=0.040
S=0.028
S=0.012
60" R.C.P.
Transition
b=5 to b=8'
1,100-b=5' d=6.50(Arc.)
Z=1½:1 n=0.014
Q=645
1,370-69" R.C.P.
Q=496
1,320-66" R.C.P.
Q=496
2,640-60" R.C.P.
Q=423
Q=280
1,730-
Q=
0100=52130
(Line 'A')
111.00
111.20
24+90
38+10 G.B.
42+30 G.B.
51+30 ± P.I.
G.B.
64+50 ± P.I.
G.B.
LINE D

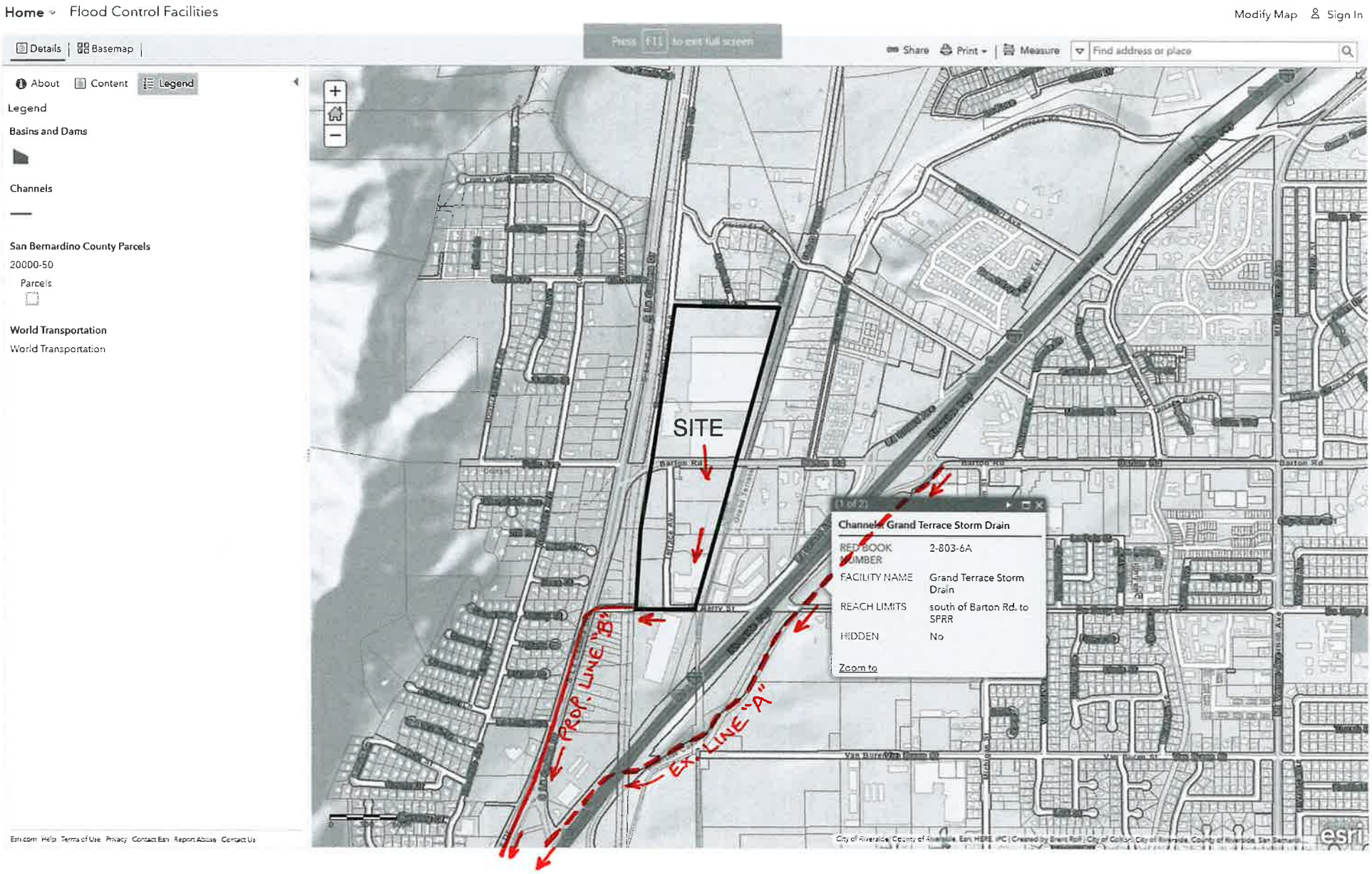


SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT		DATE MAY 1973
COMPREHENSIVE STORM DRAIN PLAN	PROJECT NO. 3-17	HORIZ 1"=1000' VERT. 1"=40'
		SHEET 3 OF 4

PHONE 831-8187
VERPET ENGINEERING CO.
8824 MELROSE AVE. LOS ANGELES, CALIFORNIA 90038



VERPET ENGINEERING CO. 3284 MELROSE AVE. LOS ANGELES, CALIFORNIA 90029	SAN BERNARDINO COUNTY FLOOD CONTROL DISTRICT	DATE MAY 1973
	COMPREHENSIVE STORM DRAIN PLAN	HORIZ. 1"=1000' VERT. 1"=40'
	PROJECT NO. 3-17	SHEET 4 OF 4


Home
Flood Control Facilities
Modify Map
Sign In
Details
Basemap
Press F11 to exit full screen
Share
Print
Measure
Find address or place
About
Content
Legend
Legend
Basins and Dams
Channels
San Bernardino County Parcels
20000-50
Parcels
World Transportation
World Transportation
SITE
Barton Rd
Channels: Grand Terrace Storm Drain
RED BOOK NUMBER
2-803-6A
FACILITY NAME
Grand Terrace Storm Drain
REACH LIMITS
south of Barton Rd. to SPRR
HIDDEN
No
Zoom to
PROP. LINE "B"
EXT. LINE "A"
esri

CITY OF COLTON
R00640

PROFILE SCALES
HORIZ 1"=40'
VERT 1"=4'

PROFILE - STORM DRAIN
STA. 9+17.01

BENCH MARK
Chis in in top of curb North side of Barton Rd - Sta 4+396.5.02 20'± West of future SF
Elev 993.70

ESTIMATE OF QUANTITIES

1.	6,050	s.f.	3" AC on 6" Base
2.	6,050	s.f.	AC Pad
3.	849	l.f.	8" P.C.C. Curb & 18" Gutter
4.	11	l.f.	P.C.C. Curb Only
5.	132	s.f.	Local Depression
6.	7646	s.f.	P.C.C. Sidewalk (Allowing for 23-4'x4' Tree Wells)
7.	3	ea.	Adjust S.M.H. To Grade
8.	1	ea.	Parkway Culvert S=2.5
9.	1	ea.	Parkway Culvert S=5.0
10.	1	ea.	Catch Basin
11.	56	l.f.	36" C.M.P. - 14ga. (Including 36"-90° Elbow & 36"x24" Reducer
12.	835	c.y.	Street Excavation
13.	1475	s.f.	Remove A.C. Pavement
14.	53	l.f.	Remove 24" C.M.P. & Inlet Structure
15.	1	ea.	Velocity Dissipator

GENERAL NOTES
1. Permit must be secured by the contractor from the City prior to any construction.
2. All work shall be in accordance with City of Colton Standards and Specifications, Los Angeles County Road Department Standard No. 62-01 (Parkway Culvert No.1) and Los Angeles County Flood Control District Standard Drawing No. 2-D88 (Local Depression No. 2, Case C).
3. Construct 23-4'x4' Tree Wells @ 37'± o.c. or as directed by the City Engineer.

PLAN SCALE
1"=40'

TYPICAL SECTION
TERRACE AVE

Curve Data
Δ = 3°00'34"
℄ R. = 5801.65 L = 304.78 T = 152.40
E. cb R = 5819.65 L = 305.68

Curb Rtn.
Δ = 84°14'00"
R = 20'
L = 29.40'
T = 18.08'

Plans Prepared by:
ANDREASEN ENGINEERING CO.
777 E. HOLT AVE.
POMONA, CALIF. (714) 623-1595

CITY OF COLTON
PUBLIC WORKS
TERRACE AVENUE
BARTON ROAD TO WALNUT AVE.

REVISIONS	DATE	APPR.
SCALE: HORIZ. 1"=40' VERT. 1"=4'	DRAWN T.C.	DESIGNED E.F.
	CHECKED	TRACED
APPROVED		F.B.
CITY ENGINEER, R.C.E. 15575		DATE

APPENDIX B

HYDROLOGY CALCULATIONS

EXISTING CONDITION
25-YEAR

```
**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
       (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
     (c) Copyright 1983-2016 Advanced Engineering Software (aes)
         Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:

                      THIENES ENGINEERING, INC.
                         14349 FIRESTONE BLVD
                         LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTAON                           *
* EXISTING CONDITION 25-YEAR                                             *
* NORTH OF BARTON ROAD, NORTHERLY TRUCK YARD (NODES 100-110)             *
 ************************************************************************

  FILE NAME: W:\3711\EX25A.DAT
  TIME/DATE OF STUDY: 17:44 12/04/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  ====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
  ELEVATION DATA: UPSTREAM(FEET) =    956.00  DOWNSTREAM(FEET) =    954.18

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.877
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.910
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        1.20      0.75       0.100    56    5.88
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.14
  TOTAL AREA(ACRES) =      1.20   PEAK FLOW RATE(CFS) =      4.14
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.09  DOWNSTREAM(FEET) =   951.21
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.10
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        4.14
 PIPE TRAVEL TIME(MIN.) =   0.12    Tc(MIN.) =    5.99
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     220.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.99
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.864
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.65      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    2.22
 EFFECTIVE AREA(ACRES) =      1.85   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.9       PEAK FLOW RATE(CFS) =       6.31

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   951.21  DOWNSTREAM(FEET) =   950.28
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.10
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =        6.31
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    6.27
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     320.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.27
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.762
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.48
 EFFECTIVE AREA(ACRES) =      2.90   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.9       PEAK FLOW RATE(CFS) =       9.62

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   950.28  DOWNSTREAM(FEET) =   949.93
```

```
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  16.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.69
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.62
 PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    6.62
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.62
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.640
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.37
 EFFECTIVE AREA(ACRES) =      3.95   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       4.0       PEAK FLOW RATE(CFS) =      12.67

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   949.93  DOWNSTREAM(FEET) =   949.55
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.27
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.67
 PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    6.94
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     520.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.94
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.539
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.27
 EFFECTIVE AREA(ACRES) =      5.00   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       5.0       PEAK FLOW RATE(CFS) =      15.59

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   949.55  DOWNSTREAM(FEET) =   949.05
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.10
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      15.59
 PIPE TRAVEL TIME(MIN.) =   0.27    Tc(MIN.) =    7.21
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     620.00 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.21
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.458
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                B        1.05      0.75       0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.20
 EFFECTIVE AREA(ACRES) =      6.05   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =      18.42

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   949.05  DOWNSTREAM(FEET) =   948.53
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.56
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      18.42
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.47
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     720.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.47
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.387
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE           GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                B        1.05      0.75       0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    3.13
 EFFECTIVE AREA(ACRES) =      7.10   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =      21.16

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.53  DOWNSTREAM(FEET) =   948.22
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.54
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      21.16
 PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    7.77
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     820.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.77
```

```
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.308
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.80      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     0.80      SUBAREA RUNOFF(CFS) =     2.33
 EFFECTIVE AREA(ACRES) =      7.90   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        7.9       PEAK FLOW RATE(CFS) =      22.99

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.22  DOWNSTREAM(FEET) =   946.51
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   9.47
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      22.99
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    8.01
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    8.01
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.246
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.35      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     0.35      SUBAREA RUNOFF(CFS) =     1.00
 EFFECTIVE AREA(ACRES) =      8.25   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        8.3       PEAK FLOW RATE(CFS) =      23.55

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   946.51  DOWNSTREAM(FEET) =   940.60
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  29.32
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      23.55
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    8.03
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     985.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        8.3  TC(MIN.) =      8.03
 EFFECTIVE AREA(ACRES) =      8.25  AREA-AVERAGED Fm(INCH/HR)=  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)    =      23.55
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                           *
* EXISTING CONDITION 25-YEAR                                           *
* NORTH OF BARTON ROAD, MIDDLE PORTION OF SITE (NODES 120-136)         *
 ************************************************************************

  FILE NAME: W:\3711\EX25B.DAT
  TIME/DATE OF STUDY: 16:46 10/08/2019
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    135.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   650.00
  ELEVATION DATA: UPSTREAM(FEET) =    957.50  DOWNSTREAM(FEET) =    949.36

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.739
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.888
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        8.95      0.75      0.100    56     9.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     22.66
 TOTAL AREA(ACRES) =      8.95   PEAK FLOW RATE(CFS) =     22.66

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    135.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.74
 RAINFALL INTENSITY(INCH/HR) =   2.89
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       8.95
 TOTAL STREAM AREA(ACRES) =       8.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      22.66

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
 ELEVATION DATA: UPSTREAM(FEET) =    959.55  DOWNSTREAM(FEET) =    953.88

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.308
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        1.70      0.75      0.100    56    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      6.48
 TOTAL AREA(ACRES) =      1.70   PEAK FLOW RATE(CFS) =      6.48

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.42  DOWNSTREAM(FEET) =   951.88
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  12.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.12
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       6.48
 PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    5.33
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =     270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.33
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.148
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
```

```
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.90      0.75      0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.90      SUBAREA RUNOFF(CFS) =    3.30
  EFFECTIVE AREA(ACRES) =      2.60   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =       9.53

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   951.81  DOWNSTREAM(FEET) =   951.36
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.24
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       9.53
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    5.64
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =     370.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.64
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.006
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        1.15      0.75      0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    4.07
  EFFECTIVE AREA(ACRES) =      3.75   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.8       PEAK FLOW RATE(CFS) =      13.27

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   951.35  DOWNSTREAM(FEET) =   950.11
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  13.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.41
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.27
  PIPE TRAVEL TIME(MIN.) =   0.20    Tc(MIN.) =    5.84
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    134.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.84
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.924
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE              GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
 COMMERCIAL                  B        1.55      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     1.55      SUBAREA RUNOFF(CFS) =     5.37
 EFFECTIVE AREA(ACRES) =      5.30   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =      18.36

****************************************************************************
 FLOW PROCESS FROM NODE    134.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   950.10  DOWNSTREAM(FEET) =   944.67
 FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.55
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      18.36
 PIPE TRAVEL TIME(MIN.) =   1.55    Tc(MIN.) =    7.39
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =    1170.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    135.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.39
 RAINFALL INTENSITY(INCH/HR) =   3.41
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       5.30
 TOTAL STREAM AREA(ACRES) =       5.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      18.36

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       22.66    9.74    2.888  0.75( 0.07) 0.10       8.9     120.00
     2       18.36    7.39    3.408  0.75( 0.07) 0.10       5.3     130.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       38.73    7.39    3.408  0.75( 0.07) 0.10      12.1     130.00
     2       38.15    9.74    2.888  0.75( 0.07) 0.10      14.2     120.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      38.73    Tc(MIN.) =     7.39
 EFFECTIVE AREA(ACRES) =      12.09   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       14.2
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =    1170.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    136.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

EX25B

```
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   943.87  DOWNSTREAM(FEET) =   932.13
 FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  12.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  36.69
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      38.73
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    7.40
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    136.00 =    1205.00 FEET.
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       14.2  TC(MIN.) =      7.40
 EFFECTIVE AREA(ACRES) =     12.09  AREA-AVERAGED Fm(INCH/HR)=  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =      38.73

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       38.73    7.40    3.404  0.75( 0.07) 0.10      12.1     130.00
     2       38.15    9.75    2.885  0.75( 0.07) 0.10      14.2     120.00
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 25-YEAR                                             *
* NORTH OF BARTON ROAD, WEST HALF OF WESTERLY BUILDING (NODES 140-141)   *
 **************************************************************************

  FILE NAME: W:\3711\EX25C.DAT
  TIME/DATE OF STUDY: 16:56 10/08/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.00
  ELEVATION DATA: UPSTREAM(FEET) =    954.50  DOWNSTREAM(FEET) =    948.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.308
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                        EX25C
  COMMERCIAL                  B        0.60      0.75      0.100    56     5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.29
  TOTAL AREA(ACRES) =      0.60   PEAK FLOW RATE(CFS) =      2.29
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.60  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       2.29
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                           *
* EXISTING CONDITION 25-YEAR                                           *
* NORTH OF BARTON ROAD, SOUTHWEST PARKING LOT (NODES 150-152)          *
 ************************************************************************

  FILE NAME: W:\3711\EX25D.DAT
  TIME/DATE OF STUDY: 17:01 10/08/2019
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
  ELEVATION DATA: UPSTREAM(FEET) =    956.25  DOWNSTREAM(FEET) =    951.84

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.235
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.981
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  B        2.05      0.75     0.100    56    9.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.36
  TOTAL AREA(ACRES) =      2.05   PEAK FLOW RATE(CFS) =      5.36

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   950.27  DOWNSTREAM(FEET) =   947.95
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   6.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  13.40
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       5.36
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    9.27
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     515.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      9.27
  EFFECTIVE AREA(ACRES) =      2.05  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       5.36
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 25-YEAR                                             *
* NROTH OF BARTON ROAD, SOUTH HALF OF SOUTHEAST BUILDING (NODES 160-161) *
 ************************************************************************

  FILE NAME: W:\3711\EX25E.DAT
  TIME/DATE OF STUDY: 18:12 12/04/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  ====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
  ELEVATION DATA: UPSTREAM(FEET) =    957.25  DOWNSTREAM(FEET) =    956.57

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.231
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.775
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        1.30      0.75      0.100    56    6.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.33
  TOTAL AREA(ACRES) =      1.30   PEAK FLOW RATE(CFS) =      4.33
==========================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =         1.3  TC(MIN.) =      6.23
  EFFECTIVE AREA(ACRES) =       1.30  AREA-AVERAGED Fm(INCH/HR)=  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       4.33
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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            Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 25-YEAR                                             *
* NORTH OF BARTON ROAD, NORTHEAST DIRT AREA (NODES 170-171)              *
 ************************************************************************

  FILE NAME: W:\3711\EX25F.DAT
  TIME/DATE OF STUDY: 11:00 12/06/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
  ELEVATION DATA: UPSTREAM(FEET) =    969.70  DOWNSTREAM(FEET) =    942.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.044
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.678
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "OPEN BRUSH"                B        1.85      0.45      1.000    76   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      3.71
  TOTAL AREA(ACRES) =      1.85   PEAK FLOW RATE(CFS) =      3.71
```

```
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        1.9  TC(MIN.) =     11.04
  EFFECTIVE AREA(ACRES) =       1.85  AREA-AVERAGED Fm(INCH/HR)=  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       3.71
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 25-YEAR                                            *
* SOUTH OF BARTON ROAD PLUS EAST RAILROAD & OFFSITE LOTS (NODES 200-256) *
 **************************************************************************

  FILE NAME: W:\3711\EX25G.DAT
  TIME/DATE OF STUDY: 11:32 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   680.00
  ELEVATION DATA: UPSTREAM(FEET) =    979.80  DOWNSTREAM(FEET) =    951.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.799
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.300
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        0.70      0.75     0.100    56    7.80
 NATURAL POOR COVER
 "BARREN"                    B        0.15      0.27     1.000    86   13.47
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.259
 SUBAREA RUNOFF(CFS) =      2.44
 TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      2.44

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    211.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  951.50  DOWNSTREAM ELEVATION(FEET) =  943.15
 STREET LENGTH(FEET) =   590.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       2.84
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.34
   HALFSTREET FLOOD WIDTH(FEET) =    9.97
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.63
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.89
 STREET FLOW TRAVEL TIME(MIN.) =   3.74   Tc(MIN.) =   11.54
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.608
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.35      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    0.80
 EFFECTIVE AREA(ACRES) =      1.20    AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.47  AREA-AVERAGED Ap =  0.21
 TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       2.71

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.34   HALFSTREET FLOOD WIDTH(FEET) =   9.78
 FLOW VELOCITY(FEET/SEC.) =  2.58   DEPTH*VELOCITY(FT*FT/SEC.) =   0.87
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =    1270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.54
 RAINFALL INTENSITY(INCH/HR) =   2.61
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.47
 AREA-AVERAGED Ap =  0.21
 EFFECTIVE STREAM AREA(ACRES) =       1.20
 TOTAL STREAM AREA(ACRES) =       1.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.71
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   975.00
 ELEVATION DATA: UPSTREAM(FEET) =    956.20  DOWNSTREAM(FEET) =    943.15

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   26.247
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.593
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        5.30      0.61     1.000    66   26.25
 NATURAL FAIR COVER
 "OPEN BRUSH"               C        1.05      0.43     1.000    77   26.25
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      5.76
 TOTAL AREA(ACRES) =      6.35   PEAK FLOW RATE(CFS) =      5.76

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   26.25
 RAINFALL INTENSITY(INCH/HR) =   1.59
 AREA-AVERAGED Fm(INCH/HR) =  0.58
 AREA-AVERAGED Fp(INCH/HR) =  0.58
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       6.35
 TOTAL STREAM AREA(ACRES) =       6.35
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.76

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        2.71   11.54    2.608  0.47( 0.10) 0.21       1.2     200.00
     2        5.76   26.25    1.593  0.58( 0.58) 1.00       6.4     210.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        7.79   11.54    2.608  0.57( 0.44) 0.76       4.0     200.00
     2        7.38   26.25    1.593  0.58( 0.51) 0.87       7.6     210.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.79    Tc(MIN.) =    11.54
 EFFECTIVE AREA(ACRES) =       3.99   AREA-AVERAGED Fm(INCH/HR) =  0.44
 AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.76
 TOTAL AREA(ACRES) =       7.6
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =    1270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    256.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
 UPSTREAM ELEVATION(FEET) =  943.15  DOWNSTREAM ELEVATION(FEET) =  941.17
 STREET LENGTH(FEET) =   410.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.24
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.52
   HALFSTREET FLOOD WIDTH(FEET) =   19.88
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.21
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.15
 STREET FLOW TRAVEL TIME(MIN.) =   3.09   Tc(MIN.) =   14.63
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.262
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.25      0.75     0.100    56
 COMMERCIAL                 C        0.20      0.57     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.67
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.45      SUBAREA RUNOFF(CFS) =    0.89
 EFFECTIVE AREA(ACRES) =      4.44    AREA-AVERAGED Fm(INCH/HR) =  0.40
 AREA-AVERAGED Fp(INCH/HR) =  0.58  AREA-AVERAGED Ap =  0.70
 TOTAL AREA(ACRES) =        8.0        PEAK FLOW RATE(CFS) =       7.79
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.51   HALFSTREET FLOOD WIDTH(FEET) =  19.41
 FLOW VELOCITY(FEET/SEC.) =  2.19   DEPTH*VELOCITY(FT*FT/SEC.) =   1.12
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    256.00 =    1680.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    256.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   14.63
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.262
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.45      0.75     0.100    56
 COMMERCIAL                 C        4.00      0.57     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    4.45      SUBAREA RUNOFF(CFS) =    8.82
 EFFECTIVE AREA(ACRES) =      8.89   AREA-AVERAGED Fm(INCH/HR) =  0.23
 AREA-AVERAGED Fp(INCH/HR) =  0.58  AREA-AVERAGED Ap =  0.40
 TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      16.27

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
```

```
 FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   220.00
 ELEVATION DATA: UPSTREAM(FEET) =    954.40  DOWNSTREAM(FEET) =    951.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.250
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.768
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        0.30      0.75     0.100    56    6.25
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.00
 TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      1.00

****************************************************************************
 FLOW PROCESS FROM NODE    221.00 TO NODE    231.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  951.50  DOWNSTREAM ELEVATION(FEET) =  944.74
 STREET LENGTH(FEET) =   425.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.46
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.28
   HALFSTREET FLOOD WIDTH(FEET) =    6.78
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.42
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.69
 STREET FLOW TRAVEL TIME(MIN.) =   2.93   Tc(MIN.) =    9.18
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.992
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.35      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    0.93
 EFFECTIVE AREA(ACRES) =      0.65    AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.7        PEAK FLOW RATE(CFS) =       1.71

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   7.47
 FLOW VELOCITY(FEET/SEC.) =  2.48   DEPTH*VELOCITY(FT*FT/SEC.) =   0.73
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    231.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    231.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
```

```
================================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    9.18
  RAINFALL INTENSITY(INCH/HR) =   2.99
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       0.65
  TOTAL STREAM AREA(ACRES) =       0.65
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.71

****************************************************************************
  FLOW PROCESS FROM NODE    230.00 TO NODE    231.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   460.00
  ELEVATION DATA: UPSTREAM(FEET) =    952.30  DOWNSTREAM(FEET) =    944.74

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.032
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.242
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                  B        1.55      0.75      0.100    56    8.03
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      4.42
  TOTAL AREA(ACRES) =      1.55   PEAK FLOW RATE(CFS) =      4.42

****************************************************************************
  FLOW PROCESS FROM NODE    231.00 TO NODE    231.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.03
  RAINFALL INTENSITY(INCH/HR) =   3.24
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       1.55
  TOTAL STREAM AREA(ACRES) =       1.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.42

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        1.71    9.18    2.992  0.75( 0.07) 0.10       0.7     220.00
      2        4.42    8.03    3.242  0.75( 0.07) 0.10       1.5     230.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1        6.05    8.03    3.242  0.75( 0.07) 0.10       2.1     230.00
      2        5.78    9.18    2.992  0.75( 0.07) 0.10       2.2     220.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =       6.05    Tc(MIN.) =     8.03
```

```
 EFFECTIVE AREA(ACRES) =       2.12   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.2
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    231.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    241.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  944.74  DOWNSTREAM ELEVATION(FEET) =  942.00
 STREET LENGTH(FEET) =   370.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       6.41
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.46
   HALFSTREET FLOOD WIDTH(FEET) =   16.45
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.46
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.12
 STREET FLOW TRAVEL TIME(MIN.) =   2.51   Tc(MIN.) =   10.54
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.754
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.30      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.30      SUBAREA RUNOFF(CFS) =    0.72
 EFFECTIVE AREA(ACRES) =      2.42    AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.5        PEAK FLOW RATE(CFS) =       6.05
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.45   HALFSTREET FLOOD WIDTH(FEET) =  16.05
 FLOW VELOCITY(FEET/SEC.) =  2.42   DEPTH*VELOCITY(FT*FT/SEC.) =   1.09
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    241.00 =    1015.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    241.00 TO NODE    241.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.54
 RAINFALL INTENSITY(INCH/HR) =   2.75
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.42
 TOTAL STREAM AREA(ACRES) =       2.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.05

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    241.00 IS CODE =  21
```

```
------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.00
 ELEVATION DATA: UPSTREAM(FEET) =    949.40  DOWNSTREAM(FEET) =    942.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.555
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.921
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        2.20      0.75     0.100    56    9.55
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      5.64
 TOTAL AREA(ACRES) =      2.20   PEAK FLOW RATE(CFS) =      5.64

****************************************************************************
 FLOW PROCESS FROM NODE    241.00 TO NODE    241.00 IS CODE =   1
------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.55
 RAINFALL INTENSITY(INCH/HR) =   2.92
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.20
 TOTAL STREAM AREA(ACRES) =       2.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.64

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        6.05   10.54    2.754  0.75( 0.07) 0.10       2.4     230.00
     1        5.78   11.71    2.585  0.75( 0.07) 0.10       2.5     220.00
     2        5.64    9.55    2.921  0.75( 0.07) 0.10       2.2     240.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       11.46    9.55    2.921  0.75( 0.07) 0.10       4.4     240.00
     2       11.35   10.54    2.754  0.75( 0.07) 0.10       4.6     230.00
     3       10.76   11.71    2.585  0.75( 0.07) 0.10       4.7     220.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.46    Tc(MIN.) =     9.55
 EFFECTIVE AREA(ACRES) =       4.39   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.7
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    241.00 =    1015.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    241.00 TO NODE    256.00 IS CODE =  62
------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  942.00  DOWNSTREAM ELEVATION(FEET) =  941.17
```

```
 STREET LENGTH(FEET) =   170.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.35
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.58
   HALFSTREET FLOOD WIDTH(FEET) =   23.32
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.45
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.42
 STREET FLOW TRAVEL TIME(MIN.) =   1.16   Tc(MIN.) =   10.71
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.727
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.75      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.75      SUBAREA RUNOFF(CFS) =    1.79
 EFFECTIVE AREA(ACRES) =      5.14    AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.5        PEAK FLOW RATE(CFS) =      12.28

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.58   HALFSTREET FLOOD WIDTH(FEET) =  23.24
 FLOW VELOCITY(FEET/SEC.) =  2.45   DEPTH*VELOCITY(FT*FT/SEC.) =   1.41
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    256.00 =    1185.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    250.00 TO NODE    251.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   960.00
 ELEVATION DATA: UPSTREAM(FEET) =    977.00  DOWNSTREAM(FEET) =    963.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.041
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.678
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        1.30      0.75     0.100    56   11.04
 COMMERCIAL                  C        4.50      0.57     0.100    69   11.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     13.66
 TOTAL AREA(ACRES) =      5.80   PEAK FLOW RATE(CFS) =     13.66

****************************************************************************
 FLOW PROCESS FROM NODE    251.00 TO NODE    252.00 IS CODE =  52
----------------------------------------------------------------------------
```

```
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    963.00  DOWNSTREAM(FEET) =    954.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   430.00   CHANNEL SLOPE =  0.0198
 CHANNEL FLOW THRU SUBAREA(CFS) =      13.66
 FLOW VELOCITY(FEET/SEC) =   3.81 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.88   Tc(MIN.) =   12.92
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    252.00 =    1390.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    251.00 TO NODE    252.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.92
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.437
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        2.65      0.75      0.100    56
 COMMERCIAL                  C        3.85      0.57      0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.64
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    6.50      SUBAREA RUNOFF(CFS) =   13.88
 EFFECTIVE AREA(ACRES) =     12.30   AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       12.3       PEAK FLOW RATE(CFS) =      26.29

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    253.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    954.50  DOWNSTREAM(FEET) =    950.75
 CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.0150
 CHANNEL FLOW THRU SUBAREA(CFS) =      26.29
 FLOW VELOCITY(FEET/SEC) =   3.95 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.05   Tc(MIN.) =   13.98
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    253.00 =    1640.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    253.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.98
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.325
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp          Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "OPEN BRUSH"                B        0.75      0.45      1.000    76
 NATURAL POOR COVER
 "OPEN BRUSH"                C        0.50      0.31      1.000    84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.39
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.25      SUBAREA RUNOFF(CFS) =    2.17
 EFFECTIVE AREA(ACRES) =     13.55   AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.51  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =       13.6       PEAK FLOW RATE(CFS) =      27.22

****************************************************************************
 FLOW PROCESS FROM NODE    253.00 TO NODE    254.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
```

```
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    950.75  DOWNSTREAM(FEET) =    948.60
  CHANNEL LENGTH THRU SUBAREA(FEET) =   665.00   CHANNEL SLOPE =  0.0032
  CHANNEL FLOW THRU SUBAREA(CFS) =      27.22
  FLOW VELOCITY(FEET/SEC) =   1.85 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   5.98   Tc(MIN.) =   19.96
  LONGEST FLOWPATH FROM NODE    250.00 TO NODE    254.00 =    2305.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    253.00 TO NODE    254.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   19.96
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.878
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "OPEN BRUSH"               C        1.35      0.31     1.000    84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    1.91
  EFFECTIVE AREA(ACRES) =     14.90   AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.26
  TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      27.22
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
  FLOW PROCESS FROM NODE    254.00 TO NODE    255.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  948.60  DOWNSTREAM ELEVATION(FEET) =  945.05
  STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.46
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.47
    HALFSTREET FLOOD WIDTH(FEET) =   17.46
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.71
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.23
  STREET FLOW TRAVEL TIME(MIN.) =   0.50   Tc(MIN.) =   20.45
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.850
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 C        0.30      0.57     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.30      SUBAREA RUNOFF(CFS) =    0.48
  EFFECTIVE AREA(ACRES) =     15.20    AREA-AVERAGED Fm(INCH/HR) =  0.11
  AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.25
  TOTAL AREA(ACRES) =       15.2        PEAK FLOW RATE(CFS) =      27.22
  NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
```

```
 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.47   HALFSTREET FLOOD WIDTH(FEET) =  17.38
 FLOW VELOCITY(FEET/SEC.) =  4.71   DEPTH*VELOCITY(FT*FT/SEC.) =   2.23
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    255.00 =    2445.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    255.00 TO NODE    256.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  945.05  DOWNSTREAM ELEVATION(FEET) =  941.17
 STREET LENGTH(FEET) =   460.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      27.56
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.67
   HALFSTREET FLOOD WIDTH(FEET) =   29.00
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.67
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.47
 STREET FLOW TRAVEL TIME(MIN.) =   2.09   Tc(MIN.) =   22.54
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.745
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.45      0.57     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.45      SUBAREA RUNOFF(CFS) =    0.68
 EFFECTIVE AREA(ACRES) =     15.65    AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.25
 TOTAL AREA(ACRES) =       15.7        PEAK FLOW RATE(CFS) =      27.22
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.67   HALFSTREET FLOOD WIDTH(FEET) =  28.70
 FLOW VELOCITY(FEET/SEC.) =  3.66   DEPTH*VELOCITY(FT*FT/SEC.) =   2.46
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    255.00 TO NODE    256.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   22.54
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.745
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 C        0.25      0.57     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.38
 EFFECTIVE AREA(ACRES) =     15.90   AREA-AVERAGED Fm(INCH/HR) =  0.11
 AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.25
 TOTAL AREA(ACRES) =       15.9       PEAK FLOW RATE(CFS) =      27.22
```

```
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       27.22   22.54    1.745  0.44( 0.11) 0.25      15.9     250.00
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       12.28   10.71    2.727  0.75( 0.07) 0.10       5.1     240.00
     2       12.14   11.70    2.587  0.75( 0.07) 0.10       5.4     230.00
     3       11.61   12.89    2.441  0.75( 0.07) 0.10       5.5     220.00
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    256.00 =    1185.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       32.98   10.71    2.727  0.51( 0.10) 0.19      12.7     240.00
     2       33.53   11.70    2.587  0.51( 0.10) 0.19      13.6     230.00
     3       33.79   12.89    2.441  0.50( 0.10) 0.19      14.5     220.00
     4       35.42   22.54    1.745  0.48( 0.10) 0.21      21.4     250.00
   TOTAL AREA(ACRES) =        21.4

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       35.42  Tc(MIN.) =   22.544
 EFFECTIVE AREA(ACRES) =     21.35  AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.51  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       21.4
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       32.98   10.71    2.727  0.51( 0.10) 0.19      12.7     240.00
     2       33.53   11.70    2.587  0.51( 0.10) 0.19      13.6     230.00
     3       33.79   12.89    2.441  0.50( 0.10) 0.19      14.5     220.00
     4       35.42   22.54    1.745  0.48( 0.10) 0.21      21.4     250.00
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       16.27   14.63    2.262  0.58( 0.23) 0.40       8.9     200.00
     2       12.97   29.40    1.488  0.58( 0.33) 0.57      12.4     210.00
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    256.00 =    1680.00 FEET.

 ** PEAK FLOW RATE TABLE **
```

EX25G

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	47.61	10.71	2.727	0.54(0.14)	0.26	19.2	240.00
2	48.62	11.70	2.587	0.54(0.14)	0.26	20.7	230.00
3	49.38	12.89	2.441	0.54(0.14)	0.26	22.4	220.00
4	50.35	14.63	2.262	0.54(0.14)	0.27	24.7	200.00
5	49.92	22.54	1.745	0.53(0.16)	0.30	32.2	250.00
6	42.85	29.40	1.488	0.54(0.19)	0.34	33.8	210.00

TOTAL AREA(ACRES) = 33.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 50.35 Tc(MIN.) = 14.632
EFFECTIVE AREA(ACRES) = 24.67 AREA-AVERAGED Fm(INCH/HR) = 0.14
AREA-AVERAGED Fp(INCH/HR) = 0.53 AREA-AVERAGED Ap = 0.30
TOTAL AREA(ACRES) = 33.8
LONGEST FLOWPATH FROM NODE 250.00 TO NODE 256.00 = 2905.00 FEET.

****
FLOW PROCESS FROM NODE 256.00 TO NODE 256.00 IS CODE = 12

>>>>>CLEAR MEMORY BANK # 1 <<<<<
==========
==========
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 33.8 TC(MIN.) = 14.63
EFFECTIVE AREA(ACRES) = 24.67 AREA-AVERAGED Fm(INCH/HR)= 0.14
AREA-AVERAGED Fp(INCH/HR) = 0.54 AREA-AVERAGED Ap = 0.268
PEAK FLOW RATE(CFS) = 50.35

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	47.61	10.71	2.727	0.54(0.14)	0.26	19.2	240.00
2	48.62	11.70	2.587	0.54(0.14)	0.26	20.7	230.00
3	49.38	12.89	2.441	0.54(0.14)	0.26	22.4	220.00
4	50.35	14.63	2.262	0.54(0.14)	0.27	24.7	200.00
5	49.92	22.54	1.745	0.53(0.16)	0.30	32.2	250.00
6	42.85	29.40	1.488	0.54(0.19)	0.34	33.8	210.00

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END OF RATIONAL METHOD ANALYSIS

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****************************************************************************
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                            Analysis prepared by:

                          THIENES ENGINEERING INC.
                            14349 FIRESTONE BLVD
                             LA MIRADA, CA90638
                                714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* EXISTING CONDITION 25-YEAR                                              *
* SOUTH OF BARTON ROAD, SOUTHWEST TRUCK PARKING (NODES 300-301)           *
 ****************************************************************************

  FILE NAME: W:\3711\EX25H.DAT
  TIME/DATE OF STUDY: 17:46 10/08/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   490.00
  ELEVATION DATA: UPSTREAM(FEET) =    945.50  DOWNSTREAM(FEET) =    935.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.888
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.277
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                        EX25H
  COMMERCIAL                  B        0.50      0.75     0.100    56    7.89
  COMMERCIAL                  C        1.50      0.57     0.100    69    7.89
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.79
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =      5.79
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        2.0  TC(MIN.) =      7.89
  EFFECTIVE AREA(ACRES) =      2.00  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       5.79
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************
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                        Analysis prepared by:

                     THIENES ENGINEERING, INC.
                        14349 FIRESTONE BLVD
                        LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 25-YEAR                                             *
* SOUTH OF BARTON ROAD, WEST SIDE SLOPE (NODES 310-311)                  *
 ************************************************************************

  FILE NAME: W:\3711\EX25I.DAT
  TIME/DATE OF STUDY: 09:45 12/06/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  ======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    25.00
  ELEVATION DATA: UPSTREAM(FEET) =    944.70  DOWNSTREAM(FEET) =    937.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.308
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "OPEN BRUSH"               B        0.25      0.45      1.000    76    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.87
  TOTAL AREA(ACRES) =      0.25   PEAK FLOW RATE(CFS) =      0.87
```

```
==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.2  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =       0.25  AREA-AVERAGED Fm(INCH/HR)=  0.45
  AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       0.87
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS

♀
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EXISTING CONDITION
100-YEAR

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                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, NORTHERLY TRUCK YARD (NODES 100-110)             *
 **************************************************************************

  FILE NAME: W:\3711\EX100A.DAT
  TIME/DATE OF STUDY: 17:42 12/04/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =  170.00
  ELEVATION DATA: UPSTREAM(FEET) =  956.00  DOWNSTREAM(FEET) =  954.18

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  5.877
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.878
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B       1.20      0.42       0.100    76    5.88
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =  5.22
  TOTAL AREA(ACRES) =  1.20  PEAK FLOW RATE(CFS) =  5.22
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.09  DOWNSTREAM(FEET) =   951.21
 FLOW LENGTH(FEET) =    50.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.64
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.22
 PIPE TRAVEL TIME(MIN.) =   0.11    Tc(MIN.) =    5.99
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     220.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.99
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.824
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.65      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    2.80
 EFFECTIVE AREA(ACRES) =      1.85   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.9       PEAK FLOW RATE(CFS) =       7.96

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    103.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   951.21  DOWNSTREAM(FEET) =   950.28
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.63
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.96
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    6.24
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    103.00 =     320.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    103.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.24
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.706
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05      SUBAREA RUNOFF(CFS) =    4.41
 EFFECTIVE AREA(ACRES) =      2.90   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.9       PEAK FLOW RATE(CFS) =      12.17

****************************************************************************
 FLOW PROCESS FROM NODE    103.00 TO NODE    104.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   950.28  DOWNSTREAM(FEET) =   949.93
```

```
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  17.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.06
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      12.17
 PIPE TRAVEL TIME(MIN.) =   0.33    Tc(MIN.) =    6.57
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    104.00 =     420.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    104.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.57
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.563
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     1.05      SUBAREA RUNOFF(CFS) =     4.27
 EFFECTIVE AREA(ACRES) =      3.95   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       4.0       PEAK FLOW RATE(CFS) =      16.07

****************************************************************************
 FLOW PROCESS FROM NODE    104.00 TO NODE    105.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   949.93  DOWNSTREAM(FEET) =   949.55
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.63
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      16.07
 PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    6.86
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    105.00 =     520.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    105.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.86
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.444
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     1.05      SUBAREA RUNOFF(CFS) =     4.16
 EFFECTIVE AREA(ACRES) =      5.00   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       5.0       PEAK FLOW RATE(CFS) =      19.81

****************************************************************************
 FLOW PROCESS FROM NODE    105.00 TO NODE    106.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   949.55  DOWNSTREAM(FEET) =   949.05
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.53
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      19.81
 PIPE TRAVEL TIME(MIN.) =   0.26    Tc(MIN.) =    7.12
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    106.00 =     620.00 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    106.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.12
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.348
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05     SUBAREA RUNOFF(CFS) =    4.07
 EFFECTIVE AREA(ACRES) =      6.05   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        6.1       PEAK FLOW RATE(CFS) =      23.44

****************************************************************************
 FLOW PROCESS FROM NODE    106.00 TO NODE    107.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   949.05  DOWNSTREAM(FEET) =   948.53
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  22.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.76
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      23.44
 PIPE TRAVEL TIME(MIN.) =   0.25    Tc(MIN.) =    7.36
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    107.00 =     720.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    107.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.36
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.260
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.05      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.05     SUBAREA RUNOFF(CFS) =    3.99
 EFFECTIVE AREA(ACRES) =      7.10   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        7.1       PEAK FLOW RATE(CFS) =      26.95

****************************************************************************
 FLOW PROCESS FROM NODE    107.00 TO NODE    108.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.53  DOWNSTREAM(FEET) =   948.22
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.89
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      26.95
 PIPE TRAVEL TIME(MIN.) =   0.28    Tc(MIN.) =    7.65
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    108.00 =     820.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    108.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.65
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.165
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.80      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     0.80      SUBAREA RUNOFF(CFS) =     2.97
 EFFECTIVE AREA(ACRES) =      7.90   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        7.9       PEAK FLOW RATE(CFS) =      29.31

****************************************************************************
 FLOW PROCESS FROM NODE    108.00 TO NODE    109.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.22  DOWNSTREAM(FEET) =   946.51
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  10.12
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      29.31
 PIPE TRAVEL TIME(MIN.) =   0.23    Tc(MIN.) =    7.88
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    109.00 =     960.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    109.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.88
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.091
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.35      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     0.35      SUBAREA RUNOFF(CFS) =     1.28
 EFFECTIVE AREA(ACRES) =      8.25   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        8.3       PEAK FLOW RATE(CFS) =      30.06

****************************************************************************
 FLOW PROCESS FROM NODE    109.00 TO NODE    110.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   946.51  DOWNSTREAM(FEET) =   940.60
 FLOW LENGTH(FEET) =    25.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  30.61
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      30.06
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.89
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    110.00 =     985.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        8.3  TC(MIN.) =      7.89
 EFFECTIVE AREA(ACRES) =      8.25  AREA-AVERAGED Fm(INCH/HR)=  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)    =      30.06
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

♀

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**************************************************************************
          RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
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                           LA MIRADA, CA90638
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 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, MIDDLE PORTION OF SITE (NODES 120-136)           *
 **************************************************************************

  FILE NAME: W:\3711\EX100B.DAT
  TIME/DATE OF STUDY: 16:44 10/08/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    135.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   650.00
  ELEVATION DATA: UPSTREAM(FEET) =    957.50  DOWNSTREAM(FEET) =    949.36

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.739
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.602
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                B        8.95      0.42     0.100    76    9.74
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     28.68
 TOTAL AREA(ACRES) =      8.95   PEAK FLOW RATE(CFS) =     28.68

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    135.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.74
 RAINFALL INTENSITY(INCH/HR) =   3.60
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       8.95
 TOTAL STREAM AREA(ACRES) =       8.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.68

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   170.00
 ELEVATION DATA: UPSTREAM(FEET) =    959.55  DOWNSTREAM(FEET) =    953.88

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.374
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        1.70      0.42     0.100    76    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      8.16
 TOTAL AREA(ACRES) =      1.70   PEAK FLOW RATE(CFS) =      8.16

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.42  DOWNSTREAM(FEET) =   951.88
 FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  12.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.47
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       8.16
 PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    5.30
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =     270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.30
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.186
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
```

```
     LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL               B        0.90      0.42      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.90      SUBAREA RUNOFF(CFS) =    4.17
  EFFECTIVE AREA(ACRES) =      2.60   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        2.6       PEAK FLOW RATE(CFS) =      12.04

****************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   951.81  DOWNSTREAM(FEET) =   951.36
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.60
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      12.04
  PIPE TRAVEL TIME(MIN.) =   0.30    Tc(MIN.) =    5.60
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =     370.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.60
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.019
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL               B        1.15      0.42      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.15      SUBAREA RUNOFF(CFS) =    5.15
  EFFECTIVE AREA(ACRES) =      3.75   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        3.8       PEAK FLOW RATE(CFS) =      16.80

****************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   951.35  DOWNSTREAM(FEET) =   950.11
  FLOW LENGTH(FEET) =   100.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  15.6 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   8.77
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.80
  PIPE TRAVEL TIME(MIN.) =   0.19    Tc(MIN.) =    5.79
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     470.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    134.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    5.79
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.920
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
```

```
 COMMERCIAL                  B        1.55      0.42     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     1.55      SUBAREA RUNOFF(CFS) =     6.80
 EFFECTIVE AREA(ACRES) =      5.30   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.3       PEAK FLOW RATE(CFS) =      23.27

****************************************************************************
 FLOW PROCESS FROM NODE    134.00 TO NODE    135.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   950.10  DOWNSTREAM(FEET) =   944.67
 FLOW LENGTH(FEET) =   700.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   8.06
 ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      23.27
 PIPE TRAVEL TIME(MIN.) =   1.45    Tc(MIN.) =    7.24
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =    1170.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    135.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.24
 RAINFALL INTENSITY(INCH/HR) =   4.30
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       5.30
 TOTAL STREAM AREA(ACRES) =       5.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      23.27

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       28.68    9.74    3.602  0.42( 0.04) 0.10       8.9     120.00
     2       23.27    7.24    4.304  0.42( 0.04) 0.10       5.3     130.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       48.78    7.24    4.304  0.42( 0.04) 0.10      12.0     130.00
     2       48.11    9.74    3.602  0.42( 0.04) 0.10      14.2     120.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      48.78    Tc(MIN.) =     7.24
 EFFECTIVE AREA(ACRES) =      11.95   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       14.2
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    135.00 =    1170.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    135.00 TO NODE    136.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   943.87  DOWNSTREAM(FEET) =   932.13
  FLOW LENGTH(FEET) =    35.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  18.0 INCH PIPE IS  11.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  39.99
  ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      48.78
  PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    7.25
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    136.00 =    1205.00 FEET.
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =       14.2  TC(MIN.) =      7.25
  EFFECTIVE AREA(ACRES) =     11.95  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =      48.78

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       48.78    7.25    4.298  0.42( 0.04) 0.10      12.0     130.00
      2       48.11    9.75    3.599  0.42( 0.04) 0.10      14.2     120.00
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                           Analysis prepared by:

                         THIENES ENGINEERING INC.
                           14349 FIRESTONE BLVD
                            LA MIRADA, CA90638
                               714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                           *
* NORTH OF BARTON ROAD, WEST HALF OF WESTERLY BUILDING (NODES 140-141)  *
 ************************************************************************

  FILE NAME: W:\3711\EX100C.DAT
  TIME/DATE OF STUDY: 16:51 10/08/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   120.00
  ELEVATION DATA: UPSTREAM(FEET) =    954.50  DOWNSTREAM(FEET) =    948.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.374
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                        EX100C
  COMMERCIAL                  B        0.60      0.42     0.100    76    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      2.88
  TOTAL AREA(ACRES) =      0.60   PEAK FLOW RATE(CFS) =      2.88
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.60  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.88
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************** DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* EXISTING CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, SOUTHWEST PARKING LOT (NODES 150-152)            *
 ************************************************************************

  FILE NAME: W:\3711\EX100D.DAT
  TIME/DATE OF STUDY: 17:00 10/08/2019
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
  ELEVATION DATA: UPSTREAM(FEET) =    956.25  DOWNSTREAM(FEET) =    951.84

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.235
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.719
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                        EX100D
  COMMERCIAL                  B        2.05      0.42     0.100    76     9.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      6.78
  TOTAL AREA(ACRES) =      2.05   PEAK FLOW RATE(CFS) =      6.78

****************************************************************************
  FLOW PROCESS FROM NODE    151.00 TO NODE    152.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   950.27  DOWNSTREAM(FEET) =   947.95
  FLOW LENGTH(FEET) =    30.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  12.0 INCH PIPE IS   7.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =  14.17
  ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       6.78
  PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    9.27
  LONGEST FLOWPATH FROM NODE    150.00 TO NODE    152.00 =     515.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      9.27
  EFFECTIVE AREA(ACRES) =      2.05  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       6.78
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
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                        Analysis prepared by:

                     THIENES ENGINEERING, INC.
                        14349 FIRESTONE BLVD
                        LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, SOUTH HALF OF SOUTHEAST BUILDING (NODES 160-161) *
 ************************************************************************

  FILE NAME: W:\3711\EX100E.DAT
  TIME/DATE OF STUDY: 13:16 11/27/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  ========  ==================  ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   135.00
  ELEVATION DATA: UPSTREAM(FEET) =    957.25  DOWNSTREAM(FEET) =    956.57

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.231
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.709
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        1.30      0.42      0.100    76    6.23
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      5.46
  TOTAL AREA(ACRES) =      1.30   PEAK FLOW RATE(CFS) =      5.46
==========================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        1.3  TC(MIN.) =      6.23
  EFFECTIVE AREA(ACRES) =      1.30  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       5.46
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, NORTHEAST DIRT AREA (NODES 170-171)              *
 ************************************************************************

  FILE NAME: W:\3711\EX100F.DAT
  TIME/DATE OF STUDY: 10:58 12/06/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
  ELEVATION DATA: UPSTREAM(FEET) =    969.70  DOWNSTREAM(FEET) =    942.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =  11.044
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.340
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "OPEN BRUSH"                B        1.85      0.20       1.000    92   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      5.23
  TOTAL AREA(ACRES) =      1.85   PEAK FLOW RATE(CFS) =      5.23
```

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================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =         1.9  TC(MIN.) =     11.04
  EFFECTIVE AREA(ACRES) =       1.85  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =        5.23
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
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**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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            Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                          Analysis prepared by:

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 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                            *
* SOUTH OF BARTON ROAD PLUS EAST RAILROAD & OFFSITE LOTS (NODES 200-256) *
 **************************************************************************

  FILE NAME: W:\3711\EX100G.DAT
  TIME/DATE OF STUDY: 11:30 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
=== ===== ========== ================== ======= ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   680.00
  ELEVATION DATA: UPSTREAM(FEET) =    979.80  DOWNSTREAM(FEET) =    951.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.799
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.116
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        0.70      0.42      0.100    76    7.80
 NATURAL POOR COVER
 "BARREN"                    B        0.15      0.11      1.000    97   13.47
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.21
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.259
 SUBAREA RUNOFF(CFS) =      3.11
 TOTAL AREA(ACRES) =      0.85   PEAK FLOW RATE(CFS) =      3.11

****************************************************************************
 FLOW PROCESS FROM NODE    201.00 TO NODE    211.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  951.50  DOWNSTREAM ELEVATION(FEET) =  943.15
 STREET LENGTH(FEET) =   590.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       3.62
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.36
   HALFSTREET FLOOD WIDTH(FEET) =   11.21
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.75
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.00
 STREET FLOW TRAVEL TIME(MIN.) =   3.58   Tc(MIN.) =   11.37
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.282
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.35      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.02
 EFFECTIVE AREA(ACRES) =      1.20    AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.21
 TOTAL AREA(ACRES) =        1.2        PEAK FLOW RATE(CFS) =       3.49

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.36   HALFSTREET FLOOD WIDTH(FEET) =  10.98
 FLOW VELOCITY(FEET/SEC.) =  2.75   DEPTH*VELOCITY(FT*FT/SEC.) =   0.99
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =    1270.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   11.37
 RAINFALL INTENSITY(INCH/HR) =   3.28
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.24
 AREA-AVERAGED Ap =  0.21
 EFFECTIVE STREAM AREA(ACRES) =       1.20
 TOTAL STREAM AREA(ACRES) =       1.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.49
```

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**************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
--------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   975.00
 ELEVATION DATA: UPSTREAM(FEET) =    956.20  DOWNSTREAM(FEET) =    943.15

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   26.247
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.987
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        5.30      0.31     1.000    84   26.25
 NATURAL FAIR COVER
 "OPEN BRUSH"                C        1.05      0.19     1.000    92   26.25
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      9.71
 TOTAL AREA(ACRES) =      6.35   PEAK FLOW RATE(CFS) =      9.71

**************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    211.00 IS CODE =   1
--------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
==========================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =   26.25
 RAINFALL INTENSITY(INCH/HR) =   1.99
 AREA-AVERAGED Fm(INCH/HR) =  0.29
 AREA-AVERAGED Fp(INCH/HR) =  0.29
 AREA-AVERAGED Ap =  1.00
 EFFECTIVE STREAM AREA(ACRES) =       6.35
 TOTAL STREAM AREA(ACRES) =       6.35
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.71

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        3.49   11.37    3.282  0.24( 0.05) 0.21       1.2     200.00
     2        9.71   26.25    1.987  0.29( 0.29) 1.00       6.4     210.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       10.90   11.37    3.282  0.28( 0.22) 0.76       4.0     200.00
     2       11.80   26.25    1.987  0.29( 0.25) 0.87       7.6     210.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.80    Tc(MIN.) =    26.25
 EFFECTIVE AREA(ACRES) =       7.55   AREA-AVERAGED Fm(INCH/HR) =  0.25
 AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  0.87
 TOTAL AREA(ACRES) =        7.6
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    211.00 =    1270.00 FEET.

**************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    256.00 IS CODE =  62
--------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
================================================================================
 UPSTREAM ELEVATION(FEET) =  943.15  DOWNSTREAM ELEVATION(FEET) =  941.17
 STREET LENGTH(FEET) =   410.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      12.17
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.58
   HALFSTREET FLOOD WIDTH(FEET) =   23.24
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.43
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.40
 STREET FLOW TRAVEL TIME(MIN.) =   2.82   Tc(MIN.) =   29.06
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.869
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.25      0.42     0.100    76
 COMMERCIAL                  C        0.20      0.27     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.36
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.45      SUBAREA RUNOFF(CFS) =    0.74
 EFFECTIVE AREA(ACRES) =      8.00    AREA-AVERAGED Fm(INCH/HR) =  0.24
 AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  0.83
 TOTAL AREA(ACRES) =        8.0        PEAK FLOW RATE(CFS) =      11.80
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.57   HALFSTREET FLOOD WIDTH(FEET) =  22.93
 FLOW VELOCITY(FEET/SEC.) =  2.41   DEPTH*VELOCITY(FT*FT/SEC.) =   1.38
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    256.00 =    1680.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    256.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   29.06
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  1.869
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.45      0.42     0.100    76
 COMMERCIAL                  C        4.00      0.27     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.29
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    4.45      SUBAREA RUNOFF(CFS) =    7.37
 EFFECTIVE AREA(ACRES) =     12.45   AREA-AVERAGED Fm(INCH/HR) =  0.16
 AREA-AVERAGED Fp(INCH/HR) =  0.29  AREA-AVERAGED Ap =  0.57
 TOTAL AREA(ACRES) =       12.4       PEAK FLOW RATE(CFS) =      19.11

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       21.96   14.23    2.869  0.29( 0.11) 0.40       8.9     200.00
     2       19.11   29.06    1.869  0.29( 0.16) 0.57      12.4     210.00
 NEW PEAK FLOW DATA ARE:
 PEAK FLOW RATE(CFS) =      21.96  Tc(MIN.) =   14.23
```

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 AREA-AVERAGED Fm(INCH/HR) =  0.11  AREA-AVERAGED Fp(INCH/HR) =  0.29
 AREA-AVERAGED Ap =  0.40  EFFECTIVE AREA(ACRES) =       8.85

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   220.00
 ELEVATION DATA: UPSTREAM(FEET) =    954.40  DOWNSTREAM(FEET) =    951.50

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.250
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.701
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        0.30      0.42     0.100    76    6.25
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.26
 TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      1.26

****************************************************************************
 FLOW PROCESS FROM NODE    221.00 TO NODE    231.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  951.50  DOWNSTREAM ELEVATION(FEET) =  944.74
 STREET LENGTH(FEET) =   425.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.85
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.30
   HALFSTREET FLOOD WIDTH(FEET) =    7.78
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.51
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.76
 STREET FLOW TRAVEL TIME(MIN.) =   2.82   Tc(MIN.) =    9.07
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.760
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.35      0.42     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.17
 EFFECTIVE AREA(ACRES) =      0.65    AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.6        PEAK FLOW RATE(CFS) =       2.17
```

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 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.47
 FLOW VELOCITY(FEET/SEC.) =  2.61   DEPTH*VELOCITY(FT*FT/SEC.) =   0.82
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    231.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    231.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.07
 RAINFALL INTENSITY(INCH/HR) =   3.76
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.65
 TOTAL STREAM AREA(ACRES) =       0.65
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       2.17

****************************************************************************
 FLOW PROCESS FROM NODE    230.00 TO NODE    231.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   460.00
 ELEVATION DATA: UPSTREAM(FEET) =    952.30  DOWNSTREAM(FEET) =    944.74

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    8.032
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.044
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        1.55      0.42     0.100    76    8.03
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      5.58
 TOTAL AREA(ACRES) =      1.55   PEAK FLOW RATE(CFS) =      5.58

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    231.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    8.03
 RAINFALL INTENSITY(INCH/HR) =   4.04
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.55
 TOTAL STREAM AREA(ACRES) =       1.55
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.58

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        2.17    9.07    3.760  0.42( 0.04) 0.10       0.6     220.00
     2        5.58    8.03    4.044  0.42( 0.04) 0.10       1.5     230.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

```
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)     NODE
     1        7.66    8.03    4.044  0.42( 0.04) 0.10       2.1      230.00
     2        7.36    9.07    3.760  0.42( 0.04) 0.10       2.2      220.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       7.66    Tc(MIN.) =     8.03
 EFFECTIVE AREA(ACRES) =       2.13   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.2
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    231.00 =     645.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    241.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  944.74  DOWNSTREAM ELEVATION(FEET) =  942.00
 STREET LENGTH(FEET) =   370.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       8.12
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.49
   HALFSTREET FLOOD WIDTH(FEET) =   18.16
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.58
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.26
 STREET FLOW TRAVEL TIME(MIN.) =   2.39   Tc(MIN.) =   10.42
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.459
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.30      0.42     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.30      SUBAREA RUNOFF(CFS) =    0.92
 EFFECTIVE AREA(ACRES) =      2.43    AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        2.5        PEAK FLOW RATE(CFS) =       7.66
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.48   HALFSTREET FLOOD WIDTH(FEET) =  17.70
 FLOW VELOCITY(FEET/SEC.) =  2.56   DEPTH*VELOCITY(FT*FT/SEC.) =   1.23
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    241.00 =    1015.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    241.00 TO NODE    241.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =   10.42
```

```
 RAINFALL INTENSITY(INCH/HR) =   3.46
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.43
 TOTAL STREAM AREA(ACRES) =       2.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.66

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    241.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   610.00
 ELEVATION DATA: UPSTREAM(FEET) =    949.40  DOWNSTREAM(FEET) =    942.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.555
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.644
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        2.20      0.42     0.100    76    9.55
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      7.13
 TOTAL AREA(ACRES) =      2.20   PEAK FLOW RATE(CFS) =      7.13

****************************************************************************
 FLOW PROCESS FROM NODE    241.00 TO NODE    241.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.55
 RAINFALL INTENSITY(INCH/HR) =   3.64
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.20
 TOTAL STREAM AREA(ACRES) =       2.20
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.13

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        7.66   10.42    3.459  0.42( 0.04) 0.10       2.4     230.00
     1        7.36   11.47    3.265  0.42( 0.04) 0.10       2.5     220.00
     2        7.13    9.55    3.644  0.42( 0.04) 0.10       2.2     240.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       14.53    9.55    3.644  0.42( 0.04) 0.10       4.4     240.00
     2       14.42   10.42    3.459  0.42( 0.04) 0.10       4.6     230.00
     3       13.74   11.47    3.265  0.42( 0.04) 0.10       4.7     220.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      14.53    Tc(MIN.) =     9.55
 EFFECTIVE AREA(ACRES) =       4.42   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
```

```
 TOTAL AREA(ACRES) =        4.7
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    241.00 =    1015.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    241.00 TO NODE    256.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  942.00  DOWNSTREAM ELEVATION(FEET) =  941.17
 STREET LENGTH(FEET) =   170.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      15.67
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.62
   HALFSTREET FLOOD WIDTH(FEET) =   25.59
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.59
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    1.61
 STREET FLOW TRAVEL TIME(MIN.) =   1.09   Tc(MIN.) =   10.65
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.415
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.75      0.42     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.75      SUBAREA RUNOFF(CFS) =    2.28
 EFFECTIVE AREA(ACRES) =      5.17    AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.4        PEAK FLOW RATE(CFS) =      15.71

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.62   HALFSTREET FLOOD WIDTH(FEET) =  25.59
 FLOW VELOCITY(FEET/SEC.) =  2.60   DEPTH*VELOCITY(FT*FT/SEC.) =   1.61
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    256.00 =    1185.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    250.00 TO NODE    251.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   960.00
 ELEVATION DATA: UPSTREAM(FEET) =    977.00  DOWNSTREAM(FEET) =    963.00

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.041
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.341
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        1.30      0.42     0.100    76   11.04
 COMMERCIAL                  C        4.50      0.27     0.100    86   11.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     17.28
 TOTAL AREA(ACRES) =      5.80   PEAK FLOW RATE(CFS) =     17.28

****************************************************************************
 FLOW PROCESS FROM NODE    251.00 TO NODE    252.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    963.00  DOWNSTREAM(FEET) =    954.50
 CHANNEL LENGTH THRU SUBAREA(FEET) =   430.00   CHANNEL SLOPE =  0.0198
 CHANNEL FLOW THRU SUBAREA(CFS) =      17.28
 FLOW VELOCITY(FEET/SEC) =   4.05 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   1.77   Tc(MIN.) =   12.81
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    252.00 =    1390.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    251.00 TO NODE    252.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   12.81
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.056
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        2.65      0.42     0.100    76
 COMMERCIAL                  C        3.85      0.27     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     6.50      SUBAREA RUNOFF(CFS) =   17.68
 EFFECTIVE AREA(ACRES) =     12.30   AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       12.3       PEAK FLOW RATE(CFS) =      33.47

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    253.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    954.50  DOWNSTREAM(FEET) =    950.75
 CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.0150
 CHANNEL FLOW THRU SUBAREA(CFS) =      33.47
 FLOW VELOCITY(FEET/SEC) =   4.23 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   0.99   Tc(MIN.) =   13.80
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    253.00 =    1640.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    253.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   13.80
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.923
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "OPEN BRUSH"                B        0.75      0.20     1.000    92
 NATURAL POOR COVER
 "OPEN BRUSH"                C        0.50      0.12     1.000    96
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.17
```

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 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.25      SUBAREA RUNOFF(CFS) =    3.10
 EFFECTIVE AREA(ACRES) =     13.55   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =       13.6       PEAK FLOW RATE(CFS) =      35.10

****************************************************************************
 FLOW PROCESS FROM NODE    253.00 TO NODE    254.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    950.75  DOWNSTREAM(FEET) =    948.60
 CHANNEL LENGTH THRU SUBAREA(FEET) =   665.00   CHANNEL SLOPE =  0.0032
 CHANNEL FLOW THRU SUBAREA(CFS) =      35.10
 FLOW VELOCITY(FEET/SEC) =   1.99 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   5.57   Tc(MIN.) =   19.37
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    254.00 =    2305.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    253.00 TO NODE    254.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   19.37
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.385
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "OPEN BRUSH"                C        1.35      0.12     1.000    96
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.12
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    2.75
 EFFECTIVE AREA(ACRES) =     14.90   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.26
 TOTAL AREA(ACRES) =       14.9       PEAK FLOW RATE(CFS) =      35.10
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

****************************************************************************
 FLOW PROCESS FROM NODE    254.00 TO NODE    255.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  948.60  DOWNSTREAM ELEVATION(FEET) =  945.05
 STREET LENGTH(FEET) =   140.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  2
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.41
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.51
   HALFSTREET FLOOD WIDTH(FEET) =   19.41
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    4.97
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.53
 STREET FLOW TRAVEL TIME(MIN.) =   0.47   Tc(MIN.) =   19.83
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.351
 SUBAREA LOSS RATE DATA(AMC III):
```

```
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                 C        0.30      0.27      0.100    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA AREA(ACRES) =     0.30      SUBAREA RUNOFF(CFS) =     0.63
EFFECTIVE AREA(ACRES) =     15.20    AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.25
TOTAL AREA(ACRES) =       15.2        PEAK FLOW RATE(CFS) =      35.10
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.51   HALFSTREET FLOOD WIDTH(FEET) =  19.34
FLOW VELOCITY(FEET/SEC.) =  4.97   DEPTH*VELOCITY(FT*FT/SEC.) =   2.52
LONGEST FLOWPATH FROM NODE    250.00 TO NODE    255.00 =    2445.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    255.00 TO NODE    256.00 IS CODE =  62
----------------------------------------------------------------------------
>>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
UPSTREAM ELEVATION(FEET) =  945.05  DOWNSTREAM ELEVATION(FEET) =  941.17
STREET LENGTH(FEET) =   460.00   CURB HEIGHT(INCHES) =  8.0
STREET HALFWIDTH(FEET) = 30.00

DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
INSIDE STREET CROSSFALL(DECIMAL) =  0.018
OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

  **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =      35.54
  ***STREET FLOW SPLITS OVER STREET-CROWN***
  FULL DEPTH(FEET) =    0.70   FLOOD WIDTH(FEET) =   31.58
  FULL HALF-STREET VELOCITY(FEET/SEC.) =    3.77
  SPLIT DEPTH(FEET) =    0.41   SPLIT FLOOD WIDTH(FEET) =   13.71
  SPLIT FLOW(CFS) =    4.40   SPLIT VELOCITY(FEET/SEC.) =    2.35
  STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
  STREET FLOW DEPTH(FEET) =  0.70
  HALFSTREET FLOOD WIDTH(FEET) =   31.58
  AVERAGE FLOW VELOCITY(FEET/SEC.) =    3.77
  PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    2.63
STREET FLOW TRAVEL TIME(MIN.) =   2.03   Tc(MIN.) =   21.87
* 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.217
SUBAREA LOSS RATE DATA(AMC III):
 DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
     LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
COMMERCIAL                 C        0.45      0.27      0.100    86
SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
SUBAREA AREA(ACRES) =     0.45      SUBAREA RUNOFF(CFS) =     0.89
EFFECTIVE AREA(ACRES) =     15.65    AREA-AVERAGED Fm(INCH/HR) =  0.05
AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.25
TOTAL AREA(ACRES) =       15.7        PEAK FLOW RATE(CFS) =      35.10
NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

END OF SUBAREA STREET FLOW HYDRAULICS:
DEPTH(FEET) = 0.70   HALFSTREET FLOOD WIDTH(FEET) =  31.58
FLOW VELOCITY(FEET/SEC.) =  3.77   DEPTH*VELOCITY(FT*FT/SEC.) =   2.63
LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

****************************************************************************
FLOW PROCESS FROM NODE    255.00 TO NODE    256.00 IS CODE =  81
```

```
------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
========================================================================
 MAINLINE Tc(MIN.) =   21.87
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.217
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  C        0.25      0.27     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =     0.25      SUBAREA RUNOFF(CFS) =     0.49
 EFFECTIVE AREA(ACRES) =     15.90   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.25
 TOTAL AREA(ACRES) =       15.9       PEAK FLOW RATE(CFS) =      35.10
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE

************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  11
------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
========================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       35.10   21.87    2.217  0.20( 0.05) 0.25      15.9     250.00
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       15.71   10.65    3.415  0.42( 0.04) 0.10       5.2     240.00
     2       15.56   11.51    3.259  0.42( 0.04) 0.10       5.4     230.00
     3       14.95   12.58    3.090  0.42( 0.04) 0.10       5.4     220.00
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    256.00 =    1185.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       42.24   10.65    3.415  0.25( 0.05) 0.19      12.9     240.00
     2       42.92   11.51    3.259  0.25( 0.05) 0.19      13.7     230.00
     3       43.27   12.58    3.090  0.25( 0.05) 0.19      14.6     220.00
     4       45.77   21.87    2.217  0.23( 0.05) 0.21      21.4     250.00
   TOTAL AREA(ACRES) =        21.4

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       45.77  Tc(MIN.) =   21.867
 EFFECTIVE AREA(ACRES) =     21.35  AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       21.4
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    256.00 =    2905.00 FEET.

************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  12
------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
========================================================================

************************************************************************
 FLOW PROCESS FROM NODE    256.00 TO NODE    256.00 IS CODE =  11
------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
========================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
```

EX100G

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	42.24	10.65	3.415	0.25(0.05)	0.19	12.9	240.00
2	42.92	11.51	3.259	0.25(0.05)	0.19	13.7	230.00
3	43.27	12.58	3.090	0.25(0.05)	0.19	14.6	220.00
4	45.77	21.87	2.217	0.23(0.05)	0.21	21.4	250.00

LONGEST FLOWPATH FROM NODE 250.00 TO NODE 256.00 = 2905.00 FEET.

** MEMORY BANK # 1 CONFLUENCE DATA **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	21.96	14.23	2.869	0.29(0.11)	0.40	8.9	200.00
2	19.11	29.06	1.869	0.29(0.16)	0.57	12.4	210.00

LONGEST FLOWPATH FROM NODE 200.00 TO NODE 256.00 = 1680.00 FEET.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	61.92	10.65	3.415	0.27(0.07)	0.26	19.5	240.00
2	63.19	11.51	3.259	0.27(0.07)	0.26	20.9	230.00
3	64.23	12.58	3.090	0.27(0.07)	0.26	22.4	220.00
4	65.67	14.23	2.869	0.27(0.07)	0.27	24.6	200.00
5	66.26	21.87	2.217	0.26(0.08)	0.30	32.1	250.00
6	57.54	29.06	1.869	0.27(0.09)	0.34	33.8	210.00

TOTAL AREA(ACRES) = 33.8

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 66.26 Tc(MIN.) = 21.867
EFFECTIVE AREA(ACRES) = 32.05 AREA-AVERAGED Fm(INCH/HR) = 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.27 AREA-AVERAGED Ap = 0.27
TOTAL AREA(ACRES) = 33.8
LONGEST FLOWPATH FROM NODE 250.00 TO NODE 256.00 = 2905.00 FEET.

****
FLOW PROCESS FROM NODE 256.00 TO NODE 256.00 IS CODE = 12

>>>>>CLEAR MEMORY BANK # 1 <<<<<
==========
==========
END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 33.8 TC(MIN.) = 21.87
EFFECTIVE AREA(ACRES) = 32.05 AREA-AVERAGED Fm(INCH/HR)= 0.08
AREA-AVERAGED Fp(INCH/HR) = 0.26 AREA-AVERAGED Ap = 0.302
PEAK FLOW RATE(CFS) = 66.26

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	61.92	10.65	3.415	0.27(0.07)	0.26	19.5	240.00
2	63.19	11.51	3.259	0.27(0.07)	0.26	20.9	230.00
3	64.23	12.58	3.090	0.27(0.07)	0.26	22.4	220.00
4	65.67	14.23	2.869	0.27(0.07)	0.27	24.6	200.00
5	66.26	21.87	2.217	0.26(0.08)	0.30	32.1	250.00
6	57.54	29.06	1.869	0.27(0.09)	0.34	33.8	210.00

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END OF RATIONAL METHOD ANALYSIS

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****************************************************************************
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                           Analysis prepared by:

                         THIENES ENGINEERING INC.
                           14349 FIRESTONE BLVD
                            LA MIRADA, CA90638
                               714-521-4811

 ************************** DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* EXISTING CONDITION 100-YEAR                                            *
* SOUTH OF BARTON ROAD, SOUTHWEST TRUCK PARKING (NODES 300-301)          *
 ****************************************************************************

  FILE NAME: W:\3711\EX100H.DAT
  TIME/DATE OF STUDY: 17:45 10/08/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   490.00
  ELEVATION DATA: UPSTREAM(FEET) =    945.50  DOWNSTREAM(FEET) =    935.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.888
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.088
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                    EX100H
  COMMERCIAL                  B        0.50      0.42     0.100    76    7.89
  COMMERCIAL                  C        1.50      0.27     0.100    86    7.89
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      7.30
  TOTAL AREA(ACRES) =      2.00   PEAK FLOW RATE(CFS) =      7.30
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        2.0  TC(MIN.) =      7.89
  EFFECTIVE AREA(ACRES) =      2.00  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       7.30
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* EXISTING CONDITION 100-YEAR                                            *
* SOUTH OF BARTON ROAD, WEST SIDE SLOPE (NODES 310-311)                  *
 ************************************************************************

  FILE NAME: W:\3711\EX100I.DAT
  TIME/DATE OF STUDY: 09:41 12/06/2018
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)     SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  =====  ====  =====  =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    25.00
  ELEVATION DATA: UPSTREAM(FEET) =    944.70  DOWNSTREAM(FEET) =    937.50

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.374
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  NATURAL POOR COVER
  "OPEN BRUSH"               B        0.25      0.20      1.000    92    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.16
  TOTAL AREA(ACRES) =      0.25   PEAK FLOW RATE(CFS) =      1.16
```

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==============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =         0.2  TC(MIN.) =       5.00
  EFFECTIVE AREA(ACRES)  =        0.25  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =    0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =        1.16
==============================================================================
==============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

♀

PROPOSED CONDITION
25-YEAR

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****************************************************************************
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                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 25-YEAR                                             *
* NORTH OF BARTON ROAD, BUILDING 1 EAST HALF (NODES 100-123)             *
 ************************************************************************

  FILE NAME: W:\3711\PR25A.DAT
  TIME/DATE OF STUDY: 16:12 01/28/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE     100.00 TO NODE     101.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
  ELEVATION DATA: UPSTREAM(FEET) =    966.35  DOWNSTREAM(FEET) =    953.51

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.643
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.633
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  B        4.30      0.75     0.100    56     6.64
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     13.77
  TOTAL AREA(ACRES) =      4.30   PEAK FLOW RATE(CFS) =     13.77

****************************************************************************
  FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   949.51  DOWNSTREAM(FEET) =   948.15
  FLOW LENGTH(FEET) =   271.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  16.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.00
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      13.77
  PIPE TRAVEL TIME(MIN.) =   0.75    Tc(MIN.) =    7.40
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     671.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.40
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.406
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        2.35      0.75     0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.35      SUBAREA RUNOFF(CFS) =    7.05
  EFFECTIVE AREA(ACRES) =      6.65   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.7       PEAK FLOW RATE(CFS) =      19.94

****************************************************************************
  FLOW PROCESS FROM NODE    102.00 TO NODE    123.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   948.05  DOWNSTREAM(FEET) =   946.70
  FLOW LENGTH(FEET) =   271.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.4 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.53
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.94
  PIPE TRAVEL TIME(MIN.) =   0.69    Tc(MIN.) =    8.09
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    123.00 =     942.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.09
  RAINFALL INTENSITY(INCH/HR) =   3.23
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       6.65
```

```
 TOTAL STREAM AREA(ACRES) =       6.65
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      19.94

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    123.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   490.00
 ELEVATION DATA: UPSTREAM(FEET) =    966.94  DOWNSTREAM(FEET) =    953.51

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.437
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.395
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        4.60      0.75      0.100    56    7.44
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     13.75
 TOTAL AREA(ACRES) =      4.60   PEAK FLOW RATE(CFS) =     13.75

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.44
 RAINFALL INTENSITY(INCH/HR) =   3.39
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       4.60
 TOTAL STREAM AREA(ACRES) =       4.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.75

****************************************************************************
 FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   280.00
 ELEVATION DATA: UPSTREAM(FEET) =    969.40  DOWNSTREAM(FEET) =    957.33

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.430
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.100
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        0.80      0.75      0.100    56    5.43
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.90
 TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      2.90

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    122.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   953.33  DOWNSTREAM(FEET) =   953.25
 FLOW LENGTH(FEET) =    15.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.21
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.90
 PIPE TRAVEL TIME(MIN.) =   0.06    Tc(MIN.) =    5.49
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    122.00 =     295.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    122.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.49
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.073
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.35      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.26
 EFFECTIVE AREA(ACRES) =      1.15   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       4.14

****************************************************************************
 FLOW PROCESS FROM NODE    122.00 TO NODE    123.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   953.15  DOWNSTREAM(FEET) =   949.51
 FLOW LENGTH(FEET) =   446.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.39
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.14
 PIPE TRAVEL TIME(MIN.) =   1.38    Tc(MIN.) =    6.87
 LONGEST FLOWPATH FROM NODE    120.00 TO NODE    123.00 =     741.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    123.00 TO NODE    123.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.87
 RAINFALL INTENSITY(INCH/HR) =   3.56
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.15
 TOTAL STREAM AREA(ACRES) =       1.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.14

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
     1       19.94    8.09    3.228  0.75( 0.07) 0.10       6.7     100.00
     2       13.75    7.44    3.395  0.75( 0.07) 0.10       4.6     110.00
     3        4.14    6.87    3.560  0.75( 0.07) 0.10       1.1     120.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
```

CONFLUENCE FORMULA USED FOR 3 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	36.19	6.87	3.560	0.75(0.07)	0.10	11.0	120.00
2	36.99	7.44	3.395	0.75(0.07)	0.10	11.9	110.00
3	36.74	8.09	3.228	0.75(0.07)	0.10	12.4	100.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 36.99 Tc(MIN.) = 7.44
EFFECTIVE AREA(ACRES) = 11.86 AREA-AVERAGED Fm(INCH/HR) = 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.10
TOTAL AREA(ACRES) = 12.4
LONGEST FLOWPATH FROM NODE 100.00 TO NODE 123.00 = 942.00 FEET.

==========

END OF STUDY SUMMARY:
TOTAL AREA(ACRES) = 12.4 TC(MIN.) = 7.44
EFFECTIVE AREA(ACRES) = 11.86 AREA-AVERAGED Fm(INCH/HR)= 0.07
AREA-AVERAGED Fp(INCH/HR) = 0.75 AREA-AVERAGED Ap = 0.100
PEAK FLOW RATE(CFS) = 36.99

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	36.19	6.87	3.560	0.75(0.07)	0.10	11.0	120.00
2	36.99	7.44	3.395	0.75(0.07)	0.10	11.9	110.00
3	36.74	8.09	3.228	0.75(0.07)	0.10	12.4	100.00

==========

==========

END OF RATIONAL METHOD ANALYSIS

```
************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
          (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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             Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                          Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                           *
* PROPOSED CONDITION 25-YEAR                                           *
* NORTH OF BARTON ROAD, BUILDING 1 (NODES 100-163)                     *
 ************************************************************************

  FILE NAME: W:\3711\PR25A.DAT
  TIME/DATE OF STUDY: 14:27 06/21/2019
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    969.40  DOWNSTREAM(FEET) =    957.33

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.313
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.154
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        0.80      0.75      0.100    56     5.31
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.94
 TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      2.94

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   953.33  DOWNSTREAM(FEET) =   953.22
 FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.12
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       2.94
 PIPE TRAVEL TIME(MIN.) =   0.09    Tc(MIN.) =    5.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     292.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.40
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.113
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.35      0.75      0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.27
 EFFECTIVE AREA(ACRES) =      1.15   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       4.18

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    111.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   953.12  DOWNSTREAM(FEET) =   950.01
 FLOW LENGTH(FEET) =   440.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.09
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.18
 PIPE TRAVEL TIME(MIN.) =   1.44    Tc(MIN.) =    6.84
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =     732.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.84
 RAINFALL INTENSITY(INCH/HR) =   3.57
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.15
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```
 TOTAL STREAM AREA(ACRES) =       1.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.18

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   490.00
 ELEVATION DATA: UPSTREAM(FEET) =    966.94  DOWNSTREAM(FEET) =    953.51

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.437
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.395
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        4.60      0.75      0.100    56    7.44
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     13.75
 TOTAL AREA(ACRES) =      4.60   PEAK FLOW RATE(CFS) =     13.75

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.44
 RAINFALL INTENSITY(INCH/HR) =   3.39
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       4.60
 TOTAL STREAM AREA(ACRES) =       4.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.75

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        4.18    6.84    3.569  0.75( 0.07) 0.10       1.1     100.00
     2       13.75    7.44    3.395  0.75( 0.07) 0.10       4.6     110.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.49    6.84    3.569  0.75( 0.07) 0.10       5.4     100.00
     2       17.72    7.44    3.395  0.75( 0.07) 0.10       5.8     110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      17.72    Tc(MIN.) =     7.44
 EFFECTIVE AREA(ACRES) =       5.75   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =     732.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   949.51  DOWNSTREAM(FEET) =   948.46
  FLOW LENGTH(FEET) =   270.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  19.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.78
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      17.72
  PIPE TRAVEL TIME(MIN.) =   0.78    Tc(MIN.) =    8.22
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.22
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.198
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        2.35      0.75      0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.35      SUBAREA RUNOFF(CFS) =    6.61
  EFFECTIVE AREA(ACRES) =      8.10   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        8.1       PEAK FLOW RATE(CFS) =      22.77

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   948.36  DOWNSTREAM(FEET) =   947.28
  FLOW LENGTH(FEET) =   270.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.9 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.24
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.77
  PIPE TRAVEL TIME(MIN.) =   0.72    Tc(MIN.) =    8.94
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    1272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.94
  RAINFALL INTENSITY(INCH/HR) =   3.04
  AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       8.10
  TOTAL STREAM AREA(ACRES) =       8.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      22.77

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =    966.00  DOWNSTREAM(FEET) =    953.51

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.680
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.621
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        4.30      0.75      0.100    56    6.68
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     13.72
 TOTAL AREA(ACRES) =      4.30   PEAK FLOW RATE(CFS) =     13.72

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.68
 RAINFALL INTENSITY(INCH/HR) =   3.62
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       4.30
 TOTAL STREAM AREA(ACRES) =       4.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      13.72

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       22.76    8.34    3.169  0.75( 0.07) 0.10       7.7     100.00
     1       22.77    8.94    3.041  0.75( 0.07) 0.10       8.1     110.00
     2       13.72    6.68    3.621  0.75( 0.07) 0.10       4.3     120.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       34.61    6.68    3.621  0.75( 0.07) 0.10      10.5     120.00
     2       34.73    8.34    3.169  0.75( 0.07) 0.10      12.0     100.00
     3       34.25    8.94    3.041  0.75( 0.07) 0.10      12.4     110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      34.73    Tc(MIN.) =     8.34
 EFFECTIVE AREA(ACRES) =      12.03   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       12.4
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    121.00 =    1272.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    163.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   947.18  DOWNSTREAM(FEET) =   943.84
 FLOW LENGTH(FEET) =   836.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.77
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      34.73
```

```
 PIPE TRAVEL TIME(MIN.) =   2.06    Tc(MIN.) =   10.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    163.00 =    2108.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    163.00 TO NODE    163.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   390.00
 ELEVATION DATA: UPSTREAM(FEET) =    957.63  DOWNSTREAM(FEET) =    952.69

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.921
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.269
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        3.70      0.75     0.100    56    7.92
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     10.64
 TOTAL AREA(ACRES) =      3.70   PEAK FLOW RATE(CFS) =     10.64

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    131.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.92
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.269
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.40      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.40      SUBAREA RUNOFF(CFS) =    1.15
 EFFECTIVE AREA(ACRES) =      4.10   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.1       PEAK FLOW RATE(CFS) =      11.79

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.69  DOWNSTREAM(FEET) =   948.09
 FLOW LENGTH(FEET) =   148.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.35
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.79
 PIPE TRAVEL TIME(MIN.) =   0.46    Tc(MIN.) =    8.38
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =     538.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
================================================================================
  MAINLINE Tc(MIN.) =    8.38
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.160
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        1.90      0.75      0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.90      SUBAREA RUNOFF(CFS) =    5.28
  EFFECTIVE AREA(ACRES) =      6.00   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.0       PEAK FLOW RATE(CFS) =      16.66

********************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   947.99  DOWNSTREAM(FEET) =   947.38
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  18.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.79
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      16.66
  PIPE TRAVEL TIME(MIN.) =   0.44    Tc(MIN.) =    8.82
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =     690.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
  MAINLINE Tc(MIN.) =    8.82
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.065
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        1.25      0.75      0.100    56
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.25      SUBAREA RUNOFF(CFS) =    3.36
  EFFECTIVE AREA(ACRES) =      7.25   AREA-AVERAGED Fm(INCH/HR) =  0.07
  AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        7.2       PEAK FLOW RATE(CFS) =      19.51

********************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
--------------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   947.28  DOWNSTREAM(FEET) =   946.67
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  27.0 INCH PIPE IS  20.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.92
  ESTIMATED PIPE DIAMETER(INCH) =  27.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      19.51
  PIPE TRAVEL TIME(MIN.) =   0.43    Tc(MIN.) =    9.25
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     842.00 FEET.

********************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    134.00 IS CODE =  81
--------------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
================================================================================
```

```
 MAINLINE Tc(MIN.) =    9.25
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.979
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        1.75      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.75      SUBAREA RUNOFF(CFS) =    4.57
 EFFECTIVE AREA(ACRES) =      9.00   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        9.0       PEAK FLOW RATE(CFS) =      23.52

****************************************************************************
 FLOW PROCESS FROM NODE    134.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   946.57  DOWNSTREAM(FEET) =   945.97
 FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  21.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.27
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      23.52
 PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    9.65
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    162.00 =     992.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   475.00
 ELEVATION DATA: UPSTREAM(FEET) =    966.00  DOWNSTREAM(FEET) =    955.92

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.730
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.317
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        1.00      0.75     0.100    56    7.73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.92
 TOTAL AREA(ACRES) =      1.00   PEAK FLOW RATE(CFS) =      2.92

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.73
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.317
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.05      0.61     1.000    66
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.12
 EFFECTIVE AREA(ACRES) =      1.05   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.70  AREA-AVERAGED Ap =  0.14
 TOTAL AREA(ACRES) =        1.0       PEAK FLOW RATE(CFS) =       3.04

****************************************************************************
 FLOW PROCESS FROM NODE    141.00 TO NODE    151.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.42  DOWNSTREAM(FEET) =   952.19
 FLOW LENGTH(FEET) =    46.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.16
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.04
 PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    7.91
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    151.00 =     521.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.91
 RAINFALL INTENSITY(INCH/HR) =   3.27
 AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.70
 AREA-AVERAGED Ap =  0.14
 EFFECTIVE STREAM AREA(ACRES) =       1.05
 TOTAL STREAM AREA(ACRES) =       1.05
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.04

****************************************************************************
 FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    958.60  DOWNSTREAM(FEET) =    955.55

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.377
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.411
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        0.45      0.75     0.100    56    7.38
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.35
 TOTAL AREA(ACRES) =      0.45   PEAK FLOW RATE(CFS) =      1.35

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
```

```
 TIME OF CONCENTRATION(MIN.) =    7.38
 RAINFALL INTENSITY(INCH/HR) =   3.41
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.45
 TOTAL STREAM AREA(ACRES) =       0.45
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.35

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        3.04    7.91    3.270  0.70( 0.10) 0.14       1.0     140.00
     2        1.35    7.38    3.411  0.75( 0.07) 0.10       0.4     150.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        4.31    7.38    3.411  0.71( 0.09) 0.13       1.4     150.00
     2        4.33    7.91    3.270  0.71( 0.09) 0.13       1.5     140.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       4.33    Tc(MIN.) =     7.91
 EFFECTIVE AREA(ACRES) =       1.50   AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.71  AREA-AVERAGED Ap =  0.13
 TOTAL AREA(ACRES) =        1.5
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    151.00 =     521.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    161.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.05  DOWNSTREAM(FEET) =   949.32
 FLOW LENGTH(FEET) =   508.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.58
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.33
 PIPE TRAVEL TIME(MIN.) =   1.85    Tc(MIN.) =    9.76
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    161.00 =    1029.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    161.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.76
 RAINFALL INTENSITY(INCH/HR) =   2.88
 AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.71
 AREA-AVERAGED Ap =  0.13
 EFFECTIVE STREAM AREA(ACRES) =       1.50
 TOTAL STREAM AREA(ACRES) =       1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.33

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   520.00
 ELEVATION DATA: UPSTREAM(FEET) =    957.10  DOWNSTREAM(FEET) =    952.82

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.687
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.897
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        2.70      0.75      0.100    56    9.69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      6.86
 TOTAL AREA(ACRES) =      2.70   PEAK FLOW RATE(CFS) =      6.86

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    161.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.69
 RAINFALL INTENSITY(INCH/HR) =   2.90
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.70
 TOTAL STREAM AREA(ACRES) =       2.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.86

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        4.31    9.22    2.984  0.71( 0.09) 0.13       1.4     150.00
     1        4.33    9.76    2.884  0.71( 0.09) 0.13       1.5     140.00
     2        6.86    9.69    2.897  0.75( 0.07) 0.10       2.7     160.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       11.04    9.22    2.984  0.73( 0.08) 0.11       4.0     150.00
     2       11.19    9.69    2.897  0.73( 0.08) 0.11       4.2     160.00
     3       11.16    9.76    2.884  0.73( 0.08) 0.11       4.2     140.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      11.19    Tc(MIN.) =     9.69
 EFFECTIVE AREA(ACRES) =       4.19   AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.73  AREA-AVERAGED Ap =  0.11
 TOTAL AREA(ACRES) =       4.2
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    161.00 =    1029.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.82  DOWNSTREAM(FEET) =   946.07
 FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   8.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  19.74
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      11.19
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    9.70
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    162.00 =    1049.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       11.04    9.24    2.980  0.73( 0.08) 0.11       4.0     150.00
     2       11.19    9.70    2.894  0.73( 0.08) 0.11       4.2     160.00
     3       11.16    9.78    2.881  0.73( 0.08) 0.11       4.2     140.00
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    162.00 =    1049.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       23.52    9.65    2.904  0.75( 0.07) 0.10       9.0     130.00
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    162.00 =     992.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1       34.18    9.24    2.980  0.74( 0.08) 0.10      12.6     150.00
     2       34.69    9.65    2.904  0.74( 0.08) 0.10      13.2     130.00
     3       34.62    9.70    2.894  0.74( 0.08) 0.10      13.2     160.00
     4       34.49    9.78    2.881  0.74( 0.08) 0.10      13.2     140.00
   TOTAL AREA(ACRES) =        13.2

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       34.69  Tc(MIN.) =    9.645
 EFFECTIVE AREA(ACRES) =     13.17  AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.74  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       13.2
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    162.00 =    1049.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   945.87  DOWNSTREAM(FEET) =   943.94
 FLOW LENGTH(FEET) =   440.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.08
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      34.69
 PIPE TRAVEL TIME(MIN.) =   1.04    Tc(MIN.) =   10.68
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    163.00 =    1489.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    163.00 TO NODE    163.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

```
 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       34.18   10.28    2.796  0.74( 0.08) 0.10      12.6     150.00
     2       34.69   10.68    2.732  0.74( 0.08) 0.10      13.2     130.00
     3       34.62   10.74    2.723  0.74( 0.08) 0.10      13.2     160.00
     4       34.49   10.82    2.712  0.74( 0.08) 0.10      13.2     140.00
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    163.00 =    1489.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       34.61    8.74    3.082  0.75( 0.07) 0.10      10.5     120.00
     2       34.73   10.40    2.776  0.75( 0.07) 0.10      12.0     100.00
     3       34.25   10.99    2.685  0.75( 0.07) 0.10      12.4     110.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    163.00 =    2108.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       66.72    8.74    3.082  0.75( 0.08) 0.10      21.2     120.00
     2       68.90   10.28    2.796  0.75( 0.08) 0.10      24.5     150.00
     3       69.07   10.40    2.776  0.75( 0.08) 0.10      24.8     100.00
     4       69.19   10.68    2.732  0.75( 0.08) 0.10      25.4     130.00
     5       69.08   10.74    2.723  0.75( 0.08) 0.10      25.4     160.00
     6       68.88   10.82    2.712  0.75( 0.08) 0.10      25.5     140.00
     7       68.38   10.99    2.685  0.75( 0.08) 0.10      25.6     110.00
   TOTAL AREA(ACRES) =        25.6

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       69.19  Tc(MIN.) =   10.681
 EFFECTIVE AREA(ACRES) =     25.37  AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       25.6
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    163.00 =    2108.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    163.00 TO NODE    163.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       25.6  TC(MIN.) =     10.68
 EFFECTIVE AREA(ACRES) =     25.37  AREA-AVERAGED Fm(INCH/HR)=  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.102
 PEAK FLOW RATE(CFS)   =      69.19

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       66.72    8.74    3.082  0.75( 0.08) 0.10      21.2     120.00
     2       68.90   10.28    2.796  0.75( 0.08) 0.10      24.5     150.00
     3       69.07   10.40    2.776  0.75( 0.08) 0.10      24.8     100.00
     4       69.19   10.68    2.732  0.75( 0.08) 0.10      25.4     130.00
     5       69.08   10.74    2.723  0.75( 0.08) 0.10      25.4     160.00
     6       68.88   10.82    2.712  0.75( 0.08) 0.10      25.5     140.00
     7       68.38   10.99    2.685  0.75( 0.08) 0.10      25.6     110.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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            Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITINO 25-YEAR                                             *
* NORTH OF BARTON ROAD, NORTHEAST DIRT AREA (NODES 170-171)              *
 **************************************************************************

  FILE NAME: W:\3711\PR25C.DAT
  TIME/DATE OF STUDY: 17:26 01/24/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
  ELEVATION DATA: UPSTREAM(FEET) =    969.70  DOWNSTREAM(FEET) =    942.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.044
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.678
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 NATURAL POOR COVER
 "OPEN BRUSH"                B        1.50      0.45     1.000    76   11.04
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.45
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      3.00
 TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      3.00
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        1.5  TC(MIN.) =     11.04
 EFFECTIVE AREA(ACRES) =      1.50  AREA-AVERAGED Fm(INCH/HR)=  0.45
 AREA-AVERAGED Fp(INCH/HR) =  0.45  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =       3.00
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
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                          Analysis prepared by:




 ************************** DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* PROPOSED CONDITION 25-YEAR                                             *
* NORTH OF BARTON ROAD, BUILDING 1 SOUTHERLY LANDSCAPE (NODES 180-181)   *
 ************************************************************************

  FILE NAME: W:\3711\PR25D.DAT
  TIME/DATE OF STUDY: 15:11 06/21/2019
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                     --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    181.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   115.00
  ELEVATION DATA: UPSTREAM(FEET) =    956.72  DOWNSTREAM(FEET) =    954.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.308
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                        PR25D
  COMMERCIAL                  B        0.10      0.75     0.100    56    5.00
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.45      0.61     1.000    66   10.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.836
  SUBAREA RUNOFF(CFS) =      1.88
  TOTAL AREA(ACRES) =      0.55   PEAK FLOW RATE(CFS) =      1.88
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.55  AREA-AVERAGED Fm(INCH/HR)=  0.52
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap = 0.836
  PEAK FLOW RATE(CFS)    =       1.88
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 25-YEAR                                               *
* NORTH OF BARTON ROAD, BUILDING 1 SOUTHWEST LANDSCAPE (NODES 190-191)     *
 ****************************************************************************

  FILE NAME: W:\3711\PR25E.DAT
  TIME/DATE OF STUDY: 14:20 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    191.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    20.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.14  DOWNSTREAM(FEET) =    943.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.308
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL FAIR COVER
  "OPEN BRUSH"                B         0.25      0.61     1.000    66    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.83
  TOTAL AREA(ACRES) =      0.25   PEAK FLOW RATE(CFS) =      0.83
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.2  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.25  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       0.83
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
            RATIONAL METHOD HYDROLOGY COMPUTER PROGRAM PACKAGE
         (Reference: 1986 SAN BERNARDINO CO. HYDROLOGY CRITERION)
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 25-YEAR                                             *
* NORTH OF BARTON ROAD, BUILDING 1 NORTHWEST LANDSCAPE (NODES 195-196)   *
 **************************************************************************

  FILE NAME: W:\3711\PR25F.DAT
  TIME/DATE OF STUDY: 14:22 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    196.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    20.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.80  DOWNSTREAM(FEET) =    949.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.117
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.249
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.45      0.61     1.000    66    5.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.47
  TOTAL AREA(ACRES) =      0.45   PEAK FLOW RATE(CFS) =      1.47
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      5.12
  EFFECTIVE AREA(ACRES) =      0.45  AREA-AVERAGED Fm(INCH/HR)=  0.61
  AREA-AVERAGED Fp(INCH/HR) =  0.61  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       1.47
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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            Ver. 23.0  Release Date: 07/01/2016  License ID 1435

                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* PROPOSED CONDITION 25-YEAR                                              *
* SOUTH OF BARTON ROAD, BUILDING 2 (NODES 200-252)                        *
 ****************************************************************************

  FILE NAME: W:\3711\PR25G.DAT
  TIME/DATE OF STUDY: 14:34 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  ========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   460.00
  ELEVATION DATA: UPSTREAM(FEET) =    947.89  DOWNSTREAM(FEET) =    944.63

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.504
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.930
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  B        3.20      0.75     0.100    56    9.50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      8.22
  TOTAL AREA(ACRES) =      3.20   PEAK FLOW RATE(CFS) =      8.22

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.50
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.930
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.15      0.61     1.000    66
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.15      SUBAREA RUNOFF(CFS) =    0.31
  EFFECTIVE AREA(ACRES) =      3.35   AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.71  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =       8.54

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   940.13  DOWNSTREAM(FEET) =   938.59
  FLOW LENGTH(FEET) =   384.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   4.90
  ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =       8.54
  PIPE TRAVEL TIME(MIN.) =   1.31    Tc(MIN.) =   10.81
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =     844.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.81
  RAINFALL INTENSITY(INCH/HR) =   2.71
  AREA-AVERAGED Fm(INCH/HR) =  0.10
  AREA-AVERAGED Fp(INCH/HR) =  0.71
  AREA-AVERAGED Ap =  0.14
  EFFECTIVE STREAM AREA(ACRES) =       3.35
  TOTAL STREAM AREA(ACRES) =       3.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.54

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   370.00
  ELEVATION DATA: UPSTREAM(FEET) =    958.40  DOWNSTREAM(FEET) =    945.96

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.380
```

```
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.722
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        0.90      0.75      0.100    56    6.38
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      2.95
 TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      2.95

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.38
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.722
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    B        0.15      0.27      1.000    86
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        0.10      0.61      1.000    66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.41
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.75
 EFFECTIVE AREA(ACRES) =      1.15   AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  0.30
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       3.70

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   940.63  DOWNSTREAM(FEET) =   939.81
 FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  12.44
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.70
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.39
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    212.00 =     380.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.39
 RAINFALL INTENSITY(INCH/HR) =   3.72
 AREA-AVERAGED Fm(INCH/HR) =  0.15
 AREA-AVERAGED Fp(INCH/HR) =  0.50
 AREA-AVERAGED Ap =  0.30
 EFFECTIVE STREAM AREA(ACRES) =       1.15
 TOTAL STREAM AREA(ACRES) =       1.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.70

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae      HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)     NODE
```

1	8.54	10.81	2.713	0.71(0.10)	0.14	3.4	200.00
2	3.70	6.39	3.717	0.50(0.15)	0.30	1.1	210.00

RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
CONFLUENCE FORMULA USED FOR 2 STREAMS.

** PEAK FLOW RATE TABLE **

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	10.69	6.39	3.717	0.59(0.12)	0.20	3.1	210.00
2	11.20	10.81	2.713	0.62(0.11)	0.18	4.5	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 11.20 Tc(MIN.) = 10.81
EFFECTIVE AREA(ACRES) = 4.50 AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.62 AREA-AVERAGED Ap = 0.18
TOTAL AREA(ACRES) = 4.5
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 212.00 = 844.00 FEET.

****
FLOW PROCESS FROM NODE 212.00 TO NODE 222.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========
ELEVATION DATA: UPSTREAM(FEET) = 938.49 DOWNSTREAM(FEET) = 937.27
FLOW LENGTH(FEET) = 306.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 15.4 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.26
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 11.20
PIPE TRAVEL TIME(MIN.) = 0.97 Tc(MIN.) = 11.78
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 1150.00 FEET.

****
FLOW PROCESS FROM NODE 222.00 TO NODE 222.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 11.78
RAINFALL INTENSITY(INCH/HR) = 2.58
AREA-AVERAGED Fm(INCH/HR) = 0.11
AREA-AVERAGED Fp(INCH/HR) = 0.62
AREA-AVERAGED Ap = 0.18
EFFECTIVE STREAM AREA(ACRES) = 4.50
TOTAL STREAM AREA(ACRES) = 4.50
PEAK FLOW RATE(CFS) AT CONFLUENCE = 11.20

****
FLOW PROCESS FROM NODE 220.00 TO NODE 221.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========
INITIAL SUBAREA FLOW-LENGTH(FEET) = 260.00
ELEVATION DATA: UPSTREAM(FEET) = 954.59 DOWNSTREAM(FEET) = 947.60

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 5.794
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.944
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	1.00	0.75	0.100	56	5.79

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.75

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.48
 TOTAL AREA(ACRES) =      1.00   PEAK FLOW RATE(CFS) =      3.48

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.79
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.944
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        0.10      0.61     1.000    66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.30
 EFFECTIVE AREA(ACRES) =      1.10   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.68  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       3.78

****************************************************************************
 FLOW PROCESS FROM NODE    221.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   944.10  DOWNSTREAM(FEET) =   938.27
 FLOW LENGTH(FEET) =    36.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.1 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  16.03
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.78
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.83
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    222.00 =     296.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.83
 RAINFALL INTENSITY(INCH/HR) =   3.93
 AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.68
 AREA-AVERAGED Ap =  0.18
 EFFECTIVE STREAM AREA(ACRES) =       1.10
 TOTAL STREAM AREA(ACRES) =       1.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.78

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       10.69    7.37    3.413  0.59( 0.12) 0.20       3.1     210.00
     1       11.20   11.78    2.576  0.62( 0.11) 0.18       4.5     200.00
     2        3.78    5.83    3.928  0.68( 0.12) 0.18       1.1     220.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
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PR25G

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	13.56	5.83	3.928	0.62(0.12)	0.19	3.6	220.00
2	13.96	7.37	3.413	0.61(0.12)	0.19	4.2	210.00
3	13.63	11.78	2.576	0.63(0.11)	0.18	5.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 13.96 Tc(MIN.) = 7.37
EFFECTIVE AREA(ACRES) = 4.23 AREA-AVERAGED Fm(INCH/HR) = 0.12
AREA-AVERAGED Fp(INCH/HR) = 0.61 AREA-AVERAGED Ap = 0.19
TOTAL AREA(ACRES) = 5.6
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 1150.00 FEET.

****
FLOW PROCESS FROM NODE 222.00 TO NODE 231.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==
ELEVATION DATA: UPSTREAM(FEET) = 937.17 DOWNSTREAM(FEET) = 936.57
FLOW LENGTH(FEET) = 150.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 24.0 INCH PIPE IS 18.2 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.46
ESTIMATED PIPE DIAMETER(INCH) = 24.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 13.96
PIPE TRAVEL TIME(MIN.) = 0.46 Tc(MIN.) = 7.83
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 231.00 = 1300.00 FEET.

****
FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.83
RAINFALL INTENSITY(INCH/HR) = 3.29
AREA-AVERAGED Fm(INCH/HR) = 0.12
AREA-AVERAGED Fp(INCH/HR) = 0.61
AREA-AVERAGED Ap = 0.19
EFFECTIVE STREAM AREA(ACRES) = 4.23
TOTAL STREAM AREA(ACRES) = 5.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 13.96

****
FLOW PROCESS FROM NODE 230.00 TO NODE 231.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==
INITIAL SUBAREA FLOW-LENGTH(FEET) = 370.00
ELEVATION DATA: UPSTREAM(FEET) = 954.70 DOWNSTREAM(FEET) = 943.72

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.541
* 25 YEAR RAINFALL INTENSITY(INCH/HR) = 3.667
SUBAREA Tc AND LOSS RATE DATA(AMC II):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	3.40	0.75	0.100	56	6.54
COMMERCIAL	C	0.25	0.57	0.100	69	6.54

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.74
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 11.80
TOTAL AREA(ACRES) = 3.65 PEAK FLOW RATE(CFS) = 11.80

****

```
 FLOW PROCESS FROM NODE    230.00 TO NODE    231.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.54
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.667
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        0.05      0.61     1.000    66
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.61
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.14
 EFFECTIVE AREA(ACRES) =      3.70   AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.72  AREA-AVERAGED Ap =  0.11
 TOTAL AREA(ACRES) =        3.7       PEAK FLOW RATE(CFS) =      11.94

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    231.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.54
 RAINFALL INTENSITY(INCH/HR) =   3.67
 AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.72
 AREA-AVERAGED Ap =  0.11
 EFFECTIVE STREAM AREA(ACRES) =       3.70
 TOTAL STREAM AREA(ACRES) =       3.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      11.94

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.56    6.29    3.753  0.62( 0.12) 0.19       3.6     220.00
     1       13.96    7.83    3.291  0.61( 0.12) 0.19       4.2     210.00
     1       13.63   12.24    2.518  0.63( 0.11) 0.18       5.6     200.00
     2       11.94    6.54    3.667  0.72( 0.08) 0.11       3.7     230.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       25.32    6.29    3.753  0.66( 0.10) 0.15       7.1     220.00
     2       25.56    6.54    3.667  0.66( 0.10) 0.15       7.4     230.00
     3       24.65    7.83    3.291  0.65( 0.10) 0.16       7.9     210.00
     4       21.75   12.24    2.518  0.66( 0.10) 0.15       9.3     200.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      25.56    Tc(MIN.) =     6.54
 EFFECTIVE AREA(ACRES) =       7.38   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.66  AREA-AVERAGED Ap =  0.15
 TOTAL AREA(ACRES) =        9.3
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    231.00 =    1300.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   936.47  DOWNSTREAM(FEET) =   935.91
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  23.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.34
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      25.56
 PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    6.91
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    232.00 =    1440.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    232.00 TO NODE    232.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.91
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.548
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.60      0.75     0.100    56
 COMMERCIAL                 C        0.80      0.57     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.64
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.40      SUBAREA RUNOFF(CFS) =    4.39
 EFFECTIVE AREA(ACRES) =      8.78   AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap =  0.14
 TOTAL AREA(ACRES) =       10.7       PEAK FLOW RATE(CFS) =      27.30

****************************************************************************
 FLOW PROCESS FROM NODE    232.00 TO NODE    233.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   935.81  DOWNSTREAM(FEET) =   935.23
 FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  30.0 INCH PIPE IS  24.4 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.38
 ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      27.30
 PIPE TRAVEL TIME(MIN.) =   0.38    Tc(MIN.) =    7.29
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    233.00 =    1584.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    233.00 TO NODE    233.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.29
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.437
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.40      0.75     0.100    56
 COMMERCIAL                 C        0.90      0.57     0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.30      SUBAREA RUNOFF(CFS) =    3.95
 EFFECTIVE AREA(ACRES) =     10.08   AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap =  0.14
 TOTAL AREA(ACRES) =       12.0       PEAK FLOW RATE(CFS) =      30.37

****************************************************************************
 FLOW PROCESS FROM NODE    233.00 TO NODE    234.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   935.13  DOWNSTREAM(FEET) =   934.56
 FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.7 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.66
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      30.37
 PIPE TRAVEL TIME(MIN.) =   0.36    Tc(MIN.) =    7.65
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    234.00 =    1728.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    234.00 TO NODE    234.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
 MAINLINE Tc(MIN.) =    7.65
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.339
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.50      0.75      0.100    56
 COMMERCIAL                 C        1.05      0.57      0.100    69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.62
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.55      SUBAREA RUNOFF(CFS) =    4.57
 EFFECTIVE AREA(ACRES) =     11.63   AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.65  AREA-AVERAGED Ap =  0.13
 TOTAL AREA(ACRES) =       13.6       PEAK FLOW RATE(CFS) =      34.05

****************************************************************************
 FLOW PROCESS FROM NODE    234.00 TO NODE    252.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   934.46  DOWNSTREAM(FEET) =   933.89
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  25.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.83
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      34.05
 PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    7.99
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    252.00 =    1868.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.99
 RAINFALL INTENSITY(INCH/HR) =   3.25
 AREA-AVERAGED Fm(INCH/HR) =  0.09
 AREA-AVERAGED Fp(INCH/HR) =  0.65
 AREA-AVERAGED Ap =  0.13
 EFFECTIVE STREAM AREA(ACRES) =      11.63
 TOTAL STREAM AREA(ACRES) =      13.55
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      34.05

****************************************************************************
 FLOW PROCESS FROM NODE    240.00 TO NODE    252.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =    946.83  DOWNSTREAM(FEET) =    943.72

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.903
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.859
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        0.20      0.75     0.100    56    9.90
 COMMERCIAL                 C        2.55      0.57     0.100    69    9.90
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.58
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      6.93
 TOTAL AREA(ACRES) =      2.75   PEAK FLOW RATE(CFS) =      6.93

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.90
 RAINFALL INTENSITY(INCH/HR) =   2.86
 AREA-AVERAGED Fm(INCH/HR) =  0.06
 AREA-AVERAGED Fp(INCH/HR) =  0.58
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.75
 TOTAL STREAM AREA(ACRES) =       2.75
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       6.93

****************************************************************************
 FLOW PROCESS FROM NODE    250.00 TO NODE    251.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   480.00
 ELEVATION DATA: UPSTREAM(FEET) =    947.89  DOWNSTREAM(FEET) =    944.73

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.810
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.875
 SUBAREA Tc AND LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        1.90      0.75     0.100    56    9.81
 COMMERCIAL                 C        1.05      0.57     0.100    69    9.81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.68
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      7.45
 TOTAL AREA(ACRES) =      2.95   PEAK FLOW RATE(CFS) =      7.45

****************************************************************************
 FLOW PROCESS FROM NODE    251.00 TO NODE    252.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   940.40  DOWNSTREAM(FEET) =   936.29
 FLOW LENGTH(FEET) =   822.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  14.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.05
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       7.45
 PIPE TRAVEL TIME(MIN.) =   2.71    Tc(MIN.) =   12.52
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    252.00 =    1302.00 FEET.
```

```
****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
 TIME OF CONCENTRATION(MIN.) =   12.52
 RAINFALL INTENSITY(INCH/HR) =   2.48
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.68
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.95
 TOTAL STREAM AREA(ACRES) =       2.95
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       7.45

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       34.02    7.74    3.315  0.65( 0.09) 0.13      11.4     220.00
     1       34.05    7.99    3.252  0.65( 0.09) 0.13      11.6     230.00
     1       32.36    9.28    2.972  0.64( 0.09) 0.14      12.2     210.00
     1       28.02   13.73    2.350  0.65( 0.09) 0.14      13.6     200.00
     2        6.93    9.90    2.859  0.58( 0.06) 0.10       2.8     240.00
     3        7.45   12.52    2.483  0.68( 0.07) 0.10       2.9     250.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  3 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       46.51    7.74    3.315  0.64( 0.08) 0.12      15.4     220.00
     2       46.70    7.99    3.252  0.64( 0.08) 0.12      15.7     230.00
     3       45.77    9.28    2.972  0.64( 0.08) 0.13      16.9     210.00
     4       45.50    9.90    2.859  0.64( 0.08) 0.13      17.5     240.00
     5       42.72   12.52    2.483  0.65( 0.08) 0.13      18.9     250.00
     6       40.73   13.73    2.350  0.65( 0.08) 0.13      19.2     200.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      46.70    Tc(MIN.) =     7.99
 EFFECTIVE AREA(ACRES) =      15.73   AREA-AVERAGED Fm(INCH/HR) =  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.64  AREA-AVERAGED Ap =  0.12
 TOTAL AREA(ACRES) =       19.2
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    252.00 =    1868.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       19.2  TC(MIN.) =      7.99
 EFFECTIVE AREA(ACRES) =     15.73  AREA-AVERAGED Fm(INCH/HR)=  0.08
 AREA-AVERAGED Fp(INCH/HR) =  0.64  AREA-AVERAGED Ap = 0.125
 PEAK FLOW RATE(CFS)   =      46.70

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       46.51    7.74    3.315  0.64( 0.08) 0.12      15.4     220.00
     2       46.70    7.99    3.252  0.64( 0.08) 0.12      15.7     230.00
     3       45.77    9.28    2.972  0.64( 0.08) 0.13      16.9     210.00
     4       45.50    9.90    2.859  0.64( 0.08) 0.13      17.5     240.00
     5       42.72   12.52    2.483  0.65( 0.08) 0.13      18.9     250.00
     6       40.73   13.73    2.350  0.65( 0.08) 0.13      19.2     200.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 25-YEAR                                               *
* SOUTH OF BARTON ROAD, BUILDING 2 WESTERLY LANDSCAPE (NODES 260-261)      *
 ****************************************************************************

  FILE NAME: W:\3711\PR25H.DAT
  TIME/DATE OF STUDY: 14:42 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    260.00 TO NODE    261.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    15.00
  ELEVATION DATA: UPSTREAM(FEET) =    941.45  DOWNSTREAM(FEET) =    939.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.308
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        0.15      0.61     1.000    66    5.00
 NATURAL FAIR COVER
 "OPEN BRUSH"                C        0.05      0.43     1.000    77    5.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA RUNOFF(CFS) =      0.67
 TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.67
================================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =        0.2  TC(MIN.) =      5.00
 EFFECTIVE AREA(ACRES) =      0.20  AREA-AVERAGED Fm(INCH/HR)=  0.57
 AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap = 1.000
 PEAK FLOW RATE(CFS)    =       0.67
================================================================================
================================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 25-YEAR                                               *
* SOUTH OF BARTON ROAD, EASTERLY RAILROAD & OFFSITE LOTS (NODES 300-304)   *
 ****************************************************************************

  FILE NAME: W:\3711\PR25I.DAT
  TIME/DATE OF STUDY: 14:49 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   960.00
  ELEVATION DATA: UPSTREAM(FEET) =    977.00  DOWNSTREAM(FEET) =    963.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.041
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.678
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                B        1.20      0.75     0.100    56   11.04
  COMMERCIAL                C        4.50      0.57     0.100    69   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.60
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     13.43
  TOTAL AREA(ACRES) =      5.70   PEAK FLOW RATE(CFS) =     13.43

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    963.00  DOWNSTREAM(FEET) =    954.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   430.00   CHANNEL SLOPE =  0.0198
  CHANNEL FLOW THRU SUBAREA(CFS) =      13.43
  FLOW VELOCITY(FEET/SEC) =   3.79 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.89   Tc(MIN.) =   12.93
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.93
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.436
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        2.50      0.75     0.100    56
  COMMERCIAL                C        3.85      0.57     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.64
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =     6.35      SUBAREA RUNOFF(CFS) =   13.56
  EFFECTIVE AREA(ACRES) =     12.05   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.62  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       12.0       PEAK FLOW RATE(CFS) =      25.74

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    954.50  DOWNSTREAM(FEET) =    950.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.0150
  CHANNEL FLOW THRU SUBAREA(CFS) =      25.74
  FLOW VELOCITY(FEET/SEC) =   3.93 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.06   Tc(MIN.) =   13.99
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.99
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.323
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "OPEN BRUSH"              B        0.85      0.45     1.000    76
  NATURAL POOR COVER
  "OPEN BRUSH"              C        0.50      0.31     1.000    84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.40
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    2.34
 EFFECTIVE AREA(ACRES) =     13.40   AREA-AVERAGED Fm(INCH/HR) =  0.10
 AREA-AVERAGED Fp(INCH/HR) =  0.50  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       13.4       PEAK FLOW RATE(CFS) =      26.86

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    950.75  DOWNSTREAM(FEET) =    947.75
 CHANNEL LENGTH THRU SUBAREA(FEET) =   690.00   CHANNEL SLOPE =  0.0043
 CHANNEL FLOW THRU SUBAREA(CFS) =      26.86
 FLOW VELOCITY(FEET/SEC) =   2.14 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   5.37   Tc(MIN.) =   19.36
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =    2330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   19.36
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  1.912
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "OPEN BRUSH"               C        1.35      0.31     1.000    84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    1.95
 EFFECTIVE AREA(ACRES) =     14.75   AREA-AVERAGED Fm(INCH/HR) =  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap =  0.26
 TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      26.86
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)      =       14.8  TC(MIN.) =     19.36
 EFFECTIVE AREA(ACRES) =     14.75  AREA-AVERAGED Fm(INCH/HR)=  0.12
 AREA-AVERAGED Fp(INCH/HR) =  0.44  AREA-AVERAGED Ap = 0.265
 PEAK FLOW RATE(CFS)    =      26.86
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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****************************************************************************
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                          Analysis prepared by:

                         THIENES ENGINEERING INC.
                           14349 FIRESTONE BLVD
                            LA MIRADA, CA90638
                               714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 25-YEAR                                               *
* STREET FLOW FROM SOUTH HALF OF BARTON ROAD (NODES 310-312)               *
 ****************************************************************************

  FILE NAME: W:\3711\PR25J.DAT
  TIME/DATE OF STUDY: 14:52 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =    970.60  DOWNSTREAM(FEET) =    966.73

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.998
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.843
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        0.30      0.75     0.100    56   10.00
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.75
 TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.75

****************************************************************************
 FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  966.73  DOWNSTREAM ELEVATION(FEET) =  951.87
 STREET LENGTH(FEET) =   670.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.41
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.27
   HALFSTREET FLOOD WIDTH(FEET) =    5.91
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.78
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.75
 STREET FLOW TRAVEL TIME(MIN.) =   4.01   Tc(MIN.) =   14.01
 *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  2.322
 SUBAREA LOSS RATE DATA(AMC  II):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.65      0.75     0.100    56
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.75
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    1.31
 EFFECTIVE AREA(ACRES) =      0.95    AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       1.92

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.22
 FLOW VELOCITY(FEET/SEC.) =  2.91   DEPTH*VELOCITY(FT*FT/SEC.) =   0.85
 LONGEST FLOWPATH FROM NODE    310.00 TO NODE    312.00 =    1200.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =     14.01
 EFFECTIVE AREA(ACRES) =      0.95  AREA-AVERAGED Fm(INCH/HR)=  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.75  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =       1.92
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

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****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 25-YEAR                                               *
* STREET FLOW FROM NORTH HALF OF DE BERRY ST (NODES 320-322)               *
 ****************************************************************************

  FILE NAME: W:\3711\PR25K.DAT
  TIME/DATE OF STUDY: 15:01 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    321.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.30  DOWNSTREAM(FEET) =    944.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.265
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.176
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  C        0.15      0.57     0.100    69    5.27
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.56
  TOTAL AREA(ACRES) =      0.15   PEAK FLOW RATE(CFS) =      0.56

****************************************************************************
  FLOW PROCESS FROM NODE    321.00 TO NODE    322.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  944.90  DOWNSTREAM ELEVATION(FEET) =  942.80
  STREET LENGTH(FEET) =   160.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.88
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.25
    HALFSTREET FLOOD WIDTH(FEET) =    5.03
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.10
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.53
  STREET FLOW TRAVEL TIME(MIN.) =   1.27   Tc(MIN.) =    6.54
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.668
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.20      0.57     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.20      SUBAREA RUNOFF(CFS) =    0.65
  EFFECTIVE AREA(ACRES) =      0.35    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =      1.14

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.27   HALFSTREET FLOOD WIDTH(FEET) =   6.16
  FLOW VELOCITY(FEET/SEC.) =  2.14   DEPTH*VELOCITY(FT*FT/SEC.) =   0.58
  LONGEST FLOWPATH FROM NODE    320.00 TO NODE    322.00 =     350.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      6.54
  EFFECTIVE AREA(ACRES) =      0.35  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       1.14
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 25-YEAR                                               *
* STREET FLOW FROM SOUTH HALF OF DE BERRY ST (NODES 330-332)               *
 ****************************************************************************

  FILE NAME: W:\3711\PR25L.DAT
  TIME/DATE OF STUDY: 15:12 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    331.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.30  DOWNSTREAM(FEET) =    945.15

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.494
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  4.071
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  C        0.15      0.57     0.100    69     5.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.54
  TOTAL AREA(ACRES) =      0.15   PEAK FLOW RATE(CFS) =      0.54

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    332.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  945.15  DOWNSTREAM ELEVATION(FEET) =  942.75
  STREET LENGTH(FEET) =   200.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       0.93
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.26
    HALFSTREET FLOOD WIDTH(FEET) =    5.47
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.01
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.52
  STREET FLOW TRAVEL TIME(MIN.) =   1.66   Tc(MIN.) =    7.15
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.476
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.25      0.57     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.77
  EFFECTIVE AREA(ACRES) =      0.40    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.23

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.28   HALFSTREET FLOOD WIDTH(FEET) =   6.66
  FLOW VELOCITY(FEET/SEC.) =  2.09   DEPTH*VELOCITY(FT*FT/SEC.) =   0.59
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    332.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    332.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.15
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.476
  SUBAREA LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.05      0.57     0.100    69
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.15
  EFFECTIVE AREA(ACRES) =      0.45   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       1.38
============================================================================
```

PR25L

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.5  TC(MIN.) =      7.15
  EFFECTIVE AREA(ACRES) =      0.45  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       1.38
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

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****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* PROPOSED CONDITION 25-YEAR                                              *
* ACCESS ROAD SOUTHWEST OF BUILDING 2 SITE (NODES 340-341)                *
 ************************************************************************

  FILE NAME: W:\3711\PR25M.DAT
  TIME/DATE OF STUDY: 15:25 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =   25.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 0.9700

  *ANTECEDENT MOISTURE CONDITION (AMC) II ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    341.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    944.00  DOWNSTREAM(FEET) =    935.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.413
  *  25 YEAR RAINFALL INTENSITY(INCH/HR) =  3.710
  SUBAREA Tc AND LOSS RATE DATA(AMC  II):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                        PR25M
  COMMERCIAL                  C        0.30      0.57     0.100    69    6.41
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.57
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.99
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.99
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      6.41
  EFFECTIVE AREA(ACRES) =      0.30  AREA-AVERAGED Fm(INCH/HR)=  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       0.99
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

PROPOSED CONDITION
100-YEAR

```
************************************************************************
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                        Analysis prepared by:



 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                           *
* PROPOSED CONDITION 100-YEAR                                           *
* NORTH OF BARTON ROAD, BUILDING 1 (NODES 100-163)                      *
 ************************************************************************

  FILE NAME: W:\3711\PR100A.DAT
  TIME/DATE OF STUDY: 14:22 06/21/2019
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    100.00 TO NODE    101.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   270.00
  ELEVATION DATA: UPSTREAM(FEET) =    969.40  DOWNSTREAM(FEET) =    957.33

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.313
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.182
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  B        0.80      0.42     0.100    76     5.31
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.70
 TOTAL AREA(ACRES) =      0.80   PEAK FLOW RATE(CFS) =      3.70

****************************************************************************
 FLOW PROCESS FROM NODE    101.00 TO NODE    102.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   953.33  DOWNSTREAM(FEET) =   953.22
 FLOW LENGTH(FEET) =    22.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   9.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.34
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.70
 PIPE TRAVEL TIME(MIN.) =   0.08    Tc(MIN.) =    5.40
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    102.00 =     292.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    102.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.40
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.133
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        0.35      0.42     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.35      SUBAREA RUNOFF(CFS) =    1.60
 EFFECTIVE AREA(ACRES) =      1.15   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       5.27

****************************************************************************
 FLOW PROCESS FROM NODE    102.00 TO NODE    111.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   953.12  DOWNSTREAM(FEET) =   950.01
 FLOW LENGTH(FEET) =   440.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  11.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.30
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.27
 PIPE TRAVEL TIME(MIN.) =   1.38    Tc(MIN.) =    6.78
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =     732.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.78
 RAINFALL INTENSITY(INCH/HR) =   4.48
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       1.15
```

```
 TOTAL STREAM AREA(ACRES) =       1.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.27

****************************************************************************
 FLOW PROCESS FROM NODE    110.00 TO NODE    111.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   490.00
 ELEVATION DATA: UPSTREAM(FEET) =    966.94  DOWNSTREAM(FEET) =    953.51

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.437
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.235
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        4.60      0.42      0.100    76    7.44
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     17.36
 TOTAL AREA(ACRES) =      4.60   PEAK FLOW RATE(CFS) =     17.36

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    111.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.44
 RAINFALL INTENSITY(INCH/HR) =   4.23
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       4.60
 TOTAL STREAM AREA(ACRES) =       4.60
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.36

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        5.27    6.78    4.476  0.42( 0.04) 0.10       1.1     100.00
     2       17.36    7.44    4.235  0.42( 0.04) 0.10       4.6     110.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       22.01    6.78    4.476  0.42( 0.04) 0.10       5.3     100.00
     2       22.34    7.44    4.235  0.42( 0.04) 0.10       5.8     110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      22.34    Tc(MIN.) =     7.44
 EFFECTIVE AREA(ACRES) =       5.75   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        5.8
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    111.00 =     732.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    111.00 TO NODE    112.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
```

```
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
================================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   949.51  DOWNSTREAM(FEET) =   948.46
  FLOW LENGTH(FEET) =   270.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  20.8 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.15
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      22.34
  PIPE TRAVEL TIME(MIN.) =   0.73    Tc(MIN.) =    8.17
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    112.00 =    1002.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    112.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    8.17
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.003
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        2.35      0.42     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    2.35      SUBAREA RUNOFF(CFS) =    8.38
  EFFECTIVE AREA(ACRES) =      8.10   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        8.1       PEAK FLOW RATE(CFS) =      28.87

****************************************************************************
  FLOW PROCESS FROM NODE    112.00 TO NODE    113.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   948.36  DOWNSTREAM(FEET) =   947.28
  FLOW LENGTH(FEET) =   270.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  33.0 INCH PIPE IS  22.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.63
  ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      28.87
  PIPE TRAVEL TIME(MIN.) =   0.68    Tc(MIN.) =    8.85
  LONGEST FLOWPATH FROM NODE    100.00 TO NODE    113.00 =    1272.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
----------------------------------------------------------------------------
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    8.85
  RAINFALL INTENSITY(INCH/HR) =   3.82
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       8.10
  TOTAL STREAM AREA(ACRES) =       8.10
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      28.87

****************************************************************************
  FLOW PROCESS FROM NODE    120.00 TO NODE    121.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   400.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =    966.00  DOWNSTREAM(FEET) =    953.51

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.680
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.516
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        4.30      0.42      0.100    76    6.68
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     17.31
 TOTAL AREA(ACRES) =      4.30   PEAK FLOW RATE(CFS) =     17.31

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.68
 RAINFALL INTENSITY(INCH/HR) =   4.52
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       4.30
 TOTAL STREAM AREA(ACRES) =       4.30
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      17.31

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       28.85    8.19    3.996  0.42( 0.04) 0.10       7.7     100.00
     1       28.87    8.85    3.816  0.42( 0.04) 0.10       8.1     110.00
     2       17.31    6.68    4.516  0.42( 0.04) 0.10       4.3     120.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       43.94    6.68    4.516  0.42( 0.04) 0.10      10.6     120.00
     2       44.15    8.19    3.996  0.42( 0.04) 0.10      12.0     100.00
     3       43.48    8.85    3.816  0.42( 0.04) 0.10      12.4     110.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      44.15    Tc(MIN.) =     8.19
 EFFECTIVE AREA(ACRES) =      11.99   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       12.4
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    121.00 =    1272.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    121.00 TO NODE    163.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   947.18  DOWNSTREAM(FEET) =   943.84
 FLOW LENGTH(FEET) =   836.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  29.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.18
 ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      44.15
```

```
 PIPE TRAVEL TIME(MIN.) =   1.94    Tc(MIN.) =   10.13
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    163.00 =    2108.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    163.00 TO NODE    163.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 1 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    130.00 TO NODE    131.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   390.00
 ELEVATION DATA: UPSTREAM(FEET) =    957.63  DOWNSTREAM(FEET) =    952.69

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.921
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.078
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                 B        3.70      0.42     0.100    76    7.92
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =     13.44
 TOTAL AREA(ACRES) =      3.70   PEAK FLOW RATE(CFS) =     13.44

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    131.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.92
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.078
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.40      0.42     0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.40      SUBAREA RUNOFF(CFS) =    1.45
 EFFECTIVE AREA(ACRES) =      4.10   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        4.1       PEAK FLOW RATE(CFS) =      14.89

****************************************************************************
 FLOW PROCESS FROM NODE    131.00 TO NODE    132.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.69  DOWNSTREAM(FEET) =   948.09
 FLOW LENGTH(FEET) =   148.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  24.0 INCH PIPE IS  19.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.52
 ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      14.89
 PIPE TRAVEL TIME(MIN.) =   0.45    Tc(MIN.) =    8.37
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    132.00 =     538.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    132.00 TO NODE    132.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
```

```
==========================================================================
  MAINLINE Tc(MIN.) =    8.37
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.946
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        1.90      0.42      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.90      SUBAREA RUNOFF(CFS) =    6.67
  EFFECTIVE AREA(ACRES) =      6.00   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        6.0       PEAK FLOW RATE(CFS) =      21.08

**************************************************************************
  FLOW PROCESS FROM NODE    132.00 TO NODE    133.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   947.99  DOWNSTREAM(FEET) =   947.38
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  19.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.16
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      21.08
  PIPE TRAVEL TIME(MIN.) =   0.41    Tc(MIN.) =    8.78
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    133.00 =     690.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    133.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    8.78
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.834
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  B        1.25      0.42      0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.25      SUBAREA RUNOFF(CFS) =    4.27
  EFFECTIVE AREA(ACRES) =      7.25   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        7.2       PEAK FLOW RATE(CFS) =      24.74

**************************************************************************
  FLOW PROCESS FROM NODE    133.00 TO NODE    134.00 IS CODE =  31
--------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   947.28  DOWNSTREAM(FEET) =   946.67
  FLOW LENGTH(FEET) =   152.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  30.0 INCH PIPE IS  22.3 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   6.33
  ESTIMATED PIPE DIAMETER(INCH) =  30.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      24.74
  PIPE TRAVEL TIME(MIN.) =   0.40    Tc(MIN.) =    9.18
  LONGEST FLOWPATH FROM NODE    130.00 TO NODE    134.00 =     842.00 FEET.

**************************************************************************
  FLOW PROCESS FROM NODE    134.00 TO NODE    134.00 IS CODE =  81
--------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
```

```
 MAINLINE Tc(MIN.) =    9.18
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.732
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  B        1.75      0.42      0.100    76
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.75      SUBAREA RUNOFF(CFS) =    5.81
 EFFECTIVE AREA(ACRES) =      9.00   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        9.0       PEAK FLOW RATE(CFS) =      29.89

****************************************************************************
 FLOW PROCESS FROM NODE    134.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   946.57  DOWNSTREAM(FEET) =   945.97
 FLOW LENGTH(FEET) =   150.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  23.3 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.67
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      29.89
 PIPE TRAVEL TIME(MIN.) =   0.37    Tc(MIN.) =    9.55
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    162.00 =     992.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  10
----------------------------------------------------------------------------
 >>>>>MAIN-STREAM MEMORY COPIED ONTO MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   475.00
 ELEVATION DATA: UPSTREAM(FEET) =    966.00  DOWNSTREAM(FEET) =    955.92

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.730
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.138
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        1.00      0.42      0.100    76    7.73
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.69
 TOTAL AREA(ACRES) =      1.00   PEAK FLOW RATE(CFS) =      3.69

****************************************************************************
 FLOW PROCESS FROM NODE    140.00 TO NODE    141.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.73
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.138
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        0.05      0.31      1.000    84
```

```
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.17
 EFFECTIVE AREA(ACRES) =      1.05   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.38  AREA-AVERAGED Ap =  0.14
 TOTAL AREA(ACRES) =        1.0       PEAK FLOW RATE(CFS) =       3.86

****************************************************************************
 FLOW PROCESS FROM NODE    141.00 TO NODE    151.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.42  DOWNSTREAM(FEET) =   952.19
 FLOW LENGTH(FEET) =    46.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS  10.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.36
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       3.86
 PIPE TRAVEL TIME(MIN.) =   0.18    Tc(MIN.) =    7.91
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    151.00 =     521.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    7.91
 RAINFALL INTENSITY(INCH/HR) =   4.08
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.38
 AREA-AVERAGED Ap =  0.14
 EFFECTIVE STREAM AREA(ACRES) =       1.05
 TOTAL STREAM AREA(ACRES) =       1.05
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       3.86

****************************************************************************
 FLOW PROCESS FROM NODE    150.00 TO NODE    151.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   295.00
 ELEVATION DATA: UPSTREAM(FEET) =    958.60  DOWNSTREAM(FEET) =    955.55

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    7.377
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.255
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        0.45      0.42     0.100    76    7.38
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      1.71
 TOTAL AREA(ACRES) =      0.45   PEAK FLOW RATE(CFS) =      1.71

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    151.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
```

```
 TIME OF CONCENTRATION(MIN.) =    7.38
 RAINFALL INTENSITY(INCH/HR) =   4.26
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       0.45
 TOTAL STREAM AREA(ACRES) =       0.45
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       1.71

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        3.86    7.91    4.082  0.38( 0.05) 0.14       1.0     140.00
     2        1.71    7.38    4.255  0.42( 0.04) 0.10       0.4     150.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)         (ACRES)    NODE
     1        5.46    7.38    4.255  0.39( 0.05) 0.13       1.4     150.00
     2        5.49    7.91    4.082  0.39( 0.05) 0.13       1.5     140.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       5.49    Tc(MIN.) =     7.91
 EFFECTIVE AREA(ACRES) =       1.50   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.39  AREA-AVERAGED Ap =  0.13
 TOTAL AREA(ACRES) =        1.5
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    151.00 =     521.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    151.00 TO NODE    161.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   952.05  DOWNSTREAM(FEET) =   949.32
 FLOW LENGTH(FEET) =   508.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  18.0 INCH PIPE IS  10.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   4.94
 ESTIMATED PIPE DIAMETER(INCH) =  18.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       5.49
 PIPE TRAVEL TIME(MIN.) =   1.71    Tc(MIN.) =    9.62
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    161.00 =    1029.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    161.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.62
 RAINFALL INTENSITY(INCH/HR) =   3.63
 AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.39
 AREA-AVERAGED Ap =  0.13
 EFFECTIVE STREAM AREA(ACRES) =       1.50
 TOTAL STREAM AREA(ACRES) =       1.50
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       5.49

****************************************************************************
 FLOW PROCESS FROM NODE    160.00 TO NODE    161.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
```

```
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   520.00
 ELEVATION DATA: UPSTREAM(FEET) =    957.10  DOWNSTREAM(FEET) =    952.82

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.687
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.614
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        2.70      0.42      0.100    76    9.69
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      8.68
 TOTAL AREA(ACRES) =      2.70   PEAK FLOW RATE(CFS) =      8.68

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    161.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.69
 RAINFALL INTENSITY(INCH/HR) =   3.61
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.70
 TOTAL STREAM AREA(ACRES) =       2.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.68

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1        5.46    9.09    3.753  0.39( 0.05) 0.13       1.4     150.00
     1        5.49    9.62    3.629  0.39( 0.05) 0.13       1.5     140.00
     2        8.68    9.69    3.614  0.42( 0.04) 0.10       2.7     160.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.93    9.09    3.753  0.41( 0.05) 0.11       4.0     150.00
     2       14.15    9.62    3.629  0.41( 0.05) 0.11       4.2     140.00
     3       14.15    9.69    3.614  0.41( 0.05) 0.11       4.2     160.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      14.15    Tc(MIN.) =     9.69
 EFFECTIVE AREA(ACRES) =       4.20   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.41  AREA-AVERAGED Ap =  0.11
 TOTAL AREA(ACRES) =        4.2
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    161.00 =    1029.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    161.00 TO NODE    162.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   948.82  DOWNSTREAM(FEET) =   946.07
 FLOW LENGTH(FEET) =    20.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  15.0 INCH PIPE IS   8.0 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  21.19
```

```
 ESTIMATED PIPE DIAMETER(INCH) =  15.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      14.15
 PIPE TRAVEL TIME(MIN.) =   0.02    Tc(MIN.) =    9.70
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    162.00 =    1049.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 2 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================

 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.93    9.11    3.749  0.41( 0.05) 0.11       4.0     150.00
     2       14.15    9.64    3.625  0.41( 0.05) 0.11       4.2     140.00
     3       14.15    9.70    3.610  0.41( 0.05) 0.11       4.2     160.00
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    162.00 =    1049.00 FEET.

 ** MEMORY BANK #  2 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       29.89    9.55    3.644  0.42( 0.04) 0.10       9.0     130.00
 LONGEST FLOWPATH FROM NODE    130.00 TO NODE    162.00 =     992.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       43.26    9.11    3.749  0.42( 0.04) 0.10      12.5     150.00
     2       44.00    9.55    3.644  0.42( 0.04) 0.10      13.1     130.00
     3       43.89    9.64    3.625  0.42( 0.04) 0.10      13.2     140.00
     4       43.76    9.70    3.610  0.42( 0.04) 0.10      13.2     160.00
   TOTAL AREA(ACRES) =        13.2

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       44.00  Tc(MIN.) =    9.554
 EFFECTIVE AREA(ACRES) =     13.15  AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       13.2
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    162.00 =    1049.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 2 <<<<<
============================================================================

****************************************************************************
 FLOW PROCESS FROM NODE    162.00 TO NODE    163.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   945.87  DOWNSTREAM(FEET) =   943.94
 FLOW LENGTH(FEET) =   440.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  36.0 INCH PIPE IS  27.8 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   7.50
 ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      44.00
 PIPE TRAVEL TIME(MIN.) =   0.98    Tc(MIN.) =   10.53
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    163.00 =    1489.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    163.00 TO NODE    163.00 IS CODE =  11
----------------------------------------------------------------------------
 >>>>>CONFLUENCE MEMORY BANK # 1 WITH THE MAIN-STREAM MEMORY<<<<<
============================================================================
```

```
 ** MAIN STREAM CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       43.26   10.09    3.527  0.42( 0.04) 0.10      12.5     150.00
     2       44.00   10.53    3.437  0.42( 0.04) 0.10      13.1     130.00
     3       43.89   10.61    3.421  0.42( 0.04) 0.10      13.2     140.00
     4       43.76   10.68    3.408  0.42( 0.04) 0.10      13.2     160.00
 LONGEST FLOWPATH FROM NODE    140.00 TO NODE    163.00 =    1489.00 FEET.

 ** MEMORY BANK #  1 CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       43.94    8.62    3.876  0.42( 0.04) 0.10      10.6     120.00
     2       44.15   10.13    3.517  0.42( 0.04) 0.10      12.0     100.00
     3       43.48   10.79    3.388  0.42( 0.04) 0.10      12.4     110.00
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    163.00 =    2108.00 FEET.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       84.61    8.62    3.876  0.42( 0.04) 0.10      21.3     120.00
     2       87.41   10.09    3.527  0.42( 0.04) 0.10      24.5     150.00
     3       87.49   10.13    3.517  0.42( 0.04) 0.10      24.6     100.00
     4       87.75   10.53    3.437  0.42( 0.04) 0.10      25.4     130.00
     5       87.54   10.61    3.421  0.42( 0.04) 0.10      25.5     140.00
     6       87.35   10.68    3.408  0.42( 0.04) 0.10      25.5     160.00
     7       86.97   10.79    3.388  0.42( 0.04) 0.10      25.6     110.00
   TOTAL AREA(ACRES) =        25.6

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =       87.75  Tc(MIN.) =   10.531
 EFFECTIVE AREA(ACRES) =     25.39  AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =       25.6
 LONGEST FLOWPATH FROM NODE    100.00 TO NODE    163.00 =    2108.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    163.00 TO NODE    163.00 IS CODE =  12
----------------------------------------------------------------------------
 >>>>>CLEAR MEMORY BANK # 1 <<<<<
============================================================================
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       25.6  TC(MIN.) =     10.53
 EFFECTIVE AREA(ACRES) =     25.39  AREA-AVERAGED Fm(INCH/HR)=  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.102
 PEAK FLOW RATE(CFS)   =      87.75

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)           (ACRES)    NODE
     1       84.61    8.62    3.876  0.42( 0.04) 0.10      21.3     120.00
     2       87.41   10.09    3.527  0.42( 0.04) 0.10      24.5     150.00
     3       87.49   10.13    3.517  0.42( 0.04) 0.10      24.6     100.00
     4       87.75   10.53    3.437  0.42( 0.04) 0.10      25.4     130.00
     5       87.54   10.61    3.421  0.42( 0.04) 0.10      25.5     140.00
     6       87.35   10.68    3.408  0.42( 0.04) 0.10      25.5     160.00
     7       86.97   10.79    3.388  0.42( 0.04) 0.10      25.6     110.00
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                           *
* PROPOSED CONDITION 100-YEAR                                           *
* NORTH OF BARTON ROAD, NORTHEAST DIRT AREA (NODES 170-171)             *
 ************************************************************************

  FILE NAME: W:\3711\PR100C.DAT
  TIME/DATE OF STUDY: 17:11 12/07/2018
========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0313 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

************************************************************************
  FLOW PROCESS FROM NODE    170.00 TO NODE    171.00 IS CODE =  21
------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
  ELEVATION DATA: UPSTREAM(FEET) =    969.70  DOWNSTREAM(FEET) =    942.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.044
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.340
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL POOR COVER
  "OPEN BRUSH"                B        1.50      0.20     1.000    92   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.20
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      4.24
  TOTAL AREA(ACRES) =      1.50   PEAK FLOW RATE(CFS) =      4.24
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        1.5  TC(MIN.) =     11.04
  EFFECTIVE AREA(ACRES) =      1.50  AREA-AVERAGED Fm(INCH/HR)=  0.20
  AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       4.24
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                        Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, BUILDING 1 SOUTHERLY LANDSCAPE (NODES 180-181)   *
 **************************************************************************

  FILE NAME: W:\3711\PR100D.DAT
  TIME/DATE OF STUDY: 15:06 06/21/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    180.00 TO NODE    181.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   115.00
  ELEVATION DATA: UPSTREAM(FEET) =    956.72  DOWNSTREAM(FEET) =    954.10

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.374
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                B        0.10      0.42     0.100    76    5.00
  NATURAL FAIR COVER
  "OPEN BRUSH"              B        0.45      0.31     1.000    84   10.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.836
  SUBAREA RUNOFF(CFS) =      2.53
  TOTAL AREA(ACRES) =      0.55   PEAK FLOW RATE(CFS) =      2.53
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.6  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.55  AREA-AVERAGED Fm(INCH/HR)=  0.26
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap = 0.836
  PEAK FLOW RATE(CFS)   =       2.53
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
******************************************************************************
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                          Analysis prepared by:

                         THIENES ENGINEERING INC.
                           14349 FIRESTONE BLVD
                            LA MIRADA, CA90638
                               714-521-4811

 ************************** DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* PROPOSED CONDITION 100-YEAR                                             *
* NORTH OF BARTON ROAD, BUILDING 1 SOUTHWEST LANDSCAPE (NODES 190-191)    *
 ****************************************************************************

  FILE NAME: W:\3711\PR100E.DAT
  TIME/DATE OF STUDY: 14:16 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

******************************************************************************
  FLOW PROCESS FROM NODE    190.00 TO NODE    191.00 IS CODE =  21
------------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    20.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.14  DOWNSTREAM(FEET) =    943.64

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.374
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.25      0.31     1.000    84    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      1.14
  TOTAL AREA(ACRES) =      0.25   PEAK FLOW RATE(CFS) =      1.14
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =         0.2  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.25  AREA-AVERAGED Fm(INCH/HR)=  0.31
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       1.14
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 100-YEAR                                            *
* NORTH OF BARTON ROAD, NORTHWEST LANDSCAPE (NODES 195-196)              *
 **************************************************************************

  FILE NAME: W:\3711\PR100F.DAT
  TIME/DATE OF STUDY: 14:18 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  ==================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    195.00 TO NODE    196.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    20.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.80  DOWNSTREAM(FEET) =    949.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.117
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.300
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.45      0.31     1.000    84    5.12
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      2.02
  TOTAL AREA(ACRES) =      0.45   PEAK FLOW RATE(CFS) =      2.02
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      5.12
  EFFECTIVE AREA(ACRES) =      0.45  AREA-AVERAGED Fm(INCH/HR)=  0.31
  AREA-AVERAGED Fp(INCH/HR) =  0.31  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)   =       2.02
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************** DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* PROPOSED CONDITION 100-YEAR                                             *
* SOUTH OF BARTON ROAD, BUILDING 2 (NODES 200-252)                        *
 ****************************************************************************

  FILE NAME: W:\3711\PR100G.DAT
  TIME/DATE OF STUDY: 14:30 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   460.00
  ELEVATION DATA: UPSTREAM(FEET) =    947.89  DOWNSTREAM(FEET) =    944.63

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.504
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.655
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  B        3.20      0.42     0.100    76    9.50
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     10.41
  TOTAL AREA(ACRES) =      3.20   PEAK FLOW RATE(CFS) =     10.41

****************************************************************************
  FLOW PROCESS FROM NODE    200.00 TO NODE    201.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    9.50
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.655
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.15      0.31     1.000    84
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA AREA(ACRES) =    0.15      SUBAREA RUNOFF(CFS) =    0.45
  EFFECTIVE AREA(ACRES) =      3.35   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.39  AREA-AVERAGED Ap =  0.14
  TOTAL AREA(ACRES) =        3.4       PEAK FLOW RATE(CFS) =      10.86

****************************************************************************
  FLOW PROCESS FROM NODE    201.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   940.13  DOWNSTREAM(FEET) =   938.59
  FLOW LENGTH(FEET) =   384.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  15.0 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.24
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      10.86
  PIPE TRAVEL TIME(MIN.) =   1.22    Tc(MIN.) =   10.73
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =     844.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   10.73
  RAINFALL INTENSITY(INCH/HR) =   3.40
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.39
  AREA-AVERAGED Ap =  0.14
  EFFECTIVE STREAM AREA(ACRES) =       3.35
  TOTAL STREAM AREA(ACRES) =       3.35
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      10.86

****************************************************************************
  FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   370.00
  ELEVATION DATA: UPSTREAM(FEET) =    958.40  DOWNSTREAM(FEET) =    945.96

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.380
```

```
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.643
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        0.90      0.42     0.100    76    6.38
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      3.73
 TOTAL AREA(ACRES) =      0.90   PEAK FLOW RATE(CFS) =      3.73

****************************************************************************
 FLOW PROCESS FROM NODE    210.00 TO NODE    211.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.38
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.643
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "BARREN"                    B        0.15      0.11     1.000    97
 NATURAL FAIR COVER
 "OPEN BRUSH"                B        0.10      0.31     1.000    84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.19
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    1.00
 EFFECTIVE AREA(ACRES) =      1.15   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.25  AREA-AVERAGED Ap =  0.30
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       4.73

****************************************************************************
 FLOW PROCESS FROM NODE    211.00 TO NODE    212.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   940.63  DOWNSTREAM(FEET) =   939.81
 FLOW LENGTH(FEET) =    10.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   5.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  13.27
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.73
 PIPE TRAVEL TIME(MIN.) =   0.01    Tc(MIN.) =    6.39
 LONGEST FLOWPATH FROM NODE    210.00 TO NODE    212.00 =     380.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    212.00 TO NODE    212.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.39
 RAINFALL INTENSITY(INCH/HR) =   4.64
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.25
 AREA-AVERAGED Ap =  0.30
 EFFECTIVE STREAM AREA(ACRES) =       1.15
 TOTAL STREAM AREA(ACRES) =       1.15
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.73

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
```

```
    1       10.86   10.73    3.400  0.39( 0.05) 0.14       3.4      200.00
    2        4.73    6.39    4.637  0.25( 0.07) 0.30       1.1      210.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  2 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       13.59    6.39    4.637  0.31( 0.06) 0.20       3.1      210.00
      2       14.30   10.73    3.400  0.33( 0.06) 0.18       4.5      200.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      14.30    Tc(MIN.) =    10.73
  EFFECTIVE AREA(ACRES) =       4.50   AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.33  AREA-AVERAGED Ap =  0.18
  TOTAL AREA(ACRES) =        4.5
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    212.00 =     844.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    212.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   938.49  DOWNSTREAM(FEET) =   937.27
  FLOW LENGTH(FEET) =   306.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  24.0 INCH PIPE IS  18.7 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   5.46
  ESTIMATED PIPE DIAMETER(INCH) =  24.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      14.30
  PIPE TRAVEL TIME(MIN.) =   0.93    Tc(MIN.) =   11.66
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    222.00 =    1150.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  2
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =   11.66
  RAINFALL INTENSITY(INCH/HR) =   3.23
  AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.33
  AREA-AVERAGED Ap =  0.18
  EFFECTIVE STREAM AREA(ACRES) =       4.50
  TOTAL STREAM AREA(ACRES) =       4.50
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      14.30

****************************************************************************
  FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   260.00
  ELEVATION DATA: UPSTREAM(FEET) =    954.59  DOWNSTREAM(FEET) =    947.60

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.794
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.919
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
  COMMERCIAL                 B        1.00      0.42     0.100    76    5.79
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      4.39
 TOTAL AREA(ACRES) =      1.00   PEAK FLOW RATE(CFS) =      4.39

****************************************************************************
 FLOW PROCESS FROM NODE    220.00 TO NODE    221.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    5.79
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.919
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"               B        0.10      0.31     1.000    84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.10      SUBAREA RUNOFF(CFS) =    0.42
 EFFECTIVE AREA(ACRES) =      1.10   AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.37  AREA-AVERAGED Ap =  0.18
 TOTAL AREA(ACRES) =        1.1       PEAK FLOW RATE(CFS) =       4.80

****************************************************************************
 FLOW PROCESS FROM NODE    221.00 TO NODE    222.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   944.10  DOWNSTREAM(FEET) =   938.27
 FLOW LENGTH(FEET) =    36.00   MANNING'S N =  0.012
 ESTIMATED PIPE DIAMETER(INCH) INCREASED TO 12.000
 DEPTH OF FLOW IN  12.0 INCH PIPE IS   4.6 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =  17.10
 ESTIMATED PIPE DIAMETER(INCH) =  12.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       4.80
 PIPE TRAVEL TIME(MIN.) =   0.04    Tc(MIN.) =    5.83
 LONGEST FLOWPATH FROM NODE    220.00 TO NODE    222.00 =     296.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    222.00 TO NODE    222.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    5.83
 RAINFALL INTENSITY(INCH/HR) =   4.90
 AREA-AVERAGED Fm(INCH/HR) =  0.07
 AREA-AVERAGED Fp(INCH/HR) =  0.37
 AREA-AVERAGED Ap =  0.18
 EFFECTIVE STREAM AREA(ACRES) =       1.10
 TOTAL STREAM AREA(ACRES) =       1.10
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       4.80

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)      Ap      Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       13.59    7.33    4.271  0.31( 0.06) 0.20       3.1     210.00
     1       14.30   11.66    3.233  0.33( 0.06) 0.18       4.5     200.00
     2        4.80    5.83    4.901  0.37( 0.07) 0.18       1.1     220.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
```

STREAM NUMBER	Q (CFS)	Tc (MIN.)	Intensity (INCH/HR)	Fp(Fm) (INCH/HR)	Ap	Ae (ACRES)	HEADWATER NODE
1	17.23	5.83	4.901	0.33(0.06)	0.19	3.6	220.00
2	17.77	7.33	4.271	0.32(0.06)	0.19	4.2	210.00
3	17.45	11.66	3.233	0.34(0.06)	0.18	5.6	200.00

COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
PEAK FLOW RATE(CFS) = 17.77 Tc(MIN.) = 7.33
EFFECTIVE AREA(ACRES) = 4.25 AREA-AVERAGED Fm(INCH/HR) = 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.32 AREA-AVERAGED Ap = 0.19
TOTAL AREA(ACRES) = 5.6
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 222.00 = 1150.00 FEET.

****
FLOW PROCESS FROM NODE 222.00 TO NODE 231.00 IS CODE = 31

>>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
>>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==
ELEVATION DATA: UPSTREAM(FEET) = 937.17 DOWNSTREAM(FEET) = 936.57
FLOW LENGTH(FEET) = 150.00 MANNING'S N = 0.012
DEPTH OF FLOW IN 27.0 INCH PIPE IS 19.3 INCHES
PIPE-FLOW VELOCITY(FEET/SEC.) = 5.85
ESTIMATED PIPE DIAMETER(INCH) = 27.00 NUMBER OF PIPES = 1
PIPE-FLOW(CFS) = 17.77
PIPE TRAVEL TIME(MIN.) = 0.43 Tc(MIN.) = 7.76
LONGEST FLOWPATH FROM NODE 200.00 TO NODE 231.00 = 1300.00 FEET.

****
FLOW PROCESS FROM NODE 231.00 TO NODE 231.00 IS CODE = 1

>>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==
TOTAL NUMBER OF STREAMS = 2
CONFLUENCE VALUES USED FOR INDEPENDENT STREAM 1 ARE:
TIME OF CONCENTRATION(MIN.) = 7.76
RAINFALL INTENSITY(INCH/HR) = 4.13
AREA-AVERAGED Fm(INCH/HR) = 0.06
AREA-AVERAGED Fp(INCH/HR) = 0.32
AREA-AVERAGED Ap = 0.19
EFFECTIVE STREAM AREA(ACRES) = 4.25
TOTAL STREAM AREA(ACRES) = 5.60
PEAK FLOW RATE(CFS) AT CONFLUENCE = 17.77

****
FLOW PROCESS FROM NODE 230.00 TO NODE 231.00 IS CODE = 21

>>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
>>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==
INITIAL SUBAREA FLOW-LENGTH(FEET) = 370.00
ELEVATION DATA: UPSTREAM(FEET) = 954.70 DOWNSTREAM(FEET) = 943.72

Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) = 6.541
* 100 YEAR RAINFALL INTENSITY(INCH/HR) = 4.574
SUBAREA Tc AND LOSS RATE DATA(AMC III):

DEVELOPMENT TYPE/ LAND USE	SCS SOIL GROUP	AREA (ACRES)	Fp (INCH/HR)	Ap (DECIMAL)	SCS CN	Tc (MIN.)
COMMERCIAL	B	3.40	0.42	0.100	76	6.54
COMMERCIAL	C	0.25	0.27	0.100	86	6.54

SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) = 0.41
SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap = 0.100
SUBAREA RUNOFF(CFS) = 14.89
TOTAL AREA(ACRES) = 3.65 PEAK FLOW RATE(CFS) = 14.89

****

```
 FLOW PROCESS FROM NODE    230.00 TO NODE    231.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.54
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.574
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL FAIR COVER
 "OPEN BRUSH"                 B        0.05      0.31     1.000    84
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.31
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.19
 EFFECTIVE AREA(ACRES) =      3.70   AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.40  AREA-AVERAGED Ap =  0.11
 TOTAL AREA(ACRES) =        3.7       PEAK FLOW RATE(CFS) =      15.08

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    231.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
 >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  2
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    6.54
 RAINFALL INTENSITY(INCH/HR) =   4.57
 AREA-AVERAGED Fm(INCH/HR) =  0.04
 AREA-AVERAGED Fp(INCH/HR) =  0.40
 AREA-AVERAGED Ap =  0.11
 EFFECTIVE STREAM AREA(ACRES) =       3.70
 TOTAL STREAM AREA(ACRES) =       3.70
 PEAK FLOW RATE(CFS) AT CONFLUENCE =      15.08

 ** CONFLUENCE DATA **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       17.23    6.26    4.697  0.33( 0.06) 0.19       3.6     220.00
     1       17.77    7.76    4.129  0.32( 0.06) 0.19       4.2     210.00
     1       17.45   12.09    3.164  0.34( 0.06) 0.18       5.6     200.00
     2       15.08    6.54    4.574  0.40( 0.04) 0.11       3.7     230.00

 RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
 CONFLUENCE FORMULA USED FOR  2 STREAMS.

 ** PEAK FLOW RATE TABLE **
  STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
  NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
     1       32.05    6.26    4.697  0.35( 0.05) 0.15       7.1     220.00
     2       32.41    6.54    4.574  0.35( 0.05) 0.15       7.4     230.00
     3       31.37    7.76    4.129  0.35( 0.05) 0.16       7.9     210.00
     4       27.84   12.09    3.164  0.35( 0.05) 0.15       9.3     200.00

 COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
 PEAK FLOW RATE(CFS) =      32.41    Tc(MIN.) =     6.54
 EFFECTIVE AREA(ACRES) =       7.42   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.35  AREA-AVERAGED Ap =  0.15
 TOTAL AREA(ACRES) =        9.3
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    231.00 =    1300.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    231.00 TO NODE    232.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
```

```
 ELEVATION DATA: UPSTREAM(FEET) =   936.47  DOWNSTREAM(FEET) =   935.91
 FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  24.9 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.75
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      32.41
 PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    6.89
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    232.00 =    1440.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    232.00 TO NODE    232.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    6.89
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.434
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.60      0.42      0.100    76
 COMMERCIAL                 C        0.80      0.27      0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.34
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.40      SUBAREA RUNOFF(CFS) =    5.55
 EFFECTIVE AREA(ACRES) =      8.82   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.35  AREA-AVERAGED Ap =  0.14
 TOTAL AREA(ACRES) =       10.7       PEAK FLOW RATE(CFS) =      34.81

****************************************************************************
 FLOW PROCESS FROM NODE    232.00 TO NODE    233.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   935.81  DOWNSTREAM(FEET) =   935.23
 FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  33.0 INCH PIPE IS  26.5 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   6.80
 ESTIMATED PIPE DIAMETER(INCH) =  33.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =      34.81
 PIPE TRAVEL TIME(MIN.) =   0.35    Tc(MIN.) =    7.24
 LONGEST FLOWPATH FROM NODE    200.00 TO NODE    233.00 =    1584.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    233.00 TO NODE    233.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =    7.24
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.304
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                 B        0.40      0.42      0.100    76
 COMMERCIAL                 C        0.90      0.27      0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    1.30      SUBAREA RUNOFF(CFS) =    5.00
 EFFECTIVE AREA(ACRES) =     10.12   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.35  AREA-AVERAGED Ap =  0.14
 TOTAL AREA(ACRES) =       12.0       PEAK FLOW RATE(CFS) =      38.77

****************************************************************************
 FLOW PROCESS FROM NODE    233.00 TO NODE    234.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
```

```
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   935.13  DOWNSTREAM(FEET) =   934.56
  FLOW LENGTH(FEET) =   144.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  26.1 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.07
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      38.77
  PIPE TRAVEL TIME(MIN.) =   0.34    Tc(MIN.) =    7.58
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    234.00 =    1728.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    234.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
==========================================================================
  MAINLINE Tc(MIN.) =    7.58
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.187
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp          Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                 B        0.50      0.42      0.100    76
  COMMERCIAL                 C        1.05      0.27      0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.32
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    1.55      SUBAREA RUNOFF(CFS) =    5.80
  EFFECTIVE AREA(ACRES) =     11.67   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.35  AREA-AVERAGED Ap =  0.13
  TOTAL AREA(ACRES) =       13.6       PEAK FLOW RATE(CFS) =      43.50

****************************************************************************
  FLOW PROCESS FROM NODE    234.00 TO NODE    252.00 IS CODE =  31
----------------------------------------------------------------------------
  >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
==========================================================================
  ELEVATION DATA: UPSTREAM(FEET) =   934.46  DOWNSTREAM(FEET) =   933.89
  FLOW LENGTH(FEET) =   140.00   MANNING'S N =  0.012
  DEPTH OF FLOW IN  36.0 INCH PIPE IS  28.5 INCHES
  PIPE-FLOW VELOCITY(FEET/SEC.) =   7.24
  ESTIMATED PIPE DIAMETER(INCH) =  36.00    NUMBER OF PIPES =   1
  PIPE-FLOW(CFS) =      43.50
  PIPE TRAVEL TIME(MIN.) =   0.32    Tc(MIN.) =    7.90
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    252.00 =    1868.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
==========================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  1 ARE:
  TIME OF CONCENTRATION(MIN.) =    7.90
  RAINFALL INTENSITY(INCH/HR) =   4.08
  AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.35
  AREA-AVERAGED Ap =  0.13
  EFFECTIVE STREAM AREA(ACRES) =      11.67
  TOTAL STREAM AREA(ACRES) =      13.55
  PEAK FLOW RATE(CFS) AT CONFLUENCE =      43.50

****************************************************************************
  FLOW PROCESS FROM NODE    240.00 TO NODE    252.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   485.00
```

```
 ELEVATION DATA: UPSTREAM(FEET) =    946.83  DOWNSTREAM(FEET) =    943.72

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.903
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.566
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        0.20      0.42     0.100    76    9.90
 COMMERCIAL                  C        2.55      0.27     0.100    86    9.90
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      8.76
 TOTAL AREA(ACRES) =      2.75   PEAK FLOW RATE(CFS) =      8.76

****************************************************************************
 FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
----------------------------------------------------------------------------
 >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
============================================================================
 TOTAL NUMBER OF STREAMS =  3
 CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  2 ARE:
 TIME OF CONCENTRATION(MIN.) =    9.90
 RAINFALL INTENSITY(INCH/HR) =   3.57
 AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.28
 AREA-AVERAGED Ap =  0.10
 EFFECTIVE STREAM AREA(ACRES) =       2.75
 TOTAL STREAM AREA(ACRES) =       2.75
 PEAK FLOW RATE(CFS) AT CONFLUENCE =       8.76

****************************************************************************
 FLOW PROCESS FROM NODE    250.00 TO NODE    251.00 IS CODE =  21
----------------------------------------------------------------------------
 >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
 >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
 INITIAL SUBAREA FLOW-LENGTH(FEET) =   480.00
 ELEVATION DATA: UPSTREAM(FEET) =    947.89  DOWNSTREAM(FEET) =    944.73

 Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
 SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.810
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.586
 SUBAREA Tc AND LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
      LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
 COMMERCIAL                  B        1.90      0.42     0.100    76    9.81
 COMMERCIAL                  C        1.05      0.27     0.100    86    9.81
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.37
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      9.42
 TOTAL AREA(ACRES) =      2.95   PEAK FLOW RATE(CFS) =      9.42

****************************************************************************
 FLOW PROCESS FROM NODE    251.00 TO NODE    252.00 IS CODE =  31
----------------------------------------------------------------------------
 >>>>>COMPUTE PIPE-FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>USING COMPUTER-ESTIMATED PIPESIZE (NON-PRESSURE FLOW)<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =   940.40  DOWNSTREAM(FEET) =   936.29
 FLOW LENGTH(FEET) =   822.00   MANNING'S N =  0.012
 DEPTH OF FLOW IN  21.0 INCH PIPE IS  14.2 INCHES
 PIPE-FLOW VELOCITY(FEET/SEC.) =   5.46
 ESTIMATED PIPE DIAMETER(INCH) =  21.00    NUMBER OF PIPES =   1
 PIPE-FLOW(CFS) =       9.42
 PIPE TRAVEL TIME(MIN.) =   2.51    Tc(MIN.) =   12.32
 LONGEST FLOWPATH FROM NODE    250.00 TO NODE    252.00 =    1302.00 FEET.
```

```
****************************************************************************
  FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
----------------------------------------------------------------------------
  >>>>>DESIGNATE INDEPENDENT STREAM FOR CONFLUENCE<<<<<
  >>>>>AND COMPUTE VARIOUS CONFLUENCED STREAM VALUES<<<<<
============================================================================
  TOTAL NUMBER OF STREAMS =  3
  CONFLUENCE VALUES USED FOR INDEPENDENT STREAM  3 ARE:
  TIME OF CONCENTRATION(MIN.) =   12.32
  RAINFALL INTENSITY(INCH/HR) =   3.13
  AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.37
  AREA-AVERAGED Ap =  0.10
  EFFECTIVE STREAM AREA(ACRES) =       2.95
  TOTAL STREAM AREA(ACRES) =       2.95
  PEAK FLOW RATE(CFS) AT CONFLUENCE =       9.42

  ** CONFLUENCE DATA **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       43.44    7.62    4.174  0.35( 0.05) 0.13      11.4     220.00
      1       43.50    7.90    4.083  0.35( 0.05) 0.13      11.7     230.00
      1       41.50    9.13    3.746  0.34( 0.05) 0.14      12.2     210.00
      1       36.09   13.49    2.963  0.35( 0.05) 0.14      13.6     200.00
      2        8.76    9.90    3.566  0.28( 0.03) 0.10       2.8     240.00
      3        9.42   12.32    3.128  0.37( 0.04) 0.10       2.9     250.00

  RAINFALL INTENSITY AND TIME OF CONCENTRATION RATIO
  CONFLUENCE FORMULA USED FOR  3 STREAMS.

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       59.14    7.62    4.174  0.34( 0.04) 0.12      15.3     220.00
      2       59.42    7.90    4.083  0.34( 0.04) 0.12      15.8     230.00
      3       58.36    9.13    3.746  0.34( 0.04) 0.13      16.9     210.00
      4       57.94    9.90    3.566  0.34( 0.04) 0.13      17.6     240.00
      5       54.72   12.32    3.128  0.34( 0.04) 0.13      18.9     250.00
      6       52.27   13.49    2.963  0.34( 0.04) 0.13      19.2     200.00

  COMPUTED CONFLUENCE ESTIMATES ARE AS FOLLOWS:
  PEAK FLOW RATE(CFS) =      59.42    Tc(MIN.) =     7.90
  EFFECTIVE AREA(ACRES) =      15.76   AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.34  AREA-AVERAGED Ap =  0.12
  TOTAL AREA(ACRES) =       19.2
  LONGEST FLOWPATH FROM NODE    200.00 TO NODE    252.00 =    1868.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =       19.2  TC(MIN.) =      7.90
  EFFECTIVE AREA(ACRES) =     15.76  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.34  AREA-AVERAGED Ap = 0.125
  PEAK FLOW RATE(CFS)   =      59.42

  ** PEAK FLOW RATE TABLE **
   STREAM       Q      Tc   Intensity   Fp(Fm)     Ap     Ae     HEADWATER
   NUMBER     (CFS)  (MIN.) (INCH/HR) (INCH/HR)          (ACRES)    NODE
      1       59.14    7.62    4.174  0.34( 0.04) 0.12      15.3     220.00
      2       59.42    7.90    4.083  0.34( 0.04) 0.12      15.8     230.00
      3       58.36    9.13    3.746  0.34( 0.04) 0.13      16.9     210.00
      4       57.94    9.90    3.566  0.34( 0.04) 0.13      17.6     240.00
      5       54.72   12.32    3.128  0.34( 0.04) 0.13      18.9     250.00
      6       52.27   13.49    2.963  0.34( 0.04) 0.13      19.2     200.00
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 100-YEAR                                            *
* SOUTH OF BARTON ROAD, BUILDING 2 WESTERLY LANDSCAPE (NODES 260-261)    *
 **************************************************************************

  FILE NAME: W:\3711\PR100H.DAT
  TIME/DATE OF STUDY: 14:41 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    260.00 TO NODE    261.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =    15.00
  ELEVATION DATA: UPSTREAM(FEET) =    941.45  DOWNSTREAM(FEET) =    939.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.000
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.374
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  NATURAL FAIR COVER
  "OPEN BRUSH"                B        0.15      0.31     1.000    84    5.00
  NATURAL FAIR COVER
  "OPEN BRUSH"                C        0.05      0.19     1.000    92    5.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.28
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
  SUBAREA RUNOFF(CFS) =      0.92
  TOTAL AREA(ACRES) =      0.20   PEAK FLOW RATE(CFS) =      0.92
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.2  TC(MIN.) =      5.00
  EFFECTIVE AREA(ACRES) =      0.20  AREA-AVERAGED Fm(INCH/HR)=  0.28
  AREA-AVERAGED Fp(INCH/HR) =  0.28  AREA-AVERAGED Ap = 1.000
  PEAK FLOW RATE(CFS)    =       0.92
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 100-YEAR                                            *
* SOUTH OF BARTON ROAD, EASTERLY RAILROAD & OFFSITE LOTS (NODES 300-304) *
 **************************************************************************

  FILE NAME: W:\3711\PR100I.DAT
  TIME/DATE OF STUDY: 14:48 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    300.00 TO NODE    301.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   960.00
  ELEVATION DATA: UPSTREAM(FEET) =    977.00  DOWNSTREAM(FEET) =    963.00

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =   11.041
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.341
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                B        1.20      0.42     0.100    76   11.04
  COMMERCIAL                C        4.50      0.27     0.100    86   11.04
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.30
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =     16.98
  TOTAL AREA(ACRES) =      5.70   PEAK FLOW RATE(CFS) =     16.98

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    963.00  DOWNSTREAM(FEET) =    954.50
  CHANNEL LENGTH THRU SUBAREA(FEET) =   430.00   CHANNEL SLOPE =  0.0198
  CHANNEL FLOW THRU SUBAREA(CFS) =      16.98
  FLOW VELOCITY(FEET/SEC) =   4.03 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   1.78   Tc(MIN.) =   12.82
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    302.00 =    1390.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    301.00 TO NODE    302.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   12.82
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.055
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        2.50      0.42     0.100    76
  COMMERCIAL                C        3.85      0.27     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.33
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    6.35      SUBAREA RUNOFF(CFS) =   17.27
  EFFECTIVE AREA(ACRES) =     12.05   AREA-AVERAGED Fm(INCH/HR) =  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.32  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =       12.0       PEAK FLOW RATE(CFS) =      32.78

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  52
----------------------------------------------------------------------------
  >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
  >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
  ELEVATION DATA: UPSTREAM(FEET) =    954.50  DOWNSTREAM(FEET) =    950.75
  CHANNEL LENGTH THRU SUBAREA(FEET) =   250.00   CHANNEL SLOPE =  0.0150
  CHANNEL FLOW THRU SUBAREA(CFS) =      32.78
  FLOW VELOCITY(FEET/SEC) =   4.20 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
  TRAVEL TIME(MIN.) =   0.99   Tc(MIN.) =   13.81
  LONGEST FLOWPATH FROM NODE    300.00 TO NODE    303.00 =    1640.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    302.00 TO NODE    303.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =   13.81
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.921
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  NATURAL POOR COVER
  "OPEN BRUSH"              B        0.85      0.20     1.000    92
  NATURAL POOR COVER
  "OPEN BRUSH"              C        0.50      0.12     1.000    96
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.17
```

```
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    3.34
 EFFECTIVE AREA(ACRES) =     13.40   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.24  AREA-AVERAGED Ap =  0.19
 TOTAL AREA(ACRES) =       13.4       PEAK FLOW RATE(CFS) =      34.68

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  52
----------------------------------------------------------------------------
 >>>>>COMPUTE NATURAL VALLEY CHANNEL FLOW<<<<<
 >>>>>TRAVELTIME THRU SUBAREA<<<<<
============================================================================
 ELEVATION DATA: UPSTREAM(FEET) =    950.75  DOWNSTREAM(FEET) =    947.75
 CHANNEL LENGTH THRU SUBAREA(FEET) =   690.00   CHANNEL SLOPE =  0.0043
 CHANNEL FLOW THRU SUBAREA(CFS) =      34.68
 FLOW VELOCITY(FEET/SEC) =   2.30 (PER LACFCD/RCFC&WCD HYDROLOGY MANUAL)
 TRAVEL TIME(MIN.) =   5.00   Tc(MIN.) =   18.81
 LONGEST FLOWPATH FROM NODE    300.00 TO NODE    304.00 =    2330.00 FEET.

****************************************************************************
 FLOW PROCESS FROM NODE    303.00 TO NODE    304.00 IS CODE =  81
----------------------------------------------------------------------------
 >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
 MAINLINE Tc(MIN.) =   18.81
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.427
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 NATURAL POOR COVER
 "OPEN BRUSH"               C        1.35      0.12     1.000    96
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.12
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  1.000
 SUBAREA AREA(ACRES) =    1.35      SUBAREA RUNOFF(CFS) =    2.80
 EFFECTIVE AREA(ACRES) =     14.75   AREA-AVERAGED Fm(INCH/HR) =  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap =  0.26
 TOTAL AREA(ACRES) =       14.8       PEAK FLOW RATE(CFS) =      34.68
 NOTE: PEAK FLOW RATE DEFAULTED TO UPSTREAM VALUE
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =       14.8  TC(MIN.) =     18.81
 EFFECTIVE AREA(ACRES) =     14.75  AREA-AVERAGED Fm(INCH/HR)=  0.05
 AREA-AVERAGED Fp(INCH/HR) =  0.20  AREA-AVERAGED Ap = 0.265
 PEAK FLOW RATE(CFS)   =      34.68
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                              *
* PROPOSED CONDITION 100-YEAR                                              *
* STREET FLOW FROM SOUTH HALF OF BARTON ROAD (NODES 310-312)               *
 ****************************************************************************

  FILE NAME: W:\3711\PR100J.DAT
  TIME/DATE OF STUDY: 14:51 10/09/2019
============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

****************************************************************************
  FLOW PROCESS FROM NODE    310.00 TO NODE    311.00 IS CODE =  21
----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   530.00
  ELEVATION DATA: UPSTREAM(FEET) =    970.60  DOWNSTREAM(FEET) =    966.73

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    9.998
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  3.546
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                B        0.30      0.42     0.100    76   10.00
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.95
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      0.95

****************************************************************************
  FLOW PROCESS FROM NODE    311.00 TO NODE    312.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  966.73  DOWNSTREAM ELEVATION(FEET) =  951.87
  STREET LENGTH(FEET) =   670.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.79
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.29
    HALFSTREET FLOOD WIDTH(FEET) =    6.91
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.88
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.82
  STREET FLOW TRAVEL TIME(MIN.) =   3.87   Tc(MIN.) =   13.87
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  2.914
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                B        0.65      0.42     0.100    76
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.42
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.65      SUBAREA RUNOFF(CFS) =    1.68
  EFFECTIVE AREA(ACRES) =      0.95    AREA-AVERAGED Fm(INCH/HR) =  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.9        PEAK FLOW RATE(CFS) =       2.46

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.31   HALFSTREET FLOOD WIDTH(FEET) =   8.28
  FLOW VELOCITY(FEET/SEC.) =  3.05   DEPTH*VELOCITY(FT*FT/SEC.) =   0.95
  LONGEST FLOWPATH FROM NODE    310.00 TO NODE    312.00 =    1200.00 FEET.
============================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.9  TC(MIN.) =     13.87
  EFFECTIVE AREA(ACRES) =      0.95  AREA-AVERAGED Fm(INCH/HR)=  0.04
  AREA-AVERAGED Fp(INCH/HR) =  0.42  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       2.46
============================================================================
============================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                         THIENES ENGINEERING INC.
                           14349 FIRESTONE BLVD
                            LA MIRADA, CA90638
                               714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 100-YEAR                                            *
* STREET FLOW FROM NORTH HALF OF DE BERRY ST (NODES 320-322)             *
 **************************************************************************

  FILE NAME: W:\3711\PR100K.DAT
  TIME/DATE OF STUDY: 14:58 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    320.00 TO NODE    321.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   190.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.30  DOWNSTREAM(FEET) =    944.90

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.265
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.210
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
 COMMERCIAL                  C        0.15      0.27     0.100    86     5.27
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA RUNOFF(CFS) =      0.70
 TOTAL AREA(ACRES) =      0.15   PEAK FLOW RATE(CFS) =      0.70

****************************************************************************
 FLOW PROCESS FROM NODE    321.00 TO NODE    322.00 IS CODE =  62
----------------------------------------------------------------------------
 >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
 >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
 UPSTREAM ELEVATION(FEET) =  944.90  DOWNSTREAM ELEVATION(FEET) =  942.80
 STREET LENGTH(FEET) =   160.00   CURB HEIGHT(INCHES) =  8.0
 STREET HALFWIDTH(FEET) = 30.00

 DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
 INSIDE STREET CROSSFALL(DECIMAL) =  0.018
 OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

 SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
 STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
 Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
 Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

   **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.11
   STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
   STREET FLOW DEPTH(FEET) =  0.27
   HALFSTREET FLOOD WIDTH(FEET) =    6.03
   AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.14
   PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
 STREET FLOW TRAVEL TIME(MIN.) =   1.25   Tc(MIN.) =    6.51
 * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.587
 SUBAREA LOSS RATE DATA(AMC III):
  DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap     SCS
      LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
 COMMERCIAL                  C        0.20      0.27     0.100    86
 SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
 SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
 SUBAREA AREA(ACRES) =    0.20      SUBAREA RUNOFF(CFS) =    0.82
 EFFECTIVE AREA(ACRES) =      0.35    AREA-AVERAGED Fm(INCH/HR) =  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap =  0.10
 TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.44

 END OF SUBAREA STREET FLOW HYDRAULICS:
 DEPTH(FEET) = 0.29   HALFSTREET FLOOD WIDTH(FEET) =   7.09
 FLOW VELOCITY(FEET/SEC.) =  2.23   DEPTH*VELOCITY(FT*FT/SEC.) =   0.65
 LONGEST FLOWPATH FROM NODE    320.00 TO NODE    322.00 =     350.00 FEET.
============================================================================
 END OF STUDY SUMMARY:
 TOTAL AREA(ACRES)     =        0.4  TC(MIN.) =      6.51
 EFFECTIVE AREA(ACRES) =      0.35  AREA-AVERAGED Fm(INCH/HR)=  0.03
 AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap = 0.100
 PEAK FLOW RATE(CFS)   =       1.44
============================================================================
============================================================================
 END OF RATIONAL METHOD ANALYSIS
```

```
*****************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY **************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                             *
* PROPOSED CONDITION 100-YEAR                                             *
* STREET FLOW FROM SOUTH HALF OF DE BERRY ST (NODES 330-332)              *
 *************************************************************************

  FILE NAME: W:\3711\PR100L.DAT
  TIME/DATE OF STUDY: 15:10 10/09/2019
=============================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
=============================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

*****************************************************************************
  FLOW PROCESS FROM NODE    330.00 TO NODE    331.00 IS CODE =  21
-----------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
=============================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   200.00
  ELEVATION DATA: UPSTREAM(FEET) =    949.30  DOWNSTREAM(FEET) =    945.15

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    5.494
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  5.079
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/       SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE             GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
  COMMERCIAL                  C        0.15      0.27     0.100    86     5.49
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      0.68
  TOTAL AREA(ACRES) =      0.15   PEAK FLOW RATE(CFS) =      0.68

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    332.00 IS CODE =  62
----------------------------------------------------------------------------
  >>>>>COMPUTE STREET FLOW TRAVEL TIME THRU SUBAREA<<<<<
  >>>>>(STREET TABLE SECTION #  1 USED)<<<<<
============================================================================
  UPSTREAM ELEVATION(FEET) =  945.15  DOWNSTREAM ELEVATION(FEET) =  942.75
  STREET LENGTH(FEET) =   200.00   CURB HEIGHT(INCHES) =  8.0
  STREET HALFWIDTH(FEET) = 30.00

  DISTANCE FROM CROWN TO CROSSFALL GRADEBREAK(FEET) =  20.00
  INSIDE STREET CROSSFALL(DECIMAL) =  0.018
  OUTSIDE STREET CROSSFALL(DECIMAL)  =  0.018

  SPECIFIED NUMBER OF HALFSTREETS CARRYING RUNOFF =  1
  STREET PARKWAY CROSSFALL(DECIMAL)  =  0.020
  Manning's FRICTION FACTOR for Streetflow Section(curb-to-curb) =   0.0150
  Manning's FRICTION FACTOR for Back-of-Walk Flow Section =   0.0200

    **TRAVEL TIME COMPUTED USING ESTIMATED FLOW(CFS) =       1.16
    STREETFLOW MODEL RESULTS USING ESTIMATED FLOW:
    STREET FLOW DEPTH(FEET) =  0.28
    HALFSTREET FLOOD WIDTH(FEET) =    6.41
    AVERAGE FLOW VELOCITY(FEET/SEC.) =    2.08
    PRODUCT OF DEPTH&VELOCITY(FT*FT/SEC.) =    0.58
  STREET FLOW TRAVEL TIME(MIN.) =   1.60   Tc(MIN.) =    7.10
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.355
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  A        0.25      0.74     0.100    52
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.74
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.25      SUBAREA RUNOFF(CFS) =    0.96
  EFFECTIVE AREA(ACRES) =      0.40    AREA-AVERAGED Fm(INCH/HR) =  0.06
  AREA-AVERAGED Fp(INCH/HR) =  0.57  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.4        PEAK FLOW RATE(CFS) =       1.55

  END OF SUBAREA STREET FLOW HYDRAULICS:
  DEPTH(FEET) = 0.30   HALFSTREET FLOOD WIDTH(FEET) =   7.59
  FLOW VELOCITY(FEET/SEC.) =  2.18   DEPTH*VELOCITY(FT*FT/SEC.) =   0.65
  LONGEST FLOWPATH FROM NODE    330.00 TO NODE    332.00 =     400.00 FEET.

****************************************************************************
  FLOW PROCESS FROM NODE    331.00 TO NODE    332.00 IS CODE =  81
----------------------------------------------------------------------------
  >>>>>ADDITION OF SUBAREA TO MAINLINE PEAK FLOW<<<<<
============================================================================
  MAINLINE Tc(MIN.) =    7.10
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.355
  SUBAREA LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN
  COMMERCIAL                  C        0.05      0.27     0.100    86
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA AREA(ACRES) =    0.05      SUBAREA RUNOFF(CFS) =    0.19
  EFFECTIVE AREA(ACRES) =      0.45   AREA-AVERAGED Fm(INCH/HR) =  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.53  AREA-AVERAGED Ap =  0.10
  TOTAL AREA(ACRES) =        0.5       PEAK FLOW RATE(CFS) =       1.74
============================================================================
```

```
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)      =        0.5  TC(MIN.) =      7.10
  EFFECTIVE AREA(ACRES) =      0.45  AREA-AVERAGED Fm(INCH/HR)=  0.05
  AREA-AVERAGED Fp(INCH/HR) =  0.53  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)    =       1.74
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

```
**************************************************************************
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* PROPOSED CONDITION 100-YEAR                                            *
* ACCESS ROAD SOUTHWEST OF BUILDING 2 SITE (NODES 340-341)               *
 **************************************************************************

  FILE NAME: W:\3711\PR100M.DAT
  TIME/DATE OF STUDY: 15:23 10/09/2019
==========================================================================
  USER SPECIFIED HYDROLOGY AND HYDRAULIC MODEL INFORMATION:
==========================================================================
                    --*TIME-OF-CONCENTRATION MODEL*--

  USER SPECIFIED STORM EVENT(YEAR) =  100.00
  SPECIFIED MINIMUM PIPE SIZE(INCH) =  12.00
  SPECIFIED PERCENT OF GRADIENTS(DECIMAL) TO USE FOR FRICTION SLOPE = 0.95
  *USER-DEFINED LOGARITHMIC INTERPOLATION USED FOR RAINFALL*

  SLOPE OF INTENSITY DURATION CURVE(LOG(I;IN/HR) vs. LOG(Tc;MIN)) = 0.6000
  USER SPECIFIED 1-HOUR INTENSITY(INCH/HOUR) = 1.2100

  *ANTECEDENT MOISTURE CONDITION (AMC) III ASSUMED FOR RATIONAL METHOD*

  *USER-DEFINED STREET-SECTIONS FOR COUPLED PIPEFLOW AND STREETFLOW MODEL*
     HALF-  CROWN TO   STREET-CROSSFALL:   CURB  GUTTER-GEOMETRIES:  MANNING
     WIDTH  CROSSFALL  IN-  / OUT-/PARK-  HEIGHT  WIDTH  LIP   HIKE  FACTOR
NO.   (FT)     (FT)    SIDE / SIDE/ WAY    (FT)    (FT)  (FT)  (FT)    (n)
===  =====  =========  =================  ======  ===== ====== ===== =======
  1   30.0     20.0    0.018/0.018/0.020   0.67    2.00 0.0312 0.167 0.0150

  GLOBAL STREET FLOW-DEPTH CONSTRAINTS:
    1. Relative Flow-Depth =  0.00 FEET
       as (Maximum Allowable Street Flow Depth) - (Top-of-Curb)
    2. (Depth)*(Velocity) Constraint =  6.0 (FT*FT/S)
  *SIZE PIPE WITH A FLOW CAPACITY GREATER THAN
   OR EQUAL TO THE UPSTREAM TRIBUTARY PIPE.*
  *USER-SPECIFIED MINIMUM TOPOGRAPHIC SLOPE ADJUSTMENT NOT SELECTED

**************************************************************************
  FLOW PROCESS FROM NODE    340.00 TO NODE    341.00 IS CODE =  21
--------------------------------------------------------------------------
  >>>>>RATIONAL METHOD INITIAL SUBAREA ANALYSIS<<<<<
  >>USE TIME-OF-CONCENTRATION NOMOGRAPH FOR INITIAL SUBAREA<<
==========================================================================
  INITIAL SUBAREA FLOW-LENGTH(FEET) =   330.00
  ELEVATION DATA: UPSTREAM(FEET) =    944.00  DOWNSTREAM(FEET) =    935.40

  Tc = K*[(LENGTH** 3.00)/(ELEVATION CHANGE)]**0.20
  SUBAREA ANALYSIS USED MINIMUM Tc(MIN.) =    6.413
  * 100 YEAR RAINFALL INTENSITY(INCH/HR) =  4.628
  SUBAREA Tc AND LOSS RATE DATA(AMC III):
   DEVELOPMENT TYPE/      SCS SOIL   AREA      Fp         Ap      SCS   Tc
       LAND USE            GROUP   (ACRES)  (INCH/HR)  (DECIMAL)  CN  (MIN.)
```

```
                                                    PR100M
  COMMERCIAL                  C        0.30      0.27     0.100    86    6.41
  SUBAREA AVERAGE PERVIOUS LOSS RATE, Fp(INCH/HR) =  0.27
  SUBAREA AVERAGE PERVIOUS AREA FRACTION, Ap =  0.100
  SUBAREA RUNOFF(CFS) =      1.24
  TOTAL AREA(ACRES) =      0.30   PEAK FLOW RATE(CFS) =      1.24
================================================================================
  END OF STUDY SUMMARY:
  TOTAL AREA(ACRES)     =        0.3  TC(MIN.) =      6.41
  EFFECTIVE AREA(ACRES) =      0.30  AREA-AVERAGED Fm(INCH/HR)=  0.03
  AREA-AVERAGED Fp(INCH/HR) =  0.27  AREA-AVERAGED Ap = 0.100
  PEAK FLOW RATE(CFS)   =       1.24
================================================================================
================================================================================
  END OF RATIONAL METHOD ANALYSIS
```

APPENDIX C

DETENTION ANALYSIS

```
************************************************************************
          NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
                AND LOW LOSS FRACTION ESTIMATIONS
========================================================================
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                          Analysis prepared by:

                        THIENES ENGINEERING, INC.
                           14349 FIRESTONE BLVD
                           LA MIRADA, CA 90638


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 Problem Descriptions:
  JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
  100-YEAR LOSS RATE & LOW LOSS FRACTION

========================================================================
*** NON-HOMOGENEOUS WATERSHED AREA-AVERAGED LOSS RATE (Fm)
    AND LOW LOSS FRACTION ESTIMATIONS FOR AMC III:

    TOTAL 24-HOUR DURATION RAINFALL DEPTH =     4.80 (inches)

    SOIL-COVER     AREA      PERCENT OF    SCS CURVE    LOSS RATE
       TYPE      (Acres)   PERVIOUS AREA    NUMBER    Fp(in./hr.)    YIELD
         1         47.50       10.00       56.(AMC II)     0.423       0.905

    TOTAL AREA (Acres) =     47.50

    AREA-AVERAGED LOSS RATE, Fm (in./hr.) =  0.042

    AREA-AVERAGED LOW LOSS FRACTION, Y = 0.095
========================================================================
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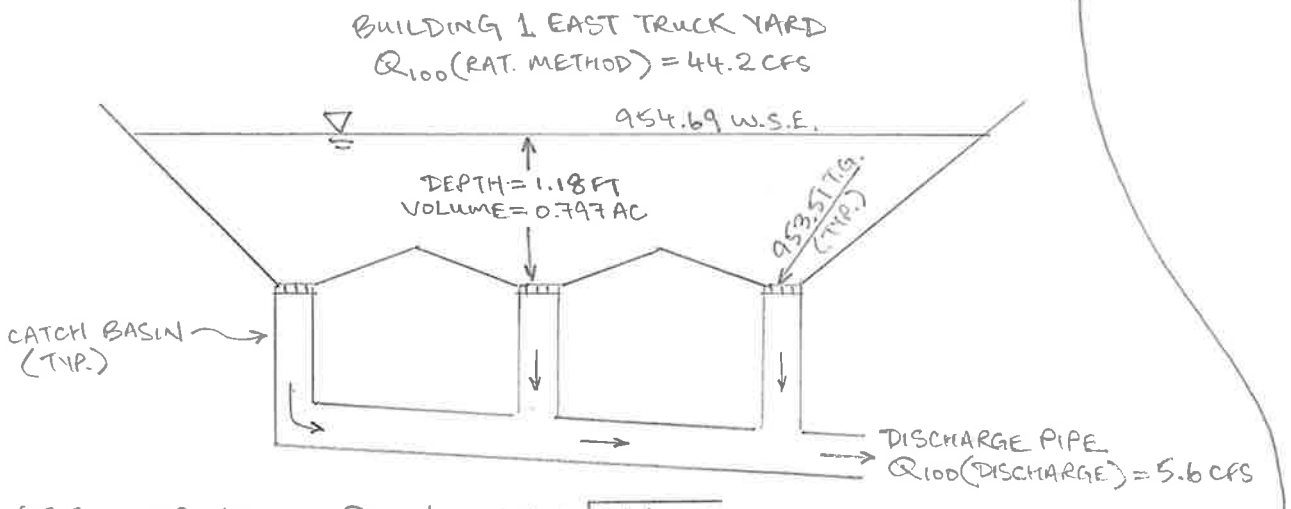
JOB #3711 - BARTON ROAD & TERRACE AVE, COLTON
DETENTION IN BUILDING 1 EAST TRUCK YARD (NODE 121)

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Q Discharge (cfs)
953.51	0.00	0				
			10	10	0.00	4.0
953.60	0.09	220				
			237	247	0.01	4.3
953.80	0.29	2150				
			1333	1580	0.04	4.6
954.00	0.49	11180				
			3884	5464	0.13	4.9
954.20	0.69	27660				
			7891	13355	0.31	5.2
954.40	0.89	51250				
			12764	26119	0.60	5.5
954.60	1.09	76390				
			18217	44336	1.02	5.8
954.80	1.29	105780				
			23885	68221	1.57	6.0
955.00	1.49	133070				
			29030	97251	2.23	6.2
955.20	1.69	157230				
			9490	106741	2.45	6.3
955.26	1.75	159100				



ORIFICE EQUATION : $Q = 0.6 * AREA * \sqrt{64.4 * H}$

H = DEPTH + 1.00 FT

CROSS-SECTION AREA OF 12" DISCHARGE PIPE.
$= 3.14 * (6/12\ FT^2)$
$= 0.79\ FT^2$

e.g. AT ELEVATION 955.00 (DEPTH = 1.49 FT OR H = 2.49 FT)
$Q(DISCHARGE) = 0.6 * 0.79 * \sqrt{64.4 * 2.49} = 6.0\ CFS$

```
**************************************************************************

            F L O O D    R O U T I N G    A N A L Y S I S
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                          Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* 100-YEAR DETENTION                                                     *
* NORTH OF BARTON ROAD, BUILDING 1 EAST TRUCK YARD (NODE 121)            *
 ************************************************************************

  FILE NAME: W:\3711\TRUCK1E.DAT
  TIME/DATE OF STUDY: 10:04 06/24/2019


**************************************************************************
  FLOW PROCESS FROM NODE    121.00 TO NODE    121.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      12.400 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.110 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.042
         LOW LOSS FRACTION = 0.095
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.44
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.90
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.21
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  1.85
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.40
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  4.80

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  75.758


==========================================================================
                     UNIT HYDROGRAPH DETERMINATION
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	10.090	15.131
2	59.010	73.362
3	92.268	49.874
4	98.542	9.409
5	99.502	1.440
6	99.801	0.448
7	99.950	0.224
8	100.000	0.075

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0083	0.0008	0.0075
2	0.0084	0.0008	0.0076
3	0.0084	0.0008	0.0076
4	0.0084	0.0008	0.0076
5	0.0084	0.0008	0.0076
6	0.0084	0.0008	0.0076
7	0.0085	0.0008	0.0077
8	0.0085	0.0008	0.0077
9	0.0085	0.0008	0.0077
10	0.0085	0.0008	0.0077
11	0.0086	0.0008	0.0078
12	0.0086	0.0008	0.0078
13	0.0086	0.0008	0.0078
14	0.0086	0.0008	0.0078
15	0.0087	0.0008	0.0078
16	0.0087	0.0008	0.0079
17	0.0087	0.0008	0.0079
18	0.0087	0.0008	0.0079
19	0.0088	0.0008	0.0079
20	0.0088	0.0008	0.0079
21	0.0088	0.0008	0.0080
22	0.0088	0.0008	0.0080
23	0.0089	0.0008	0.0080
24	0.0089	0.0008	0.0080
25	0.0089	0.0008	0.0081
26	0.0089	0.0008	0.0081
27	0.0090	0.0009	0.0081
28	0.0090	0.0009	0.0081
29	0.0090	0.0009	0.0082
30	0.0090	0.0009	0.0082
31	0.0091	0.0009	0.0082
32	0.0091	0.0009	0.0082
33	0.0091	0.0009	0.0083
34	0.0092	0.0009	0.0083
35	0.0092	0.0009	0.0083
36	0.0092	0.0009	0.0083
37	0.0093	0.0009	0.0084
38	0.0093	0.0009	0.0084
39	0.0093	0.0009	0.0084
40	0.0093	0.0009	0.0084
41	0.0094	0.0009	0.0085
42	0.0094	0.0009	0.0085
43	0.0094	0.0009	0.0085
44	0.0095	0.0009	0.0086
45	0.0095	0.0009	0.0086
46	0.0095	0.0009	0.0086
47	0.0096	0.0009	0.0087

48	0.0096	0.0009	0.0087
49	0.0096	0.0009	0.0087
50	0.0097	0.0009	0.0087
51	0.0097	0.0009	0.0088
52	0.0097	0.0009	0.0088
53	0.0098	0.0009	0.0088
54	0.0098	0.0009	0.0089
55	0.0098	0.0009	0.0089
56	0.0099	0.0009	0.0089
57	0.0099	0.0009	0.0090
58	0.0099	0.0009	0.0090
59	0.0100	0.0009	0.0090
60	0.0100	0.0010	0.0091
61	0.0101	0.0010	0.0091
62	0.0101	0.0010	0.0091
63	0.0101	0.0010	0.0092
64	0.0102	0.0010	0.0092
65	0.0102	0.0010	0.0092
66	0.0102	0.0010	0.0093
67	0.0103	0.0010	0.0093
68	0.0103	0.0010	0.0093
69	0.0104	0.0010	0.0094
70	0.0104	0.0010	0.0094
71	0.0105	0.0010	0.0095
72	0.0105	0.0010	0.0095
73	0.0106	0.0010	0.0096
74	0.0106	0.0010	0.0096
75	0.0106	0.0010	0.0096
76	0.0107	0.0010	0.0097
77	0.0107	0.0010	0.0097
78	0.0108	0.0010	0.0097
79	0.0108	0.0010	0.0098
80	0.0109	0.0010	0.0098
81	0.0109	0.0010	0.0099
82	0.0110	0.0010	0.0099
83	0.0110	0.0010	0.0100
84	0.0111	0.0011	0.0100
85	0.0111	0.0011	0.0101
86	0.0112	0.0011	0.0101
87	0.0112	0.0011	0.0102
88	0.0113	0.0011	0.0102
89	0.0113	0.0011	0.0103
90	0.0114	0.0011	0.0103
91	0.0115	0.0011	0.0104
92	0.0115	0.0011	0.0104
93	0.0116	0.0011	0.0105
94	0.0116	0.0011	0.0105
95	0.0117	0.0011	0.0106
96	0.0117	0.0011	0.0106
97	0.0118	0.0011	0.0107
98	0.0118	0.0011	0.0107
99	0.0119	0.0011	0.0108
100	0.0120	0.0011	0.0108
101	0.0121	0.0011	0.0109
102	0.0121	0.0011	0.0110
103	0.0122	0.0012	0.0110
104	0.0122	0.0012	0.0111
105	0.0123	0.0012	0.0112
106	0.0124	0.0012	0.0112
107	0.0125	0.0012	0.0113
108	0.0125	0.0012	0.0113
109	0.0126	0.0012	0.0114
110	0.0127	0.0012	0.0115
111	0.0128	0.0012	0.0116
112	0.0128	0.0012	0.0116
113	0.0129	0.0012	0.0117
114	0.0130	0.0012	0.0118

115	0.0131	0.0012	0.0119
116	0.0132	0.0013	0.0119
117	0.0133	0.0013	0.0120
118	0.0133	0.0013	0.0121
119	0.0135	0.0013	0.0122
120	0.0135	0.0013	0.0122
121	0.0136	0.0013	0.0123
122	0.0137	0.0013	0.0124
123	0.0138	0.0013	0.0125
124	0.0139	0.0013	0.0126
125	0.0140	0.0013	0.0127
126	0.0141	0.0013	0.0128
127	0.0142	0.0014	0.0129
128	0.0143	0.0014	0.0130
129	0.0145	0.0014	0.0131
130	0.0145	0.0014	0.0132
131	0.0147	0.0014	0.0133
132	0.0148	0.0014	0.0134
133	0.0149	0.0014	0.0135
134	0.0150	0.0014	0.0136
135	0.0152	0.0014	0.0138
136	0.0153	0.0015	0.0138
137	0.0155	0.0015	0.0140
138	0.0156	0.0015	0.0141
139	0.0158	0.0015	0.0143
140	0.0159	0.0015	0.0144
141	0.0161	0.0015	0.0145
142	0.0162	0.0015	0.0146
143	0.0164	0.0016	0.0148
144	0.0165	0.0016	0.0149
145	0.0126	0.0012	0.0114
146	0.0127	0.0012	0.0115
147	0.0129	0.0012	0.0117
148	0.0130	0.0012	0.0118
149	0.0133	0.0013	0.0120
150	0.0134	0.0013	0.0121
151	0.0137	0.0013	0.0124
152	0.0138	0.0013	0.0125
153	0.0141	0.0013	0.0128
154	0.0143	0.0014	0.0129
155	0.0146	0.0014	0.0132
156	0.0147	0.0014	0.0133
157	0.0151	0.0014	0.0136
158	0.0152	0.0014	0.0138
159	0.0156	0.0015	0.0141
160	0.0158	0.0015	0.0143
161	0.0162	0.0015	0.0147
162	0.0164	0.0016	0.0149
163	0.0169	0.0016	0.0153
164	0.0171	0.0016	0.0155
165	0.0177	0.0017	0.0160
166	0.0179	0.0017	0.0162
167	0.0185	0.0018	0.0167
168	0.0188	0.0018	0.0170
169	0.0201	0.0019	0.0181
170	0.0204	0.0019	0.0185
171	0.0212	0.0020	0.0192
172	0.0216	0.0020	0.0195
173	0.0225	0.0021	0.0203
174	0.0229	0.0022	0.0208
175	0.0240	0.0023	0.0217
176	0.0246	0.0023	0.0222
177	0.0258	0.0025	0.0234
178	0.0265	0.0025	0.0240
179	0.0281	0.0027	0.0254
180	0.0290	0.0028	0.0262
181	0.0309	0.0029	0.0280

182	0.0321	0.0030	0.0290
183	0.0347	0.0033	0.0314
184	0.0363	0.0034	0.0328
185	0.0441	0.0035	0.0406
186	0.0465	0.0035	0.0430
187	0.0524	0.0035	0.0489
188	0.0564	0.0035	0.0529
189	0.0632	0.0035	0.0597
190	0.0713	0.0035	0.0678
191	0.1019	0.0035	0.0984
192	0.1404	0.0035	0.1369
193	0.4398	0.0035	0.4363
194	0.0830	0.0035	0.0795
195	0.0612	0.0035	0.0577
196	0.0492	0.0035	0.0457
197	0.0380	0.0035	0.0345
198	0.0333	0.0032	0.0302
199	0.0299	0.0028	0.0271
200	0.0273	0.0026	0.0247
201	0.0252	0.0024	0.0228
202	0.0235	0.0022	0.0212
203	0.0220	0.0021	0.0199
204	0.0208	0.0020	0.0188
205	0.0191	0.0018	0.0173
206	0.0182	0.0017	0.0165
207	0.0174	0.0017	0.0157
208	0.0167	0.0016	0.0151
209	0.0160	0.0015	0.0145
210	0.0154	0.0015	0.0140
211	0.0149	0.0014	0.0135
212	0.0144	0.0014	0.0130
213	0.0140	0.0013	0.0126
214	0.0135	0.0013	0.0123
215	0.0132	0.0012	0.0119
216	0.0128	0.0012	0.0116
217	0.0166	0.0016	0.0150
218	0.0163	0.0015	0.0147
219	0.0160	0.0015	0.0144
220	0.0157	0.0015	0.0142
221	0.0154	0.0015	0.0139
222	0.0151	0.0014	0.0137
223	0.0149	0.0014	0.0135
224	0.0146	0.0014	0.0132
225	0.0144	0.0014	0.0130
226	0.0142	0.0013	0.0128
227	0.0140	0.0013	0.0126
228	0.0138	0.0013	0.0125
229	0.0136	0.0013	0.0123
230	0.0134	0.0013	0.0121
231	0.0132	0.0013	0.0120
232	0.0130	0.0012	0.0118
233	0.0129	0.0012	0.0117
234	0.0127	0.0012	0.0115
235	0.0126	0.0012	0.0114
236	0.0124	0.0012	0.0112
237	0.0123	0.0012	0.0111
238	0.0121	0.0012	0.0110
239	0.0120	0.0011	0.0109
240	0.0119	0.0011	0.0108
241	0.0118	0.0011	0.0106
242	0.0116	0.0011	0.0105
243	0.0115	0.0011	0.0104
244	0.0114	0.0011	0.0103
245	0.0113	0.0011	0.0102
246	0.0112	0.0011	0.0101
247	0.0111	0.0011	0.0100
248	0.0110	0.0010	0.0099

249	0.0109	0.0010	0.0099
250	0.0108	0.0010	0.0098
251	0.0107	0.0010	0.0097
252	0.0106	0.0010	0.0096
253	0.0105	0.0010	0.0095
254	0.0104	0.0010	0.0094
255	0.0104	0.0010	0.0094
256	0.0103	0.0010	0.0093
257	0.0102	0.0010	0.0092
258	0.0101	0.0010	0.0092
259	0.0100	0.0010	0.0091
260	0.0100	0.0009	0.0090
261	0.0099	0.0009	0.0089
262	0.0098	0.0009	0.0089
263	0.0097	0.0009	0.0088
264	0.0097	0.0009	0.0088
265	0.0096	0.0009	0.0087
266	0.0095	0.0009	0.0086
267	0.0095	0.0009	0.0086
268	0.0094	0.0009	0.0085
269	0.0094	0.0009	0.0085
270	0.0093	0.0009	0.0084
271	0.0092	0.0009	0.0084
272	0.0092	0.0009	0.0083
273	0.0091	0.0009	0.0083
274	0.0091	0.0009	0.0082
275	0.0090	0.0009	0.0082
276	0.0090	0.0009	0.0081
277	0.0089	0.0008	0.0081
278	0.0088	0.0008	0.0080
279	0.0088	0.0008	0.0080
280	0.0087	0.0008	0.0079
281	0.0087	0.0008	0.0079
282	0.0086	0.0008	0.0078
283	0.0086	0.0008	0.0078
284	0.0086	0.0008	0.0077
285	0.0085	0.0008	0.0077
286	0.0085	0.0008	0.0077
287	0.0084	0.0008	0.0076
288	0.0084	0.0008	0.0076

TOTAL STORM RAINFALL(INCHES) = 4.80
TOTAL SOIL-LOSS(INCHES) = 0.38
TOTAL EFFECTIVE RAINFALL(INCHES) = 4.42

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.3958
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 4.5618

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	12.5	25.0	37.5	50.0
0.083	0.0008	0.11 Q	.	.	.	.	
0.167	0.0054	0.67 Q	.	.	.	.	
0.250	0.0126	1.05 Q	.	.	.	.	
0.333	0.0203	1.12 Q	.	.	.	.	
0.417	0.0281	1.13 Q	.	.	.	.	
0.500	0.0360	1.14 Q	.	.	.	.	

0.583	0.0438	1.14	Q	.	.	.	.
0.667	0.0518	1.15	Q	.	.	.	.
0.750	0.0597	1.15	Q	.	.	.	.
0.833	0.0676	1.15	Q	.	.	.	.
0.917	0.0756	1.16	Q	.	.	.	.
1.000	0.0836	1.16	Q	.	.	.	.
1.083	0.0916	1.16	Q	.	.	.	.
1.167	0.0997	1.17	Q	.	.	.	.
1.250	0.1077	1.17	Q	.	.	.	.
1.333	0.1158	1.17	QV	.	.	.	.
1.417	0.1239	1.18	QV	.	.	.	.
1.500	0.1320	1.18	QV	.	.	.	.
1.583	0.1402	1.18	QV	.	.	.	.
1.667	0.1484	1.19	QV	.	.	.	.
1.750	0.1566	1.19	QV	.	.	.	.
1.833	0.1648	1.19	QV	.	.	.	.
1.917	0.1730	1.20	QV	.	.	.	.
2.000	0.1813	1.20	QV	.	.	.	.
2.083	0.1896	1.20	QV	.	.	.	.
2.167	0.1979	1.21	QV	.	.	.	.
2.250	0.2063	1.21	QV	.	.	.	.
2.333	0.2146	1.22	QV	.	.	.	.
2.417	0.2230	1.22	QV	.	.	.	.
2.500	0.2315	1.22	Q V	.	.	.	.
2.583	0.2399	1.23	Q V	.	.	.	.
2.667	0.2484	1.23	Q V	.	.	.	.
2.750	0.2569	1.23	Q V	.	.	.	.
2.833	0.2654	1.24	Q V	.	.	.	.
2.917	0.2740	1.24	Q V	.	.	.	.
3.000	0.2825	1.25	Q V	.	.	.	.
3.083	0.2912	1.25	Q V	.	.	.	.
3.167	0.2998	1.25	.QV	.	.	.	.
3.250	0.3084	1.26	.QV	.	.	.	.
3.333	0.3171	1.26	.QV	.	.	.	.
3.417	0.3259	1.27	.QV	.	.	.	.
3.500	0.3346	1.27	.QV	.	.	.	.
3.583	0.3434	1.27	.Q V	.	.	.	.
3.667	0.3522	1.28	.Q V	.	.	.	.
3.750	0.3610	1.28	.Q V	.	.	.	.
3.833	0.3699	1.29	.Q V	.	.	.	.
3.917	0.3788	1.29	.Q V	.	.	.	.
4.000	0.3877	1.30	.Q V	.	.	.	.
4.083	0.3967	1.30	.Q V	.	.	.	.
4.167	0.4056	1.30	.Q V	.	.	.	.
4.250	0.4147	1.31	.Q V	.	.	.	.
4.333	0.4237	1.31	.Q V	.	.	.	.
4.417	0.4328	1.32	.Q V	.	.	.	.
4.500	0.4419	1.32	.Q V	.	.	.	.
4.583	0.4511	1.33	.Q V	.	.	.	.
4.667	0.4602	1.33	.Q V	.	.	.	.
4.750	0.4695	1.34	.Q V	.	.	.	.
4.833	0.4787	1.34	.Q V	.	.	.	.
4.917	0.4880	1.35	.Q V	.	.	.	.
5.000	0.4973	1.35	.Q V	.	.	.	.
5.083	0.5066	1.36	.Q V	.	.	.	.
5.167	0.5160	1.36	.Q V	.	.	.	.
5.250	0.5255	1.37	.Q V	.	.	.	.
5.333	0.5349	1.37	.Q V	.	.	.	.
5.417	0.5444	1.38	.Q V	.	.	.	.
5.500	0.5539	1.38	.Q V	.	.	.	.
5.583	0.5635	1.39	.Q V	.	.	.	.
5.667	0.5731	1.39	.Q V	.	.	.	.
5.750	0.5828	1.40	.Q V	.	.	.	.
5.833	0.5924	1.41	.Q V	.	.	.	.
5.917	0.6022	1.41	.Q V	.	.	.	.
6.000	0.6119	1.42	.Q V	.	.	.	.
6.083	0.6217	1.42	.Q V	.	.	.	.

6.167	0.6316	1.43	.Q	V	.	.	.	.
6.250	0.6414	1.44	.Q	V	.	.	.	.
6.333	0.6514	1.44	.Q	V	.	.	.	.
6.417	0.6613	1.45	.Q	V	.	.	.	.
6.500	0.6714	1.45	.Q	V	.	.	.	.
6.583	0.6814	1.46	.Q	V	.	.	.	.
6.667	0.6915	1.47	.Q	V	.	.	.	.
6.750	0.7016	1.47	.Q	V	.	.	.	.
6.833	0.7118	1.48	.Q	V	.	.	.	.
6.917	0.7221	1.49	.Q	V	.	.	.	.
7.000	0.7323	1.49	.Q	V	.	.	.	.
7.083	0.7427	1.50	.Q	V	.	.	.	.
7.167	0.7530	1.51	.Q	V	.	.	.	.
7.250	0.7635	1.51	.Q	V	.	.	.	.
7.333	0.7739	1.52	.Q	V	.	.	.	.
7.417	0.7845	1.53	.Q	V	.	.	.	.
7.500	0.7950	1.54	.Q	V	.	.	.	.
7.583	0.8057	1.54	.Q	V	.	.	.	.
7.667	0.8163	1.55	.Q	V	.	.	.	.
7.750	0.8271	1.56	.Q	V	.	.	.	.
7.833	0.8378	1.57	.Q	V	.	.	.	.
7.917	0.8487	1.57	.Q	V	.	.	.	.
8.000	0.8596	1.58	.Q	V	.	.	.	.
8.083	0.8705	1.59	.Q	V	.	.	.	.
8.167	0.8815	1.60	.Q	V	.	.	.	.
8.250	0.8926	1.61	.Q	V	.	.	.	.
8.333	0.9037	1.61	.Q	V	.	.	.	.
8.417	0.9149	1.62	.Q	V	.	.	.	.
8.500	0.9261	1.63	.Q	V	.	.	.	.
8.583	0.9374	1.64	.Q	V	.	.	.	.
8.667	0.9488	1.65	.Q	V	.	.	.	.
8.750	0.9602	1.66	.Q	V	.	.	.	.
8.833	0.9717	1.67	.Q	V	.	.	.	.
8.917	0.9832	1.68	.Q	V	.	.	.	.
9.000	0.9948	1.69	.Q	V	.	.	.	.
9.083	1.0065	1.70	.Q	V	.	.	.	.
9.167	1.0183	1.71	.Q	V	.	.	.	.
9.250	1.0301	1.72	.Q	V.	.	.	.	.
9.333	1.0420	1.73	.Q	V.	.	.	.	.
9.417	1.0540	1.74	.Q	V.	.	.	.	.
9.500	1.0661	1.75	.Q	V.	.	.	.	.
9.583	1.0782	1.76	.Q	V.	.	.	.	.
9.667	1.0904	1.77	.Q	V.	.	.	.	.
9.750	1.1027	1.78	.Q	V.	.	.	.	.
9.833	1.1150	1.80	.Q	V.	.	.	.	.
9.917	1.1275	1.81	.Q	V.	.	.	.	.
10.000	1.1400	1.82	.Q	V.	.	.	.	.
10.083	1.1526	1.83	.Q	V	.	.	.	.
10.167	1.1653	1.84	.Q	V	.	.	.	.
10.250	1.1781	1.86	.Q	V	.	.	.	.
10.333	1.1910	1.87	.Q	V	.	.	.	.
10.417	1.2039	1.88	.Q	V	.	.	.	.
10.500	1.2170	1.90	.Q	V	.	.	.	.
10.583	1.2302	1.91	.Q	V	.	.	.	.
10.667	1.2434	1.93	.Q	V	.	.	.	.
10.750	1.2568	1.94	.Q	.V	.	.	.	.
10.833	1.2703	1.96	.Q	.V	.	.	.	.
10.917	1.2838	1.97	.Q	.V	.	.	.	.
11.000	1.2975	1.99	.Q	.V	.	.	.	.
11.083	1.3113	2.00	.Q	.V	.	.	.	.
11.167	1.3252	2.02	.Q	.V	.	.	.	.
11.250	1.3392	2.04	.Q	.V	.	.	.	.
11.333	1.3534	2.05	.Q	.V	.	.	.	.
11.417	1.3676	2.07	.Q	.V	.	.	.	.
11.500	1.3820	2.09	.Q	. V	.	.	.	.
11.583	1.3966	2.11	.Q	. V	.	.	.	.
11.667	1.4112	2.13	.Q	. V	.	.	.	.

11.750	1.4260	2.15	.Q	.	V	.	.	.	.
11.833	1.4409	2.17	.Q	.	V	.	.	.	.
11.917	1.4560	2.19	.Q	.	V	.	.	.	.
12.000	1.4712	2.21	.Q	.	V	.	.	.	.
12.083	1.4862	2.18	.Q	.	V	.	.	.	.
12.167	1.4995	1.92	.Q	.	V	.	.	.	.
12.250	1.5116	1.76	.Q	.	V	.	.	.	.
12.333	1.5236	1.75	.Q	.	V	.	.	.	.
12.417	1.5358	1.77	.Q	.	V	.	.	.	.
12.500	1.5481	1.79	.Q	.	V	.	.	.	.
12.583	1.5606	1.81	.Q	.	V	.	.	.	.
12.667	1.5733	1.84	.Q	.	V	.	.	.	.
12.750	1.5862	1.87	.Q	.	V	.	.	.	.
12.833	1.5992	1.90	.Q	.	V	.	.	.	.
12.917	1.6125	1.93	.Q	.	V	.	.	.	.
13.000	1.6260	1.96	.Q	.	V	.	.	.	.
13.083	1.6397	1.99	.Q	.	V	.	.	.	.
13.167	1.6537	2.03	.Q	.	V	.	.	.	.
13.250	1.6678	2.06	.Q	.	V	.	.	.	.
13.333	1.6823	2.10	.Q	.	V	.	.	.	.
13.417	1.6970	2.14	.Q	.	V	.	.	.	.
13.500	1.7120	2.18	.Q	.	V	.	.	.	.
13.583	1.7273	2.22	.Q	.	V	.	.	.	.
13.667	1.7430	2.27	.Q	.	V	.	.	.	.
13.750	1.7589	2.32	.Q	.	V	.	.	.	.
13.833	1.7752	2.37	.Q	.	V	.	.	.	.
13.917	1.7919	2.42	.Q	.	V	.	.	.	.
14.000	1.8090	2.48	.Q	.	V	.	.	.	.
14.083	1.8265	2.55	. Q	.	V	.	.	.	.
14.167	1.8448	2.65	. Q	.	V	.	.	.	.
14.250	1.8637	2.75	. Q	.	V	.	.	.	.
14.333	1.8832	2.83	. Q	.	V	.	.	.	.
14.417	1.9032	2.91	. Q	.	V	.	.	.	.
14.500	1.9238	3.00	. Q	.	V	.	.	.	.
14.583	1.9451	3.09	. Q	.	V	.	.	.	.
14.667	1.9672	3.20	. Q	.	V	.	.	.	.
14.750	1.9899	3.31	. Q	.	V	.	.	.	.
14.833	2.0136	3.44	. Q	.	V	.	.	.	.
14.917	2.0381	3.57	. Q	.	V	.	.	.	.
15.000	2.0638	3.73	. Q	.	V	.	.	.	.
15.083	2.0906	3.89	. Q	.	V	.	.	.	.
15.167	2.1188	4.09	. Q	.	V	.	.	.	.
15.250	2.1484	4.30	. Q	.	V	.	.	.	.
15.333	2.1799	4.57	. Q	.	V.	.	.	.	.
15.417	2.2138	4.92	. Q	.	V.	.	.	.	.
15.500	2.2525	5.62	. Q	.	V.	.	.	.	.
15.583	2.2959	6.30	. Q	.	V	.	.	.	.
15.667	2.3440	6.99	. Q	.	V	.	.	.	.
15.750	2.3971	7.71	. Q	.	.V	.	.	.	.
15.833	2.4563	8.59	. Q	.	.V	.	.	.	.
15.917	2.5254	10.04	. Q	.	. V	.	.	.	.
16.000	2.6173	13.34	. Q	.	. V	.	.	.	.
16.083	2.7710	22.31	.	.	Q	.	V	.	.
16.167	3.0540	41.10	.	.	.	V	. Q	.	.
16.250	3.2602	29.94	.	.	. Q	V .	.	.	.
16.333	3.3515	13.25	.	Q	.	V.	.	.	.
16.417	3.4081	8.22	. Q	.	.	V.	.	.	.
16.500	3.4505	6.16	. Q	.	.	V	.	.	.
16.583	3.4850	5.00	. Q	.	.	V	.	.	.
16.667	3.5148	4.33	. Q	.	.	V	.	.	.
16.750	3.5415	3.88	. Q	.	.	.V	.	.	.
16.833	3.5660	3.55	. Q	.	.	.V	.	.	.
16.917	3.5886	3.29	. Q	.	.	.V	.	.	.
17.000	3.6098	3.08	. Q	.	.	.V	.	.	.
17.083	3.6297	2.89	. Q	.	.	.V	.	.	.
17.167	3.6482	2.69	. Q	.	.	.V	.	.	.
17.250	3.6657	2.53	. Q	.	.	. V	.	.	.

17.333	3.6823	2.41	.Q	.	.	.	V	.		
17.417	3.6982	2.31	.Q	.	.	.	V	.		
17.500	3.7134	2.21	.Q	.	.	.	V	.		
17.583	3.7281	2.13	.Q	.	.	.	V	.		
17.667	3.7422	2.05	.Q	.	.	.	V	.		
17.750	3.7559	1.98	.Q	.	.	.	V	.		
17.833	3.7691	1.92	.Q	.	.	.	V	.		
17.917	3.7819	1.86	.Q	.	.	.	V	.		
18.000	3.7944	1.81	.Q	.	.	.	V	.		
18.083	3.8069	1.81	.Q	.	.	.	V	.		
18.167	3.8209	2.04	.Q	.	.	.	V	.		
18.250	3.8360	2.18	.Q	.	.	.	V	.		
18.333	3.8509	2.18	.Q	.	.	.	V	.		
18.417	3.8657	2.14	.Q	.	.	.	V	.		
18.500	3.8802	2.10	.Q	.	.	.	V	.		
18.583	3.8944	2.07	.Q	.	.	.	V	.		
18.667	3.9084	2.03	.Q	.	.	.	V	.		
18.750	3.9222	2.00	.Q	.	.	.	V	.		
18.833	3.9357	1.97	.Q	.	.	.	V	.		
18.917	3.9490	1.94	.Q	.	.	.	V	.		
19.000	3.9622	1.91	.Q	.	.	.	V	.		
19.083	3.9751	1.88	.Q	.	.	.	V	.		
19.167	3.9879	1.85	.Q	.	.	.	V	.		
19.250	4.0005	1.83	.Q	.	.	.	V	.		
19.333	4.0129	1.80	.Q	.	.	.	V	.		
19.417	4.0252	1.78	.Q	.	.	.	V	.		
19.500	4.0373	1.76	.Q	.	.	.	V	.		
19.583	4.0492	1.74	.Q	.	.	.	V	.		
19.667	4.0610	1.72	.Q	.	.	.	V	.		
19.750	4.0727	1.69	.Q	.	.	.	V	.		
19.833	4.0843	1.68	.Q	.	.	.	V	.		
19.917	4.0957	1.66	.Q	.	.	.	V	.		
20.000	4.1069	1.64	.Q	.	.	.	V	.		
20.083	4.1181	1.62	.Q	.	.	.	V	.		
20.167	4.1291	1.60	.Q	.	.	.	V	.		
20.250	4.1401	1.59	.Q	.	.	.	V	.		
20.333	4.1509	1.57	.Q	.	.	.	V	.		
20.417	4.1616	1.56	.Q	.	.	.	V	.		
20.500	4.1722	1.54	.Q	.	.	.	V	.		
20.583	4.1827	1.53	.Q	.	.	.	V	.		
20.667	4.1931	1.51	.Q	.	.	.	V	.		
20.750	4.2035	1.50	.Q	.	.	.	V	.		
20.833	4.2137	1.48	.Q	.	.	.	V	.		
20.917	4.2238	1.47	.Q	.	.	.	V	.		
21.000	4.2338	1.46	.Q	.	.	.	V	.		
21.083	4.2438	1.45	.Q	.	.	.	V	.		
21.167	4.2537	1.43	.Q	.	.	.	V	.		
21.250	4.2635	1.42	.Q	.	.	.	V	.		
21.333	4.2732	1.41	.Q	.	.	.	V	.		
21.417	4.2828	1.40	.Q	.	.	.	V	.		
21.500	4.2924	1.39	.Q	.	.	.	V	.		
21.583	4.3019	1.38	.Q	.	.	.	V	.		
21.667	4.3113	1.37	.Q	.	.	.	V	.		
21.750	4.3206	1.36	.Q	.	.	.	V	.		
21.833	4.3299	1.35	.Q	.	.	.	V	.		
21.917	4.3391	1.34	.Q	.	.	.	V	.		
22.000	4.3482	1.33	.Q	.	.	.	V	.		
22.083	4.3573	1.32	.Q	.	.	.	V	.		
22.167	4.3663	1.31	.Q	.	.	.	V	.		
22.250	4.3753	1.30	.Q	.	.	.	V	.		
22.333	4.3841	1.29	.Q	.	.	.	V	.		
22.417	4.3930	1.28	.Q	.	.	.	V	.		
22.500	4.4017	1.27	.Q	.	.	.	V	.		
22.583	4.4104	1.26	.Q	.	.	.	V	.		
22.667	4.4191	1.26	.Q	.	.	.	V	.		
22.750	4.4277	1.25	Q	.	.	.	V	.		
22.833	4.4362	1.24	Q	.	.	.	V	.		

22.917	4.4447	1.23	Q	.	.	.	V .
23.000	4.4532	1.23	Q	.	.	.	V.
23.083	4.4616	1.22	Q	.	.	.	V.
23.167	4.4699	1.21	Q	.	.	.	V.
23.250	4.4782	1.20	Q	.	.	.	V.
23.333	4.4864	1.20	Q	.	.	.	V.
23.417	4.4946	1.19	Q	.	.	.	V.
23.500	4.5028	1.18	Q	.	.	.	V.
23.583	4.5109	1.18	Q	.	.	.	V.
23.667	4.5189	1.17	Q	.	.	.	V.
23.750	4.5269	1.16	Q	.	.	.	V.
23.833	4.5349	1.16	Q	.	.	.	V.
23.917	4.5428	1.15	Q	.	.	.	V.
24.000	4.5507	1.14	Q	.	.	.	V.
24.083	4.5578	1.02	Q	.	.	.	V.
24.167	4.5610	0.47	Q	.	.	.	V.
24.250	4.5616	0.09	Q	.	.	.	V.
24.333	4.5617	0.02	Q	.	.	.	V.
24.417	4.5617	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1465.0
10%	90.0
20%	35.0
30%	25.0
40%	15.0
50%	15.0
60%	10.0
70%	10.0
80%	5.0
90%	5.0

****
FLOW PROCESS FROM NODE 121.00 TO NODE 121.00 IS CODE = 3.1

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
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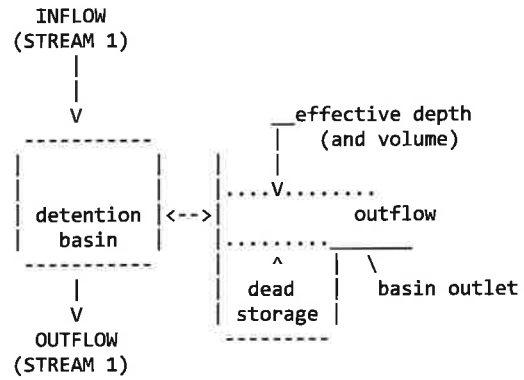


ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN
SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000

TRUCK1E

SPECIFIED DEAD STORAGE(AF) FILLED = 0.000

SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000

DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	0.09	4.00	0.002
3	0.29	4.30	0.006
4	0.49	4.60	0.040
5	0.69	4.90	0.130
6	0.89	5.20	0.310
7	1.09	5.50	0.600
8	1.29	5.80	1.020
9	1.49	6.00	1.570
10	1.69	6.20	2.230
11	1.75	6.30	2.450

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.083	0.000	0.11	0.00	0.00	0.1	0.000
0.167	0.000	0.67	0.00	0.02	0.6	0.001
0.250	0.000	1.05	0.00	0.02	1.0	0.001
0.333	0.000	1.12	0.00	0.03	1.1	0.001
0.417	0.000	1.13	0.00	0.03	1.1	0.001
0.500	0.000	1.14	0.00	0.03	1.1	0.001
0.583	0.000	1.14	0.00	0.03	1.1	0.001
0.667	0.000	1.15	0.00	0.03	1.1	0.001
0.750	0.000	1.15	0.00	0.03	1.2	0.001
0.833	0.000	1.15	0.00	0.03	1.2	0.001
0.917	0.000	1.16	0.00	0.03	1.2	0.001
1.000	0.000	1.16	0.00	0.03	1.2	0.001
1.083	0.000	1.16	0.00	0.03	1.2	0.001
1.167	0.000	1.17	0.00	0.03	1.2	0.001
1.250	0.000	1.17	0.00	0.03	1.2	0.001
1.333	0.000	1.17	0.00	0.03	1.2	0.001
1.417	0.000	1.18	0.00	0.03	1.2	0.001
1.500	0.000	1.18	0.00	0.03	1.2	0.001
1.583	0.000	1.18	0.00	0.03	1.2	0.001
1.667	0.000	1.19	0.00	0.03	1.2	0.001
1.750	0.000	1.19	0.00	0.03	1.2	0.001
1.833	0.000	1.19	0.00	0.03	1.2	0.001
1.917	0.000	1.20	0.00	0.03	1.2	0.001
2.000	0.000	1.20	0.00	0.03	1.2	0.001
2.083	0.000	1.20	0.00	0.03	1.2	0.001
2.167	0.000	1.21	0.00	0.03	1.2	0.001
2.250	0.000	1.21	0.00	0.03	1.2	0.001
2.333	0.000	1.22	0.00	0.03	1.2	0.001
2.417	0.000	1.22	0.00	0.03	1.2	0.001
2.500	0.000	1.22	0.00	0.03	1.2	0.001
2.583	0.000	1.23	0.00	0.03	1.2	0.001
2.667	0.000	1.23	0.00	0.03	1.2	0.001
2.750	0.000	1.23	0.00	0.03	1.2	0.001
2.833	0.000	1.24	0.00	0.03	1.2	0.001
2.917	0.000	1.24	0.00	0.03	1.2	0.001
3.000	0.000	1.25	0.00	0.03	1.2	0.001

TRUCK1E

3.083	0.000	1.25	0.00	0.03	1.2	0.001
3.167	0.000	1.25	0.00	0.03	1.3	0.001
3.250	0.000	1.26	0.00	0.03	1.3	0.001
3.333	0.000	1.26	0.00	0.03	1.3	0.001
3.417	0.000	1.27	0.00	0.03	1.3	0.001
3.500	0.000	1.27	0.00	0.03	1.3	0.001
3.583	0.000	1.27	0.00	0.03	1.3	0.001
3.667	0.000	1.28	0.00	0.03	1.3	0.001
3.750	0.000	1.28	0.00	0.03	1.3	0.001
3.833	0.000	1.29	0.00	0.03	1.3	0.001
3.917	0.000	1.29	0.00	0.03	1.3	0.001
4.000	0.000	1.30	0.00	0.03	1.3	0.001
4.083	0.000	1.30	0.00	0.03	1.3	0.001
4.167	0.000	1.30	0.00	0.03	1.3	0.001
4.250	0.000	1.31	0.00	0.03	1.3	0.001
4.333	0.000	1.31	0.00	0.03	1.3	0.001
4.417	0.000	1.32	0.00	0.03	1.3	0.001
4.500	0.000	1.32	0.00	0.03	1.3	0.001
4.583	0.000	1.33	0.00	0.03	1.3	0.001
4.667	0.000	1.33	0.00	0.03	1.3	0.001
4.750	0.000	1.34	0.00	0.03	1.3	0.001
4.833	0.000	1.34	0.00	0.03	1.3	0.001
4.917	0.000	1.35	0.00	0.03	1.3	0.001
5.000	0.000	1.35	0.00	0.03	1.4	0.001
5.083	0.000	1.36	0.00	0.03	1.4	0.001
5.167	0.000	1.36	0.00	0.03	1.4	0.001
5.250	0.000	1.37	0.00	0.03	1.4	0.001
5.333	0.000	1.37	0.00	0.03	1.4	0.001
5.417	0.000	1.38	0.00	0.03	1.4	0.001
5.500	0.000	1.38	0.00	0.03	1.4	0.001
5.583	0.000	1.39	0.00	0.03	1.4	0.001
5.667	0.000	1.39	0.00	0.03	1.4	0.001
5.750	0.000	1.40	0.00	0.03	1.4	0.001
5.833	0.000	1.41	0.00	0.03	1.4	0.001
5.917	0.000	1.41	0.00	0.03	1.4	0.001
6.000	0.000	1.42	0.00	0.03	1.4	0.001
6.083	0.000	1.42	0.00	0.03	1.4	0.001
6.167	0.000	1.43	0.00	0.03	1.4	0.001
6.250	0.000	1.44	0.00	0.03	1.4	0.001
6.333	0.000	1.44	0.00	0.03	1.4	0.001
6.417	0.000	1.45	0.00	0.03	1.4	0.001
6.500	0.000	1.45	0.00	0.03	1.5	0.001
6.583	0.000	1.46	0.00	0.03	1.5	0.001
6.667	0.000	1.47	0.00	0.03	1.5	0.001
6.750	0.000	1.47	0.00	0.03	1.5	0.001
6.833	0.000	1.48	0.00	0.03	1.5	0.001
6.917	0.000	1.49	0.00	0.03	1.5	0.001
7.000	0.000	1.49	0.00	0.03	1.5	0.001
7.083	0.000	1.50	0.00	0.03	1.5	0.001
7.167	0.000	1.51	0.00	0.03	1.5	0.001
7.250	0.000	1.51	0.00	0.03	1.5	0.001
7.333	0.000	1.52	0.00	0.03	1.5	0.001
7.417	0.000	1.53	0.00	0.03	1.5	0.001
7.500	0.000	1.54	0.00	0.03	1.5	0.001
7.583	0.000	1.54	0.00	0.03	1.5	0.001
7.667	0.000	1.55	0.00	0.03	1.5	0.001
7.750	0.000	1.56	0.00	0.04	1.6	0.001
7.833	0.000	1.57	0.00	0.04	1.6	0.001
7.917	0.000	1.57	0.00	0.04	1.6	0.001
8.000	0.000	1.58	0.00	0.04	1.6	0.001
8.083	0.000	1.59	0.00	0.04	1.6	0.001
8.167	0.000	1.60	0.00	0.04	1.6	0.001
8.250	0.000	1.61	0.00	0.04	1.6	0.001
8.333	0.000	1.61	0.00	0.04	1.6	0.001
8.417	0.000	1.62	0.00	0.04	1.6	0.001
8.500	0.000	1.63	0.00	0.04	1.6	0.001
8.583	0.000	1.64	0.00	0.04	1.6	0.001

TRUCK1E

8.667	0.000	1.65	0.00	0.04	1.6	0.001
8.750	0.000	1.66	0.00	0.04	1.7	0.001
8.833	0.000	1.67	0.00	0.04	1.7	0.001
8.917	0.000	1.68	0.00	0.04	1.7	0.001
9.000	0.000	1.69	0.00	0.04	1.7	0.001
9.083	0.000	1.70	0.00	0.04	1.7	0.001
9.167	0.000	1.71	0.00	0.04	1.7	0.001
9.250	0.000	1.72	0.00	0.04	1.7	0.001
9.333	0.000	1.73	0.00	0.04	1.7	0.001
9.417	0.000	1.74	0.00	0.04	1.7	0.001
9.500	0.000	1.75	0.00	0.04	1.7	0.001
9.583	0.000	1.76	0.00	0.04	1.8	0.001
9.667	0.000	1.77	0.00	0.04	1.8	0.001
9.750	0.000	1.78	0.00	0.04	1.8	0.001
9.833	0.000	1.80	0.00	0.04	1.8	0.001
9.917	0.000	1.81	0.00	0.04	1.8	0.001
10.000	0.000	1.82	0.00	0.04	1.8	0.001
10.083	0.000	1.83	0.00	0.04	1.8	0.001
10.167	0.000	1.84	0.00	0.04	1.8	0.001
10.250	0.000	1.86	0.00	0.04	1.9	0.001
10.333	0.000	1.87	0.00	0.04	1.9	0.001
10.417	0.000	1.88	0.00	0.04	1.9	0.001
10.500	0.000	1.90	0.00	0.04	1.9	0.001
10.583	0.000	1.91	0.00	0.04	1.9	0.001
10.667	0.000	1.93	0.00	0.04	1.9	0.001
10.750	0.000	1.94	0.00	0.04	1.9	0.001
10.833	0.000	1.96	0.00	0.04	2.0	0.001
10.917	0.000	1.97	0.00	0.04	2.0	0.001
11.000	0.000	1.99	0.00	0.04	2.0	0.001
11.083	0.000	2.00	0.00	0.05	2.0	0.001
11.167	0.000	2.02	0.00	0.05	2.0	0.001
11.250	0.000	2.04	0.00	0.05	2.0	0.001
11.333	0.000	2.05	0.00	0.05	2.1	0.001
11.417	0.000	2.07	0.00	0.05	2.1	0.001
11.500	0.000	2.09	0.00	0.05	2.1	0.001
11.583	0.000	2.11	0.00	0.05	2.1	0.001
11.667	0.000	2.13	0.00	0.05	2.1	0.001
11.750	0.000	2.15	0.00	0.05	2.1	0.001
11.833	0.000	2.17	0.00	0.05	2.2	0.001
11.917	0.000	2.19	0.00	0.05	2.2	0.001
12.000	0.000	2.21	0.00	0.05	2.2	0.001
12.083	0.000	2.18	0.00	0.05	2.2	0.001
12.167	0.000	1.92	0.00	0.04	2.0	0.001
12.250	0.000	1.76	0.00	0.04	1.8	0.001
12.333	0.000	1.75	0.00	0.04	1.7	0.001
12.417	0.000	1.77	0.00	0.04	1.8	0.001
12.500	0.000	1.79	0.00	0.04	1.8	0.001
12.583	0.000	1.81	0.00	0.04	1.8	0.001
12.667	0.000	1.84	0.00	0.04	1.8	0.001
12.750	0.000	1.87	0.00	0.04	1.9	0.001
12.833	0.000	1.90	0.00	0.04	1.9	0.001
12.917	0.000	1.93	0.00	0.04	1.9	0.001
13.000	0.000	1.96	0.00	0.04	2.0	0.001
13.083	0.000	1.99	0.00	0.05	2.0	0.001
13.167	0.000	2.03	0.00	0.05	2.0	0.001
13.250	0.000	2.06	0.00	0.05	2.1	0.001
13.333	0.000	2.10	0.00	0.05	2.1	0.001
13.417	0.000	2.14	0.00	0.05	2.1	0.001
13.500	0.000	2.18	0.00	0.05	2.2	0.001
13.583	0.000	2.22	0.00	0.05	2.2	0.001
13.667	0.000	2.27	0.00	0.05	2.3	0.001
13.750	0.000	2.32	0.00	0.05	2.3	0.001
13.833	0.000	2.37	0.00	0.05	2.4	0.001
13.917	0.000	2.42	0.00	0.05	2.4	0.001
14.000	0.000	2.48	0.00	0.06	2.5	0.001
14.083	0.000	2.55	0.00	0.06	2.5	0.001
14.167	0.000	2.65	0.00	0.06	2.6	0.001

TRUCK1E

14.250	0.000	2.75	0.00	0.06	2.7	0.001
14.333	0.000	2.83	0.00	0.06	2.8	0.001
14.417	0.000	2.91	0.00	0.07	2.9	0.001
14.500	0.000	3.00	0.00	0.07	3.0	0.002
14.583	0.000	3.09	0.00	0.07	3.1	0.002
14.667	0.000	3.20	0.00	0.07	3.2	0.002
14.750	0.000	3.31	0.00	0.08	3.3	0.002
14.833	0.000	3.44	0.00	0.08	3.4	0.002
14.917	0.000	3.57	0.00	0.08	3.6	0.002
15.000	0.000	3.73	0.00	0.09	3.7	0.002
15.083	0.000	3.89	0.00	0.09	3.9	0.002
15.167	0.000	4.09	0.00	0.12	4.0	0.003
15.250	0.000	4.30	0.00	0.19	4.1	0.004
15.333	0.000	4.57	0.00	0.29	4.2	0.006
15.417	0.000	4.92	0.00	0.32	4.3	0.011
15.500	0.000	5.62	0.00	0.37	4.4	0.019
15.583	0.000	6.30	0.00	0.44	4.5	0.032
15.667	0.000	6.99	0.00	0.51	4.6	0.048
15.750	0.000	7.71	0.00	0.56	4.7	0.069
15.833	0.000	8.59	0.00	0.61	4.7	0.096
15.917	0.000	10.04	0.00	0.69	4.8	0.132
16.000	0.000	13.34	0.00	0.76	5.0	0.189
16.083	0.000	22.31	0.00	0.89	5.1	0.308
16.167	0.000	41.10	0.00	1.06	5.3	0.554
16.250	0.000	29.94	0.00	1.15	5.5	0.722
16.333	0.000	13.25	0.00	1.17	5.6	0.775
16.417	0.000	8.22	0.00	1.18	5.6	0.793
16.500	0.000	6.16	0.00	1.18	5.6	0.797
16.583	0.000	5.00	0.00	1.18	5.6	0.792
16.667	0.000	4.33	0.00	1.18	5.6	0.783
16.750	0.000	3.88	0.00	1.17	5.6	0.771
16.833	0.000	3.55	0.00	1.16	5.6	0.757
16.917	0.000	3.29	0.00	1.16	5.6	0.741
17.000	0.000	3.08	0.00	1.15	5.6	0.724
17.083	0.000	2.89	0.00	1.14	5.6	0.705
17.167	0.000	2.69	0.00	1.13	5.6	0.685
17.250	0.000	2.53	0.00	1.12	5.6	0.664
17.333	0.000	2.41	0.00	1.11	5.5	0.643
17.417	0.000	2.31	0.00	1.10	5.5	0.621
17.500	0.000	2.21	0.00	1.09	5.5	0.598
17.583	0.000	2.13	0.00	1.07	5.5	0.575
17.667	0.000	2.05	0.00	1.06	5.5	0.551
17.750	0.000	1.98	0.00	1.04	5.4	0.528
17.833	0.000	1.92	0.00	1.02	5.4	0.504
17.917	0.000	1.86	0.00	1.01	5.4	0.479
18.000	0.000	1.81	0.00	0.99	5.4	0.455
18.083	0.000	1.81	0.00	0.97	5.3	0.431
18.167	0.000	2.04	0.00	0.96	5.3	0.408
18.250	0.000	2.18	0.00	0.94	5.3	0.387
18.333	0.000	2.18	0.00	0.93	5.3	0.365
18.417	0.000	2.14	0.00	0.91	5.2	0.344
18.500	0.000	2.10	0.00	0.90	5.2	0.323
18.583	0.000	2.07	0.00	0.88	5.2	0.301
18.667	0.000	2.03	0.00	0.86	5.2	0.279
18.750	0.000	2.00	0.00	0.83	5.1	0.258
18.833	0.000	1.97	0.00	0.81	5.1	0.236
18.917	0.000	1.94	0.00	0.78	5.1	0.215
19.000	0.000	1.91	0.00	0.76	5.0	0.193
19.083	0.000	1.88	0.00	0.74	5.0	0.172
19.167	0.000	1.85	0.00	0.71	5.0	0.151
19.250	0.000	1.83	0.00	0.69	4.9	0.129
19.333	0.000	1.80	0.00	0.64	4.9	0.108
19.417	0.000	1.78	0.00	0.60	4.8	0.087
19.500	0.000	1.76	0.00	0.55	4.7	0.067
19.583	0.000	1.74	0.00	0.51	4.7	0.047
19.667	0.000	1.72	0.00	0.42	4.6	0.027
19.750	0.000	1.69	0.00	0.31	4.4	0.009

Q_{100}(DISCHARGE) = 5.6 CFS
DEPTH = 1.18 FT
VOLUME = 0.797 AC-FT

				TRUCK1E		
19.833	0.000	1.68	0.00	0.03	2.8	0.001
19.917	0.000	1.66	0.00	0.04	1.6	0.001
20.000	0.000	1.64	0.00	0.03	1.7	0.001
20.083	0.000	1.62	0.00	0.04	1.6	0.001
20.167	0.000	1.60	0.00	0.03	1.6	0.001
20.250	0.000	1.59	0.00	0.04	1.6	0.001
20.333	0.000	1.57	0.00	0.03	1.6	0.001
20.417	0.000	1.56	0.00	0.04	1.5	0.001
20.500	0.000	1.54	0.00	0.03	1.5	0.001
20.583	0.000	1.53	0.00	0.03	1.5	0.001
20.667	0.000	1.51	0.00	0.03	1.5	0.001
20.750	0.000	1.50	0.00	0.03	1.5	0.001
20.833	0.000	1.48	0.00	0.03	1.5	0.001
20.917	0.000	1.47	0.00	0.03	1.5	0.001
21.000	0.000	1.46	0.00	0.03	1.5	0.001
21.083	0.000	1.45	0.00	0.03	1.4	0.001
21.167	0.000	1.43	0.00	0.03	1.4	0.001
21.250	0.000	1.42	0.00	0.03	1.4	0.001
21.333	0.000	1.41	0.00	0.03	1.4	0.001
21.417	0.000	1.40	0.00	0.03	1.4	0.001
21.500	0.000	1.39	0.00	0.03	1.4	0.001
21.583	0.000	1.38	0.00	0.03	1.4	0.001
21.667	0.000	1.37	0.00	0.03	1.4	0.001
21.750	0.000	1.36	0.00	0.03	1.4	0.001
21.833	0.000	1.35	0.00	0.03	1.3	0.001
21.917	0.000	1.34	0.00	0.03	1.3	0.001
22.000	0.000	1.33	0.00	0.03	1.3	0.001
22.083	0.000	1.32	0.00	0.03	1.3	0.001
22.167	0.000	1.31	0.00	0.03	1.3	0.001
22.250	0.000	1.30	0.00	0.03	1.3	0.001
22.333	0.000	1.29	0.00	0.03	1.3	0.001
22.417	0.000	1.28	0.00	0.03	1.3	0.001
22.500	0.000	1.27	0.00	0.03	1.3	0.001
22.583	0.000	1.26	0.00	0.03	1.3	0.001
22.667	0.000	1.26	0.00	0.03	1.3	0.001
22.750	0.000	1.25	0.00	0.03	1.2	0.001
22.833	0.000	1.24	0.00	0.03	1.2	0.001
22.917	0.000	1.23	0.00	0.03	1.2	0.001
23.000	0.000	1.23	0.00	0.03	1.2	0.001
23.083	0.000	1.22	0.00	0.03	1.2	0.001
23.167	0.000	1.21	0.00	0.03	1.2	0.001
23.250	0.000	1.20	0.00	0.03	1.2	0.001
23.333	0.000	1.20	0.00	0.03	1.2	0.001
23.417	0.000	1.19	0.00	0.03	1.2	0.001
23.500	0.000	1.18	0.00	0.03	1.2	0.001
23.583	0.000	1.18	0.00	0.03	1.2	0.001
23.667	0.000	1.17	0.00	0.03	1.2	0.001
23.750	0.000	1.16	0.00	0.03	1.2	0.001
23.833	0.000	1.16	0.00	0.03	1.2	0.001
23.917	0.000	1.15	0.00	0.03	1.2	0.001

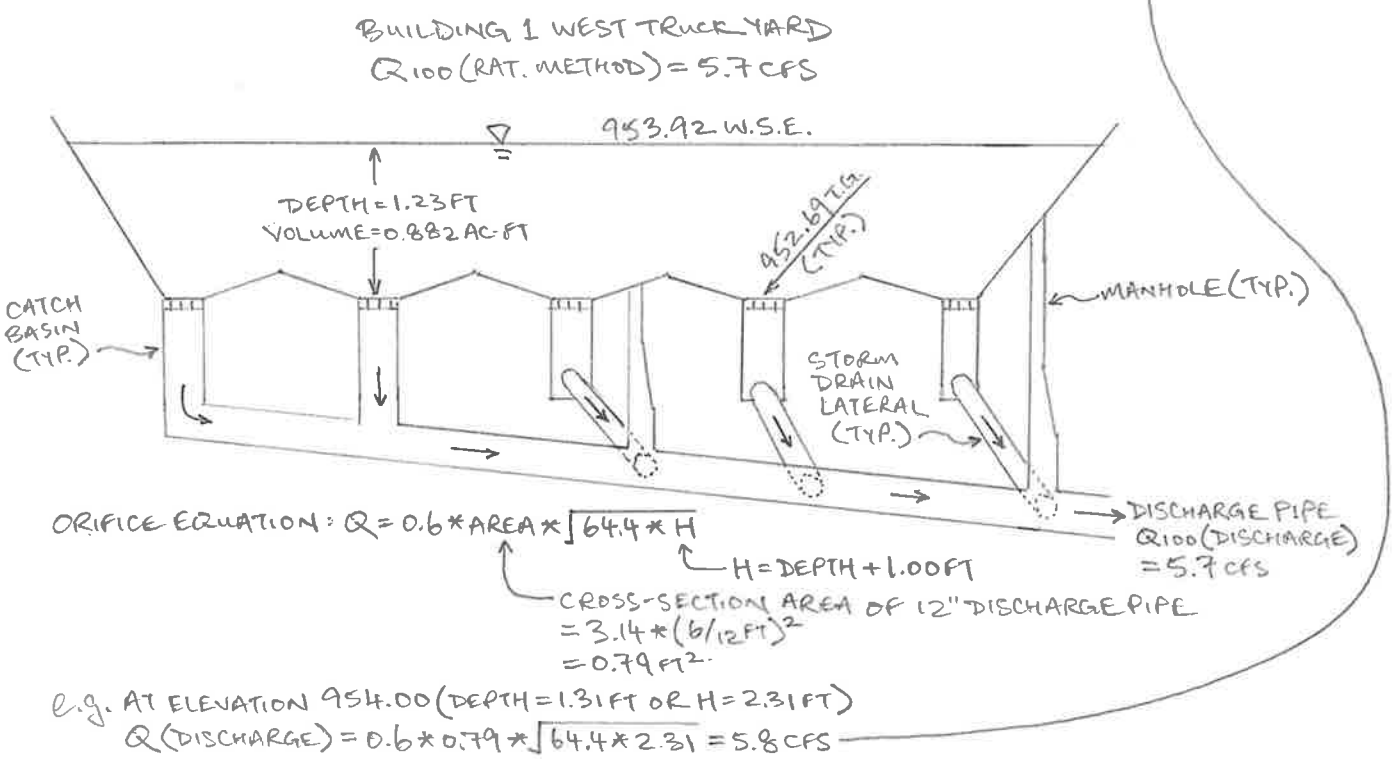
PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 4.562 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 4.562 AF
LOSS VOLUME = 0.000 AF

==========

END OF FLOODSCx ROUTING ANALYSIS

JOB #3711 - BARTON ROAD & TERRACE AVE, COLTON
DETENTION IN BUILDING 1 WEST TRUCK YARD (NODE 162)

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Q Discharge (cfs)
952.69	0.00	0				
			52	52	0.00	4.0
952.80	0.11	950				
			960	1012	0.02	4.4
953.00	0.31	8650				
			3024	4036	0.09	4.7
953.20	0.51	21590				
			5711	9747	0.22	5.0
953.40	0.71	35520				
			8520	18267	0.42	5.3
953.60	0.91	49680				
			11386	29653	0.68	5.5
953.80	1.11	64180				
			14203	43856	1.01	5.8
954.00	1.31	77850				
			16959	60815	1.40	6.0
954.20	1.51	91740				
			9522	70337	1.61	6.2
954.30	1.61	98700				



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            F L O O D    R O U T I N G    A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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                         Analysis prepared by:




 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* 100-YEAR DETENTION                                                     *
* NORTH OF BARTON ROAD, BUILDING 1 WEST TRUCK YARD (NODE 162)            *
 ************************************************************************

  FILE NAME: W:\3711\TRUCK1W.DAT
  TIME/DATE OF STUDY: 10:37 06/24/2019


**************************************************************************
  FLOW PROCESS FROM NODE    162.00 TO NODE    162.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      13.200 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.130 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.042
         LOW LOSS FRACTION = 0.095
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.44
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.90
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.21
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  1.85
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.40
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  4.80

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  64.103


==========================================================================
                     UNIT HYDROGRAPH DETERMINATION
```

TRUCK1W

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	7.295	11.646
2	46.095	61.938
3	85.053	62.193
4	96.839	18.814
5	98.998	3.447
6	99.527	0.845
7	99.811	0.453
8	99.953	0.226
9	100.000	0.075

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0083	0.0008	0.0075
2	0.0084	0.0008	0.0076
3	0.0084	0.0008	0.0076
4	0.0084	0.0008	0.0076
5	0.0084	0.0008	0.0076
6	0.0084	0.0008	0.0076
7	0.0085	0.0008	0.0077
8	0.0085	0.0008	0.0077
9	0.0085	0.0008	0.0077
10	0.0085	0.0008	0.0077
11	0.0086	0.0008	0.0078
12	0.0086	0.0008	0.0078
13	0.0086	0.0008	0.0078
14	0.0086	0.0008	0.0078
15	0.0087	0.0008	0.0078
16	0.0087	0.0008	0.0079
17	0.0087	0.0008	0.0079
18	0.0087	0.0008	0.0079
19	0.0088	0.0008	0.0079
20	0.0088	0.0008	0.0079
21	0.0088	0.0008	0.0080
22	0.0088	0.0008	0.0080
23	0.0089	0.0008	0.0080
24	0.0089	0.0008	0.0080
25	0.0089	0.0008	0.0081
26	0.0089	0.0008	0.0081
27	0.0090	0.0009	0.0081
28	0.0090	0.0009	0.0081
29	0.0090	0.0009	0.0082
30	0.0090	0.0009	0.0082
31	0.0091	0.0009	0.0082
32	0.0091	0.0009	0.0082
33	0.0091	0.0009	0.0083
34	0.0092	0.0009	0.0083
35	0.0092	0.0009	0.0083
36	0.0092	0.0009	0.0083
37	0.0093	0.0009	0.0084
38	0.0093	0.0009	0.0084
39	0.0093	0.0009	0.0084
40	0.0093	0.0009	0.0084
41	0.0094	0.0009	0.0085
42	0.0094	0.0009	0.0085
43	0.0094	0.0009	0.0085
44	0.0095	0.0009	0.0086
45	0.0095	0.0009	0.0086
46	0.0095	0.0009	0.0086

47	0.0096	0.0009	0.0087
48	0.0096	0.0009	0.0087
49	0.0096	0.0009	0.0087
50	0.0097	0.0009	0.0087
51	0.0097	0.0009	0.0088
52	0.0097	0.0009	0.0088
53	0.0098	0.0009	0.0088
54	0.0098	0.0009	0.0089
55	0.0098	0.0009	0.0089
56	0.0099	0.0009	0.0089
57	0.0099	0.0009	0.0090
58	0.0099	0.0009	0.0090
59	0.0100	0.0009	0.0090
60	0.0100	0.0010	0.0091
61	0.0101	0.0010	0.0091
62	0.0101	0.0010	0.0091
63	0.0101	0.0010	0.0092
64	0.0102	0.0010	0.0092
65	0.0102	0.0010	0.0092
66	0.0102	0.0010	0.0093
67	0.0103	0.0010	0.0093
68	0.0103	0.0010	0.0093
69	0.0104	0.0010	0.0094
70	0.0104	0.0010	0.0094
71	0.0105	0.0010	0.0095
72	0.0105	0.0010	0.0095
73	0.0106	0.0010	0.0096
74	0.0106	0.0010	0.0096
75	0.0106	0.0010	0.0096
76	0.0107	0.0010	0.0097
77	0.0107	0.0010	0.0097
78	0.0108	0.0010	0.0097
79	0.0108	0.0010	0.0098
80	0.0109	0.0010	0.0098
81	0.0109	0.0010	0.0099
82	0.0110	0.0010	0.0099
83	0.0110	0.0010	0.0100
84	0.0111	0.0011	0.0100
85	0.0111	0.0011	0.0101
86	0.0112	0.0011	0.0101
87	0.0112	0.0011	0.0102
88	0.0113	0.0011	0.0102
89	0.0113	0.0011	0.0103
90	0.0114	0.0011	0.0103
91	0.0115	0.0011	0.0104
92	0.0115	0.0011	0.0104
93	0.0116	0.0011	0.0105
94	0.0116	0.0011	0.0105
95	0.0117	0.0011	0.0106
96	0.0117	0.0011	0.0106
97	0.0118	0.0011	0.0107
98	0.0118	0.0011	0.0107
99	0.0119	0.0011	0.0108
100	0.0120	0.0011	0.0108
101	0.0121	0.0011	0.0109
102	0.0121	0.0011	0.0110
103	0.0122	0.0012	0.0110
104	0.0122	0.0012	0.0111
105	0.0123	0.0012	0.0112
106	0.0124	0.0012	0.0112
107	0.0125	0.0012	0.0113
108	0.0125	0.0012	0.0113
109	0.0126	0.0012	0.0114
110	0.0127	0.0012	0.0115
111	0.0128	0.0012	0.0116
112	0.0128	0.0012	0.0116
113	0.0129	0.0012	0.0117

114	0.0130	0.0012	0.0118
115	0.0131	0.0012	0.0119
116	0.0132	0.0013	0.0119
117	0.0133	0.0013	0.0120
118	0.0133	0.0013	0.0121
119	0.0135	0.0013	0.0122
120	0.0135	0.0013	0.0122
121	0.0136	0.0013	0.0123
122	0.0137	0.0013	0.0124
123	0.0138	0.0013	0.0125
124	0.0139	0.0013	0.0126
125	0.0140	0.0013	0.0127
126	0.0141	0.0013	0.0128
127	0.0142	0.0014	0.0129
128	0.0143	0.0014	0.0130
129	0.0145	0.0014	0.0131
130	0.0145	0.0014	0.0132
131	0.0147	0.0014	0.0133
132	0.0148	0.0014	0.0134
133	0.0149	0.0014	0.0135
134	0.0150	0.0014	0.0136
135	0.0152	0.0014	0.0138
136	0.0153	0.0015	0.0138
137	0.0155	0.0015	0.0140
138	0.0156	0.0015	0.0141
139	0.0158	0.0015	0.0143
140	0.0159	0.0015	0.0144
141	0.0161	0.0015	0.0145
142	0.0162	0.0015	0.0146
143	0.0164	0.0016	0.0148
144	0.0165	0.0016	0.0149
145	0.0126	0.0012	0.0114
146	0.0127	0.0012	0.0115
147	0.0129	0.0012	0.0117
148	0.0130	0.0012	0.0118
149	0.0133	0.0013	0.0120
150	0.0134	0.0013	0.0121
151	0.0137	0.0013	0.0124
152	0.0138	0.0013	0.0125
153	0.0141	0.0013	0.0128
154	0.0143	0.0014	0.0129
155	0.0146	0.0014	0.0132
156	0.0147	0.0014	0.0133
157	0.0151	0.0014	0.0136
158	0.0152	0.0014	0.0138
159	0.0156	0.0015	0.0141
160	0.0158	0.0015	0.0143
161	0.0162	0.0015	0.0147
162	0.0164	0.0016	0.0149
163	0.0169	0.0016	0.0153
164	0.0171	0.0016	0.0155
165	0.0177	0.0017	0.0160
166	0.0179	0.0017	0.0162
167	0.0185	0.0018	0.0167
168	0.0188	0.0018	0.0170
169	0.0201	0.0019	0.0181
170	0.0204	0.0019	0.0185
171	0.0212	0.0020	0.0192
172	0.0216	0.0020	0.0195
173	0.0225	0.0021	0.0203
174	0.0229	0.0022	0.0208
175	0.0240	0.0023	0.0217
176	0.0246	0.0023	0.0222
177	0.0258	0.0025	0.0234
178	0.0265	0.0025	0.0240
179	0.0281	0.0027	0.0254
180	0.0290	0.0028	0.0262

181	0.0309	0.0029	0.0280
182	0.0321	0.0030	0.0290
183	0.0347	0.0033	0.0314
184	0.0363	0.0034	0.0328
185	0.0441	0.0035	0.0406
186	0.0465	0.0035	0.0430
187	0.0524	0.0035	0.0489
188	0.0564	0.0035	0.0529
189	0.0632	0.0035	0.0597
190	0.0713	0.0035	0.0678
191	0.1019	0.0035	0.0984
192	0.1404	0.0035	0.1369
193	0.4397	0.0035	0.4362
194	0.0830	0.0035	0.0795
195	0.0612	0.0035	0.0577
196	0.0492	0.0035	0.0457
197	0.0380	0.0035	0.0345
198	0.0333	0.0032	0.0302
199	0.0299	0.0028	0.0271
200	0.0273	0.0026	0.0247
201	0.0252	0.0024	0.0228
202	0.0235	0.0022	0.0212
203	0.0220	0.0021	0.0199
204	0.0208	0.0020	0.0188
205	0.0191	0.0018	0.0173
206	0.0182	0.0017	0.0165
207	0.0174	0.0017	0.0157
208	0.0167	0.0016	0.0151
209	0.0160	0.0015	0.0145
210	0.0154	0.0015	0.0140
211	0.0149	0.0014	0.0135
212	0.0144	0.0014	0.0130
213	0.0140	0.0013	0.0126
214	0.0135	0.0013	0.0123
215	0.0132	0.0012	0.0119
216	0.0128	0.0012	0.0116
217	0.0166	0.0016	0.0150
218	0.0163	0.0015	0.0147
219	0.0160	0.0015	0.0144
220	0.0157	0.0015	0.0142
221	0.0154	0.0015	0.0139
222	0.0151	0.0014	0.0137
223	0.0149	0.0014	0.0135
224	0.0146	0.0014	0.0132
225	0.0144	0.0014	0.0130
226	0.0142	0.0013	0.0128
227	0.0140	0.0013	0.0126
228	0.0138	0.0013	0.0125
229	0.0136	0.0013	0.0123
230	0.0134	0.0013	0.0121
231	0.0132	0.0013	0.0120
232	0.0130	0.0012	0.0118
233	0.0129	0.0012	0.0117
234	0.0127	0.0012	0.0115
235	0.0126	0.0012	0.0114
236	0.0124	0.0012	0.0112
237	0.0123	0.0012	0.0111
238	0.0121	0.0012	0.0110
239	0.0120	0.0011	0.0109
240	0.0119	0.0011	0.0108
241	0.0118	0.0011	0.0106
242	0.0116	0.0011	0.0105
243	0.0115	0.0011	0.0104
244	0.0114	0.0011	0.0103
245	0.0113	0.0011	0.0102
246	0.0112	0.0011	0.0101
247	0.0111	0.0011	0.0100

248	0.0110	0.0010	0.0099
249	0.0109	0.0010	0.0099
250	0.0108	0.0010	0.0098
251	0.0107	0.0010	0.0097
252	0.0106	0.0010	0.0096
253	0.0105	0.0010	0.0095
254	0.0104	0.0010	0.0094
255	0.0104	0.0010	0.0094
256	0.0103	0.0010	0.0093
257	0.0102	0.0010	0.0092
258	0.0101	0.0010	0.0092
259	0.0100	0.0010	0.0091
260	0.0100	0.0009	0.0090
261	0.0099	0.0009	0.0089
262	0.0098	0.0009	0.0089
263	0.0097	0.0009	0.0088
264	0.0097	0.0009	0.0088
265	0.0096	0.0009	0.0087
266	0.0095	0.0009	0.0086
267	0.0095	0.0009	0.0086
268	0.0094	0.0009	0.0085
269	0.0094	0.0009	0.0085
270	0.0093	0.0009	0.0084
271	0.0092	0.0009	0.0084
272	0.0092	0.0009	0.0083
273	0.0091	0.0009	0.0083
274	0.0091	0.0009	0.0082
275	0.0090	0.0009	0.0082
276	0.0090	0.0009	0.0081
277	0.0089	0.0008	0.0081
278	0.0088	0.0008	0.0080
279	0.0088	0.0008	0.0080
280	0.0087	0.0008	0.0079
281	0.0087	0.0008	0.0079
282	0.0086	0.0008	0.0078
283	0.0086	0.0008	0.0078
284	0.0086	0.0008	0.0077
285	0.0085	0.0008	0.0077
286	0.0085	0.0008	0.0077
287	0.0084	0.0008	0.0076
288	0.0084	0.0008	0.0076

TOTAL STORM RAINFALL(INCHES) = 4.80
TOTAL SOIL-LOSS(INCHES) = 0.38
TOTAL EFFECTIVE RAINFALL(INCHES) = 4.42

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.4213
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 4.8561

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	10.0	20.0	30.0	40.0
0.083	0.0006	0.09	Q	.	.	.	.
0.167	0.0044	0.56	Q	.	.	.	.
0.250	0.0115	1.03	VQ	.	.	.	.
0.333	0.0196	1.17	VQ	.	.	.	.
0.417	0.0278	1.20	VQ	.	.	.	.

0.500	0.0362	1.21	VQ	.	.	.	.
0.583	0.0445	1.22	VQ	.	.	.	.
0.667	0.0529	1.22	VQ	.	.	.	.
0.750	0.0614	1.22	VQ	.	.	.	.
0.833	0.0698	1.23	VQ	.	.	.	.
0.917	0.0783	1.23	VQ	.	.	.	.
1.000	0.0868	1.23	VQ	.	.	.	.
1.083	0.0953	1.24	VQ	.	.	.	.
1.167	0.1039	1.24	VQ	.	.	.	.
1.250	0.1125	1.25	VQ	.	.	.	.
1.333	0.1211	1.25	VQ	.	.	.	.
1.417	0.1297	1.25	.Q	.	.	.	.
1.500	0.1383	1.26	.Q	.	.	.	.
1.583	0.1470	1.26	.Q	.	.	.	.
1.667	0.1557	1.26	.Q	.	.	.	.
1.750	0.1644	1.27	.Q	.	.	.	.
1.833	0.1732	1.27	.Q	.	.	.	.
1.917	0.1820	1.27	.Q	.	.	.	.
2.000	0.1908	1.28	.Q	.	.	.	.
2.083	0.1996	1.28	.Q	.	.	.	.
2.167	0.2084	1.29	.Q	.	.	.	.
2.250	0.2173	1.29	.Q	.	.	.	.
2.333	0.2262	1.29	.Q	.	.	.	.
2.417	0.2351	1.30	.Q	.	.	.	.
2.500	0.2441	1.30	.QV	.	.	.	.
2.583	0.2531	1.30	.QV	.	.	.	.
2.667	0.2621	1.31	.QV	.	.	.	.
2.750	0.2711	1.31	.QV	.	.	.	.
2.833	0.2802	1.32	.QV	.	.	.	.
2.917	0.2893	1.32	.QV	.	.	.	.
3.000	0.2984	1.33	.QV	.	.	.	.
3.083	0.3076	1.33	.QV	.	.	.	.
3.167	0.3168	1.33	.QV	.	.	.	.
3.250	0.3260	1.34	.QV	.	.	.	.
3.333	0.3352	1.34	.QV	.	.	.	.
3.417	0.3445	1.35	.QV	.	.	.	.
3.500	0.3538	1.35	.QV	.	.	.	.
3.583	0.3631	1.36	.QV	.	.	.	.
3.667	0.3725	1.36	.Q V	.	.	.	.
3.750	0.3819	1.36	.Q V	.	.	.	.
3.833	0.3913	1.37	.Q V	.	.	.	.
3.917	0.4008	1.37	.Q V	.	.	.	.
4.000	0.4103	1.38	.Q V	.	.	.	.
4.083	0.4198	1.38	.Q V	.	.	.	.
4.167	0.4294	1.39	.Q V	.	.	.	.
4.250	0.4390	1.39	.Q V	.	.	.	.
4.333	0.4486	1.40	.Q V	.	.	.	.
4.417	0.4582	1.40	.Q V	.	.	.	.
4.500	0.4679	1.41	.Q V	.	.	.	.
4.583	0.4777	1.41	.Q V	.	.	.	.
4.667	0.4874	1.42	.Q V	.	.	.	.
4.750	0.4972	1.42	.Q V	.	.	.	.
4.833	0.5071	1.43	.Q V	.	.	.	.
4.917	0.5169	1.43	.Q V	.	.	.	.
5.000	0.5268	1.44	.Q V	.	.	.	.
5.083	0.5368	1.44	.Q V	.	.	.	.
5.167	0.5468	1.45	.Q V	.	.	.	.
5.250	0.5568	1.45	.Q V	.	.	.	.
5.333	0.5668	1.46	.Q V	.	.	.	.
5.417	0.5769	1.47	.Q V	.	.	.	.
5.500	0.5871	1.47	.Q V	.	.	.	.
5.583	0.5972	1.48	.Q V	.	.	.	.
5.667	0.6075	1.48	.Q V	.	.	.	.
5.750	0.6177	1.49	.Q V	.	.	.	.
5.833	0.6280	1.50	.Q V	.	.	.	.
5.917	0.6384	1.50	.Q V	.	.	.	.
6.000	0.6487	1.51	.Q V	.	.	.	.

6.083	0.6592	1.51	.Q	V	.	.	.	.
6.167	0.6696	1.52	.Q	V	.	.	.	.
6.250	0.6801	1.53	.Q	V	.	.	.	.
6.333	0.6907	1.53	.Q	V	.	.	.	.
6.417	0.7013	1.54	.Q	V	.	.	.	.
6.500	0.7119	1.55	.Q	V	.	.	.	.
6.583	0.7226	1.55	.Q	V	.	.	.	.
6.667	0.7334	1.56	.Q	V	.	.	.	.
6.750	0.7441	1.57	.Q	V	.	.	.	.
6.833	0.7550	1.57	.Q	V	.	.	.	.
6.917	0.7659	1.58	.Q	V	.	.	.	.
7.000	0.7768	1.59	.Q	V	.	.	.	.
7.083	0.7878	1.59	.Q	V	.	.	.	.
7.167	0.7988	1.60	.Q	V	.	.	.	.
7.250	0.8099	1.61	.Q	V	.	.	.	.
7.333	0.8210	1.62	.Q	V	.	.	.	.
7.417	0.8322	1.62	.Q	V	.	.	.	.
7.500	0.8434	1.63	.Q	V	.	.	.	.
7.583	0.8547	1.64	.Q	V	.	.	.	.
7.667	0.8661	1.65	.Q	V	.	.	.	.
7.750	0.8775	1.66	.Q	V	.	.	.	.
7.833	0.8889	1.66	.Q	V	.	.	.	.
7.917	0.9005	1.67	.Q	V	.	.	.	.
8.000	0.9120	1.68	.Q	V	.	.	.	.
8.083	0.9237	1.69	.Q	V	.	.	.	.
8.167	0.9354	1.70	.Q	V	.	.	.	.
8.250	0.9471	1.71	.Q	V	.	.	.	.
8.333	0.9590	1.72	.Q	V	.	.	.	.
8.417	0.9708	1.73	.Q	V	.	.	.	.
8.500	0.9828	1.73	.Q	V	.	.	.	.
8.583	0.9948	1.74	.Q	V	.	.	.	.
8.667	1.0069	1.75	.Q	V	.	.	.	.
8.750	1.0190	1.76	.Q	V	.	.	.	.
8.833	1.0312	1.77	.Q	V	.	.	.	.
8.917	1.0435	1.78	.Q	V	.	.	.	.
9.000	1.0559	1.79	.Q	V	.	.	.	.
9.083	1.0683	1.80	.Q	V	.	.	.	.
9.167	1.0808	1.81	.Q	V	.	.	.	.
9.250	1.0934	1.83	.Q	V	.	.	.	.
9.333	1.1060	1.84	.Q	V	.	.	.	.
9.417	1.1187	1.85	.Q	V	.	.	.	.
9.500	1.1315	1.86	.Q	V	.	.	.	.
9.583	1.1444	1.87	.Q	V	.	.	.	.
9.667	1.1574	1.88	.Q	V	.	.	.	.
9.750	1.1705	1.90	.Q	V	.	.	.	.
9.833	1.1836	1.91	.Q	V	.	.	.	.
9.917	1.1968	1.92	.Q	V	.	.	.	.
10.000	1.2101	1.93	.Q	V	.	.	.	.
10.083	1.2235	1.95	.Q	V	.	.	.	.
10.167	1.2370	1.96	.Q	V	.	.	.	.
10.250	1.2506	1.97	.Q	V	.	.	.	.
10.333	1.2643	1.99	.Q	V	.	.	.	.
10.417	1.2781	2.00	. Q	V	.	.	.	.
10.500	1.2920	2.02	. Q	V	.	.	.	.
10.583	1.3059	2.03	. Q	V	.	.	.	.
10.667	1.3200	2.05	. Q	V	.	.	.	.
10.750	1.3342	2.06	. Q	V	.	.	.	.
10.833	1.3485	2.08	. Q	.V	.	.	.	.
10.917	1.3630	2.09	. Q	.V	.	.	.	.
11.000	1.3775	2.11	. Q	.V	.	.	.	.
11.083	1.3921	2.13	. Q	.V	.	.	.	.
11.167	1.4069	2.15	. Q	.V	.	.	.	.
11.250	1.4218	2.16	. Q	.V	.	.	.	.
11.333	1.4368	2.18	. Q	.V	.	.	.	.
11.417	1.4520	2.20	. Q	.V	.	.	.	.
11.500	1.4673	2.22	. Q	. V	.	.	.	.
11.583	1.4827	2.24	. Q	. V	.	.	.	.

11.667	1.4983	2.26	. Q . V . . .
11.750	1.5140	2.28	. Q . V . . .
11.833	1.5298	2.30	. Q . V . . .
11.917	1.5458	2.32	. Q . V . . .
12.000	1.5620	2.35	. Q . V . . .
12.083	1.5780	2.33	. Q . V . . .
12.167	1.5926	2.12	. Q . V . . .
12.250	1.6058	1.91	.Q . V . . .
12.333	1.6186	1.86	.Q . V . . .
12.417	1.6316	1.88	.Q . V . . .
12.500	1.6446	1.90	.Q . V . . .
12.583	1.6579	1.92	.Q . V . . .
12.667	1.6713	1.95	.Q . V . . .
12.750	1.6850	1.98	.Q . V . . .
12.833	1.6988	2.01	. Q . V . . .
12.917	1.7129	2.04	. Q . V . . .
13.000	1.7272	2.08	. Q . V . . .
13.083	1.7418	2.11	. Q . V . . .
13.167	1.7565	2.15	. Q . V . . .
13.250	1.7716	2.18	. Q . V . . .
13.333	1.7869	2.22	. Q . V . . .
13.417	1.8025	2.26	. Q . V . . .
13.500	1.8184	2.31	. Q . V . . .
13.583	1.8346	2.35	. Q . V . . .
13.667	1.8511	2.40	. Q . V . . .
13.750	1.8680	2.45	. Q . V . . .
13.833	1.8853	2.51	. Q . V . . .
13.917	1.9029	2.56	. Q . V . . .
14.000	1.9210	2.62	. Q . V . . .
14.083	1.9396	2.69	. Q . V . . .
14.167	1.9588	2.79	. Q . V . . .
14.250	1.9788	2.90	. Q . V . . .
14.333	1.9994	2.99	. Q . V . . .
14.417	2.0205	3.07	. Q . V . . .
14.500	2.0423	3.17	. Q . V . . .
14.583	2.0648	3.27	. Q . V . . .
14.667	2.0881	3.37	. Q . V . . .
14.750	2.1121	3.49	. Q . V . . .
14.833	2.1371	3.62	. Q . V . . .
14.917	2.1630	3.76	. Q . V . . .
15.000	2.1900	3.92	. Q . V . . .
15.083	2.2182	4.10	. Q . V . . .
15.167	2.2478	4.30	. Q . V . . .
15.250	2.2790	4.52	. Q . V . . .
15.333	2.3120	4.79	. Q . V. . .
15.417	2.3474	5.14	. Q . V. . .
15.500	2.3873	5.79	. Q . V. . .
15.583	2.4322	6.53	. Q . V . .
15.667	2.4822	7.25	. Q . V . .
15.750	2.5374	8.02	. Q . V . .
15.833	2.5987	8.90	. Q . .V . .
15.917	2.6695	10.29	. Q .V . .
16.000	2.7610	13.28	. Q . V . .
16.083	2.9073	21.24	. .Q V . .
16.167	3.1733	38.63	. V . Q .
16.250	3.4195	35.74	. V . Q .
16.333	3.5425	17.86	. Q . V. .
16.417	3.6113	10.00	. Q. . V. .
16.500	3.6606	7.15	. Q . . V .
16.583	3.6998	5.69	. Q . . V .
16.667	3.7331	4.84	. Q . . V .
16.750	3.7626	4.28	. Q . . V .
16.833	3.7893	3.88	. Q . . .V .
16.917	3.8139	3.58	. Q . . .V .
17.000	3.8369	3.33	. Q . . .V .
17.083	3.8584	3.13	. Q . . .V .
17.167	3.8785	2.92	. Q . . .V .

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TRUCK1W

22.833	4.7201	1.32	.Q	.	.	.	V .
22.917	4.7292	1.31	.Q	.	.	.	V .
23.000	4.7382	1.31	.Q	.	.	.	V.
23.083	4.7471	1.30	.Q	.	.	.	V.
23.167	4.7560	1.29	.Q	.	.	.	V.
23.250	4.7648	1.28	.Q	.	.	.	V.
23.333	4.7736	1.28	.Q	.	.	.	V.
23.417	4.7824	1.27	.Q	.	.	.	V.
23.500	4.7910	1.26	.Q	.	.	.	V.
23.583	4.7997	1.25	.Q	.	.	.	V.
23.667	4.8083	1.25	.Q	.	.	.	V.
23.750	4.8168	1.24	.Q	.	.	.	V.
23.833	4.8253	1.23	.Q	.	.	.	V.
23.917	4.8338	1.23	.Q	.	.	.	V.
24.000	4.8422	1.22	.Q	.	.	.	V.
24.083	4.8499	1.13	.Q	.	.	.	V.
24.167	4.8544	0.65	Q	.	.	.	V.
24.250	4.8557	0.18	Q	.	.	.	V.
24.333	4.8559	0.04	Q	.	.	.	V.
24.417	4.8560	0.01	Q	.	.	.	V.
24.500	4.8560	0.01	Q	.	.	.	V.

TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
(Note: 100% of Peak Flow Rate estimate assumed to have
an instantaneous time duration)

Percentile of Estimated Peak Flow Rate	Duration (minutes)
0%	1470.0
10%	115.0
20%	45.0
30%	25.0
40%	20.0
50%	15.0
60%	10.0
70%	10.0
80%	10.0
90%	10.0

****
FLOW PROCESS FROM NODE 162.00 TO NODE 162.00 IS CODE = 3.1

>>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
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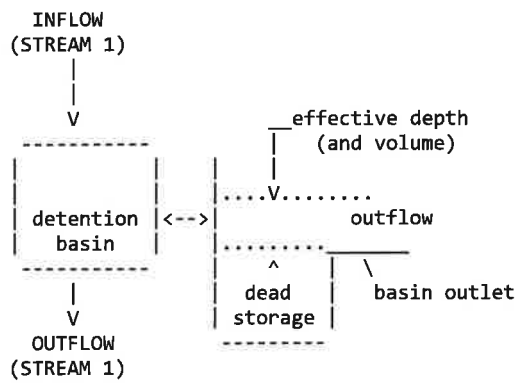

ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
THROUGH A FLOW-THROUGH DETENTION BASIN

SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
DEAD STORAGE(AF) = 0.000
SPECIFIED DEAD STORAGE(AF) FILLED = 0.000
SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000
DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	0.11	4.00	0.002
3	0.31	4.40	0.020
4	0.51	4.70	0.090
5	0.71	5.00	0.220
6	0.91	5.30	0.420
7	1.11	5.50	0.680
8	1.31	5.80	1.010
9	1.51	6.00	1.400
10	1.61	6.20	1.610

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.083	0.000	0.09	0.00	0.00	0.1	0.000
0.167	0.000	0.56	0.00	0.02	0.5	0.000
0.250	0.000	1.03	0.00	0.03	1.0	0.001
0.333	0.000	1.17	0.00	0.03	1.2	0.001
0.417	0.000	1.20	0.00	0.03	1.2	0.001
0.500	0.000	1.21	0.00	0.03	1.2	0.001
0.583	0.000	1.22	0.00	0.03	1.2	0.001
0.667	0.000	1.22	0.00	0.03	1.2	0.001
0.750	0.000	1.22	0.00	0.03	1.2	0.001
0.833	0.000	1.23	0.00	0.03	1.2	0.001
0.917	0.000	1.23	0.00	0.03	1.2	0.001
1.000	0.000	1.23	0.00	0.03	1.2	0.001
1.083	0.000	1.24	0.00	0.03	1.2	0.001
1.167	0.000	1.24	0.00	0.03	1.2	0.001
1.250	0.000	1.25	0.00	0.03	1.2	0.001
1.333	0.000	1.25	0.00	0.03	1.2	0.001
1.417	0.000	1.25	0.00	0.03	1.3	0.001
1.500	0.000	1.26	0.00	0.03	1.3	0.001
1.583	0.000	1.26	0.00	0.03	1.3	0.001
1.667	0.000	1.26	0.00	0.03	1.3	0.001
1.750	0.000	1.27	0.00	0.03	1.3	0.001
1.833	0.000	1.27	0.00	0.03	1.3	0.001
1.917	0.000	1.27	0.00	0.04	1.3	0.001
2.000	0.000	1.28	0.00	0.04	1.3	0.001
2.083	0.000	1.28	0.00	0.04	1.3	0.001
2.167	0.000	1.29	0.00	0.04	1.3	0.001
2.250	0.000	1.29	0.00	0.04	1.3	0.001
2.333	0.000	1.29	0.00	0.04	1.3	0.001
2.417	0.000	1.30	0.00	0.04	1.3	0.001
2.500	0.000	1.30	0.00	0.04	1.3	0.001
2.583	0.000	1.30	0.00	0.04	1.3	0.001
2.667	0.000	1.31	0.00	0.04	1.3	0.001
2.750	0.000	1.31	0.00	0.04	1.3	0.001
2.833	0.000	1.32	0.00	0.04	1.3	0.001
2.917	0.000	1.32	0.00	0.04	1.3	0.001

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3.000	0.000	1.33	0.00	0.04	1.3	0.001
3.083	0.000	1.33	0.00	0.04	1.3	0.001
3.167	0.000	1.33	0.00	0.04	1.3	0.001
3.250	0.000	1.34	0.00	0.04	1.3	0.001
3.333	0.000	1.34	0.00	0.04	1.3	0.001
3.417	0.000	1.35	0.00	0.04	1.3	0.001
3.500	0.000	1.35	0.00	0.04	1.4	0.001
3.583	0.000	1.36	0.00	0.04	1.4	0.001
3.667	0.000	1.36	0.00	0.04	1.4	0.001
3.750	0.000	1.36	0.00	0.04	1.4	0.001
3.833	0.000	1.37	0.00	0.04	1.4	0.001
3.917	0.000	1.37	0.00	0.04	1.4	0.001
4.000	0.000	1.38	0.00	0.04	1.4	0.001
4.083	0.000	1.38	0.00	0.04	1.4	0.001
4.167	0.000	1.39	0.00	0.04	1.4	0.001
4.250	0.000	1.39	0.00	0.04	1.4	0.001
4.333	0.000	1.40	0.00	0.04	1.4	0.001
4.417	0.000	1.40	0.00	0.04	1.4	0.001
4.500	0.000	1.41	0.00	0.04	1.4	0.001
4.583	0.000	1.41	0.00	0.04	1.4	0.001
4.667	0.000	1.42	0.00	0.04	1.4	0.001
4.750	0.000	1.42	0.00	0.04	1.4	0.001
4.833	0.000	1.43	0.00	0.04	1.4	0.001
4.917	0.000	1.43	0.00	0.04	1.4	0.001
5.000	0.000	1.44	0.00	0.04	1.4	0.001
5.083	0.000	1.44	0.00	0.04	1.4	0.001
5.167	0.000	1.45	0.00	0.04	1.4	0.001
5.250	0.000	1.45	0.00	0.04	1.5	0.001
5.333	0.000	1.46	0.00	0.04	1.5	0.001
5.417	0.000	1.47	0.00	0.04	1.5	0.001
5.500	0.000	1.47	0.00	0.04	1.5	0.001
5.583	0.000	1.48	0.00	0.04	1.5	0.001
5.667	0.000	1.48	0.00	0.04	1.5	0.001
5.750	0.000	1.49	0.00	0.04	1.5	0.001
5.833	0.000	1.50	0.00	0.04	1.5	0.001
5.917	0.000	1.50	0.00	0.04	1.5	0.001
6.000	0.000	1.51	0.00	0.04	1.5	0.001
6.083	0.000	1.51	0.00	0.04	1.5	0.001
6.167	0.000	1.52	0.00	0.04	1.5	0.001
6.250	0.000	1.53	0.00	0.04	1.5	0.001
6.333	0.000	1.53	0.00	0.04	1.5	0.001
6.417	0.000	1.54	0.00	0.04	1.5	0.001
6.500	0.000	1.55	0.00	0.04	1.5	0.001
6.583	0.000	1.55	0.00	0.04	1.6	0.001
6.667	0.000	1.56	0.00	0.04	1.6	0.001
6.750	0.000	1.57	0.00	0.04	1.6	0.001
6.833	0.000	1.57	0.00	0.04	1.6	0.001
6.917	0.000	1.58	0.00	0.04	1.6	0.001
7.000	0.000	1.59	0.00	0.04	1.6	0.001
7.083	0.000	1.59	0.00	0.04	1.6	0.001
7.167	0.000	1.60	0.00	0.04	1.6	0.001
7.250	0.000	1.61	0.00	0.04	1.6	0.001
7.333	0.000	1.62	0.00	0.04	1.6	0.001
7.417	0.000	1.62	0.00	0.04	1.6	0.001
7.500	0.000	1.63	0.00	0.04	1.6	0.001
7.583	0.000	1.64	0.00	0.05	1.6	0.001
7.667	0.000	1.65	0.00	0.05	1.6	0.001
7.750	0.000	1.66	0.00	0.05	1.7	0.001
7.833	0.000	1.66	0.00	0.05	1.7	0.001
7.917	0.000	1.67	0.00	0.05	1.7	0.001
8.000	0.000	1.68	0.00	0.05	1.7	0.001
8.083	0.000	1.69	0.00	0.05	1.7	0.001
8.167	0.000	1.70	0.00	0.05	1.7	0.001
8.250	0.000	1.71	0.00	0.05	1.7	0.001
8.333	0.000	1.72	0.00	0.05	1.7	0.001
8.417	0.000	1.73	0.00	0.05	1.7	0.001
8.500	0.000	1.73	0.00	0.05	1.7	0.001

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8.583	0.000	1.74	0.00	0.05	1.7	0.001
8.667	0.000	1.75	0.00	0.05	1.8	0.001
8.750	0.000	1.76	0.00	0.05	1.8	0.001
8.833	0.000	1.77	0.00	0.05	1.8	0.001
8.917	0.000	1.78	0.00	0.05	1.8	0.001
9.000	0.000	1.79	0.00	0.05	1.8	0.001
9.083	0.000	1.80	0.00	0.05	1.8	0.001
9.167	0.000	1.81	0.00	0.05	1.8	0.001
9.250	0.000	1.83	0.00	0.05	1.8	0.001
9.333	0.000	1.84	0.00	0.05	1.8	0.001
9.417	0.000	1.85	0.00	0.05	1.8	0.001
9.500	0.000	1.86	0.00	0.05	1.9	0.001
9.583	0.000	1.87	0.00	0.05	1.9	0.001
9.667	0.000	1.88	0.00	0.05	1.9	0.001
9.750	0.000	1.90	0.00	0.05	1.9	0.001
9.833	0.000	1.91	0.00	0.05	1.9	0.001
9.917	0.000	1.92	0.00	0.05	1.9	0.001
10.000	0.000	1.93	0.00	0.05	1.9	0.001
10.083	0.000	1.95	0.00	0.05	1.9	0.001
10.167	0.000	1.96	0.00	0.05	2.0	0.001
10.250	0.000	1.97	0.00	0.05	2.0	0.001
10.333	0.000	1.99	0.00	0.05	2.0	0.001
10.417	0.000	2.00	0.00	0.06	2.0	0.001
10.500	0.000	2.02	0.00	0.06	2.0	0.001
10.583	0.000	2.03	0.00	0.06	2.0	0.001
10.667	0.000	2.05	0.00	0.06	2.0	0.001
10.750	0.000	2.06	0.00	0.06	2.1	0.001
10.833	0.000	2.08	0.00	0.06	2.1	0.001
10.917	0.000	2.09	0.00	0.06	2.1	0.001
11.000	0.000	2.11	0.00	0.06	2.1	0.001
11.083	0.000	2.13	0.00	0.06	2.1	0.001
11.167	0.000	2.15	0.00	0.06	2.1	0.001
11.250	0.000	2.16	0.00	0.06	2.2	0.001
11.333	0.000	2.18	0.00	0.06	2.2	0.001
11.417	0.000	2.20	0.00	0.06	2.2	0.001
11.500	0.000	2.22	0.00	0.06	2.2	0.001
11.583	0.000	2.24	0.00	0.06	2.2	0.001
11.667	0.000	2.26	0.00	0.06	2.3	0.001
11.750	0.000	2.28	0.00	0.06	2.3	0.001
11.833	0.000	2.30	0.00	0.06	2.3	0.001
11.917	0.000	2.32	0.00	0.06	2.3	0.001
12.000	0.000	2.35	0.00	0.06	2.3	0.001
12.083	0.000	2.33	0.00	0.06	2.3	0.001
12.167	0.000	2.12	0.00	0.05	2.1	0.001
12.250	0.000	1.91	0.00	0.05	1.9	0.001
12.333	0.000	1.86	0.00	0.05	1.9	0.001
12.417	0.000	1.88	0.00	0.05	1.9	0.001
12.500	0.000	1.90	0.00	0.05	1.9	0.001
12.583	0.000	1.92	0.00	0.05	1.9	0.001
12.667	0.000	1.95	0.00	0.05	1.9	0.001
12.750	0.000	1.98	0.00	0.05	2.0	0.001
12.833	0.000	2.01	0.00	0.06	2.0	0.001
12.917	0.000	2.04	0.00	0.06	2.0	0.001
13.000	0.000	2.08	0.00	0.06	2.1	0.001
13.083	0.000	2.11	0.00	0.06	2.1	0.001
13.167	0.000	2.15	0.00	0.06	2.1	0.001
13.250	0.000	2.18	0.00	0.06	2.2	0.001
13.333	0.000	2.22	0.00	0.06	2.2	0.001
13.417	0.000	2.26	0.00	0.06	2.3	0.001
13.500	0.000	2.31	0.00	0.06	2.3	0.001
13.583	0.000	2.35	0.00	0.07	2.4	0.001
13.667	0.000	2.40	0.00	0.07	2.4	0.001
13.750	0.000	2.45	0.00	0.07	2.4	0.001
13.833	0.000	2.51	0.00	0.07	2.5	0.001
13.917	0.000	2.56	0.00	0.07	2.6	0.001
14.000	0.000	2.62	0.00	0.07	2.6	0.001
14.083	0.000	2.69	0.00	0.07	2.7	0.001

TRUCK1W

14.167	0.000	2.79	0.00	0.08	2.8	0.001
14.250	0.000	2.90	0.00	0.08	2.9	0.001
14.333	0.000	2.99	0.00	0.08	3.0	0.002
14.417	0.000	3.07	0.00	0.09	3.1	0.002
14.500	0.000	3.17	0.00	0.09	3.2	0.002
14.583	0.000	3.27	0.00	0.09	3.3	0.002
14.667	0.000	3.37	0.00	0.09	3.4	0.002
14.750	0.000	3.49	0.00	0.10	3.5	0.002
14.833	0.000	3.62	0.00	0.10	3.6	0.002
14.917	0.000	3.76	0.00	0.11	3.8	0.002
15.000	0.000	3.92	0.00	0.11	3.9	0.002
15.083	0.000	4.10	0.00	0.12	4.0	0.003
15.167	0.000	4.30	0.00	0.14	4.0	0.004
15.250	0.000	4.52	0.00	0.17	4.1	0.007
15.333	0.000	4.79	0.00	0.22	4.2	0.012
15.417	0.000	5.14	0.00	0.28	4.3	0.018
15.500	0.000	5.79	0.00	0.33	4.4	0.027
15.583	0.000	6.53	0.00	0.37	4.5	0.042
15.667	0.000	7.25	0.00	0.43	4.5	0.060
15.750	0.000	8.02	0.00	0.49	4.6	0.084
15.833	0.000	8.90	0.00	0.54	4.7	0.112
15.917	0.000	10.29	0.00	0.60	4.8	0.150
16.000	0.000	13.28	0.00	0.69	4.9	0.208
16.083	0.000	21.24	0.00	0.81	5.1	0.319
16.167	0.000	38.63	0.00	1.01	5.3	0.549
16.250	0.000	35.74	0.00	1.16	5.5	0.758
16.333	0.000	17.86	0.00	1.21	5.6	0.842
16.417	0.000	10.00	0.00	1.23	5.7	0.872
16.500	0.000	7.15	0.00	1.23	5.7	0.882
16.583	0.000	5.69	0.00	1.23	5.7	0.882
16.667	0.000	4.84	0.00	1.23	5.7	0.876
16.750	0.000	4.28	0.00	1.22	5.7	0.867
16.833	0.000	3.88	0.00	1.22	5.7	0.854
16.917	0.000	3.58	0.00	1.21	5.7	0.840
17.000	0.000	3.33	0.00	1.20	5.6	0.824
17.083	0.000	3.13	0.00	1.19	5.6	0.807
17.167	0.000	2.92	0.00	1.18	5.6	0.788
17.250	0.000	2.74	0.00	1.16	5.6	0.769
17.333	0.000	2.60	0.00	1.15	5.6	0.748
17.417	0.000	2.48	0.00	1.14	5.6	0.727
17.500	0.000	2.38	0.00	1.13	5.5	0.705
17.583	0.000	2.29	0.00	1.11	5.5	0.683
17.667	0.000	2.21	0.00	1.10	5.5	0.661
17.750	0.000	2.13	0.00	1.08	5.5	0.638
17.833	0.000	2.06	0.00	1.06	5.5	0.614
17.917	0.000	2.00	0.00	1.04	5.4	0.590
18.000	0.000	1.94	0.00	1.02	5.4	0.566
18.083	0.000	1.93	0.00	1.00	5.4	0.543
18.167	0.000	2.11	0.00	0.99	5.4	0.520
18.250	0.000	2.29	0.00	0.97	5.4	0.499
18.333	0.000	2.32	0.00	0.95	5.4	0.478
18.417	0.000	2.29	0.00	0.94	5.3	0.457
18.500	0.000	2.25	0.00	0.92	5.3	0.436
18.583	0.000	2.21	0.00	0.90	5.3	0.414
18.667	0.000	2.17	0.00	0.88	5.3	0.393
18.750	0.000	2.14	0.00	0.86	5.2	0.372
18.833	0.000	2.10	0.00	0.84	5.2	0.350
18.917	0.000	2.07	0.00	0.82	5.2	0.329
19.000	0.000	2.04	0.00	0.80	5.1	0.307
19.083	0.000	2.01	0.00	0.78	5.1	0.286
19.167	0.000	1.98	0.00	0.75	5.1	0.265
19.250	0.000	1.95	0.00	0.73	5.1	0.243
19.333	0.000	1.93	0.00	0.71	5.0	0.222
19.417	0.000	1.90	0.00	0.68	5.0	0.201
19.500	0.000	1.88	0.00	0.65	4.9	0.180
19.583	0.000	1.85	0.00	0.62	4.9	0.159
19.667	0.000	1.83	0.00	0.58	4.8	0.138

Q_{100} (DISCHARGE) = 5.7 CFS
DEPTH = 1.23 FT
VOLUME = 0.882 AC-FT

				TRUCK1W		
19.750	0.000	1.81	0.00	0.55	4.8	0.118
19.833	0.000	1.79	0.00	0.52	4.7	0.097
19.917	0.000	1.77	0.00	0.47	4.7	0.077
20.000	0.000	1.75	0.00	0.42	4.6	0.058
20.083	0.000	1.73	0.00	0.36	4.5	0.038
20.167	0.000	1.71	0.00	0.31	4.4	0.020
20.250	0.000	1.69	0.00	0.12	4.2	0.002
20.333	0.000	1.68	0.00	0.00	2.0	0.000
20.417	0.000	1.66	0.00	0.08	1.5	0.001
20.500	0.000	1.64	0.00	0.02	1.8	0.000
20.583	0.000	1.63	0.00	0.06	1.5	0.001
20.667	0.000	1.61	0.00	0.03	1.7	0.001
20.750	0.000	1.60	0.00	0.05	1.5	0.001
20.833	0.000	1.58	0.00	0.04	1.6	0.001
20.917	0.000	1.57	0.00	0.05	1.5	0.001
21.000	0.000	1.56	0.00	0.04	1.6	0.001
21.083	0.000	1.54	0.00	0.05	1.5	0.001
21.167	0.000	1.53	0.00	0.04	1.5	0.001
21.250	0.000	1.52	0.00	0.04	1.5	0.001
21.333	0.000	1.50	0.00	0.04	1.5	0.001
21.417	0.000	1.49	0.00	0.04	1.5	0.001
21.500	0.000	1.48	0.00	0.04	1.5	0.001
21.583	0.000	1.47	0.00	0.04	1.5	0.001
21.667	0.000	1.46	0.00	0.04	1.5	0.001
21.750	0.000	1.45	0.00	0.04	1.4	0.001
21.833	0.000	1.44	0.00	0.04	1.4	0.001
21.917	0.000	1.43	0.00	0.04	1.4	0.001
22.000	0.000	1.42	0.00	0.04	1.4	0.001
22.083	0.000	1.40	0.00	0.04	1.4	0.001
22.167	0.000	1.40	0.00	0.04	1.4	0.001
22.250	0.000	1.39	0.00	0.04	1.4	0.001
22.333	0.000	1.38	0.00	0.04	1.4	0.001
22.417	0.000	1.37	0.00	0.04	1.4	0.001
22.500	0.000	1.36	0.00	0.04	1.4	0.001
22.583	0.000	1.35	0.00	0.04	1.3	0.001
22.667	0.000	1.34	0.00	0.04	1.3	0.001
22.750	0.000	1.33	0.00	0.04	1.3	0.001
22.833	0.000	1.32	0.00	0.04	1.3	0.001
22.917	0.000	1.31	0.00	0.04	1.3	0.001
23.000	0.000	1.31	0.00	0.04	1.3	0.001
23.083	0.000	1.30	0.00	0.04	1.3	0.001
23.167	0.000	1.29	0.00	0.04	1.3	0.001
23.250	0.000	1.28	0.00	0.04	1.3	0.001
23.333	0.000	1.28	0.00	0.03	1.3	0.001
23.417	0.000	1.27	0.00	0.03	1.3	0.001
23.500	0.000	1.26	0.00	0.03	1.3	0.001
23.583	0.000	1.25	0.00	0.03	1.3	0.001
23.667	0.000	1.25	0.00	0.03	1.2	0.001
23.750	0.000	1.24	0.00	0.03	1.2	0.001
23.833	0.000	1.23	0.00	0.03	1.2	0.001
23.917	0.000	1.23	0.00	0.03	1.2	0.001

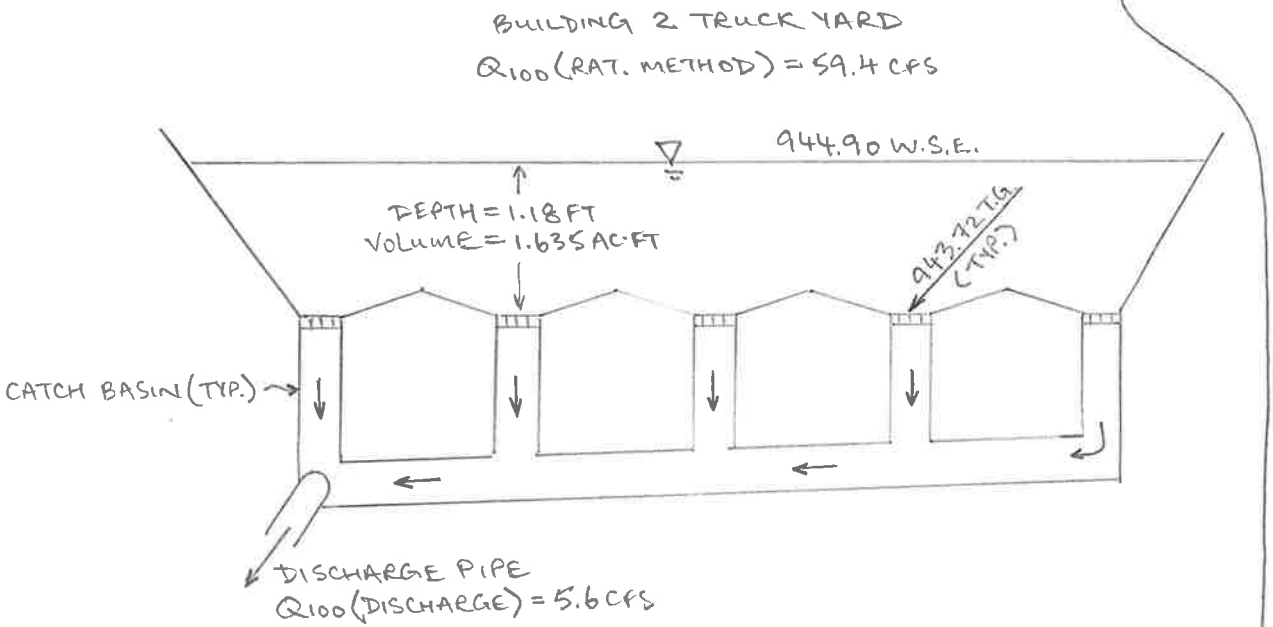
PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 4.856 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 4.856 AF
LOSS VOLUME = 0.000 AF

==========

END OF FLOODSCx ROUTING ANALYSIS

JOB #3711 - BARTON ROAD & TERRACE AVE, COLTON
DETENTION IN BUILDING 2 TRUCK YARD (NODE 252)

Elevation	Depth (feet)	Area (sq. ft.)	Volume (c.f.)	Σ Volume (c.f.)	Σ Volume (ac-ft)	Q Discharge (cfs)
943.72	0.00	0				
			55	55	0.00	4.0
943.80	0.08	1385				
			1965	2020	0.05	4.3
944.00	0.28	18260				
			6925	8945	0.21	4.6
944.20	0.48	50992				
			13241	22186	0.51	4.9
944.40	0.68	81414				
			17778	39964	0.92	5.2
944.60	0.88	96370				
			20334	60298	1.38	5.5
944.80	1.08	106970				
			22187	82485	1.89	5.8
945.00	1.28	114904				



ORIFICE EQUATION: $Q = 0.6 * \text{AREA} * \sqrt{64.4 * H}$

H = DEPTH + 1.00 FT

CROSS-SECTION AREA OF 12" DISCHARGE PIPE
$= 3.14 * (6/12\ \text{FT})^2$
$= 0.79\ \text{FT}^2$

e.g. AT ELEVATION 944.00 (DEPTH = 0.28 FT OR H = 1.28 FT)
$Q\text{(DISCHARGE)} = 0.6 * 0.79 * \sqrt{64.4 * 1.28} = 4.3$ CFS

```
**************************************************************************

            F L O O D    R O U T I N G    A N A L Y S I S
          USING COUNTY HYDROLOGY MANUAL OF SAN BERNARDINO(1986)
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                          Analysis prepared by:

                        THIENES ENGINEERING INC.
                          14349 FIRESTONE BLVD
                           LA MIRADA, CA90638
                              714-521-4811

 ************************* DESCRIPTION OF STUDY *************************
* JOB #3711 BARTON ROAD & TERRACE AVE, COLTON                            *
* 100-YEAR DETENTION                                                     *
* SOUTH OF BARTON ROAD, BUILDING 2 (NODE 252)                            *
 ************************************************************************

  FILE NAME: W:\3711\TRUCK2.DAT
  TIME/DATE OF STUDY: 15:49 10/09/2019


**************************************************************************
  FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE =   1
--------------------------------------------------------------------------
  >>>>>SUBAREA RUNOFF (UNIT-HYDROGRAPH ANALYSIS)<<<<<
==========================================================================

      (UNIT-HYDROGRAPH ADDED TO STREAM #1)

         WATERSHED AREA =      19.250 ACRES
         BASEFLOW =   0.000 CFS/SQUARE-MILE
         *USER ENTERED "LAG" TIME =    0.110 HOURS
          CAUTION: LAG TIME IS LESS THAN 0.50 HOURS.
          THE 5-MINUTE PERIOD UH MODEL (USED IN THIS COMPUTER PROGRAM)
          MAY BE TOO LARGE FOR PEAK FLOW ESTIMATES.
         VALLEY(DEVELOPED) S-GRAPH SELECTED
         MAXIMUM WATERSHED LOSS RATE(INCH/HOUR) =  0.042
         LOW LOSS FRACTION = 0.095
         *HYDROGRAPH MODEL #1 SPECIFIED*

         SPECIFIED PEAK  5-MINUTES RAINFALL(INCH)=  0.44
         SPECIFIED PEAK 30-MINUTES RAINFALL(INCH)=  0.90
         SPECIFIED PEAK  1-HOUR RAINFALL(INCH) =  1.21
         SPECIFIED PEAK  3-HOUR RAINFALL(INCH) =  1.85
         SPECIFIED PEAK  6-HOUR RAINFALL(INCH) =  2.40
         SPECIFIED PEAK 24-HOUR RAINFALL(INCH) =  4.80

         PRECIPITATION DEPTH-AREA REDUCTION FACTORS:
           5-MINUTE FACTOR = 0.999
          30-MINUTE FACTOR = 0.999
           1-HOUR FACTOR = 0.999
           3-HOUR FACTOR = 1.000
           6-HOUR FACTOR = 1.000
          24-HOUR FACTOR = 1.000

         UNIT HYDROGRAPH TIME UNIT =   5.000 MINUTES
         UNIT INTERVAL PERCENTAGE OF LAG-TIME =  75.758


==========================================================================
                      UNIT HYDROGRAPH DETERMINATION
```

INTERVAL NUMBER	"S" GRAPH MEAN VALUES	UNIT HYDROGRAPH ORDINATES(CFS)
1	10.090	23.489
2	59.010	113.888
3	92.268	77.426
4	98.542	14.607
5	99.502	2.235
6	99.801	0.696
7	99.950	0.348
8	100.000	0.116

UNIT PERIOD (NUMBER)	UNIT RAINFALL (INCHES)	UNIT SOIL-LOSS (INCHES)	EFFECTIVE RAINFALL (INCHES)
1	0.0083	0.0008	0.0075
2	0.0084	0.0008	0.0076
3	0.0084	0.0008	0.0076
4	0.0084	0.0008	0.0076
5	0.0084	0.0008	0.0076
6	0.0084	0.0008	0.0076
7	0.0085	0.0008	0.0077
8	0.0085	0.0008	0.0077
9	0.0085	0.0008	0.0077
10	0.0085	0.0008	0.0077
11	0.0086	0.0008	0.0078
12	0.0086	0.0008	0.0078
13	0.0086	0.0008	0.0078
14	0.0086	0.0008	0.0078
15	0.0087	0.0008	0.0078
16	0.0087	0.0008	0.0079
17	0.0087	0.0008	0.0079
18	0.0087	0.0008	0.0079
19	0.0088	0.0008	0.0079
20	0.0088	0.0008	0.0079
21	0.0088	0.0008	0.0080
22	0.0088	0.0008	0.0080
23	0.0089	0.0008	0.0080
24	0.0089	0.0008	0.0080
25	0.0089	0.0008	0.0081
26	0.0089	0.0008	0.0081
27	0.0090	0.0009	0.0081
28	0.0090	0.0009	0.0081
29	0.0090	0.0009	0.0082
30	0.0090	0.0009	0.0082
31	0.0091	0.0009	0.0082
32	0.0091	0.0009	0.0082
33	0.0091	0.0009	0.0083
34	0.0092	0.0009	0.0083
35	0.0092	0.0009	0.0083
36	0.0092	0.0009	0.0083
37	0.0093	0.0009	0.0084
38	0.0093	0.0009	0.0084
39	0.0093	0.0009	0.0084
40	0.0093	0.0009	0.0084
41	0.0094	0.0009	0.0085
42	0.0094	0.0009	0.0085
43	0.0094	0.0009	0.0085
44	0.0095	0.0009	0.0086
45	0.0095	0.0009	0.0086
46	0.0095	0.0009	0.0086
47	0.0096	0.0009	0.0087

48	0.0096	0.0009	0.0087
49	0.0096	0.0009	0.0087
50	0.0097	0.0009	0.0087
51	0.0097	0.0009	0.0088
52	0.0097	0.0009	0.0088
53	0.0098	0.0009	0.0088
54	0.0098	0.0009	0.0089
55	0.0098	0.0009	0.0089
56	0.0099	0.0009	0.0089
57	0.0099	0.0009	0.0090
58	0.0099	0.0009	0.0090
59	0.0100	0.0009	0.0090
60	0.0100	0.0010	0.0091
61	0.0101	0.0010	0.0091
62	0.0101	0.0010	0.0091
63	0.0101	0.0010	0.0092
64	0.0102	0.0010	0.0092
65	0.0102	0.0010	0.0092
66	0.0102	0.0010	0.0093
67	0.0103	0.0010	0.0093
68	0.0103	0.0010	0.0093
69	0.0104	0.0010	0.0094
70	0.0104	0.0010	0.0094
71	0.0105	0.0010	0.0095
72	0.0105	0.0010	0.0095
73	0.0106	0.0010	0.0096
74	0.0106	0.0010	0.0096
75	0.0106	0.0010	0.0096
76	0.0107	0.0010	0.0097
77	0.0107	0.0010	0.0097
78	0.0108	0.0010	0.0097
79	0.0108	0.0010	0.0098
80	0.0109	0.0010	0.0098
81	0.0109	0.0010	0.0099
82	0.0110	0.0010	0.0099
83	0.0110	0.0010	0.0100
84	0.0111	0.0011	0.0100
85	0.0111	0.0011	0.0101
86	0.0112	0.0011	0.0101
87	0.0112	0.0011	0.0102
88	0.0113	0.0011	0.0102
89	0.0113	0.0011	0.0103
90	0.0114	0.0011	0.0103
91	0.0115	0.0011	0.0104
92	0.0115	0.0011	0.0104
93	0.0116	0.0011	0.0105
94	0.0116	0.0011	0.0105
95	0.0117	0.0011	0.0106
96	0.0117	0.0011	0.0106
97	0.0118	0.0011	0.0107
98	0.0118	0.0011	0.0107
99	0.0119	0.0011	0.0108
100	0.0120	0.0011	0.0108
101	0.0121	0.0011	0.0109
102	0.0121	0.0011	0.0110
103	0.0122	0.0012	0.0110
104	0.0122	0.0012	0.0111
105	0.0123	0.0012	0.0112
106	0.0124	0.0012	0.0112
107	0.0125	0.0012	0.0113
108	0.0125	0.0012	0.0113
109	0.0126	0.0012	0.0114
110	0.0127	0.0012	0.0115
111	0.0128	0.0012	0.0116
112	0.0128	0.0012	0.0116
113	0.0129	0.0012	0.0117
114	0.0130	0.0012	0.0118

115	0.0131	0.0012	0.0119
116	0.0132	0.0013	0.0119
117	0.0133	0.0013	0.0120
118	0.0133	0.0013	0.0121
119	0.0135	0.0013	0.0122
120	0.0135	0.0013	0.0122
121	0.0136	0.0013	0.0123
122	0.0137	0.0013	0.0124
123	0.0138	0.0013	0.0125
124	0.0139	0.0013	0.0126
125	0.0140	0.0013	0.0127
126	0.0141	0.0013	0.0128
127	0.0142	0.0014	0.0129
128	0.0143	0.0014	0.0130
129	0.0145	0.0014	0.0131
130	0.0145	0.0014	0.0132
131	0.0147	0.0014	0.0133
132	0.0148	0.0014	0.0134
133	0.0149	0.0014	0.0135
134	0.0150	0.0014	0.0136
135	0.0152	0.0014	0.0138
136	0.0153	0.0015	0.0138
137	0.0155	0.0015	0.0140
138	0.0156	0.0015	0.0141
139	0.0158	0.0015	0.0143
140	0.0159	0.0015	0.0144
141	0.0161	0.0015	0.0145
142	0.0162	0.0015	0.0146
143	0.0164	0.0016	0.0148
144	0.0165	0.0016	0.0149
145	0.0126	0.0012	0.0114
146	0.0127	0.0012	0.0115
147	0.0129	0.0012	0.0117
148	0.0130	0.0012	0.0118
149	0.0133	0.0013	0.0120
150	0.0134	0.0013	0.0121
151	0.0137	0.0013	0.0124
152	0.0138	0.0013	0.0125
153	0.0141	0.0013	0.0128
154	0.0143	0.0014	0.0129
155	0.0146	0.0014	0.0132
156	0.0147	0.0014	0.0133
157	0.0151	0.0014	0.0136
158	0.0152	0.0014	0.0138
159	0.0156	0.0015	0.0141
160	0.0158	0.0015	0.0143
161	0.0162	0.0015	0.0147
162	0.0164	0.0016	0.0149
163	0.0169	0.0016	0.0153
164	0.0171	0.0016	0.0155
165	0.0177	0.0017	0.0160
166	0.0179	0.0017	0.0162
167	0.0185	0.0018	0.0167
168	0.0188	0.0018	0.0170
169	0.0201	0.0019	0.0182
170	0.0204	0.0019	0.0185
171	0.0212	0.0020	0.0192
172	0.0216	0.0021	0.0195
173	0.0225	0.0021	0.0203
174	0.0230	0.0022	0.0208
175	0.0240	0.0023	0.0217
176	0.0246	0.0023	0.0222
177	0.0258	0.0025	0.0234
178	0.0265	0.0025	0.0240
179	0.0281	0.0027	0.0254
180	0.0290	0.0028	0.0262
181	0.0310	0.0029	0.0280

182	0.0321	0.0030	0.0290
183	0.0347	0.0033	0.0314
184	0.0363	0.0034	0.0328
185	0.0441	0.0035	0.0406
186	0.0465	0.0035	0.0430
187	0.0524	0.0035	0.0489
188	0.0564	0.0035	0.0529
189	0.0631	0.0035	0.0596
190	0.0713	0.0035	0.0678
191	0.1019	0.0035	0.0984
192	0.1403	0.0035	0.1368
193	0.4396	0.0035	0.4361
194	0.0830	0.0035	0.0795
195	0.0612	0.0035	0.0577
196	0.0492	0.0035	0.0457
197	0.0380	0.0035	0.0345
198	0.0333	0.0032	0.0302
199	0.0299	0.0028	0.0271
200	0.0273	0.0026	0.0247
201	0.0252	0.0024	0.0228
202	0.0235	0.0022	0.0212
203	0.0220	0.0021	0.0199
204	0.0208	0.0020	0.0188
205	0.0191	0.0018	0.0173
206	0.0182	0.0017	0.0165
207	0.0174	0.0017	0.0157
208	0.0167	0.0016	0.0151
209	0.0160	0.0015	0.0145
210	0.0154	0.0015	0.0140
211	0.0149	0.0014	0.0135
212	0.0144	0.0014	0.0130
213	0.0140	0.0013	0.0126
214	0.0135	0.0013	0.0123
215	0.0132	0.0012	0.0119
216	0.0128	0.0012	0.0116
217	0.0166	0.0016	0.0150
218	0.0163	0.0015	0.0147
219	0.0160	0.0015	0.0144
220	0.0157	0.0015	0.0142
221	0.0154	0.0015	0.0139
222	0.0151	0.0014	0.0137
223	0.0149	0.0014	0.0135
224	0.0146	0.0014	0.0132
225	0.0144	0.0014	0.0130
226	0.0142	0.0013	0.0128
227	0.0140	0.0013	0.0126
228	0.0138	0.0013	0.0125
229	0.0136	0.0013	0.0123
230	0.0134	0.0013	0.0121
231	0.0132	0.0013	0.0120
232	0.0130	0.0012	0.0118
233	0.0129	0.0012	0.0117
234	0.0127	0.0012	0.0115
235	0.0126	0.0012	0.0114
236	0.0124	0.0012	0.0112
237	0.0123	0.0012	0.0111
238	0.0121	0.0012	0.0110
239	0.0120	0.0011	0.0109
240	0.0119	0.0011	0.0108
241	0.0118	0.0011	0.0106
242	0.0116	0.0011	0.0105
243	0.0115	0.0011	0.0104
244	0.0114	0.0011	0.0103
245	0.0113	0.0011	0.0102
246	0.0112	0.0011	0.0101
247	0.0111	0.0011	0.0100
248	0.0110	0.0010	0.0099

249	0.0109	0.0010	0.0099
250	0.0108	0.0010	0.0098
251	0.0107	0.0010	0.0097
252	0.0106	0.0010	0.0096
253	0.0105	0.0010	0.0095
254	0.0104	0.0010	0.0094
255	0.0104	0.0010	0.0094
256	0.0103	0.0010	0.0093
257	0.0102	0.0010	0.0092
258	0.0101	0.0010	0.0092
259	0.0100	0.0010	0.0091
260	0.0100	0.0009	0.0090
261	0.0099	0.0009	0.0089
262	0.0098	0.0009	0.0089
263	0.0097	0.0009	0.0088
264	0.0097	0.0009	0.0088
265	0.0096	0.0009	0.0087
266	0.0095	0.0009	0.0086
267	0.0095	0.0009	0.0086
268	0.0094	0.0009	0.0085
269	0.0094	0.0009	0.0085
270	0.0093	0.0009	0.0084
271	0.0092	0.0009	0.0084
272	0.0092	0.0009	0.0083
273	0.0091	0.0009	0.0083
274	0.0091	0.0009	0.0082
275	0.0090	0.0009	0.0082
276	0.0090	0.0009	0.0081
277	0.0089	0.0008	0.0081
278	0.0088	0.0008	0.0080
279	0.0088	0.0008	0.0080
280	0.0087	0.0008	0.0079
281	0.0087	0.0008	0.0079
282	0.0086	0.0008	0.0078
283	0.0086	0.0008	0.0078
284	0.0086	0.0008	0.0077
285	0.0085	0.0008	0.0077
286	0.0085	0.0008	0.0077
287	0.0084	0.0008	0.0076
288	0.0084	0.0008	0.0076

TOTAL STORM RAINFALL(INCHES) = 4.80
TOTAL SOIL-LOSS(INCHES) = 0.38
TOTAL EFFECTIVE RAINFALL(INCHES) = 4.42

TOTAL SOIL-LOSS VOLUME(ACRE-FEET) = 0.6144
TOTAL STORM RUNOFF VOLUME(ACRE-FEET) = 7.0816

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2 4 - H O U R S T O R M
R U N O F F H Y D R O G R A P H

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HYDROGRAPH IN FIVE-MINUTE UNIT INTERVALS(CFS)
(Note: Time indicated is at END of Each Unit Intervals)

TIME(HRS)	VOLUME(AF)	Q(CFS)	0.	17.5	35.0	52.5	70.0
0.083	0.0012	0.18 Q	.	.	.	.	
0.167	0.0084	1.04 Q	.	.	.	.	
0.250	0.0195	1.62 Q	.	.	.	.	
0.333	0.0315	1.74 Q	.	.	.	.	
0.417	0.0436	1.76 VQ	.	.	.	.	
0.500	0.0558	1.77 VQ	.	.	.	.	

0.583	0.0681	1.78	VQ	.	.	.	.
0.667	0.0803	1.78	VQ	.	.	.	.
0.750	0.0927	1.79	VQ	.	.	.	.
0.833	0.1050	1.79	VQ	.	.	.	.
0.917	0.1174	1.80	VQ	.	.	.	.
1.000	0.1298	1.80	VQ	.	.	.	.
1.083	0.1422	1.81	VQ	.	.	.	.
1.167	0.1547	1.81	VQ	.	.	.	.
1.250	0.1672	1.82	VQ	.	.	.	.
1.333	0.1798	1.82	.Q	.	.	.	.
1.417	0.1924	1.83	.Q	.	.	.	.
1.500	0.2050	1.83	.Q	.	.	.	.
1.583	0.2176	1.84	.Q	.	.	.	.
1.667	0.2303	1.84	.Q	.	.	.	.
1.750	0.2431	1.85	.Q	.	.	.	.
1.833	0.2558	1.85	.Q	.	.	.	.
1.917	0.2686	1.86	.Q	.	.	.	.
2.000	0.2815	1.86	.Q	.	.	.	.
2.083	0.2944	1.87	.Q	.	.	.	.
2.167	0.3073	1.88	.Q	.	.	.	.
2.250	0.3202	1.88	.Q	.	.	.	.
2.333	0.3332	1.89	.Q	.	.	.	.
2.417	0.3463	1.89	.Q	.	.	.	.
2.500	0.3593	1.90	.QV	.	.	.	.
2.583	0.3724	1.90	.QV	.	.	.	.
2.667	0.3856	1.91	.QV	.	.	.	.
2.750	0.3988	1.92	.QV	.	.	.	.
2.833	0.4120	1.92	.QV	.	.	.	.
2.917	0.4253	1.93	.QV	.	.	.	.
3.000	0.4386	1.93	.QV	.	.	.	.
3.083	0.4520	1.94	.QV	.	.	.	.
3.167	0.4654	1.95	.QV	.	.	.	.
3.250	0.4788	1.95	.QV	.	.	.	.
3.333	0.4923	1.96	.QV	.	.	.	.
3.417	0.5059	1.97	.QV	.	.	.	.
3.500	0.5194	1.97	.QV	.	.	.	.
3.583	0.5331	1.98	.Q V	.	.	.	.
3.667	0.5467	1.98	.Q V	.	.	.	.
3.750	0.5605	1.99	.Q V	.	.	.	.
3.833	0.5742	2.00	.Q V	.	.	.	.
3.917	0.5880	2.00	.Q V	.	.	.	.
4.000	0.6019	2.01	.Q V	.	.	.	.
4.083	0.6158	2.02	.Q V	.	.	.	.
4.167	0.6297	2.03	.Q V	.	.	.	.
4.250	0.6437	2.03	.Q V	.	.	.	.
4.333	0.6578	2.04	.Q V	.	.	.	.
4.417	0.6719	2.05	.Q V	.	.	.	.
4.500	0.6860	2.05	.Q V	.	.	.	.
4.583	0.7002	2.06	.Q V	.	.	.	.
4.667	0.7145	2.07	.Q V	.	.	.	.
4.750	0.7288	2.08	.Q V	.	.	.	.
4.833	0.7431	2.08	.Q V	.	.	.	.
4.917	0.7575	2.09	.Q V	.	.	.	.
5.000	0.7720	2.10	.Q V	.	.	.	.
5.083	0.7865	2.11	.Q V	.	.	.	.
5.167	0.8011	2.12	.Q V	.	.	.	.
5.250	0.8157	2.12	.Q V	.	.	.	.
5.333	0.8304	2.13	.Q V	.	.	.	.
5.417	0.8451	2.14	.Q V	.	.	.	.
5.500	0.8599	2.15	.Q V	.	.	.	.
5.583	0.8748	2.16	.Q V	.	.	.	.
5.667	0.8897	2.17	.Q V	.	.	.	.
5.750	0.9047	2.17	.Q V	.	.	.	.
5.833	0.9197	2.18	.Q V	.	.	.	.
5.917	0.9348	2.19	.Q V	.	.	.	.
6.000	0.9500	2.20	.Q V	.	.	.	.
6.083	0.9652	2.21	.Q V	.	.	.	.

6.167	0.9804	2.22	.Q	V	.	.	.	.
6.250	0.9958	2.23	.Q	V	.	.	.	.
6.333	1.0112	2.24	.Q	V	.	.	.	.
6.417	1.0267	2.25	.Q	V	.	.	.	.
6.500	1.0422	2.26	.Q	V	.	.	.	.
6.583	1.0578	2.27	.Q	V	.	.	.	.
6.667	1.0735	2.28	.Q	V	.	.	.	.
6.750	1.0892	2.29	.Q	V	.	.	.	.
6.833	1.1051	2.30	.Q	V	.	.	.	.
6.917	1.1209	2.31	.Q	V	.	.	.	.
7.000	1.1369	2.32	.Q	V	.	.	.	.
7.083	1.1529	2.33	.Q	V	.	.	.	.
7.167	1.1690	2.34	.Q	V	.	.	.	.
7.250	1.1852	2.35	.Q	V	.	.	.	.
7.333	1.2015	2.36	.Q	V	.	.	.	.
7.417	1.2178	2.37	.Q	V	.	.	.	.
7.500	1.2342	2.38	.Q	V	.	.	.	.
7.583	1.2507	2.39	.Q	V	.	.	.	.
7.667	1.2673	2.41	.Q	V	.	.	.	.
7.750	1.2839	2.42	.Q	V	.	.	.	.
7.833	1.3007	2.43	.Q	V	.	.	.	.
7.917	1.3175	2.44	.Q	V	.	.	.	.
8.000	1.3344	2.45	.Q	V	.	.	.	.
8.083	1.3514	2.47	.Q	V	.	.	.	.
8.167	1.3685	2.48	.Q	V	.	.	.	.
8.250	1.3856	2.49	.Q	V	.	.	.	.
8.333	1.4029	2.51	.Q	V	.	.	.	.
8.417	1.4202	2.52	.Q	V	.	.	.	.
8.500	1.4377	2.53	.Q	V	.	.	.	.
8.583	1.4552	2.55	.Q	V	.	.	.	.
8.667	1.4729	2.56	.Q	V	.	.	.	.
8.750	1.4906	2.58	.Q	V	.	.	.	.
8.833	1.5084	2.59	.Q	V	.	.	.	.
8.917	1.5264	2.60	.Q	V	.	.	.	.
9.000	1.5444	2.62	.Q	V	.	.	.	.
9.083	1.5626	2.63	.Q	V	.	.	.	.
9.167	1.5808	2.65	.Q	V	.	.	.	.
9.250	1.5992	2.67	.Q	V	.	.	.	.
9.333	1.6177	2.68	.Q	V	.	.	.	.
9.417	1.6362	2.70	.Q	V	.	.	.	.
9.500	1.6550	2.72	.Q	V	.	.	.	.
9.583	1.6738	2.73	.Q	V	.	.	.	.
9.667	1.6927	2.75	.Q	V	.	.	.	.
9.750	1.7118	2.77	.Q	V	.	.	.	.
9.833	1.7310	2.79	.Q	V	.	.	.	.
9.917	1.7503	2.80	.Q	V	.	.	.	.
10.000	1.7697	2.82	.Q	V	.	.	.	.
10.083	1.7893	2.84	.Q	V	.	.	.	.
10.167	1.8090	2.86	.Q	V	.	.	.	.
10.250	1.8289	2.88	.Q	V	.	.	.	.
10.333	1.8489	2.90	.Q	V	.	.	.	.
10.417	1.8690	2.92	.Q	V	.	.	.	.
10.500	1.8893	2.95	.Q	V	.	.	.	.
10.583	1.9097	2.97	.Q	V	.	.	.	.
10.667	1.9303	2.99	.Q	V	.	.	.	.
10.750	1.9511	3.01	.Q	V	.	.	.	.
10.833	1.9720	3.04	.Q	V	.	.	.	.
10.917	1.9930	3.06	.Q	V	.	.	.	.
11.000	2.0143	3.08	.Q	V	.	.	.	.
11.083	2.0357	3.11	.Q	V	.	.	.	.
11.167	2.0573	3.14	.Q	V	.	.	.	.
11.250	2.0790	3.16	.Q	V	.	.	.	.
11.333	2.1010	3.19	.Q	V	.	.	.	.
11.417	2.1231	3.22	.Q	V	.	.	.	.
11.500	2.1455	3.24	.Q	V	.	.	.	.
11.583	2.1680	3.27	.Q	V	.	.	.	.
11.667	2.1908	3.30	.Q	V	.	.	.	.

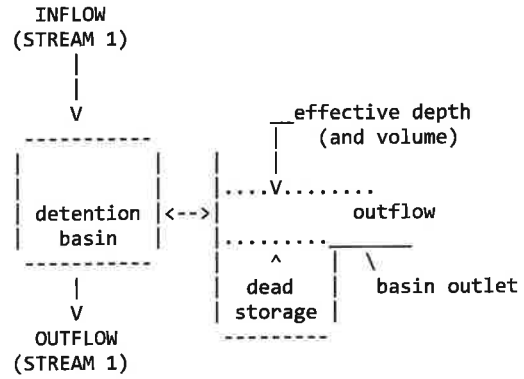
11.750	2.2137	3.33	.Q . V . . .
11.833	2.2369	3.37	.Q . V . . .
11.917	2.2603	3.40	.Q . V . . .
12.000	2.2840	3.43	.Q . V . . .
12.083	2.3072	3.38	.Q . V . . .
12.167	2.3278	2.99	.Q . V . . .
12.250	2.3466	2.73	.Q . V . . .
12.333	2.3653	2.71	.Q . V . . .
12.417	2.3842	2.74	.Q . V . . .
12.500	2.4033	2.78	.Q . V . . .
12.583	2.4227	2.82	.Q . V . . .
12.667	2.4424	2.86	.Q . V . . .
12.750	2.4624	2.90	.Q . V . . .
12.833	2.4827	2.95	.Q . V . . .
12.917	2.5033	2.99	.Q . V . . .
13.000	2.5242	3.04	.Q . V . . .
13.083	2.5455	3.09	.Q . V . . .
13.167	2.5672	3.15	.Q . V . . .
13.250	2.5892	3.20	.Q . V . . .
13.333	2.6116	3.26	.Q . V . . .
13.417	2.6345	3.32	.Q . V . . .
13.500	2.6578	3.38	.Q . V . . .
13.583	2.6815	3.45	.Q . V . . .
13.667	2.7058	3.52	. Q . V . . .
13.750	2.7306	3.59	. Q . V . . .
13.833	2.7559	3.68	. Q . V . . .
13.917	2.7818	3.76	. Q . V . . .
14.000	2.8083	3.85	. Q . V . . .
14.083	2.8355	3.95	. Q . V . . .
14.167	2.8639	4.12	. Q . V . . .
14.250	2.8932	4.27	. Q . V . . .
14.333	2.9235	4.39	. Q . V . . .
14.417	2.9546	4.52	. Q . V . . .
14.500	2.9867	4.66	. Q . V . . .
14.583	3.0198	4.80	. Q . V . . .
14.667	3.0540	4.97	. Q . V . . .
14.750	3.0893	5.14	. Q . V . . .
14.833	3.1261	5.34	. Q . V . . .
14.917	3.1642	5.54	. Q . V . . .
15.000	3.2041	5.79	. Q . V . . .
15.083	3.2457	6.04	. Q . V . . .
15.167	3.2894	6.35	. Q . V . . .
15.250	3.3355	6.68	. Q . V . . .
15.333	3.3843	7.10	. Q . V. . .
15.417	3.4370	7.64	. Q . V. . .
15.500	3.4971	8.73	. Q . V. . .
15.583	3.5644	9.77	. Q . V . . .
15.667	3.6391	10.84	. Q . V . . .
15.750	3.7215	11.97	. Q . .V . . .
15.833	3.8134	13.33	. Q . .V . . .
15.917	3.9207	15.58	. Q . . V . . .
16.000	4.0633	20.71	.Q . . V . . .
16.083	4.3018	34.63	. . Q. V . . .
16.167	4.7410	63.78	. . . V . Q .
16.250	5.0610	46.46	. . . Q V . . .
16.333	5.2027	20.57	.Q . . V. . .
16.417	5.2905	12.75	. Q . . V. . .
16.500	5.3564	9.56	. Q . . V . . .
16.583	5.4099	7.77	. Q . . V . . .
16.667	5.4562	6.73	. Q . . V . . .
16.750	5.4977	6.02	. Q . . .V . . .
16.833	5.5356	5.52	. Q . . .V . . .
16.917	5.5708	5.11	. Q . . .V . . .
17.000	5.6037	4.78	. Q . . .V . . .
17.083	5.6346	4.48	. Q . . .V . . .
17.167	5.6634	4.18	. Q . . .V . . .
17.250	5.6905	3.93	. Q . . . V . . .

17.333	5.7163	3.74	. Q	.	.	.	V	.
17.417	5.7409	3.58	. Q	.	.	.	V	.
17.500	5.7646	3.44	.Q	.	.	.	V	.
17.583	5.7874	3.31	.Q	.	.	.	V	.
17.667	5.8093	3.19	.Q	.	.	.	V	.
17.750	5.8305	3.08	.Q	.	.	.	V	.
17.833	5.8511	2.98	.Q	.	.	.	V	.
17.917	5.8710	2.89	.Q	.	.	.	V	.
18.000	5.8903	2.81	.Q	.	.	.	V	.
18.083	5.9097	2.82	.Q	.	.	.	V	.
18.167	5.9315	3.17	.Q	.	.	.	V	.
18.250	5.9549	3.39	.Q	.	.	.	V	.
18.333	5.9781	3.38	.Q	.	.	.	V	.
18.417	6.0010	3.32	.Q	.	.	.	V	.
18.500	6.0235	3.26	.Q	.	.	.	V	.
18.583	6.0456	3.21	.Q	.	.	.	V	.
18.667	6.0673	3.15	.Q	.	.	.	V	.
18.750	6.0887	3.10	.Q	.	.	.	V	.
18.833	6.1097	3.05	.Q	.	.	.	V	.
18.917	6.1304	3.01	.Q	.	.	.	V	.
19.000	6.1508	2.96	.Q	.	.	.	V	.
19.083	6.1709	2.92	.Q	.	.	.	V	.
19.167	6.1907	2.88	.Q	.	.	.	V	.
19.250	6.2103	2.84	.Q	.	.	.	V	.
19.333	6.2296	2.80	.Q	.	.	.	V	.
19.417	6.2486	2.76	.Q	.	.	.	V	.
19.500	6.2674	2.73	.Q	.	.	.	V	.
19.583	6.2860	2.69	.Q	.	.	.	V	.
19.667	6.3043	2.66	.Q	.	.	.	V	.
19.750	6.3224	2.63	.Q	.	.	.	V	.
19.833	6.3403	2.60	.Q	.	.	.	V	.
19.917	6.3580	2.57	.Q	.	.	.	V	.
20.000	6.3756	2.54	.Q	.	.	.	V	.
20.083	6.3929	2.52	.Q	.	.	.	V	.
20.167	6.4100	2.49	.Q	.	.	.	V	.
20.250	6.4270	2.46	.Q	.	.	.	V	.
20.333	6.4438	2.44	.Q	.	.	.	V	.
20.417	6.4604	2.41	.Q	.	.	.	V	.
20.500	6.4769	2.39	.Q	.	.	.	V	.
20.583	6.4932	2.37	.Q	.	.	.	V	.
20.667	6.5094	2.35	.Q	.	.	.	V	.
20.750	6.5254	2.32	.Q	.	.	.	V	.
20.833	6.5412	2.30	.Q	.	.	.	V	.
20.917	6.5570	2.28	.Q	.	.	.	V	.
21.000	6.5726	2.26	.Q	.	.	.	V	.
21.083	6.5880	2.24	.Q	.	.	.	V	.
21.167	6.6033	2.23	.Q	.	.	.	V	.
21.250	6.6185	2.21	.Q	.	.	.	V	.
21.333	6.6336	2.19	.Q	.	.	.	V	.
21.417	6.6486	2.17	.Q	.	.	.	V	.
21.500	6.6634	2.15	.Q	.	.	.	V	.
21.583	6.6781	2.14	.Q	.	.	.	V	.
21.667	6.6928	2.12	.Q	.	.	.	V	.
21.750	6.7073	2.11	.Q	.	.	.	V	.
21.833	6.7216	2.09	.Q	.	.	.	V	.
21.917	6.7359	2.07	.Q	.	.	.	V	.
22.000	6.7501	2.06	.Q	.	.	.	V	.
22.083	6.7642	2.05	.Q	.	.	.	V	.
22.167	6.7782	2.03	.Q	.	.	.	V	.
22.250	6.7921	2.02	.Q	.	.	.	V	.
22.333	6.8059	2.00	.Q	.	.	.	V	.
22.417	6.8196	1.99	.Q	.	.	.	V	.
22.500	6.8332	1.98	.Q	.	.	.	V	.
22.583	6.8467	1.96	.Q	.	.	.	V	.
22.667	6.8601	1.95	.Q	.	.	.	V	.
22.750	6.8735	1.94	.Q	.	.	.	V	.
22.833	6.8868	1.93	.Q	.	.	.	V	.

```
                                                    TRUCK2
  22.917      6.8999      1.91  .Q        .         .         .        V .
  23.000      6.9131      1.90  .Q        .         .         .         V.
  23.083      6.9261      1.89  .Q        .         .         .         V.
  23.167      6.9390      1.88  .Q        .         .         .         V.
  23.250      6.9519      1.87  .Q        .         .         .         V.
  23.333      6.9647      1.86  .Q        .         .         .         V.
  23.417      6.9774      1.85  .Q        .         .         .         V.
  23.500      6.9900      1.84  .Q        .         .         .         V.
  23.583      7.0026      1.83  .Q        .         .         .         V.
  23.667      7.0151      1.82  .Q        .         .         .         V.
  23.750      7.0276      1.81  .Q        .         .         .         V.
  23.833      7.0399      1.80  .Q        .         .         .         V.
  23.917      7.0522      1.79  .Q        .         .         .         V.
  24.000      7.0645      1.78  .Q        .         .         .         V.
  24.083      7.0754      1.59  Q         .         .         .         V.
  24.167      7.0804      0.72  Q         .         .         .         V.
  24.250      7.0814      0.14  Q         .         .         .         V.
  24.333      7.0815      0.03  Q         .         .         .         V.
  24.417      7.0816      0.01  Q         .         .         .         V.
--------------------------------------------------------------------------------
    TIME DURATION(minutes) OF PERCENTILES OF ESTIMATED PEAK FLOW RATE:
    (Note: 100% of Peak Flow Rate estimate assumed to have
    an instantaneous time duration)

    Percentile of Estimated              Duration
        Peak Flow Rate                   (minutes)
    ========================             =========
                0%                        1465.0
               10%                          90.0
               20%                          35.0
               30%                          25.0
               40%                          15.0
               50%                          15.0
               60%                          10.0
               70%                          10.0
               80%                           5.0
               90%                           5.0

********************************************************************************
  FLOW PROCESS FROM NODE    252.00 TO NODE    252.00 IS CODE = 3.1
--------------------------------------------------------------------------------
  >>>>>FLOW-THROUGH DETENTION BASIN ROUTING MODEL APPLIED TO STREAM #1<<<<<
================================================================================
```




```
        ROUTE RUNOFF HYDROGRAPH FROM STREAM NUMBER 1
        THROUGH A FLOW-THROUGH DETENTION BASIN
        SPECIFIED BASIN CONDITIONS ARE AS FOLLOWS:
          DEAD STORAGE(AF) =      0.000
```

TRUCK2

SPECIFIED DEAD STORAGE(AF) FILLED = 0.000

SPECIFIED EFFECTIVE VOLUME(AF) FILLED ABOVE OUTLET = 0.000

DETENTION BASIN CONSTANT LOSS RATE(CFS) = 0.00

BASIN DEPTH VERSUS OUTFLOW AND STORAGE INFORMATION:

INTERVAL NUMBER	DEPTH (FT)	OUTFLOW (CFS)	STORAGE (AF)
1	0.00	0.00	0.000
2	0.08	4.00	0.001
3	0.28	4.30	0.050
4	0.48	4.60	0.210
5	0.68	4.90	0.510
6	0.88	5.20	0.920
7	1.08	5.50	1.380
8	1.28	5.80	1.890

MODIFIED-PULS BASIN ROUTING MODEL RESULTS(5-MINUTE COMPUTATION INTERVALS):
(Note: Computed EFFECTIVE DEPTH and VOLUME are estimated at the clock time;
MEAN OUTFLOW is the average value during the unit interval.)

CLOCK TIME (HRS)	DEAD-STORAGE FILLED(AF)	INFLOW (CFS)	LOSS (CFS)	EFFECTIVE DEPTH(FT)	MEAN OUTFLOW (CFS)	EFFECTIVE VOLUME(AF)
0.083	0.000	0.18	0.00	0.01	0.2	0.000
0.167	0.000	1.04	0.00	0.03	1.0	0.000
0.250	0.000	1.62	0.00	0.03	1.6	0.000
0.333	0.000	1.74	0.00	0.04	1.7	0.001
0.417	0.000	1.76	0.00	0.03	1.8	0.000
0.500	0.000	1.77	0.00	0.04	1.8	0.001
0.583	0.000	1.78	0.00	0.03	1.8	0.000
0.667	0.000	1.78	0.00	0.04	1.8	0.001
0.750	0.000	1.79	0.00	0.03	1.8	0.000
0.833	0.000	1.79	0.00	0.04	1.8	0.001
0.917	0.000	1.80	0.00	0.04	1.8	0.000
1.000	0.000	1.80	0.00	0.04	1.8	0.001
1.083	0.000	1.81	0.00	0.04	1.8	0.000
1.167	0.000	1.81	0.00	0.04	1.8	0.001
1.250	0.000	1.82	0.00	0.04	1.8	0.000
1.333	0.000	1.82	0.00	0.04	1.8	0.001
1.417	0.000	1.83	0.00	0.04	1.8	0.000
1.500	0.000	1.83	0.00	0.04	1.8	0.001
1.583	0.000	1.84	0.00	0.04	1.8	0.001
1.667	0.000	1.84	0.00	0.04	1.8	0.001
1.750	0.000	1.85	0.00	0.04	1.8	0.001
1.833	0.000	1.85	0.00	0.04	1.9	0.001
1.917	0.000	1.86	0.00	0.04	1.9	0.001
2.000	0.000	1.86	0.00	0.04	1.9	0.001
2.083	0.000	1.87	0.00	0.04	1.9	0.001
2.167	0.000	1.88	0.00	0.04	1.9	0.001
2.250	0.000	1.88	0.00	0.04	1.9	0.001
2.333	0.000	1.89	0.00	0.04	1.9	0.001
2.417	0.000	1.89	0.00	0.04	1.9	0.001
2.500	0.000	1.90	0.00	0.04	1.9	0.001
2.583	0.000	1.90	0.00	0.04	1.9	0.001
2.667	0.000	1.91	0.00	0.04	1.9	0.001
2.750	0.000	1.92	0.00	0.04	1.9	0.001
2.833	0.000	1.92	0.00	0.04	1.9	0.001
2.917	0.000	1.93	0.00	0.04	1.9	0.001
3.000	0.000	1.93	0.00	0.04	1.9	0.001
3.083	0.000	1.94	0.00	0.04	1.9	0.001
3.167	0.000	1.95	0.00	0.04	1.9	0.001
3.250	0.000	1.95	0.00	0.04	2.0	0.001

3.333	0.000	1.96	0.00	0.04	2.0	0.001
3.417	0.000	1.97	0.00	0.04	2.0	0.001
3.500	0.000	1.97	0.00	0.04	2.0	0.001
3.583	0.000	1.98	0.00	0.04	2.0	0.001
3.667	0.000	1.98	0.00	0.04	2.0	0.001
3.750	0.000	1.99	0.00	0.04	2.0	0.001
3.833	0.000	2.00	0.00	0.04	2.0	0.001
3.917	0.000	2.00	0.00	0.04	2.0	0.001
4.000	0.000	2.01	0.00	0.04	2.0	0.001
4.083	0.000	2.02	0.00	0.04	2.0	0.001
4.167	0.000	2.03	0.00	0.04	2.0	0.001
4.250	0.000	2.03	0.00	0.04	2.0	0.001
4.333	0.000	2.04	0.00	0.04	2.0	0.001
4.417	0.000	2.05	0.00	0.04	2.0	0.001
4.500	0.000	2.05	0.00	0.04	2.1	0.001
4.583	0.000	2.06	0.00	0.04	2.1	0.001
4.667	0.000	2.07	0.00	0.04	2.1	0.001
4.750	0.000	2.08	0.00	0.04	2.1	0.001
4.833	0.000	2.08	0.00	0.04	2.1	0.001
4.917	0.000	2.09	0.00	0.04	2.1	0.001
5.000	0.000	2.10	0.00	0.04	2.1	0.001
5.083	0.000	2.11	0.00	0.04	2.1	0.001
5.167	0.000	2.12	0.00	0.04	2.1	0.001
5.250	0.000	2.12	0.00	0.04	2.1	0.001
5.333	0.000	2.13	0.00	0.04	2.1	0.001
5.417	0.000	2.14	0.00	0.04	2.1	0.001
5.500	0.000	2.15	0.00	0.04	2.1	0.001
5.583	0.000	2.16	0.00	0.04	2.2	0.001
5.667	0.000	2.17	0.00	0.04	2.2	0.001
5.750	0.000	2.17	0.00	0.04	2.2	0.001
5.833	0.000	2.18	0.00	0.04	2.2	0.001
5.917	0.000	2.19	0.00	0.04	2.2	0.001
6.000	0.000	2.20	0.00	0.04	2.2	0.001
6.083	0.000	2.21	0.00	0.04	2.2	0.001
6.167	0.000	2.22	0.00	0.04	2.2	0.001
6.250	0.000	2.23	0.00	0.04	2.2	0.001
6.333	0.000	2.24	0.00	0.04	2.2	0.001
6.417	0.000	2.25	0.00	0.04	2.2	0.001
6.500	0.000	2.26	0.00	0.05	2.3	0.001
6.583	0.000	2.27	0.00	0.05	2.3	0.001
6.667	0.000	2.28	0.00	0.05	2.3	0.001
6.750	0.000	2.29	0.00	0.05	2.3	0.001
6.833	0.000	2.30	0.00	0.05	2.3	0.001
6.917	0.000	2.31	0.00	0.05	2.3	0.001
7.000	0.000	2.32	0.00	0.05	2.3	0.001
7.083	0.000	2.33	0.00	0.05	2.3	0.001
7.167	0.000	2.34	0.00	0.05	2.3	0.001
7.250	0.000	2.35	0.00	0.05	2.3	0.001
7.333	0.000	2.36	0.00	0.05	2.4	0.001
7.417	0.000	2.37	0.00	0.05	2.4	0.001
7.500	0.000	2.38	0.00	0.05	2.4	0.001
7.583	0.000	2.39	0.00	0.05	2.4	0.001
7.667	0.000	2.41	0.00	0.05	2.4	0.001
7.750	0.000	2.42	0.00	0.05	2.4	0.001
7.833	0.000	2.43	0.00	0.05	2.4	0.001
7.917	0.000	2.44	0.00	0.05	2.4	0.001
8.000	0.000	2.45	0.00	0.05	2.5	0.001
8.083	0.000	2.47	0.00	0.05	2.5	0.001
8.167	0.000	2.48	0.00	0.05	2.5	0.001
8.250	0.000	2.49	0.00	0.05	2.5	0.001
8.333	0.000	2.51	0.00	0.05	2.5	0.001
8.417	0.000	2.52	0.00	0.05	2.5	0.001
8.500	0.000	2.53	0.00	0.05	2.5	0.001
8.583	0.000	2.55	0.00	0.05	2.5	0.001
8.667	0.000	2.56	0.00	0.05	2.6	0.001
8.750	0.000	2.58	0.00	0.05	2.6	0.001
8.833	0.000	2.59	0.00	0.05	2.6	0.001

8.917	0.000	2.60	0.00	0.05	2.6	0.001
9.000	0.000	2.62	0.00	0.05	2.6	0.001
9.083	0.000	2.63	0.00	0.05	2.6	0.001
9.167	0.000	2.65	0.00	0.05	2.7	0.001
9.250	0.000	2.67	0.00	0.05	2.7	0.001
9.333	0.000	2.68	0.00	0.05	2.7	0.001
9.417	0.000	2.70	0.00	0.05	2.7	0.001
9.500	0.000	2.72	0.00	0.05	2.7	0.001
9.583	0.000	2.73	0.00	0.05	2.7	0.001
9.667	0.000	2.75	0.00	0.06	2.7	0.001
9.750	0.000	2.77	0.00	0.06	2.8	0.001
9.833	0.000	2.79	0.00	0.06	2.8	0.001
9.917	0.000	2.80	0.00	0.06	2.8	0.001
10.000	0.000	2.82	0.00	0.06	2.8	0.001
10.083	0.000	2.84	0.00	0.06	2.8	0.001
10.167	0.000	2.86	0.00	0.06	2.9	0.001
10.250	0.000	2.88	0.00	0.06	2.9	0.001
10.333	0.000	2.90	0.00	0.06	2.9	0.001
10.417	0.000	2.92	0.00	0.06	2.9	0.001
10.500	0.000	2.95	0.00	0.06	2.9	0.001
10.583	0.000	2.97	0.00	0.06	3.0	0.001
10.667	0.000	2.99	0.00	0.06	3.0	0.001
10.750	0.000	3.01	0.00	0.06	3.0	0.001
10.833	0.000	3.04	0.00	0.06	3.0	0.001
10.917	0.000	3.06	0.00	0.06	3.1	0.001
11.000	0.000	3.08	0.00	0.06	3.1	0.001
11.083	0.000	3.11	0.00	0.06	3.1	0.001
11.167	0.000	3.14	0.00	0.06	3.1	0.001
11.250	0.000	3.16	0.00	0.06	3.2	0.001
11.333	0.000	3.19	0.00	0.06	3.2	0.001
11.417	0.000	3.22	0.00	0.06	3.2	0.001
11.500	0.000	3.24	0.00	0.07	3.2	0.001
11.583	0.000	3.27	0.00	0.07	3.3	0.001
11.667	0.000	3.30	0.00	0.07	3.3	0.001
11.750	0.000	3.33	0.00	0.07	3.3	0.001
11.833	0.000	3.37	0.00	0.07	3.4	0.001
11.917	0.000	3.40	0.00	0.07	3.4	0.001
12.000	0.000	3.43	0.00	0.07	3.4	0.001
12.083	0.000	3.38	0.00	0.07	3.4	0.001
12.167	0.000	2.99	0.00	0.05	3.0	0.001
12.250	0.000	2.73	0.00	0.05	2.7	0.001
12.333	0.000	2.71	0.00	0.05	2.7	0.001
12.417	0.000	2.74	0.00	0.06	2.7	0.001
12.500	0.000	2.78	0.00	0.06	2.8	0.001
12.583	0.000	2.82	0.00	0.06	2.8	0.001
12.667	0.000	2.86	0.00	0.06	2.9	0.001
12.750	0.000	2.90	0.00	0.06	2.9	0.001
12.833	0.000	2.95	0.00	0.06	2.9	0.001
12.917	0.000	2.99	0.00	0.06	3.0	0.001
13.000	0.000	3.04	0.00	0.06	3.0	0.001
13.083	0.000	3.09	0.00	0.06	3.1	0.001
13.167	0.000	3.15	0.00	0.06	3.1	0.001
13.250	0.000	3.20	0.00	0.06	3.2	0.001
13.333	0.000	3.26	0.00	0.07	3.3	0.001
13.417	0.000	3.32	0.00	0.07	3.3	0.001
13.500	0.000	3.38	0.00	0.07	3.4	0.001
13.583	0.000	3.45	0.00	0.07	3.4	0.001
13.667	0.000	3.52	0.00	0.07	3.5	0.001
13.750	0.000	3.59	0.00	0.07	3.6	0.001
13.833	0.000	3.68	0.00	0.07	3.7	0.001
13.917	0.000	3.76	0.00	0.08	3.8	0.001
14.000	0.000	3.85	0.00	0.08	3.8	0.001
14.083	0.000	3.95	0.00	0.08	3.9	0.001
14.167	0.000	4.12	0.00	0.08	4.0	0.002
14.250	0.000	4.27	0.00	0.09	4.0	0.004
14.333	0.000	4.39	0.00	0.10	4.0	0.006
14.417	0.000	4.52	0.00	0.11	4.0	0.010

TRUCK2

14.500	0.000	4.66	0.00	0.13	4.1	0.014
14.583	0.000	4.80	0.00	0.15	4.1	0.018
14.667	0.000	4.97	0.00	0.17	4.1	0.024
14.750	0.000	5.14	0.00	0.20	4.2	0.031
14.833	0.000	5.34	0.00	0.23	4.2	0.039
14.917	0.000	5.54	0.00	0.27	4.3	0.048
15.000	0.000	5.79	0.00	0.29	4.3	0.058
15.083	0.000	6.04	0.00	0.30	4.3	0.070
15.167	0.000	6.35	0.00	0.32	4.3	0.083
15.250	0.000	6.68	0.00	0.34	4.4	0.099
15.333	0.000	7.10	0.00	0.36	4.4	0.118
15.417	0.000	7.64	0.00	0.39	4.4	0.140
15.500	0.000	8.73	0.00	0.43	4.5	0.169
15.583	0.000	9.77	0.00	0.47	4.6	0.205
15.667	0.000	10.84	0.00	0.51	4.6	0.248
15.750	0.000	11.97	0.00	0.54	4.7	0.298
15.833	0.000	13.33	0.00	0.58	4.7	0.357
15.917	0.000	15.58	0.00	0.63	4.8	0.432
16.000	0.000	20.71	0.00	0.70	4.9	0.541
16.083	0.000	34.63	0.00	0.79	5.0	0.745
16.167	0.000	63.78	0.00	0.98	5.2	1.148
16.250	0.000	46.46	0.00	1.10	5.4	1.431
16.333	0.000	20.57	0.00	1.14	5.6	1.534
16.417	0.000	12.75	0.00	1.16	5.6	1.583
16.500	0.000	9.56	0.00	1.17	5.6	1.611
16.583	0.000	7.77	0.00	1.18	5.6	1.625
16.667	0.000	6.73	0.00	1.18	5.6	1.633
16.750	0.000	6.02	0.00	1.18	5.6	1.635
16.833	0.000	5.52	0.00	1.18	5.6	1.634
16.917	0.000	5.11	0.00	1.18	5.6	1.631
17.000	0.000	4.78	0.00	1.18	5.6	1.625
17.083	0.000	4.48	0.00	1.17	5.6	1.617
17.167	0.000	4.18	0.00	1.17	5.6	1.607
17.250	0.000	3.93	0.00	1.16	5.6	1.595
17.333	0.000	3.74	0.00	1.16	5.6	1.582
17.417	0.000	3.58	0.00	1.15	5.6	1.568
17.500	0.000	3.44	0.00	1.15	5.6	1.553
17.583	0.000	3.31	0.00	1.14	5.6	1.537
17.667	0.000	3.19	0.00	1.14	5.6	1.521
17.750	0.000	3.08	0.00	1.13	5.6	1.503
17.833	0.000	2.98	0.00	1.12	5.6	1.486
17.917	0.000	2.89	0.00	1.11	5.6	1.467
18.000	0.000	2.81	0.00	1.11	5.5	1.448
18.083	0.000	2.82	0.00	1.10	5.5	1.430
18.167	0.000	3.17	0.00	1.09	5.5	1.414
18.250	0.000	3.39	0.00	1.09	5.5	1.399
18.333	0.000	3.38	0.00	1.08	5.5	1.384
18.417	0.000	3.32	0.00	1.08	5.5	1.369
18.500	0.000	3.26	0.00	1.07	5.5	1.354
18.583	0.000	3.21	0.00	1.06	5.5	1.338
18.667	0.000	3.15	0.00	1.05	5.5	1.322
18.750	0.000	3.10	0.00	1.05	5.5	1.306
18.833	0.000	3.05	0.00	1.04	5.4	1.290
18.917	0.000	3.01	0.00	1.03	5.4	1.273
19.000	0.000	2.96	0.00	1.03	5.4	1.256
19.083	0.000	2.92	0.00	1.02	5.4	1.239
19.167	0.000	2.88	0.00	1.01	5.4	1.221
19.250	0.000	2.84	0.00	1.00	5.4	1.204
19.333	0.000	2.80	0.00	1.00	5.4	1.186
19.417	0.000	2.76	0.00	0.99	5.4	1.168
19.500	0.000	2.73	0.00	0.98	5.4	1.150
19.583	0.000	2.69	0.00	0.97	5.3	1.132
19.667	0.000	2.66	0.00	0.96	5.3	1.113
19.750	0.000	2.63	0.00	0.96	5.3	1.095
19.833	0.000	2.60	0.00	0.95	5.3	1.076
19.917	0.000	2.57	0.00	0.94	5.3	1.057
20.000	0.000	2.54	0.00	0.93	5.3	1.039

← Q_{100} (DISCHARGE) = 5.6 CFS
DEPTH = 1.18 FT
VOLUME = 1.635 AC-FT

TRUCK2

20.083	0.000	2.52	0.00	0.92	5.3	1.020
20.167	0.000	2.49	0.00	0.92	5.3	1.001
20.250	0.000	2.46	0.00	0.91	5.2	0.981
20.333	0.000	2.44	0.00	0.90	5.2	0.962
20.417	0.000	2.41	0.00	0.89	5.2	0.943
20.500	0.000	2.39	0.00	0.88	5.2	0.923
20.583	0.000	2.37	0.00	0.87	5.2	0.904
20.667	0.000	2.35	0.00	0.86	5.2	0.884
20.750	0.000	2.32	0.00	0.85	5.2	0.865
20.833	0.000	2.30	0.00	0.84	5.2	0.845
20.917	0.000	2.28	0.00	0.83	5.1	0.826
21.000	0.000	2.26	0.00	0.82	5.1	0.806
21.083	0.000	2.24	0.00	0.81	5.1	0.786
21.167	0.000	2.23	0.00	0.81	5.1	0.766
21.250	0.000	2.21	0.00	0.80	5.1	0.747
21.333	0.000	2.19	0.00	0.79	5.1	0.727
21.417	0.000	2.17	0.00	0.78	5.1	0.707
21.500	0.000	2.15	0.00	0.77	5.0	0.687
21.583	0.000	2.14	0.00	0.76	5.0	0.667
21.667	0.000	2.12	0.00	0.75	5.0	0.647
21.750	0.000	2.11	0.00	0.74	5.0	0.627
21.833	0.000	2.09	0.00	0.73	5.0	0.608
21.917	0.000	2.07	0.00	0.72	5.0	0.588
22.000	0.000	2.06	0.00	0.71	4.9	0.568
22.083	0.000	2.05	0.00	0.70	4.9	0.548
22.167	0.000	2.03	0.00	0.69	4.9	0.528
22.250	0.000	2.02	0.00	0.68	4.9	0.508
22.333	0.000	2.00	0.00	0.67	4.9	0.488
22.417	0.000	1.99	0.00	0.65	4.9	0.468
22.500	0.000	1.98	0.00	0.64	4.8	0.449
22.583	0.000	1.96	0.00	0.63	4.8	0.429
22.667	0.000	1.95	0.00	0.61	4.8	0.409
22.750	0.000	1.94	0.00	0.60	4.8	0.390
22.833	0.000	1.93	0.00	0.59	4.8	0.370
22.917	0.000	1.91	0.00	0.57	4.8	0.350
23.000	0.000	1.90	0.00	0.56	4.7	0.331
23.083	0.000	1.89	0.00	0.55	4.7	0.312
23.167	0.000	1.88	0.00	0.53	4.7	0.292
23.250	0.000	1.87	0.00	0.52	4.7	0.273
23.333	0.000	1.86	0.00	0.51	4.7	0.254
23.417	0.000	1.85	0.00	0.50	4.6	0.234
23.500	0.000	1.84	0.00	0.48	4.6	0.215
23.583	0.000	1.83	0.00	0.46	4.6	0.196
23.667	0.000	1.82	0.00	0.44	4.6	0.177
23.750	0.000	1.81	0.00	0.42	4.5	0.159
23.833	0.000	1.80	0.00	0.39	4.5	0.140
23.917	0.000	1.79	0.00	0.37	4.5	0.122

PROCESS SUMMARY OF STORAGE:
INFLOW VOLUME = 7.082 AF
BASIN STORAGE = 0.000 AF (WITH 0.000 AF INITIALLY FILLED)
OUTFLOW VOLUME = 7.092 AF
LOSS VOLUME = 0.000 AF

==========

END OF FLOODSCx ROUTING ANALYSIS

APPENDIX D

HYDRAULIC CALCULATIONS

DATE: 10/12/2019
TIME: 15:24

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														
CD	42	4			3.50														
CD	48	4			4.00														
CD	54	4			4.50														
CD	60	4			5.00														
CD	66	4			5.50														
CD	72	4			6.00														

F 0 5 1 5 P

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON

HEADING LINE NO 2 IS -

MASTER PLAN STORM DRAIN LINE "B" IN LA CADENA DRIVE

HEADING LINE NO 3 IS -

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1007.20	887.00	60	900.00

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1457.20	891.95	60	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1461.87	892.00	60	0.013	0.00	0.00	0.00	1

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1599.93	893.52	60	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1911.87	896.95	60	0.013	5980.00	3.00	0.00	0

ELEMENT NO 6 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1916.54	897.00	60	0.013	0.00	0.00	0.00	1

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2366.54	901.95	60	0.013	5980.00	4.30	0.00	0

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2371.20	902.00	60	0.013	0.00	0.00	0.00	1

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2814.31	906.88	60	0.013	5980.00	4.20	0.00	0

ELEMENT NO 10 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	2818.98	907.38	60	48	0	0.013	94.0	0.0	908.38	0.00	90.00	0.00

ELEMENT NO 11 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	2897.61	908.16	60	0.013	5980.00	0.00	0.80	0

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3169.11	910.88	60	0.013	0.00	0.00	0.00	0

F 0 5 1 5 P

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 13 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3173.78	910.98	60	0.013	0.00	0.00	0.00	1

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	3523.78	914.48	60	0.013	0.00	0.00	0.00	0

ELEMENT NO 15 IS A REACH

	U/S DATA	STATION	INVERT	SECT		N			RADIUS	ANGLE	ANG PT	MAN H
		3528.44	914.58	60		0.013			0.00	0.00	0.00	1
ELEMENT NO 16 IS A REACH		*	*	*								
	U/S DATA	STATION	INVERT	SECT		N			RADIUS	ANGLE	ANG PT	MAN H
		3876.35	918.06	60		0.013			0.00	0.00	0.00	0
ELEMENT NO 17 IS A JUNCTION		*	*	*	*		*	*		*		
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		3886.01	918.16	60	48	0	0.013	57.2	0.0	919.00	0.00	45.00	0.00
ELEMENT NO 18 IS A REACH		*	*	*								
	U/S DATA	STATION	INVERT	SECT		N			RADIUS	ANGLE	ANG PT	MAN H
		3890.01	918.20	60		0.013			0.00	0.00	0.00	0
ELEMENT NO 19 IS A SYSTEM HEADWORKS				*			*					
	U/S DATA	STATION	INVERT	SECT				W S ELEV				
		3890.01	918.20	60				0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
MASTER PLAN STORM DRAIN LINE "B" IN LA CADENA DRIVE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1007.20	887.00	13.000	900.000	256.0	13.04	2.640	902.640	0.00	4.460		5.00	0.00	0.00	0	0.00
450.00	0.01100					.009662	4.35			3.842			0.00		
1457.20	891.95	12.398	904.348	256.0	13.04	2.640	906.988	0.00	4.460		5.00	0.00	0.00	0	0.00
4.67	0.01071					.009662	0.05			3.890			0.00		
1461.87	892.00	12.525	904.525	256.0	13.04	2.640	907.165	0.00	4.460		5.00	0.00	0.00	0	0.00
138.06	0.01101					.009662	1.33			3.840			0.00		
1599.93	893.52	12.339	905.859	256.0	13.04	2.640	908.499	0.00	4.460		5.00	0.00	0.00	0	0.00
311.94	0.01100					.009662	3.01			3.842			0.00		
1911.87	896.95	12.019	908.969	256.0	13.04	2.640	911.609	0.00	4.460		5.00	0.00	0.00	0	0.00
4.67	0.01071					.009662	0.05			3.890			0.00		
1916.54	897.00	12.146	909.146	256.0	13.04	2.640	911.786	0.00	4.460		5.00	0.00	0.00	0	0.00
450.00	0.01100					.009662	4.35			3.842			0.00		
2366.54	901.95	11.659	913.609	256.0	13.04	2.640	916.249	0.00	4.460		5.00	0.00	0.00	0	0.00
4.66	0.01073					.009662	0.05			3.886			0.00		
2371.20	902.00	11.786	913.786	256.0	13.04	2.640	916.426	0.00	4.460		5.00	0.00	0.00	0	0.00
443.11	0.01101					.009662	4.28			3.840			0.00		
2814.31	906.88	11.302	918.182	256.0	13.04	2.640	920.822	0.00	4.460		5.00	0.00	0.00	0	0.00
JUNCT STR	0.10707					.006766	0.03						0.00		
2818.98	907.38	13.998	921.378	162.0	8.25	1.057	922.435	0.00	3.650		5.00	0.00	0.00	0	0.00
78.63	0.00992					.003869	0.30			2.862			0.00		
2897.61	908.16	13.525	921.685	162.0	8.25	1.057	922.742	0.00	3.650		5.00	0.00	0.00	0	0.00
271.50	0.01002					.003869	1.05			2.853			0.00		

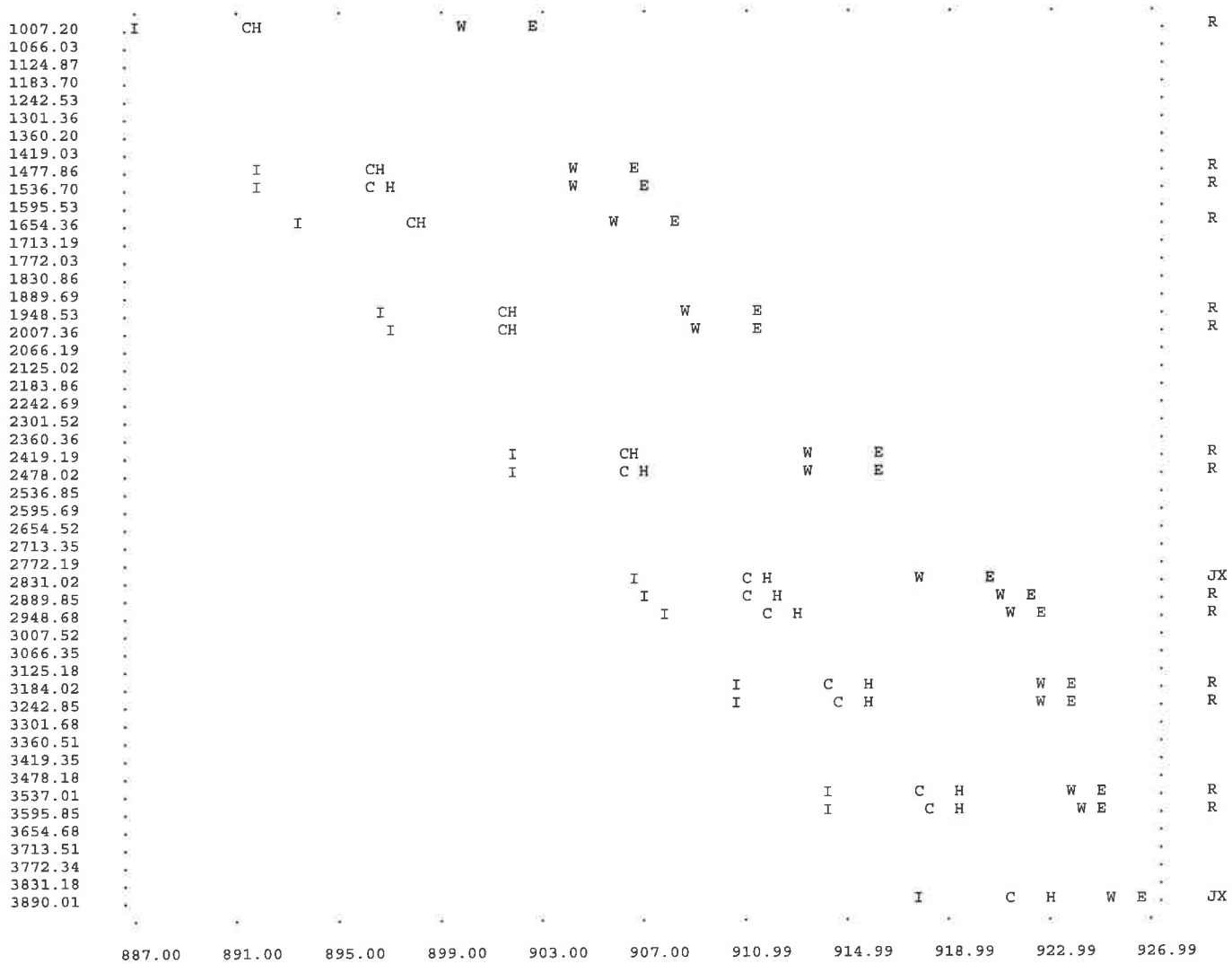
WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
MASTER PLAN STORM DRAIN LINE "B" IN LA CADENA DRIVE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
3169.11	910.88	11.856	922.736	162.0	8.25	1.057	923.793	0.00	3.650		5.00	0.00	0.00	0	0.00
4.67	0.02141					.003869	0.02			2.276			0.00		
3173.78	910.98	11.827	922.807	162.0	8.25	1.057	923.864	0.00	3.650		5.00	0.00	0.00	0	0.00
350.00	0.01000					.003869	1.35			2.855			0.00		
3523.78	914.48	9.681	924.161	162.0	8.25	1.057	925.218	0.00	3.650		5.00	0.00	0.00	0	0.00
4.66	0.02146					.003869	0.02			2.274			0.00		

3528.44	914.58	9.652	924.232	162.0	8.25	1.057	925.289	0.00	3.650		5.00	0.00	0.00	0	0.00
347.91	0.01000					.003869	1.35			2.855			0.00		
3876.35	918.06	7.518	925.578	162.0	8.25	1.057	926.635	0.00	3.650		5.00	0.00	0.00	0	0.00
JUNCT STR	0.01035					.002744	0.03						0.00		
3886.01	918.16	8.383	926.543	104.8	5.34	0.442	926.985	0.00	2.917		5.00	0.00	0.00	0	0.00
4.00	0.01000					.001619	0.01			2.206			0.00		
3890.01	918.20	8.349	926.549	104.8	5.34	0.442	926.991	0.00	2.917		5.00	0.00	0.00	0	0.00□

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
MASTER PLAN STORM DRAIN LINE "B" IN LA CADENA DRIVE



N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 10/12/2019
TIME: 15:25

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	36	4			3.00														
CD	48	4			4.00														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON

HEADING LINE NO 2 IS -

STORM DRAIN LINE "C"

HEADING LINE NO 3 IS -

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1007.91	919.00	48	926.54

ELEMENT NO 2 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1011.91	919.02	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1034.06	919.13	48	0.012	45.00	28.20	0.00	0

ELEMENT NO 4 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1314.67	920.53	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 5 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1319.33	920.63	48	0.013	0.00	0.00	0.00	1

ELEMENT NO 6 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1567.63	921.88	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 7 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1585.30	922.50	48	0.013	45.00	22.50	0.00	0

ELEMENT NO 8 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1609.21	923.34	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 9 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1626.88	923.97	48	0.013	45.00	22.50	0.00	0

ELEMENT NO 10 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1697.59	926.46	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 11 IS A JUNCTION

U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
	1702.26	926.56	48	18	18	0.013	1.7	1.4	928.96	928.96	90.00	45.00

ELEMENT NO 12 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1726.88	927.43	48	0.013	0.00	0.00	0.00	0

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 13 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1740.22	927.90	48	0.013	45.00	17.00	0.00	0

ELEMENT NO 14 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1771.42	929.00	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 15 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1798.10	929.95	48	0.013	90.00	17.00	0.00	0

ELEMENT NO 16 IS A REACH

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1929.81	934.60	48	0.013	0.00	0.00	0.00	0

ELEMENT NO 17 IS A JUNCTION															
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4		
		1936.88	935.10	36	36	0	0.013	19.4	0.0	935.10	0.00	60.00	0.00		
ELEMENT NO 18 IS A REACH															
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H
		1980.84	936.77	36			0.013					0.00	0.00	0.00	0
ELEMENT NO 19 IS A REACH															
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H
		2009.51	937.87	36			0.013					22.50	73.00	0.00	0
ELEMENT NO 20 IS A REACH															
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H
		2045.78	939.25	36			0.013					0.00	0.00	0.00	0
ELEMENT NO 21 IS A SYSTEM HEADWORKS															
	U/S DATA	STATION	INVERT	SECT							W S ELEV				
		2045.78	939.25	36							0.00				

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC □

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "C"

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1007.91	919.00	7.540	926.540	57.2	4.55	0.322	926.862	0.00	2.276		4.00	0.00	0.00	0	0.00
4.00	0.00500					.001586	0.01			2.147			0.00		
1011.91	919.02	7.526	926.546	57.2	4.55	0.322	926.868	0.00	2.276		4.00	0.00	0.00	0	0.00
22.15	0.00497					.001351	0.03			2.050			0.00		
1034.06	919.13	7.482	926.612	57.2	4.55	0.322	926.934	0.00	2.276		4.00	0.00	0.00	0	0.00
280.61	0.00499					.001586	0.45			2.149			0.00		
1314.67	920.53	6.527	927.057	57.2	4.55	0.322	927.379	0.00	2.276		4.00	0.00	0.00	0	0.00
4.66	0.02146					.001586	0.01			1.424			0.00		
1319.33	920.63	6.451	927.081	57.2	4.55	0.322	927.403	0.00	2.276		4.00	0.00	0.00	0	0.00
248.30	0.00503					.001586	0.39			2.143			0.00		
1567.63	921.88	5.594	927.474	57.2	4.55	0.322	927.796	0.00	2.276		4.00	0.00	0.00	0	0.00
17.67	0.03509					.001586	0.03			1.251			0.00		
1585.30	922.50	5.035	927.535	57.2	4.55	0.322	927.857	0.00	2.276		4.00	0.00	0.00	0	0.00
23.91	0.03513					.001586	0.04			1.251			0.00		
1609.21	923.34	4.233	927.573	57.2	4.55	0.322	927.895	0.00	2.276		4.00	0.00	0.00	0	0.00
7.44	0.03565					.001575	0.01			1.246			0.00		
1616.65	923.61	4.000	927.605	57.2	4.55	0.322	927.927	0.00	2.276		4.00	0.00	0.00	0	0.00
5.45	0.03565					.001469	0.01			1.246			0.00		
1622.10	923.80	3.803	927.602	57.2	4.64	0.334	927.936	0.00	2.276		4.00	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1622.10	923.80	1.289	925.088	57.2	16.34	4.145	929.233	0.00	2.276		4.00	0.00	0.00	0	0.00
4.78	0.03565					.031305	0.15			1.246			0.00		

□

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "C"

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1626.88	923.97	1.291	925.261	57.2	16.31	4.131	929.392	0.00	2.276		4.00	0.00	0.00	0	0.00
28.02	0.03521					.030448	0.85			1.250			0.00		
1654.90	924.96	1.308	926.265	57.2	16.01	3.982	930.247	0.00	2.276		4.00	0.00	0.00	0	0.00
42.69	0.03521					.027824	1.19			1.250			0.00		
1697.59	926.46	1.355	927.815	57.2	15.27	3.619	931.434	0.00	2.276		4.00	0.00	0.00	0	0.00

JUNCT STR	0.02141					.029786	0.14						0.00			
1702.26	926.56	1.230	927.790	54.1	16.48	4.219	932.009	0.00	2.211		4.00	0.00	0.00	0	0.00	
24.62	0.03534					.033283	0.82			1.213			0.00			
1726.88	927.43	1.236	928.666	54.1	16.37	4.163	932.829	0.00	2.211		4.00	0.00	0.00	0	0.00	
13.34	0.03523					.032782	0.44			1.214			0.00			
1740.22	927.90	1.240	929.140	54.1	16.31	4.128	933.268	0.00	2.211		4.00	0.00	0.00	0	0.00	
31.20	0.03526					.031950	1.00			1.214			0.00			
1771.42	929.00	1.253	930.253	54.1	16.07	4.011	934.264	0.00	2.211		4.00	0.00	0.00	0	0.00	
26.68	0.03561					.030485	0.81			1.211			0.00			
1798.10	929.95	1.271	931.221	54.1	15.76	3.858	935.079	0.00	2.211		4.00	0.00	0.00	0	0.00	
30.87	0.03531					.028380	0.88			1.214			0.00			
1828.97	931.04	1.300	932.340	54.1	15.26	3.616	935.956	0.00	2.211		4.00	0.00	0.00	0	0.00	
28.63	0.03531					.025428	0.73			1.214			0.00			
1857.60	932.05	1.346	933.397	54.1	14.55	3.288	936.685	0.00	2.211		4.00	0.00	0.00	0	0.00	
19.27	0.03531					.022282	0.43			1.214			0.00			
1876.87	932.73	1.394	934.125	54.1	13.88	2.990	937.115	0.00	2.211		4.00	0.00	0.00	0	0.00	
14.07	0.03531					.019532	0.27			1.214			0.00			

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "C"

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1890.94	933.23	1.444	934.672	54.1	13.23	2.718	937.390	0.00	2.211		4.00	0.00	0.00	0	0.00
10.73	0.03531					.017127	0.18			1.214			0.00		
1901.67	933.61	1.496	935.102	54.1	12.61	2.471	937.573	0.00	2.211		4.00	0.00	0.00	0	0.00
8.46	0.03531					.015018	0.13			1.214			0.00		
1910.13	933.90	1.549	935.454	54.1	12.03	2.246	937.700	0.00	2.211		4.00	0.00	0.00	0	0.00
6.65	0.03531					.013175	0.09			1.214			0.00		
1916.78	934.14	1.606	935.746	54.1	11.47	2.042	937.788	0.00	2.211		4.00	0.00	0.00	0	0.00
5.37	0.03531					.011565	0.06			1.214			0.00		
1922.15	934.33	1.664	935.994	54.1	10.93	1.856	937.850	0.00	2.211		4.00	0.00	0.00	0	0.00
4.29	0.03531					.010154	0.04			1.214			0.00		
1926.44	934.48	1.725	936.206	54.1	10.42	1.687	937.893	0.00	2.211		4.00	0.00	0.00	0	0.00
3.37	0.03531					.008921	0.03			1.214			0.00		
1929.81	934.60	1.790	936.390	54.1	9.94	1.534	937.924	0.00	2.211		4.00	0.00	0.00	0	0.00
JUNCT STR	0.07072					.020118	0.14						0.00		
1936.88	935.10	1.109	936.209	34.7	14.61	3.315	939.524	0.00	1.914		3.00	0.00	0.00	0	0.00
19.10	0.03799					.030894	0.59			1.060			0.00		
1955.98	935.83	1.128	936.954	34.7	14.27	3.164	940.118	0.00	1.914		3.00	0.00	0.00	0	0.00
24.86	0.03799					.028066	0.70			1.060			0.00		
1980.84	936.77	1.169	937.939	34.7	13.61	2.875	940.814	0.00	1.914		3.00	0.00	0.00	0	0.00
2.27	0.03837					.026021	0.06			1.054			0.00		
1983.11	936.86	1.174	938.031	34.7	13.53	2.842	940.873	0.00	1.914		3.00	0.00	0.00	0	0.00
15.30	0.03837					.024226	0.37			1.054			0.00		

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "C"

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR

L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1998.41	937.44	1.216	938.660	34.7	12.90	2.584	941.244	0.00	1.914		3.00	0.00	0.00	0	0.00
11.10	0.03837					.021265	0.24			1.054			0.00		
2009.51	937.87	1.261	939.131	34.7	12.30	2.349	941.480	0.00	1.914		3.00	0.00	0.00	0	0.00
8.43	0.03805					.018719	0.16			1.057			0.00		
2017.94	938.19	1.306	939.497	34.7	11.75	2.143	941.640	0.00	1.914		3.00	0.00	0.00	0	0.00
6.81	0.03805					.016484	0.11			1.057			0.00		
2024.75	938.45	1.354	939.804	34.7	11.20	1.948	941.752	0.00	1.914		3.00	0.00	0.00	0	0.00
5.39	0.03805					.014486	0.08			1.057			0.00		
2030.14	938.65	1.404	940.059	34.7	10.68	1.771	941.830	0.00	1.914		3.00	0.00	0.00	0	0.00
4.27	0.03805					.012741	0.05			1.057			0.00		
2034.41	938.82	1.457	940.274	34.7	10.18	1.610	941.884	0.00	1.914		3.00	0.00	0.00	0	0.00
3.36	0.03805					.011216	0.04			1.057			0.00		
2037.77	938.95	1.513	940.458	34.7	9.71	1.464	941.922	0.00	1.914		3.00	0.00	0.00	0	0.00
2.67	0.03805					.009881	0.03			1.057			0.00		
2040.44	939.05	1.571	940.618	34.7	9.26	1.330	941.948	0.00	1.914		3.00	0.00	0.00	0	0.00
2.04	0.03805					.008710	0.02			1.057			0.00		
2042.48	939.12	1.632	940.757	34.7	8.83	1.209	941.966	0.00	1.914		3.00	0.00	0.00	0	0.00
1.48	0.03805					.007686	0.01			1.057			0.00		
2043.96	939.18	1.697	940.878	34.7	8.41	1.099	941.977	0.00	1.914		3.00	0.00	0.00	0	0.00
1.06	0.03805					.006789	0.01			1.057			0.00		
2045.02	939.22	1.764	940.985	34.7	8.02	1.000	941.985	0.00	1.914		3.00	0.00	0.00	0	0.00
0.59	0.03805					.006003	0.00			1.057			0.00		

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WATER SURFACE PROFILE LISTING

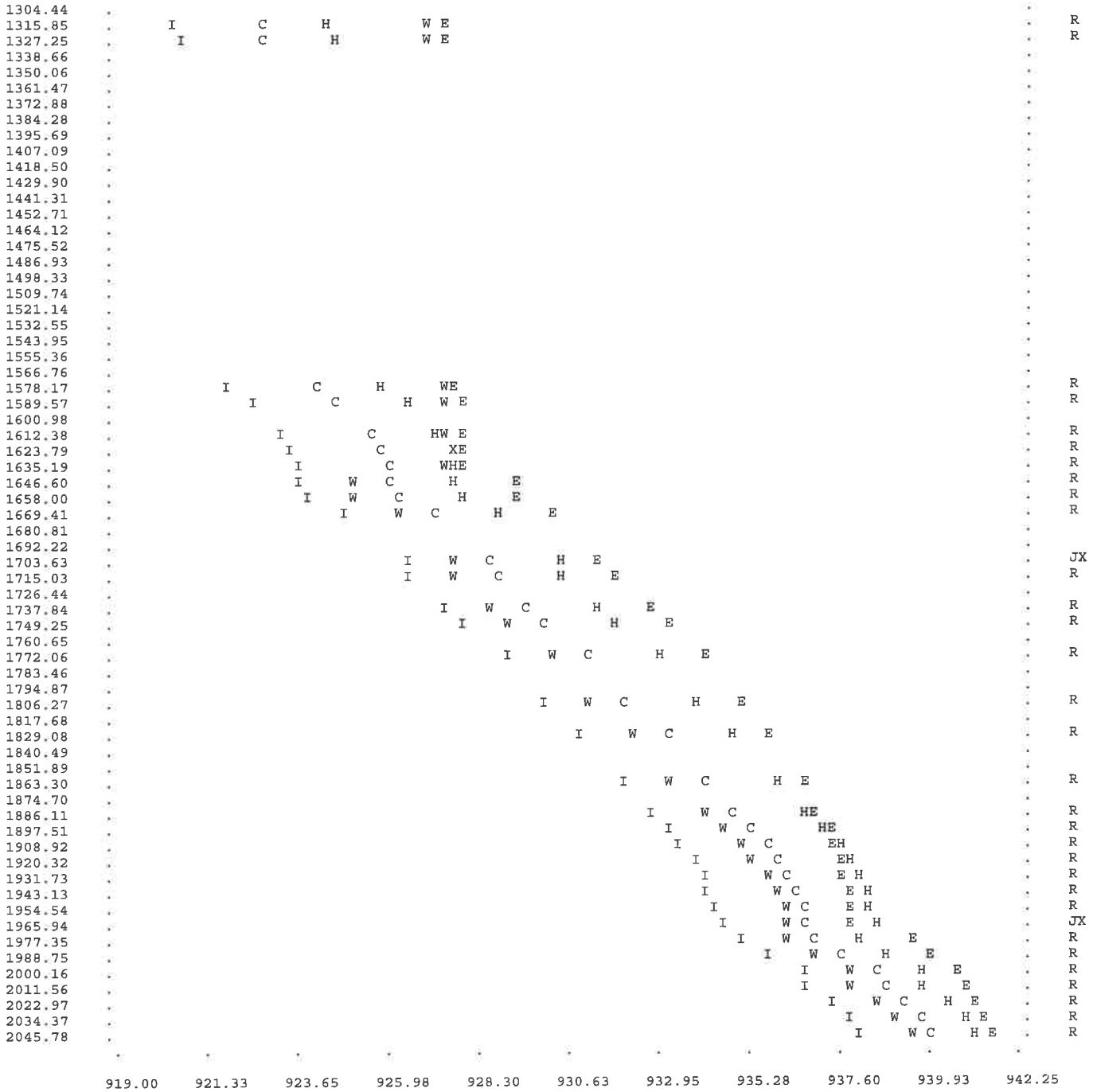
JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "C"

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2045.61	939.24	1.836	941.079	34.7	7.65	0.909	941.988	0.00	1.914		3.00	0.00	0.00	0	0.00
0.17	0.03805					.005314	0.00			1.057			0.00		
2045.78	939.25	1.914	941.164	34.7	7.29	0.825	941.989	0.00	1.914		3.00	0.00	0.00	0	

0.00□

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "C"

```
1007.91   .I      C      H          WE                                    .   R
1019.32   .I      C      H          WE                                    .   R
1030.72   .                                                               .
1042.13   .I       C     H          W E                                   .   R
1053.53   .                                                               .
1064.94   .                                                               .
1076.34   .                                                               .
1087.75   .                                                               .
1099.15   .                                                               .
1110.56   .                                                               .
1121.96   .                                                               .
1133.37   .                                                               .
1144.77   .                                                               .
1156.18   .                                                               .
1167.58   .                                                               .
1178.99   .                                                               .
1190.39   .                                                               .
1201.80   .                                                               .
1213.20   .                                                               .
1224.61   .                                                               .
1236.01   .                                                               .
1247.42   .                                                               .
1258.82   .                                                               .
1270.23   .                                                               .
1281.63   .                                                               .
1293.04   .                                                               .
```



N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 10/12/2019
TIME: 19:13

F0515P

WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														
CD	24	4			2.00														
CD	30	4			2.50														
CD	36	4			3.00														

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON

HEADING LINE NO 2 IS -

STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

HEADING LINE NO 3 IS -

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET	*	*	*						W S ELEV					
U/S DATA	STATION	INVERT	SECT						936.39					
	1004.35	935.10	36											
ELEMENT NO 2 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	1078.85	935.40	36		0.013										
ELEMENT NO 3 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							90.00	13.40	0.00	0
	1099.61	935.48	36		0.013										
ELEMENT NO 4 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	1288.25	936.24	36		0.013										
ELEMENT NO 5 IS A JUNCTION	*	*	*	*		*		*		*					
U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
	1292.25	936.34	30	18	0	0.013	5.6	0.0	937.24	0.00	45.00	0.00			
ELEMENT NO 6 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	1562.25	937.43	30		0.013										
ELEMENT NO 7 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	1
	1566.25	937.53	30		0.013										
ELEMENT NO 8 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	1836.25	938.61	30		0.013										
ELEMENT NO 9 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	1
	1840.25	938.71	30		0.013										
ELEMENT NO 10 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	1940.23	939.11	30		0.013										
ELEMENT NO 11 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							22.50	90.00	0.00	0
	1975.43	939.52	30		0.013										
ELEMENT NO 12 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	2061.75	939.59	30		0.013										

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 13 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							22.50	78.80	0.00	0
	2092.72	939.72	30		0.013										
ELEMENT NO 14 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	2098.63	939.74	30		0.013										
ELEMENT NO 15 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	1
	2102.63	939.84	30		0.013										
ELEMENT NO 16 IS A REACH	*	*	*									RADIUS	ANGLE	ANG PT	MAN H
U/S DATA	STATION	INVERT	SECT		N							0.00	0.00	0.00	0
	2214.07	940.28	30		0.013										

ELEMENT NO 17 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2249.42	940.43	30			0.013					22.50	90.00	0.00	0	
ELEMENT NO 18 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2434.63	941.17	30			0.013					0.00	0.00	0.00	0	
ELEMENT NO 19 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2438.63	941.18	30			0.013					0.00	0.00	0.00	1	
ELEMENT NO 20 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2550.01	941.60	30			0.013					0.00	0.00	0.00	0	
ELEMENT NO 21 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2583.01	941.74	30			0.013					22.50	84.00	0.00	0	
ELEMENT NO 22 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2692.83	942.17	30			0.013					0.00	0.00	0.00	0	
ELEMENT NO 23 IS A JUNCTION		*	*	*	*			*		*		*				
	U/S DATA	STATION	INVERT	SECT	LAT-1	LAT-2	N	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4			
		2696.83	942.65	24	18	0	0.013	2.5	0.0	942.65	0.00	90.00	0.00			
ELEMENT NO 24 IS A REACH		*	*	*												
	U/S DATA	STATION	INVERT	SECT			N					RADIUS	ANGLE	ANG PT	MAN H	
		2767.18	943.00	24			0.013					0.00	0.00	0.00	0	
ELEMENT NO 25 IS A SYSTEM HEADWORKS				*				*								
	U/S DATA	STATION	INVERT	SECT						W S ELEV						
		2767.18	943.00	24						0.00						

WATER SURFACE PROFILE - ELEMENT CARD LISTING
NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1004.35	935.10	1.413	936.513	19.4	5.93	0.546	937.059	0.00	1.413		3.00	0.00	0.00	0	0.00
3.21	0.00403					.004095	0.01			1.425			0.00		
1007.56	935.11	1.425	936.538	19.4	5.86	0.534	937.072	0.00	1.413		3.00	0.00	0.00	0	0.00
71.29	0.00403					.004033	0.29			1.425			0.00		
1078.85	935.40	1.425	936.825	19.4	5.86	0.534	937.359	0.00	1.413		3.00	0.00	0.00	0	0.00
10.79	0.00385					.003949	0.04			1.443			0.00		
1089.64	935.44	1.443	936.885	19.4	5.77	0.517	937.402	0.00	1.413		3.00	0.00	0.00	0	0.00
9.97	0.00385					.003862	0.04			1.443			0.00		
1099.61	935.48	1.443	936.923	19.4	5.77	0.517	937.440	0.00	1.413		3.00	0.00	0.00	0	0.00
12.65	0.00403					.003948	0.05			1.425			0.00		
1112.26	935.53	1.425	936.956	19.4	5.86	0.534	937.490	0.00	1.413		3.00	0.00	0.00	0	0.00
175.99	0.00403					.004033	0.71			1.425			0.00		
1288.25	936.24	1.425	937.665	19.4	5.86	0.534	938.199	0.00	1.413		3.00	0.00	0.00	0	0.00
JUNCT STR	0.02500												0.00		
1292.25	936.34	1.250	937.590	13.8	5.62	0.491	938.081	0.00	1.250		2.50	0.00	0.00	0	0.00
10.18	0.00404					.004288	0.04			1.292			0.00		
1302.43	936.38	1.292	937.673	13.8	5.39	0.452	938.125	0.00	1.250		2.50	0.00	0.00	0	0.00
230.91	0.00404					.004050	0.94			1.292			0.00		
1533.34	937.31	1.292	938.605	13.8	5.39	0.452	939.057	0.00	1.250		2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1533.34	937.31	1.181	938.494	13.8	6.05	0.568	939.062	0.00	1.250		2.50	0.00	0.00	0	0.00
4.36	0.00404					.005496	0.02			1.292			0.00		

WATER SURFACE PROFILE LISTING
JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1537.70	937.33	1.181	938.512	13.8	6.04	0.567	939.079	0.00	1.250		2.50	0.00	0.00	0	0.00
8.04	0.00404					.005865	0.05			1.292			0.00		
1545.74	937.36	1.139	938.502	13.8	6.34	0.623	939.125	0.00	1.250		2.50	0.00	0.00	0	0.00
8.11	0.00404					.006672	0.05			1.292			0.00		
1553.85	937.40	1.098	938.494	13.8	6.65	0.686	939.180	0.00	1.250		2.50	0.00	0.00	0	0.00
8.40	0.00404					.007593	0.06			1.292			0.00		
1562.25	937.43	1.059	938.489	13.8	6.97	0.754	939.243	0.00	1.250		2.50	0.00	0.00	0	0.00
0.90	0.02500					.007836	0.01			0.781			0.00		
1563.15	937.45	1.078	938.531	13.8	6.81	0.720	939.251	0.00	1.250		2.50	0.00	0.00	0	0.00
1.43	0.02500					.007128	0.01			0.781			0.00		
1564.58	937.49	1.118	938.606	13.8	6.49	0.655	939.261	0.00	1.250		2.50	0.00	0.00	0	0.00
0.99	0.02500					.006264	0.01			0.781			0.00		
1565.57	937.51	1.159	938.672	13.8	6.19	0.595	939.267	0.00	1.250		2.50	0.00	0.00	0	0.00
0.52	0.02500					.005508	0.00			0.781			0.00		
1566.09	937.53	1.203	938.729	13.8	5.90	0.541	939.270	0.00	1.250		2.50	0.00	0.00	0	0.00
0.16	0.02500					.004842	0.00			0.781			0.00		
1566.25	937.53	1.250	938.780	13.8	5.62	0.491	939.271	0.00	1.250		2.50	0.00	0.00	0	0.00
10.73	0.00400					.004273	0.05			1.295			0.00		
1576.98	937.57	1.295	938.868	13.8	5.38	0.449	939.317	0.00	1.250		2.50	0.00	0.00	0	0.00
231.20	0.00400					.004018	0.93			1.295			0.00		
1808.18	938.50	1.295	939.793	13.8	5.38	0.449	940.242	0.00	1.250		2.50	0.00	0.00	0	0.00

HYDRAULIC JUMP
0.00

WATER SURFACE PROFILE LISTING
JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1808.18	938.50	1.181	939.679	13.8	6.05	0.568	940.247	0.00	1.250		2.50	0.00	0.00	0	0.00
3.88	0.00400					.005496	0.02			1.295			0.00		
1812.06	938.51	1.181	939.694	13.8	6.04	0.567	940.261	0.00	1.250		2.50	0.00	0.00	0	0.00
7.88	0.00400					.005865	0.05			1.295			0.00		
1819.94	938.54	1.139	939.684	13.8	6.34	0.623	940.307	0.00	1.250		2.50	0.00	0.00	0	0.00
7.99	0.00400					.006672	0.05			1.295			0.00		
1827.93	938.58	1.098	939.675	13.8	6.65	0.686	940.361	0.00	1.250		2.50	0.00	0.00	0	0.00
8.32	0.00400					.007593	0.06			1.295			0.00		
1836.25	938.61	1.059	939.669	13.8	6.97	0.754	940.423	0.00	1.250		2.50	0.00	0.00	0	0.00
0.90	0.02500					.007836	0.01			0.781			0.00		
1837.15	938.63	1.078	939.711	13.8	6.81	0.720	940.431	0.00	1.250		2.50	0.00	0.00	0	0.00
1.43	0.02500					.007128	0.01			0.781			0.00		
1838.58	938.67	1.118	939.786	13.8	6.49	0.655	940.441	0.00	1.250		2.50	0.00	0.00	0	0.00
0.99	0.02500					.006264	0.01			0.781			0.00		
1839.57	938.69	1.159	939.852	13.8	6.19	0.595	940.447	0.00	1.250		2.50	0.00	0.00	0	0.00
0.52	0.02500					.005508	0.00			0.781			0.00		

1840.09	938.71	1.203	939.909	13.8	5.90	0.541	940.450	0.00	1.250		2.50	0.00	0.00	0	0.00
0.16	0.02500					.004842	0.00			0.781			0.00		
1840.25	938.71	1.250	939.960	13.8	5.62	0.491	940.451	0.00	1.250		2.50	0.00	0.00	0	0.00
10.77	0.00400					.004273	0.05			1.295			0.00		
1851.02	938.75	1.295	940.048	13.8	5.38	0.449	940.497	0.00	1.250		2.50	0.00	0.00	0	0.00
50.51	0.00400					.004018	0.20			1.295			0.00		

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WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1901.53	938.96	1.295	940.250	13.8	5.38	0.449	940.699	0.00	1.250		2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1901.53	938.96	1.166	940.121	13.8	6.15	0.587	940.708	0.00	1.250		2.50	0.00	0.00	0	0.00
6.35	0.00400					.005753	0.04			1.295			0.00		
1907.88	938.98	1.166	940.147	13.8	6.15	0.587	940.734	0.00	1.250		2.50	0.00	0.00	0	0.00
7.78	0.00400					.006145	0.05			1.295			0.00		
1915.66	939.01	1.124	940.136	13.8	6.45	0.646	940.782	0.00	1.250		2.50	0.00	0.00	0	0.00
8.21	0.00400					.006991	0.06			1.295			0.00		
1923.87	939.04	1.084	940.129	13.8	6.76	0.710	940.839	0.00	1.250		2.50	0.00	0.00	0	0.00
8.09	0.00400					.007957	0.06			1.295			0.00		
1931.96	939.08	1.045	940.122	13.8	7.09	0.781	940.903	0.00	1.250		2.50	0.00	0.00	0	0.00
8.27	0.00400					.009061	0.07			1.295			0.00		
1940.23	939.11	1.009	940.119	13.8	7.44	0.859	940.978	0.00	1.250		2.50	0.00	0.00	0	0.00
14.37	0.01165					.009146	0.13			0.960			0.00		
1954.60	939.28	1.040	940.317	13.8	7.14	0.792	941.109	0.00	1.250		2.50	0.00	0.00	0	0.00
9.63	0.01165					.008113	0.08			0.960			0.00		
1964.23	939.39	1.078	940.467	13.8	6.81	0.720	941.187	0.00	1.250		2.50	0.00	0.00	0	0.00
5.63	0.01165					.007128	0.04			0.960			0.00		
1969.86	939.46	1.118	940.573	13.8	6.49	0.655	941.228	0.00	1.250		2.50	0.00	0.00	0	0.00
3.44	0.01165					.006264	0.02			0.960			0.00		
1973.30	939.50	1.159	940.654	13.8	6.19	0.595	941.249	0.00	1.250		2.50	0.00	0.00	0	0.00
1.65	0.01165					.005508	0.01			0.960			0.00		

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WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1974.95	939.51	1.203	940.717	13.8	5.90	0.541	941.258	0.00	1.250		2.50	0.00	0.00	0	0.00
0.48	0.01165					.004842	0.00			0.960			0.00		
1975.43	939.52	1.250	940.770	13.8	5.62	0.491	941.261	0.00	1.250		2.50	0.00	0.00	0	0.00
0.72	0.00081					.004257	0.00			2.500			0.00		
1976.15	939.52	1.297	940.818	13.8	5.36	0.446	941.264	0.00	1.250		2.50	0.00	0.00	0	0.00
3.54	0.00081					.003752	0.01			2.500			0.00		
1979.69	939.52	1.348	940.871	13.8	5.11	0.406	941.277	0.00	1.250		2.50	0.00	0.00	0	0.00
6.45	0.00081					.003311	0.02			2.500			0.00		
1986.14	939.53	1.401	940.930	13.8	4.87	0.369	941.299	0.00	1.250		2.50	0.00	0.00	0	0.00
10.64	0.00081					.002923	0.03			2.500			0.00		

1996.78	939.54	1.457	940.994	13.8	4.65	0.335	941.329	0.00	1.250		2.50	0.00	0.00	0	0.00
16.07	0.00081					.002585	0.04			2.500			0.00		
2012.85	939.55	1.516	941.066	13.8	4.43	0.305	941.371	0.00	1.250		2.50	0.00	0.00	0	0.00
23.21	0.00081					.002288	0.05			2.500			0.00		
2036.06	939.57	1.578	941.147	13.8	4.22	0.277	941.424	0.00	1.250		2.50	0.00	0.00	0	0.00
25.69	0.00081					.002054	0.05			2.500			0.00		
2061.75	939.59	1.631	941.221	13.8	4.07	0.257	941.478	0.00	1.250		2.50	0.00	0.00	0	0.00
19.30	0.00420					.002083	0.04			1.280			0.00		
2081.05	939.67	1.564	941.235	13.8	4.27	0.283	941.518	0.00	1.250		2.50	0.00	0.00	0	0.00
11.67	0.00420					.002297	0.03			1.280			0.00		
2092.72	939.72	1.524	941.244	13.8	4.40	0.301	941.545	0.00	1.250		2.50	0.00	0.00	0	0.00
5.91	0.00338					.002414	0.01			1.363			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2098.63	939.74	1.514	941.254	13.8	4.44	0.306	941.560	0.00	1.250		2.50	0.00	0.00	0	0.00
1.29	0.02500					.002599	0.00			0.781			0.00		
2099.92	939.77	1.454	941.226	13.8	4.66	0.337	941.563	0.00	1.250		2.50	0.00	0.00	0	0.00
1.01	0.02500					.002939	0.00			0.781			0.00		
2100.93	939.80	1.398	941.195	13.8	4.88	0.370	941.565	0.00	1.250		2.50	0.00	0.00	0	0.00
0.13	0.02500					.003328	0.00			0.781			0.00		
2101.06	939.80	1.346	941.146	13.8	5.12	0.407	941.553	0.00	1.250		2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
2101.06	939.80	1.118	940.918	13.8	6.49	0.655	941.573	0.00	1.250		2.50	0.00	0.00	0	0.00
0.89	0.02500					.006265	0.01			0.781			0.00		
2101.95	939.82	1.159	940.982	13.8	6.19	0.595	941.577	0.00	1.250		2.50	0.00	0.00	0	0.00
0.52	0.02500					.005508	0.00			0.781			0.00		
2102.47	939.84	1.203	941.039	13.8	5.90	0.541	941.580	0.00	1.250		2.50	0.00	0.00	0	0.00
0.16	0.02500					.004842	0.00			0.781			0.00		
2102.63	939.84	1.250	941.090	13.8	5.62	0.491	941.581	0.00	1.250		2.50	0.00	0.00	0	0.00
7.99	0.00395					.004257	0.03			1.300			0.00		
2110.62	939.87	1.297	941.169	13.8	5.36	0.446	941.615	0.00	1.250		2.50	0.00	0.00	0	0.00
39.64	0.00395					.003976	0.16			1.300			0.00		
2150.26	940.03	1.300	941.328	13.8	5.35	0.445	941.773	0.00	1.250		2.50	0.00	0.00	0	0.00
63.81	0.00395					.003965	0.25			1.300			0.00		
2214.07	940.28	1.300	941.580	13.8	5.35	0.445	942.025	0.00	1.250		2.50	0.00	0.00	0	0.00
21.23	0.00424					.004111	0.09			1.273			0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2235.30	940.37	1.273	941.643	13.8	5.49	0.469	942.112	0.00	1.250		2.50	0.00	0.00	0	0.00
14.12	0.00424					.004254	0.06			1.273			0.00		
2249.42	940.43	1.273	941.703	13.8	5.49	0.469	942.172	0.00	1.250		2.50	0.00	0.00	0	0.00

16.58	0.00400					.004131	0.07			1.296			0.00		
2266.00	940.50	1.296	941.792	13.8	5.37	0.448	942.240	0.00	1.250		2.50	0.00	0.00	0	0.00
168.63	0.00400					.004006	0.68			1.296			0.00		
2434.63	941.17	1.296	942.466	13.8	5.37	0.448	942.914	0.00	1.250		2.50	0.00	0.00	0	0.00
4.00	0.00250					.003852	0.02			1.500			0.00		
2438.63	941.18	1.328	942.508	13.8	5.21	0.421	942.929	0.00	1.250		2.50	0.00	0.00	0	0.00
41.70	0.00377					.003732	0.16			1.320			0.00		
2480.33	941.34	1.320	942.657	13.8	5.25	0.428	943.085	0.00	1.250		2.50	0.00	0.00	0	0.00
69.68	0.00377					.003769	0.26			1.320			0.00		
2550.01	941.60	1.320	942.920	13.8	5.25	0.428	943.348	0.00	1.250		2.50	0.00	0.00	0	0.00
26.52	0.00424					.004013	0.11			1.273			0.00		
2576.53	941.71	1.273	942.986	13.8	5.49	0.469	943.455	0.00	1.250		2.50	0.00	0.00	0	0.00
6.48	0.00424					.004254	0.03			1.273			0.00		
2583.01	941.74	1.273	943.013	13.8	5.49	0.469	943.482	0.00	1.250		2.50	0.00	0.00	0	0.00
19.19	0.00392					.004091	0.08			1.304			0.00		
2602.20	941.82	1.304	943.119	13.8	5.33	0.441	943.560	0.00	1.250		2.50	0.00	0.00	0	0.00
50.15	0.00392					.003926	0.20			1.304			0.00		
2652.35	942.01	1.304	943.315	13.8	5.33	0.441	943.756	0.00	1.250		2.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
2652.35	942.01	1.189	943.200	13.8	5.99	0.558	943.758	0.00	1.250		2.50	0.00	0.00	0	0.00
1.55	0.00392					.005371	0.01			1.304			0.00		
2653.90	942.02	1.189	943.207	13.8	5.99	0.558	943.765	0.00	1.250		2.50	0.00	0.00	0	0.00
7.01	0.00392					.005735	0.04			1.304			0.00		
2660.91	942.04	1.146	943.191	13.8	6.28	0.613	943.804	0.00	1.250		2.50	0.00	0.00	0	0.00
7.79	0.00392					.006522	0.05			1.304			0.00		
2668.70	942.08	1.105	943.181	13.8	6.59	0.674	943.855	0.00	1.250		2.50	0.00	0.00	0	0.00
8.12	0.00392					.007423	0.06			1.304			0.00		
2676.82	942.11	1.066	943.173	13.8	6.91	0.742	943.915	0.00	1.250		2.50	0.00	0.00	0	0.00
7.98	0.00392					.008451	0.07			1.304			0.00		
2684.80	942.14	1.028	943.167	13.8	7.25	0.817	943.984	0.00	1.250		2.50	0.00	0.00	0	0.00
8.03	0.00392					.009626	0.08			1.304			0.00		
2692.83	942.17	0.992	943.162	13.8	7.60	0.898	944.060	0.00	1.250		2.50	0.00	0.00	0	0.00
JUNCT STR	0.12000					.007848	0.03						0.00		
2696.83	942.65	1.206	943.856	11.3	5.71	0.506	944.362	0.00	1.206		2.00	0.00	0.00	0	0.00
7.08	0.00498					.005223	0.04			1.240			0.00		
2703.91	942.68	1.240	943.925	11.3	5.52	0.474	944.399	0.00	1.206		2.00	0.00	0.00	0	0.00
63.27	0.00498					.005002	0.32			1.240			0.00		
2767.18	943.00	1.240	944.240	11.3	5.52	0.474	944.714	0.00	1.206		2.00	0.00	0.00	0	
0.00															

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "D" THROUGH BUILDING 2 SITE

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1004.35   .I          X    E         H                                        .    R
1014.54   .I          X    E         H                                        .    R
1024.73   .                                                                   .
1034.92   .                                                                   .
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1045.11
1055.30
1065.49
1075.68
1085.87 I X E H R
1096.06 I CW E H R
1106.25 I X E H R
1116.44 I X E H R
1126.63
1136.82
1147.01
1157.20
1167.39
1177.58
1187.77
1197.96
1208.15
1218.34
1228.52
1238.71
1248.90
1259.09
1269.28
1279.47
1289.66 I X E H JX
1299.85 I X E H R
1310.04 I X E H R
1320.23
1330.42
1340.61
1350.80
1360.99
1371.18
1381.37
1391.56
1401.75
1411.94
1422.13
1432.32
1442.51
1452.70
1462.89
1473.08
1483.27
1493.46
1503.65
1513.84
1524.03
1534.22 I CW E H R
1544.41 I X E H R
1554.60 I WC E H R
1564.79 I WC E H R
1574.98 I WC E H R
1585.17 I W C E H R
1595.36 I W C E H R
1605.55 I WC E H R
1615.74 I WC E H R
1625.93 I WC E H R
1636.12 I X E H R
1646.31 I CW E H R
1656.50
1666.68
1676.87
1687.06
1697.25
1707.44
1717.63
1727.82
1738.01
1748.20
1758.39
1768.58
1778.77
1788.96
1799.15
1809.34 I CW E H R
1819.53 I X E H R
1829.72 I WC E H R
1839.91 I WC E H R
1850.10 I WC E H R
1860.29 I W C E H R
1870.48 I W C E H R
1880.67 I WC E H R
1890.86 I WC E H R
1901.05 I WC E H R
1911.24 I X E H R
1921.43 I X E H R
1931.62 I CW E H R
1941.81 I WC E H R
1952.00 I WC E H R
1962.19 I W C E H R
1972.38 I W C E H R
1982.57 I W C E H R
1992.76 I W C E H R
2002.95 I W C E H R
2013.14 I WC E H R
2023.33 I WC E H R
2033.52 I WC E H R
2043.71 I WC E H R

N O T E S

1. GLOSSARY
   - I = INVERT ELEVATION
   - C = CRITICAL DEPTH
   - W = WATER SURFACE ELEVATION
   - H = HEIGHT OF CHANNEL
   - E = ENERGY GRADE LINE
   - X = CURVES CROSSING OVER
   - B = BRIDGE ENTRANCE OR EXIT
   - Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

DATE: 10/12/2019
TIME: 19:17

F0515P
WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING PAGE 1

CARD CODE	SECT NO	CHN TYPE	NO OF PIERS	AVE PIER WIDTH	HEIGHT 1 DIAMETER	BASE WIDTH	ZL	ZR	INV DROP	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CD	18	4			1.50														

F 0 5 1 5 P PAGE NO 3

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON

HEADING LINE NO 2 IS -

STORM DRAIN LINE "E" IN BARTON ROAD

HEADING LINE NO 3 IS -

F 0 5 1 5 P PAGE NO 2

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO 1 IS A SYSTEM OUTLET * * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1001.75	942.65	18	943.86

ELEMENT NO 2 IS A REACH * * *

U/S DATA	STATION	INVERT	SECT	N	RADIUS	ANGLE	ANG PT	MAN H
	1069.61	946.54	18	0.013	0.00	0.00	0.00	0

ELEMENT NO 3 IS A SYSTEM HEADWORKS * *

U/S DATA	STATION	INVERT	SECT	W S ELEV
	1069.61	946.54	18	0.00

NO EDIT ERRORS ENCOUNTERED-COMPUTATION IS NOW BEGINNING
** WARNING NO. 2 ** - WATER SURFACE ELEVATION GIVEN IS LESS THAN OR EQUALS INVERT ELEVATION IN HDWKDS, W.S.ELEV = INV + DC
LICENSEE: THIENES ENGINEERING F0515P PAGE 1

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "E" IN BARTON ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1001.75	942.65	1.210	943.860	2.5	1.64	0.042	943.902	0.00	0.599		1.50	0.00	0.00	0	0.00
0.95	0.05732					.000615	0.00			0.320			0.00		
1002.70	942.70	1.152	943.856	2.5	1.72	0.046	943.902	0.00	0.599		1.50	0.00	0.00	0	0.00
0.85	0.05732					.000682	0.00			0.320			0.00		
1003.55	942.75	1.099	943.852	2.5	1.80	0.050	943.902	0.00	0.599		1.50	0.00	0.00	0	0.00
0.76	0.05732					.000760	0.00			0.320			0.00		
1004.31	942.80	1.051	943.848	2.5	1.89	0.055	943.903	0.00	0.599		1.50	0.00	0.00	0	0.00
0.29	0.05732					.000853	0.00			0.320			0.00		
1004.60	942.81	1.007	943.820	2.5	1.98	0.061	943.881	0.00	0.599		1.50	0.00	0.00	0	0.00
HYDRAULIC JUMP													0.00		
1004.60	942.81	0.320	943.133	2.5	9.06	1.274	944.407	0.00	0.599		1.50	0.00	0.00	0	0.00
0.74	0.05732					.056911	0.04			0.320			0.00		
1005.34	942.86	0.320	943.176	2.5	9.06	1.274	944.450	0.00	0.599		1.50	0.00	0.00	0	0.00
19.11	0.05732					.056101	1.07			0.320			0.00		
1024.45	943.95	0.322	944.273	2.5	8.96	1.247	945.520	0.00	0.599		1.50	0.00	0.00	0	0.00
18.61	0.05732					.051811	0.96			0.320			0.00		
1043.06	945.02	0.333	945.351	2.5	8.56	1.138	946.489	0.00	0.599		1.50	0.00	0.00	0	0.00
7.65	0.05732					.045275	0.35			0.320			0.00		
1050.71	945.46	0.344	945.801	2.5	8.14	1.030	946.831	0.00	0.599		1.50	0.00	0.00	0	0.00
4.62	0.05732					.039574	0.18			0.320			0.00		
1055.33	945.72	0.356	946.077	2.5	7.76	0.936	947.013	0.00	0.599		1.50	0.00	0.00	0	0.00
3.22	0.05732					.034605	0.11			0.320			0.00		

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "E" IN BARTON ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1058.55	945.91	0.368	946.274	2.5	7.42	0.855	947.129	0.00	0.599		1.50	0.00	0.00	0	0.00
2.39	0.05732					.030265	0.07			0.320			0.00		
1060.94	946.04	0.381	946.424	2.5	7.06	0.774	947.198	0.00	0.599		1.50	0.00	0.00	0	0.00
1.87	0.05732					.026478	0.05			0.320			0.00		
1062.81	946.15	0.394	946.544	2.5	6.74	0.705	947.249	0.00	0.599		1.50	0.00	0.00	0	0.00
1.46	0.05732					.023167	0.03			0.320			0.00		
1064.27	946.23	0.408	946.642	2.5	6.43	0.641	947.283	0.00	0.599		1.50	0.00	0.00	0	0.00
1.20	0.05732					.020275	0.02			0.320			0.00		
1065.47	946.30	0.422	946.725	2.5	6.13	0.583	947.308	0.00	0.599		1.50	0.00	0.00	0	0.00
0.98	0.05732					.017731	0.02			0.320			0.00		
1066.45	946.36	0.436	946.795	2.5	5.84	0.530	947.325	0.00	0.599		1.50	0.00	0.00	0	0.00
0.77	0.05732					.015520	0.01			0.320			0.00		
1067.22	946.40	0.452	946.855	2.5	5.57	0.481	947.336	0.00	0.599		1.50	0.00	0.00	0	0.00
0.66	0.05732					.013588	0.01			0.320			0.00		
1067.88	946.44	0.467	946.908	2.5	5.31	0.437	947.345	0.00	0.599		1.50	0.00	0.00	0	0.00
0.50	0.05732					.011895	0.01			0.320			0.00		
1068.38	946.47	0.484	946.954	2.5	5.06	0.398	947.352	0.00	0.599		1.50	0.00	0.00	0	0.00
0.41	0.05732					.010423	0.00			0.320			0.00		
1068.79	946.49	0.501	946.994	2.5	4.83	0.362	947.356	0.00	0.599		1.50	0.00	0.00	0	0.00
0.31	0.05732					.009133	0.00			0.320			0.00		
1069.10	946.51	0.519	947.030	2.5	4.60	0.329	947.359	0.00	0.599		1.50	0.00	0.00	0	0.00
0.24	0.05732					.008004	0.00			0.320			0.00		

WATER SURFACE PROFILE LISTING

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "E" IN BARTON ROAD

STATION	INVERT ELEV	DEPTH OF FLOW	W.S. ELEV	Q	VEL	VEL HEAD	ENERGY GRD.EL.	SUPER ELEV	CRITICAL DEPTH		HGT/ DIA	BASE/ ID NO.	ZL	NO PIER	AVBPR
L/ELEM	SO					SF AVE	HF			NORM DEPTH			ZR		
1069.34	946.52	0.537	947.062	2.5	4.39	0.299	947.361	0.00	0.599		1.50	0.00	0.00	0	0.00
0.15	0.05732					.007017	0.00			0.320			0.00		
1069.49	946.53	0.557	947.090	2.5	4.19	0.272	947.362	0.00	0.599		1.50	0.00	0.00	0	0.00
0.09	0.05732					.006157	0.00			0.320			0.00		
1069.58	946.54	0.577	947.115	2.5	3.99	0.247	947.362	0.00	0.599		1.50	0.00	0.00	0	0.00
0.03	0.05732					.005386	0.00			0.320			0.00		
1069.61	946.54	0.599	947.139	2.5	3.79	0.223	947.362	0.00	0.599		1.50	0.00	0.00	0	
0.00															

JOB #3711 BARTON ROAD & TERRACE AVE, COLTON
STORM DRAIN LINE "E" IN BARTON ROAD

```
1001.75  .I          C          WE   H                                          .   R
1003.08  .I           C         WE    H                                         .   R
1004.41  . I           C        WE     H                                        .   R
1005.74  .  I          C        WE      H                                       .   R
1007.07  .  I           C      WE       H                                      .   R
1008.40  .  I     W     C               H E                                    .   R
1009.73  .   I     W    C                 H E                                  .   R
1011.06  .                                                                     .
1012.39  .                                                                     .
1013.73  .                                                                     .
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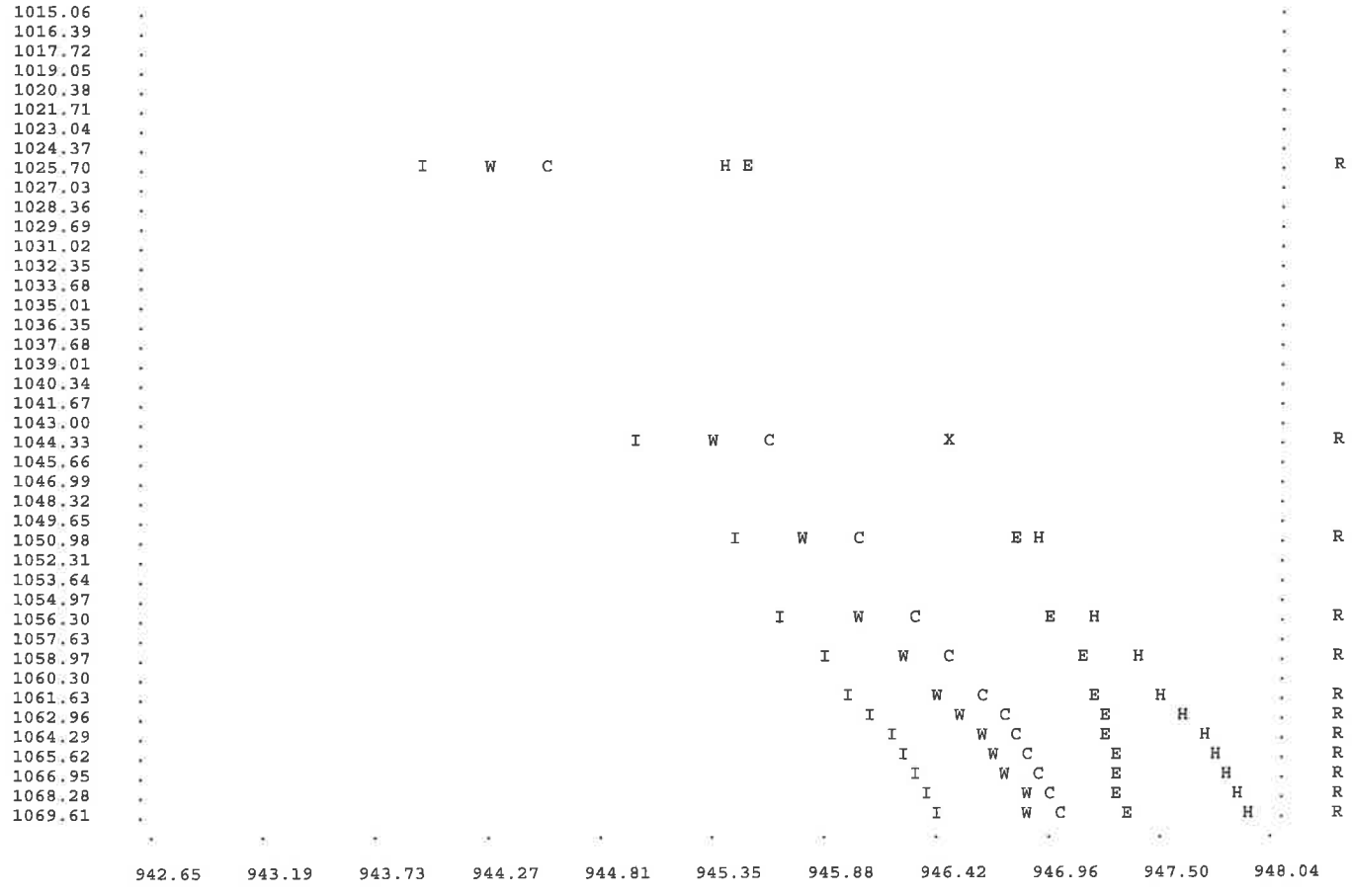


N O T E S
1. GLOSSARY
   I = INVERT ELEVATION
   C = CRITICAL DEPTH
   W = WATER SURFACE ELEVATION
   H = HEIGHT OF CHANNEL
   E = ENERGY GRADE LINE
   X = CURVES CROSSING OVER
   B = BRIDGE ENTRANCE OR EXIT
   Y = WALL ENTRANCE OR EXIT
2. STATIONS FOR POINTS AT A JUMP MAY NOT BE PLOTTED EXACTLY□

APPENDIX E

B.M.P. CALCULATIONS

FLOW-BASED BMP DESIGN (pretreatment)

$C_{BMP} = 0.858(imp)^3 - 0.78(imp)^2 + 0.774(imp) + 0.04$
$I_{BMP} = (0.605)(0.2787)(2) = 0.337$ in/hr
$Q = C_{BMP} * 0.337 * Area$

DA 1 DMA A – DEBRIS SEPARATING BAFFLE BOX (DSBB-1)

Region		Valley	
Drainage Area (acres)		18.70	acres
Drainage Area (sq-ft)		814,572	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.81	
1-hr 2-yr from NOAA		0.459	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.256	
Flow (cfs)	Q =	3.86	

Use DSBB-5-10
80% @ 125 Micron treats 4.90 cfs

DA 2 DMA A – DEBRIS SEPARATING BAFFLE BOX (DSBB-2)

Region		Valley	
Drainage Area (acres)		12.40	acres
Drainage Area (sq-ft)		540,144	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.81	
1-hr 2-yr from NOAA		0.605	
Itensity Coeff		0.2787	
Intensity BMP (in/hr)		0.337	
Flow (cfs)	Q =	3.37	

Use DSBB-5-10
80% @ 125 Micron treats 4.90 cfs

VOLUME-BASED BMP DESIGN

$C_{BMP} = 0.858(imp)^3 - 0.78(imp)^2 + 0.774(imp) + 0.04$
P6 = (0.459)(1.4807) = 0.680 inches
P0 = (1.963)(C_{BMP})(0.680)
DCV = (P0 * Area) / 12

DA 1 DMA A – STORMTECH INFILTRATION CHAMBERS (STC-1)

Region		Valley	
Drainage Area (acres)		18.70	acres
Drainage Area (sq-ft)		814,572	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.459	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.680**	
Drawdown Rate (a)		1.963	
DCV		73,082	cu-ft
DCV		**1.678**	acre-ft

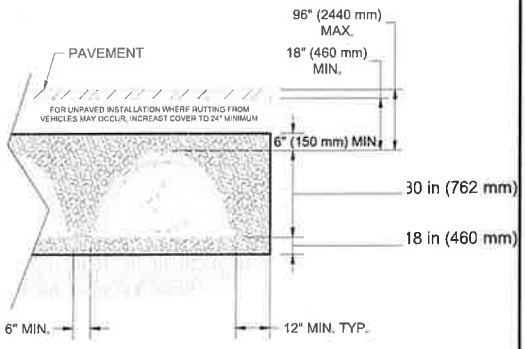
StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management™

Units: Imperial

Project: EBS (DA1 DMA A)
By: Thienes Engineering, Inc.
Point of Contact
Date: 6/26/2019

System Requirements

Required Storage Volume	73,376	CF
Select Stormtech Chamber System	DC-780	
Stone Porosity (Industry Standard = 40%)	40%	
Stone Foundation Depth	18	Inches
Storage Volume Per Chamber	88.40	CF
Avg Cover over Chambers (18 in min. & 96 in max.)	18	Inches
Number of Chambers Required	831	Each
Required Bed Size	29,055	SF
Tons of Stone Required	4,389	Tons
Volume of Excavation	4,663	CY
Area of Filter Fabric	7,830	SY
# of End Caps Required	30	Each
Length of ISOLATOR ROW	398.72	FT
ISOLATOR FABRIC	177	SY



Is the limiting dimension for the bed the width or length? width

Controlled by Width (Rows)			Controlled by Length		
Width	75	FT	Length	100	FT
# of Chambers Long	56	EA	# of Chambers Long	-	EA
# of Rows	15	EA	# of Rows	-	EA
Actual Length	402.32	FT	Actual Length	-	FT
Actual Width	72.75	FT	Actual Width	-	FT
9 of the chambers rows will contain only	55	chambers			

Design infiltration rate = 0.85 in/hr

d_{max} = 40.8 inches = Design infiltration rate x 48 hours = 0.85 in/hr x 48 hrs

d_{BMP} = 39.6 inches = [(6 inches + 18 inches) x 0.40] + 30 inches

$d_{max} > d_{BMP}$

831 chambers x 88.40 CF/chamber = 73,460 CF

DA 2 DMA A – STORMTECH INFILTRATION CHAMBERS (STC-2)

Region		Valley	
Drainage Area (acres)		12.40	acres
Drainage Area (sq-ft)		540,144	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	C =	0.807	
1-hr 2-yr from NOAA		0.459	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.680	
Drawdown Rate (a)		1.963	
DCV		48,461	cu-ft
DCV		1.113	acre-ft

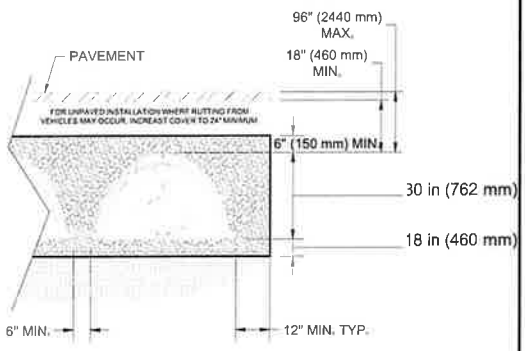
StormTech
Detention · Retention · Recharge
Subsurface Stormwater Management™

Units: Imperial

Project: EBS (DA2 DMA A)
By: Thienes Engineering, Inc.
Point of Contact
Date: 6/26/2019

System Requirements

Required Storage Volume	48,461	CF
Select Stormtech Chamber System	DC-780	
Stone Porosity (Industry Standard = 40%)	40%	
Stone Foundation Depth	18	Inches
Storage Volume Per Chamber	88.40	CF
Avg Cover over Chambers (18 in min. & 96 in max.)	18	Inches
Number of Chambers Required	549	Each
Required Bed Size	19,378	SF
Tons of Stone Required	2,931	Tons
Volume of Excavation	3,110	CY
Area of Filter Fabric	5,363	SY
# of End Caps Required	18	Each
Length of ISOLATOR ROW	434.32	FT
ISOLATOR FABRIC	193	SY



Is the limiting dimension for the bed the width or length? width

Controlled by Width (Rows)			Controlled by Length		
Width	45	FT	Length	100	FT
# of Chambers Long	61	EA	# of Chambers Long	-	EA
# of Rows	9	EA	# of Rows	-	EA
Actual Length	437.92	FT	Actual Length	-	FT
Actual Width	44.25	FT	Actual Width	-	FT

Design infiltration rate = 0.875 in/hr

d_{max} = 42.0 inches = Design infiltration rate x 48 hours = 0.875 in/hr x 48 hrs

d_{BMP} = 39.6 inches = [(6 inches + 18 inches) x 0.40] + 30 inches

$d_{max} > d_{BMP}$

549 chambers x 88.40 CF/chamber = 48,532 CF

DA 2 DMA B – STORMTECH INFILTRATION CHAMBERS & MODULAR WETLANDS SYSTEM (STC-2 & MWS-2)

Region		Valley	
Drainage Area (acres)		13.15	acres
Drainage Area (sq-ft)		572,814	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	C =	0.807	
1-hr 2-yr from NOAA		0.459	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.680	
Drawdown Rate (a)		1.963	
DCV		51,392	cu-ft
DCV		1.180	acre-ft

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	EBS Barton Road Warehouses (DA2 DMA B)
City/Town	Colton
State	California
Zip Code	92324

SIZING CALCULATIONS	Inputs	Units	Notes/References
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	13.2	Acres	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	51392	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	2	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulations.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	3140.0	cubic feet	130.83 gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	47904	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when equal to value of zero.
TOTAL STORMWATER TREATED	51392	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	46.10	hours	Drain down time must be equal to or less than requirement of local jurisdiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

Email: Info@modularwetlands.com

StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management™

MC-4500 Site Calculator

Project Information:

Project Name: Barton Road (DA2 DMA B)
Location: Colton, CA
Date: 6/26/2019
Engineer: Thienes Engineering Inc.
StormTech RPM:

System Requirements

Units		Imperial	
Required Storage Volume		47931	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	9	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		50	feet
Storage Volume per Chamber		162.6	CF
Storage Volume per End Cap		108.6	CF

System Sizing

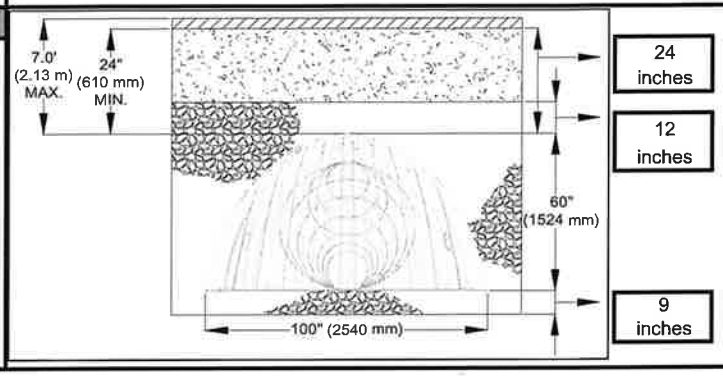
Number of Chambers Required	289	each
Number of End Caps Required	10	each
Bed Size (including perimeter stone)	11,171	square feet
Stone Required (including perimeter stone)	2324	tons
Volume of Excavation	3207	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	3496	square yards
Length of Isolator Row	240.6	feet
Woven Isolator Row Fabric (20% Safety Factor)	661	square yards
Installed Storage Volume	48,077	cubic feet

Controlled by Width (Rows)

Maximum Width = 50 feet

4 rows of 58 chambers
1 row of 57 chambers

Maximum Length = 240.6 feet
Maximum Width = 46.7 feet



APPENDIX F

HYDROLOGY MAP

A.T. & S.F. RAILROAD

TERRACE AVENUE

DIRT CHANNEL

24" C.M.P. STORM DRAIN OUTLET TO DIRT CHANNEL

24" C.M.P. STORM DRAIN (ABANDONED)

36" C.M.P. STORM DRAIN

NODES 120-136
Q25=38.7 CFS
Tc100=7.4 Min.
Q100=48.8 CFS
Tc100=7.3 Min.
AREA=14.35 Ac.

CATCH BASIN

18" R.C.P. STORM DRAIN

PROP. R/W

EX. R/W

NODES 100-110
Q25=23.6 CFS
Tc25=8.0 Min.
Q100=30.1 CFS
Tc100=7.9 Min.
AREA=8.25 Ac.

PARKWAY CULVERT

CATCH BASIN (TYP.)

0.35 Ac.

18" HDPE STORM DRAIN

NODES 140-141
Q25=2.3 CFS
Tc25=5.0 Min.
Q100=2.9 CFS
Tc100=5.0 Min.
AREA=0.60 Ac.

NODES 150-152
Q25=5.4 CFS
Tc25=9.3 Min.
Q100=6.8 CFS
Tc100=9.3 Min.
AREA=2.05 Ac.

6" STORM DRAIN

0.60 Ac.

2.05 Ac.

OFFSITE NODES 220-221
Q25=1.0 CFS
Tc25=6.3 Min.
Q100=1.3 CFS
Tc100=6.3 Min.
AREA=0.30 Ac.

OFFSITE NODES 200-201
Q25=2.4 CFS
Tc25=7.8 Min.
Q100=3.1 CFS
Tc100=7.8 Min.
AREA=0.85 Ac.

BUILDING 1 SITE

8.95 Ac.

ROOF DRAIN (TYP.)

0.80 Ac.

1.05 Ac.

1.55 Ac.

1.15 Ac.

0.90 Ac.

1.70 Ac.

0.65 Ac.

1.20 Ac.

1.85 Ac.

NODES 160-161
Q25=4.3 CFS
Tc25=6.2 Min.
Q100=5.5 CFS
Tc100=6.2 Min.
AREA=1.30 Ac.

NODES 170-171
Q25=3.7 CFS
Tc25=11.0 Min.
Q100=5.2 CFS
Tc100=11.0 Min.
AREA=1.85 Ac.

S.C.E. TOWER (TYP.)

WALNUT AVENUE

MAPLE AVENUE

BARTON ROAD

OVERPASS

PACIFIC ELECTRIC RAILROAD

SEE SHEET 2

SEE SHEET 3

VICINITY MAP
N.T.S.

SITE

SANTA ANA RIVER

LITTON AVE.

PALM AVE.

ROSEDALE AVE.

LA CADENA DRIVE

I-215

RIVERSIDE DRIVE

BARTON ROAD

DE BERRY ST.

VAN BUREN ST.

MICHIGAN ST.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- 1.00 AC. — SUBAREA AREA
- 100 — NODE NUMBER
- FLOW ARROW (SURFACE)
- FLOW ARROW (PIPE)

0 25 50 100 150

SCALE:1"=50'

Last Update: 10/10/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY MAP

EBS BARTON ROAD WAREHOUSES
BUILDING 1 SITE
BARTON ROAD AND S. TERRACE AVENUE

3711/1 OF 3 SHEETS

PREPARED FOR:
Hager Pacific Properties – N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
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FAX: (949) 253-7923

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

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Checked by _____ Date _____
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Checked by _____ Date _____

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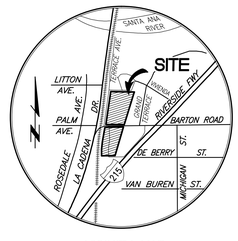
Public Works Director _____ R.C.E. XXXXX

Sheet 1 of 3 Sheets



VICINITY MAP
N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- 1.00 Ac. — SUBAREA AREA
- (100) — NODE NUMBER
- FLOW ARROW (SURFACE)
- FLOW ARROW (PIPE)

0 25 50 100 150

SCALE:1"=50'

Last Update: 10/10/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY MAP

EBS BARTON ROAD WAREHOUSES BUILDING 2 SITE BARTON ROAD AND S. TERRACE AVENUE

3711/2 OF 3 SHEETS

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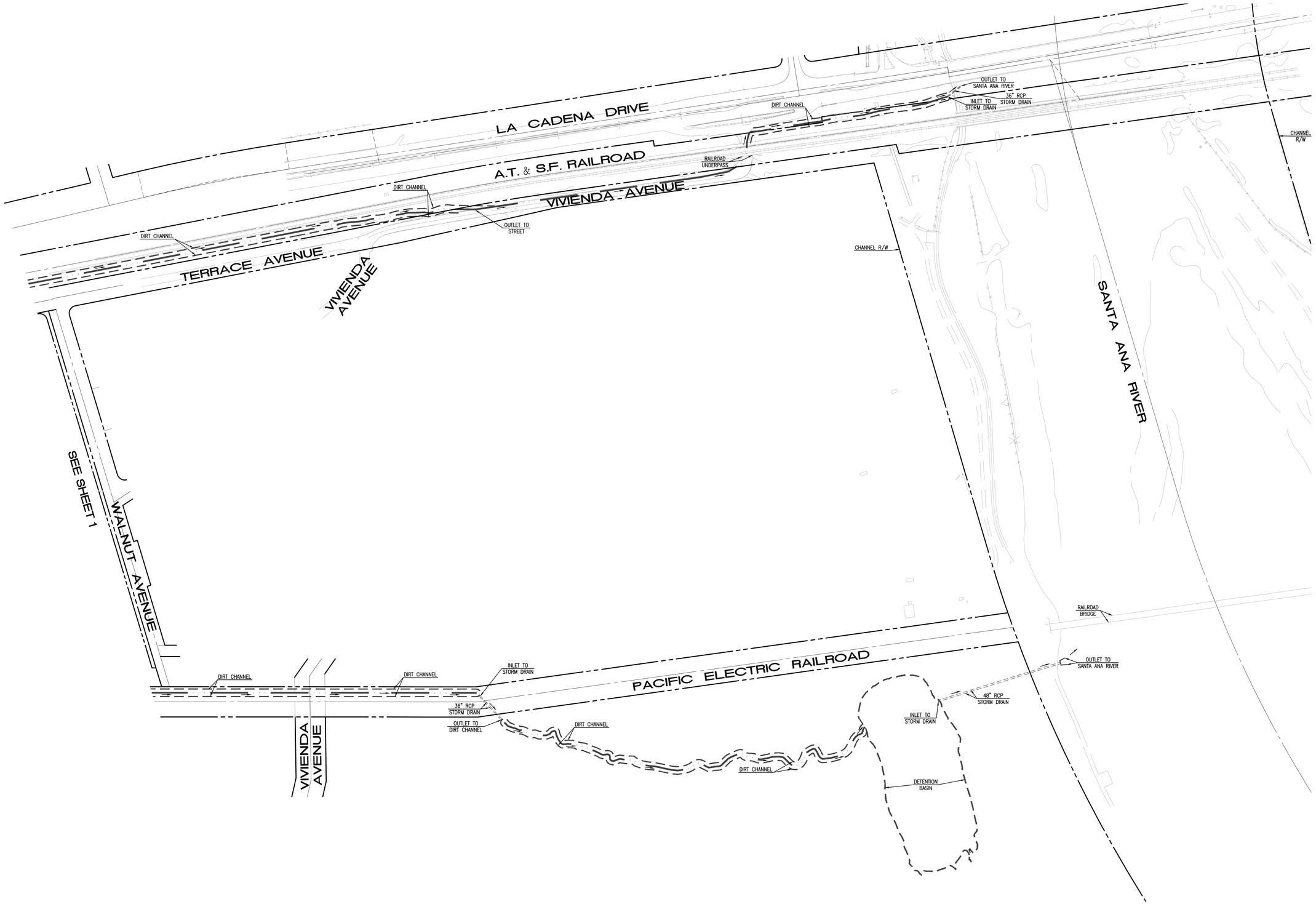

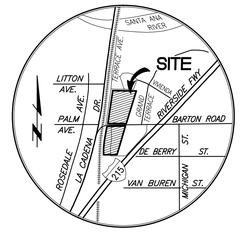

VICINITY MAP
N.T.S.

0 50 100 200 300
SCALE:1"=100'

Last Update: 10/10/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY MAP

EBS BARTON ROAD WAREHOUSES
DRAINAGE FROM SITE TO SANTA ANA RIVER
BARTON ROAD AND S. TERRACE AVENUE

3711/3 OF 3 SHEETS

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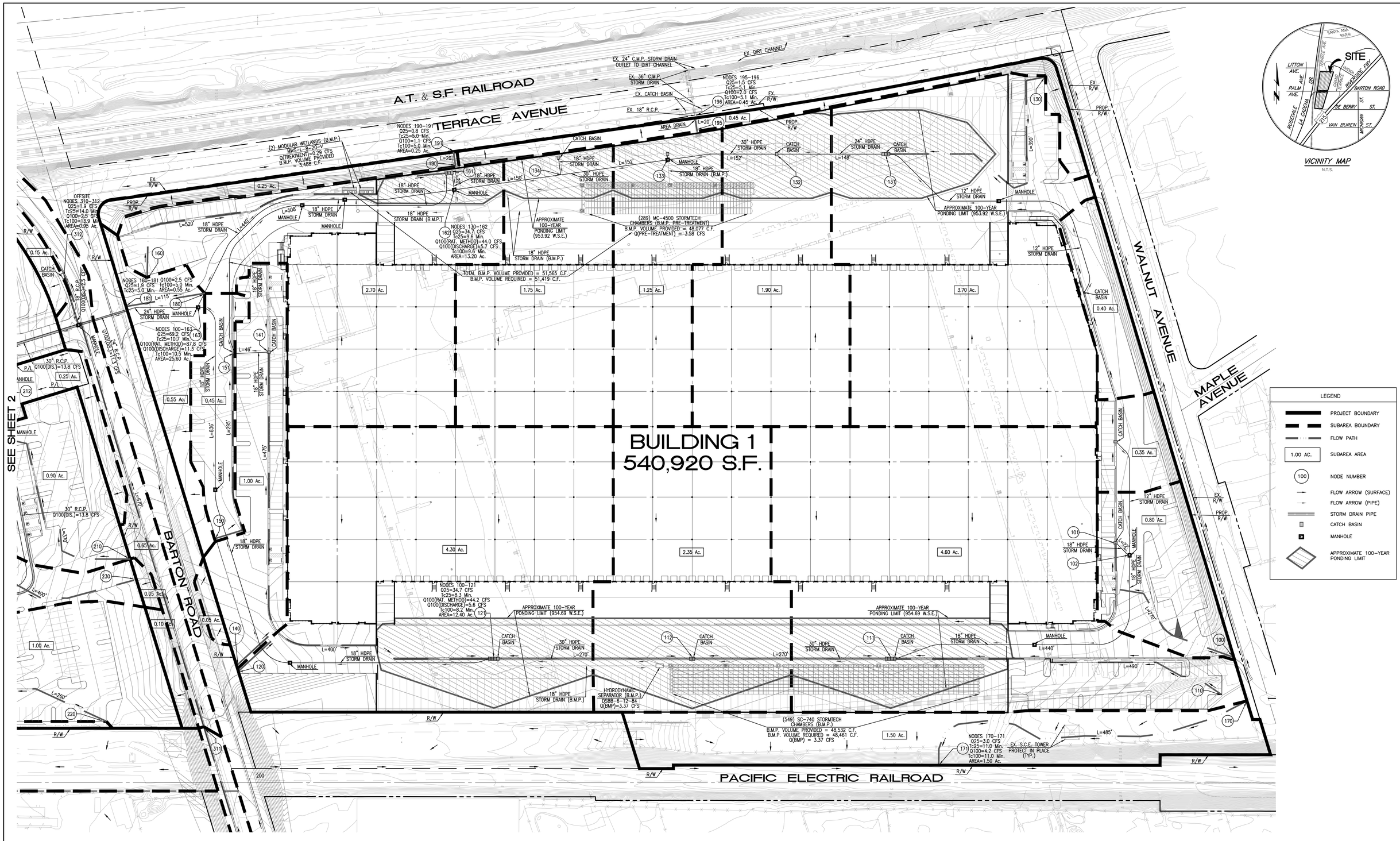
Sheet 3 of 3 Sheets



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SCALE:1"=50'

CITY OF COLTON
PUBLIC WORKS DEPARTMENT

PROPOSED CONDITION HYDROLOGY MAP

BUILDING 1 SITE
EBS BARTON ROAD WAREHOUSES
BARTON ROAD AND S. TERRACE AVENUE

3711 / 1 OF 2 SHEETS

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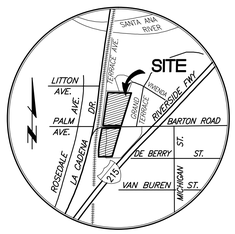

VICINITY MAP
N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- 1.00 Ac. — SUBAREA AREA
- 100 — NODE NUMBER
- FLOW ARROW (SURFACE)
- FLOW ARROW (PIPE)
- STORM DRAIN PIPE
- CATCH BASIN
- MANHOLE
- C.M.P. RISER
- APPROXIMATE 100-YEAR PONDING LIMIT

0 25 50 100 150
SCALE:1"=50'

Last Update: 10/11/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

PROPOSED CONDITION HYDROLOGY MAP

BUILDING 2 SITE
EBS BARTON ROAD WAREHOUSES
BARTON ROAD AND S. TERRACE AVENUE

PREPARED FOR:
Hager Pacific Properties – N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
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Public Works Director _____ R.C.E. XXXXX
Sheet 2 of 2 Sheets

3711 / 2 OF 2 SHEETS

PROFILE SCALE:
HORIZ. - 1" = 40'
VERT. - 1" = 4'

Q25 (MASTER PLAN)=256.0 CFS
Vmax=13.0 FPS

C/L M.H. #1
STA. 9+98.50
904.00 RIM

C/L M.H. #2
STA. 14+44.54
912.29 RIM

C/L M.H. #3
STA. 19+11.87
921.48 RIM

C/L M.H. #4
STA. 23+68.87
923.43 RIM

EXISTING SURFACE

25-YEAR H.G.L.

S=0.0110

EX. 6'x6' RCB (886.50)INV

STA. 10+07.20
889.00 INV.

STA. 14+57.20
END PIPE
891.95 INV.

STA. 14+81.87
892.00 INV.

STA. 15+99.93
BEGIN PIPE
893.32 INV.

STA. 19+11.87
END PIPE
896.95 INV.

STA. 19+15.54
BEGIN PIPE
897.00 INV.

STA. 23+68.54
END PIPE
901.95 INV.

STA. 23+71.20
BEGIN PIPE
902.00 INV.

CONST. 450.00 L.F. - 60" RCP (D=1800)

CONST. 450.00 L.F. - 60" RCP (D=2100)

CONST. 450.00 L.F. - 60" RCP (D=2100)

CONST. 78.80 L.F.
60" RCP (D=1900)

920
910
900
890

10+00 11+00 12+00 13+00 14+00 15+00 16+00 17+00 18+00 19+00 20+00 21+00 22+00 23+00 24+00

STA. 24+50 - SEE SHEET 10

STA. 24+50 - SEE SHEET 10

EX. 6'x6' RCB

EX. LINE "A"

EX. 6'x6' RCB (886.50)INV
MANHOLE SPPWC 322-2

10+00

887.00 INV

11+00 LINE "B" 60" RCP 12+00 13+00

LA CADENA DRIVE

MARYKNOLL DRIVE

MANHOLE SPPWC 320-2

14+00

891.95 INV

892.00 INV

15+00 16+00 LINE "B" 60" RCP 17+00 18+00

MANHOLE SPPWC 320-2

19+00

896.95 INV

897.00 INV

20+00 21+00 LINE "B" 60" RCP 22+00 23+00

MANHOLE SPPWC 320-2

24+00

901.95 INV

902.00 INV

LA CADENA DRIVE

IOWA AVENUE

20'

* CONTRACTOR TO VERIFY

Last Update:10/11/19
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PREPARED FOR:
Hager Pacific Properties - N.B.
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL STORM DRAIN PLAN AND PROFILE
LA CADENA DRIVE
MASTER PLAN LINE "B" STA. 10+00 - 24+50
EBS
BARTON ROAD

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 9 of 12 Sheets

JN 3711

PROFILE SCALE:
HORIZ. - 1" = 40'
VERT. - 1" = 4'

Q25 (MASTER PLAN)=256.0 CFS
Vmax=15.7 FPS

Q25 (MASTER PLAN)=162.0 CFS
Vmax=8.3 FPS

Q25=104.8 CFS
Vmax=5.3 FPS

STA. 24+50 - SEE SHEET 9

940
930
920
910
900

EXISTING SURFACE
25-YEAR H.G.L.
C/O M.H. #5 STA. 28+16.65 924.62 RIM
C/O M.H. #6 STA. 31+71.44 927.33 RIM
C/O M.H. #7 STA. 35+28.11 930.71 RIM
C/O M.H. #8 STA. 38+63.68 935.49 RIM
BRICK & MORTAR END OF PIPE
48" RCP LINE "C" 919.00 INV.
48" RCP 908.38 INV.
S=0.0110
S=0.0100
STA. 28+14.31 END PIPE 908.65 INV.
STA. 28+18.98 BEGIN PIPE 909.38 INV.
STA. 28+97.61 908.16 INV.
STA. 31+69.11 910.89 INV.
STA. 31+73.78 BEGIN PIPE 910.89 INV.
STA. 35+23.78 END PIPE 914.48 INV.
STA. 35+28.44 BEGIN PIPE 914.58 INV.
STA. 38+76.35 END PIPE 918.06 INV.
STA. 38+86.01 BEGIN PIPE 918.16 INV.
STA. 38+90.01 END PIPE 918.20 INV.
CONST. 364.31 L.F. - 60" RCP (D-1900)
CONST. 350.13 L.F. - 60" RCP (D-1800)
CONST. 350.00 L.F. - 60" RCP (D-1800)
CONST. 347.91 L.F. - 60" RCP (D-1800)
CONST. 4.00 L.F. 60" RCP (D-1800)
LINE "B"

25+00 26+00 27+00 28+00 29+00 30+00 31+00 32+00 33+00 34+00 35+00 36+00 37+00 38+00 39+00

STA. 24+50 - SEE SHEET 9

LA LOMA STREET

25+00 LINE "B" 60" RCP 26+00 27+00
BRICK & MORTAR END OF PIPE
48" RCP L=4'
28+00
906.88 INV
907.38 INV
MANHOLE SPPWC 322-2
LINE "B" 60" RCP 29+00 30+00
20'
LA CADENA DRIVE
31+00
MANHOLE SPPWC 320-2
910.88 INV
910.98 INV
LINE "B" 60" RCP 33+00 34+00
MANHOLE SPPWC 320-2 35+00
914.48 INV
914.58 INV
20'
36+00 LINE "B" 60" RCP 37+00 38+00
MANHOLE SPPWC 322-2
918.06 INV
918.16 INV
BRICK & MORTAR END OF PIPE
919.20 INV
LA CADENA DRIVE
918.00 INV
918.13 INV
DE BERRY STREET
LINE "C" 48" RCP 60.11'

LINE "C"
SEE SHEET 11

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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL STORM DRAIN PLAN AND PROFILE
LA CADENA DRIVE
MASTER PLAN LINE "B" STA. 24+50 - 38+90
EBS
BARTON ROAD

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____
Approved by _____ Date _____
Public Works Director _____ R.C.E. XXXXX

Sheet 10 of 12 Sheets

JOB NO. 3711

PROFILE SCALE:
HORIZ. - 1" = 40'
VERT. - 1" = 4'

Q100(DISCHARGE)=57.2 CFS
Vmax=16.3 FPS

Q100(DISCHARGE)=54.1 CFS
Vmax=16.5 FPS

Q100(DISCHARGE)=34.7 CFS
Vmax=14.6 FPS

Q100(DISCHARGE)=19.4 CFS
Vmax=5.9 FPS

Q100(DISCHARGE) =13.8 CFS
Vmax =7.6 FPS

C/L M.H. #8
STA. 10+00.00
935.49 RIM

C/L M.H. #9
STA. 13+17.00
932.62 RIM

C/L M.H. #10
STA. 16+39.83
931.11 RIM

C/L M.H. #11
STA. 19+74.53
945.08 RIM

C/L M.H. #12
STA. 20+00.00
946.08 RIM

C/L M.H. #13
STA. 12+92.76
944.34 RIM

947.75 TG

C.M.P. RISER

EXISTING SURFACE

PROPOSED SURFACE

100-YEAR H.G.L.

CONCRETE COLLAR

60" RCP
LINE "B"
918.06 INV.

STA. 10+07.81
BEGIN PIPE
918.06 INV.

STA. 10+11.91
918.02 INV.

STA. 10+34.06
916.13 INV.

S=0.0050

CONST. 306.76 L.F. - 48" RCP (D-1900)

STA. 13+14.67
920.59 INV.

STA. 13+19.33
920.63 INV.

STA. 15+67.63
BREAK
921.88 INV.

STA. 15+85.35
922.50 INV.

STA. 16+09.21
922.74 INV.

STA. 16+26.88
923.97 INV.

CONST. 378.26 L.F. - 48" RCP (D-1900)

STA. 16+97.59
926.46 INV.

STA. 17+02.26
926.56 INV.

(2) 18" RCP
LINE "D"
928.96 INV.

S=0.0353

STA. 17+26.88
927.43 INV.

STA. 17+40.22
927.90 INV.

STA. 17+71.42
928.00 INV.

STA. 17+98.10
928.95 INV.

CONST. 227.55 L.F. - 48" RCP (D-1900)

36" RCP
LINE "D"
935.10 INV.

PROP. 6" SEWER
STA. 18+62.03
930.66 TOP
1.08' CLEAR

STA. 19+29.81
END PIPE
934.60 INV.

STA. 19+58.88
935.10 INV.

PROP. 8" SEWER
STA. 19+90.90
929.74 TOP
7.03' CLEAR

STA. 19+80.84
936.77 INV.

STA. 20+09.51
937.87 INV.

STA. 20+45.78
939.25 INV.

CONST. 108.90 L.F. - 36" RCP (D-1750)

S=0.0380

48" RCP
LINE "C"
934.60 INV.

STA. 10+04.35
935.10 INV.
BEGIN PIPE
935.01 INV.

STA. 10+78.65
935.40 INV.

STA. 10+99.99
935.48 INV.

CONST. 283.9 L.F. - 36" RCP (D-1750)

18" HDPE
FROM ONSITE
STORM DRAIN

STA. 12+88.25
939.24 INV.

STA. 12+92.25
939.34 INV.
939.4

CONST. 57.75 L.F.
30" RCP (D-1500)

S=0.0040

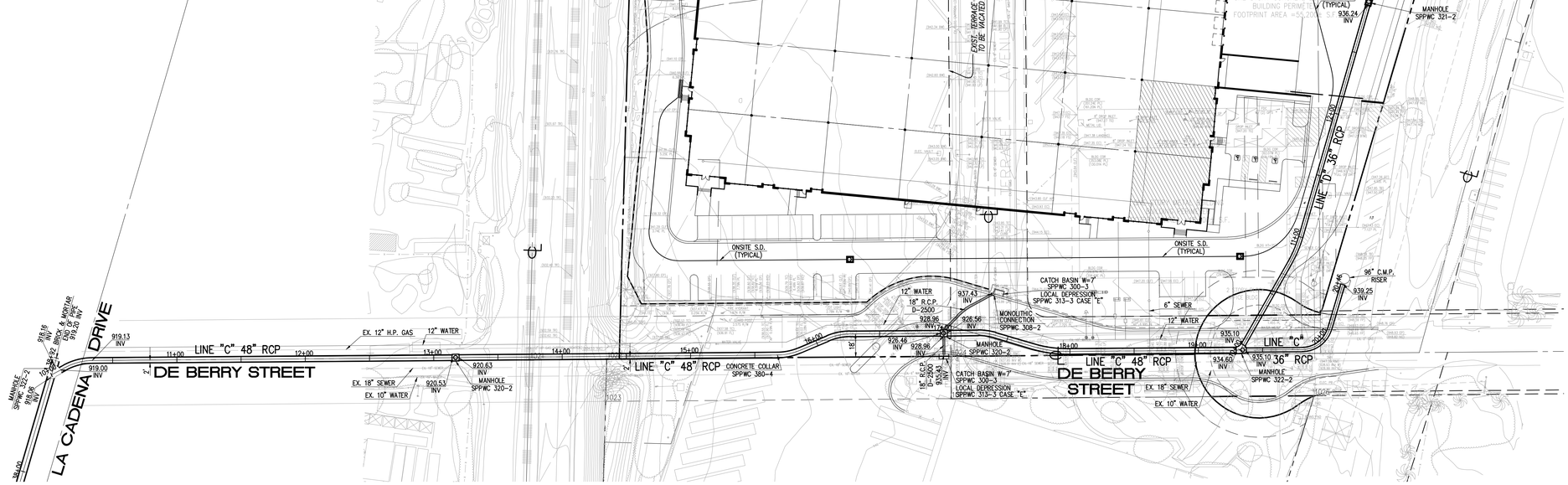
LINE "C"

LINE "D"

STA. 13+50 - SEE SHEET 12

STA. 13+50 - SEE SHEET 11

* CONTRACTOR TO VERIFY



LINE "B"
SEE SHEET 10

0 20 40 80 120
SCALE: 1"=40'

Last Update:10/11/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL STORM DRAIN PLAN AND PROFILE
LINE "C - DE BERRY STREET
LINE "D" STA. 10+00 - 13+50
EBS
BARTON ROAD

Designed by ____ Date ____ Checked by ____ Date ____	Approved by ____ Date ____	JN 3711
Designed by ____ Date ____ Checked by ____ Date ____	Public Works Director ____ R.C.E. XXXXX	
	Sheet 11 of 12 Sheets	

PROFILE SCALE:
HORIZ. – 1" = 40'
VERT. – 1" = 4'

STA. 13+50 – SEE SHEET 11

Q100(DISCHARGE)=13.8 CFS
Vmax=7.6 FPS

Q100(DISCHARGE)=11.3 CFS
Vmax=5.7 FPS

960 / 950 / 940 / 930

EXISTING SURFACE
PROPOSED SURFACE
100-YEAR H.G.L.
S=0.0040
S=0.0050

C/L M.H. #13
STA. 15+62.25
946.47 RIM
937.40 INV.

STA. 15+66.25
BEGIN PIPE
937.53 INV.

CONST. 212.25 L.F.
30" RCP (D-1500)

CONST. 270.00 L.F. – 30" RCP (D-1500)

C/L M.H. #14
STA. 18+40.75
946.82 RIM

STA. 18+36.25
938.61 INV.

STA. 18+40.25
BEGIN PIPE
938.71 INV.

STA. 19+40.23
939.11 INV.

STA. 19+75.63
939.25 INV.

CONST. 258.38 L.F. – 30" RCP (D-1500)

C/L M.H. #15
STA. 20+45.15
943.05 RIM

STA. 20+61.75
BEGIN PIPE
939.59 INV.

STA. 20+92.72
939.72 INV.

STA. 20+98.63
END PIPE
939.74 INV.

STA. 21+02.63
939.84 INV.

STA. 22+14.07
940.28 INV.

STA. 22+49.42
940.43 INV.

CONST. 332.00 L.F. – 30" RCP (D-1500)

C/L M.H. #16
STA. 24+57.13
947.32 RIM

STA. 24+34.63
941.77 INV.

STA. 24+38.63
BEGIN PIPE
941.18 INV.

STA. 29+50.01
941.60 INV.

STA. 25+63.01
941.74 INV.

CONST. 254.20 L.F. – 30" RCP (D-1500)

C/L M.H. #17
STA. 26+83.53
952.75 RIM

EX. AT&T LINE
STA. 27+18.31 *

EX. 4" GAS
STA. 27+16.68 *

EX. 8" WATER
STA. 27+02.27 *

18" RCP
LINE "E"
942.65 INV.

24" HDPE
FROM ONSITE
STORM DRAIN

STA. 26+82.83
END PIPE
942.17 INV.

STA. 26+86.83
BEGIN PIPE
942.65 INV.

STA. 27+67.18
943.00 INV.

CONST. 70.35 L.F.
24" RCP (D-2250)

LINE "D"

14+00 / 15+00 / 16+00 / 17+00 / 18+00 / 19+00 / 20+00 / 21+00 / 22+00 / 23+00 / 24+00 / 25+00 / 26+00 / 27+00

STA. 13+50 – SEE SHEET 11

BLDG. 2
419,120 S.F.

49 DOCK DOORS

EXIST. TERRACE AVE TO BE VACATED

CATCH BASIN W=7'
SPPWC 300-3
LOCAL DEPRESSION
SPPWC 313-3 CASE "E"

946.54 INV

LINE "E" 18" RCP

ONSITE S.D. (TYPICAL)

LINE "D" 24" RCP

942.65 INV

942.17 INV

943.00 INV

CONCRETE COLLAR
SPPWC 380-4

MANHOLE
SPPWC 321-2

LINE "D" 30" RCP

941.16 INV

941.17 INV

BARTON ROAD

MANHOLE
SPPWC 321-2

939.84 INV

939.74 INV

ONSITE S.D. (TYPICAL)

LINE "D" 30" RCP

MANHOLE
SPPWC 321-2

938.71 INV

938.61 INV

MANHOLE
SPPWC 321-2

LINE "D" 30" RCP

LINE "D" 30" RCP

14+00 / 15+00 / 16+00 / 17+00 / 18+00 / 19+00 / 20+00 / 21+00 / 22+00

937.42 INV

937.53 INV

* CONTRACTOR TO VERIFY

0 20 40 80 120
SCALE: 1"=40'

Last Update:10/11/19
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Q100(DISCHARGE)=2.5 CFS
Vmax=9.1 FPS

960 / 950 / 940

C/L M.H. #7
STA. 10+00.00
952.75 RIM

PROPOSED SURFACE

952.54 TC
951.87 FL

EXISTING SURFACE

CATCH BASIN

100-YEAR H.G.L.

S=0.0075

30" RCP
LINE "D"
942.17 INV.

STA. 10+69.61
END PIPE
940.67 INV.

STA. 10+04.75
BEGIN PIPE
942.55 INV.

CONST. 67.86 L.F.
18" RCP (D-2250)

LINE "E"

10+00 / 11+00

PROFILE SCALE:
HORIZ. – 1" = 40'
VERT. – 1" = 4'

PREPARED FOR:
Hager Pacific Properties – N.B.
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL STORM DRAIN PLAN AND PROFILE

LINE "D" STA. 13+50 – 27+42

EBS
BARTON ROAD

JN 3711

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 12 of 12 Sheets

LA CADENA DRIVE

PROP. 60" R.C.P. STORM DRAIN

JOIN EXISTING 12" WATERLINE IN LA CADENA DRIVE

PROP. NEW 12" WATER

PROP. 48" R.C.P. STORM DRAIN

PROP. S.D. MANHOLE SPPWC 320-2

PROP. MONOLITHIC CONNECTION SPPWC 308-2

PROP. 36" H.D.P.E. STORM DRAIN

PROP. (4) CATCH BASINS SPPWC 303-3

948.43 FF
936.68 INV-8'S

PROP. 36" H.D.P.E. REMOVE EXISTING & STORM DRAIN SEWER MANHOLES

PROP. 18" R.C.P. STORM DRAIN

CONTRACTOR TO PROVIDE CLEAN-OUT EVERY 100' PER PLUMBING PLANS

S=0.0100

JOIN EX.10" WATER TO NEW 12" WATER

PROP. S.D. MANHOLE SPPWC 320-2

PROP. 18" R.C.P. STORM DRAIN

PROP. CATCH BASIN SPPWC 300-3 W=7

W/ LOCAL DEPRESSION SPPWC 313-3 CASE "E"

JOIN EX.10" WATER TO NEW 12" WATER

STA: 12+93.04 EXIST. SEWER M.H. 944.17 RIM

PROP. CATCH BASIN SPPWC 300-3 W=7

W/ LOCAL DEPRESSION SPPWC 313-3 CASE "E"

REMOVE 10" WATER INSTALL 12" WATER

PROP. NEW DOM. SERVICE METER & BACKFLOW

PROP. NEW IRR. SERVICE METER & BACKFLOW

929.95 SEW/INV

N0°22'40"W 1.30' 6" VCP S=0.3846

N0°27'23"W 46.77' 6" VCP S=0.0200

PROP. 48" R.C.P. STORM DRAIN

N89°32'36"E 244.49' 18" VCP S=0.0038

PROP. S.D. MANHOLE SPPWC 322-2

PROP. 36" R.C.P. STORM DRAIN

JOIN EX.10" WATER TO NEW 12" WATER

928.93 SEW/INV

STA 15+41.57 EXIST. SEWER M.H. 947.43 RIM

STA 10+00.00 Rim: 947.43 INV IN:929.96 8" VCP

928.99 SEW/INV

PROP. 96" C.M.P. RISER

STA 10+55.12 Rim: 947.06 INV IN:935.56 8" VCP INV OUT:935.36 8" VCP

N0°27'24"W 51.12' 8" VCP S=0.1056

PROP. NEW FIRE HYD.

PROP. NEW FIRE SERVICE

PROP. NEW DCDA

PROP. 3" W.L.

S=0.0050

933.25 INV-6'S

933.17 INV-6'S

PROP. 8" SEWER N0°27'24"W 54.01' 6" PVC S=0.0200

STA 10+48.07 Rim: 946.11 INV IN:930.89 6" PVC INV OUT:930.89 6" VCP

PROP. S.D. MANHOLE SPPWC 320-2

PROP. 36" H.D.P.E. STORM DRAIN

PROP. 36" R.C.P. STORM DRAIN

REMOVE 10" WATER INSTALL 12" WATER

PROP. PUBLIC 12" WATER

928.99 SEW/INV

PROP. PUBLIC 8" SEWER

STA 13+80.37 Rim: 945.29 INV IN:938.23 8" VCP INV OUT:938.13 8" VCP

EXIST P/L

N16°31'33"E 321.25' 8" VCP S=0.0080

PROP. PUBLIC 8" SEWER

ASSUMED (941.00) SEW/INV

PROP. 18" H.D.P.E. STORM DRAIN (B.M.P.)

PROP. HYDRODYNAMIC SEPARATOR (B.M.P.) DSBB-6-12-84

PROP. 18" H.D.P.E. STORM DRAIN (B.M.P.)

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

PROP. S.D. MANHOLE SPPWC 321-2

PRESSURE SHAFT & PLATE SPPWC 329-2

PROP. 30" R.C.P. STORM DRAIN

PROP. 36" H.D.P.E. STORM DRAIN

PROP. CATCH BASIN SPPWC 305-3

PROP. (3) CATCH BASINS SPPWC 305-3

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

(834) CHAMBERS STORMTECH DC-780 18-INCH FOUNDATION STONE (940.65) SEW/INV

REMOVE EXISTING SEWER MAIN AND EXIST. SEWER MANHOLES

ASSUMED 8" S.D.

PROP. S.D. MANHOLE

PROP. 30" R.C.P. STORM DRAIN

PROP. PUBLIC 12" WATER

STA 17+05.61 Rim: 946.78 INV OUT:940.80 8" VCP

PROP. 96" C.M.P. RISER

PROP. PUBLIC 8" SEWER

EXIST. 8" SEWER

CITY OF COLTON
CITY OF GRAND TERRACE

BLDG. 2
419,120 S.F.

49 DOCK DOORS

SEE SHEET 5

PROP. NEW 12" WATER

EXIST P/L

REMOVE EXISTING ST LT

REMOVE EXISTING ELECTRICAL AND OTHER APPURTENANCES

REMOVE EXISTING 10" W.L. AND OTHER APPURTENANCES

REMOVE EXISTING 8" SEWER MAIN AND EXIST. SEWER MANHOLES

REMOVE EXISTING 2" GAS LINE

REMOVE EXISTING 8" SEWER MAIN, LATERALS, AND EXIST. SEWER MANHOLES

EXIST. TERRACE AVE TO BE VACATED

CONTRACTOR TO PROVIDE CLEAN-OUT EVERY 100' PER PLUMBING PLANS

STA 11+02.07 Rim: 946.11 INV IN:931.97 6" PVC INV OUT:931.97 6" PVC

STA 10+48.07 Rim: 946.11 INV IN:930.89 6" PVC INV OUT:930.89 6" VCP

PROP. 36" H.D.P.E. STORM DRAIN

PROP. (3) CATCH BASINS SPPWC 305-3

PROP. 18" H.D.P.E. STORM DRAIN (B.M.P.)

PROP. 30" R.C.P. STORM DRAIN

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

PROP. S.D. MANHOLE SPPWC 321-2

PROP. 36" R.C.P. STORM DRAIN

PROP. PUBLIC 12" WATER

N16°31'33"E 321.25' 8" VCP S=0.0080

PROP. PUBLIC 8" SEWER

EXIST P/L

PROP. 36" H.D.P.E. STORM DRAIN

PROP. CATCH BASIN SPPWC 305-3

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

PROP. (3) CATCH BASINS SPPWC 305-3

PROP. S.D. MANHOLE

PROP. 30" R.C.P. STORM DRAIN

PROP. PUBLIC 12" WATER

(834) CHAMBERS STORMTECH DC-780 18-INCH FOUNDATION STONE (940.65) SEW/INV

REMOVE EXISTING SEWER MAIN AND EXIST. SEWER MANHOLES

ASSUMED 8" S.D.

PROP. 8" SEWER N0°27'24"W 54.01' 6" PVC S=0.0200

PROP. 36" H.D.P.E. STORM DRAIN

PROP. CATCH BASIN SPPWC 305-3

PROP. 18" H.D.P.E. STORM DRAIN

PROP. S.D. MANHOLE SPPWC 320-2

PROP. 36" H.D.P.E. STORM DRAIN

PROP. 36" R.C.P. STORM DRAIN

PROP. 30" R.C.P. STORM DRAIN

PRESSURE SHAFT & PLATE SPPWC 329-2

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

PROP. S.D. MANHOLE SPPWC 321-2

PROP. PUBLIC 12" WATER

PROP. PUBLIC 8" SEWER

N16°31'33"E 321.25' 8" VCP S=0.0080

STA 13+80.37 Rim: 945.29 INV IN:938.23 8" VCP INV OUT:938.13 8" VCP

EXIST P/L

PROP. PUBLIC 8" SEWER

ASSUMED (941.00) SEW/INV

PROP. 96" C.M.P. RISER

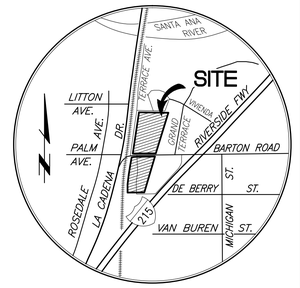
STA 10+55.12 Rim: 947.06 INV IN:935.56 8" VCP INV OUT:935.36 8" VCP

N0°27'24"W 51.12' 8" VCP S=0.1056

STA 10+00.00 Rim: 947.43 INV IN:929.96 8" VCP

DE BERRY ST

CITY OF COLTON
CITY OF GRAND TERRACE



VICINITY MAP
N.T.S.

0 20 40 80 120
SCALE:1"=40'

PREPARED FOR:
Hager Pacific Properties – N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
PHONE: (949) 253-7920
FAX: (949) 253-7923

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL UTILITY PLAN AND ON-SITE STORM DRAIN PLAN EBS BARTON ROAD

JN 3711

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Last Update: 10/11/19
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SEE SHEET 4

SEE SHEET 6

CITY OF GRAND TERRACE
CITY OF COLTON

TERRACE AVE

EXIST R/W

PROP R/W

STA 21+48.54
Rim: 945.10
INV. OUT:940.94 8" VCP

STA 18+72.15
Rim: 942.87
INV IN:936.13 8" VCP
INV OUT:936.08 8" VCP

STA 18+26.00
Rim: 941.97
INV IN:935.78 8" VCP
INV OUT:935.76 8" VCP

STA 15+26.14
Rim: 937.66
INV IN:933.87 8" VCP
INV OUT:933.85 8" VCP

EXISTING 8" SEWER MAIN (S=0.0037)

PROP. NEW 12" WATER (BRIDGED TO BRIDGE)

PROP. (3) CATCH BASINS SPPWC 305-3

PROP. MODULAR WETLANDS SYSTEM TWO (2) MWS-L-8-20-V

PROP. 18" H.D.P.E. STORM DRAIN (B.M.P.)

PROP. S.D. MANHOLE SPPWC 321-2

PROP. 18" H.D.P.E. STORM DRAIN

PROP. 24" H.D.P.E. STORM DRAIN

PROP. 30" H.D.P.E. STORM DRAIN

PROP. CATCH BASIN SPPWC 305-3

PROP. 18" H.D.P.E. STORM DRAIN (B.M.P.)

PROP. 24" AREA DRAIN

PROTECT IN PLACE EX. 18" STORM DRAIN

REMOVE EX. 18" STORM DRAIN

REMOVE EX. CATCH BASIN

PROP. S.D. MANHOLE SPPWC 321-2

PRESSURE SHAFT & PLATE SPPWC 329-2

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

(289) CHAMBERS STORMTECH MC-4500 9-INCH FOUNDATION STONE

PROP. SUMP PUMP (B.M.P.)

PROP. 4" P.V.C. FORCE MAIN (B.M.P.)

PROP. NEW 12" WATER

PROP. CATCH BASIN SPPWC 300-3 W=7' W/ LOCAL DEPRESSION SPPWC 313-3 CASE "E"

PROP. 18" R.C.P. STORM DRAIN

REMOVE EXISTING 8" SEWER MAIN AND EXIST. SEWER MANHOLES

PROP. 24" R.C.P. STORM DRAIN

PROP. CONCRETE COLLAR SPPWC 380-4

PROP. 30" R.C.P. STORM DRAIN

REMOVE EXISTING ST L

PROP. NEW DCDA

PROP. NEW FIRE SERVICE

PROP. NEW FIRE HYDRANT

PROP. 3" W.L.

PROP. NEW IRR. SERVICE METER & BACKFLOW

PROP. NEW DOM. SERVICE METER & BACKFLOW

PROP. 36" H.D.P.E. STORM DRAIN

PROP. (2) CATCH BASINS SPPWC 300-3 W=3.5' W/ LOCAL DEPRESSION SPPWC 313-3 CASE "E"

PROP. CATCH BASIN SPPWC 300-3 W=3.5' W/ LOCAL DEPRESSION SPPWC 313-3 CASE "E"

PROP. (4) CATCH BASINS SPPWC 305-3

CONTRACTOR TO PROVIDE CLEAN-OUT EVERY 100' PER PLUMBING PLANS

S=0.0100

943.35 INV-6"S

948.43 FF

STA 20+57.47
Rim: 959.28
INV IN:952.58 6" PVC
INV OUT:952.58 6" PVC

S16°31'33"W 776.66'
6" PVC S=0.0100

S73°28'27"E 479.17'
6" PVC S=0.0100

STA 25+36.64
Rim: 959.28
INV OUT:957.37 6" PVC

959.28 FF

57 DOCK DOORS

ONE STORY CONCRETE TILT-UP BUILDING FOOTPRINT AREA = 414,100± S.F.

ONE STORY CONCRETE TILT-UP BUILDING PERIMETER = 1,760.00±

50.00'

20.00'

BARTON ROAD

PROP. 24" H.D.P.E. STORM DRAIN

PROP. 18" H.D.P.E. STORM DRAIN (B.M.P.)

PROP. HYDRODYNAMIC SEPARATOR (B.M.P.) DSBB-6-12-84

(549) CHAMBERS STORMTECH DC-780 18-INCH FOUNDATION STONE

EXIST P/L

CITY OF COLTON
CITY OF GRAND TERRACE

BLDG. 1
540,920 S.F.

0 20 40 80 120

SCALE:1"=40'

PREPARED FOR:

Hager Pacific Properties – N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
PHONE: (949) 253-7920
FAX: (949) 253-7923

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14349 FIRESTONE BOULEVARD
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PH.(714)521-4811 FAX(714)521-4173

CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL UTILITY PLAN AND ON-SITE STORM DRAIN PLAN EBS BARTON ROAD

JN 3711

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 5 of 12 Sheets

Last Update: 10/11/19
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SEE SHEET 5

TERRACE AVE

WALNUT AVE

MAPLE AVE

BURNS AVE

CITY OF GRAND TERRACE
CITY OF COLTON

EXISTING 8" SEWER MAIN

STA 10+00.00
Rim: 946.06
INV IN:931.78 8" VCP

10+00

11+00

STA 12+49.09
Rim: 939.26
INV IN:932.86 8" VCP
INV OUT:932.80 8" VCP

12+00

933.12 SEW/INV

13+00

EXIST R/W

PROP R/W

S83°10'48"E 1.29'
6" VCP S=0.5875

934.04 SEW/INV

ABANDON EX. PARKWAY CULVERT
REMOVE EX. CATCH BASIN

REMOVE EX. 18" STORM DRAIN

PROP. 6" SEWER

S83°10'48"E 59.52'
6" VCP S=0.0201

STA 10+60.81
Rim: 953.75
INV IN:935.23 6" PVC
INV OUT:935.23 6" VCP

PROP. (3) CATCH BASINS SPPWC 305-3

PROP. 24" H.D.P.E. STORM DRAIN

PROP R/W

EXIST R/W

EXISTING 8" SEWER MAIN

S73°28'27"E 100.00'
6" PVC S=0.0200

STA 11+60.81
Rim: 953.81
INV IN:937.23 6" PVC
INV OUT:937.23 6" PVC

PROP. 12" H.D.P.E. STORM DRAIN

PROP. S.D. MANHOLE SPPWC 321-2

S73°28'27"E 100.00'
6" PVC S=0.0200

PROP. 6" SEWER

STA 12+60.81
Rim: 955.17
INV IN:939.23 6" PVC
INV OUT:939.23 6" PVC

PROP. 12" H.D.P.E. STORM DRAIN

15'

S73°28'27"E 20.00'
6" PVC S=0.2790

CONTRACTOR TO PROVIDE CLEAN-OUT EVERY 100' PER PLUMBING PLANS

N16°31'33"E 308.67'
6" PVC S=0.0250

STA 12+80.81
Rim: 959.26
INV IN:944.81 6" PVC
INV OUT:944.81 6" PVC

Rim: 959.26
INV IN:952.53 6" PVC
INV OUT:952.53 6" PVC

PROP. MONOLITHIC CONNECTION SPPWC 308-2

PROP. CATCH BASIN SPPWC 305-3

N89°45'31"E 117.29'
6" PVC S=0.0100

Rim: 959.26
INV IN:953.70 6" PVC
INV OUT:953.70 6" PVC

15'

CONTRACTOR TO PROVIDE CLEAN-OUT EVERY 100' PER PLUMBING PLANS

PROP. CATCH BASIN SPPWC 305-3

PROP. MONOLITHIC CONNECTION SPPWC 308-2

PROP. 12" H.D.P.E. STORM DRAIN

S73°28'27"E 366.86'
6" PVC S=0.0100

PROP R/W

EXISTING 8" SEWER MAIN

EXIST R/W

PROP. 12" H.D.P.E. STORM DRAIN

PROP. S.D. MANHOLE SPPWC 321-2

15'

Rim: 959.26
INV OUT:957.37 6" PVC

959.26
15'

PROP. 18" H.D.P.E. STORM DRAIN

PROP. (4) CATCH BASINS SPPWC 305-3

PROP. 30" NYLOPLAST MANHOLE (B.M.P.)

PROP. 24" H.D.P.E. STORM DRAIN

PROP. 18" H.D.P.E. STORM DRAIN

PROP. S.D. MANHOLE SPPWC 321-2

(549) CHAMBERS STORMTECH DC-780 18-INCH FOUNDATION STONE

BURNS

CITY OF COLTON
CITY OF GRAND TERRACE

EXIST P/L

0 20 40 80 120

SCALE:1"=40'

PREPARED FOR:
Hager Pacific Properties – N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
PHONE: (949) 253-7920
FAX: (949) 253-7923

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

CITY OF COLTON
PUBLIC WORKS DEPARTMENT

CONCEPTUAL UTILITY PLAN AND ON-SITE STORM DRAIN PLAN
EBS
BARTON ROAD

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 6 of 12 Sheets

JN 3711

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L.2 - Preliminary Water Quality Management Plan

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Thienes Engineering, Inc.
CIVIL ENGINEERING LAND SURVEYING

Preliminary Water Quality Management Plan (PWQMP)

For:

EBS Barton Road Warehouses
Barton Road
Colton, CA 92324

DAP-001-602
APNs: 1167-131-003, -004 & 1167-051-002, -015, -016, -018, -019, -020, 1167-061-006, 0275-223-023, -044 & -045

Prepared for:

Hager Pacific Properties
4100 Newport Place Drive, Suite 820
Newport Beach, CA 92660
Phone: (949) 253-7920

Prepared by:

Thienes Engineering, Inc.
14349 Firestone Boulevard
La Mirada, CA 90638
Phone: (714) 521-4811
Contact: Luis Prado (luisp@thieneseng.com)
JN 3711

Submittal Date:	August 6, 2019
Revision Date:	October 11, 2019
Revision Date:	January 21, 2020

Approval Date: _____

Project Owner's Certification

This Water Quality Management Plan (WQMP) has been prepared for **Hager Pacific Properties** by **Thienes Engineering, Inc**. The WQMP is intended to comply with the requirements of the City of Colton and the NPDES Areawide Stormwater Program requiring the preparation of a WQMP. The undersigned, while it owns the subject property, is responsible for the implementation of the provisions of this plan and will ensure that this plan is amended as appropriate to reflect up-to-date conditions on the site consistent with San Bernardino County's Municipal Storm Water Management Program and the intent of the NPDES Permit for San Bernardino County and the incorporated cities of San Bernardino County within the Santa Ana Region. Once the undersigned transfers its interest in the property, its successors in interest and the city/county shall be notified of the transfer. The new owner will be informed of its responsibility under this WQMP. A copy of the approved WQMP shall be available on the subject site in perpetuity.

"I certify under a penalty of law that the provisions (implementation, operation, maintenance, and funding) of the WQMP have been accepted and that the plan will be transferred to future successors."

.

Project Data			
Permit/Application Number(s):	DAP-001-602	Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 1167-131-003, -004 & 1167-051-002, -015, -016, -018, -019, -020, 1167-061-006, 0275-223-023, -044 & -045

Owner's Signature			
Owner Name: Robert Neal			
Title	Managing Partner		
Company	Hager Pacific Properties		
Address	4100 Newport Place Drive, Suite 820		
Email	rob.neal@hagerpacific.com		
Telephone #	(949) 253-7920		
Signature		Date	

Preparer's Certification

Project Data			
Permit/Application Number(s):	DAP-001-602	Grading Permit Number(s):	
Tract/Parcel Map Number(s):		Building Permit Number(s):	
CUP, SUP, and/or APN (Specify Lot Numbers if Portions of Tract):			APN: 1167-131-003, -004 & 1167-051-002, -015, -016, -018, -019, -020, 1167-061-006, 0275-223-023, -044 & -045

"The selection, sizing and design of stormwater treatment and other stormwater quality and quantity control measures in this plan were prepared under my oversight and meet the requirements of Regional Water Quality Control Board Order No. R8-2010-0036."

Engineer: Reinhard Stenzel	
Title	Director of Engineering
Company	Thienes Engineering, Inc.
Address	14349 Firestone Boulevard, La Mirada, CA 90638
Email	reinhard@thieneseng.com
Telephone #	(714) 521-4811
Signature	
Date	1/21/2020

PE Stamp Below

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Attachment A: Existing Condition Site Photos

Attachment B: BMP Design Calculations & Supporting Documentation

Attachment C: WQMP Site Map

Attachment D: WQMP and Stormwater BMP Transfer, Access and Maintenance Agreement

Attachment E: Educational Materials

Attachment F: Infiltration Report

Section 1 Discretionary Permit(s)

Form 1-1 Project Information

Project Name	EBS Barton Road Warehouses				
Project Owner Contact Name:	Robert Neal				
Mailing Address:	4100 Newport Place Drive, Suite 820 Newport Beach, CA 92660	E-mail Address:	Rob.neal@hagerpacific.com	Telephone:	(949) 253-7920
Permit/Application Number(s):	DAP-001-602		Tract/Parcel Map Number(s):		
Additional Information/ Comments:	n/a				
Description of Project:	The proposed project site encompasses approximately 47.75 acres, with 28.30 acres on the north side of Barton Road and 19.45 acres on the south side. The site north of Barton Road (Building 1) is currently developed with three warehouse type buildings, several truck yards (between the warehouse buildings), and a vehicle parking lot (southwest corner of site). The site generally drains westerly to Terrace Avenue, then further west via a street catch basin and a 36-inch C.M.P. outletting to a dirt channel within the westerly railroad easement. The dirt channel drains northerly and discharges to the Santa Ana River. The northeast portion of the site, south of Barton Road (Building 2) is an open grass lot. The remainder of the site is developed with two warehouse type buildings (southeast corner of the site), truck yards (southwest corner of the site), and vehicle parking lots (north of warehouse buildings and truck yards). The southerly portion of Terrace Avenue bisects the Building 2 site. A majority of the site drains to Terrace Avenue via surface flows and parkway culverts, then southerly to a riser inlet near the south end of Terrace Avenue, then westerly (along with offsite flows from Barton Road, easterly railroad and easterly offsite lots) via a storm drain outletting to the dirt channel within the westerly railroad easement. Following complete demolition of all existing development on both sites, proposed improvements to the sites include two commercial type buildings (one on each side of Barton Road). There will be truck yards on the east and west sides of the northerly Building 1, and a truck yard on the east side of the southerly Building 2. Vehicle parking lots will be adjacent to the other sides of the proposed buildings. Landscape areas will be adjacent to street frontages and scattered throughout the site. The existing Barton Road overpass over the easterly railroad easement will be removed and reconstructed to improve pedestrian and truck access. Finally, the portion of Terrace Avenue south of Barton Road and bisecting the Building 2 site will be vacated to allow for the construction of Building 2. Proposed condition overflow runoff from the Building 1 site will be conveyed southerly via a proposed private storm drain system. This storm drain will continue southerly and accept runoff from the south half of Barton Road via a proposed street catch basin and lateral. The storm drain will then become a public storm drain and continue further south into – and accepting onsite overflow runoff from – the Building 2 site, then westerly in De Berry Street. Offsite runoffs from the easterly railroad easement and adjacent easterly offsite lots are tributary to the proposed 48-inch storm drain in De Berry Street via a C.M.P. riser within the railroad easement immediately north of De Berry Street. Runoff from the portion of De Berry Street fronting the Building 2 site will be accepted into the proposed 48-inch storm drain via				

	proposed street catch basins and laterals. The storm drain will then continue west across the westerly railroad easement to La Cadena Drive. Underground retention systems will be utilized to temporarily store stormwater runoff for infiltration or treatment of the water quality design capture volume (DCV). A low flow pipe, set at a low invert elevation, will be used to direct the DCV into the retention systems. A high flow pipe, set at a higher invert elevation, will take flows greater than the DCV. Due to the low infiltration rates west of Building 1, DA 2 DMA B will be treated via proprietary biofiltration units, a pump and an underground retention system. Treated flows will connect back to the main line. Landscape areas in the Building 1 site that are fronting Barton Road and Terrace Avenue (1.25 acres) and the open grass area consisting of a utility easement that is located east of Building 1 (1.50 acres) are considered self-treating areas and will drain offsite without being routed to the LID BMPs. Landscape areas in the Building 2 site that are fronting the existing railroad tracks west of the building (0.20 acres) are considered self-treating areas and will drain offsite without being routed to the LID BMPs. Also, the most southerly existing and proposed impervious areas that serve as a shared access driveway between the proposed site and the southerly existing site (0.55 acres) will drain into the proposed public storm drain system without being routed to the LID BMPs.
Provide summary of Conceptual WQMP conditions (if previously submitted and approved). Attach complete copy.	n/a

Section 2 Project Description

2.1 Project Information

This section of the WQMP should provide the information listed below. The information provided for Conceptual/ Preliminary WQMP should give sufficient detail to identify the major proposed site design and LID BMPs and other anticipated water quality features that impact site planning. Final Project WQMP must specifically identify all BMP incorporated into the final site design and provide other detailed information as described herein.

The purpose of this information is to help determine the applicable development category, pollutants of concern, watershed description, and long term maintenance responsibilities for the project, and any applicable water quality credits. This information will be used in conjunction with the information in Section 3, Site Description, to establish the performance criteria and to select the LID BMP or other BMP for the project or other alternative programs that the project will participate in, which are described in Section 4.

Form 2.1-1 Description of Proposed Project

1 Development Category (Select all that apply):

☐ Significant re-development involving the addition or replacement of 5,000 ft^2 or more of impervious surface on an already developed site	☒ New development involving the creation of 10,000 ft^2 or more of impervious surface collectively over entire site	☐ Automotive repair shops with standard industrial classification (SIC) codes 5013, 5014, 5541, 7532- 7534, 7536-7539	☐ Restaurants (with SIC code 5812) where the land area of development is 5,000 ft^2 or more
☐ Hillside developments of 5,000 ft^2 or more which are located on areas with known erosive soil conditions or where the natural slope is 25 percent or more	☐ Developments of 2,500 ft^2 of impervious surface or more adjacent to (within 200 ft) or discharging directly into environmentally sensitive areas or waterbodies listed on the CWA Section 303(d) list of impaired waters.	☐ Parking lots of 5,000 ft^2 or more exposed to storm water	☐ Retail gasoline outlets that are either 5,000 ft^2 or more, or have a projected average daily traffic of 100 or more vehicles per day

☐ Non-Priority / Non-Category Project *May require source control LID BMPs and other LIP requirements. Please consult with local jurisdiction on specific requirements*.

2 Project Area (ft2):	2,079,624 (47.75 acres)*	**3** Number of Dwelling Units:	n/a	**4** SIC Code:	4225

5 Is Project going to be phased? Yes ☐ No ☒ *If yes, ensure that the WQMP evaluates each phase as a distinct DA, requiring LID BMPs to address runoff at time of completion.*

6 Does Project include roads? Yes ☒ No ☐ *If yes, ensure that applicable requirements for transportation projects are addressed (see Appendix A of TGD for WQMP)*

*This value includes 3.5 acres of mostly self-treating landscape that drains offsite without being routed to the LID BMPs.

2.2 Property Ownership/Management

Describe the ownership/management of all portions of the project and site. State whether any infrastructure will transfer to public agencies (City, County, Caltrans, etc.) after project completion. State if a homeowners or property owners association will be formed and be responsible for the long-term maintenance of project stormwater facilities. Describe any lot-level stormwater features that will be the responsibility of individual property owners.

Form 2.2-1 Property Ownership/Management

Describe property ownership/management responsible for long-term maintenance of WQMP stormwater facilities:

Hager Pacific Properties
4100 Newport Place Drive, Suite 820
Newport Beach, CA 92660
Phone: (949) 253-7920
Contact: Robert Neal

No infrastructure will be transferred to a public agency after project completion.
A property owner's association (POA) will not be formed for long-term maintenance of proposed project stormwater facilities.

2.3 Potential Stormwater Pollutants

Determine and describe expected stormwater pollutants of concern based on land uses and site activities (refer to Table 3-3 in the TGD for WQMP).

Form 2.3-1 Pollutants of Concern			
Pollutant	Please check: E=Expected, N=Not Expected		Additional Information and Comments
Pathogens (Bacterial / Virus)	E ☒	N ☐	Bacterial indicators are routinely detected in pavement runoff.
Nutrients - Phosphorous	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Nutrients - Nitrogen	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Noxious Aquatic Plants	E ☐	N ☒	Not an expected pollutant.
Sediment	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Metals	E ☒	N ☐	Expected pollutant if parking lots exists on-site.
Oil and Grease	E ☒	N ☐	Expected pollutant if parking lots exists on-site.
Trash/Debris	E ☒	N ☐	Expected pollutant if landscaping and parking lots exists on-site.
Pesticides / Herbicides	E ☒	N ☐	Expected pollutant if landscaping exists on-site.
Organic Compounds	E ☒	N ☐	Expected pollutant if landscaping exists on-site. Including petroleum hydrocarbons and solvents.
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	
Other:	E ☐	N ☐	

The expected POCs for the project site are **Pathogens and Nitrogen**

2.4 Water Quality Credits

A water quality credit program is applicable for certain types of development projects if it is not feasible to meet the requirements for on-site LID. Proponents for eligible projects, as described below, can apply for water quality credits that would reduce project obligations for selecting and sizing other treatment BMP or participating in other alternative compliance programs. Refer to Section 6.2 in the TGD for WQMP to determine if water quality credits are applicable for the project.

Form 2.4-1 Water Quality Credits

1 Project Types that Qualify for Water Quality Credits: *Select all that apply*

☐ Redevelopment projects that reduce the overall impervious footprint of the project site. [Credit = % impervious reduced]	Higher density development projects ☐ Vertical density [20%] ☐ 7 units/ acre [5%]	☐ Mixed use development, (combination of residential, commercial, industrial, office, institutional, or other land uses which incorporate design principles that demonstrate environmental benefits not realized through single use projects) [20%]	☐ Brownfield redevelopment (redevelop real property complicated by presence or potential of hazardous contaminants) [25%]
☐ Redevelopment projects in established historic district, historic preservation area, or similar significant core city center areas [10%]	☐ Transit-oriented developments (mixed use residential or commercial area designed to maximize access to public transportation) [20%]	☐ In-fill projects (conversion of empty lots & other underused spaces < 5 acres, substantially surrounded by urban land uses, into more beneficially used spaces, such as residential or commercial areas) [10%]	☐ Live-Work developments (variety of developments designed to support residential and vocational needs) [20%]

2 Total Credit % n/a *(Total all credit percentages up to a maximum allowable credit of 50 percent)*

Description of Water Quality Credit Eligibility (if applicable)	n/a

Section 3 Site and Watershed Description

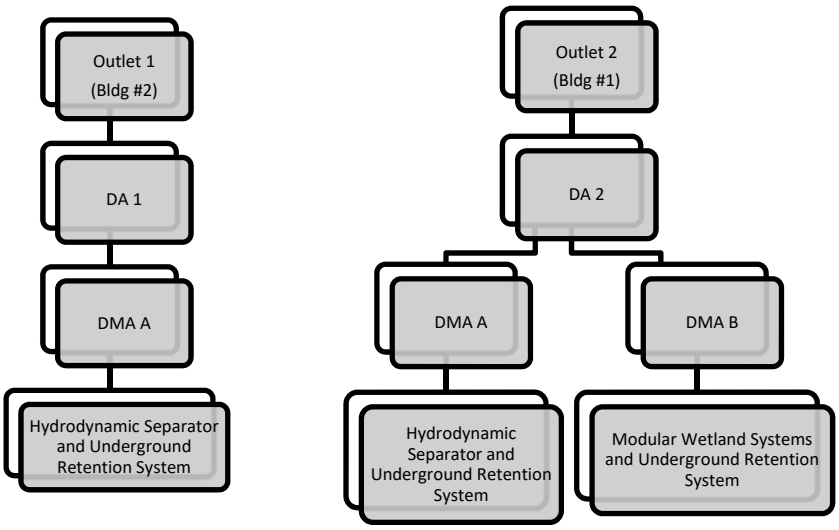
Describe the project site conditions that will facilitate the selection of BMP through an analysis of the physical conditions and limitations of the site and its receiving waters. Identify distinct drainage areas (DA) that collect flow from a portion of the site and describe how runoff from each DA (and sub-watershed DMAs) is conveyed to the site outlet(s). Refer to Section 3.2 in the TGD for WQMP. The form below is provided as an example. Then complete Forms 3.2 and 3.3 for each DA on the project site. ***If the project has more than one drainage area for stormwater management, then complete additional versions of these forms for each DA / outlet.***

Form 3-1 Site Location and Hydrologic Features

Site coordinates *take GPS measurement at approximate center of site*	Latitude 34.0351	Longitude -117.3310	Thomas Bros Map page Page 646

1 San Bernardino County climatic region: ☒ Valley ☐ Mountain

2 Does the site have more than one drainage area (DA): Yes☒ No☐ *If no, proceed to Form 3-2. If yes, then use this form to show a conceptual schematic describing DMAs and hydrologic feature connecting DMAs to the site outlet(s). An example is provided below that can be modified for proposed project or a drawing clearly showing DMA and flow routing may be attached*



Conveyance	Briefly describe on-site drainage features to convey runoff that is not retained within a DMA
DA 1 DMA A flows to Outlet 1 (Building #2 Site)	Underground retention systems will be utilized to infiltrate the water quality design capture volume (DCV). A low flow pipe, set at a low invert elevation, will be used to direct the DCV into the retention systems. A high flow pipe, set at a higher invert elevation, will take flows greater than the DCV. Flows will ultimately drain to a proposed public storm drain in De Berry Street.

DA 2 DMA A flows to Outlet 2 (Building #1 Site)	Underground retention systems will be utilized to infiltrate the water quality design capture volume (DCV). A low flow pipe, set at a low invert elevation, will be used to direct the DCV into the retention systems. A high flow pipe, set at a higher invert elevation, will take flows greater than the DCV. Flows will ultimately drain to a proposed public storm drain in De Berry Street.
DA 2 DMA B flows to Outlet 2 (Building #1 Site)	Due to the low infiltration rates west of Building 1, this drainage area will be partially infiltrated into the subsoil of the underground chamber system. The treated via proprietary biofiltration units, a pump and an underground retention system. Treated flows will connect back to the main line.

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	Hydrology Nodes 100-110	Hydrology Nodes 120-135	Hydrology Nodes 130-135	Hydrology Nodes 140-141
1 DMA drainage area (ft^2)	359,370 (8.25 acres)	389,370 (8.95 acres)	230,686 (5.30 acres)	26,136 (0.60 acres)
2 Existing site impervious area (ft^2)	359,370	387,684	230,686	23,958
3 Antecedent moisture condition *For desert areas, use http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	AMC II	AMC II	AMC II	AMC II
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	B	B	B	B
5 Longest flowpath length (ft)	985	650	1,205	120
6 Longest flowpath slope (ft/ft)	0.016	0.012	0.020	0.048
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Commercial	Commercial	Commercial	Commercial
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Poor	Poor	Poor	Poor

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	Hydrology Nodes 150-151	Hydrology Nodes 160-161	Hydrology Nodes 170-171	n/a
1 DMA drainage area (ft^2)	89,298 (2.05 acres)	56,628 (1.30 acres)	80,586 (1.85 acres)	n/a
2 Existing site impervious area (ft^2)	87,120	56,628	80,586	n/a
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	AMC II	AMC II	AMC II	n/a
4 Hydrologic soil group *Refer to Watershed Mapping Tool –* *http://permitrack.sbcounty.gov/wap/*	B	B	B	n/a
5 Longest flowpath length (ft)	485	135	485	n/a
6 Longest flowpath slope (ft/ft)	0.009	0.005	0.052	n/a
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Commercial	Commercial	Commercial	n/a
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Poor	Poor	Poor	n/a

Form 3-2 Existing Hydrologic Characteristics for Drainage Area 1

For Drainage Area 1's sub-watershed DMA, provide the following characteristics	Hydrology Nodes 210-256	Hydrology Nodes 300-301	Hydrology Nodes 310-311	n/a
1 DMA drainage area (ft^2)	749,232 (17.20 acres)	87,120 (2.00 acres)	10,890 (0.25 acres)	n/a
2 Existing site impervious area (ft^2)	407,718	80,586	0	n/a
3 Antecedent moisture condition *For desert areas, use* *http://www.sbcounty.gov/dpw/floodcontrol/pdf/20100412_map.pdf*	AMC II	AMC II	AMC II	n/a
4 Hydrologic soil group *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	A and B	B	B	n/a
5 Longest flowpath length (ft)	1,435	510	510	n/a
6 Longest flowpath slope (ft/ft)	0.006	0.008	0.008	n/a
7 Current land cover type(s) *Select from Fig C-3 of Hydrology Manual*	Commercial	Commercial	Commercial	n/a
8 Pre-developed pervious area condition: *Based on the extent of wet season vegetated cover good >75%; Fair 50-75%; Poor <50% Attach photos of site to support rating*	Poor	Poor	Poor	n/a

Form 3-3 Watershed Description for Drainage Area

Receiving waters *Refer to Watershed Mapping Tool - http://permitrack.sbcounty.gov/wap/ See 'Drainage Facilities" link at this website*	Santa Ana River, Reach 4 Santa Ana River, Reach 3 Prado Dam Santa Ana River, Reach 2 Santa Ana River, Reach 1 Pacific Ocean
Applicable TMDLs *Refer to Local Implementation Plan*	Santa Ana River, Reach 4: None Santa Ana River, Reach 3: Indicator Bacteria Prado Dam: Indicator Bacteria Santa Ana River, Reach 2: None Santa Ana River, Reach 1: None Pacific Ocean: None
303(d) listed impairments *Refer to Local Implementation Plan and Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/ and State Water Resources Control Board website – http://www.waterboards.ca.gov/santaana/water_issues/programs/tmdl/index.shtml*	Santa Ana River, Reach 4: Indicator Bacteria Santa Ana River, Reach 3: Copper, Indicator Bacteria Prado Dam: pH, Indicator Bacteria Santa Ana River, Reach 2: None Santa Ana River, Reach 1: None Pacific Ocean: None
Environmentally Sensitive Areas (ESA) *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	n/a
Unlined Downstream Water Bodies *Refer to Watershed Mapping Tool – http://permitrack.sbcounty.gov/wap/*	Santa Ana River
Hydrologic Conditions of Concern	☐ Yes *Complete Hydrologic Conditions of Concern (HCOC) Assessment. Include Forms 4.2-2 through Form 4.2-5 and Hydromodification BMP Form 4.3-10 in submittal* ☒ No
Watershed–based BMP included in a RWQCB approved WAP	☐ Yes *Attach verification of regional BMP evaluation criteria in WAP* • *More Effective than On-site LID* • *Remaining Capacity for Project DCV* • *Upstream of any Water of the US* • *Operational at Project Completion* • *Long-Term Maintenance Plan* ☐ No

Section 4 Best Management Practices (BMP)

4.1 Source Control BMP

4.1.1 Pollution Prevention

Non-structural and structural source control BMP are required to be incorporated into all new development and significant redevelopment projects. Form 4.1-1 and 4.1-2 are used to describe specific source control BMPs used in the WQMP or to explain why a certain BMP is not applicable. Table 7-3 of the TGD for WQMP provides a list of applicable source control BMP for projects with specific types of potential pollutant sources or activities. The source control BMP in this table must be implemented for projects with these specific types of potential pollutant sources or activities.

The preparers of this WQMP have reviewed the source control BMP requirements for new development and significant redevelopment projects. The preparers have also reviewed the specific BMP required for project as specified in Forms 4.1-1 and 4.1-2. All applicable non-structural and structural source control BMP shall be implemented in the project.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N1	Education of Property Owners, Tenants and Occupants on Stormwater BMPs	☒	☐	The property owner(s) shall familiarize him/herself with the WQMP document and content, including BMP educational materials in Attachment 'E' (Section 6.4) of this WQMP and shall ensure that all employees are also educated on stormwater BMPs.
N2	Activity Restrictions	☒	☐	The property owner shall control the discharge of stormwater pollutants from this site through activity restrictions, training of employees and control of tenant activities.
N3	Landscape Management BMPs	☒	☐	Maintenance shall be conducted by a landscape contractor on a weekly basis to verify that the irrigation system is functioning properly and to repair as needed. Landscape contractor will also verify that there are no leaks or run-off from landscaped areas. Adjust irrigation heads and system run times as necessary to prevent overwatering of vegetation, overspray or run-off from landscaped areas to ensure the health and aesthetic quality of the landscape. Mowing and trimming waste shall be properly removed from the site and herbicides, pesticides and fertilizers shall be properly applied to prevent storm drainage contamination.
N4	BMP Maintenance	☒	☐	BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative and are listed in Form 5-1 of this document.
N5	Title 22 CCR Compliance (How development will comply)	☒	☐	If future occupants store hazardous materials, they must comply with all Title 22 CCR regulations.
N6	Local Water Quality Ordinances	☒	☐	The owner shall comply with the City of Colton's stormwater ordinance through the implementation of BMPs.
N7	Spill Contingency Plan	☒	☐	Any liquid chemicals storage on-site shall comply with hazmat regulations and any required spill contingency plans.
N8	Underground Storage Tank Compliance	☐	☒	No USTs onsite.
N9	Hazardous Materials Disclosure Compliance	☒	☐	If hazardous materials are present, then the occupants will comply with all Title 22 CCR regulations.

Form 4.1-1 Non-Structural Source Control BMPs				
N10	Uniform Fire Code Implementation	☒	☐	Owner will comply with Article 80 of the Uniform Fire Code enforced by the fire protection agency.
N11	Litter/Debris Control Program	☒	☐	Trash and litter shall be swept from the site and disposed of into a dumpster with lids. Owner shall ensure that tenant contracts with the local trash collector to empty dumpsters on a weekly basis.
N12	Employee Training	☒	☐	The owner will ensure that employees, contractors and tenants are familiar with onsite structural treatment control BMPs and necessary source control BMPs required of all site occupants. Owner will check with City and County at least once a year to obtain new or updated educational materials and provide these materials to tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. The WQMP requires annual employee training and for new hires, within 2 months.
N13	Housekeeping of Loading Docks	☒	☐	Keep all fluids indoors. Clean up spills immediately and keep spills from entering storm drain system. No discharges of wastewater or cleanup water from maintenance of loading docks into the storm drain system. Loading areas shall be inspected weekly for proper sweeping and cleanup practices with spills cleaned up immediately and disposed of properly. Cleanup procedures should minimize or eliminate the use of water and should rely on dry-cleanup methods or pressure washing with complete containment by vacuum, for proper disposal.
N14	Catch Basin Inspection Program	☒	☐	Inspected semi-annually (by October 1st and February 1st) by owner's designee. Basin sump areas shall be vacuumed and disposed of properly. The owner shall clean all catch basins whenever debris, trash or sediment accumulates and shall investigate any suspected illegal dumping into these drains.
N15	Vacuum Sweeping of Private Streets and Parking Lots	☒	☐	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowings and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be vacuum swept monthly, by sweeping contractor.

Form 4.1-1 Non-Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, if not applicable, state reason
		Included	Not Applicable	
N16	Other Non-structural Measures for Public Agency Projects	☐	☒	No public agency projects associated, this is a private project.
N17	Comply with all other applicable NPDES permits	☒	☐	The developer will comply with the Construction General Permit during construction and all future occupants of the site shall comply with the requirements of the Industrial General Stormwater Permit.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, If not applicable, state reason
		Included	Not Applicable	
S1	Provide storm drain system stencilling and signage (CASQA New Development BMP Handbook SD-13)	☒	☐	A "No Dumping – Drains to River" message shall be painted with stencil, onto each catch basin inlet. Legibility of stencil will be maintained on a yearly basis.
S2	Design and construct outdoor material storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-34)	☐	☒	No outdoor storage shall be allowed on-site.
S3	Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	☒	☐	Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash, and designed with a solid roof to cover dumpsters.
S4	Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	☒	☐	The irrigation system will include devices to prevent low head drainage, overspray and run off through the use of pressure regulating devices, check valves, flow sensors, proper spacing, low precipitation emission devices and ET or weather based controllers. Landscape and irrigation shall be consistent with the State Model Water Efficient landscape Ordinance and the City of Colton landscape requirements. Plants installed will be arranged according to similar hydrozones and meet the required water budget for the site. Shade trees shall be used to intercept rainwater and reduce heat gain on paving.
S5	Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	☒	☐	Landscaped areas will be depressed in order to increase retention of stormwater/irrigation water and promote infiltration, 1"-2" below top of curb or pavement elevations.
S6	Protect slopes and channels and provide energy dissipation (CASQA New Development BMP Handbook SD-10)	☐	☒	Not applicable, no basins are proposed.
S7	Covered dock areas (CASQA New Development BMP Handbook SD-31)	☒	☐	"Dock high" doors for freight loading and unloading, will be installed.
S8	Covered maintenance bays with spill containment plans (CASQA New Development BMP Handbook SD-31)	☐	☒	No maintenance bays onsite. Owner will not allow vehicle maintenance on this site.

Form 4.1-2 Structural Source Control BMPs

Identifier	Name	Check One		Describe BMP Implementation OR, *If not applicable, state reason
		Included	Not Applicable	
S9	Vehicle wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No vehicle wash areas onsite. Owner will not allow vehicle washing on this site.
S10	Covered outdoor processing areas (CASQA New Development BMP Handbook SD-36)	☐	☒	No outdoor processing areas onsite. Owner will not allow outdoor processing onsite.
S11	Equipment wash areas with spill containment plans (CASQA New Development BMP Handbook SD-33)	☐	☒	No equipment wash areas onsite and no equipment will be allowed onsite.
S12	Fueling areas (CASQA New Development BMP Handbook SD-30)	☐	☒	No fueling areas onsite. No mobile fueling will be allowed by owner.
S13	Hillside landscaping (CASQA New Development BMP Handbook SD-10)	☐	☒	No hillsides onsite.
S14	Wash water control for food preparation areas	☐	☒	No food preparation onsite.
S15	Community car wash racks (CASQA New Development BMP Handbook SD-33)	☐	☒	No community cars wash racks onsite.

4.1.2 Preventative LID Site Design Practices

Site design practices associated with new LID requirements in the MS4 Permit should be considered in the earliest phases of a project. Preventative site design practices can result in smaller DCV for LID BMP and hydromodification control BMP by reducing runoff generation. Describe site design and drainage plan including:

- A narrative of site design practices utilized or rationale for not using practices
- A narrative of how site plan incorporates preventive site design practices
- Include an attached Site Plan layout which shows how preventative site design practices are included in WQMP

Refer to Section 5.2 of the TGD for WQMP for more details.

Form 4.1-3 Preventative LID Site Design Practices Checklist

Site Design Practices *If yes, explain how preventative site design practice is addressed in project site plan. If no, other LID BMPs must be selected to meet targets*
Minimize impervious areas: Yes ☒ No ☐ Explanation: Impervious areas were minimized to the Maximum Extent Practicable (MEP) for this project type. In addition, the project utilizes LID BMPs to collect runoff from impervious areas for infiltration and treatment.
Maximize natural infiltration capacity: Yes ☒ No ☐ Explanation: The LID BMPs will maximize natural infiltration.
Preserve existing drainage patterns and time of concentration: Yes ☒ No ☐ Explanation: Post-development drainage patterns will mimic pre-development conditions. Proposed LID BMPs will assist in increasing the time of concentration, compared to existing condition.
Disconnect impervious areas: Yes ☒ No ☐ Explanation: The LID BMPs will disconnect impervious areas before discharging offsite.
Protect existing vegetation and sensitive areas: Yes ☐ No ☒ Explanation: Project development consists of complete demolition of existing development, mass grading and construction of a new light industrial facility. In addition there is no sensitive areas to protect.
Re-vegetate disturbed areas: Yes ☐ No ☒ Explanation: Following demolition, re-grading and construction, most of the disturbed areas will be paved or built over however, all impervious area runoff will be collected by LID BMPs and landscaping will be provided throughout the site.
Minimize unnecessary compaction in stormwater retention/infiltration basin/trench areas: Yes ☒ No ☐ Explanation: Heavy construction vehicles will be prohibited from unnecessary soil compaction of LID BMPs footprint areas.
Utilize vegetated drainage swales in place of underground piping or imperviously lined swales: Yes ☐ No ☒ Explanation: Underground piping and imperviously lined swales are located at truck and car loading areas that could not be substituted with vegetated swales. All Imperviously lined swales will be directed to LID BMPs for treatment or infiltration.
Stake off areas that will be used for landscaping to minimize compaction during construction : Yes ☒ No ☐ Explanation: Landscaped areas will be staked to minimize unnecessary compaction during construction.

4.2 Project Performance Criteria

The purpose of this section of the Project WQMP is to establish targets for post-development hydrology based on performance criteria specified in the MS4 Permit. These targets include runoff volume for water quality control (referred to as LID design capture volume), and runoff volume, time of concentration, and peak runoff for protection of any downstream waterbody segments with a HCOC. ***If the project has more than one outlet for stormwater runoff, then complete additional versions of these forms for each DA / outlet.***

Methods applied in the following forms include:

- For LID BMP Design Capture Volume (DCV), the San Bernardino County Stormwater Program requires use of the P_6 method (MS4 Permit Section XI.D.6a.ii) – Form 4.2-1
- For HCOC pre- and post-development hydrologic calculation, the San Bernardino County Stormwater Program requires the use of the Rational Method (San Bernardino County Hydrology Manual Section D). Forms 4.2-2 through Form 4.2-5 calculate hydrologic variables including runoff volume, time of concentration, and peak runoff from the project site pre- and post-development using the Hydrology Manual Rational Method approach. For projects greater than 640 acres (1.0 mi²), the Rational Method and these forms should not be used. For such projects, the Unit Hydrograph Method (San Bernardino County Hydrology Manual Section E) shall be applied for hydrologic calculations for HCOC performance criteria.

Refer to Section 4 in the TGD for WQMP for detailed guidance and instructions.

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 1)

1 Project area(ft^2): DA 1 DMA A 814,572 (18.70 ac)*	**2** Imperviousness after applying preventative site design practices (Imp%): 95%	**3** Runoff Coefficient (Rc): 0.807 *$R_c = 0.858(Imp\%)^{\wedge 3} - 0.78(Imp\%)^{\wedge 2} + 0.774(Imp\%) + 0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.459 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.680 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 73,082 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

Form 4.2-1 LID BMP Performance Criteria for Design Capture Volume (DA 2)

1 Project area(ft^2): DA 2 DMA A 540,144 (12.40 ac)*	**2** Imperviousness after applying preventative site design practices (Imp%): 95%	**3** Runoff Coefficient (Rc): 0.807 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.459 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.680 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 48,461 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		
1 Project area(ft^2): DA 2 DMA B 572,814 (13.15 ac)*	**2** Imperviousness after applying preventative site design practices (Imp%): 95%	**3** Runoff Coefficient (Rc): 0.807 *$R_c = 0.858(Imp\%)^{\wedge 3}-0.78(Imp\%)^{\wedge 2}+0.774(Imp\%)+0.04$*
4 Determine 1-hour rainfall depth for a 2-year return period $P_{2yr\text{-}1hr}$ (in): 0.459 http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html		
5 Compute P_6, Mean 6-hr Precipitation (inches): 0.680 *P_6 = Item 4 *C_1, where C_1 is a function of site climatic region specified in Form 3-1 Item 1 (Valley = 1.4807; Mountain = 1.909; Desert = 1.2371)*		
6 Drawdown Rate *Use 48 hours as the default condition. Selection and use of the 24 hour drawdown time condition is subject to approval by the local jurisdiction. The necessary BMP footprint is a function of drawdown time. While shorter drawdown times reduce the performance criteria for LID BMP design capture volume, the depth of water that can be stored is also reduced.*		24-hrs ☐ 48-hrs ☒
7 Compute design capture volume, DCV (ft^3): 51,392 *DCV = 1/12 * [Item 1* Item 3 *Item 5 * C_2], where C_2 is a function of drawdown rate (24-hr = 1.582; 48-hr = 1.963)* *Compute separate DCV for each outlet from the project site per schematic drawn in Form 3-1 Item 2*		

*These values do not include 3.50 acres of mostly self-treating landscape that drain offsite without being routed to the LID BMPs.

DA DMA ID	BMP ID	DCV REQUIRED (CF)	VOLUME PROVIDED (CF)
DA 1 DMA A	STC-1	73,376	73,460
DA 2 DMA A	STC-2	48,461	48,532
DA 2 DMA B	STC-3 & MWS	51,419	51,565

Form 4.2-2 Summary of HCOC Assessment (DA 1)

Does project have the potential to cause or contribute to an HCOC in a downstream channel: Yes ☐ No ☒

Go to: *http://permitrack.sbcounty.gov/wap/*

If "Yes", then complete HCOC assessment of site hydrology for 2yr storm event using Forms 4.2-3 through 4.2-5 and insert results below

(Forms 4.2-3 through 4.2-5 may be replaced by computer software analysis based on the San Bernardino County Hydrology Manual)

If "No," then proceed to Section 4.3 Project Conformance Analysis

Condition	Runoff Volume (ft^3)	Time of Concentration (min)	Peak Runoff (cfs)
Pre-developed	**1** n/a *Form 4.2-3 Item 12*	**2** n/a *Form 4.2-4 Item 13*	**3** n/a *Form 4.2-5 Item 10*
Post-developed	**4** n/a *Form 4.2-3 Item 13*	**5** n/a *Form 4.2-4 Item 14*	**6** n/a *Form 4.2-5 Item 14*
Difference	**7** n/a *Item 4 – Item 1*	**8** n/a *Item 2 – Item 5*	**9** n/a *Item 6 – Item 3*
Difference (as % of pre-developed)	**10** n/a*%* *Item 7 / Item 1*	**11** n/a *%* *Item 8 / Item 2*	**12** n/a *%* *Item 9 / Item 3*

Form 4.2-3 HCOC Assessment for Runoff Volume (DA 1)

Weighted Curve Number Determination for: Pre-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1a Land Cover type	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2a Hydrologic Soil Group (HSG)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3a DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4a Curve Number (CN) *use Items 1 and 2 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Weighted Curve Number Determination for: Post-developed DA	DMA A	DMA B	DMA C	DMA D	DMA E	DMA F	DMA G	DMA H
1b Land Cover type	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2b Hydrologic Soil Group (HSG)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3b DMA Area, ft^2 *sum of areas of DMA should equal area of DA*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4b Curve Number (CN) *use Items 5 and 6 to select the appropriate CN from Appendix C-2 of the TGD for WQMP*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

5 Pre-Developed area-weighted CN: n/a	**7** Pre-developed soil storage capacity, S (in): n/a *S = (1000 / Item 5) - 10*	**9** Initial abstraction, I_a (in): n/a *I_a = 0.2 * Item 7*
6 Post-Developed area-weighted CN: n/a	**8** Post-developed soil storage capacity, S (in): n/a *S = (1000 / Item 6) - 10*	**10** Initial abstraction, I_a (in): n/a *I_a = 0.2 * Item 8*

11 Precipitation for 2 yr, 24 hr storm (in): n/a
Go to: http://hdsc.nws.noaa.gov/hdsc/pfds/sa/sca_pfds.html

12 Pre-developed Volume (ft^3): n/a
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 9)^2 / ((Item 11 – Item 9 + Item 7)*

13 Post-developed Volume (ft^3): n/a
*V_{pre} =(1 / 12) * (Item sum of Item 3) * [(Item 11 – Item 10)^2 / ((Item 11 – Item 10 + Item 8)*

14 Volume Reduction needed to meet HCOC Requirement, (ft^3): n/a
*V_{HCOC} = (Item 13 * 0.95) – Item 12*

Form 4.2-4 HCOC Assessment for Time of Concentration (DA 1)

Compute time of concentration for pre and post developed conditions for each DA *(For projects using the Hydrology Manual complete the form below)*

Variables	Pre-developed DA1 *Use additional forms if there are more than 4 DMA*				Post-developed DA1 *Use additional forms if there are more than 4 DMA*			
	DMA A	DMA B	DMA C	DMA D	DMA A	DMA B	DMA C	DMA D
1 Length of flowpath (ft) *Use Form 3-2 Item 5 for pre-developed condition*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2 Change in elevation (ft)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3 Slope (ft/ft), *S_o = Item 2 / Item 1*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4 Land cover	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
5 Initial DMA Time of Concentration (min) *Appendix C-1 of the TGD for WQMP*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
6 Length of conveyance from DMA outlet to project site outlet (ft) *May be zero if DMA outlet is at project site outlet*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
7 Cross-sectional area of channel (ft^2)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
8 Wetted perimeter of channel (ft)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
9 Manning's roughness of channel (n)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
10 Channel flow velocity (ft/sec) *V_{fps} = (1.49 / Item 9) * (Item 7/Item 8)^0.67 * (Item 3)^0.5*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
11 Travel time to outlet (min) *T_t = Item 6 / (Item 10 * 60)*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
12 Total time of concentration (min) *T_c = Item 5 + Item 11*	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

13 Pre-developed time of concentration (min): n/a *Minimum of Item 12 pre-developed DMA*

14 Post-developed time of concentration (min): n/a *Minimum of Item 12 post-developed DMA*

15 Additional time of concentration needed to meet HCOC requirement (min): n/a *$T_{C\text{-}HCOC}$ = (Item 13 * 0.95) – Item 14*

Form 4.2-5 HCOC Assessment for Peak Runoff (DA 1)

Compute peak runoff for pre- and post-developed conditions

Variables		Pre-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*			Post-developed DA to Project Outlet (*Use additional forms if more than 3 DMA)*		
		DMA A	DMA B	DMA C	DMA A	DMA B	DMA C
1 Rainfall Intensity for storm duration equal to time of concentration *I_{peak} = 10^(LOG Form 4.2-1 Item 4 - 0.6 LOG Form 4.2-4 Item 5 /60)*		n/a	n/a	n/a	n/a	n/a	n/a
2 Drainage Area of each DMA (Acres) *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		n/a	n/a	n/a	n/a	n/a	n/a
3 Ratio of pervious area to total area *For DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		n/a	n/a	n/a	n/a	n/a	n/a
4 Pervious area infiltration rate (in/hr) *Use pervious area CN and antecedent moisture condition with Appendix C-3 of the TGD for WQMP*		n/a	n/a	n/a	n/a	n/a	n/a
5 Maximum loss rate (in/hr) *F_m = Item 3 * Item 4* *Use area-weighted F_m from DMA with outlet at project site outlet, include upstream DMA (Using example schematic in Form 3-1, DMA A will include drainage from DMA C)*		n/a	n/a	n/a	n/a	n/a	n/a
6 Peak Flow from DMA (cfs) *Q_p =Item 2 * 0.9 * (Item 1 - Item 5)*		n/a	n/a	n/a	n/a	n/a	n/a
7 Time of concentration adjustment factor for other DMA to site discharge point *Form 4.2-4 Item 12 DMA / Other DMA upstream of site discharge point (If ratio is greater than 1.0, then use maximum value of 1.0)*	DMA A	*n/a*			*n/a*		
	DMA B		*n/a*			*n/a*	
	DMA C			*n/a*			*n/a*

8 Pre-developed Q_p at T_c for DMA A: n/a *Q_p = Item 6_{DMAA} + [Item 6_{DMAB} * (Item 1_{DMAA} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAA/2}$] + [Item 6_{DMAC} * (Item 1_{DMAA} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAA/3}$]*	**9** Pre-developed Q_p at T_c for DMA B: n/a *Q_p = Item 6_{DMAB} + [Item 6_{DMAA} * (Item 1_{DMAB} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAB/1}$] + [Item 6_{DMAC} * (Item 1_{DMAB} - Item 5_{DMAC})/(Item 1_{DMAC} - Item 5_{DMAC})* Item $7_{DMAB/3}$]*	**10** Pre-developed Q_p at T_c for DMA C: n/a *Q_p = Item 6_{DMAC} + [Item 6_{DMAA} * (Item 1_{DMAC} - Item 5_{DMAA})/(Item 1_{DMAA} - Item 5_{DMAA})* Item $7_{DMAC/1}$] + [Item 6_{DMAB} * (Item 1_{DMAC} - Item 5_{DMAB})/(Item 1_{DMAB} - Item 5_{DMAB})* Item $7_{DMAC/2}$]*
10 Peak runoff from pre-developed condition confluence analysis (cfs): n/a *Maximum of Item 8, 9, and 10 (including additional forms as needed)*		
11 Post-developed Q_p at T_c for DMA A: n/a *Same as Item 8 for post-developed values*	**12** Post-developed Q_p at T_c for DMA B: n/a *Same as Item 9 for post-developed values*	**13** Post-developed Q_p at T_c for DMA C: n/a *Same as Item 10 for post-developed values*
14 Peak runoff from post-developed condition confluence analysis (cfs): n/a *Maximum of Item 11, 12, and 13 (including additional forms as needed)*		
15 Peak runoff reduction needed to meet HCOC Requirement (cfs): n/a *$Q_{p\text{-}HCOC}$ = (Item 14 * 0.95) – Item 10*		

4.3 Project Conformance Analysis

Complete the following forms for each project site DA to document that the proposed LID BMPs conform to the project DCV developed to meet performance criteria specified in the MS4 Permit (WQMP Template Section 4.2). For the LID DCV, the forms are ordered according to hierarchy of BMP selection as required by the MS4 Permit (see Section 5.3.1 in the TGD for WQMP). The forms compute the following for on-site LID BMP:

- Site Design and Hydrologic Source Controls (Form 4.3-2)
- Retention and Infiltration (Form 4.3-3)
- Harvested and Use (Form 4.3-4) or
- Biotreatment (Form 4.3-5).

At the end of each form, additional fields facilitate the determination of the extent of mitigation provided by the specific BMP category, allowing for use of the next category of BMP in the hierarchy, if necessary.

The first step in the analysis, using Section 5.3.2.1 of the TGD for WQMP, is to complete Forms 4.3-1 and 4.3-3) to determine if retention and infiltration BMPs are infeasible for the project. For each feasibility criterion in Form 4.3-1, if the answer is "Yes," provide all study findings that includes relevant calculations, maps, data sources, etc. used to make the determination of infeasibility.

Next, complete Forms 4.3-2 and 4.3-4 to determine the feasibility of applicable HSC and harvest and use BMPs, and, if their implementation is feasible, the extent of mitigation of the DCV.

If no site constraints exist that would limit the type of BMP to be implemented in a DA, evaluate the use of combinations of LID BMPs, including all applicable HSC BMPs to maximize on-site retention of the DCV. If no combination of BMP can mitigate the entire DCV, implement the single BMP type, or combination of BMP types, that maximizes on-site retention of the DCV within the minimum effective area.

If the combination of LID HSC, retention and infiltration, and harvest and use BMPs are unable to mitigate the entire DCV, then biotreatment BMPs may be implemented by the project proponent. If biotreatment BMPs are used, then they must be sized to provide sufficient capacity for effective treatment of the remainder of the volume-based performance criteria that cannot be achieved with LID BMPs (TGD for WQMP Section 5.4.4.2). **Under no circumstances shall any portion of the DCV be released from the site without effective mitigation and/or treatment**.

Form 4.3-1 Infiltration BMP Feasibility (DA 1)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☐ No ☒
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.

[9] All answers to Item 1 through Item 6 are "No":
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

Form 4.3-1 Infiltration BMP Feasibility (DA 2)

Feasibility Criterion – Complete evaluation for each DA on the Project Site

[1] Would infiltration BMP pose significant risk for groundwater related concerns? Yes ☐ No ☒
Refer to Section 5.3.2.1 of the TGD for WQMP

If Yes, Provide basis: (attach)

[2] Would installation of infiltration BMP significantly increase the risk of geotechnical hazards? Yes ☐ No ☒
(Yes, if the answer to any of the following questions is yes, as established by a geotechnical expert):

- The location is less than 50 feet away from slopes steeper than 15 percent
- The location is less than eight feet from building foundations or an alternative setback.
- A study certified by a geotechnical professional or an available watershed study determines that stormwater infiltration would result in significantly increased risks of geotechnical hazards.

If Yes, Provide basis: (attach)

[3] Would infiltration of runoff on a Project site violate downstream water rights? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[4] Is proposed infiltration facility located on hydrologic soil group (HSG) D soils or does the site geotechnical investigation indicate presence of soil characteristics, which support categorization as D soils? Yes ☐ No ☒

If Yes, Provide basis: (attach)

[5] Is the design infiltration rate, after accounting for safety factor of 2.0, below proposed facility less than 0.3 in/hr (accounting for soil amendments)? Yes ☒ No ☐

If Yes, Provide basis: Refer to Attachment F for the infiltration report. DA 2 DMA B resulted in infiltration rates less than 0.3 in/hr after accounting for a safety factor of 2.0.

[6] Would on-site infiltration or reduction of runoff over pre-developed conditions be partially or fully inconsistent with watershed management strategies as defined in the WAP, or impair beneficial uses? Yes ☐ No ☒
See Section 3.5 of the TGD for WQMP and WAP

If Yes, Provide basis: (attach)

[7] Any answer from Item 1 through Item 3 is "Yes": Yes ☐ No ☒
If yes, infiltration of any volume is not feasible onsite. Proceed to Form 4.3-4, Harvest and Use BMP. If no, then proceed to Item 8 below.

[8] Any answer from Item 4 through Item 6 is "Yes": Yes ☒ No ☐
If yes, infiltration is permissible but is not required to be considered. Proceed to Form 4.3-2, Hydrologic Source Control BMP.
If no, then proceed to Item 9, below.
Only applicable to DA 2 DMA B

[9] All answers to Item 1 through Item 6 are "No": Yes ☐ No ☒
Infiltration of the full DCV is potentially feasible, LID infiltration BMP must be designed to infiltrate the full DCV to the MEP.
Proceed to Form 4.3-2, Hydrologic Source Control BMP.

4.3.1 Site Design Hydrologic Source Control BMP

Section XI.E. of the Permit emphasizes the use of LID preventative measures; and the use of LID HSC BMPs reduces the portion of the DCV that must be addressed in downstream BMPs. Therefore, all applicable HSC shall be provided except where they are mutually exclusive with each other, or with other BMPs. Mutual exclusivity may result from overlapping BMP footprints such that either would be potentially feasible by itself, but both could not be implemented. Please note that while there are no numeric standards regarding the use of HSC, if a project cannot feasibly meet BMP sizing requirements or cannot fully address HCOCs, feasibility of all applicable HSC must be part of demonstrating that the BMP system has been designed to retain the maximum feasible portion of the DCV. Complete Form 4.3-2 to identify and calculate estimated retention volume from implementing site design HSC BMP. Refer to Section 5.4.1 in the TGD for more detailed guidance.

Form 4.3-2 Site Design Hydrologic Source Control BMPs (DA 1)

1 Implementation of Impervious Area Dispersion BMP (i.e. routing runoff from impervious to pervious areas), excluding impervious areas planned for routing to on-lot infiltration BMP: Yes ☐ No ☐ *If yes, complete Items 2-5; If no, proceed to Item 6*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Total impervious area draining to pervious area (ft^2)	n/a	n/a	n/a
3 Ratio of pervious area receiving runoff to impervious area	n/a	n/a	n/a
4 Retention volume achieved from impervious area dispersion (ft^3) *V = Item2 * Item 3 * (0.5/12), assuming retention of 0.5 inches of runoff*	n/a	n/a	n/a
5 Sum of retention volume achieved from impervious area dispersion (ft^3): n/a *$V_{retention}$ =Sum of Item 4 for all BMPs*			
6 Implementation of Localized On-lot Infiltration BMPs (e.g. on-lot rain gardens): Yes ☐ No ☐ *If yes, complete Items 7-13 for aggregate of all on-lot infiltration BMP in each DA; If no, proceed to Item 14*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
7 Ponding surface area (ft^2)	n/a	n/a	n/a
8 Ponding depth (ft)	n/a	n/a	n/a
9 Surface area of amended soil/gravel (ft^2)	n/a	n/a	n/a
10 Average depth of amended soil/gravel (ft)	n/a	n/a	n/a
11 Average porosity of amended soil/gravel	n/a	n/a	n/a
12 Retention volume achieved from on-lot infiltration (ft^3) *$V_{retention}$ = (Item 7 *Item 8) + (Item 9 * Item 10 * Item 11)*	n/a	n/a	n/a
13 Runoff volume retention from on-lot infiltration (ft^3): n/a *$V_{retention}$ =Sum of Item 12 for all BMPs*			

Form 4.3-2 cont. Site Design Hydrologic Source Control BMPs (DA 1)

14 Implementation of evapotranspiration BMP (green, brown, or blue roofs): Yes ☐ No ☐ *If yes, complete Items 15-20. If no, proceed to Item 21*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
15 Rooftop area planned for ET BMP (ft^2)	n/a	n/a	n/a
16 Average wet season ET demand (in/day) *Use local values, typical ~ 0.1*	n/a	n/a	n/a
17 Daily ET demand (ft^3/day) *Item 15 * (Item 16 / 12)*	n/a	n/a	n/a
18 Drawdown time (hrs) *Copy Item 6 in Form 4.2-1*	n/a	n/a	n/a
19 Retention Volume (ft^3) $V_{retention}$ *= Item 17 * (Item 18 / 24)*	n/a	n/a	n/a
20 Runoff volume retention from evapotranspiration BMPs (ft^3): n/a $V_{retention}$ *=Sum of Item 19 for all BMPs*			
21 Implementation of Street Trees: Yes ☐ No ☐ *If yes, complete Items 22-25. If no, proceed to Item 26*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
22 Number of Street Trees	n/a	n/a	n/a
23 Average canopy cover over impervious area (ft^2)	n/a	n/a	n/a
24 Runoff volume retention from street trees (ft^3) $V_{retention}$ *= Item 22 * Item 23 * (0.05/12) assume runoff retention of 0.05 inches*	n/a	n/a	n/a
25 Runoff volume retention from street tree BMPs (ft^3): n/a $V_{retention}$ *= Sum of Item 24 for all BMPs*			
26 Implementation of residential rain barrel/cisterns: Yes ☐ No ☐ *If yes, complete Items 27-29; If no, proceed to Item 30*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
27 Number of rain barrels/cisterns	n/a	n/a	n/a
28 Runoff volume retention from rain barrels/cisterns (ft^3) $V_{retention}$ *= Item 27 * 3*	n/a	n/a	n/a
29 Runoff volume retention from residential rain barrels/Cisterns (ft3): n/a $V_{retention}$ *=Sum of Item 28 for all BMPs*			
30 Total Retention Volume from Site Design Hydrologic Source Control BMPs: n/a *Sum of Items 5, 13, 20, 25 and 29*			

4.3.2 Infiltration BMPs

Use Form 4.3-3 to compute on-site retention of runoff from proposed retention and infiltration BMPs. Volume retention estimates are sensitive to the percolation rate used, which determines the amount of runoff that can be infiltrated within the specified drawdown time. The infiltration safety factor reduces field measured percolation to account for potential inaccuracy associated with field measurements, declining BMP performance over time, and compaction during construction. Appendix D of the TGD for WQMP provides guidance on estimating an appropriate safety factor to use in Form 4.3-3.

If site constraints limit the use of BMPs to a single type and implementation of retention and infiltration BMPs mitigate no more than 40% of the DCV, then they are considered infeasible and the Project Proponent may evaluate the effectiveness of BMPs lower in the LID hierarchy of use (Section 5.5.1 of the TGD for WQMP)

If implementation of infiltrations BMPs is feasible as determined using Form 4.3-1, then LID infiltration BMPs shall be implemented to the MEP (section 4.1 of the TGD for WQMP).

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Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 73,376 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*			
BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 1 DMA A Underground Retention System	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	1.7	n/a	n/a
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.0	n/a	n/a
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.85	n/a	n/a
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	n/a	n/a
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	3.3	n/a	n/a
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3.3	n/a	n/a
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	29,055	n/a	n/a
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
10 Amended soil porosity	n/a	n/a	n/a
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	1.50	n/a	n/a
12 Gravel porosity	0.40	n/a	n/a
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	n/a	n/a	n/a
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	73,460	n/a	n/a
16 Total Retention Volume from LID Infiltration BMPs: 73,460 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*			
17 Fraction of DCV achieved with infiltration BMP: 100 % *Retention% = Item 16 / Form 4.2-1 Item 7*			
18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☒ No ☐ *If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.*			

Form 4.3-3 Infiltration LID BMP - including underground BMPs (DA 2)

1 Remaining LID DCV not met by site design HSC BMP (ft^3): 99,880 *V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30*

BMP Type *Use columns to the right to compute runoff volume retention from proposed infiltration BMP (select BMP from Table 5-4 in TGD for WQMP) - Use additional forms for more BMPs*	DA 2 DMA A Underground Retention System	DA DMA BMP Type *(Use additional forms for more BMPs)*	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Infiltration rate of underlying soils (in/hr) *See Section 5.4.2 and Appendix D of the TGD for WQMP for minimum requirements for assessment methods*	1.75	n/a	n/a
3 Infiltration safety factor *See TGD Section 5.4.2 and Appendix D*	2.0	n/a	n/a
4 Design percolation rate (in/hr) *P_{design} = Item 2 / Item 3*	0.875	n/a	n/a
5 Ponded water drawdown time (hr) *Copy Item 6 in Form 4.2-1*	48	n/a	n/a
6 Maximum ponding depth (ft) *BMP specific, see Table 5-4 of the TGD for WQMP for BMP design details*	3.3	n/a	n/a
7 Ponding Depth (ft) *d_{BMP} = Minimum of (1/12*Item 4*Item 5) or Item 6*	3.3	n/a	n/a
8 Infiltrating surface area, SA_{BMP} (ft^2) *the lesser of the area needed for infiltration of full DCV or minimum space requirements from Table 5.7 of the TGD for WQMP*	19,378	n/a	n/a
9 Amended soil depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 in the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
10 Amended soil porosity	n/a	n/a	n/a
11 Gravel depth, d_{media} (ft) *Only included in certain BMP types, see Table 5-4 of the TGD for WQMP for BMP design details*	1.50	n/a	n/a
12 Gravel porosity	0.40	n/a	n/a
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	n/a	n/a	n/a
14 Above Ground Retention Volume (ft^3) *$V_{retention}$ = Item 8 * [Item7 + (Item 9 * Item 10) + (Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	n/a	n/a	n/a
15 Underground Retention Volume (ft^3) *Volume determined using manufacturer's specifications and calculations*	48,532	n/a	n/a

16 Total Retention Volume from LID Infiltration BMPs: 48,532 *(Sum of Items 14 and 15 for all infiltration BMP included in plan)*

17 Fraction of DCV achieved with infiltration BMP: 100 % *Retention% = Item 16 / Form 4.2-1 Item 7*

18 Is full LID DCV retained onsite with combination of hydrologic source control and LID retention/infiltration BMPs? Yes ☐ No ☒

If yes, demonstrate conformance using Form 4.3-10; If no, then reduce Item 3, Factor of Safety to 2.0 and increase Item 8, Infiltrating Surface Area, such that the portion of the site area used for retention and infiltration BMPs equals or exceeds the minimum effective area thresholds (Table 5-7 of the TGD for WQMP) for the applicable category of development and repeat all above calculations.

4.3.3 Harvest and Use BMP

Harvest and use BMP may be considered if the full LID DCV cannot be met by maximizing infiltration BMPs. Use Form 4.3-4 to compute on-site retention of runoff from proposed harvest and use BMPs.

Volume retention estimates for harvest and use BMPs are sensitive to the on-site demand for captured stormwater. Since irrigation water demand is low in the wet season, when most rainfall events occur in San Bernardino County, the volume of water that can be used within a specified drawdown period is relatively low. The bottom portion of Form 4.3-4 facilitates the necessary computations to show infeasibility if a minimum incremental benefit of 40 percent of the LID DCV would not be achievable with MEP implementation of on-site harvest and use of stormwater (Section 5.5.4 of the TGD for WQMP).

Form 4.3-4 Harvest and Use BMPs (DA 1)

1 Remaining LID DCV not met by site design HSC or infiltration BMP (ft^3): 51,419
V_{unmet} = Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16

BMP Type(s) *Compute runoff volume retention from proposed harvest and use BMP (Select BMPs from Table 5-4 of the TGD for WQMP) - Use additional forms for more BMPs*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
2 Describe cistern or runoff detention facility	n/a	n/a	n/a
3 Storage volume for proposed detention type (ft^3) *Volume of cistern*	n/a	n/a	n/a
4 Landscaped area planned for use of harvested stormwater (ft^2)	n/a	n/a	n/a
5 Average wet season daily irrigation demand (in/day) Use local values, typical ~ 0.1 in/day	n/a	n/a	n/a
6 Daily water demand (ft^3/day) *Item 4 * (Item 5 / 12)*	n/a	n/a	n/a
7 Drawdown time (hrs) *Copy Item 6 from Form 4.2-1*	n/a	n/a	n/a
8 Retention Volume (ft^3) *$V_{retention}$ = Minimum of (Item 3) or (Item 6 * (Item 7 / 24))*	n/a	n/a	n/a

9 Total Retention Volume (ft^3) from Harvest and Use BMP 0 *Sum of Item 8 for all harvest and use BMP included in plan*

10 Is the full DCV retained with a combination of LID HSC, retention and infiltration, and harvest & use BMPs? Yes ☐ No ☒

If yes, demonstrate conformance using Form 4.3-10. If no, then re-evaluate combinations of all LID BMP and optimize their implementation such that the maximum portion of the DCV is retained on-site (using a single BMP type or combination of BMP types). If the full DCV cannot be mitigated after this optimization process, proceed to Section 4.3.4.

4.3.4 Biotreatment BMP

Biotreatment BMPs may be considered if the full LID DCV cannot be met by maximizing retention and infiltration, and harvest and use BMPs. A key consideration when using biotreatment BMP is the effectiveness of the proposed BMP in addressing the pollutants of concern for the project (see Table 5-5 of the TGD for WQMP).

Use Form 4.3-5 to summarize the potential for volume based and/or flow based biotreatment options to biotreat the remaining unmet LID DCV w. Biotreatment computations are included as follows:

- Use Form 4.3-6 to compute biotreatment in small volume based biotreatment BMP (e.g. bioretention w/underdrains);
- Use Form 4.3-7 to compute biotreatment in large volume based biotreatment BMP (e.g. constructed wetlands);
- Use Form 4.3-8 to compute sizing criteria for flow-based biotreatment BMP (e.g. bioswales)

Form 4.3-5 Selection and Evaluation of Biotreatment BMP (DA 2)

1 Remaining LID DCV not met by site design HSC, infiltration, or harvest and use BMP for potential biotreatment (ft^3): 51,419 *Form 4.2-1 Item 7 - Form 4.3-2 Item 30 – Form 4.3-3 Item 16- Form 4.3-4 Item 9*

List pollutants of concern *Copy from Form 2.3-1.*
n/a

2 Biotreatment BMP Selected *(Select biotreatment BMP(s) necessary to ensure all pollutants of concern are addressed through Unit Operations and Processes, described in Table 5-5 of the TGD for WQMP)*	Volume-based biotreatment *Use Forms 4.3-6 and 4.3-7 to compute treated volume*	Flow-based biotreatment *Use Form 4.3-8 to compute treated volume*
	☐ Bioretention with underdrain ☐ Planter box with underdrain ☐ Constructed wetlands ☐ Wet extended detention ☐ Dry extended detention ☒ Proprietary biotreatment (volume)	☐ Vegetated swale ☐ Vegetated filter strip ☐ Proprietary biotreatment

3 Volume biotreated in volume based biotreatment BMP (ft^3): 51,419 *Form 4.3-6 Item 15 + Form 4.3-7 Item 13*	**4** Compute remaining LID DCV with implementation of volume based biotreatment BMP (ft^3): 0 *Item 1 – Item 3*	**5** Remaining fraction of LID DCV for sizing flow based biotreatment BMP: 0% *Item 4 / Item 1*

6 Flow-based biotreatment BMP capacity provided (cfs): 0 *Use Figure 5-2 of the TGD for WQMP to determine flow capacity required to provide biotreatment of remaining percentage of unmet LID DCV (Item 5), for the project's precipitation zone (Form 3-1 Item 1)*

7 Metrics for MEP determination:

- ☐ Provided a WQMP with the portion of site area used for suite of LID BMP equal to minimum thresholds in Table 5-7 of the TGD for WQMP for the proposed category of development: *If maximized on-site retention BMPs is feasible for partial capture, then LID BMP implementation must be optimized to retain and infiltrate the maximum portion of the DCV possible within the prescribed minimum effective area. The remaining portion of the DCV shall then be mitigated using biotreatment BMP.*

*Volume Treated During Event + Volume Treated Following Event + Volume provided in underground retention system. See

Form 4.3-6 Volume Based Biotreatment (DA 1) – Bioretention and Planter Boxes with Underdrains

Biotreatment BMP Type *(Bioretention w/underdrain, planter box w/underdrain, other comparable BMP)*	DA 2 DMA A Proprietary Biofiltration Units & Underground Retention System	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*	Pathogens Nitrogen	n/a	n/a
2 Amended soil infiltration rate *Typical ~ 5.0*	*	n/a	n/a
3 Amended soil infiltration safety factor *Typical ~ 2.0*	*	n/a	n/a
4 Amended soil design percolation rate (in/hr) P_{design} *= Item 2 / Item 3*	*	n/a	n/a
5 Ponded water drawdown time (hr) *Copy Item 6 from Form 4.2-1*	*	n/a	n/a
6 Maximum ponding depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	*	n/a	n/a
7 Ponding Depth (ft) d_{BMP} *= Minimum of (1/12 * Item 4 * Item 5) or Item 6*	*	n/a	n/a
8 Amended soil surface area (ft^2)	*	n/a	n/a
9 Amended soil depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	*	n/a	n/a
10 Amended soil porosity, *n*	*	n/a	n/a
11 Gravel depth (ft) *see Table 5-6 of the TGD for WQMP for reference to BMP design details*	*	n/a	n/a
12 Gravel porosity, *n*	*	n/a	n/a
13 Duration of storm as basin is filling (hrs) *Typical ~ 3hrs*	*	n/a	n/a
14 Biotreated Volume (ft^3) $V_{biotreated}$ *= Item 8 * [(Item 7/2) + (Item 9 * Item 10) +(Item 11 * Item 12) + (Item 13 * (Item 4 / 12))]*	3,140 + 348 + 48,077 = 51,565	n/a	n/a
15 Total biotreated volume from bioretention and/or planter box with underdrains BMP: 51,565 *Sum of Item 14 for all volume-based BMPs included in this form*			

Attachment B for software calculations.

Form 4.3-7 Volume Based Biotreatment (DA 1) – Constructed Wetlands and Extended Detention

Biotreatment BMP Type *Constructed wetlands, extended wet detention, extended dry detention, or other comparable proprietary BMP. If BMP includes multiple modules (e.g. forebay and main basin), provide separate estimates for storage and pollutants treated in each module.*	DA DMA BMP Type		DA DMA BMP Type *(Use additional forms for more BMPs)*	
	Forebay	Basin	Forebay	Basin
1 Pollutants addressed with BMP forebay and basin *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in Table 5-5 of the TGD for WQMP*	n/a	n/a	n/a	n/a
2 Bottom width (ft)	n/a	n/a	n/a	n/a
3 Bottom length (ft)	n/a	n/a	n/a	n/a
4 Bottom area (ft^2) A_{bottom} = *Item 2 * Item 3*	n/a	n/a	n/a	n/a
5 Side slope (ft/ft)	n/a	n/a	n/a	n/a
6 Depth of storage (ft)	n/a	n/a	n/a	n/a
7 Water surface area (ft^2) $A_{surface}$ =*(Item 2 + (2 * Item 5 * Item 6)) * (Item 3 + (2 * Item 5 * Item 6))*	n/a	n/a	n/a	n/a
8 Storage volume (ft^3) *For BMP with a forebay, ensure fraction of total storage is within ranges specified in BMP specific fact sheets, see Table 5-6 of the TGD for WQMP for reference to BMP design details* V =*Item 6 / 3 * [Item 4 + Item 7 + (Item 4 * Item 7)^0.5]*	n/a	n/a	n/a	n/a
9 Drawdown Time (hrs) *Copy Item 6 from Form 2.1*	n/a		n/a	
10 Outflow rate (cfs) Q_{BMP} = *(Item $8_{forebay}$ + Item 8_{basin}) / (Item 9 * 3600)*	n/a		n/a	
11 Duration of design storm event (hrs)	n/a		n/a	
12 Biotreated Volume (ft^3) $V_{biotreated}$ = *(Item $8_{forebay}$ + Item 8_{basin}) +(Item 10 * Item 11 * 3600)*	n/a		n/a	

13 Total biotreated volume from constructed wetlands, extended dry detention, or extended wet detention : n/a
(Sum of Item 12 for all BMP included in plan)

Form 4.3-8 Flow Based Biotreatment (DA 1)

Biotreatment BMP Type *Vegetated swale, vegetated filter strip, or other comparable proprietary BMP*	DA DMA BMP Type	DA DMA BMP Type	DA DMA BMP Type *(Use additional forms for more BMPs)*
1 Pollutants addressed with BMP *List all pollutant of concern that will be effectively reduced through specific Unit Operations and Processes described in TGD Table 5-5*	n/a	n/a	n/a
2 Flow depth for water quality treatment (ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
3 Bed slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
4 Manning's roughness coefficient	n/a	n/a	n/a
5 Bottom width (ft) b_w *= (Form 4.3-5 Item 6 * Item 4) / (1.49 * Item 2^1.67 * Item 3^0.5)*	n/a	n/a	n/a
6 Side Slope (ft/ft) *BMP specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
7 Cross sectional area (ft^2) *A = (Item 5 * Item 2) + (Item 6 * Item 2^2)*	n/a	n/a	n/a
8 Water quality flow velocity (ft/sec) *V = Form 4.3-5 Item 6 / Item 7*	n/a	n/a	n/a
9 Hydraulic residence time (min) *Pollutant specific, see Table 5-6 of the TGD for WQMP for reference to BMP design details*	n/a	n/a	n/a
10 Length of flow based BMP (ft) *L = Item 8 * Item 9 * 60*	n/a	n/a	n/a
11 Water surface area at water quality flow depth (ft^2) SA_{top} *= (Item 5 + (2 * Item 2 * Item 6)) * Item 10*	n/a	n/a	n/a

4.3.5 Conformance Summary

Complete Form 4.3-9 to demonstrate how on-site LID DCV is met with proposed site design hydrologic source control, infiltration, harvest and use, and/or biotreatment BMP. The bottom line of the form is used to describe the basis for infeasibility determination for on-site LID BMP to achieve full LID DCV, and provides methods for computing remaining volume to be addressed in an alternative compliance plan. If the project has more than one outlet, then complete additional versions of this form for each outlet.

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 1)

1 Total LID DCV for the Project DA 1 DMA A (ft^3): 73,376 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 73,460 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 0 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☒ No ☐
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☐ No ☒
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} *= (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

Form 4.3-9 Conformance Summary and Alternative Compliance Volume Estimate (DA 2)

1 Total LID DCV for the Project DA 2 DMA A (ft^3): 99,880 *Copy Item 7 in Form 4.2-1*

2 On-site retention with site design hydrologic source control LID BMP (ft^3): 0 *Copy Item 30 in Form 4.3-2*

3 On-site retention with LID infiltration BMP (ft^3): 48,532 *Copy Item 16 in Form 4.3-3*

4 On-site retention with LID harvest and use BMP (ft^3): 0 *Copy Item 9 in Form 4.3-4*

5 On-site biotreatment with volume based biotreatment BMP (ft^3): 51,565 *Copy Item 3 in Form 4.3-5*

6 Flow capacity provided by flow based biotreatment BMP (cfs): 0 *Copy Item 6 in Form 4.3-5*

7 LID BMP performance criteria are achieved if answer to any of the following is "Yes":

- Full retention of LID DCV with site design HSC, infiltration, or harvest and use BMP: Yes ☐ No ☒
  If yes, sum of Items 2, 3, and 4 is greater than Item 1
- Combination of on-site retention BMPs for a portion of the LID DCV and volume-based biotreatment BMP that address all pollutants of concern for the remaining LID DCV: Yes ☒ No ☐
  If yes, a) sum of Items 2, 3, 4, and 5 is greater than Item 1, and Items 2, 3 and 4 are maximized; or b) Item 6 is greater than Form 4.3--5 Item 6 and Items 2, 3 and 4 are maximized
- On-site retention and infiltration is determined to be infeasible and biotreatment BMP provide biotreatment for all pollutants of concern for full LID DCV: Yes ☐ No ☒
  If yes, Form 4.3-1 Items 7 and 8 were both checked yes

8 If the LID DCV is not achieved by any of these means, then the project may be allowed to develop an alternative compliance plan. Check box that describes the scenario which caused the need for alternative compliance:

- Combination of HSC, retention and infiltration, harvest and use, and biotreatment BMPs provide less than full LID DCV capture: ☐
  *Checked yes for Form 4.3-5 Item 7, Item 6 is zero, and sum of Items 2, 3, 4, and 5 is less than Item 1. If so, apply water quality credits and calculate volume for alternative compliance, V_{alt} = (Item 1 – Item 2 – Item 3 – Item 4 – Item 5) * (100 - Form 2.4-1 Item 2)%*
- An approved Watershed Action Plan (WAP) demonstrates that water quality and hydrologic impacts of urbanization are more effective when managed in at an off-site facility: ☐
  Attach appropriate WAP section, including technical documentation, showing effectiveness comparisons for the project site and regional watershed

4.3.6 Hydromodification Control BMP

Use Form 4.3-10 to compute the remaining runoff volume retention, after LID BMP are implemented, needed to address HCOC, and the increase in time of concentration and decrease in peak runoff necessary to meet targets for protection of waterbodies with a potential HCOC. Describe hydromodification control BMP that address HCOC, which may include off-site BMP and/or in-stream controls. Section 5.6 of the TGD for WQMP provides additional details on selection and evaluation of hydromodification control BMP.

Form 4.3-10 Hydromodification Control BMPs (DA 1)

1 Volume reduction needed for HCOC performance criteria (ft^3): n/a *(Form 4.2-2 Item 4 * 0.95) – Form 4.2-2 Item 1*	**2** On-site retention with site design hydrologic source control, infiltration, and harvest and use LID BMP (ft^3): n/a *Sum of Form 4.3-9 Items 2, 3, and 4 Evaluate option to increase implementation of on-site retention in Forms 4.3-2, 4.3-3, and 4.3-4 in excess of LID DCV toward achieving HCOC volume reduction*
3 Remaining volume for HCOC volume capture (ft^3): n/a *Item 1 – Item 2*	**4** Volume capture provided by incorporating additional on-site or off-site retention BMPs (ft^3): n/a *Existing downstream BMP may be used to demonstrate additional volume capture (if so, attach to this WQMP a hydrologic analysis showing how the additional volume would be retained during a 2-yr storm event for the regional watershed)*

5 If Item 4 is less than Item 3, incorporate in-stream controls on downstream waterbody segment to prevent impacts due to hydromodification ☐ *Attach in-stream control BMP selection and evaluation to this WQMP*

6 Is Form 4.2-2 Item 11 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate increase in time of concentration achieved by proposed LID site design, LID BMP, and additional on-site or off-site retention BMP ☐
  BMP upstream of a waterbody segment with a potential HCOC may be used to demonstrate increased time of concentration through hydrograph attenuation (if so, show that the hydraulic residence time provided in BMP for a 2-year storm event is equal or greater than the addition time of concentration requirement in Form 4.2-4 Item 15)
- Increase time of concentration by preserving pre-developed flow path and/or increase travel time by reducing slope and increasing cross-sectional area and roughness for proposed on-site conveyance facilities ☐
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

7 Form 4.2-2 Item 12 less than or equal to 5%: Yes ☐ No ☐

If yes, HCOC performance criteria is achieved. If no, select one or more mitigation options below:

- Demonstrate reduction in peak runoff achieved by proposed LID site design, LID BMPs, and additional on-site or off-site retention BMPs ☐
  BMPs upstream of a waterbody segment with a potential HCOC may be used to demonstrate additional peak runoff reduction through hydrograph attenuation (if so, attach to this WQMP, a hydrograph analysis showing how the peak runoff would be reduced during a 2-yr storm event)
- Incorporate appropriate in-stream controls for downstream waterbody segment to prevent impacts due to hydromodification, in a plan approved and signed by a licensed engineer in the State of California ☐

4.4 Alternative Compliance Plan (if applicable)

Describe an alternative compliance plan (if applicable) for projects not fully able to infiltrate, harvest and use, or biotreat the DCV via on-site LID practices. A project proponent must develop an alternative compliance plan to address the remainder of the LID DCV. Depending on project type some projects may qualify for water quality credits that can be applied to reduce the DCV that must be treated prior to development of an alternative compliance plan (see Form 2.4-1, Water Quality Credits). Form 4.3-9 Item 8 includes instructions on how to apply water quality credits when computing the DCV that must be met through alternative compliance. Alternative compliance plans may include one or more of the following elements:

- On-site structural treatment control BMP - All treatment control BMP should be located as close to possible to the pollutant sources and should not be located within receiving waters;
- Off-site structural treatment control BMP - Pollutant removal should occur prior to discharge of runoff to receiving waters;
- Urban runoff fund or In-lieu program, if available

Depending upon the proposed alternative compliance plan, approval by the executive officer may or may not be required (see Section 6 of the TGD for WQMP).

Section 5 Inspection and Maintenance Responsibility for Post Construction BMP

All BMP included as part of the project WQMP are required to be maintained through regular scheduled inspection and maintenance (refer to Section 8, Post Construction BMP Requirements, in the TGD for WQMP). Fully complete Form 5-1 summarizing all BMP included in the WQMP. Attach additional forms as needed. The WQMP shall also include a detailed Operation and Maintenance Plan for all BMP and may require a Maintenance Agreement (consult the jurisdiction's LIP). If a Maintenance Agreement is required, it must also be attached to the WQMP.

Form 5-1 BMP Inspection and Maintenance

BMP	Reponsible Party(s)	Inspection/ Maintenance Activities Required	Minimum Frequency of Activities
Drain Inserts	Owner	Visually inspect for defects and illegal dumping. Notify proper authorities if illegal dumping has occurred. Using an industrial vacuum, the collected materials shall be removed from the filter basket and disposed of properly. Inspect biosorb hydrocarbon boom and replace as necessary.	Annually
Hydrodynamic Separator	Owner	Open access hatches or manholes. Remove gross solids from screening basket upon reaching 25% capacity. Hinges open the bottom screen panels to access sedimentation chambers. Vacuum out sedimentation chambers when any chamber reaches 25% capacity.	Inspect semi-annually (by October 1st and February 1st) and maintain, upon reaching 25% capacity, through maintenance service contract with the vendor or equally qualified contractor.
Storm Drain Stenciled Message	Owner	Visually inspect for legibility and replace or repaint as necessary.	Annually
Proprietary Biofiltration	Owner	Remove trash from Screening Device, sediment from Separation Chamber and replace cartridge Filter Media, and Drain Down Filter Media. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.	Average maintenance interval of 6 to 12 months for removing trash from Screening Device. Average interval of 12 to 24 months for removing sediment, replacing Cartridge Filter Media, replacing Drain Down Filter

		Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.	Media and trimming vegetation.
Underground Retention System	Owner	The isolator row shall be inspected semi-annually (October 1st and February 1st) and maintained upon sediment reaching 3-inches in depth. The isolator row shall be inspected and maintained by a qualified technician and he/she will properly dispose of all wastes. A manhole is installed in order to inspect and maintain the isolator row. It is installed per OSHA codes to ensure operator and inspector safety.	Semi-annually (October 1st and February 1st) through maintenance service contract with the vendor or equally qualified contractor.
N1: Education of Property Owners, Tenants and Occupants on Stormwater BMPs	Owner	The property owner(s) shall familiarize him/herself with the WQMP document and content, including BMP educational materials in Attachment 'E' (Section 6.4) of this WQMP and shall ensure that all employees are also educated on stormwater BMPs.	Annually for all employees and within 2 months for new hires.
N2: Activity Restrictions	Owner	The property owner shall control the discharge of stormwater pollutants from this site through activity restrictions, training of employees and control of tenant activities.	Ongoing
N3: Landscape Management BMPs	Owner	Maintenance shall be conducted by a landscape contractor on a weekly basis to verify that the irrigation system is functioning properly and to repair as needed. Landscape contractor will also verify that there are no leaks or run-off from landscaped areas. Adjust irrigation heads and system run times as necessary to prevent overwatering of vegetation, overspray or run-off from landscaped areas to ensure the health and aesthetic quality of the landscape. Mowing and trimming waste shall be properly removed from the site and herbicides, pesticides and fertilizers shall be properly applied to prevent storm drainage contamination.	Ongoing
N4: BMP Maintenance	Owner	BMP maintenance, implementation schedules, and responsible parties are included with each specific BMP narrative and are listed in Form 5-1 of this document.	As described in each BMP.
N7: Spill Contingency Plan	Owner	Any liquid chemicals storage on-site shall comply with hazmat regulations and any required spill contingency plans.	Ongoing
N10: Uniform Fire Code Implementation	Owner	Owner will comply with Article 80 of the Uniform Fire Code enforced by the fire protection agency.	Ongoing
N11: Litter/Debris Control Program	Owner	Trash and litter shall be swept from the site and disposed of into a dumpster with lids. Owner shall	Weekly

		ensure that tenant contracts with the local trash collector to empty dumpsters on a weekly basis.	
N12: Employee Training	Owner	The owner will ensure that employees, contractors and tenants are familiar with onsite structural treatment control BMPs and necessary source control BMPs required of all site occupants. Owner will check with City and County at least once a year to obtain new or updated educational materials and provide these materials to tenants. Employees shall be trained to clean up spills and participate in ongoing maintenance. The WQMP requires annual employee training and for new hires, within 2 months.	Annually for all employees and within 2 months for new hires.
N13: Housekeeping of Loading Docks	Owner	Keep all fluids indoors. Clean up spills immediately and keep spills from entering storm drain system. No discharges of wastewater or cleanup water from maintenance of loading docks into the storm drain system. Loading areas shall be inspected weekly for proper sweeping and cleanup practices with spills cleaned up immediately and disposed of properly. Cleanup procedures should minimize or eliminate the use of water and should rely on dry-cleanup methods or pressure washing with complete containment by vacuum, for proper disposal.	Ongoing
N14: Catch Basin Inspection Program	Owner	Inspected semi-annually (by October 1st and February 1st) by owner's designee. Basin sump areas shall be vacuumed and disposed of properly. The owner shall clean all catch basins whenever debris, trash or sediment accumulates and shall investigate any suspected illegal dumping into these drains.	Monthly inspection and maintain as necessary.
N15: Vacuum Sweeping of Private Streets and Parking Lots	Owner	All landscape maintenance contractors will be required to sweep up all landscape cuttings, mowings and fertilizer materials off paved areas weekly and dispose of properly. Parking areas and drive ways will be vacuum swept monthly, by sweeping contractor.	Monthly
N17: Comply with all other applicable NPDES permits	Owner	The developer will comply with the Construction General Permit during construction and all future occupants of the site shall comply with the requirements of the Industrial General Stormwater Permit.	Ongoing
S1: Provide storm drain system stenciling and signage (CASQA New Development BMP Handbook SD-13)	Owner	A "No Dumping – Drains to River" message shall be painted with stencil, onto each catch basin inlet. Legibility of stencil will be maintained on a yearly basis.	Annually

S3: Design and construct trash and waste storage areas to reduce pollution introduction (CASQA New Development BMP Handbook SD-32)	Owner	Paved with an impervious surface, designed not to allow run-on from adjoining areas, designed to divert drainage from adjoining roofs and pavements diverted around the area, screened or walled to prevent off-site transport of trash, and designed with a solid roof to cover dumpsters.	Ongoing
S4: Use efficient irrigation systems & landscape design, water conservation, smart controllers, and source control (Statewide Model Landscape Ordinance; CASQA New Development BMP Handbook SD-12)	Owner	The irrigation system will include devices to prevent low head drainage, overspray and run off through the use of pressure regulating devices, check valves, flow sensors, proper spacing, low precipitation emission devices and ET or weather based controllers. Landscape and irrigation shall be consistent with the State Model Water Efficient landscape Ordinance and the City of Colton landscape requirements. Plants installed will be arranged according to similar hydrozones and meet the required water budget for the site. Shade trees shall be used to intercept rainwater and reduce heat gain on paving.	Adjust watering cycles and duration seasonally / quarterly.
S5: Finish grade of landscaped areas at a minimum of 1-2 inches below top of curb, sidewalk, or pavement	Owner	Landscaped areas will be depressed in order to increase retention of stormwater/irrigation water and promote infiltration, 1”-2” below top of curb or pavement elevations.	Ongoing

Section 6 WQMP Attachments

6.1. Site Plan and Drainage Plan

Include a site plan and drainage plan sheet set containing the following minimum information:

- Project location
- Site boundary
- Land uses and land covers, as applicable
- Suitability/feasibility constraints
- Structural Source Control BMP locations
- Site Design Hydrologic Source Control BMP locations
- LID BMP details
- Drainage delineations and flow information
- Drainage connections

See Attachment C for the WQMP Site Map.

6.2 Electronic Data Submittal

Minimum requirements include submittal of PDF exhibits in addition to hard copies. Format must not require specialized software to open. If the local jurisdiction requires specialized electronic document formats (as described in their local Local Implementation Plan), this section will describe the contents (e.g., layering, nomenclature, geo-referencing, etc.) of these documents so that they may be interpreted efficiently and accurately.

6.3 Post Construction

Attach all O&M Plans and Maintenance Agreements for BMP to the WQMP (Attachment D).

6.4 Other Supporting Documentation

- BMP Educational Materials (Attachment E)
- Infiltration Report (Attachment F)

6.1 Site Plan and Drainage Plans

- **Attachment A – Existing Condition Site Photos**
- **Attachment B – BMP Design Calculations & Supporting Documentation**
- **Attachment C – WQMP Site Map**

Attachment A
Existing Condition Site Photos

2018/10/14

2018/10/14

2018/10/14

2018/10/14

2018/10/14

2018/10/14

2018/10/14

2018/10/14

2018/10/14

Attachment B
BMP Design Calculations & Supporting Documentation

www.nws.noaa.gov

NOAA's National Weather Service
Hydrometeorological Design Studies Center
Precipitation Frequency Data Server (PFDS)

NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: CA

Data description

Data type: Precipitation depth **Units:** English **Time series type:** Partial duration

Select location

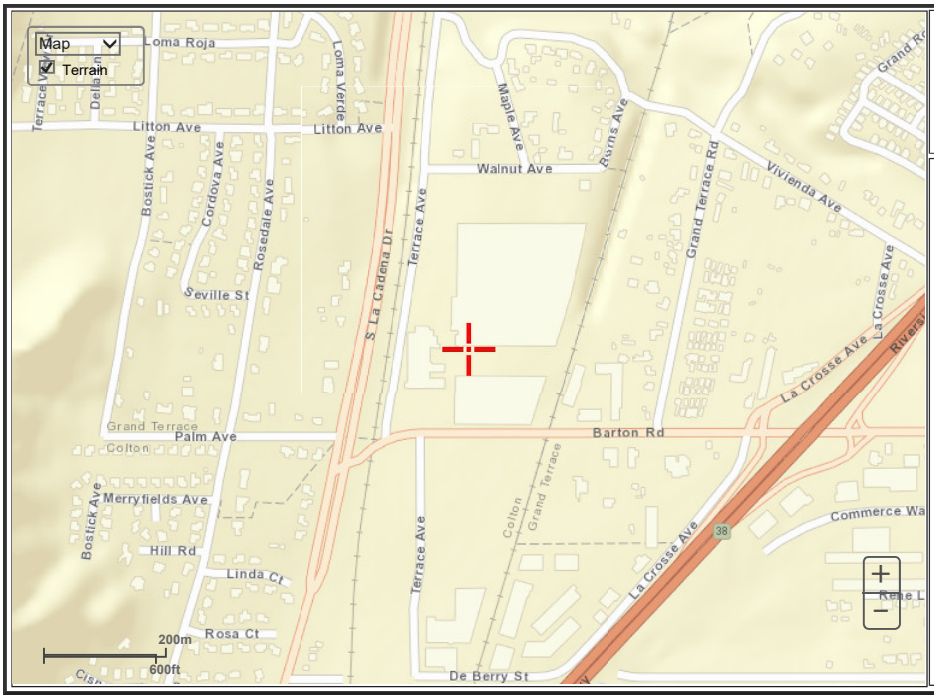
1) Manually:

a) By location (decimal degrees, use "-" for S and W): Latitude: 34.0351 Longitude: -117.3310 Submit

b) By station (list of CA stations): Select station

c) By address Search

2) Use map (if ESRI interactive map is not loading, try adding the host: **https://js.arcgis.com/** to the firewall, or contact us at hdsc.questions@noaa.gov):



a) Select location
Move crosshair or double click

b) Click on station icon
Show stations on map

Location information:
Name: Colton, California, USA*
Latitude: 34.0351°
Longitude: -117.3310°
Elevation: 956.39 ft **

* Source: ESRI Maps
** Source: USGS

POINT PRECIPITATION FREQUENCY (PF) ESTIMATES

WITH 90% CONFIDENCE INTERVALS AND SUPPLEMENTARY INFORMATION
NOAA Atlas 14, Volume 6, Version 2

PF tabular PF graphical Supplementary information Print page

PDS-based precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years) 1	2	5	10	25	50	100	200	500	1000
5-min	**0.093** (0.077-0.112)	**0.118** (0.099-0.144)	**0.152** (0.127-0.186)	**0.180** (0.149-0.222)	**0.219** (0.174-0.278)	**0.249** (0.194-0.323)	**0.280** (0.212-0.373)	**0.312** (0.230-0.428)	**0.357** (0.252-0.510)	**0.392** (0.267-0.581)
10-min	**0.133** (0.111-0.161)	**0.170** (0.141-0.206)	**0.219** (0.181-0.266)	**0.259** (0.213-0.318)	**0.314** (0.250-0.399)	**0.357** (0.278-0.464)	**0.401** (0.304-0.534)	**0.448** (0.330-0.613)	**0.511** (0.361-0.731)	**0.561** (0.382-0.832)
15-min	**0.161** (0.134-0.195)	**0.205** (0.171-0.249)	**0.264** (0.219-0.322)	**0.313** (0.257-0.384)	**0.380** (0.302-0.482)	**0.432** (0.336-0.561)	**0.485** (0.368-0.646)	**0.541** (0.399-0.742)	**0.618** (0.436-0.884)	**0.679** (0.462-1.01)
30-min	**0.245** (0.204-0.297)	**0.313** (0.261-0.380)	**0.403** (0.334-0.490)	**0.477** (0.393-0.585)	**0.579** (0.460-0.735)	**0.658** (0.512-0.855)	**0.740** (0.561-0.985)	**0.825** (0.608-1.13)	**0.942** (0.665-1.35)	**1.03** (0.705-1.53)
60-min	**0.360** (0.300-0.436)	**0.459** (0.382-0.558)	**0.591** (0.491-0.720)	**0.700** (0.576-0.859)	**0.850** (0.676-1.08)	**0.966** (0.752-1.25)	**1.09** (0.824-1.45)	**1.21** (0.893-1.66)	**1.38** (0.977-1.98)	**1.52** (1.03-2.25)
2-hr	**0.510** (0.426-0.619)	**0.651** (0.542-0.790)	**0.837** (0.695-1.02)	**0.990** (0.815-1.22)	**1.20** (0.954-1.53)	**1.36** (1.06-1.77)	**1.53** (1.16-2.04)	**1.71** (1.26-2.34)	**1.95** (1.37-2.79)	**2.14** (1.46-3.17)
3-hr	**0.627** (0.523-0.760)	**0.800** (0.666-0.970)	**1.03** (0.853-1.25)	**1.22** (1.00-1.49)	**1.47** (1.17-1.87)	**1.67** (1.30-2.17)	**1.88** (1.43-2.50)	**2.09** (1.54-2.87)	**2.38** (1.68-3.41)	**2.62** (1.78-3.88)
6-hr	**0.879** (0.733-1.07)	**1.12** (0.934-1.36)	**1.44** (1.20-1.75)	**1.70** (1.40-2.09)	**2.06** (1.64-2.62)	**2.34** (1.82-3.04)	**2.62** (1.99-3.49)	**2.92** (2.15-4.00)	**3.32** (2.35-4.75)	**3.64** (2.48-5.39)
12-hr	**1.17**	**1.49**	**1.92**	**2.26**	**2.74**	**3.10**	**3.47**	**3.85**	**4.37**	**4.77**

	(0.972-1.41)	(1.24-1.81)	(1.59-2.33)	(1.86-2.78)	(2.17-3.48)	(2.41-4.02)	(2.63-4.62)	(2.84-5.28)	(3.08-6.25)	(3.25-7.08)
24-hr	**1.55** (1.38-1.79)	**2.00** (1.76-2.30)	**2.57** (2.27-2.97)	**3.04** (2.66-3.54)	**3.67** (3.11-4.42)	**4.15** (3.44-5.11)	**4.64** (3.76-5.85)	**5.14** (4.05-6.66)	**5.82** (4.40-7.85)	**6.35** (4.64-8.85)
2-day	**1.90** (1.68-2.19)	**2.47** (2.18-2.85)	**3.22** (2.84-3.72)	**3.83** (3.35-4.47)	**4.66** (3.95-5.62)	**5.30** (4.40-6.52)	**5.95** (4.82-7.50)	**6.63** (5.22-8.58)	**7.54** (5.71-10.2)	**8.25** (6.04-11.5)
3-day	**2.02** (1.79-2.33)	**2.68** (2.37-3.09)	**3.54** (3.12-4.10)	**4.26** (3.72-4.97)	**5.24** (4.44-6.31)	**6.00** (4.98-7.38)	**6.79** (5.50-8.55)	**7.60** (5.99-9.84)	**8.72** (6.60-11.8)	**9.60** (7.02-13.4)
4-day	**2.17** (1.92-2.50)	**2.90** (2.56-3.34)	**3.87** (3.41-4.47)	**4.67** (4.09-5.45)	**5.78** (4.89-6.96)	**6.65** (5.52-8.18)	**7.55** (6.11-9.50)	**8.48** (6.69-11.0)	**9.77** (7.40-13.2)	**10.8** (7.90-15.1)
7-day	**2.50** (2.22-2.88)	**3.36** (2.97-3.87)	**4.49** (3.96-5.20)	**5.44** (4.76-6.34)	**6.75** (5.71-8.13)	**7.77** (6.45-9.56)	**8.83** (7.15-11.1)	**9.94** (7.84-12.9)	**11.5** (8.68-15.5)	**12.7** (9.28-17.7)
10-day	**2.72** (2.41-3.14)	**3.66** (3.24-4.23)	**4.92** (4.34-5.69)	**5.96** (5.22-6.95)	**7.41** (6.27-8.93)	**8.55** (7.09-10.5)	**9.72** (7.88-12.2)	**11.0** (8.64-14.2)	**12.7** (9.59-17.1)	**14.0** (10.3-19.6)
20-day	**3.31** (2.93-3.82)	**4.48** (3.96-5.17)	**6.06** (5.34-7.01)	**7.37** (6.45-8.60)	**9.20** (7.79-11.1)	**10.6** (8.83-13.1)	**12.1** (9.84-15.3)	**13.7** (10.8-17.8)	**15.9** (12.1-21.5)	**17.7** (12.9-24.7)
30-day	**3.92** (3.47-4.52)	**5.33** (4.71-6.15)	**7.23** (6.38-8.37)	**8.82** (7.71-10.3)	**11.0** (9.35-13.3)	**12.8** (10.6-15.7)	**14.6** (11.9-18.4)	**16.6** (13.1-21.5)	**19.3** (14.6-26.0)	**21.5** (15.7-29.9)
45-day	**4.69** (4.15-5.40)	**6.39** (5.65-7.37)	**8.68** (7.65-10.0)	**10.6** (9.27-12.4)	**13.3** (11.3-16.0)	**15.4** (12.8-19.0)	**17.7** (14.3-22.3)	**20.1** (15.8-26.0)	**23.4** (17.7-31.5)	**26.1** (19.1-36.3)
60-day	**5.45** (4.82-6.28)	**7.42** (6.56-8.57)	**10.1** (8.89-11.7)	**12.3** (10.8-14.4)	**15.4** (13.1-18.6)	**17.9** (14.9-22.1)	**20.5** (16.6-25.9)	**23.3** (18.4-30.2)	**27.2** (20.6-36.7)	**30.3** (22.2-42.3)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Estimates from the table in CSV format: Precipitation frequency estimates Submit

Main Link Categories:
Home | OWP

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
Office of Water Prediction (OWP)
1325 East West Highway
Silver Spring, MD 20910
Page Author: HDSC webmaster
Page last modified: April 21, 2017

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Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet
(DA 1 DMA A)

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.0

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.0
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	1.70
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	0.85

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

A site-specific infiltration test was conducted to support a measured infiltration rate of 1.7 in/hr. The design rate is 0.85 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

Worksheet H: Factor of Safety and Design Infiltration Rate Worksheet
(DA 2 DMA A)

Factor Category		Factor Description	Assigned Weight (w)	Factor Value (v)	Product (p) p = w x v
A	Suitability Assessment	Soil assessment methods	0.25	1	0.25
		Predominant soil texture	0.25	1	0.25
		Site soil variability	0.25	1	0.25
		Depth to groundwater / impervious layer	0.25	1	0.25
		Suitability Assessment Safety Factor, $S_A = \Sigma p$			1.00
B	Design	Tributary area size	0.25	3	0.75
		Level of pretreatment/ expected sediment loads	0.25	1	0.25
		Redundancy	0.25	3	0.75
		Compaction during construction	0.25	1	0.25
		Design Safety Factor, $S_B = \Sigma p$			2.0

Combined Safety Factor, $S_{TOT} = S_A \times S_B$	2.0
Measured Infiltration Rate, inch/hr, K_M (corrected for test-specific bias)	1.75
Design Infiltration Rate, in/hr, $K_{DESIGN} = K_M / S_{TOT}$	0.875

Supporting Data

Briefly describe infiltration test and provide reference to test forms:

A site-specific infiltration test was conducted to support a measured infiltration rate of 1.75 in/hr. The design rate is 0.875 in/hr after applying the appropriate safety factor. This design rate is suitable for infiltration facilities.

Note: The minimum combined adjustment factor shall not be less than 2.0 and the maximum combined adjustment factor shall not exceed 9.0.

FLOW-BASED BMP DESIGN (pretreatment)

$C_{BMP} = 0.858(imp)^3 - 0.78(imp)^2 + 0.774(imp) + 0.04$
$I_{BMP} = (0.605)(0.2787)(2) = 0.337$ in/hr
$Q = C_{BMP} * 0.337 * Area$

DA 1 DMA A – DEBRIS SEPARATING BAFFLE BOX (DSBB-1)

Region		Valley	
Drainage Area (acres)		18.70	acres
Drainage Area (sq-ft)		**814,572**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.459	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.256**	
Flow (cfs)	Q =	**3.86**	

Use DSBB-6-12
80% @ 100 Micron treats 5.41 cfs

DA 2 DMA A – DEBRIS SEPARATING BAFFLE BOX (DSBB-2)

Region		Valley	
Drainage Area (acres)		12.40	acres
Drainage Area (sq-ft)		**540,144**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.81**	
1-hr 2-yr from NOAA		0.605	
Itensity Coeff		**0.2787**	
Intensity BMP (in/hr)		**0.337**	
Flow (cfs)	Q =	**3.37**	

Use DSBB-5-10
80% @ 100 Micron treats 3.75 cfs

VOLUME-BASED BMP DESIGN

$C_{BMP} = 0.858(imp)^3 - 0.78(imp)^2 + 0.774(imp) + 0.04$
P6 = (0.459)(1.4807) = 0.680 inches
$P0 = (1.963)(C_{BMP})(0.680)$
DCV = (P0 * Area) / 12

DA 1 DMA A – STORMTECH INFILTRATION CHAMBERS (STC-1)

Region		Valley	
Drainage Area (acres)		18.70	acres
Drainage Area (sq-ft)		**814,572**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.459	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.680**	
Drawdown Rate (a)		1.963	
DCV		**73,082**	cu-ft
DCV		**1.678**	acre-ft

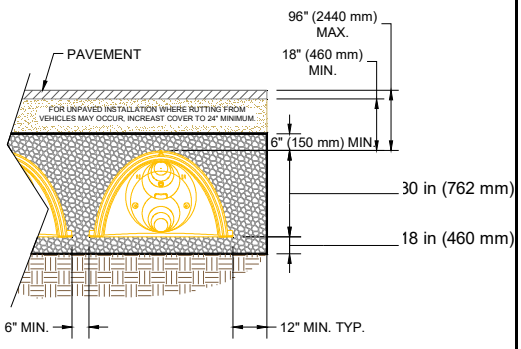
StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management™

Units: **Imperial**

Project: EBS (DA1 DMA A)
By: Thienes Engineering, Inc.
Point of Contact
Date: 6/26/2019

System Requirements

Required Storage Volume	**73,376**	CF
Select Stormtech Chamber System	DC-780	
Stone Porosity (Industry Standard = 40%)	**40%**	
Stone Foundation Depth	18	Inches
Storage Volume Per Chamber	88.40	CF
Avg Cover over Chambers (18 in min. & 96 in max.)	18	Inches
Number of Chambers Required	831	Each
Required Bed Size	29,055	SF
Tons of Stone Required	4,389	Tons
Volume of Excavation	4,663	CY
Area of Filter Fabric	7,830	SY
# of End Caps Required	**30**	Each
Length of ISOLATOR ROW	**398.72**	FT
ISOLATOR FABRIC	**177**	SY



Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)			Controlled by Length		
Width	75	FT	Length	100	FT
# of Chambers Long	56	EA	# of Chambers Long	-	EA
# of Rows	15	EA	# of Rows	-	EA
Actual Length	402.32	FT	Actual Length	-	FT
Actual Width	72.75	FT	Actual Width	-	FT

9 of the chambers rows will contain only 55 chambers

Design infiltration rate = 0.85 in/hr

d_{max} = 40.8 inches = Design infiltration rate x 48 hours = 0.85 in/hr x 48 hrs

d_{BMP} = 39.6 inches = [(6 inches + 18 inches) x 0.40] + 30 inches

$d_{max} > d_{BMP}$

831 chambers x 88.40 CF/chamber = 73,460 CF

DA 2 DMA A – STORMTECH INFILTRATION CHAMBERS (STC-2)

Region		Valley	
Drainage Area (acres)		12.40	acres
Drainage Area (sq-ft)		540,144	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	0.807	
1-hr 2-yr from NOAA		0.459	
P6 Coeff		1.4807	
Mean 6-hr (P6)		0.680	
Drawdown Rate (a)		1.963	
DCV		48,461	cu-ft
DCV		1.113	acre-ft

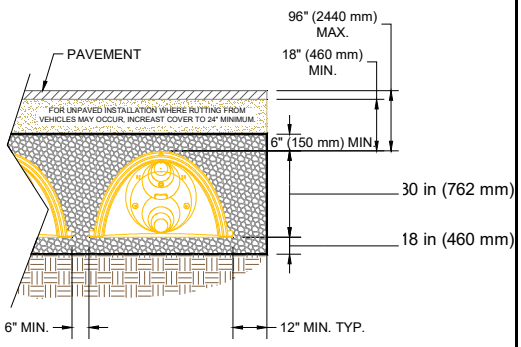
StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management™

Units: **Imperial**

Project: EBS (DA2 DMA A)
By: Thienes Engineering, Inc.
Point of Contact
Date: 6/26/2019

System Requirements

Required Storage Volume	**48,461**	CF
Select Stormtech Chamber System	DC-780	
Stone Porosity (Industry Standard = 40%)	**40%**	
Stone Foundation Depth	18	Inches
Storage Volume Per Chamber	88.40	CF
Avg Cover over Chambers (18 in min. & 96 in max.)	18	Inches
Number of Chambers Required	549	Each
Required Bed Size	19,378	SF
Tons of Stone Required	2,931	Tons
Volume of Excavation	3,110	CY
Area of Filter Fabric	5,363	SY
# of End Caps Required	**18**	Each
Length of ISOLATOR ROW	**434.32**	FT
ISOLATOR FABRIC	**193**	SY



Is the limiting dimension for the bed the width or length? **width**

Controlled by Width (Rows)			Controlled by Length		
Width	**45**	FT	Length	**100**	FT
# of Chambers Long	61	EA	# of Chambers Long	-	EA
# of Rows	9	EA	# of Rows	-	EA
Actual Length	437.92	FT	Actual Length	-	FT
Actual Width	44.25	FT	Actual Width	-	FT

Design infiltration rate = 0.875 in/hr

d_{max} = 42.0 inches = Design infiltration rate x 48 hours = 0.875 in/hr x 48 hrs

d_{BMP} = 39.6 inches = [(6 inches + 18 inches) x 0.40] + 30 inches

$d_{max} > d_{BMP}$

549 chambers x 88.40 CF/chamber = 48,532 CF

DA 2 DMA B – STORMTECH INFILTRATION CHAMBERS & MODULAR WETLANDS SYSTEM (STC-2 & MWS-2)

Region		Valley	
Drainage Area (acres)		13.15	acres
Drainage Area (sq-ft)		**572,814**	sq-ft
Impervious Coeff	i =	0.95	< 1.0
Runoff Coeff	**C =**	**0.807**	
1-hr 2-yr from NOAA		0.459	
P6 Coeff		**1.4807**	
Mean 6-hr (P6)		**0.680**	
Drawdown Rate (a)		1.963	
DCV		**51,392**	cu-ft
DCV		**1.180**	acre-ft

WetlandMOD VOLUME BASED SIZING SHEET

Horizontal Flow Biofiltration System

Project Location

Project Name	EBS Barton Road Warehouses (DA2 DMA B)
City/Town	Colton
State	California
Zip Code	92324

SIZING CALCULATIONS	**Inputs**	**Units**	**Notes/References**
Impervious Area			
BMP Drainage Area (not required - manual entry - not part of formula)	13.2	**Acres**	This includes all areas that will contribute runoff to the proposed BMP, including pervious areas, impervious areas, and off-site areas, whether or not they are directly or indirectly connected to the BMP.
Watershed Impervious Ratio (not required - manual entry - not part of formula)			Watershed Imperviousness Ratio", is equal to the percent of total impervious area in the "BMP Drainage Area" divided by 100
Runoff Coefficient "C" (not required - manual entry - not part of formula)			
Water Quality Volume (required)	51392	cubic feet	Use sizing procedures provided by state or local agencies to determine the appropriate Water Quality Volume. Intensities and design storms vary widely by region and method.
Design Storm Duration	3	hours	Varies depending on geographical region. Set at 0 for pump system set up. LA County 3 hours. Call for details.
MWS - Linear Sizing			
MWS - Linear Model Number (from matrix)	MWS-L-8-20	quantity	Please choose size from "Model Size Matrix" Tab
# Of Units	2	quantity	Select the number of systems required to treat the water quality volume. Will very depending on drain down time regulaitons.
Discharge Rate (from matrix)	65.42	gallons/minute	Rate of 0.26 gpm/sq ft or 25 in/hr. Field Verified.
Volume Treated During Event			
Processed through MWS - Linear	3140.0	cubic feet	**130.83** gals/minute
Volume Treated Following Event			
MWS - Linear Static Capacity (from matrix)	348	cubic feet	
Volume Needed in *Pre-Storage*	47904	cubic feet	Set at zero to start. Size pre-storage system to hold this volume
			Sizing complete when eqaul to value of zero.
TOTAL STORMWATER TREATED	51392	cubic feet	Note: This amount should be equal to the "Water Quality Volume"
Drain Down Time	46.10	hours	Drain down time must be equal to or less than requirement of local juristiction. Default 48 hours.

Feel free to fax or email proposed sizing calculations to Modular Wetlands Systems, Inc. for assistance with sizing, compliance, and design.

Phone: 760.433.7640

Fax: 760.433.3176

Email: Info@modularwetlands.com

StormTech
Detention • Retention • Recharge
Subsurface Stormwater Management℠

MC-4500 Site Calculator

Project Information:

Project Name:	Barton Road (DA2 DMA B)
Location:	Colton, CA
Date:	6/26/2019
Engineer:	Thienes Engineering Inc.
StormTech RPM:	

System Requirements

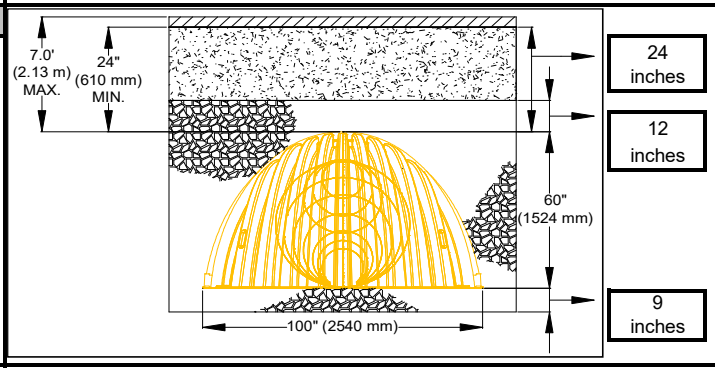
Units		Imperial	
Required Storage Volume		47931	CF
Stone Porosity (Industry Standard = 40%)		40	%
Stone Above Chambers	(12 inch min.)	12	inches
Stone Foundation Depth	(9 inch min.)	9	inches
Average Cover over Chambers	(24 inch min.)	24	inches
Bed size controlled by WIDTH or LENGTH?		WIDTH	
Limiting WIDTH or LENGTH dimension		50	feet
Storage Volume per Chamber		162.6	CF
Storage Volume per End Cap		108.6	CF

System Sizing

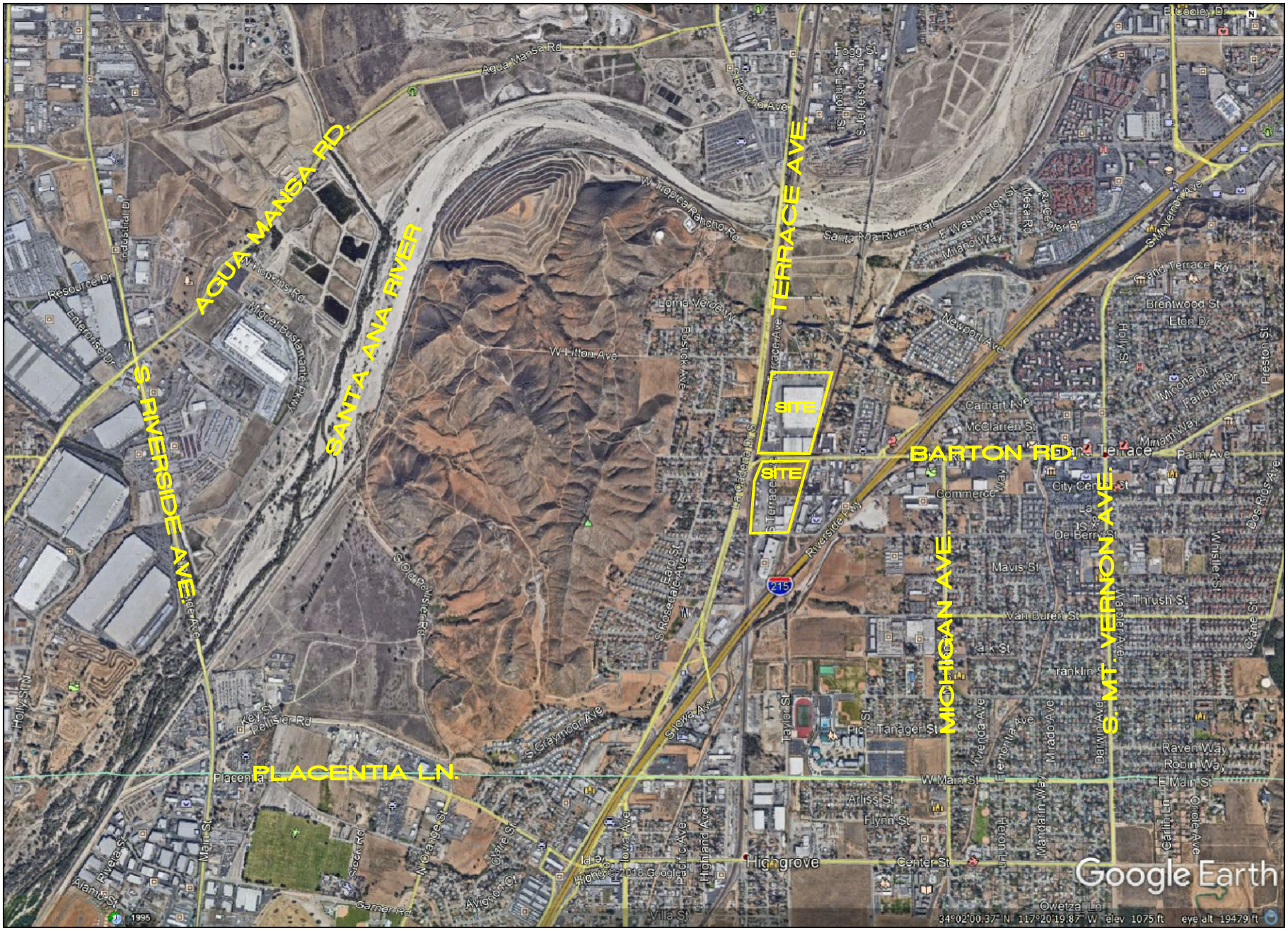
Number of Chambers Required	289	each
Number of End Caps Required	10	each
Bed Size (including perimeter stone)	11,171	square feet
Stone Required (including perimeter stone)	2324	tons
Volume of Excavation	3207	cubic yards
Non-woven Filter Fabric Required (20% Safety Factor)	3496	square yards
Length of Isolator Row	240.6	feet
Woven Isolator Row Fabric (20% Safety Factor)	661	square yards
Installed Storage Volume	48,077	cubic feet

Controlled by Width (Rows)

Maximum Width =	50	feet
4 rows of 58 chambers		
1 row of 57 chambers		
Maximum Length =	240.6	feet
Maximum Width =	46.7	feet



Attachment C
WQMP Site Map



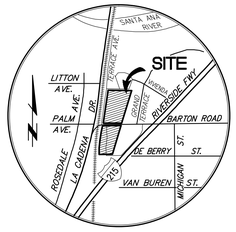
Last Update: 12/6/18
O:\3700-3799\3711\3711VICMAP.dwg

Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

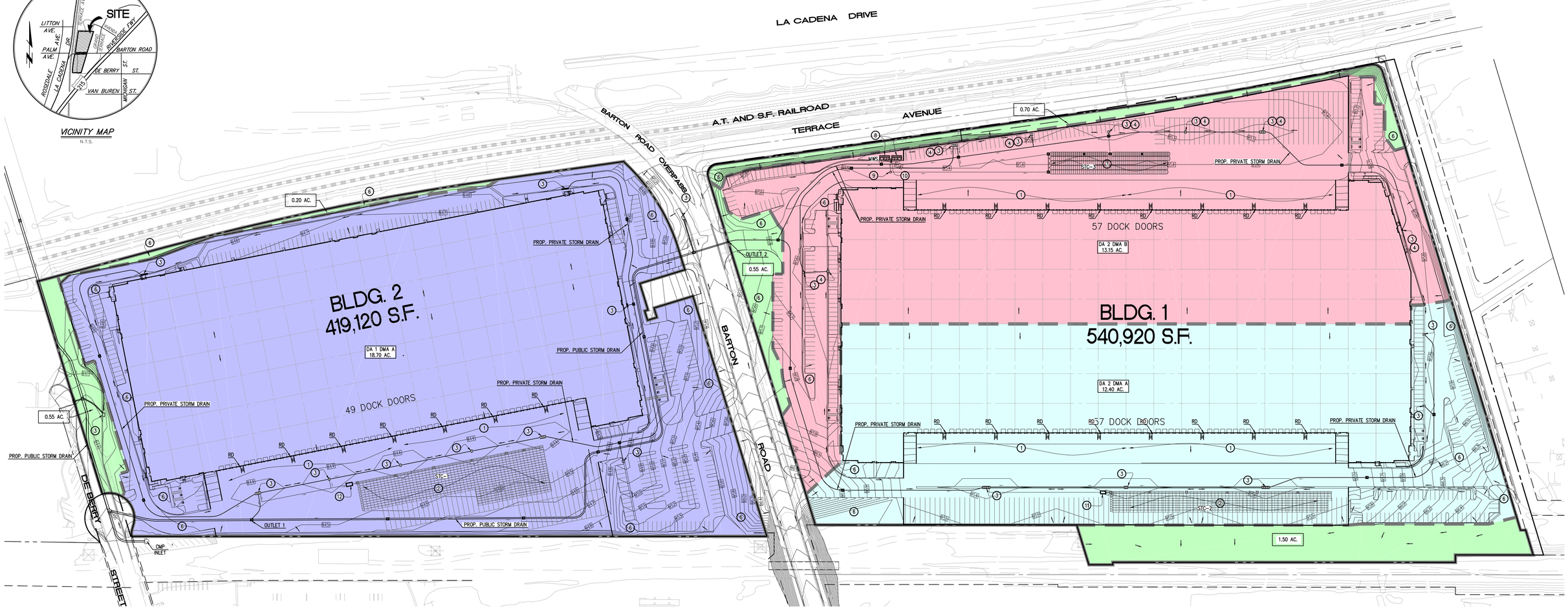
"VICINITY MAP"

FOR

BARTON RD. AND TERRACE AVE.
COLTON, CA



VICINITY MAP
N.T.S.



DA DMA ID	BMP ID	DCV REQUIRED (CF)	VOLUME PROVIDED (CF)
DA 1 DMA A	STC-1	73,082	73,460
DA 2 DMA A	STC-2	48,461	48,532
DA 2 DMA B	STC-3 & MWS	51,392	51,565

LEGEND

1. ABOVEGROUND TRUCK DOCK
2. UNDERGROUND RETENTION SYSTEM DC-780 STORMTECH CHAMBERS (STC)
3. CATCH BASIN STORM DRAIN STENCIL "NO DUMPING-DRAINS TO RIVER"
4. DRAIN INSERT(S)
5. TRASH STORAGE AREAS
6. LANDSCAPE & EFFICIENT IRRIGATION
7. UNDERGROUND RETENTION SYSTEM MC-4500 STORMTECH CHAMBERS (STC)
8. PROPRIETARY BIOFILTRATION UNITS (MWS)
9. SUMP PUMP
10. FORCE MAIN DISCHARGE LOCATION
11. HYDRODYNAMIC SEPARATOR – DSBB-5-10
12. HYDRODYNAMIC SEPARATOR – DSBB-6-12

NOTES

RD ROOF DRAIN
BOUNDARY
DRAINAGE AREAS
FLOW LINE
SD FLOW LINE
DA 1 DMA A
DA 2 DMA A
DA 2 DMA B
AREAS DRAINING OFFSITE (MOSTLY SELF-TREATING LANDSCAPE)

StormTech ADS

STORMTECH DC-780 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

- 12" (3.0 m) Deep Cover Applications
- Designed in accordance with ASTM F 2787 and produced to meet the ASTM 2418 product standard.
- AASHTO safety factors provided for AASHTO Design Truck (H20 and deep cover conditions.)

STORMTECH DC-780 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
85.4" x 51.0" x 30.0"
2,170 mm x 1,295 mm x 762 mm

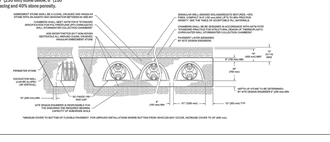
Chamber Storage
46.2 ft³ (1.30 m³)

Min. Installed Storage*
78.4 ft³ (2.20 m³)

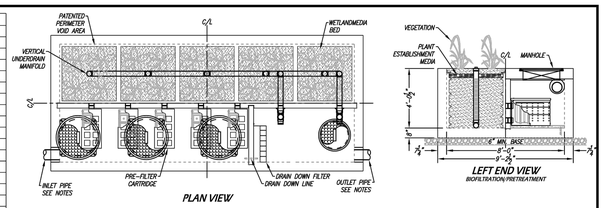
Weight
80.0 lbs (36.3 kg)

Shipping
24 chambers/pallet
60 end caps/pallet
12 pallets/truck

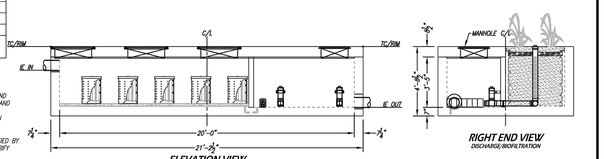
*Assumes 9" (230 mm) stone below, 6" (150 mm) row spacing and 40% stone porosity.



SITE SPECIFIC DATA			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
VOLUME BASED (CF)		FLOW BASED (CFS)	
TREATMENT HGL AVAILABLE (FT)			
PEAK BYPASS REQUIRED (CFS) – IF APPLICABLE			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE 1			
INLET PIPE 2			
OUTLET PIPE			
	PRETREATMENT	BIOFILTRATION	DISCHARGE
RIM ELEVATION			
SURFACE LOAD	PARKWAY	OPEN PLANTER	PARKWAY
FRAME & COVER	ø30"	N/A	ø24"
METLANDMEDIA VOLUME (CY)			11.85
METLANDMEDIA DELIVERY METHOD			TBD
ORIFICE SIZE (DIA. INCHES)			#2.43"
MAXIMUM PICK WEIGHT (LBS)			TBD
NOTES:			



PLAN VIEW



INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE SYSTEM AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURERS SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. UNIT MUST BE INSTALLED ON LEVEL BASE. MANUFACTURER RECOMMENDS A MINIMUM 6" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH). INVERT OF OUTFLOW PIPE MUST BE FLUSH WITH DISCHARGE CHAMBER FLOOR. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
4. CONTRACTOR TO SUPPLY AND INSTALL ALL EXTERNAL CONNECTING PIPES.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.
6. DRIP OR SPRAY IRRIGATION REQUIRED ON ALL UNITS WITH VEGETATION.

GENERAL NOTES

1. MANUFACTURER TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT MODULAR WETLANDS SYSTEMS.

TREATMENT FLOW (CFS)	0.577
OPERATING HEAD (FT)	3.4
PRETREATMENT LOADING RATE (GPM/SF)	TBD
WETLAND MEDIA LOADING RATE (GPM/SF)	1.0

THE PRODUCT DESCRIBED MAY BE PROTECTED BY ONE OR MORE OF THE FOLLOWING US PATENTS: 8,452,603; 8,673,163; 9,474,978; 9,556,588; 9,695,592; AND OTHER PATENTS PENDING

PROPRIETARY AND CONFIDENTIAL:

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MODULAR WETLAND SYSTEM

MWS-L-8-20-V
STORMWATER BIOFILTRATION SYSTEM
STANDARD DETAIL

StormTech | ADS

MC-4500 CHAMBER

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots, thus maximizing land usage for private (commercial) and public applications. StormTech chambers can also be used in conjunction with Green Infrastructure, thus enhancing the performance and extending the service life of these practices.

STORMTECH MC-4500 CHAMBER
(not to scale)

Nominal Chamber Specifications

Size (L x W x H)
52" x 100" x 60"
1,321 mm x 2,540 mm x 1,524 mm

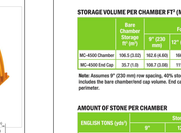
Chamber Storage
106.5 ft³ (3.01 m³)

Min. Installed Storage*
162.6 ft³ (4.60 m³)

Weight
120 lbs (54.4 kg)

Shipping
7 chambers/pallet
11 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone between chambers, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.



STORMTECH MC-4500 END CAP
(not to scale)

Nominal End Cap Specifications

Size (L x W x H)
35.1" x 90.2" x 59.4"
891 mm x 2,291 mm x 1,509 mm

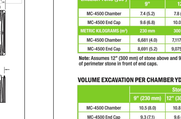
End Cap Storage
35.7 ft³ (1.01 m³)

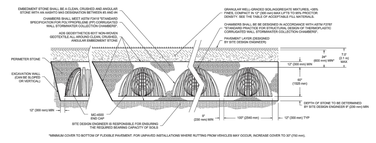
Min. Installed Storage*
108.7 ft³ (3.08 m³)

Weight
120 lbs (54.4 kg)

Shipping
7 end caps/pallet
11 pallets/truck

*Assumes a minimum of 12" (300 mm) of stone above, 9" (230 mm) of stone below, 9" (230 mm) of stone between perimeter, 9" (230 mm) of stone between chambers/end caps and 40% stone porosity.





StormTech | ADS

MC-4500 CHAMBER SPECIFICATIONS

STORAGE VOLUME PER CHAMBER FT³ (M³)

	Bare Chamber Storage, 9" (9")	Chamber and Stone Foundation Depth in. (mm)			
		9" (230 mm)	12" (300 mm)	15" (375 mm)	18" (450 mm)
MC-4500 Chamber	106.5 (3.02)	162.6 (4.606)	166.3 (4.71)	169.8 (4.81)	173.6 (4.91)
MC-4500 End Cap	35.7 (1.0)	108.7 (3.08)	111.9 (3.17)	115.2 (3.26)	118.4 (3.35)

Note: Assumes 9" (230 mm) row spacing, 40% stone porosity, 12" (300 mm) stone above and includes the bare chamber/end cap volume. End cap volume assumes 12" (300 mm) stone perimeter.

AMOUNT OF STONE PER CHAMBER

ENGLISH TONS (yds³)	Stone Foundation Depth			
	9"	12"	15"	18"
MC-4500 Chamber	7.4 (5.7)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
MC-4500 End Cap	9.8 (6.8)	10.3 (7.1)	10.4 (7.4)	10.9 (7.7)
METRIC KILOGRAMS (m³)	230 mm	300 mm	375 mm	450 mm
MC-4500 Chamber	6.691 (4.5)	7.117 (4.2)	7.552 (4.5)	7.987 (4.7)
MC-4500 End Cap	8.891 (5.2)	9.275 (5.4)	9.460 (5.6)	9.845 (5.8)

Note: Assumes 12" (300 mm) of stone above and 9" (230 mm) row spacing and 12" (300 mm) of perimeter stone in front of end caps.

VOLUME EXCAVATION PER CHAMBER YD³ (M³)

	Stone Foundation Depth			
	9" (230 mm)	12" (300 mm)	15" (375mm)	18" (450 mm)
MC-4500 Chamber	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
MC-4500 End Cap	9.3 (7.1)	9.6 (7.3)	9.9 (7.6)	10.2 (7.8)

Note: Assumes 9" (230 mm) of separation between chamber rows, 12" (300 mm) of perimeter in front of the end caps, and 24" (600 mm) of cover. The volume of excavation will varyas depth of cover increases.

Working on a project?
Visit us at www.stormtech.com
and utilize the StormTech Design Tool

For more information on the StormTech MC-4500 Chamber and other ADS products, please contact our Customer Service Representatives at 1-800-821-6710

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

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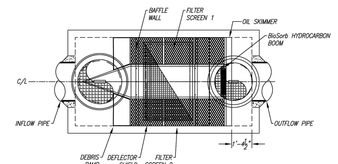
SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			
OUTLET PIPE			
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PEDESTRIAN	
FRAME & COVER		(1) ø36" (1) ø30" (1) 3' X 5' HATCH	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA		
TREATMENT FLOW RATE (CFS)		
SETTLING AREA (SF)		72.0
LOADING RATE (GPM/SF)		//////
SCREEN SYSTEM STORAGE CAPACITY (CF)		47.29
SEDIMENT STORAGE CAPACITY (CF)		203.94
BOD TSS REMOVAL @ ---- MICRON		

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	6.46	1.83	2.00	23.64
SCREEN 2	6.46	1.83	2.00	23.64
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	3.79	6.00	3.00	68.22
CHAMBER 2	3.67	6.00	3.00	66.06
CHAMBER 3	3.87	6.00	3.00	69.66



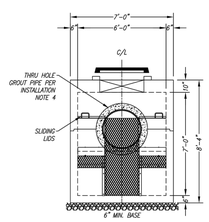
PLAN VIEW

GENERAL NOTES

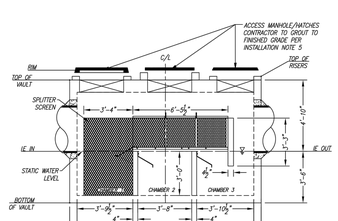
1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE DSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. MANUFACTURER RECOMMENDS A 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



END VIEW



ELEVATION VIEW

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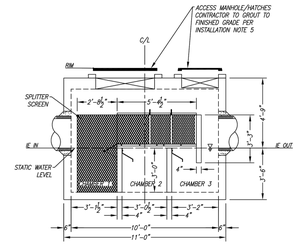
Bio Clean — A Forterra Company

DSBB-6-12-84
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

SITE SPECIFIC DATA			
PROJECT NUMBER			
PROJECT NAME			
PROJECT LOCATION			
STRUCTURE ID			
TREATMENT REQUIRED			
WATER QUALITY FLOW RATE (CFS)			
PEAK FLOW RATE (CFS)			
PEAK STORM DURATION (YEARS)			
PIPE & ELEVATION DATA			
PIPE DATA	I.E.	MATERIAL	DIAMETER
INLET PIPE			24"
OUTLET PIPE			24"
RIM ELEVATION			
LOADING & SOIL DATA			
SURFACE LOADING		PEDESTRIAN	
FRAME & COVER		(1) ø30" (1) 4' X 4' HATCH	
CORROSIVE SOIL CONDITIONS		N/K	
GROUNDWATER ELEVATION		N/K	
NOTES: PRELIMINARY, NOT FOR CONSTRUCTION.			

DSBB PERFORMANCE DATA		
TREATMENT FLOW RATE (CFS)		
SETTLING AREA (SF)		50.0
LOADING RATE (GPM/SF)		//////
SCREEN SYSTEM STORAGE CAPACITY (CF)		34.00
SEDIMENT STORAGE CAPACITY (CF)		140.10
BOD TSS REMOVAL @ ---- MICRON		

DSBB STORAGE CAPACITIES				
CAGE SCREEN CAPACITY				
	LENGTH (FT)	WIDTH (FT)	HEIGHT (FT)	TOTAL (CF)
SCREEN 1	5.38	1.58	2.00	17.00
SCREEN 2	5.38	1.58	2.00	17.00
SEDIMENT CHAMBER CAPACITY				
CHAMBER 1	3.13	5.00	3.00	46.95
CHAMBER 2	3.04	5.00	3.00	45.60
CHAMBER 3	3.17	5.00	3.00	47.55



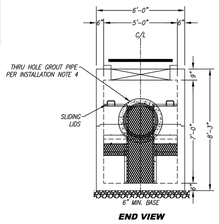
PLAN VIEW

GENERAL NOTES

1. BIO CLEAN TO PROVIDE ALL MATERIALS UNLESS OTHERWISE NOTED.
2. ALL DIMENSIONS, ELEVATIONS, SPECIFICATIONS, AND CAPACITIES ARE SUBJECT TO CHANGE. FOR PROJECT SPECIFIC DRAWINGS DETAILING EXACT DIMENSIONS, WEIGHTS, AND ACCESSORIES PLEASE CONTACT BIO CLEAN.
3. LIDS FOR SCREEN SYSTEM & ALTERNATIVE HATCHES AVAILABLE UPON REQUEST.

INSTALLATION NOTES

1. CONTRACTOR TO PROVIDE ALL LABOR, EQUIPMENT, MATERIALS, AND INCIDENTALS REQUIRED TO OFFLOAD AND INSTALL THE DSBB UNIT AND APPURTENANCES IN ACCORDANCE WITH THIS DRAWING AND THE MANUFACTURER'S SPECIFICATIONS, UNLESS OTHERWISE STATED IN MANUFACTURER'S CONTRACT.
2. MANUFACTURER RECOMMENDS A 6"-12" LEVEL ROCK BASE UNLESS SPECIFIED BY THE PROJECT ENGINEER. CONTRACTOR IS RESPONSIBLE TO VERIFY PROJECT ENGINEERS RECOMMENDED BASE SPECIFICATIONS.
3. ALL PIPES MUST BE FLUSH WITH INSIDE SURFACE OF CONCRETE. (PIPES CANNOT INTRUDE BEYOND FLUSH).
4. ALL GAPS AROUND PIPES SHALL BE SEALED WATER TIGHT WITH A NON-SHRINK GROUT PER MANUFACTURERS STANDARD CONNECTION DETAIL AND SHALL MEET OR EXCEED REGIONAL PIPE CONNECTION STANDARDS.
5. CONTRACTOR RESPONSIBLE FOR INSTALLATION OF ALL RISERS, MANHOLES, AND HATCHES. ALL COVERS SHALL BE SHIPPED LOOSE. CONTRACTOR TO GROUT ALL MANHOLES AND HATCHES TO MATCH FINISHED SURFACE UNLESS SPECIFIED OTHERWISE.



END VIEW

ELEVATION VIEW

PROPRIETARY AND CONFIDENTIAL:

THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF BIOCLEAN, A FORTERRA COMPANY. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF BIOCLEAN, A FORTERRA COMPANY IS PROHIBITED.

Bio Clean — A Forterra Company

DSBB-5-10-84
DUAL STAGE HYDRODYNAMIC SEPARATOR
STANDARD DETAIL

Last Update:1/21/20
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

WQMP SITE MAP

EBS BARTON ROAD WAREHOUSES
BARTON ROAD

PREPARED FOR:
Hager Pacific Properties
4100 Newport Place Drive, Suite 820
Newport Beach, CA 92660
PHONE: (949) 253-7920
FAX: (949) 253-7923

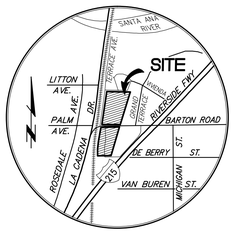
PREPARED BY:
Thienes Engineering, Inc.
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director _____ R.C.E. _____

Sheet 2 of 2 Sheets

3711 / 2 OF 2 SHEETS



VICINITY MAP
N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- 1.00 AC. — SUBAREA AREA
- 100 — NODE NUMBER
- FLOW ARROW (SURFACE)
- FLOW ARROW (PIPE)

0 25 50 100 150

SCALE: 1"=50'

Last Update: 10/10/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY MAP

EBS BARTON ROAD WAREHOUSES
BUILDING 1 SITE
BARTON ROAD AND S. TERRACE AVENUE

3711/1 OF 3 SHEETS

PREPARED FOR:
Hager Pacific Properties – N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
PHONE: (949) 253-7920
FAX: (949) 253-7923

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Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____
Public Works Director _____ R.C.E. XXXXX

Sheet 1 of 3 Sheets

A.T. & S.F. RAILROAD

DIRT CHANNEL

DIRT CHANNEL

NODES 310-311
Q25=0.9 CFS
Tc25=5.0 Min.
Q100=1.2 CFS
Tc100=5.0 Min.
AREA=0.25 Ac.

OUTLET TO DIRT CHANNEL

311

L=15'

0.25 Ac.

310

300

240

230

1.55 Ac.

L=460'

220

0.30 Ac.

NODES 150-152
Q25=5.4 CFS
Tc25=9.3 Min.
Q100=6.8 CFS
Tc100=9.3 Min.
AREA=2.05 Ac.

152

TERRACE AVE.

6" STORM DRAIN

CATCH BASIN

151

L=220'

OFFSITE
NODES
220-221
Q25=1.0 CFS
Tc25=6.3 Min.
Q100=1.3 CFS
Tc100=6.3 Min.
AREA=0.30 Ac.

221

OFFSITE
NODES
200-201
Q25=2.4 CFS
Tc25=7.8 Min.
Q100=3.1 CFS
Tc100=7.8 Min.
AREA=0.85 Ac.

201

2.05 Ac.

L=485'

2.20 Ac.

L=510'

0.35 Ac.

L=425'

0.35 Ac.

L=580'

PARKWAY CULVERT

231

L=370'

0.30 Ac.

211

PARKWAY CULVERT

241

L=410'

SOUTH TERRACE AVENUE

L=975'

L=680'

BARTON ROAD

0.85 Ac.

1.30 Ac.

ROOF DRAIN (TYP.)

160

L=135'

NODES 160-161
Q25=4.3 CFS
Tc25=6.2 Min.
Q100=5.5 CFS
Tc100=6.2 Min.
AREA=1.30 Ac.

161

NODES 300-301
Q25=5.8 CFS
Tc25=7.9 Min.
Q100=7.3 CFS
Tc100=7.9 Min.
AREA=2.00 Ac.

301

L=490'

36" R.C.P. STORM DRAIN

L=90'

SOIL TYPE "B"
SOIL TYPE "C"

CONCRETE CHANNEL

0.75 Ac.

2.00 Ac.

SOIL TYPE "B" - 0.50 Ac.
SOIL TYPE "C" - 1.50 Ac.

NODES 200-256
Q25=50.4 CFS (19.8 CFS ONSITE)
Tc25=14.6 Min.
Q100=66.3 CFS (26.8 CFS ONSITE)
Tc100=21.9 Min.
AREA=33.80 Ac.

256

INLET OPENING

RISER INLET TO STORM DRAIN

L=170'

L=460'

0.45 Ac.

SOIL TYPE "B" - 0.25 Ac.
SOIL TYPE "C" - 0.20 Ac.

0.45 Ac.

BUILDING 2 SITE

SOIL TYPE "B"
SOIL TYPE "C"

6.35 Ac.

SOIL TYPE "B" - 5.30 Ac.
SOIL TYPE "C" - 1.05 Ac.

4.45 Ac.

SOIL TYPE "B" - 0.45 Ac.
SOIL TYPE "C" - 4.00 Ac.

0.25 Ac.

OFFSITE
NODES 250-255
Q25=27.2 CFS
Tc25=20.5 Min.
Q100=35.1 CFS
Tc100=19.8 Min.
AREA=15.20 Ac.

255

0.30 Ac.

L=40'

DE BERRY STREET

254

1.35 Ac.

L=665'

S.C.E. TOWER (TYP.)

PACIFIC ELECTRIC RAILROAD

253

L=250'

SOIL TYPE "B"
SOIL TYPE "C"

1.25 Ac.

SOIL TYPE "B" - 0.75 Ac.
SOIL TYPE "C" - 0.50 Ac.

252

210

OVERPASS

200

SEE RIGHT

251

BARTON ROAD

GRAND TERRACE ROAD

SOIL TYPE "B"
SOIL TYPE "C"

L=980'

5.80 Ac.

SOIL TYPE "B" - 1.30 Ac.
SOIL TYPE "C" - 4.50 Ac.

250

6.50 Ac.

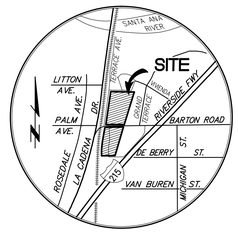
SOIL TYPE "B" - 2.65 Ac.
SOIL TYPE "C" - 3.85 Ac.

L=430'

251

SEE LEFT

SEE SHEET 1



VICINITY MAP
N.T.S.

LEGEND

- PROJECT BOUNDARY
- SUBAREA BOUNDARY
- FLOW PATH
- 1.00 AC. — SUBAREA AREA
- (100) — NODE NUMBER
- FLOW ARROW (SURFACE)
- FLOW ARROW (PIPE)

0 25 50 100 150

SCALE: 1"=50'

Last Update:10/10/19
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CITY OF COLTON
PUBLIC WORKS DEPARTMENT

EXISTING CONDITION HYDROLOGY MAP

EBS BARTON ROAD WAREHOUSES
BUILDING 2 SITE
BARTON ROAD AND S. TERRACE AVENUE

3711/2 OF 3 SHEETS

PREPARED FOR:
Hager Pacific Properties - N.B.
4100 Newport Place Drive, Suite 820
Newport Beach, Ca 92660
PHONE: (949) 253-7920
FAX: (949) 253-7923

Thienes Engineering, Inc.
CIVIL ENGINEERING * LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

Designed by _____ Date _____
Checked by _____ Date _____
Designed by _____ Date _____
Checked by _____ Date _____

Approved by _____ Date _____

Public Works Director _____ R.C.E. XXXXX

Sheet 2 of 3 Sheets

Section 6.2
Electronic Submittal

6.3 Post Construction

Attachment D – WQMP and Stormwater BMP Transfer, Access and Maintenance Agreement

Attachment D
WQMP and Stormwater BMP Transfer, Access and Maintenance Agreement

Water Quality Management Plan and Storm Water BMP Transfer, Access and Maintenance Agreement (adapted from documents from the Ventura County Storm Water Management Program)

Recorded at the request of:

City of Colton

After recording, return to:

City of Colton

City Clerk

Water Quality Management Plan and Storm Water BMP Transfer, Access and Maintenance Agreement

OWNER: Hager Pacific Properties

PROPERTY ADDRESS: Barton Road

Colton, CA 92324

APN: 1167-131-003, -004 & 1167-051-002, -015, -016, -018, -019, -020, 1167-061-006, 0275-223-023, -044 & -045

THIS AGREEMENT is made and entered into in _____, California, this _____ day of _____2020____ , by and between Hager Pacific Properties, herein after referred to as "Owner" and the CITY OF Colton , a municipal corporation, located in the County of San Bernardino, State of California hereinafter referred to as "CITY";

WHEREAS, the Owner owns real property ("Property") in the City of

Colton, County of San Bernardino, State of California, more specifically described in Exhibit "A" and depicted in Exhibit "B", each of which exhibits is attached hereto and incorporated herein by this reference;

WHEREAS, at the time of initial approval of development project known as

EBS Barton Road Warehouses within the Property described herein, the City required the project to employ Best Management Practices, hereinafter referred to as "BMPs," to minimize pollutants in urban runoff;

WHEREAS, the Owner has chosen to install and/or implement BMPs as described in the Water Quality Management Plan, on file with the City, hereinafter referred to as "WQMP", to minimize pollutants in urban runoff and to minimize other adverse impacts of urban runoff;

WHEREAS, said WQMP has been certified by the Owner and reviewed and approved by the City;

WHEREAS, said BMPs, with installation and/or implementation on private property and draining only private property, are part of a private facility with all maintenance or replacement, therefore, the sole responsibility of the Owner in accordance with the terms of this Agreement;

WHEREAS, the Owner is aware that periodic and continuous maintenance, including, but not necessarily limited to, filter material replacement and sediment removal, is required to assure peak performance of all BMPs in the WQMP and that, furthermore, such maintenance activity will require compliance with all Local, State, or Federal laws and regulations, including those pertaining to confined space and waste disposal methods, in effect at the time such maintenance occurs;

NOW THEREFORE, it is mutually stipulated and agreed as follows:

1. Owner hereby provides the City of City's designee complete access, of any duration, to the BMPs and their immediate vicinity at any time, upon reasonable notice, or in the event of emergency, as determined by City's Director of Public Works no advance notice, for the purpose of inspection, sampling, testing of the Device, and in case of emergency, to undertake all necessary repairs or other preventative measures at owner's expense as provided in paragraph 3 below. City shall make every effort at all times to minimize or avoid interference with Owner's use of the Property.

2. Owner shall use its best efforts diligently to maintain all BMPs in a manner assuring peak performance at all times. All reasonable precautions shall be exercised by Owner and Owner's representative or contractor in the removal and extraction of any material(s) from the BMPs and the ultimate disposal of the material(s) in a manner consistent with all relevant laws and regulations in effect at the time. As may be requested from time to time by the City, the Owner shall provide the City with documentation identifying the material(s) removed, the quantity, and disposal destination.

3. In the event Owner, or its successors or assigns, fails to accomplish the necessary maintenance contemplated by this Agreement, within five (5) days of being given written notice by the City, the City is hereby authorized to cause any maintenance necessary to be done and charge the entire cost and expense to the Owner or Owner's successors or assigns, including administrative costs, attorneys fees and interest thereon at the maximum rate authorized by the Civil Code from the date of the notice of expense until paid in full.

4. The City may require the owner to post security in form and for a time period satisfactory to the city to guarantee the performance of the obligations state herein. Should the Owner fail to perform the obligations under the Agreement, the City may, in the case of a cash bond, act for the Owner using the proceeds from it, or in the case of a surety bond, require the sureties to perform the obligations of the Agreement. As an additional remedy, the Director may withdraw any previous storm water-related approval with respect to the property on which BMPs have been installed and/or implemented until such time as Owner repays to City its reasonable costs incurred in accordance with paragraph 3 above.

5. This agreement shall be recorded in the Office of the Recorder of San Bernardino County, California, at the expense of the Owner and shall constitute notice to all successors and assigns of the title to said Property of the obligation herein set forth, and also a lien in such amount as will fully reimburse the City, including interest as herein above set forth, subject to foreclosure in event of default in payment.

6. In event of legal action occasioned by any default or action of the Owner, or its successors or assigns, then the Owner and its successors or assigns agree(s) to pay all costs incurred by the City in enforcing the terms of this Agreement, including reasonable attorney's fees and costs, and that the same shall become a part of the lien against said Property.

7. It is the intent of the parties hereto that burdens and benefits herein undertaken shall constitute covenants that run with said Property and constitute a lien there against.

8. The obligations herein undertaken shall be binding upon the heirs, successors, executors, administrators and assigns of the parties hereto. The term "Owner" shall include not only the present Owner, but also its heirs, successors, executors, administrators, and assigns. Owner shall notify any successor to title of all or part of the Property about the existence of this Agreement. Owner shall provide such notice prior to such successor obtaining an interest in all or part of the Property. Owner shall provide a copy of such notice to the City at the same time such notice is provided to the successor.

9. Time is of the essence in the performance of this Agreement.

10. Any notice to a party required or called for in this Agreement shall be served in person, or by deposit in the U.S. Mail, first class postage prepaid, to the address set forth below. Notice(s) shall be deemed effective upon receipt, or seventy-two (72) hours after deposit in the U.S. Mail, whichever is earlier. A party may change a notice address only by providing written notice thereof to the other party.

IF TO CITY:

City of Colton – Engineering Department

160 South 10th Street

Newport Beach, CA 92660

(909) 370-5099

IF TO OWNER:

Hager Pacific Properties

4100 Newport Place Drive, Suite 820

Newport Beach, CA 92660

(949) 253-7920

IN WITNESS THEREOF, the parties hereto have affixed their signatures as of the date first written above.

APPROVED AS TO FORM:

City Attorney

CITY OF

Name

Title

ATTEST:

City Clerk Date

OWNER:

Name

Title

OWNER:

Name

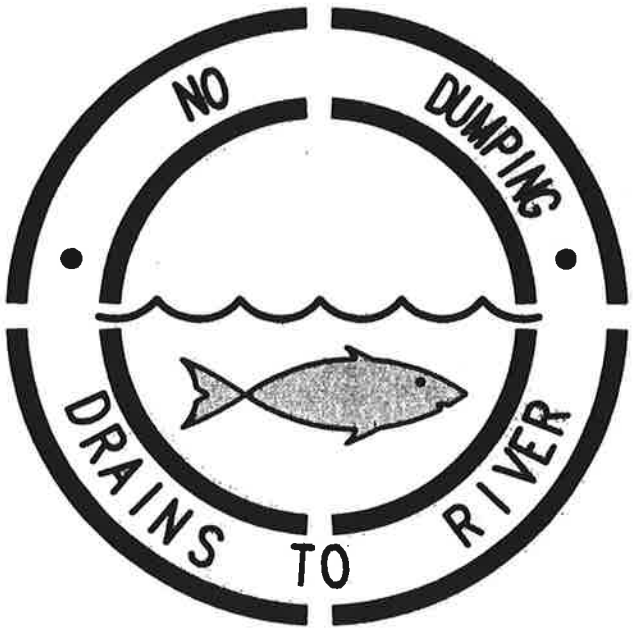
Title

NOTARIES ON FOLLOWING PAGE

6.4 Other Supporting Documentation

- **Attachment E –Educational Materials**
- **Attachment F – Infiltration Report**

Attachment E
Educational Materials



SAMPLE STENCIL TO BE USED NEAR GRATE AND CURB OPENING INLETS

SYMBOL TO BE 24" IN DIAMETER

Thienes Engineering
CIVIL ENGINEERING • LAND SURVEYING
14349 FIRESTONE BOULEVARD
LA MIRADA, CALIFORNIA 90638
PH.(714)521-4811 FAX(714)521-4173

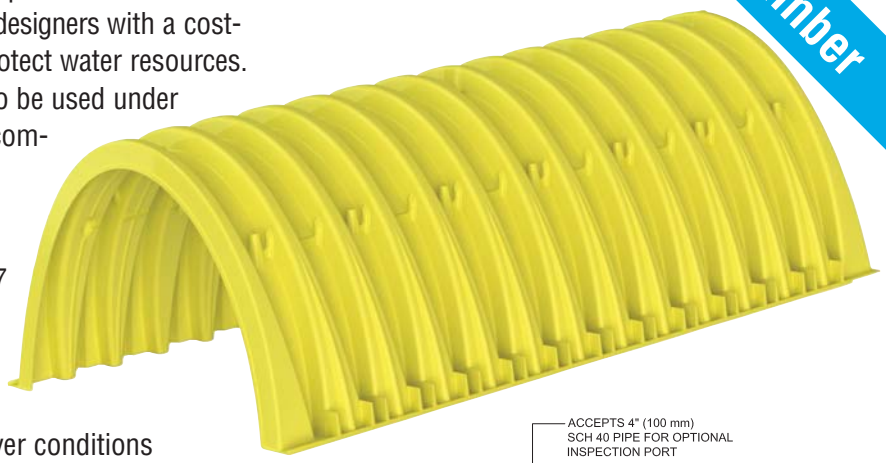
SAMPLE CATCH BASIN STENCIL
PER BMP SD-13

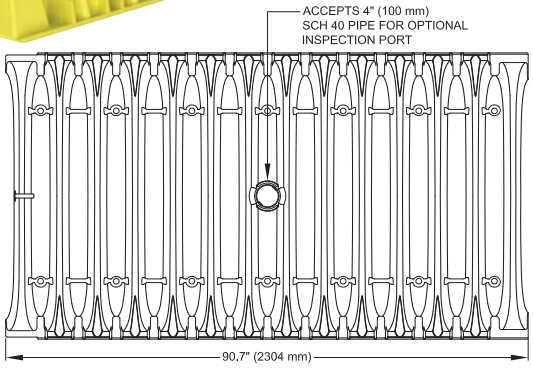
StormTech DC-780 Chamber

DC-780 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.

- 12' Deep Cover applications.
- Designed in accordance with ASTM F 2787 and produced to meet the ASTM F 2418 product standard.
- AASHTO safety factors provided for AASHTO Design Truck (H20) and deep cover conditions





StormTech DC-780 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	85.4" x 51.0" x 30.0" (2169 x 1295 x 762 mm)
Chamber Storage	46.2 ft³ (1.3 m³)
Min. Installed Storage*	78.4 ft³ (2.2 m³)

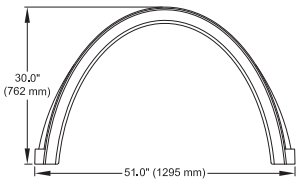
* Assumes 9" (230 mm) stone below, 6" (150 mm) stone above, 6" (150 mm) row spacing and 40% stone porosity.

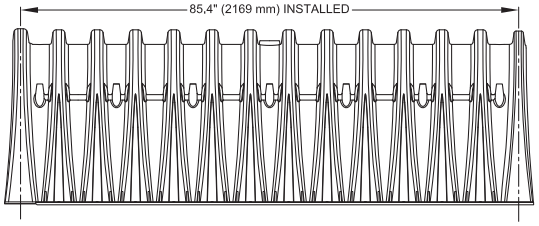
Shipping

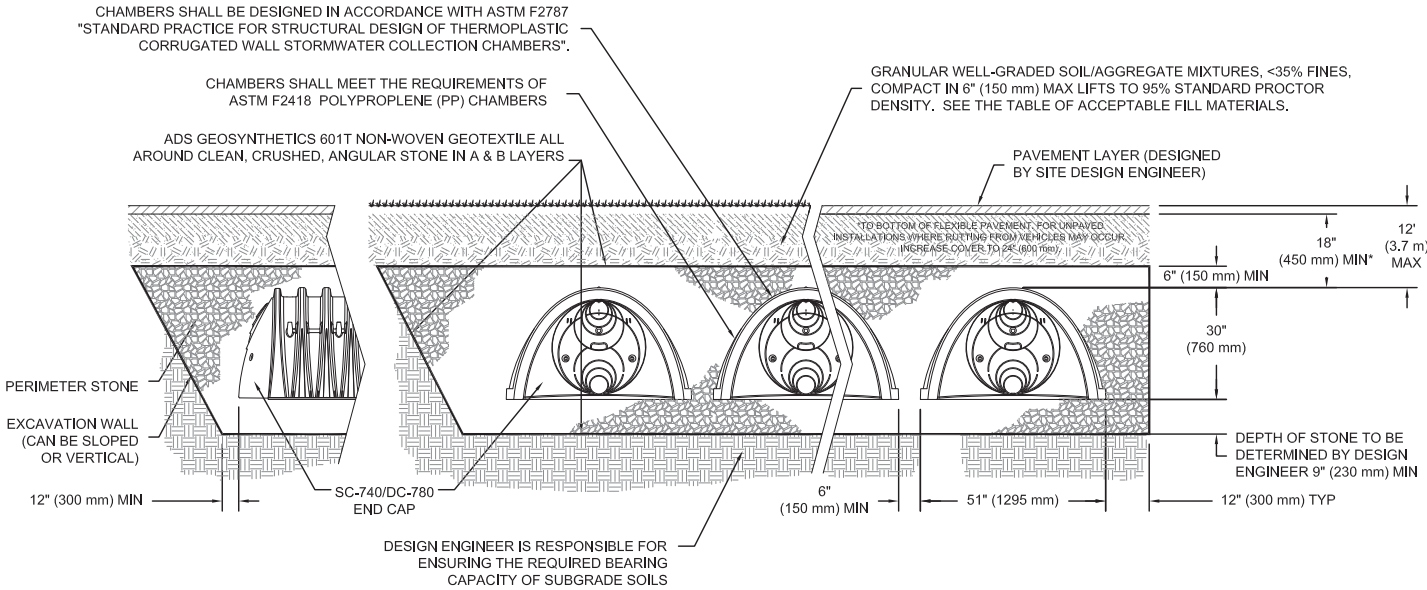
24 chambers/pallet

60 end caps/pallet

12 pallets/truck







THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

StormTech DC-780 Chamber

DC-780 Cumulative Storage Volumes Per Chamber

Assumes 40% Stone Porosity. Calculations are Based Upon a 9" (230 mm) Stone Base Under the Chambers.

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
45 (1143)	46.27 (1.310)	78.47 (2.222)
44 (1118)	46.27 (1.310)	77.34 (2.190)
43 (1092)	Stone 46.27 (1.310)	76.21 (2.158)
42 (1067)	Cover 46.27 (1.310)	75.09 (2.126)
41 (1041)	46.27 (1.310)	73.96 (2.094)
40 (1016)	46.27 (1.310)	72.83 (2.062)
39 (991)	46.27 (1.310)	71.71 (2.030)
38 (965)	46.21 (1.309)	70.54 (1.998)
37 (940)	46.04 (1.304)	69.32 (1.963)
36 (914)	45.76 (1.296)	68.02 (1.926)
35 (889)	45.15 (1.278)	66.53 (1.884)
34 (864)	44.34 (1.255)	64.91 (1.838)
33 (838)	43.38 (1.228)	63.21 (1.790)
32 (813)	42.29 (1.198)	61.43 (1.740)
31 (787)	41.11 (1.164)	59.59 (1.688)
30 (762)	39.83 (1.128)	57.70 (1.634)
29 (737)	38.47 (1.089)	55.76 (1.579)
28 (711)	37.01 (1.048)	53.76 (1.522)
27 (686)	35.49 (1.005)	51.72 (1.464)
26 (660)	33.90 (0.960)	49.63 (1.405)
25 (635)	32.24 (0.913)	47.52 (1.346)
24 (610)	30.54 (0.865)	45.36 (1.285)
23 (584)	28.77 (0.815)	43.18 (1.223)
22 (559)	26.96 (0.763)	40.97 (1.160)
21 (533)	25.10 (0.711)	38.72 (1.096)
20 (508)	23.19 (0.657)	36.45 (1.032)
19 (483)	21.25 (0.602)	34.16 (0.967)
18 (457)	19.26 (0.545)	31.84 (0.902)
17 (432)	17.24 (0.488)	29.50 (0.835)
16 (406)	15.19 (0.430)	27.14 (0.769)
15 (381)	13.10 (0.371)	24.76 (0.701)
14 (356)	10.98 (0.311)	22.36 (0.633)
13 (330)	8.83 (0.250)	19.95 (0.565)
12 (305)	6.66 (0.189)	17.52 (0.496)
11 (279)	4.46 (0.126)	15.07 (0.427)

DC-780 Cumulative Storage Volumes Per Chamber (cont.)

Depth of Water in System Inches (mm)	Cumulative Chamber Storage ft³ (m³)	Total System Cumulative Storage ft³ (m³)
10 (254)	2.24 (0.064)	12.61 (0.357)
9 (229)	0	10.14 (0.287)
8 (203)	0	9.01 (0.255)
7 (178)	0	7.89 (0.223)
6 (152)	0	6.76 (0.191)
5 (127)	Stone Foundation 0	5.63 (0.160)
4 (102)	0	4.51 (0.128)
3 (76)	0	3.38 (0.096)
2 (51)	0	2.25 (0.064)
1 (25)	0	1.13 (0.032)

Note: Add 1.13 cu. ft. (0.032 m³) of storage for each additional inch (25 mm) of stone foundation.

Storage Volume Per Chamber ft³ (m³)

	Bare Chamber Storage ft³ (m³)	Chamber and Stone Volume- Stone Foundation Depth inches (millimeters)		
		9 (230)	12 (300)	18 (450)
StormTech DC-780	46.2 (1.3)	78.4 (2.2)	81.8 (2.3)	88.6 (2.5)

Note: Assumes 40% porosity for the stone, the bare chamber volume, 6" (150 mm) stone above, and 6" (150 mm) row spacing.

Amount of Stone Per Chamber

	Stone Foundation Depth		
ENGLISH TONS (YD³)	9"	12"	18"
StormTech DC-780	4.2 (3.0 yd³)	4.7 (3.3 yd³)	5.6 (3.9 yd³)
METRIC KILOGRAMS (M³)	**230 mm**	**300 mm**	**450 mm**
StormTech DC-780	3810 (2.3 m³)	4264 (2.5 m³)	5080 (3.0 m³)

Note: Assumes 6" (150 mm) of stone above, and between chambers.

Volume of Excavation Per Chamber yd³ (m³)

	Stone Foundation Depth		
	9" (230 mm)	12" (300 mm)	18" (450 mm)
StormTech DC-780	5.9 (4.5)	6.3 (4.8)	6.9 (5.3)

Note: Assumes 6" (150 mm) of separation between chamber rows and 18" (450 mm) of cover. The volume of excavation will vary as the depth of the cover increases.

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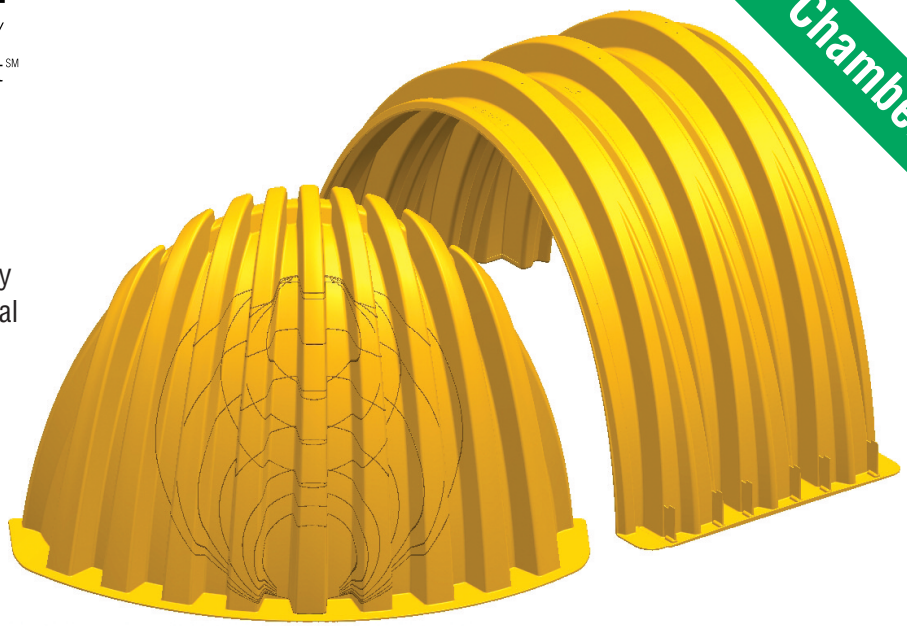
Subsurface Stormwater Management℠

MC-4500 Chamber

StormTech™ MC-4500 Chamber

Designed to meet the most stringent industry performance standards for superior structural integrity while providing designers with a cost-effective method to save valuable land and protect water resources. The StormTech system is designed primarily to be used under parking lots thus maximizing land usage for commercial and municipal applications.



StormTech MC-4500 Chamber (not to scale)

Nominal Chamber Specifications

Size (L x W x H)	52" (1321 mm) x 100" (2540 mm) x 60" (1524 mm)
Chamber Storage	106.5 ft³ (3.01 m³)
Min. Installed Storage*	162.6 ft³ (4.60 m³)
Nominal Weight	120 lbs (54.4 kg)

* This assumes a minimum of 12" (305 mm) of stone above, 9" (229 mm) of stone below chambers, 9" (229 mm) of stone between chambers/end caps and 40% stone porosity.

StormTech MC-4500 End Cap (not to scale)

Nominal End Cap Specifications

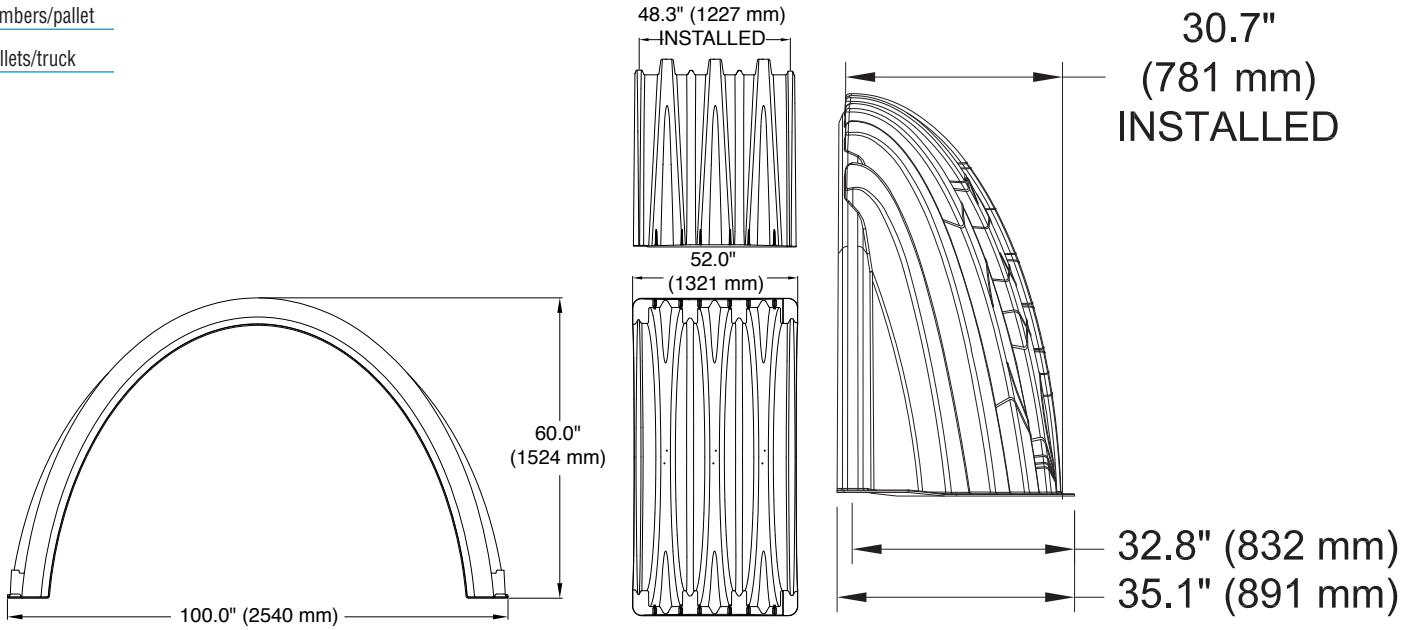
Size (L x W x H)	35.1" (891 mm) x 90.2" (2291 mm) x 59.4" (1509 mm)
End Cap Storage	35.7 ft³ (1.01 m³)
Min. Installed Storage*	108.7 ft³ (3.08 m³)
Nominal Weight	120 lbs (54.4 kg)

*This assumes a minimum of 12" (305 mm) of stone above, 9" (229 mm) of stone below, 12" (305 mm) of stone perimeter, 9" (229 mm) of stone between chambers/end caps and 40% stone porosity.

Shipping

8 chambers/pallet

11 pallets/truck



Storage Volume Per Chamber/End Cap ft³ (m³)

	Bare Unit Storage	Chamber/End Cap and Stone Volume — Stone Foundation Depth in. (mm)			
	ft³ (m³)	9" (229 mm)	12" (305 mm)	15" (381 mm)	18" (457 mm)
Chamber	106.5 (3.02)	162.6 (4.60)	166.3 (4.71)	169.9 (4.81)	173.6 (4.91)
End Cap	35.7 (1.01)	108.7 (3.08)	111.9 (3.17)	115.2 (3.26)	118.4 (3.35)

NOTE: Assumes 9" (229 mm) min. row spacing, 12" (305 mm) min. of stone above, 40% stone porosity and includes the bare chamber/end cap volume. End cap volume assumes 12" (305 mm) min. stone perimeter.

Volume of Excavation Per Chamber/End Cap in yd³ (m³)

	Stone Foundation Depth			
	9" (229 mm)	12" (305 mm)	15" (381 mm)	18" (457 mm)
Chamber	10.5 (8.0)	10.8 (8.3)	11.2 (8.5)	11.5 (8.8)
End Cap	9.3 (7.1)	9.6 (7.3)	9.9 (7.6)	10.2 (7.8)

NOTE: Assumes 9" (229 mm) min. of separation between chamber rows, 12" (305 mm) min. of perimeter in front of end caps, and 24" (610 mm) of cover. The volume of excavation will vary as the depth of cover increases.

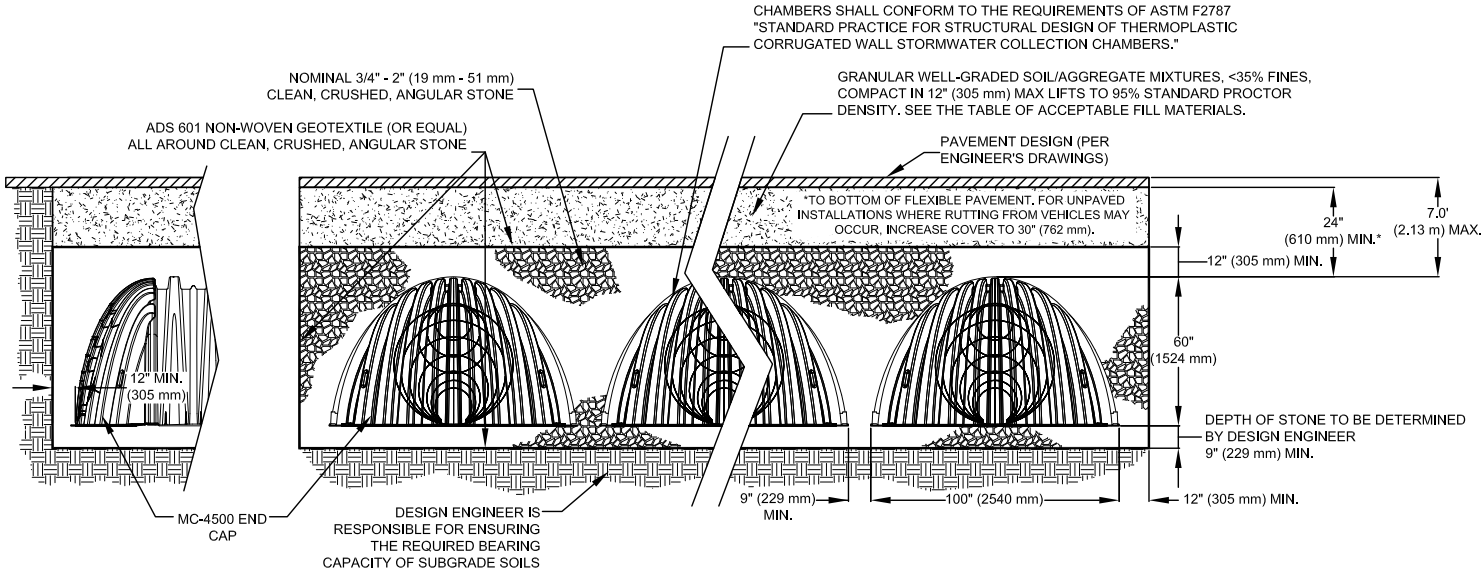
Amount of Stone Per Chamber

ENGLISH tons (yds³)	Stone Foundation Depth			
	9" (229 mm)	12" (305 mm)	15" (381 mm)	18" (457 mm)
Chamber	7.4 (5.2)	7.8 (5.5)	8.3 (5.9)	8.8 (6.2)
End Cap	9.6 (6.8)	10.0 (7.1)	10.4 (7.4)	10.9 (7.7)
METRIC kg (m³)	**229 mm**	**305 mm**	**381 mm**	**457 mm**
Chamber	6681 (4.0)	7117 (4.2)	7552 (4.5)	7987 (4.7)
End Cap	8691 (5.2)	9075 (5.4)	9460 (5.6)	9845 (5.9)

NOTE: Assumes 12" (305 mm) of stone above, 9" (229 mm) min. row spacing, and 12" (305 mm) min. of perimeter stone in front of end caps.

General Cross Section

**Contact your local StormTech representative or visit www.stormtech.com for a copy of the latest installation instructions.



THE INSTALLED CHAMBER SYSTEM SHALL PROVIDE THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS SECTION 12.12 FOR EARTH AND LIVE LOADS, WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.

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Division of ADS

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Isolator® Row O&M Manual

THE MOST ADVANCED NAME IN WATER MANAGEMENT SOLUTIONS™

ADS®

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

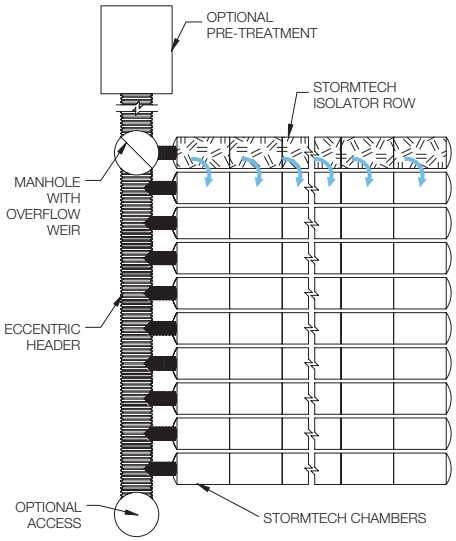
The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

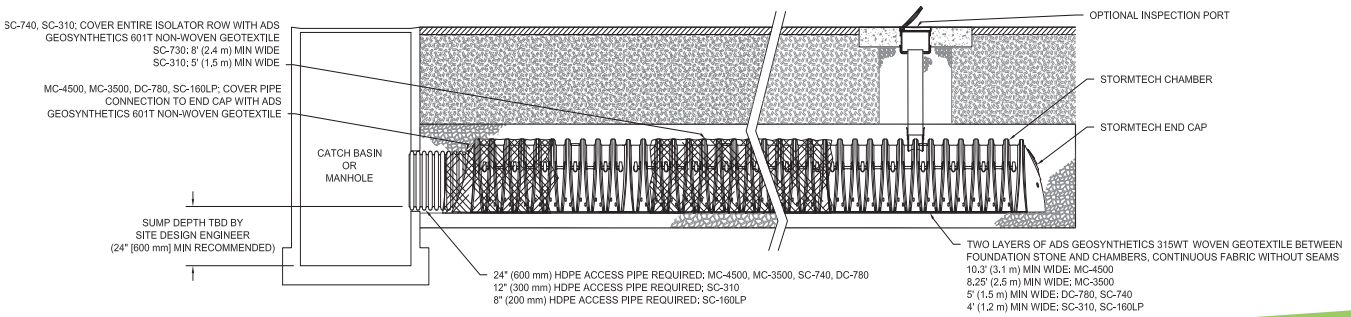
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



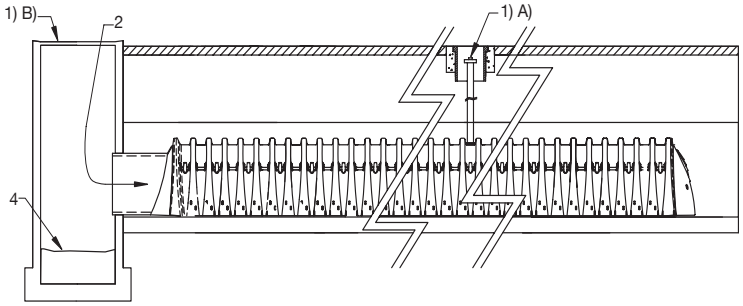
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

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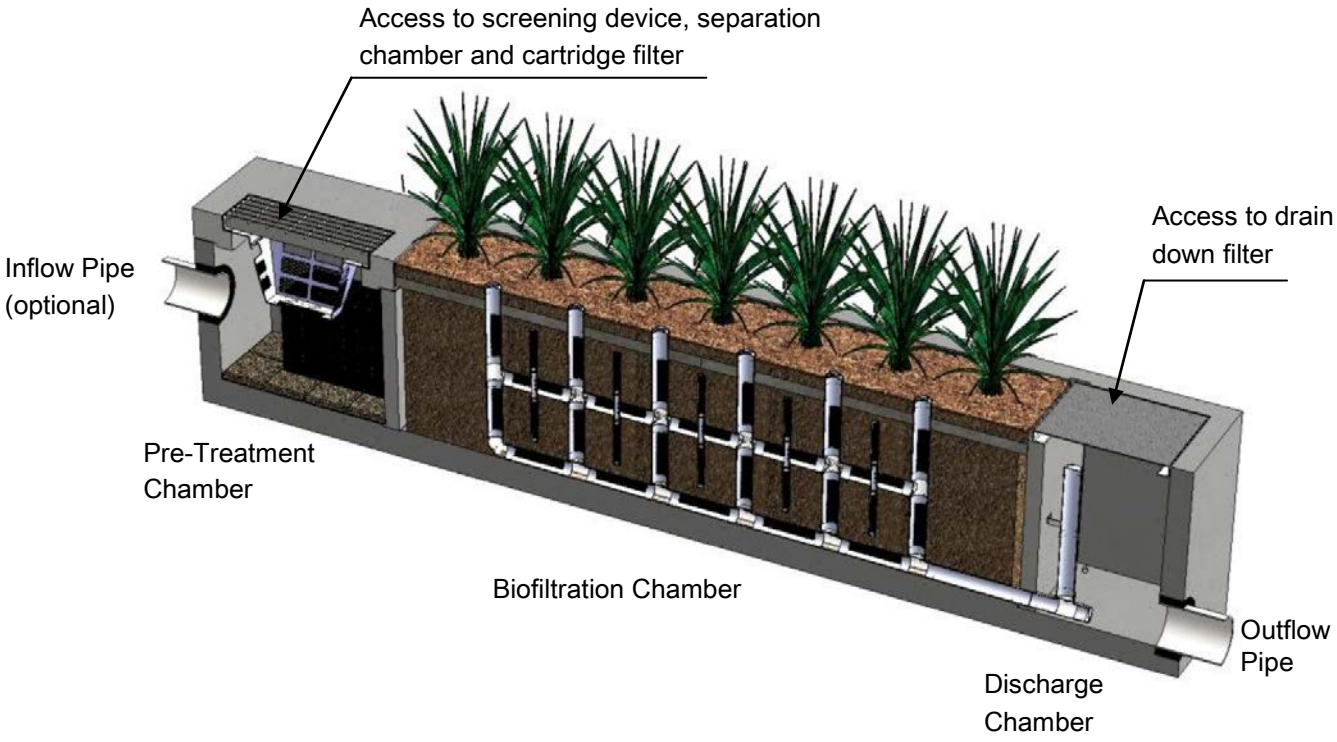
Maintenance Guidelines for Modular Wetland System - Linear

Maintenance Summary

- Remove Trash from Screening Device – average maintenance interval is 6 to 12 months.
  - (*5 minute average service time*).
- Remove Sediment from Separation Chamber – average maintenance interval is 12 to 24 months.
  - (*10 minute average service time*).
- Replace Cartridge Filter Media – average maintenance interval 12 to 24 months.
  - (*10-15 minute per cartridge average service time*).
- Replace Drain Down Filter Media – average maintenance interval is 12 to 24 months.
  - (*5 minute average service time*).
- Trim Vegetation – average maintenance interval is 6 to 12 months.
  - (*Service time varies*).

System Diagram



Maintenance Procedures

Screening Device

1. Remove grate or manhole cover to gain access to the screening device in the Pre-Treatment Chamber. Vault type units do not have screening device. Maintenance can be performed without entry.
2. Remove all pollutants collected by the screening device. Removal can be done manually or with the use of a vacuum truck. The hose of the vacuum truck will not damage the screening device.
3. Screening device can easily be removed from the Pre-Treatment Chamber to gain access to separation chamber and media filters below. Replace grate or manhole cover when completed.

Separation Chamber

1. Perform maintenance procedures of screening device listed above before maintaining the separation chamber.
2. With a pressure washer spray down pollutants accumulated on walls and cartridge filters.
3. Vacuum out Separation Chamber and remove all accumulated pollutants. Replace screening device, grate or manhole cover when completed.

Cartridge Filters

1. Perform maintenance procedures on screening device and separation chamber before maintaining cartridge filters.
2. Enter separation chamber.
3. Unscrew the two bolts holding the lid on each cartridge filter and remove lid.
4. Remove each of 4 to 8 media cages holding the media in place.
5. Spray down the cartridge filter to remove any accumulated pollutants.
6. Vacuum out old media and accumulated pollutants.
7. Reinstall media cages and fill with new media from manufacturer or outside supplier. Manufacturer will provide specification of media and sources to purchase.
8. Replace the lid and tighten down bolts. Replace screening device, grate or manhole cover when completed.

Drain Down Filter

1. Remove hatch or manhole cover over discharge chamber and enter chamber.
2. Unlock and lift drain down filter housing and remove old media block. Replace with new media block. Lower drain down filter housing and lock into place.
3. Exit chamber and replace hatch or manhole cover.

Maintenance Notes

1. Following maintenance and/or inspection, it is recommended the maintenance operator prepare a maintenance/inspection record. The record should include any maintenance activities performed, amount and description of debris collected, and condition of the system and its various filter mechanisms.

2. The owner should keep maintenance/inspection record(s) for a minimum of five years from the date of maintenance. These records should be made available to the governing municipality for inspection upon request at any time.

3. Transport all debris, trash, organics and sediments to approved facility for disposal in accordance with local and state requirements.

4. Entry into chambers may require confined space training based on state and local regulations.

5. No fertilizer shall be used in the Biofiltration Chamber.

6. Irrigation should be provided as recommended by manufacturer and/or landscape architect. Amount of irrigation required is dependent on plant species. Some plants may require irrigation.

Maintenance Procedure Illustration

Screening Device

The screening device is located directly under the manhole or grate over the Pre-Treatment Chamber. It's mounted directly underneath for easy access and cleaning. Device can be cleaned by hand or with a vacuum truck.

Separation Chamber

The separation chamber is located directly beneath the screening device. It can be quickly cleaned using a vacuum truck or by hand. A pressure washer is useful to assist in the cleaning process.

Cartridge Filters

The cartridge filters are located in the Pre-Treatment chamber connected to the wall adjacent to the biofiltration chamber. The cartridges have removable tops to access the individual media filters. Once the cartridge is open media can be easily removed and replaced by hand or a vacuum truck.

Drain Down Filter

The drain down filter is located in the Discharge Chamber. The drain filter unlocks from the wall mount and hinges up. Remove filter block and replace with new block.

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Trim Vegetation

Vegetation should be maintained in the same manner as surrounding vegetation and trimmed as needed. No fertilizer shall be used on the plants. Irrigation per the recommendation of the manufacturer and or landscape architect. Different types of vegetation requires different amounts of irrigation.

Inspection Form

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E. Info@BioCleanEnvironmental.com

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Inspection Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ___/___/___ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Inspection Checklist

Modular Wetland System Type (Curb, Grate or UG Vault): _____ Size (22', 14' or etc.): _____

Structural Integrity:	**Yes**	**No**	**Comments**
Damage to pre-treatment access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Damage to discharge chamber access cover (manhole cover/grate) or cannot be opened using normal lifting pressure?			
Does the MWS unit show signs of structural deterioration (cracks in the wall, damage to frame)?			
Is the inlet/outlet pipe or drain down pipe damaged or otherwise not functioning properly?			
Working Condition:			
Is there evidence of illicit discharge or excessive oil, grease, or other automobile fluids entering and clogging the unit?			
Is there standing water in inappropriate areas after a dry period?			
Is the filter insert (if applicable) at capacity and/or is there an accumulation of debris/trash on the shelf system?			
Does the depth of sediment/trash/debris suggest a blockage of the inflow pipe, bypass or cartridge filter? If yes, specify which one in the comments section. Note depth of accumulation in in pre-treatment chamber.			Depth:
Does the cartridge filter media need replacement in pre-treatment chamber and/or discharge chamber?			Chamber:
Any signs of improper functioning in the discharge chamber? Note issues in comments section.			
Other Inspection Items:			
Is there an accumulation of sediment/trash/debris in the wetland media (if applicable)?			
Is it evident that the plants are alive and healthy (if applicable)? Please note Plant Information below.			
Is there a septic or foul odor coming from inside the system?			

Waste:	**Yes**	**No**
Sediment / Silt / Clay		
Trash / Bags / Bottles		
Green Waste / Leaves / Foliage		

Recommended Maintenance	
No Cleaning Needed	
Schedule Maintenance as Planned	
Needs Immediate Maintenance	

Plant Information	
Damage to Plants	
Plant Replacement	
Plant Trimming	

Additional Notes: _____

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Maintenance Report

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Cleaning and Maintenance Report
Modular Wetlands System

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Manufacturer / Description / Sizing	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Total Debris Accumulation	Condition of Media 25/50/75/100 (will be changed @ 75%)	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:	MWS Catch Basins						
		MWS Sedimentation Basin						
		Media Filter Condition						
		Plant Condition						
		Drain Down Media Condition						
		Discharge Chamber Condition						
		Drain Down Pipe Condition						
		Inlet and Outlet Pipe Condition						

Comments:

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Drain Inserts MP-52

Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

California Experience

The number of installations is unknown but likely exceeds a thousand. Some users have reported that these systems require considerable maintenance to prevent plugging and bypass.

Advantages

- Does not require additional space as inserts as the drain inlets are already a component of the standard drainage systems.
- Easy access for inspection and maintenance.
- As there is no standing water, there is little concern for mosquito breeding.
- A relatively inexpensive retrofit option.

Limitations

Performance is likely significantly less than treatment systems that are located at the end of the drainage system such as ponds and vaults. Usually not suitable for large areas or areas with trash or leaves than can plug the insert.

Design and Sizing Guidelines

Refer to manufacturer's guidelines. Drain inserts come any many configurations but can be placed into three general groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are

Design Considerations

- Use with other BMPs
- Fit and Seal Capacity within Inlet

Targeted Constituents

- ☑ Sediment
- ☑ Nutrients
- ☑ Trash
- ☑ Metals
- Bacteria
- ☑ Oil and Grease
- ☑ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

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one box; that is, the setting area and filtration through media occurs in the same box. One manufacturer has a double-box. Stormwater enters the first box where setting occurs. The stormwater flows into the second box where the filter media is located. Some products consist of one or more trays or mesh grates. The trays can hold different types of media. Filtration media vary with the manufacturer: types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Construction/Inspection Considerations

Be certain that installation is done in a manner that makes certain that the stormwater enters the unit and does not leak around the perimeter. Leakage between the frame of the insert and the frame of the drain inlet can easily occur with vertical (drop) inlets.

Performance

Few products have performance data collected under field conditions.

Siting Criteria

It is recommended that inserts be used only for retrofit situations or as pretreatment where other treatment BMPs presented in this section area used.

Additional Design Guidelines

Follow guidelines provided by individual manufacturers.

Maintenance

Likely require frequent maintenance, on the order of several times per year.

Cost

- The initial cost of individual inserts ranges from less than $100 to about $2,000. The cost of using multiple units in curb inlet drains varies with the size of the inlet.
- The low cost of inserts may tend to favor the use of these systems over other, more effective treatment BMPs. However, the low cost of each unit may be offset by the number of units that are required, more frequent maintenance, and the shorter structural life (and therefore replacement).

References and Sources of Additional Information

Hrachovec, R., and G. Minton, 2001, Field testing of a sock-type catch basin insert, Planet CPR, Seattle, Washington

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Manufacturers literature

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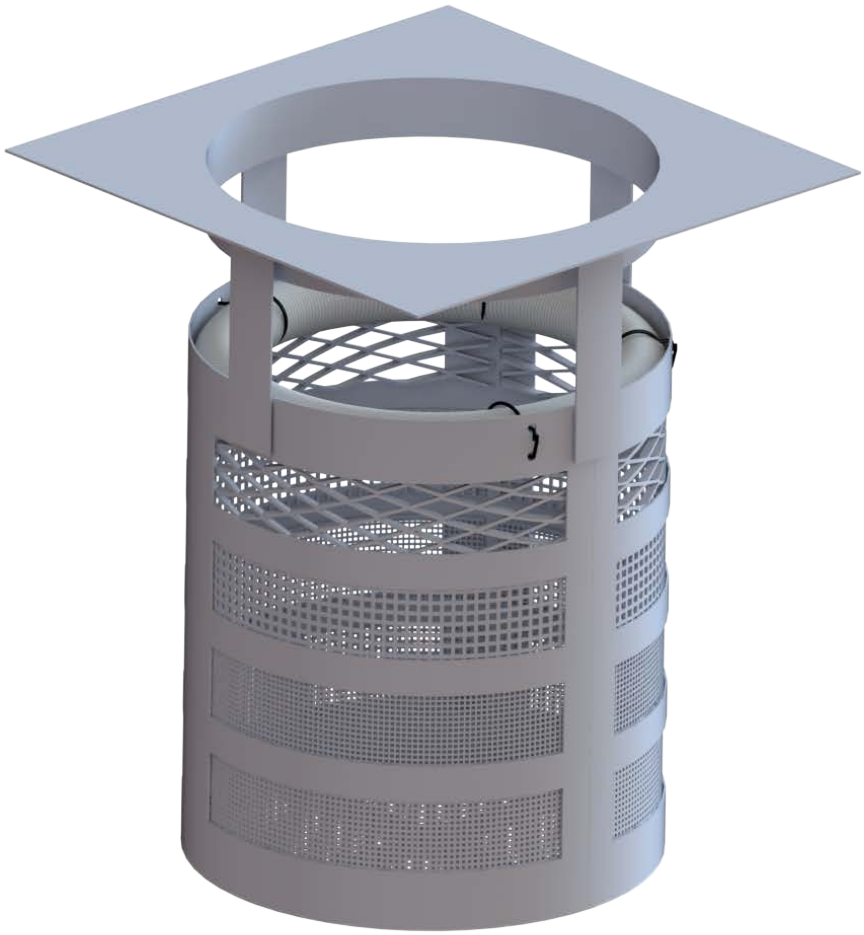
Woodward Clyde, June 11, 1996, Parking Lot Monitoring Report, Santa Clara Valley Nonpoint Source Pollution Control Program.

Grate Inlet Filter
MLS Type

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



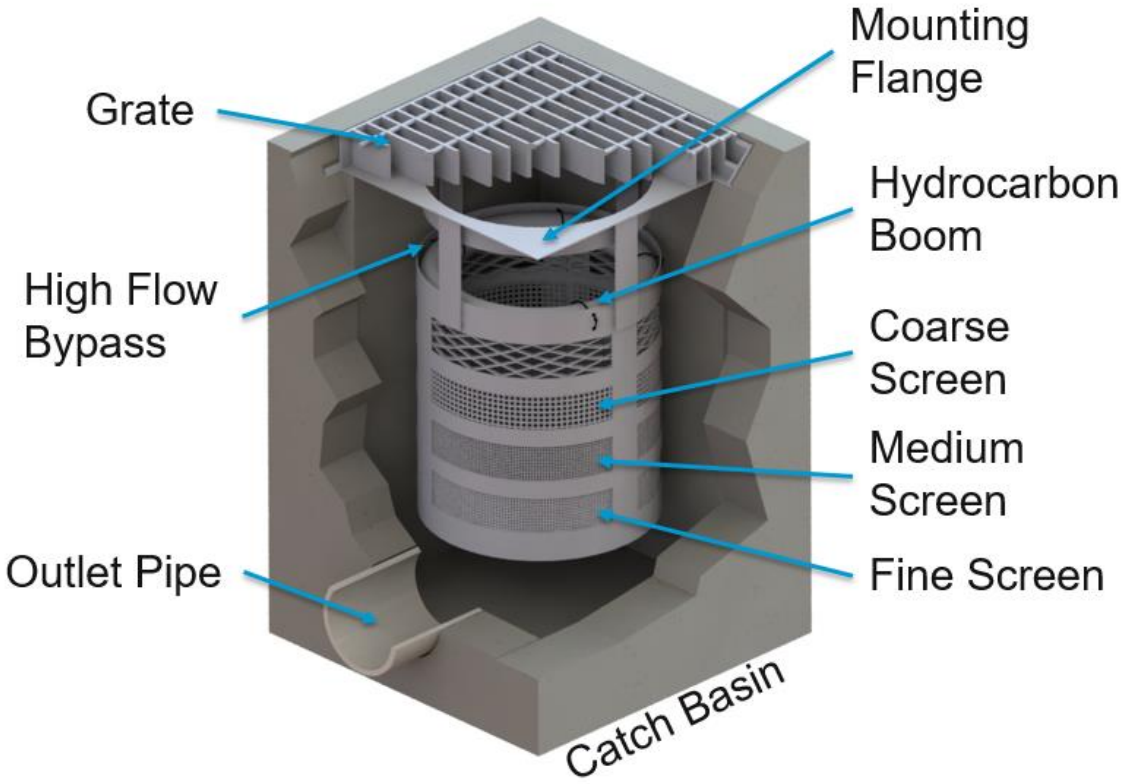
Bio Clean Environmental Services, Inc.
398 Via El Centro
Oceanside, CA 92058

www.BioCleanEnvironmental.com
p: 760.433.7640
f: 760.433.3176

OPERATION & MAINTENANCE

The Bio Clean Grate Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the multi-level screening configuration. A supplemental manual is available for the trash full capture configuration, as well as the Kraken and media filter variations. This filter is made of 100% stainless steel and is available in various sizes and depths allowing it to fit in any grated catch basin inlet. The filter's heavy duty construction allows for cleaning with any vacuum truck. The filter can also easily be cleaned by hand.

As with all stormwater BMPs, inspection and maintenance on the Grate Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Grate Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Grate Inlet Filter are quick and easy. As mentioned above, the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Grate Inlet Filter can be inspected though visual observation. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open grated inlet. Once the grate has been safely removed the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the filter with the grate removed.
- Look for any out of the ordinary obstructions on the grate or in the filter and its bypass. Write down any observations on the inspection form.
- Through observation and/or digital photographs, estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the filter basket and its bypass.
- Excessive accumulation of trash, foliage and sediment in the filter basket. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-GRATE-12-12-18	10.00	18.00	0.41	0.82
BC-GRATE-18-18-18	16.00	18.00	1.05	2.09
BC-GRATE-24-24-24	21.00	24.00	2.40	4.81
BC-GRATE-30-30-24	27.00	24.00	3.97	7.95
BC-GRATE-25-38-24	21.00	24.00	4.15	8.31
BC-GRATE-36-36-24	33.00	24.00	5.94	11.87
BC-GRATE-48-48-18	44.00	18.00	7.92	15.83

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter, though it can be easily cleaned by hand:

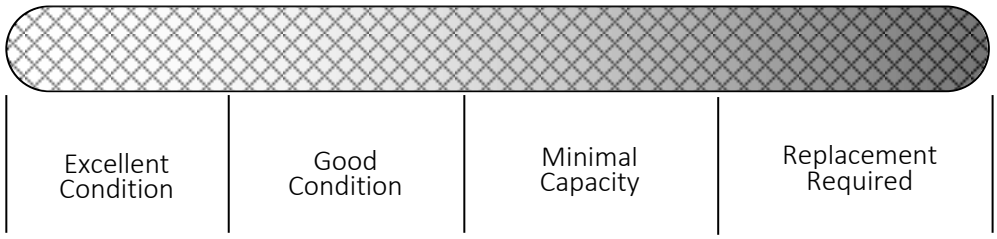
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to remove the grate.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will

increase the time and complexity required for maintenance. Cleaning of the Grate Inlet Filter can be performed utilizing a vacuum truck. Once all safety measures have been set up, cleaning of the Grate Inlet Filter can proceed as followed:

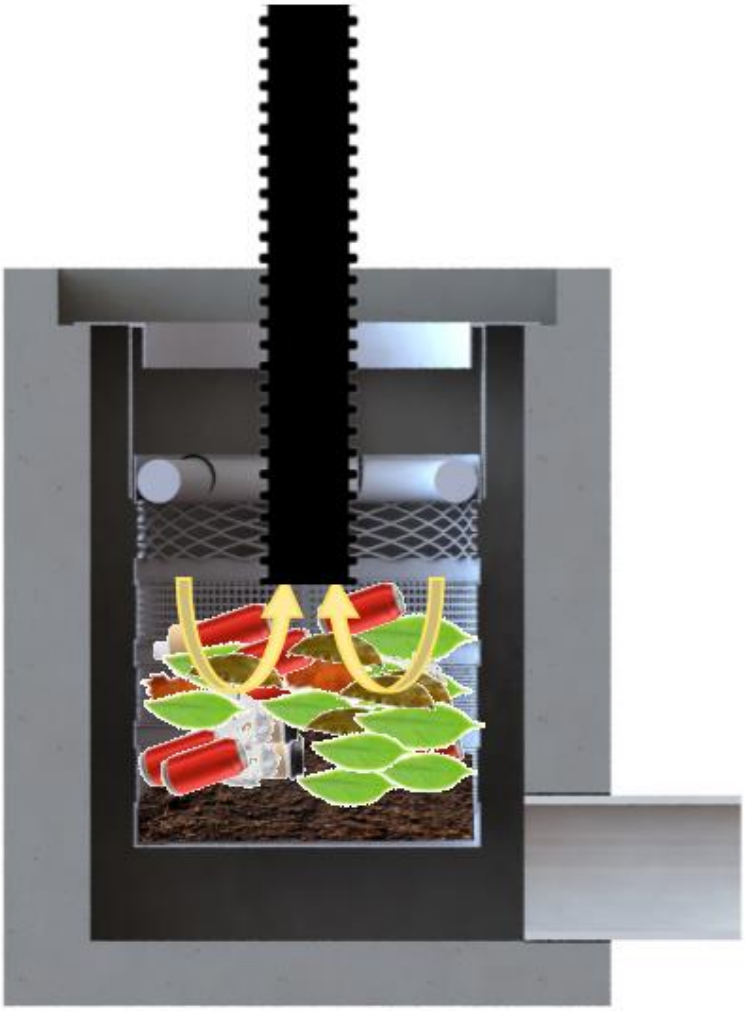
- Remove grate (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck, position the hose over the opened catch basin. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying off any debris stuck on the side or bottom of the filter basket. Power wash the sides and bottom of the filter basket off.
- Next, remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is zip tied to the top perimeter of the filter. Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required, install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- The following is a replacement indication color chart for the hydrocarbon booms:



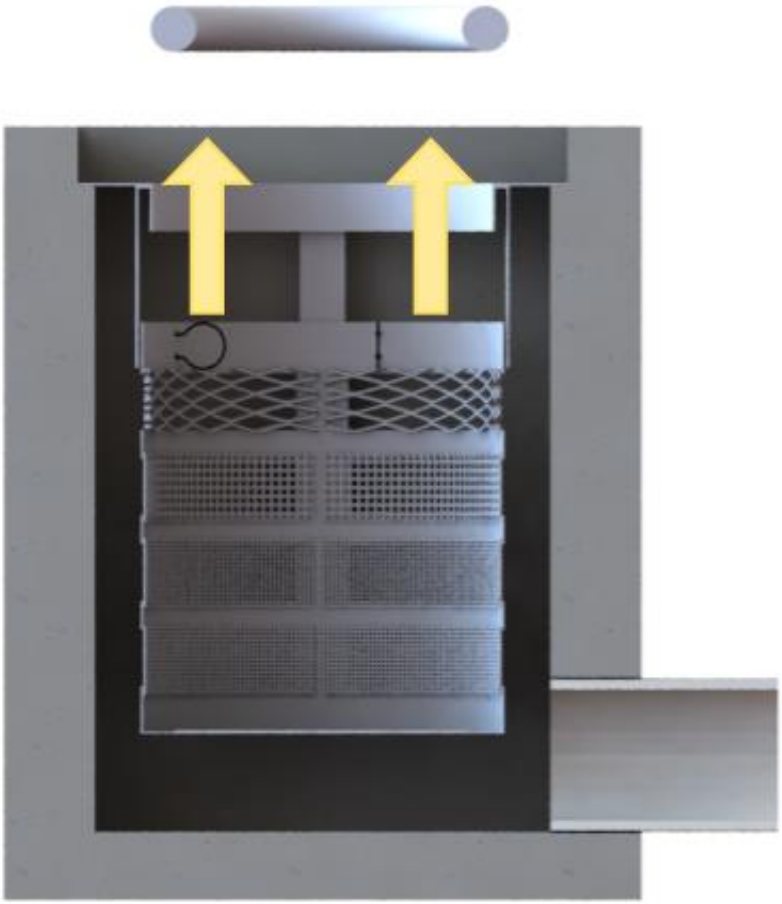
- The last step is to replace the grate and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted. NOTE: outlet to catch basin (if it does not have a sump) should be blocked during power washing to prevent any dirty water from discharging from the catch basin.

Maintenance Sequence

Remove grate and set up vacuum truck to clean the filter basket.



Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off screens.



Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is zip tied to the top perimeter of the filter. Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required, install and fasten on a new hydrocarbon boom.

Close up and replace the grate and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email:
info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ ☐

Weather Condition _____ Additional Notes _____

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
7	Lat: Long:							
8	Lat: Long:							
10	Lat: Long:							
11	Lat: Long:							
12	Lat: Long:							

Comments:

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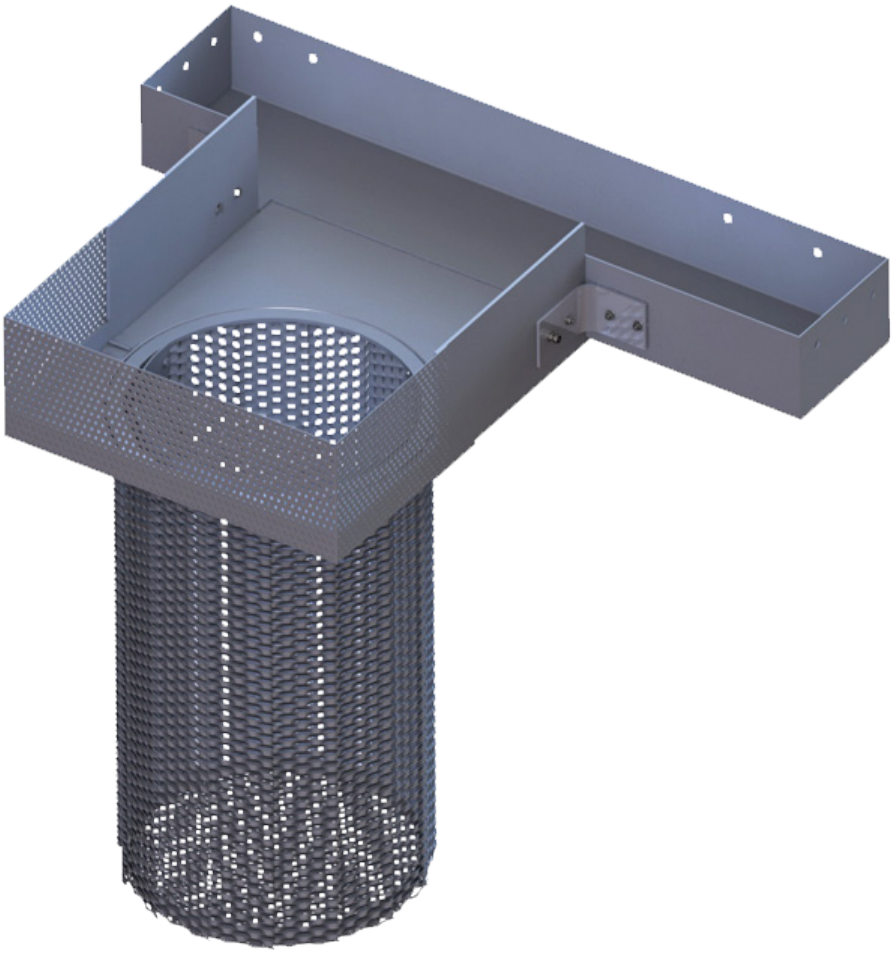
Curb Inlet Filter

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



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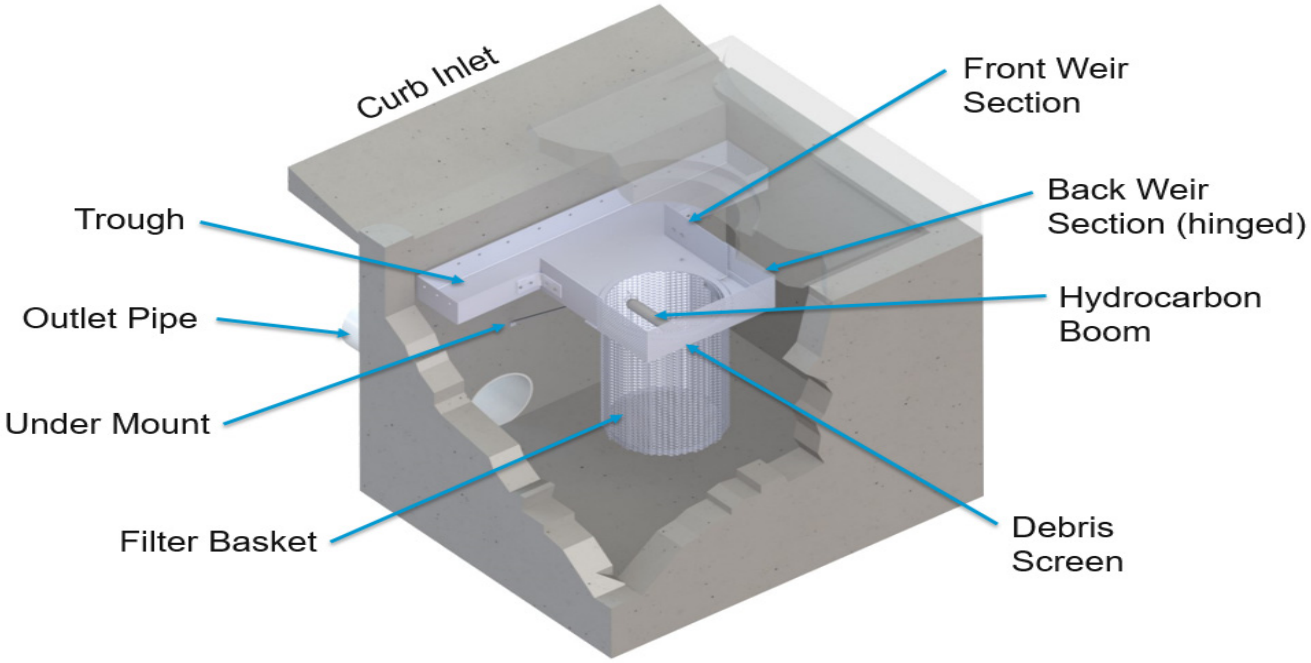
The Bio Clean Curb Inlet Filter is a stormwater device designed to remove high levels of trash, debris, sediments and hydrocarbons. The filter is available in several configurations including trash full capture, multi-level screening, Kraken membrane filter and media filter variations. This manual covers maintenance procedures of the trash full capture and multi-level screening configurations. A supplemental manual is available for the Kraken and media filter variations. The innovative trough & weir system is mounted along the curb face and directs incoming stormwater toward the filter basket which is positioned "directly" under the manhole access opening regardless of its location in the catch basin. This innovative design allows the filter to be cleaned from finish surface without access into the catch basin, therefore drastically reducing maintenance time and eliminating confined space entry. The filter has a lifting handle allowing for the filter to be removed easily through the manhole. The weir also folds up to allow for unimpeded access into the basin for routine maintenance or pipe jetting.

As with all stormwater BMPs, inspection and maintenance on the Curb Inlet Filter is necessary. Stormwater regulations require BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the Curb Inlet Filter:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the Curb Inlet Fitler are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The Curb Inlet Filter can be inspected though visual observation without entry into the catch basin. All necessary pre-inspection steps must be carried out before inspection occurs, such as safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once the manhole has been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the catch basin through the manhole. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the catch basin.
- Look for any out of the ordinary obstructions in the catch basin, trough, weir, filter basket, basin floor our outlet pipe. Write down any observations on the inspection form.
- Through observation and/or digital photographs estimate the amount of trash, foliage and sediment accumulated inside the filter basket. Record this information on the inspection form.
- Observe the condition and color of the hydrocarbon boom. Record this information on the inspection form.

- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the trough, weir, filter basket or catch basin.
- Excessive accumulation of trash, foliage and sediment in the filter basket and/or trough and weir sections. Maintenance is required when the basket is greater than half-full.
- The following chart shows the 50% and 100% storage capacity of each filter height:

Model	Filter Basket Diameter (in)	Filter Basket Height (in)	50% Storage Capacity (cu ft)	100% Storage Capacity (cu ft)
BC-CURB-30	18	30	2.21	4.42
BC-CURB-24	18	24	1.77	3.53
BC-CURB-18	18	18	1.33	2.65
BC-CURB-12	18	12	0.88	1.77

Maintenance Equipment

It is recommended that a vacuum truck be utilized to minimize the time required to maintain the Curb Inlet Filter though it can easily cleaned by hand:

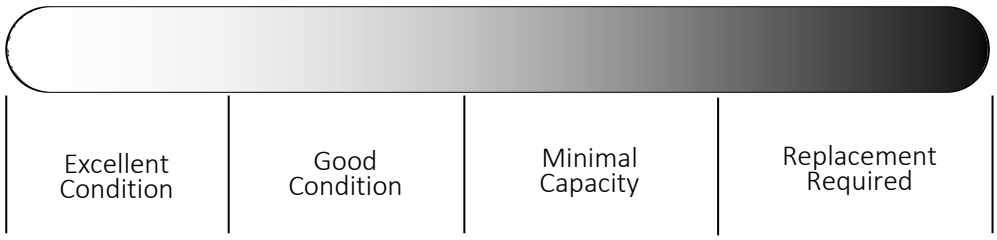
- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate safety signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Small or large vacuum truck (with pressure washer attachment preferred).

Maintenance Procedures

It is recommended that maintenance occurs at least two days after the most recent rain event to allow debris and sediments to dry out. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Cleaning of the Curb Inlet Filter can be performed from finish surface without entry into catch basin utilizing a vacuum truck. Some unique

and custom configurations may create conditions which would require entry for some or all of the maintenance procedures. Once all safety measures have been set up cleaning of the Curb Inlet Filter can proceed as followed:

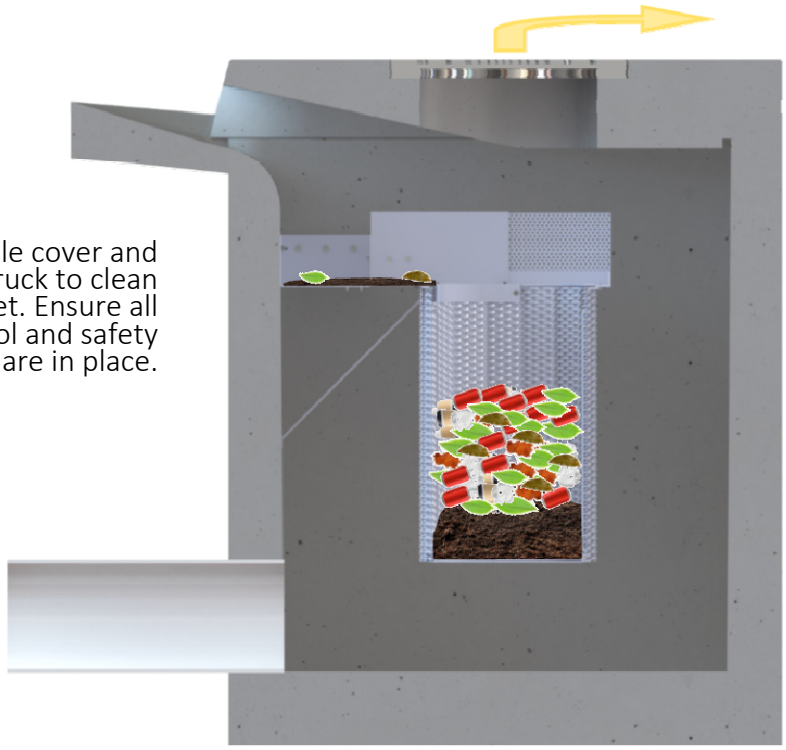
- Remove all manhole cover or access hatches (traffic control and safety measures to be completed prior).
- Using an extension on a vacuum truck position the hose over the opened manhole or hatch opening. Insert the vacuum hose down into the filter basket and suck out trash, foliage and sediment. A pressure wash is recommended and will assist in spraying of any debris stuck on the side or bottom of the filter basket. If the filter basket is full, trash, sediment, and debris will accumulate inside the trough and weir sections of the system. Once the filter basket is clean power wash the weir and trough pushing these debris into the filter basket (leave the hose in the filter basket during this process so entering debris will be sucked out). Power wash off the trough, weir, debris screen, and filter basket sides and bottom.
- Next remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom. Booms can be ordered directly from the manufacturer.
- Follow is a replacement indication color chart for the hydrocarbon booms:



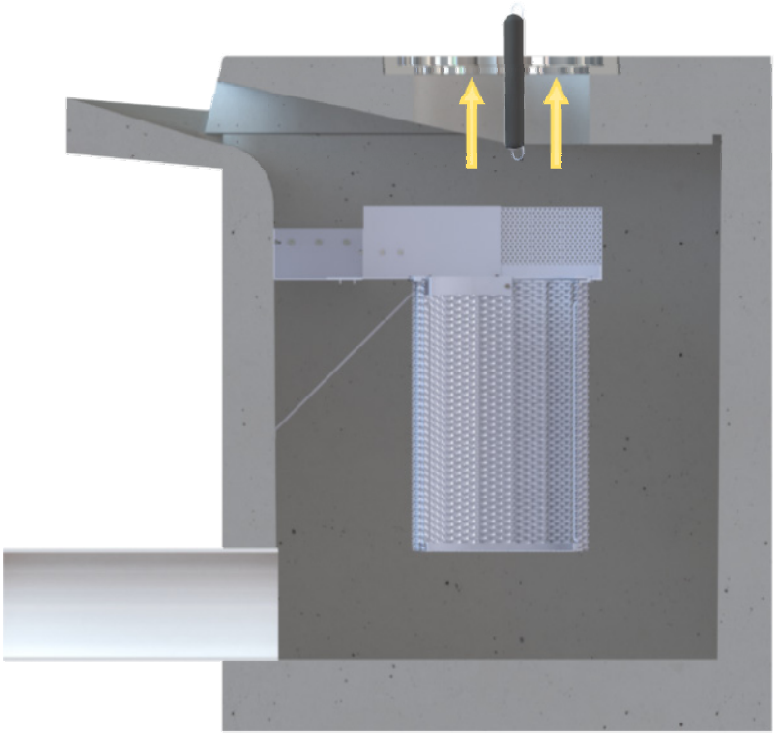
- The last step is to close up and replace the manhole or hatch and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.
- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer as previously noted.

Maintenance Sequence

Remove manhole cover and set up vacuum truck to clean the filter basket. Ensure all traffic control and safety measures are in place.

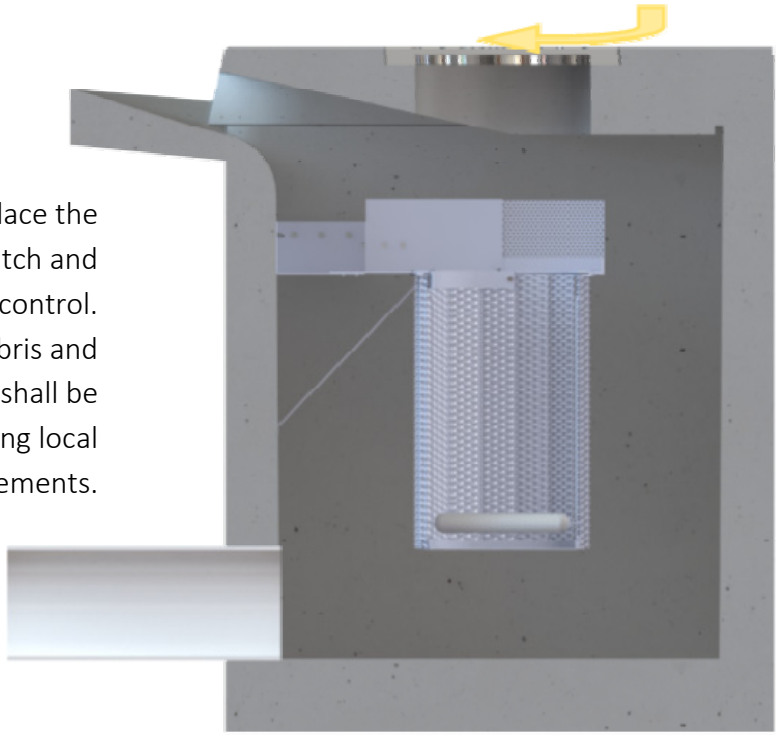


Insert the vacuum hose down into the filter basket and suck out debris. Use a pressure washer to assist in vacuum removal. Pressure wash off the weir and trough and vacuum out any remaining debris.



Remove the hydrocarbon boom that is attached to the inside of the filter basket. The hydrocarbon boom is fastened to rails on two opposite sides of the basket (vertical rails). Assess the color and condition of the boom using the following information in the next bullet point. If replacement is required install and fasten on a new hydrocarbon boom.

Close up and replace the manhole or hatch and remove all traffic control. All removed debris and pollutants shall be disposed of following local and state requirements.



For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Catch Basin Only

Project Name _____

Project Address _____ (city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ ☐

Weather Condition _____ Additional Notes _____

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(Reviewed By)
(Date)
Office personnel to complete section to the left.

Site Map #	GPS Coordinates of Insert	Catch Basin Size	Evidence of Illicit Discharge?	Trash Accumulation	Foliage Accumulation	Sediment Accumulation	Signs of Structural Damage?	Functioning Properly or Maintenance Needed?
1	Lat: Long:							
2	Lat: Long:							
3	Lat: Long:							
4	Lat: Long:							
5	Lat: Long:							
6	Lat: Long:							
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11	Lat: Long:							
12	Lat: Long:							

Comments:

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Vortex Separator MP-51

Description

Vortex separators: (alternatively, swirl concentrators) are gravity separators, and in principle are essentially wet vaults. The difference from wet vaults, however, is that the vortex separator is round, rather than rectangular, and the water moves in a centrifugal fashion before exiting. By having the water move in a circular fashion, rather than a straight line as is the case with a standard wet vault, it is possible to obtain significant removal of suspended sediments and attached pollutants with less space. Vortex separators were originally developed for combined sewer overflows (CSOs), where it is used primarily to remove coarse inorganic solids. Vortex separation has been adapted to stormwater treatment by several manufacturers.

California Experience

There are currently about 100 installations in California.

Advantages

- May provide the desired performance in less space and therefore less cost.
- May be more cost-effective pre-treatment devices than traditional wet or dry basins.
- Mosquito control may be less of an issue than with traditional wet basins.

Limitations

- As some of the systems have standing water that remains between storms, there is concern about mosquito breeding.
- It is likely that vortex separators are not as effective as wet vaults at removing fine sediments, on the order 50 to 100 microns in diameter and less.
- The area served is limited by the capacity of the largest models.
- As the products come in standard sizes, the facilities will be oversized in many cases relative to the design treatment storm, increasing the cost.
- The non-steady flows of stormwater decreases the efficiency of vortex separators from what may be estimated or determined from testing under constant flow.
- Do not remove dissolved pollutants.

Design Considerations

- Service Area
- Settling Velocity
- Appropriate Sizing
- Inlet Pipe Diameter

Targeted Constituents

☑	Sediment	▲
☑	Nutrients	●
☑	Trash	
☑	Metals	●
	Bacteria	
☑	Oil and Grease	
☑	Organics	

Legend *(Removal Effectiveness)*

● Low ■ High

▲ Medium

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CALIFORNIA STORMWATER QUALITY ASSOCIATION

- A loss of dissolved pollutants may occur as accumulated organic matter (e.g., leaves) decomposes in the units.

Design and Sizing Guidelines

The stormwater enters, typically below the effluent line, tangentially into the basin, thereby imparting a circular motion in the system. Due to centrifugal forces created by the circular motion, the suspended particles move to the center of the device where they settle to the bottom. There are two general types of vortex separation: free vortex and dampened (or impeded) vortex. Free vortex separation becomes dampened vortex separation by the placement of radial baffles on the weir-plate that impede the free vortex-flow pattern

It has been stated with respect to CSOs that the practical lower limit of vortex separation is a particle with a settling velocity of 12 to 16.5 feet per hour (0.10 to 0.14 cm/s). As such, the focus for vortex separation in CSOs has been with settleable solids generally 200 microns and larger, given the presence of the lighter organic solids. For inorganic sediment, the above settling velocity range represents a particle diameter of 50 to 100 microns. Head loss is a function of the size of the target particle. At 200 microns it is normally minor but increases significantly if the goal is to remove smaller particles.

The commercial separators applied to stormwater treatment vary considerably with respect to geometry, and the inclusion of radial baffles and internal circular chambers. At one extreme is the inclusion of a chamber within the round concentrator. Water flows initially around the perimeter between the inner and outer chambers, and then into the inner chamber, giving rise to a sudden change in velocity that purportedly enhances removal efficiency. The opposite extreme is to introduce the water tangentially into a round manhole with no internal parts of any kind except for an outlet hood. Whether the inclusion of chambers and baffles gives better performance is unknown. Some contend that free vortex, also identified as swirl concentration, creates less turbulence thereby increasing removal efficiency. One product is unique in that it includes a static separator screen.

- Sized is based on the peak flow of the design treatment event as specified by local government.
- If an in-line facility, the design peak flow is four times the peak of the design treatment event.
- If an off-line facility, the design peak flow is equal to the peak of the design treatment event.
- Headloss differs with the product and the model but is generally on the order of one foot or less in most cases.

Construction/Inspection Considerations

No special considerations.

Performance

Manufacturer's differ with respect to performance claims, but a general statement is that the manufacturer's design and rated capacity (cfs) for each model is based on and believed to achieve an aggregate reduction of 90% of all particles with a specific gravity of 2.65 (glacial sand) down to 150 microns, and to capture the floatables, and oil and grease. Laboratory tests of

two products support this claim. The stated performance expectation therefore implies that a lesser removal efficiency is obtained with particles less than 150 microns, and the lighter, organic settleables. Laboratory tests of one of the products found about 60% removal of 50 micron sand at the expected average operating flow rate

Experience with the use of vortex separators for treating combined sewer overflows (CSOs), the original application of this technology, suggests that the lower practical limit for particle removal are particles with a settling velocity of 12 feet per hour (Sullivan, 1982), which represents a particle diameter of 100 to 200 microns, depending on the specific gravity of the particle. The CSO experience therefore seems consistent with the limited experience with treating stormwater, summarized above

Traditional treatment technologies such as wet ponds and extended detention basins are generally believed to be more effective at removing very small particles, down to the range of 10 to 20 microns. Hence, it is intuitively expected that vortex separators do not perform as well as the traditional wet and dry basins, and filters. Whether this matters depends on the particle size distribution of the sediments in stormwater. If the distribution leans towards small material, there should be a marked difference between vortex separators and, say, traditional wet vaults. There are little data to support this conjecture

In comparison to other treatment technologies, such as wet ponds and grass swales, there are few studies of vortex separators. Only two of manufactured products currently available have been field tested. Two field studies have been conducted. Both achieved in excess of 80% removal of TSS. However, the test was conducted in the Northeast (New York state and Maine) where it is possible the stormwater contained significant quantities of deicing sand. Consequently, the influent TSS concentrations and particle size are both likely considerably higher than is found in California stormwater. These data suggest that if the stormwater particles are for the most part fine (i.e., less than 50 microns), vortex separators will not be as efficient as traditional treatment BMPs such as wet ponds and swales, if the latter are sized according to the recommendations of this handbook.

There are no equations that provide a straightforward determination of efficiency as a function of unit configuration and size. Design specifications of commercial separators are derived from empirical equations that are unique and proprietary to each manufacturer. However, some general relationships between performance and the geometry of a separator have been developed. CSO studies have found that the primary determinants of performance of vortex separators are the diameters of the inlet pipe and chamber with all other geometry proportional to these two.

Sullivan et al. (1982) found that performance is related to the ratios of chamber to inlet diameters, D2/D1, and height between the inlet and outlet and the inlet diameter, H1/D1, shown in Figure 3. The relationships are: as D2/D1 approaches one, the efficiency decreases; and, as the H1/D1 ratio decreases, the efficiency decreases. These relationships may allow qualitative comparisons of the alternative designs of manufacturers. Engineers who wish to apply these concepts should review relevant publications presented in the References.

Siting Criteria

There are no particularly unique siting criteria. The size of the drainage area that can be served by vortex separators is directly related to the capacities of the largest models.

Additional Design Guidelines

Vortex separators have two capacities if positioned as in-line facilities, a treatment capacity and a hydraulic capacity. Failure to recognize the difference between the two may lead to significant under sizing; i.e., too small a model is selected. This observation is relevant to three of the five products. These three technologies all are designed to experience a unit flow rate of about 24 gallons/square foot of separator footprint at the peak of the design treatment event. This is the horizontal area of the separator zone within the container, not the total footprint of the unit. At this unit flow rate, laboratory tests by these manufacturers have established that the performance will meet the general claims previously described. However, the units are sized to handle 100 gallons/square foot at the peak of the hydraulic event. Hence, in selecting a particular model the design engineer must be certain to match the peak flow of the design event to the stated treatment capacity, not the hydraulic capacity. The former is one-fourth the latter. If the unit is positioned as an off-line facility, the model selected is based on the capacity equal to the peak of the design treatment event.

Maintenance

Maintenance consists of the removal of accumulated material with an eductor truck. It may be necessary to remove and dispose the floatables separately due to the presence of petroleum product.

Maintenance Requirements

Remove all accumulated sediment, and litter and other floatables, annually, unless experience indicates the need for more or less frequent maintenance.

Cost

Manufacturers provide costs for the units including delivery. Installation costs are generally on the order of 50 to 100 % of the manufacturer's cost. For most sites the units are cleaned annually.

Cost Considerations

The different geometry of the several manufactured separators suggests that when comparing the costs of these systems to each other, that local conditions (e.g., groundwater levels) may affect the relative cost-effectiveness.

References and Sources of Additional Information

Field, R., 1972, The swirl concentrator as a combined sewer overflow regulator facility, EPA/R2-72-008, U.S. Environmental Protection Agency, Washington, D.C.

Field, R., D. Averill, T.P. O'Connor, and P. Steel, 1997, Vortex separation technology, Water Qual. Res. J. Canada, 32, 1, 185

Manufacturers technical materials

Sullivan, R.H., et al., 1982, Design manual – swirl and helical bend pollution control devices, EPA-600/8-82/013, U.S. Environmental Protection Agency, Washington, D.C.

Sullivan, R.H., M.M. Cohn, J.E. Ure, F.F. Parkinson, and G. Caliana, 1974, Relationship between diameter and height for the design of a swirl concentrator as a combined sewer overflow regulator, EPA 670/2-74-039, U.S. Environmental Protection Agency, Washington, D.C.

Sullivan, R.H., M.M. Cohn, J.E. Ure, F.F. Parkinson, and G. Caliana, 1974, The swirl concentrator as a grit separator device, EPA670/2-74-026, U.S. Environmental Protection Agency, Washington, D.C.

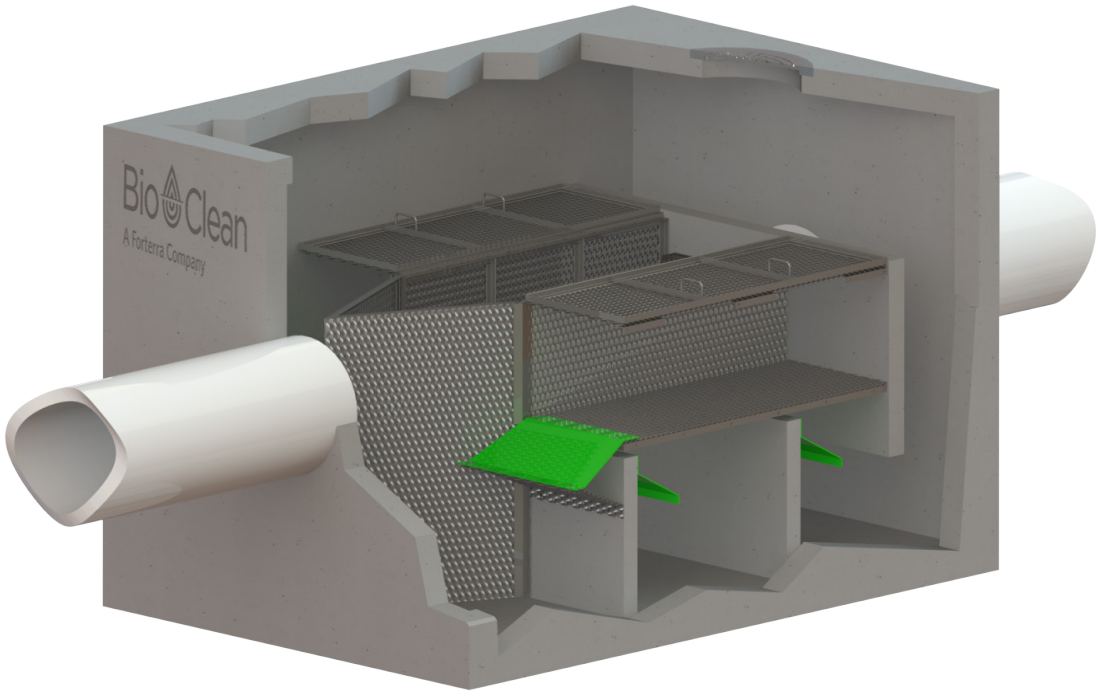
Sullivan, R.H., M.M. Cohn, J.E. Ure, F.F. Parkinson, and G. Caliana, 1978, Swirl primary separator device and pilot demonstration, EPA600/2-78-126, U.S. Environmental Protection Agency, Washington, D.C.

DUAL STAGE

Hydrodynamic Separator (DSBB)

Bio Clean
A Forterra Company

OPERATION & MAINTENANCE



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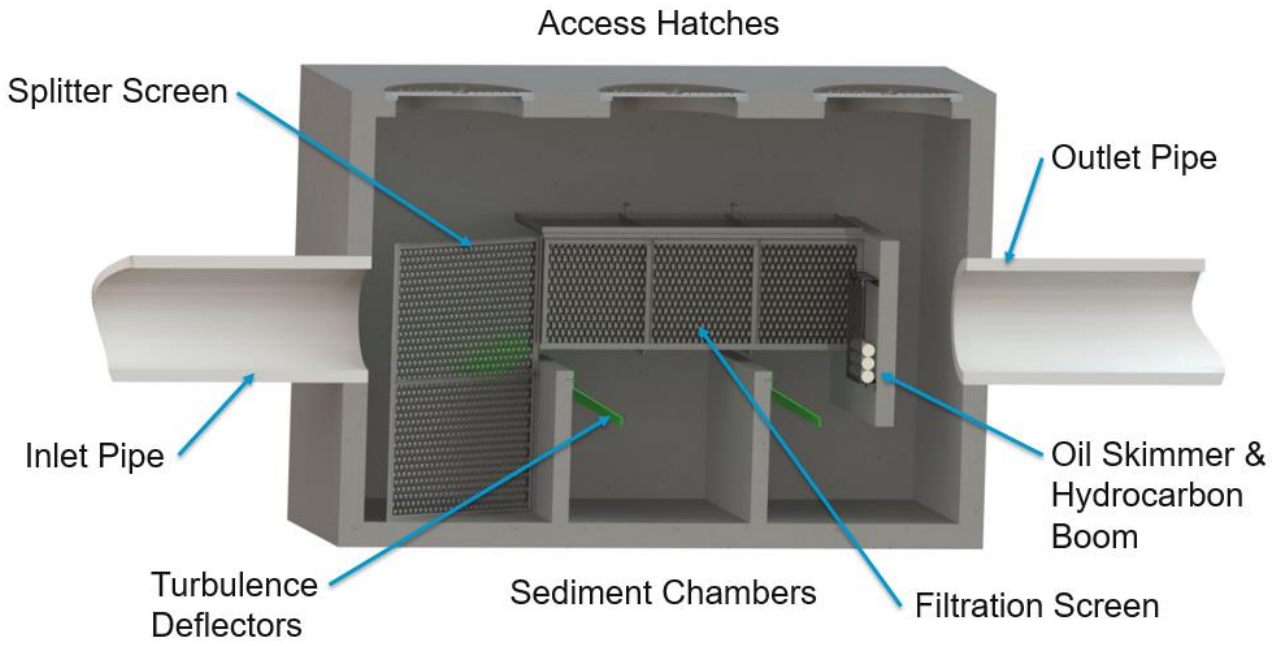
OPERATION & MAINTENANCE

The Debris Separating Baffle Box (DSBB), a stormwater dual-stage Hydrodynamic Separator is designed to remove high levels of trash, debris, sediments and hydrocarbons. The innovative screening system directs floatable trash, debris, and organics into raised filtration screens for dry state storage which prevents septic conditions, odor, nutrient leaching and allows for easy removal. The raised filtration screens are assisted by a non-clogging inlet splitting screen which directs flows to the filtration screens while maintaining high treatment flow rates. The DSBB is able to effectively capture and store sediment with no maintenance or loss of treatment capacity for several years based on annual average loading in most regions.

Yet, as with all stormwater BMPs, inspection and maintenance on the DSBB Hydrodynamic Separator is necessary. Stormwater regulations require that all BMPs be inspected and maintained to ensure they are operating as designed to allow for effective pollutant removal and provide protection to receiving water bodies. It is recommended that inspections be performed multiple times during the first year to assess site-specific loading conditions. This is recommended because pollutant loading can vary greatly from site to site. Variables such as nearby soil erosion or construction sites, winter sanding of roads, amount of daily traffic and land use can increase pollutant loading on the system. The first year of inspections can be used to set inspection and maintenance intervals for subsequent years. Without appropriate maintenance a BMP can exceed its storage capacity which can negatively affect its continued performance in removing and retaining captured pollutants.



System Diagram:

Inspection Equipment

Following is a list of equipment to allow for simple and effective inspection of the DSBB Separator:

- Bio Clean Environmental Inspection Form (contained within this manual).
- Flashlight.
- Manhole hook or appropriate tools to remove access hatches and covers.
- Appropriate traffic control signage and procedures.
- Measuring pole and/or tape measure.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine inspections or maintenance of the system.

Inspection Steps

The core to any successful stormwater BMP maintenance program is routine inspections. The inspection steps required on the DSBB are quick and easy. As mentioned above the first year should be seen as the maintenance interval establishment phase. During the first year more frequent inspections should occur in order to gather loading data and maintenance requirements for that specific site. This information can be used to establish a base for long-term inspection and maintenance interval requirements.

The DSBB Separator can be inspected though visual observation without entry into the system. All necessary pre-inspection steps must be carried out before inspection occurs, especially traffic control and other safety measures to protect the inspector and nearby pedestrians from any dangers associated with an open access hatch or manhole. Once these access covers have been safely opened the inspection process can proceed:

- Prepare the inspection form by writing in the necessary information including project name, location, date & time, unit number and other info (see inspection form).
- Observe the inside of the system through the access hatches. If minimal light is available and vision into the unit is impaired utilize a flashlight to see inside the system.
- Look for any out of the ordinary obstructions in the inflow pipe, sediment chambers, filtration screens, splitter screen, or outflow pipe. Write down any observations on the inspection form.

- Through observation and/or digital photographs estimate the amount of floatable debris accumulated inside the filtration screens. Record this information on the inspection form. Check both the right and left filtration screens if applicable.
- Utilizing a tape measure or measuring stick estimate the amount of sediment accumulated in each of the three sediment chambers. Record this depth on the inspection form.
- Observe the condition and color of the hydrocarbon booms and any floating oils in front of the boom cage. Record this information on the inspection form.
- Finalize inspection report for analysis by the maintenance manager to determine if maintenance is required.

Maintenance Indicators

Based upon observations made during inspection, maintenance of the system may be required based on the following indicators:

- Missing or damaged internal components.
- Obstructions in the system or its inlet or outlet.
- Excessive accumulation of floatable trash, debris and foliage in the filtration screens in which the length and width of the chambers screens is more than half full and/or flow into the screens is fully impeded by these debris. Large items blocking the entrance.
- Excessive accumulation of sediment in any of the three separation chambers is more than half-full (18" to 27" depending on the model size). See chart below:

Model	Sediment Chamber				Screen Basket Dimensions				Hydrocarbon Boom Cage		
	ID Length (in)	ID Width (in)	Sediment Chamber Depth (in)	Sediment Chamber Capacity at 50% Full (cu ft)	Screen Basket Quantity	Screen Basket Width (in)	Screen Basket Height (in)	Screen Basket Capacity (cu ft)	Cage Height (in)	Cage Width (in)	Booms
2.5-4	48	30	36	14.8	2	9	12	3.3	9	5	1
3-6	72	36	36	26.8	2	11	18	9.0	15	7	1
4-6	72	48	36	35.8	2	15	18	12.3	15	11	1
4-8	96	48	36	47.8	2	15	24	22.0	21	11	2
5-10	120	60	36	70.0	2	19	24	34.0	21	15	2
6-12	144	72	36	102.0	2	22	24	47.4	21	21	2
8-12	144	96	36	136.0	2	30	27	72.7	24	29	2
8-14	168	96	36	160.0	2	30	27	84.4	24	29	2
10-14	168	120	36	200.0	2	38	27	106.9	24	37	2
11-16	192	132	45	309.4	2	40	33	160.4	30	45	3
11-24	288	132	54	569.3	2	40	36	263.3	33	45	3
11-34	408	132	54	816.8	2	40	36	373.3	33	45	3

Maintenance Equipment

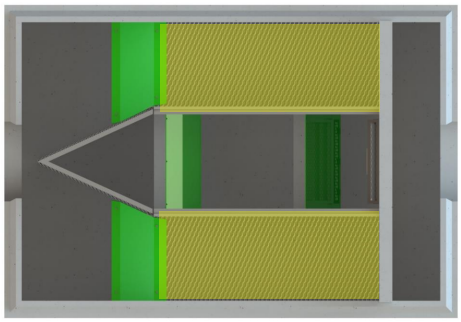
It is recommended that a vacuum truck be utilized to minimize the time required to maintain the DSBB Separator:

- Bio Clean Environmental Maintenance Form (contained in O&M Manual).
- Flashlight.
- Manhole hook or appropriate tools to access hatches and covers.
- Appropriate traffic control signage and procedures.
- Protective clothing and eye protection.
- Note: entering a confined space requires appropriate safety and certification. It is generally not required for routine maintenance of the system. Exception is deeper units entry may be required to open filtration screen lids and replace hydrocarbon booms.
- Vacuum truck (with pressure washer attachment preferred).

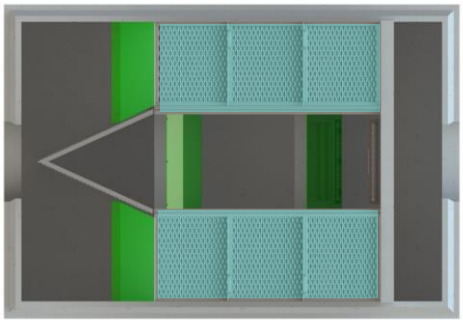
Maintenance Procedures

It is recommended that maintenance occurs at least three days after the most recent rain event to allow for drain down from any associated upstream detention systems. Maintaining the system while flows are still entering it will increase the time and complexity required for maintenance. Debris captured in the filtration screens requires time to dry out which decreases time to remove and associated weight. Cleaning of the filtration screens and sediment chambers can be performed from finish surface without entry into the vault utilizing a vacuum truck on most installations. Depth and configuration of the installation may create conditions which would require entry for some or all of the maintenance procedures. Configuration and size of access hatches also effects the conditions in which entry may be required. Once all safety measures have been set up cleaning of the filtration screens, hydrocarbon boom(s) and/or sediment chambers can proceed as followed:

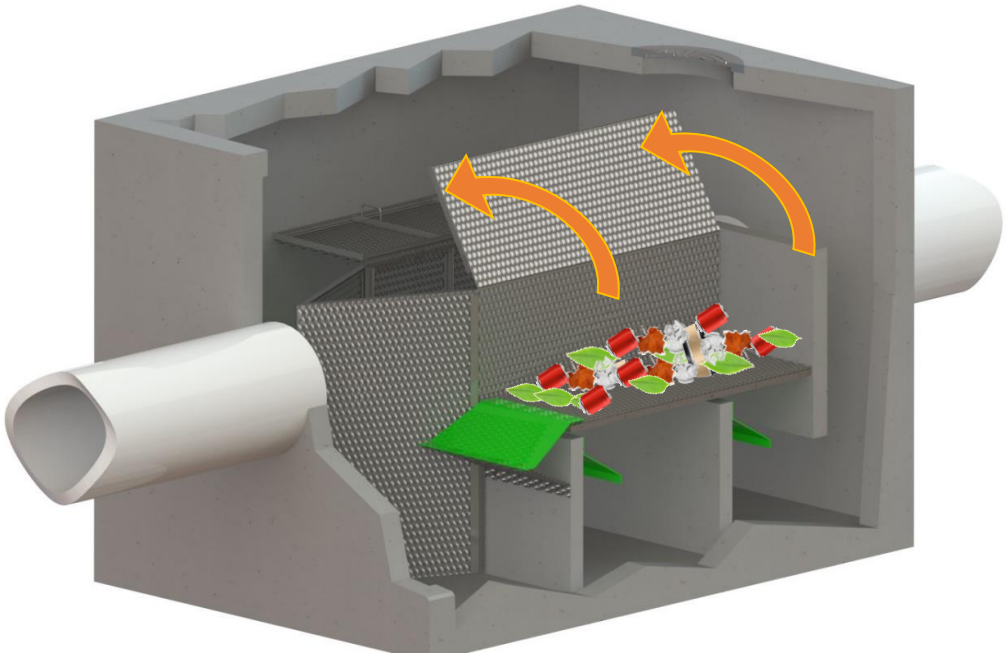
- Remove all access hatches (requires traffic control and safety measures to be completed prior).
- Locate the right and left filtration screens. Manhole or hatch access will be provided to each of these screens. As highlighted below. Depending on the configuration of the DSBB the filtration screens may or may not have hinged lids depending on factors such as online or offline bypass, water level at peak flow, back flow conditions amongst other site-specific variables. Units that have lids are designed with hinges and locking mechanisms along the sidewall of the structure that can be unlocked by finish surface with an extension rod. The length of this rod is limited and for deeper installs entry may be required to unlock and open the lids.



Top view into DSBB. Filtration screens highlighted in yellow without hinged lids.



Top view into DSBB. Filtration screens highlighted in turquoise with hinged lids.

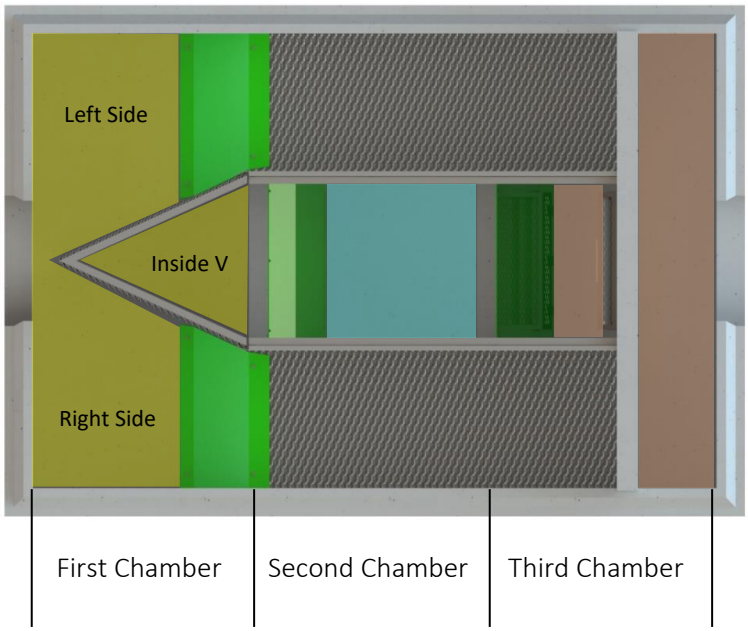


Isometric view into the DSBB illustrating the hinged lids of the filtration screens. Lids can hinge up and toward the center up to 180 degrees from closed & locked position for easy access for cleaning and removal of debris.

- Once filtration screens lids are opened (if applicable) the vacuum hose extension is inserted down into the screens for removal of debris. The width of the screen of the smallest model is 9” therefore allowing an standard 8” vacuum hose to be used for all models and sizes. All debris should be removed with the vacuum hose and the pressure washer should be used to

spray down and remove all debris on the bottom, side and top screens. Ensure all holes within in the screen are cleared of debris. This is critical to restoring the full hydraulic capacity of the filtration screens. Once completed close and lock lids (if applicable).

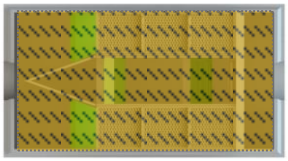
- Using an extension on a vacuum truck position the hose over the opened access hatch or hatches leading to the first sediment chamber adjacent to the pipe inlet and includes the splitter screen. Lower vacuum hose into the sediment chamber on the left and right side of the splitter screen. This is where a majority of the larger sediments and heavy debris will accumulate. Remove all floating debris, standing water and sediment from this sediment chamber. Vertical access to the bottom of the sediment chamber is unimpeded. The vac hose can be moved from side-to-side to fully remove sediments at the corners. A power washer can be used to assist if sediments have become hardened and stuck to the walls or the floor of the chamber. The power washer should also be used to spray the splitter screen clean of any accumulated debris. The vacuum hose can also be inserted on the outlet side of the splitter screen (inside the V) to remove any remaining accumulated sediment.



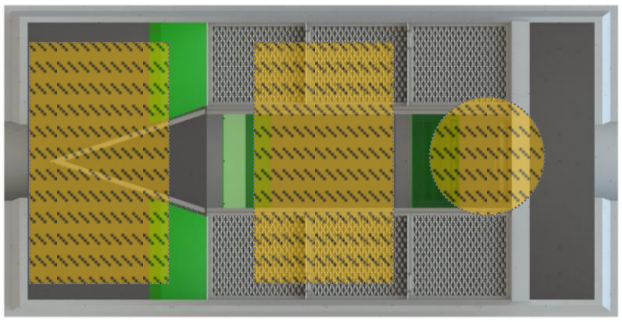
Top view into DSBB illustrating the three sediment chambers.

- The **yellow** highlighted areas show where the vacuum hose should be inserted for cleaning of the **first** sediment chamber.
- The **turquoise** highlighted area show where the vacuum hose should be inserted for cleaning of the **second** sediment chamber.
- The **orange** highlighted areas shows where the vacuum hose is inserted for cleaning of the **third** sediment chamber.

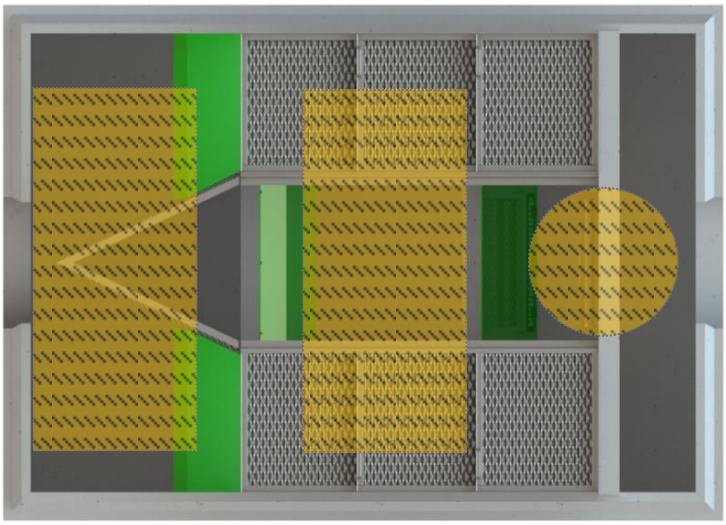
- Repeat the same procedure in the second and third sediment chambers in the locations shown in the above diagrams. Access to these two chambers is in the center of the system unlike the first sediment chamber. The filtration screens cover the sediment chamber along the sides, yet allow for unimpeded access in the middle without requirement to open filtration chamber tops or go through the filtration screens (hinged floor) as found with other baffle box systems. Hatch or manhole size, quantity and location vary based on model size and site specific project constraints. Various access hatch sizes and configurations are available to meet individual project requirements. Larger hatches, open assisted hatches and/or taller ID dimensions to increase headroom are available by request. Below are a few examples of various models and optimal hatch configurations.



A DSBB-2.5-4 is offered with a 2.5-4 access hatch in either parkway, direct or indirect traffic rating. This provides full access. Bolt and pull, hinged or hinged with lift-assisted options offered. *Figures not to scale.*

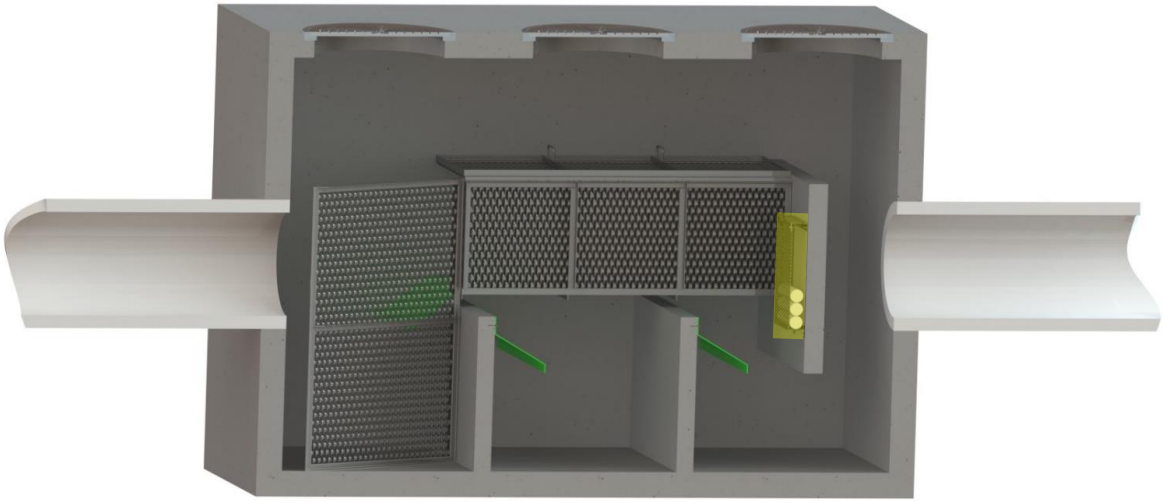


A DSBB-5-10 is offered with two 2.5-4 access hatches in either parkway, direct or indirect traffic rating along with a single 24" diameter manhole for access to the third sediment chamber and hydrocarbon booms. Bolt and pull, hinged or hinged with lift assisted options offered. *Figures not to scale.*

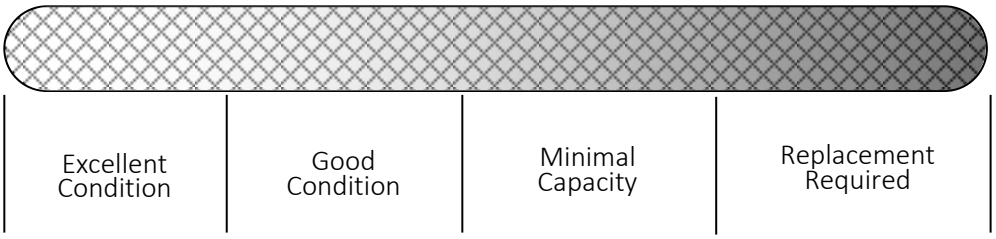


A DSBB-8-12 is offered with two 3-6 access hatches in either parkway, direct or indirect traffic rating along with a single 30" diameter manhole for access to the third sediment chamber and hydrocarbon booms. Bolt and pull, hinged or hinged with lift-assisted options offered. *Figures not to scale.*

- Based on the color of the hydrocarbon booms replacement may be necessary. The booms are housed inside the boom cage which is attached to the influent side of the oil skimmer wall. The cage has a hinged top which is opened allowing access to the hydrocarbon booms. Once old booms are removed new booms can be dropped in and the top closed. See below image.



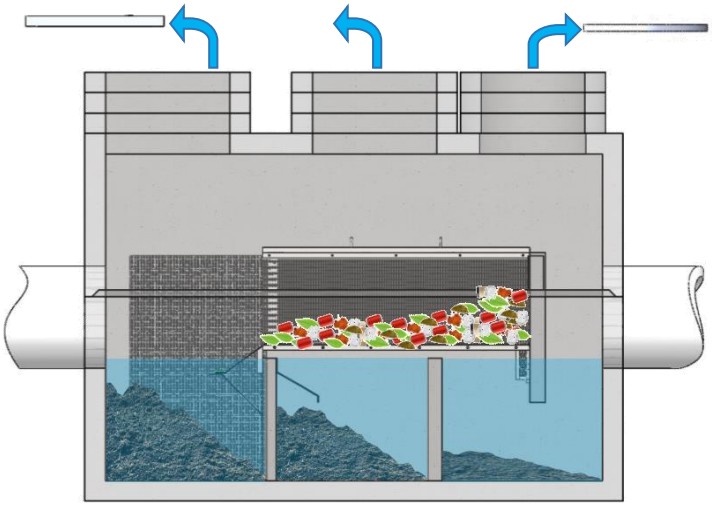
- Follow is a replacement indication color chart for the hydrocarbon booms:



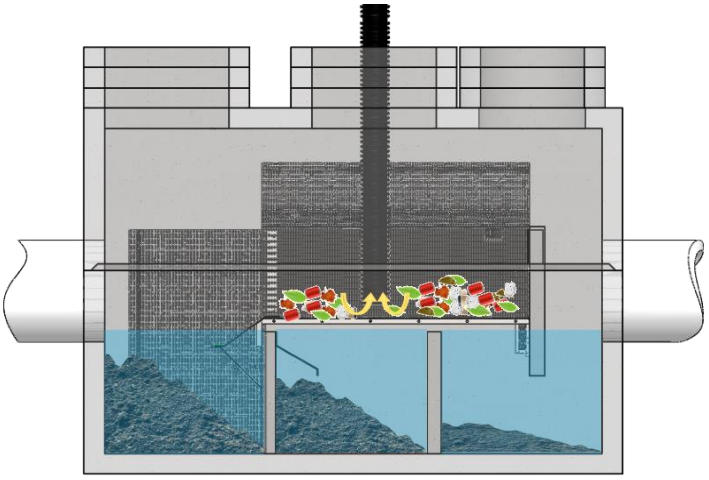
- NOTE: Filtration screens can be cleaned before or after cleaning and removal of sediment for the sediment chambers. Cleaning them before is preferred before removing sediment and standing water from the second and third chamber as debris and water will be deposited on the sediment chamber floors in the process of cleaning the filtration screens over the second and third chamber. Cleaning the first sediment chamber before the filtration screens allows the splitter screen to be fully exposed. Thus the pressure washing of all screens (splitter and filtration) can be done as the same time if needed.
- The last step is to close up and replace all access hatches and remove all traffic control.
- All removed debris and pollutants shall be disposed of following local and state requirements.

- Disposal requirements for recovered pollutants may vary depending on local guidelines. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste.
- In the case of damaged components, replacement parts can be ordered from the manufacturer. Hydrocarbon booms can also be ordered directly from the manufacturer.

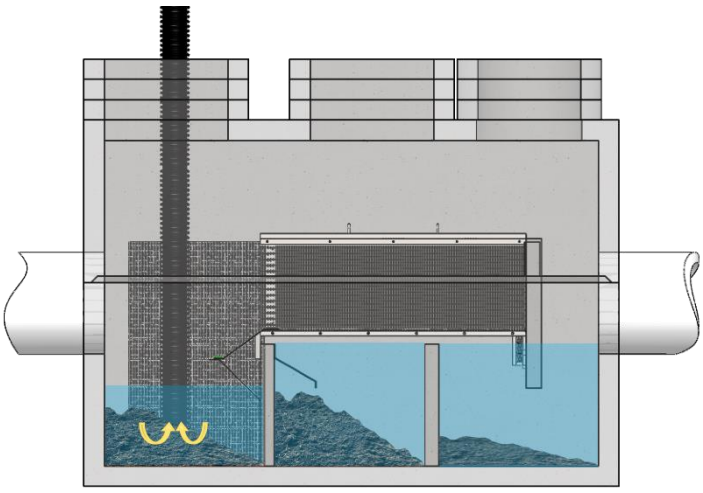
Maintenance Sequence



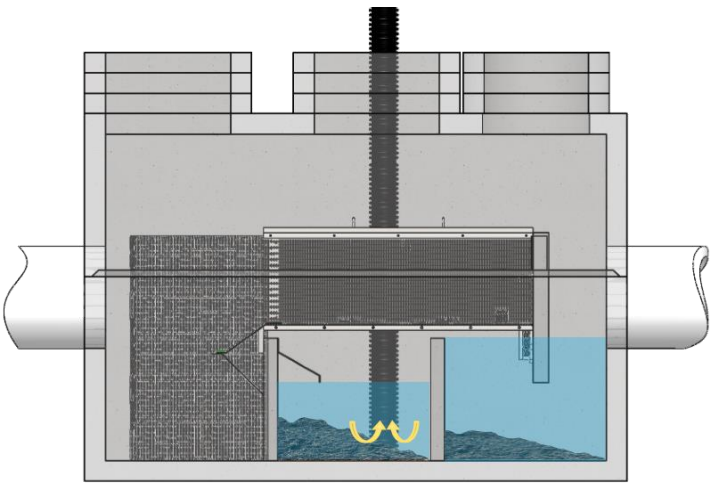
Remove access hatches set up vacuum truck to clean the filtration screens and sediment chamber. Locate positions of filtration screens and first, second and third sediment chambers plus the hydrocarbon boom cage.



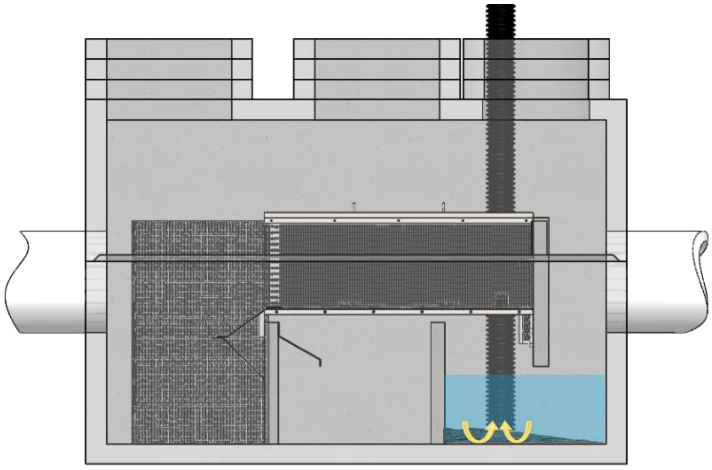
Unlock and open filtration screen lids (if applicable, some units will not have lids). Insert vacuum hose into the first filtration screen and clean out trash & debris. Use a pressure washer to remove any debris stuck on the screens.



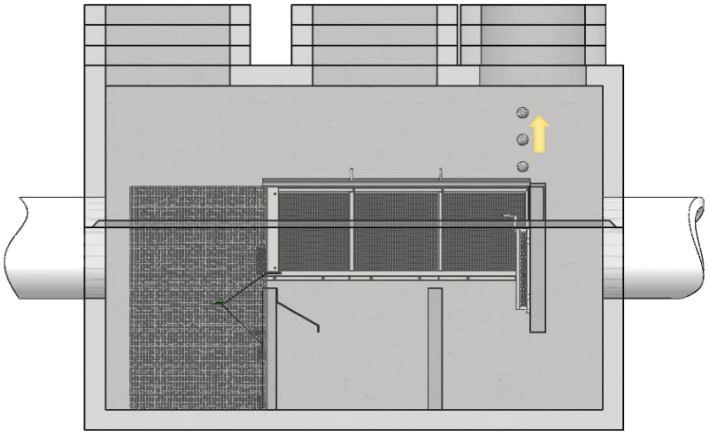
Insert vacuum hose in the first sediment chamber to remove sediment and debris. The vacuum hose will need to be inserted on the right and left side of the splitter screen to remove all sediment. Once completed use a pressure washer to clean off the splitter screen.



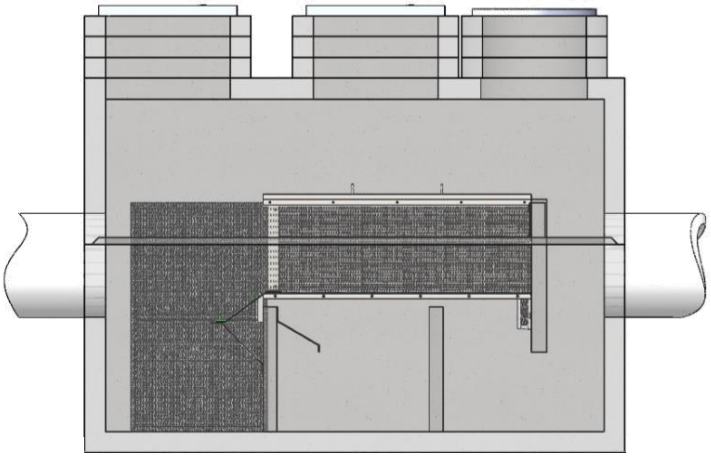
Repeat the above steps for cleaning the second sediment chamber. Compacted sediment can be loosened using a pressure washer.



Repeat the above steps for cleaning the third sediment chamber. Compacted sediment can be loosened using a pressure washer.



Once the unit is fully cleaned check the condition of the hydrocarbon booms in the boom cage hanging on the oil skimmer wall. Use color indicator in this manual to decide if replacement is required. If required open boom cage and replace booms.



Once cleaning and maintenance is complete ensure boom cage lid and filtration screen lids are closed and locked. Replace all manhole covers and or access hatches and remove traffic control.

For Maintenance Services or Information Please Contact Us At:
760-433-7640
Or Email: info@biocleanenvironmental.com

Bio Clean
A Forterra Company

Inspection and Maintenance Report
Bio Clean Debris Separating Baffle Box

Project Name _____

Project Address _____
(city) (Zip Code)

Owner / Management Company _____

Contact _____ Phone ( ) –

For Office Use Only
(Reviewed By)
(Date)
Office personnel to complete section to the left.

Inspector Name _____ Date ____/____/____ Time _____ AM / PM

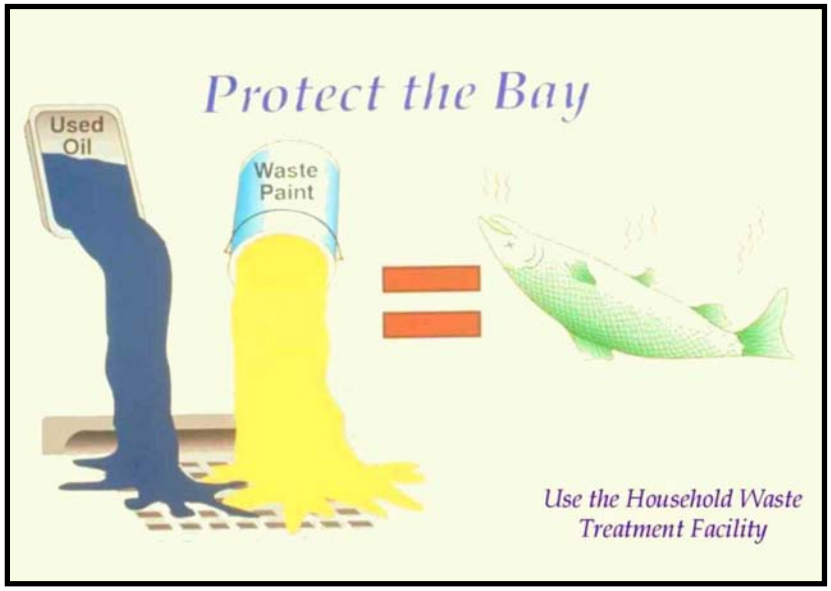
Type of Inspection ☐ Routine ☐ Follow Up ☐ Complaint ☐ Storm Storm Event in Last 72-hours? ☐ No ☐ Yes

Weather Condition _____ Additional Notes _____

Site Map #	GPS Coordinates of Vault	Model #	Debris, Trash and Foliage Accumilation Inside Filtration Screens (lbs)	Sediment Accumulation In Sediment Chambers (lbs) & Depth (inches)	Structural Notes	Operational Per Manufactures' Specifications (If not, why?)
	Lat: Long:					
	Lat: Long:					
	Lat: Long:					

Comments:

Non-Stormwater Discharges SC-10



Art Credit: Margie Winter

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

Description

Non-stormwater discharges are those flows that do not consist entirely of stormwater. Some non-stormwater discharges do not include pollutants and may be discharged to the storm drain. These include uncontaminated groundwater and natural springs. There are also some non-stormwater discharges that typically do not contain pollutants and may be discharged to the storm drain with conditions. These include car washing, air conditioner condensate, etc. However there are certain non-stormwater discharges that pose environmental concern. These discharges may originate from illegal dumping or from internal floor drains, appliances, industrial processes, sinks, and toilets that are connected to the nearby storm drainage system. These discharges (which may include: process waste waters, cooling waters, wash waters, and sanitary wastewater) can carry substances such as paint, oil, fuel and other automotive fluids, chemicals and other pollutants into storm drains. They can generally be detected through a combination of detection and elimination. The ultimate goal is to effectively eliminate non-stormwater discharges to the stormwater drainage system through implementation of measures to detect, correct, and enforce against illicit connections and illegal discharges of pollutants on streets and into the storm drain system and creeks.

Approach

Initially the industry must make an assessment of non-stormwater discharges to determine which types must be eliminated or addressed through BMPs. The focus of the following approach is in the elimination of non-stormwater discharges.

CASQA California Stormwater Quality Association

Pollution Prevention

- Ensure that used oil, used antifreeze, and hazardous chemical recycling programs are being implemented. Encourage litter control.

Suggested Protocols

Recommended Complaint Investigation Equipment

- Field Screening Analysis
  - pH paper or meter
  - Commercial stormwater pollutant screening kit that can detect for reactive phosphorus, nitrate nitrogen, ammonium nitrogen, specific conductance, and turbidity
  - Sample jars
  - Sample collection pole
  - A tool to remove access hole covers
- Laboratory Analysis
  - Sample cooler
  - Ice
  - Sample jars and labels
  - Chain of custody forms
- Documentation
  - Camera
  - Notebook
  - Pens
  - Notice of Violation forms
  - Educational materials

General

- Develop clear protocols and lines of communication for effectively prohibiting non-stormwater discharges, especially those that are not classified as hazardous. These are often not responded to as effectively as they need to be.
- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as “Dump No Waste Drains to Stream” stenciled or demarcated next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.

- See SC44 Stormwater Drainage System Maintenance for additional information.

Illicit Connections

- Locate discharges from the industrial storm drainage system to the municipal storm drain system through review of "as-built" piping schematics.
- Isolate problem areas and plug illicit discharge points.
- Locate and evaluate all discharges to the industrial storm drain system.

Visual Inspection and Inventory

- Inventory and inspect each discharge point during dry weather.
- Keep in mind that drainage from a storm event can continue for a day or two following the end of a storm and groundwater may infiltrate the underground stormwater collection system. Also, non-stormwater discharges are often intermittent and may require periodic inspections.

Review Infield Piping

- A review of the "as-built" piping schematic is a way to determine if there are any connections to the stormwater collection system.
- Inspect the path of floor drains in older buildings.

Smoke Testing

- Smoke testing of wastewater and stormwater collection systems is used to detect connections between the two systems.
- During dry weather the stormwater collection system is filled with smoke and then traced to sources. The appearance of smoke at the base of a toilet indicates that there may be a connection between the sanitary and the stormwater system.

Dye Testing

- A dye test can be performed by simply releasing a dye into either your sanitary or process wastewater system and examining the discharge points from the stormwater collection system for discoloration.

TV Inspection of Drainage System

- TV Cameras can be employed to visually identify illicit connections to the industrial storm drainage system.

Illegal Dumping

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste.

- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Once a site has been cleaned:

- Post "No Dumping" signs with a phone number for reporting dumping and disposal.
- Landscaping and beautification efforts of hot spots may also discourage future dumping, as well as provide open space and increase property values.
- Lighting or barriers may also be needed to discourage future dumping.
- See fact sheet SC11 Spill Prevention, Control, and Cleanup.

Inspection

- Regularly inspect and clean up hot spots and other storm drainage areas where illegal dumping and disposal occurs.
- Conduct field investigations of the industrial storm drain system for potential sources of non-stormwater discharges.
- Pro-actively conduct investigations of high priority areas. Based on historical data, prioritize specific geographic areas and/or incident type for pro-active investigations.

Reporting

- A database is useful for defining and tracking the magnitude and location of the problem.
- Report prohibited non-stormwater discharges observed during the course of normal daily activities so they can be investigated, contained, and cleaned up or eliminated.
- Document that non-stormwater discharges have been eliminated by recording tests performed, methods used, dates of testing, and any on-site drainage points observed.
- Document and report annually the results of the program.
- Maintain documentation of illicit connection and illegal dumping incidents, including significant conditionally exempt discharges that are not properly managed.

Training

- Training of technical staff in identifying and documenting illegal dumping incidents is required.
- Consider posting the quick reference table near storm drains to reinforce training.
- Train employees to identify non-stormwater discharges and report discharges to the appropriate departments.

- Educate employees about spill prevention and cleanup.
- Well-trained employees can reduce human errors that lead to accidental releases or spills. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur. Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.
- Determine and implement appropriate outreach efforts to reduce non-permissible non-stormwater discharges.
- Conduct spill response drills annually (if no events occurred to evaluate your plan) in cooperation with other industries.
- When a responsible party is identified, educate the party on the impacts of his or her actions.

Spill Response and Prevention

- See SC11 Spill Prevention Control and Cleanup.

Other Considerations

- Many facilities do not have accurate, up-to-date schematic drawings.

Requirements

Costs (including capital and operation & maintenance)

- The primary cost is for staff time and depends on how aggressively a program is implemented.
- Cost for containment and disposal is borne by the discharger.
- Illicit connections can be difficult to locate especially if there is groundwater infiltration.
- Indoor floor drains may require re-plumbing if cross-connections to storm drains are detected.

Maintenance (including administrative and staffing)

- Illegal dumping and illicit connection violations requires technical staff to detect and investigate them.

Supplemental Information

Further Detail of the BMP

Illegal Dumping

- Substances illegally dumped on streets and into the storm drain systems and creeks include paints, used oil and other automotive fluids, construction debris, chemicals, fresh concrete, leaves, grass clippings, and pet wastes. All of these wastes cause stormwater and receiving water quality problems as well as clog the storm drain system itself.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots

- Types and quantities (in some cases) of wastes
- Patterns in time of occurrence (time of day/night, month, or year)
- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
- Responsible parties

One of the keys to success of reducing or eliminating illegal dumping is increasing the number of people at the facility who are aware of the problem and who have the tools to at least identify the incident, if not correct it. Therefore, train field staff to recognize and report the incidents.

What constitutes a "non-stormwater" discharge?

- Non-stormwater discharges to the stormwater collection system may include any water used directly in the manufacturing process (process wastewater), air conditioning condensate and coolant, non-contact cooling water, cooling equipment condensate, outdoor secondary containment water, vehicle and equipment wash water, sink and drinking fountain wastewater, sanitary wastes, or other wastewaters.

Permit Requirements

- Facilities subject to stormwater permit requirements must include a certification that the stormwater collection system has been tested or evaluated for the presence of non-stormwater discharges. The State's General Industrial Stormwater Permit requires that non-stormwater discharges be eliminated prior to implementation of the facility's SWPPP.

Performance Evaluation

- Review annually internal investigation results; assess whether goals were met and what changes or improvements are necessary.
- Obtain feedback from personnel assigned to respond to, or inspect for, illicit connections and illegal dumping incidents.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Spill Prevention, Control & Cleanup SC-11

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

Many activities that occur at an industrial or commercial site have the potential to cause accidental or illegal spills. Preparation for accidental or illegal spills, with proper training and reporting systems implemented, can minimize the discharge of pollutants to the environment.

Spills and leaks are one of the largest contributors of stormwater pollutants. Spill prevention and control plans are applicable to any site at which hazardous materials are stored or used. An effective plan should have spill prevention and response procedures that identify potential spill areas, specify material handling procedures, describe spill response procedures, and provide spill clean-up equipment. The plan should take steps to identify and characterize potential spills, eliminate and reduce spill potential, respond to spills when they occur in an effort to prevent pollutants from entering the stormwater drainage system, and train personnel to prevent and control future spills.

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Approach

Pollution Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- Develop a Spill Prevention Control and Countermeasure (SPCC) Plan. The plan should include:

- Description of the facility, owner and address, activities and chemicals present
- Facility map
- Notification and evacuation procedures
- Cleanup instructions
- Identification of responsible departments
- Identify key spill response personnel

- Recycle, reclaim, or reuse materials whenever possible. This will reduce the amount of process materials that are brought into the facility.

Suggested Protocols (including equipment needs)

Spill Prevention

- Develop procedures to prevent/mitigate spills to storm drain systems. Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures.

- If consistent illegal dumping is observed at the facility:
  - Post "No Dumping" signs with a phone number for reporting illegal dumping and disposal. Signs should also indicate fines and penalties applicable for illegal dumping.
  - Landscaping and beautification efforts may also discourage illegal dumping.
  - Bright lighting and/or entrance barriers may also be needed to discourage illegal dumping.

- Store and contain liquid materials in such a manner that if the tank is ruptured, the contents will not discharge, flow, or be washed into the storm drainage system, surface waters, or groundwater.

- If the liquid is oil, gas, or other material that separates from and floats on water, install a spill control device (such as a tee section) in the catch basins that collects runoff from the storage tank area.

- Routine maintenance:
  - Place drip pans or absorbent materials beneath all mounted taps, and at all potential drip and spill locations during filling and unloading of tanks. Any collected liquids or soiled absorbent materials must be reused/recycled or properly disposed.
  - Store and maintain appropriate spill cleanup materials in a location known to all near the tank storage area; and ensure that employees are familiar with the site's spill control plan and/or proper spill cleanup procedures.
  - Sweep and clean the storage area monthly if it is paved, *do not hose down the area to a storm drain.*

  - Check tanks (and any containment sumps) daily for leaks and spills. Replace tanks that are leaking, corroded, or otherwise deteriorating with tanks in good condition. Collect all spilled liquids and properly dispose of them.

- Label all containers according to their contents (e.g., solvent, gasoline).
- Label hazardous substances regarding the potential hazard (corrosive, radioactive, flammable, explosive, poisonous).
- Prominently display required labels on transported hazardous and toxic materials (per US DOT regulations).
- Identify key spill response personnel.

Spill Control and Cleanup Activities

- Follow the Spill Prevention Control and Countermeasure Plan.
- Clean up leaks and spills immediately.
- Place a stockpile of spill cleanup materials where it will be readily accessible (e.g., near storage and maintenance areas).
- On paved surfaces, clean up spills with as little water as possible. Use a rag for small spills, a damp mop for general cleanup, and absorbent material for larger spills. If the spilled material is hazardous, then the used cleanup materials are also hazardous and must be sent to a certified laundry (rags) or disposed of as hazardous waste. Physical methods for the cleanup of dry chemicals include the use of brooms, shovels, sweepers, or plows.
- Never hose down or bury dry material spills. Sweep up the material and dispose of properly.
- Chemical cleanups of material can be achieved with the use of adsorbents, gels, and foams. Use adsorbent materials on small spills rather than hosing down the spill. Remove the adsorbent materials promptly and dispose of properly.
- For larger spills, a private spill cleanup company or Hazmat team may be necessary.

Reporting

- Report spills that pose an immediate threat to human health or the environment to the Regional Water Quality Control Board.
- Federal regulations require that any oil spill into a water body or onto an adjoining shoreline be reported to the National Response Center (NRC) at 800-424-8802 (24 hour).
- Report spills to local agencies, such as the fire department; they can assist in cleanup.
- Establish a system for tracking incidents. The system should be designed to identify the following:

  - Types and quantities (in some cases) of wastes

  - Patterns in time of occurrence (time of day/night, month, or year)

- Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)

- Responsible parties

Training

- Educate employees about spill prevention and cleanup.

- Well-trained employees can reduce human errors that lead to accidental releases or spills:

  - The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

  - Employees should be familiar with the Spill Prevention Control and Countermeasure Plan.

- Employees should be educated about aboveground storage tank requirements. Employees responsible for aboveground storage tanks and liquid transfers should be thoroughly familiar with the Spill Prevention Control and Countermeasure Plan and the plan should be readily available.

- Train employees to recognize and report illegal dumping incidents.

Other Considerations (Limitations and Regulations)

- State regulations exist for facilities with a storage capacity of 10,000 gallons or more of petroleum to prepare a Spill Prevention Control and Countermeasure (SPCC) Plan (Health & Safety Code Chapter 6.67).

- State regulations also exist for storage of hazardous materials (Health & Safety Code Chapter 6.95), including the preparation of area and business plans for emergency response to the releases or threatened releases.

- Consider requiring smaller secondary containment areas (less than 200 sq. ft.) to be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.

Requirements

Costs (including capital and operation & maintenance)

- Will vary depending on the size of the facility and the necessary controls.

- Prevention of leaks and spills is inexpensive. Treatment and/or disposal of contaminated soil or water can be quite expensive.

Maintenance (including administrative and staffing)

- This BMP has no major administrative or staffing requirements. However, extra time is needed to properly handle and dispose of spills, which results in increased labor costs.

Supplemental Information

Further Detail of the BMP

Reporting

Record keeping and internal reporting represent good operating practices because they can increase the efficiency of the facility and the effectiveness of BMPs. A good record keeping system helps the facility minimize incident recurrence, correctly respond with appropriate cleanup activities, and comply with legal requirements. A record keeping and reporting system should be set up for documenting spills, leaks, and other discharges, including discharges of hazardous substances in reportable quantities. Incident records describe the quality and quantity of non-stormwater discharges to the storm sewer. These records should contain the following information:

- Date and time of the incident
- Weather conditions
- Duration of the spill/leak/discharge
- Cause of the spill/leak/discharge
- Response procedures implemented
- Persons notified
- Environmental problems associated with the spill/leak/discharge

Separate record keeping systems should be established to document housekeeping and preventive maintenance inspections, and training activities. All housekeeping and preventive maintenance inspections should be documented. Inspection documentation should contain the following information:

- The date and time the inspection was performed
- Name of the inspector
- Items inspected
- Problems noted
- Corrective action required
- Date corrective action was taken

Other means to document and record inspection results are field notes, timed and dated photographs, videotapes, and drawings and maps.

Aboveground Tank Leak and Spill Control

Accidental releases of materials from aboveground liquid storage tanks present the potential for contaminating stormwater with many different pollutants. Materials spilled, leaked, or lost from

tanks may accumulate in soils or on impervious surfaces and be carried away by stormwater runoff.

The most common causes of unintentional releases are:

- Installation problems
- Failure of piping systems (pipes, pumps, flanges, couplings, hoses, and valves)
- External corrosion and structural failure
- Spills and overfills due to operator error
- Leaks during pumping of liquids or gases from truck or rail car to a storage tank or vice versa

Storage of reactive, ignitable, or flammable liquids should comply with the Uniform Fire Code and the National Electric Code. Practices listed below should be employed to enhance the code requirements:

- Tanks should be placed in a designated area.
- Tanks located in areas where firearms are discharged should be encapsulated in concrete or the equivalent.
- Designated areas should be impervious and paved with Portland cement concrete, free of cracks and gaps, in order to contain leaks and spills.
- Liquid materials should be stored in UL approved double walled tanks or surrounded by a curb or dike to provide the volume to contain 10 percent of the volume of all of the containers or 110 percent of the volume of the largest container, whichever is greater. The area inside the curb should slope to a drain.
- For used oil or dangerous waste, a dead-end sump should be installed in the drain.
- All other liquids should be drained to the sanitary sewer if available. The drain must have a positive control such as a lock, valve, or plug to prevent release of contaminated liquids.
- Accumulated stormwater in petroleum storage areas should be passed through an oil/water separator.

Maintenance is critical to preventing leaks and spills. Conduct routine inspections and:

- Check for external corrosion and structural failure.
- Check for spills and overfills due to operator error.
- Check for failure of piping system (pipes, pumps, flanger, coupling, hoses, and valves).
- Check for leaks or spills during pumping of liquids or gases from truck or rail car to a storage facility or vice versa.

- Visually inspect new tank or container installation for loose fittings, poor welding, and improper or poorly fitted gaskets.
- Inspect tank foundations, connections, coatings, and tank walls and piping system. Look for corrosion, leaks, cracks, scratches, and other physical damage that may weaken the tank or container system.
- Frequently relocate accumulated stormwater during the wet season.
- Periodically conduct integrity testing by a qualified professional.

Vehicle Leak and Spill Control

Major spills on roadways and other public areas are generally handled by highly trained Hazmat teams from local fire departments or environmental health departments. The measures listed below pertain to leaks and smaller spills at vehicle maintenance shops.

In addition to implementing the spill prevention, control, and clean up practices above, use the following measures related to specific activities:

Vehicle and Equipment Maintenance

- Perform all vehicle fluid removal or changing inside or under cover to prevent the run-on of stormwater and the runoff of spills.
- Regularly inspect vehicles and equipment for leaks, and repair immediately.
- Check incoming vehicles and equipment (including delivery trucks, and employee and subcontractor vehicles) for leaking oil and fluids. Do not allow leaking vehicles or equipment onsite.
- Always use secondary containment, such as a drain pan or drop cloth, to catch spills or leaks when removing or changing fluids.
- Immediately drain all fluids from wrecked vehicles.
- Store wrecked vehicles or damaged equipment under cover.
- Place drip pans or absorbent materials under heavy equipment when not in use.
- Use adsorbent materials on small spills rather than hosing down the spill.
- Remove the adsorbent materials promptly and dispose of properly.
- Promptly transfer used fluids to the proper waste or recycling drums. Don't leave full drip pans or other open containers lying around.
- Oil filters disposed of in trashcans or dumpsters can leak oil and contaminate stormwater. Place the oil filter in a funnel over a waste oil recycling drum to drain excess oil before disposal. Oil filters can also be recycled. Ask your oil supplier or recycler about recycling oil filters.

- Store cracked batteries in a non-leaking secondary container. Do this with all cracked batteries, even if you think all the acid has drained out. If you drop a battery, treat it as if it is cracked. Put it into the containment area until you are sure it is not leaking.

Vehicle and Equipment Fueling

- Design the fueling area to prevent the run-on of stormwater and the runoff of spills:
  - Cover fueling area if possible.
  - Use a perimeter drain or slope pavement inward with drainage to a sump.
  - Pave fueling area with concrete rather than asphalt.
- If dead-end sump is not used to collect spills, install an oil/water separator.
- Install vapor recovery nozzles to help control drips as well as air pollution.
- Discourage "topping-off' of fuel tanks.
- Use secondary containment when transferring fuel from the tank truck to the fuel tank.
- Use adsorbent materials on small spills and general cleaning rather than hosing down the area. Remove the adsorbent materials promptly.
- Carry out all Federal and State requirements regarding underground storage tanks, or install above ground tanks.
- Do not use mobile fueling of mobile industrial equipment around the facility; rather, transport the equipment to designated fueling areas.
- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Train employees in proper fueling and cleanup procedures.

Industrial Spill Prevention Response

For the purposes of developing a spill prevention and response program to meet the stormwater regulations, facility managers should use information provided in this fact sheet and the spill prevention/response portions of the fact sheets in this handbook, for specific activities. The program should:

- Integrate with existing emergency response/hazardous materials programs (e.g., Fire Department)
- Develop procedures to prevent/mitigate spills to storm drain systems
- Identify responsible departments
- Develop and standardize reporting procedures, containment, storage, and disposal activities, documentation, and follow-up procedures
- Address spills at municipal facilities, as well as public areas

- Provide training concerning spill prevention, response and cleanup to all appropriate personnel

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Stormwater Managers Resource Center http://www.stormwatercenter.net/

Outdoor Loading/Unloading SC-30

Photo Credit: Geoff Brosseau

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Description

The loading/unloading of materials usually takes place outside on docks or terminals; therefore, materials spilled, leaked, or lost during loading/unloading may collect in the soil or on other surfaces and have the potential to be carried away by stormwater runoff or when the area is cleaned. Additionally, rainfall may wash pollutants from machinery used to unload or move materials. Implementation of the following protocols will prevent or reduce the discharge of pollutants to stormwater from outdoor loading/unloading of materials.

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Keep accurate maintenance logs to evaluate materials removed and improvements made.
- Park tank trucks or delivery vehicles in designated areas so that spills or leaks can be contained.
- Limit exposure of material to rainfall whenever possible.
- Prevent stormwater run-on.
- Check equipment regularly for leaks.

CASQA California Stormwater Quality Association

Suggested Protocols

Loading and Unloading – General Guidelines

- Develop an operations plan that describes procedures for loading and/or unloading.
- Conduct loading and unloading in dry weather if possible.
- Cover designated loading/unloading areas to reduce exposure of materials to rain.
- Consider placing a seal or door skirt between delivery vehicles and building to prevent exposure to rain.
- Design loading/unloading area to prevent stormwater run-on, which would include grading or berming the area, and position roof downspouts so they direct stormwater away from the loading/unloading areas.
- Have employees load and unload all materials and equipment in covered areas such as building overhangs at loading docks if feasible.
- Load/unload only at designated loading areas.
- Use drip pans underneath hose and pipe connections and other leak-prone spots during liquid transfer operations, and when making and breaking connections. Several drip pans should be stored in a covered location near the liquid transfer area so that they are always available, yet protected from precipitation when not in use. Drip pans can be made specifically for railroad tracks. Drip pans must be cleaned periodically, and drip collected materials must be disposed of properly.
- Pave loading areas with concrete instead of asphalt.
- Avoid placing storm drains in the area.
- Grade and/or berm the loading/unloading area to a drain that is connected to a deadend.

Inspection

- Check loading and unloading equipment regularly for leaks, including valves, pumps, flanges and connections.
- Look for dust or fumes during loading or unloading operations.

Training

- Train employees (e.g., fork lift operators) and contractors on proper spill containment and cleanup.
- Have employees trained in spill containment and cleanup present during loading/unloading.
- Train employees in proper handling techniques during liquid transfers to avoid spills.
- Make sure forklift operators are properly trained on loading and unloading procedures.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Contain leaks during transfer.
- Store and maintain appropriate spill cleanup materials in a location that is readily accessible and known to all and ensure that employees are familiar with the site's spill control plan and proper spill cleanup procedures.
- Have an emergency spill cleanup plan readily available.
- Use drip pans or comparable devices when transferring oils, solvents, and paints.

Other Considerations (Limitations and Regulations)

- Space and time limitations may preclude all transfers from being performed indoors or under cover.
- It may not be possible to conduct transfers only during dry weather.

Requirements

Costs

Costs should be low except when covering a large loading/unloading area.

Maintenance

- Conduct regular inspections and make repairs as necessary. The frequency of repairs will depend on the age of the facility.
- Check loading and unloading equipment regularly for leaks.
- Conduct regular broom dry-sweeping of area.

Supplemental Information

Further Detail of the BMP

Special Circumstances for Indoor Loading/Unloading of Materials

Loading or unloading of liquids should occur in the manufacturing building so that any spills that are not completely retained can be discharged to the sanitary sewer, treatment plant, or treated in a manner consistent with local sewer authorities and permit requirements.

- For loading and unloading tank trucks to above and below ground storage tanks, the following procedures should be used:
  - The area where the transfer takes place should be paved. If the liquid is reactive with the asphalt, Portland cement should be used to pave the area.
  - The transfer area should be designed to prevent run-on of stormwater from adjacent areas. Sloping the pad and using a curb, like a speed bump, around the uphill side of the transfer area should reduce run-on.

- The transfer area should be designed to prevent runoff of spilled liquids from the area. Sloping the area to a drain should prevent runoff. The drain should be connected to a dead-end sump or to the sanitary sewer. A positive control valve should be installed on the drain.

- For transfer from rail cars to storage tanks that must occur outside, use the following procedures:

  - Drip pans should be placed at locations where spillage may occur, such as hose connections, hose reels, and filler nozzles. Use drip pans when making and breaking connections.

  - Drip pan systems should be installed between the rails to collect spillage from tank cars.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Outdoor Equipment Operations SC-32

Description

Outside process equipment operations and maintenance can contaminate stormwater runoff. Activities, such as grinding, painting, coating, sanding, degreasing or parts cleaning, landfills and waste piles, solid waste treatment and disposal, are examples of process operations that can lead to contamination of stormwater runoff. Source controls for outdoor process equipment operations and maintenance include reducing the amount of waste created, enclosing or covering all or some of the equipment, installing secondary containment, and training employees.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Approach

Pollution Prevention

- Perform the activity during dry periods.
- Use non-toxic chemicals for maintenance and minimize or eliminate the use of solvents.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Suggested Protocols

- Consider enclosing the activity in a building and connecting the floor drains to the sanitary sewer.
- Cover the work area with a permanent roof if possible.
- Minimize contact of stormwater with outside process equipment operations through berming and drainage routing (run-on prevention). If possible, connect process equipment area to public sewer or facility wastewater treatment system. Some municipalities require that secondary containment areas be connected to the sanitary sewer, prohibiting any hard connections to the storm drain.
- Dry clean the work area regularly.

Training

- Train employees to perform the activity during dry periods only or substituting benign materials for more toxic ones.
- Train employee and contractors in proper techniques for spill containment and cleanup. Employees should have the tools and knowledge to immediately begin cleaning up a spill should one occur.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.

- Have employees trained in emergency spill cleanup procedures present when dangerous waste, liquid chemicals, or other wastes are delivered.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Prevent operator errors by using engineering safe guards and thus reducing accidental releases of pollutant.
- Inspect storage areas regularly for leaks or spills. Also check for structural failure, spills and overfills due to operator error, and/or failure of piping system.

Other Considerations

- Providing cover may be expensive.
- Space limitations may preclude enclosing some equipment.
- Storage sheds often must meet building and fire code requirements.

Requirements

Costs

Costs vary depending on the complexity of the operation and the amount of control necessary for stormwater pollution control.

Maintenance

- Conduct routine preventive maintenance, including checking process equipment for leaks.
- Clean the storm drain system regularly.

Supplemental Information

Further Detail of the BMP

Hydraulic/Treatment Modifications

If stormwater becomes polluted, it should be captured and treated. If you do not have your own process wastewater treatment system, consider discharging to the public sewer system. Use of the public sewer might be allowed under the following conditions:

- If the activity area is very small (less than a few hundred square feet), the local sewer authority may be willing to allow the area to remain uncovered with the drain connected to the public sewer.
- It may be possible under unusual circumstances to connect a much larger area to the public sewer, as long as the rate of stormwater discharges does not exceed the capacity of the wastewater treatment plant. The stormwater could be stored during the storm and then transferred to the public sewer when the normal flow is low, such as at night.

Industries that generate large volumes of process wastewater typically have their own treatment system and corresponding permit. These industries have the discretion to use their wastewater treatment system to treat stormwater within the constraints of their permit requirements for process treatment. It may also be possible for the industry to discharge the stormwater directly to an effluent outfall without treatment as long as the total loading of the discharged process

water and stormwater does not exceed the loading had a stormwater treatment device been used. This could be achieved by reducing the loading from the process wastewater treatment system. Check with your Regional Water Quality Control Board or local sewering agency, as this option would be subject to permit constraints and potentially regular monitoring.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

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The Stormwater Managers Resource Center http://www.stormwatercenter.net

Waste Handling & Disposal SC-34

Photo Credit: Geoff Brosseau

Description

Improper storage and handling of solid wastes can allow toxic compounds, oils and greases, heavy metals, nutrients, suspended solids, and other pollutants to enter stormwater runoff. The discharge of pollutants to stormwater from waste handling and disposal can be prevented and reduced by tracking waste generation, storage, and disposal; reducing waste generation and disposal through source reduction, reuse, and recycling; and preventing run-on and runoff.

Approach

Pollution Prevention

- Accomplish reduction in the amount of waste generated using the following source controls:
  - Production planning and sequencing
  - Process or equipment modification
  - Raw material substitution or elimination
  - Loss prevention and housekeeping
  - Waste segregation and separation
  - Close loop recycling
- Establish a material tracking system to increase awareness about material usage. This may reduce spills and minimize contamination, thus reducing the amount of waste produced.
- Recycle materials whenever possible.

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	✓
Organics	✓

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Suggested Protocols

General

- Cover storage containers with leak proof lids or some other means. If waste is not in containers, cover all waste piles (plastic tarps are acceptable coverage) and prevent stormwater run-on and runoff with a berm. The waste containers or piles must be covered except when in use.
- Use drip pans or absorbent materials whenever grease containers are emptied by vacuum trucks or other means. Grease cannot be left on the ground. Collected grease must be properly disposed of as garbage.
- Check storage containers weekly for leaks and to ensure that lids are on tightly. Replace any that are leaking, corroded, or otherwise deteriorating.
- Sweep and clean the storage area regularly. If it is paved, do not hose down the area to a storm drain.
- Dispose of rinse and wash water from cleaning waste containers into a sanitary sewer if allowed by the local sewer authority. Do not discharge wash water to the street or storm drain.
- Transfer waste from damaged containers into safe containers.
- Take special care when loading or unloading wastes to minimize losses. Loading systems can be used to minimize spills and fugitive emission losses such as dust or mist. Vacuum transfer systems can minimize waste loss.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide a sufficient number of litter receptacles for the facility.
- Clean out and cover litter receptacles frequently to prevent spillage.

Waste Collection

- Keep waste collection areas clean.
- Inspect solid waste containers for structural damage regularly. Repair or replace damaged containers as necessary.
- Secure solid waste containers; containers must be closed tightly when not in use.
- Do not fill waste containers with washout water or any other liquid.
- Ensure that only appropriate solid wastes are added to the solid waste container. Certain wastes such as hazardous wastes, appliances, fluorescent lamps, pesticides, etc., may not be disposed of in solid waste containers (see chemical/ hazardous waste collection section below).

- Do not mix wastes; this can cause chemical reactions, make recycling impossible, and complicate disposal.

Good Housekeeping

- Use all of the product before disposing of the container.
- Keep the waste management area clean at all times by sweeping and cleaning up spills immediately.
- Use dry methods when possible (e.g., sweeping, use of absorbents) when cleaning around restaurant/food handling dumpster areas. If water must be used after sweeping/using absorbents, collect water and discharge through grease interceptor to the sewer.

Chemical/Hazardous Wastes

- Select designated hazardous waste collection areas on-site.
- Store hazardous materials and wastes in covered containers and protect them from vandalism.
- Place hazardous waste containers in secondary containment.
- Make sure that hazardous waste is collected, removed, and disposed of only at authorized disposal areas.
- Stencil or demarcate storm drains on the facility's property with prohibitive message regarding waste disposal.

Run-on/Runoff Prevention

- Prevent stormwater run-on from entering the waste management area by enclosing the area or building a berm around the area.
- Prevent waste materials from directly contacting rain.
- Cover waste piles with temporary covering material such as reinforced tarpaulin, polyethylene, polyurethane, polypropyleneor hypalon.
- Cover the area with a permanent roof if feasible.
- Cover dumpsters to prevent rain from washing waste out of holes or cracks in the bottom of the dumpster.
- Move the activity indoor after ensuring all safety concerns such as fire hazard and ventilation are addressed.

Inspection

- Inspect and replace faulty pumps or hoses regularly to minimize the potential of releases and spills.
- Check waste management areas for leaking containers or spills.

- Repair leaking equipment including valves, lines, seals, or pumps promptly.

Training

- Train staff in pollution prevention measures and proper disposal methods.
- Train employees and contractors in proper spill containment and cleanup. The employee should have the tools and knowledge to immediately begin cleaning up a spill should one occur.
- Train employees and subcontractors in proper hazardous waste management.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Have an emergency plan, equipment and trained personnel ready at all times to deal immediately with major spills
- Collect all spilled liquids and properly dispose of them.
- Store and maintain appropriate spill cleanup materials in a location known to all near the designated wash area.
- Ensure that vehicles transporting waste have spill prevention equipment that can prevent spills during transport. Spill prevention equipment includes:
  - Vehicles equipped with baffles for liquid waste
  - Trucks with sealed gates and spill guards for solid waste

Other Considerations (Limitations and Regulations)

Hazardous waste cannot be reused or recycled; it must be disposed of by a licensed hazardous waste hauler.

Requirements

Costs

Capital and O&M costs for these programs will vary substantially depending on the size of the facility and the types of waste handled. Costs should be low if there is an inventory program in place.

Maintenance

- None except for maintaining equipment for material tracking program.

Supplemental Information

Further Detail of the BMP

Land Treatment System

Minimize runoff of polluted stormwater from land application by:

- Choosing a site where slopes are under 6%, the soil is permeable, there is a low water table, it is located away from wetlands or marshes, and there is a closed drainage system

- Avoiding application of waste to the site when it is raining or when the ground is saturated with water
- Growing vegetation on land disposal areas to stabilize soils and reduce the volume of surface water runoff from the site
- Maintaining adequate barriers between the land application site and the receiving waters (planted strips are particularly good)
- Using erosion control techniques such as mulching and matting, filter fences, straw bales, diversion terracing, and sediment basins
- Performing routine maintenance to ensure the erosion control or site stabilization measures are working

Examples

The port of Long Beach has a state-of-the-art database for identifying potential pollutant sources, documenting facility management practices, and tracking pollutants.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Solid Waste Container Best Management Practices – Fact Sheet On-Line Resources – Environmental Health and Safety. Harvard University. 2002.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Safer Alternative Products SC-35

Description

Promote the use of less harmful products and products that contain little or no TMDL pollutants. Alternatives exist for most product classes including chemical fertilizers, pesticides, cleaning solutions, janitorial chemicals, automotive and paint products, and consumables (batteries, fluorescent lamps).

Approach

Pattern a new program after the many established programs around the state and country. Integrate this best management practice as much as possible with existing programs at your facility.

Develop a comprehensive program based on:

- The "Precautionary Principle," which is an alternative to the "Risk Assessment" model that says it's acceptable to use a potentially harmful product until physical evidence of its harmful effects are established and deemed too costly from an environmental or public health perspective. For instance, a risk assessment approach might say it's acceptable to use a pesticide until there is direct proof of an environmental impact. The Precautionary Principle approach is used to evaluate whether a given product is safe, whether it is really necessary, and whether alternative products would perform just as well.
- Environmentally Preferable Purchasing Program to minimize the purchase of products containing hazardous ingredients used in the facility's custodial services, fleet maintenance, and facility maintenance in favor of using alternate products that pose less risk to employees and to the environment.
- Integrated Pest Management (IPM) or Less-Toxic Pesticide Program, which uses a pest management approach that minimizes the use of toxic chemicals and gets rid of pests by methods that pose a lower risk to employees, the public, and the environment.
- Energy Efficiency Program including no-cost and low-cost energy conservation and efficiency actions that can reduce both energy consumption and electricity bills, along with long-term energy efficiency investments.

Consider the following mechanisms for developing and implementing a comprehensive program:

- Policies

Objectives

- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	
Nutrients	✓
Trash	
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

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- Procedures
  - Standard operating procedures (SOPs)
  - Purchasing guidelines and procedures
  - Bid packages (services and supplies)
- Materials
  - Preferred or approved product and supplier lists
  - Product and supplier evaluation criteria
  - Training sessions and manuals
  - Fact sheets for employees

Implement this BMP in conjunction with the Vehicle and Equipment Management fact sheets (SC20 – SC22) and SC41, Building and Grounds Maintenance.

Training

- Employees who handle potentially harmful materials in the use of safer alternatives.
- Purchasing departments should be encouraged to procure less hazardous materials and products that contain little or no harmful substances or TMDL pollutants.

Regulations

This BMP has no regulatory requirements. Existing regulations already encourage facilities to reduce the use of hazardous materials through incentives such as reduced:

- Specialized equipment storage and handling requirements,
- Storm water runoff sampling requirements,
- Training and licensing requirements, and
- Record keeping and reporting requirements.

Equipment

- There are no major equipment requirements to this BMP.

Limitations

- Alternative products may not be available, suitable, or effective in every case.

Requirements

Cost Considerations

- The primary cost is for staff time to: 1) develop new policies and procedures and 2) educate purchasing departments and employees who handle potentially harmful materials about the availability, procurement, and use of safer alternatives.

- Some alternative products may be slightly more expensive than conventional products.

Supplemental Information

Employees and contractors / service providers can both be educated about safer alternatives by using information developed by a number of organizations including the references and resources listed below.

The following discussion provides some general information on safer alternatives. More specific information on particular hazardous materials and the available alternatives may be found in the references and resources listed below.

- Automotive products – Less toxic alternatives are not available for many automotive products, especially engine fluids. But there are alternatives to grease lubricants, car polishes, degreasers, and windshield washer solution. Rerefined motor oil is also available.
- Vehicle/Trailer lubrication – Fifth wheel bearings on trucks require routine lubrication. Adhesive lubricants are available to replace typical chassis grease.
- Cleaners – Vegetables-based or citrus-based soaps are available to replace petroleum-based soaps/detergents.
- Paint products – Water-based paints, wood preservatives, stains, and finishes are available.
- Pesticides – Specific alternative products or methods exist to control most insects, fungi, and weeds.
- Chemical Fertilizers – Compost and soil amendments are natural alternatives.
- Consumables – Manufacturers have either reduced or are in the process of reducing the amount of heavy metals in consumables such as batteries and fluorescent lamps. All fluorescent lamps contain mercury, however low-mercury containing lamps are now available from most hardware and lighting stores. Fluorescent lamps are also more energy efficient than the average incandescent lamp.
- Janitorial chemicals – Even biodegradable soap can harm fish and wildlife before it biodegrades. Biodegradable does not mean non-toxic. Safer products and procedures are available for floor stripping and cleaning, as well as carpet, glass, metal, and restroom cleaning and disinfecting.

Examples

There are a number of business and trade associations, and communities with effective programs. Some of the more prominent are listed below in the references and resources section.

References and Resources

Note: Many of these references provide alternative products for materials that typically are used inside and disposed to the sanitary sewer as well as alternatives to products that usually end up in the storm drain.

General Sustainable Practices and Pollution Prevention Including Pollutant-Specific Information

California Department of Toxic Substances Control (www.dtsc.ca.gov)

California Integrated Waste Management Board (www.ciwmb.ca.gov)

City of Santa Monica (www.santa-monica.org/environment)

City of Palo Alto (www.city.palo-alto.ca.us/cleanbay)

City and County of San Francisco, Department of the Environment (www.ci.sf.ca.us/sfenvironment)

Earth 911 (www.earth911.org/master.asp)

Environmental Finance Center Region IX (www.greenstart.org/efc9)

Flex Your Power (www.flexyourpower.ca.gov)

GreenBiz.com (www.greenbiz.com)

Green Business Program (www.abag.org/bayarea/enviro/gbus/gb.html)

Pacific Industrial and Business Association (www.piba.org)

Sacramento Clean Water Business Partners (www.sacstormwater.org)

USEPA BMP fact sheet – Alternative products (http://cfpub.epa.gov/npdes/stormwater/menuofbmps/poll_2.cfm)

USEPA Region IX Pollution Prevention Program (www.epa.gov/region09/p2)

Western Regional Pollution Prevention Network (www.westp2net.org)

Metals (mercury, copper)

National Electrical Manufacturers Association - Environment, Health and Safety (www.nema.org)

Sustainable Conservation (www.suscon.org)

- Auto Recycling Project
- Brake Pad Partnership

Pesticides and Chemical Fertilizers

Bio-Integral Resource Center (www.birc.org)

California Department of Pesticide Regulation (www.cdpr.ca.gov)

University of California Statewide IPM Program (www.ipm.ucdavis.edu/default.html)

Dioxins

Bay Area Dioxins Project (http://dioxin.abag.ca.gov/)

Building & Grounds Maintenance SC-41

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	✓
Trash	
Metals	✓
Bacteria	✓
Oil and Grease	
Organics	

Description

Stormwater runoff from building and grounds maintenance activities can be contaminated with toxic hydrocarbons in solvents, fertilizers and pesticides, suspended solids, heavy metals, abnormal pH, and oils and greases. Utilizing the protocols in this fact sheet will prevent or reduce the discharge of pollutants to stormwater from building and grounds maintenance activities by washing and cleaning up with as little water as possible, following good landscape management practices, preventing and cleaning up spills immediately, keeping debris from entering the storm drains, and maintaining the stormwater collection system.

Approach

Reduce potential for pollutant discharge through source control pollution prevention and BMP implementation. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Switch to non-toxic chemicals for maintenance when possible.
- Choose cleaning agents that can be recycled.
- Encourage proper lawn management and landscaping, including use of native vegetation.

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- Encourage use of Integrated Pest Management techniques for pest control.
- Encourage proper onsite recycling of yard trimmings.
- Recycle residual paints, solvents, lumber, and other material as much as possible.

Suggested Protocols

Pressure Washing of Buildings, Rooftops, and Other Large Objects

- In situations where soaps or detergents are used and the surrounding area is paved, pressure washers must use a water collection device that enables collection of wash water and associated solids. A sump pump, wet vacuum or similarly effective device must be used to collect the runoff and loose materials. The collected runoff and solids must be disposed of properly.
- If soaps or detergents are not used, and the surrounding area is paved, wash runoff does not have to be collected but must be screened. Pressure washers must use filter fabric or some other type of screen on the ground and/or in the catch basin to trap the particles in wash water runoff.
- If you are pressure washing on a grassed area (with or without soap), runoff must be dispersed as sheet flow as much as possible, rather than as a concentrated stream. The wash runoff must remain on the grass and not drain to pavement.

Landscaping Activities

- Dispose of grass clippings, leaves, sticks, or other collected vegetation as garbage, or by composting. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures on exposed soils.

Building Repair, Remodeling, and Construction

- Do not dump any toxic substance or liquid waste on the pavement, the ground, or toward a storm drain.
- Use ground or drop cloths underneath outdoor painting, scraping, and sandblasting work, and properly dispose of collected material daily.
- Use a ground cloth or oversized tub for activities such as paint mixing and tool cleaning.
- Clean paintbrushes and tools covered with water-based paints in sinks connected to sanitary sewers or in portable containers that can be dumped into a sanitary sewer drain. Brushes and tools covered with non-water-based paints, finishes, or other materials must be cleaned in a manner that enables collection of used solvents (e.g., paint thinner, turpentine, etc.) for recycling or proper disposal.
- Use a storm drain cover, filter fabric, or similarly effective runoff control mechanism if dust, grit, wash water, or other pollutants may escape the work area and enter a catch basin. This is particularly necessary on rainy days. The containment device(s) must be in place at the beginning of the work day, and accumulated dirty runoff and solids must be collected and disposed of before removing the containment device(s) at the end of the work day.

- If you need to de-water an excavation site, you may need to filter the water before discharging to a catch basin or off-site. If directed off-site, you should direct the water through hay bales and filter fabric or use other sediment filters or traps.
- Store toxic material under cover during precipitation events and when not in use. A cover would include tarps or other temporary cover material.

Mowing, Trimming, and Planting

- Dispose of leaves, sticks, or other collected vegetation as garbage, by composting or at a permitted landfill. Do not dispose of collected vegetation into waterways or storm drainage systems.
- Use mulch or other erosion control measures when soils are exposed.
- Place temporarily stockpiled material away from watercourses and drain inlets, and berm or cover stockpiles to prevent material releases to the storm drain system.
- Consider an alternative approach when bailing out muddy water: do not put it in the storm drain; pour over landscaped areas.
- Use hand weeding where practical.

Fertilizer and Pesticide Management

- Follow all federal, state, and local laws and regulations governing the use, storage, and disposal of fertilizers and pesticides and training of applicators and pest control advisors.
- Use less toxic pesticides that will do the job when applicable. Avoid use of copper-based pesticides if possible.
- Do not use pesticides if rain is expected.
- Do not mix or prepare pesticides for application near storm drains.
- Use the minimum amount needed for the job.
- Calibrate fertilizer distributors to avoid excessive application.
- Employ techniques to minimize off-target application (e.g., spray drift) of pesticides, including consideration of alternative application techniques.
- Apply pesticides only when wind speeds are low.
- Fertilizers should be worked into the soil rather than dumped or broadcast onto the surface.
- Irrigate slowly to prevent runoff and then only as much as is needed.
- Clean pavement and sidewalk if fertilizer is spilled on these surfaces before applying irrigation water.
- Dispose of empty pesticide containers according to the instructions on the container label.

- Use up the pesticides. Rinse containers, and use rinse water as product. Dispose of unused pesticide as hazardous waste.
- Implement storage requirements for pesticide products with guidance from the local fire department and County Agricultural Commissioner. Provide secondary containment for pesticides.

Inspection

- Inspect irrigation system periodically to ensure that the right amount of water is being applied and that excessive runoff is not occurring. Minimize excess watering and repair leaks in the irrigation system as soon as they are observed.

Training

- Educate and train employees on pesticide use and in pesticide application techniques to prevent pollution.
- Train employees and contractors in proper techniques for spill containment and cleanup.
- Be sure the frequency of training takes into account the complexity of the operations and the nature of the staff.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials, such as brooms, dustpans, and vacuum sweepers (if desired) near the storage area where it will be readily accessible.
- Have employees trained in spill containment and cleanup present during the loading/unloading of dangerous wastes, liquid chemicals, or other materials.
- Familiarize employees with the Spill Prevention Control and Countermeasure Plan.
- Clean up spills immediately.

Other Considerations

Alternative pest/weed controls may not be available, suitable, or effective in many cases.

Requirements

Costs

- Cost will vary depending on the type and size of facility.
- Overall costs should be low in comparison to other BMPs.

Maintenance

Sweep paved areas regularly to collect loose particles. Wipe up spills with rags and other absorbent material immediately, do not hose down the area to a storm drain.

Supplemental Information

Further Detail of the BMP

Fire Sprinkler Line Flushing

Building fire sprinkler line flushing may be a source of non-stormwater runoff pollution. The water entering the system is usually potable water, though in some areas it may be non-potable reclaimed wastewater. There are subsequent factors that may drastically reduce the quality of the water in such systems. Black iron pipe is usually used since it is cheaper than potable piping, but it is subject to rusting and results in lower quality water. Initially, the black iron pipe has an oil coating to protect it from rusting between manufacture and installation; this will contaminate the water from the first flush but not from subsequent flushes. Nitrates, poly-phosphates and other corrosion inhibitors, as well as fire suppressants and antifreeze may be added to the sprinkler water system. Water generally remains in the sprinkler system a long time (typically a year) and between flushes may accumulate iron, manganese, lead, copper, nickel, and zinc. The water generally becomes anoxic and contains living and dead bacteria and breakdown products from chlorination. This may result in a significant BOD problem and the water often smells. Consequently dispose fire sprinkler line flush water into the sanitary sewer. Do not allow discharge to storm drain or infiltration due to potential high levels of pollutants in fire sprinkler line water.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Mobile Cleaners Pilot Program: Final Report. 1997. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Building Repair and Construction SC-42

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Recycle

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Modifications are common particularly at large industrial sites. The activity may vary from minor and normal building repair to major remodeling, or the construction of new facilities. These activities can generate pollutants including solvents, paints, paint and varnish removers, finishing residues, spent thinners, soap cleaners, kerosene, asphalt and concrete materials, adhesive residues, and old asbestos installation. Protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants to stormwater from building repair, remodeling, and construction by using soil erosion controls, enclosing or covering building material storage areas, using good housekeeping practices, using safer alternative products, and training employees.

Approach

Pollution Prevention

- Recycle residual paints, solvents, lumber, and other materials to the maximum extent practical.
- Buy recycled products to the maximum extent practical.
- Inform on-site contractors of company policy on these matters and include appropriate provisions in their contract to ensure certain proper housekeeping and disposal practices are implemented.

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- Make sure that nearby storm drains are well marked to minimize the chance of inadvertent disposal of residual paints and other liquids.

Suggested Protocols

Repair & Remodeling

- Follow BMPs identified in Construction BMP Handbook.
- Maintain good housekeeping practices while work is underway.
- Keep the work site clean and orderly. Remove debris in a timely fashion. Sweep the area.
- Cover materials of particular concern that must be left outside, particularly during the rainy season.
- Do not dump waste liquids down the storm drain.
- Dispose of wash water, sweepings, and sediments properly.
- Store materials properly that are normally used in repair and remodeling such as paints and solvents.
- Sweep out the gutter or wash the gutter and trap the particles at the outlet of the downspout if when repairing roofs, small particles have accumulated in the gutter. A sock or geofabric placed over the outlet may effectively trap the materials. If the downspout is tight lined, place a temporary plug at the first convenient point in the storm drain and pump out the water with a vactor truck, and clean the catch basin sump where you placed the plug.
- Properly store and dispose waste materials generated from construction activities. See Construction BMP Handbook.
- Clean the storm drain system in the immediate vicinity of the construction activity after it is completed.

Painting

- Enclose painting operations consistent with local air quality regulations and OSHA.
- Local air pollution regulations may, in many areas of the state, specify painting procedures which if properly carried out are usually sufficient to protect water quality.
- Develop paint handling procedures for proper use, storage, and disposal of paints.
- Transport paint and materials to and from job sites in containers with secure lids and tied down to the transport vehicle.
- Test and inspect spray equipment prior to starting to paint. Tighten all hoses and connections and do not overfill paint containers.
- Mix paint indoors before using so that any spill will not be exposed to rain. Do so even during dry weather because cleanup of a spill will never be 100% effective.
- Transfer and load paint and hot thermoplastic away from storm drain inlets.

- Do not transfer or load paint near storm drain inlets.
- Plug nearby storm drain inlets prior to starting painting and remove plugs when job is complete when there is significant risk of a spill reaching storm drains.
- Cover nearby storm drain inlets prior to starting work if sand blasting is used to remove paint.
- Use a ground cloth to collect the chips if painting requires scraping or sand blasting of the existing surface. Dispose the residue properly.
- Cover or enclose painting operations properly to avoid drift.
- Clean the application equipment in a sink that is connected to the sanitary sewer if using water based paints.
- Capture all cleanup-water and dispose of properly.
- Dispose of paints containing lead or tributyl tin and considered a hazardous waste properly.
- Store leftover paints if they are to be kept for the next job properly, or dispose properly.
- Recycle paint when possible. Dispose of paint at an appropriate household hazardous waste facility.

Training

Proper education of off-site contractors is often overlooked. The conscientious efforts of well trained employees can be lost by unknowing off-site contractors, so make sure they are well informed about what they are expected to do.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible.
- Clean up spills immediately.
- Excavate and remove the contaminated (stained) soil if a spill occurs on dirt.

Limitations

- This BMP is for minor construction only. The State's General Construction Activity Stormwater Permit has more requirements for larger projects. The companion "Construction Best Management Practice Handbook" contains specific guidance and best management practices for larger-scale projects.
- Hazardous waste that cannot be reused or recycled must be disposed of by a licensed hazardous waste hauler.
- Be certain that actions to help stormwater quality are consistent with Cal- and Fed-OSHA and air quality regulations.

SC-42 Building Repair and Construction

Requirements

Costs

These BMPs are generally low to modest in cost.

Maintenance

N/A

Supplemental Information

Further Detail of the BMP

Soil/Erosion Control

If the work involves exposing large areas of soil, employ the appropriate soil erosion and control techniques. See the Construction Best Management Practice Handbook. If old buildings are being torn down and not replaced in the near future, stabilize the site using measures described in SC-40 Contaminated or Erodible Areas.

If a building is to be placed over an open area with a storm drainage system, make sure the storm inlets within the building are covered or removed, or the storm line is connected to the sanitary sewer. If because of the remodeling a new drainage system is to be installed or the existing system is to be modified, consider installing catch basins as they serve as effective "in-line" treatment devices. See Treatment Control Fact Sheet TC-20 Wet Pond/Basin in Section 5 of the New Development and Redevelopment Handbook regarding design criteria. Include in the catch basin a "turn-down" elbow or similar device to trap floatables.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Parking/Storage Area Maintenance SC-43

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize
- Product Substitution

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	✓
Bacteria	
Oil and Grease	✓
Organics	✓

Description

Parking lots and storage areas can contribute a number of substances, such as trash, suspended solids, hydrocarbons, oil and grease, and heavy metals that can enter receiving waters through stormwater runoff or non-stormwater discharges. The protocols in this fact sheet are intended to prevent or reduce the discharge of pollutants from parking/storage areas and include using good housekeeping practices, following appropriate cleaning BMPs, and training employees.

Approach

The goal of this program is to ensure stormwater pollution prevention practices are considered when conducting activities on or around parking areas and storage areas to reduce potential for pollutant discharge to receiving waters. Successful implementation depends on effective training of employees on applicable BMPs and general pollution prevention strategies and objectives.

Pollution Prevention

- Encourage alternative designs and maintenance strategies for impervious parking lots. (See New Development and Redevelopment BMP Handbook)
- Keep accurate maintenance logs to evaluate BMP implementation.

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SC-43 Parking/Storage Area Maintenance

Suggested Protocols

General

- Keep the parking and storage areas clean and orderly. Remove debris in a timely fashion.
- Allow sheet runoff to flow into biofilters (vegetated strip and swale) and/or infiltration devices.
- Utilize sand filters or oleophilic collectors for oily waste in low quantities.
- Arrange rooftop drains to prevent drainage directly onto paved surfaces.
- Design lot to include semi-permeable hardscape.
- Discharge soapy water remaining in mop or wash buckets to the sanitary sewer through a sink, toilet, clean-out, or wash area with drain.

Controlling Litter

- Post "No Littering" signs and enforce anti-litter laws.
- Provide an adequate number of litter receptacles.
- Clean out and cover litter receptacles frequently to prevent spillage.
- Provide trash receptacles in parking lots to discourage litter.
- Routinely sweep, shovel, and dispose of litter in the trash.

Surface Cleaning

- Use dry cleaning methods (e.g., sweeping, vacuuming) to prevent the discharge of pollutants into the stormwater conveyance system if possible.
- Establish frequency of public parking lot sweeping based on usage and field observations of waste accumulation.
- Sweep all parking lots at least once before the onset of the wet season.
- Follow the procedures below if water is used to clean surfaces:
  - Block the storm drain or contain runoff.
  - Collect and pump wash water to the sanitary sewer or discharge to a pervious surface. Do not allow wash water to enter storm drains.
  - Dispose of parking lot sweeping debris and dirt at a landfill.
- Follow the procedures below when cleaning heavy oily deposits:
  - Clean oily spots with absorbent materials.
  - Use a screen or filter fabric over inlet, then wash surfaces.

- Do not allow discharges to the storm drain.
- Vacuum/pump discharges to a tank or discharge to sanitary sewer.
- Appropriately dispose of spilled materials and absorbents.

Surface Repair

- Preheat, transfer or load hot bituminous material away from storm drain inlets.
- Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff.
- Cover and seal nearby storm drain inlets where applicable (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal.
- Use only as much water as necessary for dust control, to avoid runoff.
- Catch drips from paving equipment that is not in use with pans or absorbent material placed under the machines. Dispose of collected material and absorbents properly.

Inspection

- Have designated personnel conduct inspections of parking facilities and stormwater conveyance systems associated with parking facilities on a regular basis.
- Inspect cleaning equipment/sweepers for leaks on a regular basis.

Training

- Provide regular training to field employees and/or contractors regarding cleaning of paved areas and proper operation of equipment.
- Train employees and contractors in proper techniques for spill containment and cleanup.

Spill Response and Prevention

- Keep your Spill Prevention Control and Countermeasure (SPCC) Plan up-to-date.
- Place a stockpile of spill cleanup materials where it will be readily accessible or at a central location.
- Clean up fluid spills immediately with absorbent rags or material.
- Dispose of spilled material and absorbents properly.

Other Considerations

Limitations related to sweeping activities at large parking facilities may include high equipment costs, the need for sweeper operator training, and the inability of current sweeper technology to remove oil and grease.

SC-43 Parking/Storage Area Maintenance

Requirements

Costs

Cleaning/sweeping costs can be quite large. Construction and maintenance of stormwater structural controls can be quite expensive as well.

Maintenance

- Sweep parking lot regularly to minimize cleaning with water.
- Clean out oil/water/sand separators regularly, especially after heavy storms.
- Clean parking facilities regularly to prevent accumulated wastes and pollutants from being discharged into conveyance systems during rainy conditions.

Supplemental Information

Further Detail of the BMP

Surface Repair

Apply concrete, asphalt, and seal coat during dry weather to prevent contamination from contacting stormwater runoff. Where applicable, cover and seal nearby storm drain inlets (with waterproof material or mesh) and manholes before applying seal coat, slurry seal, etc. Leave covers in place until job is complete and all water from emulsified oil sealants has drained or evaporated. Clean any debris from these covered manholes and drains for proper disposal. Only use only as much water as is necessary for dust control to avoid runoff.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Pollution from Surface Cleaning Folder. 1996. Bay Area Stormwater Management Agencies Association (BASMAA). http://www.basmaa.org/

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net/

Drainage System Maintenance SC-44

Objectives

- Cover
- Contain
- Educate
- Reduce/Minimize

Description

As a consequence of its function, the stormwater conveyance system collects and transports urban runoff and stormwater that may contain certain pollutants. The protocols in this fact sheet are intended to reduce pollutants reaching receiving waters through proper conveyance system operation and maintenance.

Targeted Constituents

Sediment	✓
Nutrients	
Trash	✓
Metals	
Bacteria	✓
Oil and Grease	
Organics	

Approach

Pollution Prevention

Maintain catch basins, stormwater inlets, and other stormwater conveyance structures on a regular basis to remove pollutants, reduce high pollutant concentrations during the first flush of storms, prevent clogging of the downstream conveyance system, restore catch basins' sediment trapping capacity, and ensure the system functions properly hydraulically to avoid flooding.

Suggested Protocols

Catch Basins/Inlet Structures

- Staff should regularly inspect facilities to ensure compliance with the following:
  - Immediate repair of any deterioration threatening structural integrity.
  - Cleaning before the sump is 40% full. Catch basins should be cleaned as frequently as needed to meet this standard.
  - Stenciling of catch basins and inlets (see SC34 Waste Handling and Disposal).

- Clean catch basins, storm drain inlets, and other conveyance structures before the wet season to remove sediments and debris accumulated during the summer.
- Conduct inspections more frequently during the wet season for problem areas where sediment or trash accumulates more often. Clean and repair as needed.
- Keep accurate logs of the number of catch basins cleaned.
- Store wastes collected from cleaning activities of the drainage system in appropriate containers or temporary storage sites in a manner that prevents discharge to the storm drain.
- Dewater the wastes if necessary with outflow into the sanitary sewer if permitted. Water should be treated with an appropriate filtering device prior to discharge to the sanitary sewer. If discharge to the sanitary sewer is not allowed, water should be pumped or vacuumed to a tank and properly disposed. Do not dewater near a storm drain or stream.

Storm Drain Conveyance System

- Locate reaches of storm drain with deposit problems and develop a flushing schedule that keeps the pipe clear of excessive buildup.
- Collect and pump flushed effluent to the sanitary sewer for treatment whenever possible.

Pump Stations

- Clean all storm drain pump stations prior to the wet season to remove silt and trash.
- Do not allow discharge to reach the storm drain system when cleaning a storm drain pump station or other facility.
- Conduct routine maintenance at each pump station.
- Inspect, clean, and repair as necessary all outlet structures prior to the wet season.

Open Channel

- Modify storm channel characteristics to improve channel hydraulics, increase pollutant removals, and enhance channel/creek aesthetic and habitat value.
- Conduct channel modification/improvement in accordance with existing laws. Any person, government agency, or public utility proposing an activity that will change the natural (emphasis added) state of any river, stream, or lake in California, must enter into a Steam or Lake Alteration Agreement with the Department of Fish and Game. The developer-applicant should also contact local governments (city, county, special districts), other state agencies (SWRCB, RWQCB, Department of Forestry, Department of Water Resources), and Federal Corps of Engineers and USFWS.

Illicit Connections and Discharges

- Look for evidence of illegal discharges or illicit connections during routine maintenance of conveyance system and drainage structures:
  - Is there evidence of spills such as paints, discoloring, etc?

- Are there any odors associated with the drainage system?
- Record locations of apparent illegal discharges/illicit connections?
- Track flows back to potential dischargers and conduct aboveground inspections. This can be done through visual inspection of upgradient manholes or alternate techniques including zinc chloride smoke testing, fluorometric dye testing, physical inspection testing, or television camera inspection.
- Eliminate the discharge once the origin of flow is established.

- Stencil or demarcate storm drains, where applicable, to prevent illegal disposal of pollutants. Storm drain inlets should have messages such as "Dump No Waste Drains to Stream" stenciled next to them to warn against ignorant or intentional dumping of pollutants into the storm drainage system.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Illegal Dumping

- Inspect and clean up hot spots and other storm drainage areas regularly where illegal dumping and disposal occurs.
- Establish a system for tracking incidents. The system should be designed to identify the following:
  - Illegal dumping hot spots
  - Types and quantities (in some cases) of wastes
  - Patterns in time of occurrence (time of day/night, month, or year)
  - Mode of dumping (abandoned containers, "midnight dumping" from moving vehicles, direct dumping of materials, accidents/spills)
  - Responsible parties
- Post "No Dumping" signs in problem areas with a phone number for reporting dumping and disposal. Signs should also indicate fines and penalties for illegal dumping.
- Refer to fact sheet SC-10 Non-Stormwater Discharges.

Training

- Train crews in proper maintenance activities, including record keeping and disposal.
- Allow only properly trained individuals to handle hazardous materials/wastes.
- Have staff involved in detection and removal of illicit connections trained in the following:
  - OSHA-required Health and Safety Training (29 CFR 1910.120) plus annual refresher training (as needed).

- OSHA Confined Space Entry training (Cal-OSHA Confined Space, Title 8 and Federal OSHA 29 CFR 1910.146).

- Procedural training (field screening, sampling, smoke/dye testing, TV inspection).

Spill Response and Prevention

- Investigate all reports of spills, leaks, and/or illegal dumping promptly.
- Clean up all spills and leaks using "dry" methods (with absorbent materials and/or rags) or dig up, remove, and properly dispose of contaminated soil.
- Refer to fact sheet SC-11 Spill Prevention, Control, and Cleanup.

Other Considerations (Limitations and Regulations)

- Clean-up activities may create a slight disturbance for local aquatic species. Access to items and material on private property may be limited. Trade-offs may exist between channel hydraulics and water quality/riparian habitat. If storm channels or basins are recognized as wetlands, many activities, including maintenance, may be subject to regulation and permitting.
- Storm drain flushing is most effective in small diameter pipes (36-inch diameter pipe or less, depending on water supply and sediment collection capacity). Other considerations associated with storm drain flushing may include the availability of a water source, finding a downstream area to collect sediments, liquid/sediment disposal, and prohibition against disposal of flushed effluent to sanitary sewer in some areas.
- Regulations may include adoption of substantial penalties for illegal dumping and disposal.
- Local municipal codes may include sections prohibiting discharge of soil, debris, refuse, hazardous wastes, and other pollutants into the storm drain system.

Requirements

Costs

- An aggressive catch basin cleaning program could require a significant capital and O&M budget.
- The elimination of illegal dumping is dependent on the availability, convenience, and cost of alternative means of disposal. The primary cost is for staff time. Cost depends on how aggressively a program is implemented. Other cost considerations for an illegal dumping program include:

  - Purchase and installation of signs.

  - Rental of vehicle(s) to haul illegally-disposed items and material to landfills.

  - Rental of heavy equipment to remove larger items (e.g., car bodies) from channels.

  - Purchase of landfill space to dispose of illegally-dumped items and material.

- Methods used for illicit connection detection (smoke testing, dye testing, visual inspection, and flow monitoring) can be costly and time-consuming. Site-specific factors, such as the level of impervious area, the density and ages of buildings, and type of land use will determine the level of investigation necessary.

Maintenance

- Two-person teams may be required to clean catch basins with vactor trucks.
- Teams of at least two people plus administrative personnel are required to identify illicit discharges, depending on the complexity of the storm sewer system.
- Arrangements must be made for proper disposal of collected wastes.
- Technical staff are required to detect and investigate illegal dumping violations.

Supplemental Information

Further Detail of the BMP

Storm Drain Flushing

Flushing is a common maintenance activity used to improve pipe hydraulics and to remove pollutants in storm drainage systems. Flushing may be designed to hydraulically convey accumulated material to strategic locations, such as an open channel, another point where flushing will be initiated, or the sanitary sewer and the treatment facilities, thus preventing resuspension and overflow of a portion of the solids during storm events. Flushing prevents "plug flow" discharges of concentrated pollutant loadings and sediments. Deposits can hinder the designed conveyance capacity of the storm drain system and potentially cause backwater conditions in severe cases of clogging.

Storm drain flushing usually takes place along segments of pipe with grades that are too flat to maintain adequate velocity to keep particles in suspension. An upstream manhole is selected to place an inflatable device that temporarily plugs the pipe. Further upstream, water is pumped into the line to create a flushing wave. When the upstream reach of pipe is sufficiently full to cause a flushing wave, the inflated device is rapidly deflated with the assistance of a vacuum pump, thereby releasing the backed up water and resulting in the cleaning of the storm drain segment.

To further reduce impacts of stormwater pollution, a second inflatable device placed well downstream may be used to recollect the water after the force of the flushing wave has dissipated. A pump may then be used to transfer the water and accumulated material to the sanitary sewer for treatment. In some cases, an interceptor structure may be more practical or required to recollect the flushed waters.

It has been found that cleansing efficiency of periodic flush waves is dependent upon flush volume, flush discharge rate, sewer slope, sewer length, sewer flow rate, sewer diameter, and population density. As a rule of thumb, the length of line to be flushed should not exceed 700 feet. At this maximum recommended length, the percent removal efficiency ranges between 65-75% for organics and 55-65% for dry weather grit/inorganic material. The percent removal efficiency drops rapidly beyond that. Water is commonly supplied by a water truck, but fire hydrants can also supply water. To make the best use of water, it is recommended that reclaimed water be used or that fire hydrant line flushing coincide with storm sewer flushing.

References and Resources

California's Nonpoint Source Program Plan http://www.swrcb.ca.gov/nps/index.html

Clark County Storm Water Pollution Control Manual
http://www.co.clark.wa.us/pubworks/bmpman.pdf

Ferguson, B.K. 1991. Urban Stream Reclamation, p. 324-322, Journal of Soil and Water Conservation.

King County Storm Water Pollution Control Manual http://dnr.metrokc.gov/wlr/dss/spcm.htm

Oregon Association of Clean Water Agencies. Oregon Municipal Stormwater Toolbox for Maintenance Practices. June 1998.

Santa Clara Valley Urban Runoff Pollution Prevention Program http://www.scvurppp.org

The Storm Water Managers Resource Center http://www.stormwatercenter.net

United States Environmental Protection Agency (USEPA). 2002. Pollution Prevention/Good Housekeeping for Municipal Operations Storm Drain System Cleaning. On line:
http://www.epa.gov/npdes/menuofbmps/poll_16.htm

Drain Insert MP-52

General Description

Drain inserts are manufactured filters or fabric placed in a drop inlet to remove sediment and debris. There are a multitude of inserts of various shapes and configurations, typically falling into one of three different groups: socks, boxes, and trays. The sock consists of a fabric, usually constructed of polypropylene. The fabric may be attached to a frame or the grate of the inlet holds the sock. Socks are meant for vertical (drop) inlets. Boxes are constructed of plastic or wire mesh. Typically a polypropylene "bag" is placed in the wire mesh box. The bag takes the form of the box. Most box products are one box; that is, the setting area and filtration through media occur in the same box. Some products consist of one or more trays or mesh grates. The trays may hold different types of media. Filtration media vary by manufacturer. Types include polypropylene, porous polymer, treated cellulose, and activated carbon.

Inspection/Maintenance Considerations

Washout problems increase with rain intensity. Susceptibility of accumulated sediments to be re-suspended at low flow rates, can be corrected with an energy dissipater between gate and treatment areas.

Inspection Activities	Suggested Frequency
■ Inspect for sediment buildup and proper functioning.	At the beginning of the wet season and after significant storms
■ Verify that stormwater enters the unit and does not leak around the perimeter.	After construction.
Maintenance Activities	**Suggested Frequency**
■ Remove sediment as needed.	At the beginning of the wet season and as necessary

Maintenance Concerns, Objectives, and Goals

■ Sediment Removal

Targeted Constituents

- ✓ Sediment
- ✓ Nutrients
- ✓ Trash
- ✓ Metals
- Bacteria
- ✓ Oil and Grease
- ✓ Organics

Removal Effectiveness

See New Development and Redevelopment Handbook-Section 5.

Efficient Irrigation SD-12

Design Objectives

- ☑ Maximize Infiltration
- ☑ Provide Retention
- ☑ Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Irrigation water provided to landscaped areas may result in excess irrigation water being conveyed into stormwater drainage systems.

Approach

Project plan designs for development and redevelopment should include application methods of irrigation water that minimize runoff of excess irrigation water into the stormwater conveyance system.

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Designing New Installations

The following methods to reduce excessive irrigation runoff should be considered, and incorporated and implemented where determined applicable and feasible by the Permittee:

- Employ rain-triggered shutoff devices to prevent irrigation after precipitation.
- Design irrigation systems to each landscape area's specific water requirements.
- Include design featuring flow reducers or shutoff valves triggered by a pressure drop to control water loss in the event of broken sprinkler heads or lines.
- Implement landscape plans consistent with County or City water conservation resolutions, which may include provision of water sensors, programmable irrigation times (for short cycles), etc.

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- Design timing and application methods of irrigation water to minimize the runoff of excess irrigation water into the storm water drainage system.
- Group plants with similar water requirements in order to reduce excess irrigation runoff and promote surface filtration. Choose plants with low irrigation requirements (for example, native or drought tolerant species). Consider design features such as:
  - Using mulches (such as wood chips or bar) in planter areas without ground cover to minimize sediment in runoff
  - Installing appropriate plant materials for the location, in accordance with amount of sunlight and climate, and use native plant materials where possible and/or as recommended by the landscape architect
  - Leaving a vegetative barrier along the property boundary and interior watercourses, to act as a pollutant filter, where appropriate and feasible
  - Choosing plants that minimize or eliminate the use of fertilizer or pesticides to sustain growth
- Employ other comparable, equally effective methods to reduce irrigation water runoff.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Storm Drain Signage SD-13

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- Contain Pollutants
- Collect and Convey

Description

Waste materials dumped into storm drain inlets can have severe impacts on receiving and ground waters. Posting notices regarding discharge prohibitions at storm drain inlets can prevent waste dumping. Storm drain signs and stencils are highly visible source controls that are typically placed directly adjacent to storm drain inlets.

Approach

The stencil or affixed sign contains a brief statement that prohibits dumping of improper materials into the urban runoff conveyance system. Storm drain messages have become a popular method of alerting the public about the effects of and the prohibitions against waste disposal.

Suitable Applications

Stencils and signs alert the public to the destination of pollutants discharged to the storm drain. Signs are appropriate in residential, commercial, and industrial areas, as well as any other area where contributions or dumping to storm drains is likely.

Design Considerations

Storm drain message markers or placards are recommended at all storm drain inlets within the boundary of a development project. The marker should be placed in clear sight facing toward anyone approaching the inlet from either side. All storm drain inlet locations should be identified on the development site map.

Designing New Installations

The following methods should be considered for inclusion in the project design and show on project plans:

- Provide stenciling or labeling of all storm drain inlets and catch basins, constructed or modified, within the project area with prohibitive language. Examples include “NO DUMPING

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– DRAINS TO OCEAN" and/or other graphical icons to discourage illegal dumping.

- Post signs with prohibitive language and/or graphical icons, which prohibit illegal dumping at public access points along channels and creeks within the project area.

Note - Some local agencies have approved specific signage and/or storm drain message placards for use. Consult local agency stormwater staff to determine specific requirements for placard types and methods of application.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. If the project meets the definition of "redevelopment", then the requirements stated under " designing new installations" above should be included in all project design plans.

Additional Information

Maintenance Considerations

- Legibility of markers and signs should be maintained. If required by the agency with jurisdiction over the project, the owner/operator or homeowner's association should enter into a maintenance agreement with the agency or record a deed restriction upon the property title to maintain the legibility of placards or signs.

Placement

- Signage on top of curbs tends to weather and fade.

- Signage on face of curbs tends to be worn by contact with vehicle tires and sweeper brooms.

Supplemental Information

Examples

- Most MS4 programs have storm drain signage programs. Some MS4 programs will provide stencils, or arrange for volunteers to stencil storm drains as part of their outreach program.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Maintenance Bays & Docks SD-31

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- ☑ Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Description

Several measures can be taken to prevent operations at maintenance bays and loading docks from contributing a variety of toxic compounds, oil and grease, heavy metals, nutrients, suspended solids, and other pollutants to the stormwater conveyance system.

Approach

In designs for maintenance bays and loading docks, containment is encouraged. Preventative measures include overflow containment structures and dead-end sumps. However, in the case of loading docks from grocery stores and warehouse/distribution centers, engineered infiltration systems may be considered.

Suitable Applications

Appropriate applications include commercial and industrial areas planned for development or redevelopment.

Design Considerations

Design requirements for vehicle maintenance and repair are governed by Building and Fire Codes, and by current local agency ordinances, and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code requirements.

Designing New Installations

Designs of maintenance bays should consider the following:

- Repair/maintenance bays and vehicle parts with fluids should be indoors; or designed to preclude urban run-on and runoff.
- Repair/maintenance floor areas should be paved with Portland cement concrete (or equivalent smooth impervious surface).

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- Repair/maintenance bays should be designed to capture all wash water leaks and spills. Provide impermeable berms, drop inlets, trench catch basins, or overflow containment structures around repair bays to prevent spilled materials and wash-down waters form entering the storm drain system. Connect drains to a sump for collection and disposal. Direct connection of the repair/maintenance bays to the storm drain system is prohibited. If required by local jurisdiction, obtain an Industrial Waste Discharge Permit.

- Other features may be comparable and equally effective.

The following designs of loading/unloading dock areas should be considered:

- Loading dock areas should be covered, or drainage should be designed to preclude urban run-on and runoff.

- Direct connections into storm drains from depressed loading docks (truck wells) are prohibited.

- Below-grade loading docks from grocery stores and warehouse/distribution centers of fresh food items should drain through water quality inlets, or to an engineered infiltration system, or an equally effective alternative. Pre-treatment may also be required.

- Other features may be comparable and equally effective.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Stormwater and non-stormwater will accumulate in containment areas and sumps with impervious surfaces. Contaminated accumulated water must be disposed of in accordance with applicable laws and cannot be discharged directly to the storm drain or sanitary sewer system without the appropriate permit.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Trash Storage Areas SD-32

Description

Trash storage areas are areas where a trash receptacle (s) are located for use as a repository for solid wastes. Stormwater runoff from areas where trash is stored or disposed of can be polluted. In addition, loose trash and debris can be easily transported by water or wind into nearby storm drain inlets, channels, and/or creeks. Waste handling operations that may be sources of stormwater pollution include dumpsters, litter control, and waste piles.

Approach

This fact sheet contains details on the specific measures required to prevent or reduce pollutants in stormwater runoff associated with trash storage and handling. Preventative measures including enclosures, containment structures, and impervious pavements to mitigate spills, should be used to reduce the likelihood of contamination.

Design Objectives

- Maximize Infiltration
- Provide Retention
- Slow Runoff
- Minimize Impervious Land Coverage
- Prohibit Dumping of Improper Materials
- ☑ Contain Pollutants
- Collect and Convey

Suitable Applications

Appropriate applications include residential, commercial and industrial areas planned for development or redevelopment. (Detached residential single-family homes are typically excluded from this requirement.)

Design Considerations

Design requirements for waste handling areas are governed by Building and Fire Codes, and by current local agency ordinances and zoning requirements. The design criteria described in this fact sheet are meant to enhance and be consistent with these code and ordinance requirements. Hazardous waste should be handled in accordance with legal requirements established in Title 22, California Code of Regulation.

Wastes from commercial and industrial sites are typically hauled by either public or commercial carriers that may have design or access requirements for waste storage areas. The design criteria in this fact sheet are recommendations and are not intended to be in conflict with requirements established by the waste hauler. The waste hauler should be contacted prior to the design of your site trash collection areas. Conflicts or issues should be discussed with the local agency.

Designing New Installations

Trash storage areas should be designed to consider the following structural or treatment control BMPs:

- Design trash container areas so that drainage from adjoining roofs and pavement is diverted around the area(s) to avoid run-on. This might include berming or grading the waste handling area to prevent run-on of stormwater.
- Make sure trash container areas are screened or walled to prevent off-site transport of trash.

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- Use lined bins or dumpsters to reduce leaking of liquid waste.
- Provide roofs, awnings, or attached lids on all trash containers to minimize direct precipitation and prevent rainfall from entering containers.
- Pave trash storage areas with an impervious surface to mitigate spills.
- Do not locate storm drains in immediate vicinity of the trash storage area.
- Post signs on all dumpsters informing users that hazardous materials are not to be disposed of therein.

Redeveloping Existing Installations

Various jurisdictional stormwater management and mitigation plans (SUSMP, WQMP, etc.) define "redevelopment" in terms of amounts of additional impervious area, increases in gross floor area and/or exterior construction, and land disturbing activities with structural or impervious surfaces. The definition of " redevelopment" must be consulted to determine whether or not the requirements for new development apply to areas intended for redevelopment. If the definition applies, the steps outlined under "designing new installations" above should be followed.

Additional Information

Maintenance Considerations

The integrity of structural elements that are subject to damage (i.e., screens, covers, and signs) must be maintained by the owner/operator. Maintenance agreements between the local agency and the owner/operator may be required. Some agencies will require maintenance deed restrictions to be recorded of the property title. If required by the local agency, maintenance agreements or deed restrictions must be executed by the owner/operator before improvement plans are approved.

Other Resources

A Manual for the Standard Urban Stormwater Mitigation Plan (SUSMP), Los Angeles County Department of Public Works, May 2002.

Model Standard Urban Storm Water Mitigation Plan (SUSMP) for San Diego County, Port of San Diego, and Cities in San Diego County, February 14, 2002.

Model Water Quality Management Plan (WQMP) for County of Orange, Orange County Flood Control District, and the Incorporated Cities of Orange County, Draft February 2003.

Ventura Countywide Technical Guidance Manual for Stormwater Quality Control Measures, July 2002.

Attachment F
Infiltration Report

Geotechnical Engineering Investigation

Proposed Industrial Warehouse Development
Corner of Barton Road and Terrace Avenue
Colton, California

Hager Pacific Properties, LLC
4100 Newport Place, Suite 820
Newport Beach, California 92660

Attn: Mr. Robert Neal

Project Number 20852-18
January 25, 2019

NorCal Engineering

NorCal Engineering

Soils and Geotechnical Consultants
10641 Humbolt Street Los Alamitos, CA 90720
(562) 799-9469 Fax (562) 799-9459

January 25, 2019 Project Number 20852-18

Hager Pacific Properties, LLC
4100 Newport Place, Suite 820
Newport Beach, California 92660

Attn: Mr. Robert Neal

RE: **Geotechnical Engineering Investigation** - Proposed Industrial Warehouse Development - Located at the Corner of Barton Road and Terrace Avenue, in the City of Colton, California

Dear Mr. Neal:

Pursuant to your request, this firm has performed a Geotechnical Engineering Investigation for the above referenced project in accordance with your approval of our proposal dated November 28, 2018. The purpose of this investigation is to evaluate the geotechnical conditions of the subject site and to provide recommendations for the proposed industrial warehouse development.

The scope of work included the following: 1) site reconnaissance; 2) subsurface geotechnical exploration and sampling; 3) laboratory testing; 4) soil infiltration testing; 5) engineering analysis of field and laboratory data; 5) preparation of a geotechnical engineering report. It is the opinion of this firm that the proposed development is feasible from a geotechnical standpoint provided that the recommendations presented in this report are followed in the design and construction of the project.

1.0 Project Description

It is proposed to construct an industrial warehouse development consisting of 410,620 and 539,360 square feet buildings on the subject property as shown on the attached Site Plan. The proposed concrete tilt-up buildings will be supported by a conventional slab-on-grade foundation system with perimeter-spread footings and isolated interior footings. Other improvements will include asphalt and concrete pavement areas, hardscape and landscaping.

It is assumed that the proposed grading for the development will include cut and fill procedures on the order of a few feet to achieve finished grade elevations. Final building plans shall be reviewed by this firm prior to submittal for city approval to determine the need for any additional study and revised recommendations pertinent to the proposed development, if necessary.

2.0 Site Description

The 45.91-acre subject property is located at the corner of Barton Road and Terrace Avenue, bordered by De Berry Street, in the City of Colton. The generally rectangular-shaped parcel is elongated in a north to south direction with topography of the relatively level property descending slightly from a northeast to southwest direction. The site is occupied by two large industrial buildings with surrounding asphalt and concrete pavement. An undeveloped parcel covered with sparse vegetation growth of natural grasses and weeds is situated toward the southeast quadrant of the site.

3.0 Site Exploration

The investigation consisted of the placement of twenty-one (21) subsurface exploratory borings by a truck mounted drill rig with eight-inch outside diameter hollow-stem, continuous flight augers to depths ranging between 5 and 20 feet below current ground elevations. The borings were placed at accessible locations throughout the property. The explorations were visually classified and logged by a field engineer with locations of the subsurface explorations shown on the attached plan.

The exploratory borings revealed the existing earth materials to consist of fill and natural soil and bedrock zones. Detailed descriptions of the subsurface conditions are listed on the boring logs in Appendix A. It should be noted that the transition from one soil type to another as shown on the borings logs is approximate and may in fact be a gradual transition. The soils encountered are described as follows:

Fill: A fill soil classifying as a brown to grey, sandy to clayey SILT was encountered across the site to depths ranging from 1 to 2 feet below ground surface. These soils were noted to be loose and damp.

Natural: A natural undisturbed soil classifying as a brown to brown grey, sandy to clayey SILT and silty CLAY was encountered beneath the upper fill soils. The native soils as encountered were observed to be firm to stiff and moist.

Bedrock: A decomposed granite material classifying as a fine to coarse grained, silty SAND was encountered beneath the upper fill and natural soils at a depth of 7 to 13 feet below ground surface. The bedrock was observed to be hard to very hard and moist.

The overall engineering characteristics of the earth material were relatively uniform with each excavation. Groundwater was not encountered to the depth of our borings and no caving occurred.

4.0 Laboratory Tests

Relatively undisturbed samples of the subsurface soils were obtained to perform laboratory testing and analysis for direct shear, consolidation tests, and to determine in-place moisture/densities. These relatively undisturbed ring samples were obtained by driving a thin-walled steel sampler lined with one-inch long brass rings with an inside diameter of 2.42 inches into the undisturbed soils. The sampler was driven a total of six inches into undisturbed soils. Bulk bag samples were obtained in the upper soils for expansion index tests and maximum density tests. All test results are included in Appendix B, unless otherwise noted.

4.1 **Field Moisture Content** (ASTM: D 2216) and the dry density of the ring samples were determined in the laboratory. This data is listed on the logs of explorations.

4.2 **Maximum Density tests** (ASTM: D 1557) were performed on typical samples of the upper soils. Results of these tests are shown on Table I.

4.3 **Expansion Index tests** (ASTM: D 4829) were performed on remolded samples of the upper soils to determine expansive characteristics. Results of these tests are provided on Table II.

4.4 **Atterberg Limits** (ASTM: D 4318) consisting of liquid limit, plastic limit and plasticity index were performed on representative soil samples. Results are shown on Table III.

4.5 **Corrosion tests** consisting of sulfate, pH, resistivity and chloride analysis to determine potential corrosive effects of soils on concrete and underground utilities. Test results are provided on Table IV.

4.6 **R-Value test** per California Test Method 301 was performed on a representative sample, which may be anticipated to be near subgrade to determine pavement design. Results are provided within the pavement design section of the report.

4.7 **Direct Shear tests** (ASTM: D 3080) were performed on undisturbed and/or remolded samples of the subsurface soils. The test is performed under saturated conditions at loads of 1,000 lbs./sq.ft., 2,000 lbs./sq.ft., and 3,000 lbs./sq.ft. with results shown on Plates A and B.

4.8 **Consolidation tests** (ASTM: D 2435) were performed on undisturbed samples to determine the differential and total settlement which may be anticipated based upon the proposed loads. Water was added to the samples at a surcharge of one KSF and the settlement curves are plotted on Plates C to F.

5.0 Seismicity Evaluation

The proposed development lies outside of any Alquist Priolo Special Studies Zone and the potential for damage due to direct fault rupture is considered unlikely. The San Jacinto Fault is located 3 kilometers from the site and is capable of producing a Magnitude 6.7 earthquake. Ground shaking originating from earthquakes along other active faults in the region is expected to induce lower horizontal accelerations due to smaller anticipated earthquakes and/or greater distances to other faults.

The following seismic design parameters are provided below and are based upon the 2016 California Building Code (CBC) for the referenced project. Data was obtained from American Society of Civil Engineers (ASCE) website, https://asce7hazardtool.online/. The *ASCE 7 Hazards Report* is attached in Appendix C.

Seismic Design Acceleration Parameters

Latitude	34.034
Longitude	-117.332
Site Class	D
Risk Category	I/II/III
Mapped Spectral Response Acceleration	S_S = 1.806g S_1 = 0.795g
Adjusted Maximum Acceleration	S_{MS} = 1.806g S_{M1} = 1.193g
Design Spectral Response Acceleration Parameters	S_{DS} = 1.204g S_{D1} = 0.795g

6.0 Liquefaction Evaluation

The site is expected to experience ground shaking and earthquake activity that is typical of the Southern California area. It is during severe shaking that loose, granular soils below the groundwater table can liquefy. Based on review of the *County of San Bernardino County Land Use Plan – General Plan – Geologic Hazard Overlays (2009)*, the site lies outside a zone of "Suspected Liquefaction Susceptibility". Thus, the design of the proposed construction in conformance with the latest Building Code provisions for earthquake design is expected to provide mitigation of ground shaking hazards that are typical to Southern California.

7.0 Infiltration Characteristics

Infiltration tests within the site were performed to provide preliminary infiltration rates for the purpose of planning and design of an on-site water disposal system. A truck mounted Simco 2800 Drill Rig equipped with a hollow stem auger was used to excavate the exploratory borings to depths ranging from 10.7 to 15.7 below existing ground surface. The borings consisted of six-inch diameter test holes. A three-inch diameter perforated PVC casing with solid end cap was installed in the borings and then surrounded with gravel materials to prevent caving.

The infiltration holes were carefully filled with clean water and refilled after two initial readings. Based upon the initial rates of infiltration at each location, test measurements were measured at 10and 30-minute maximum intervals thereafter. Readings typically were performed in less time due to all water completely seeping out of the borings during the testing. Measurements were obtained by using an electronic tape measure with 1/16-inch divisions and timed with a stopwatch.

The field infiltration rate was computed using a reduction factor – R_f based on the field measurements with our calculations given in Appendix D. Based upon the results of our testing, the soils encountered in the planned on-site drainage disposal system area exhibit the following infiltration rates.

Test No. (Boring)	Depth (ft)	Infiltration Rate
TH-1 (B-6)	15.5	2.0 in/hr
TH-2 (B-7)	15.7	1.4 in/hr
TH-3 (B-13)	13.1	2.3 in/hr
TH-4 (B-12)	11.6	1.2 in/hr
TH-5 (B-17)	10.9	0.4 in/hr
TH-6 (B-16)	10.7	0.4 in/hr

The correction factors CF_t, CF_v and CF_s are given below based on soils at 10.7 to 15.7 feet from our field tests.

a) $CF_t = Rf$ =27.9 to 33.3 for our six (6) field infiltration test holes.

b) CF_v = 1.0 based on uniform soils encountered for infiltration tests

c) CF_s = 2.0 for long-term siltation, plugging and maintenance. The subsurface soils are likely to have some plugging and regular maintenance of storm water discharge devices is required.

All systems must meet the latest city and/or county specifications and the California Regional Water Quality Control Board (CRWQCB) requirements. A review of the groundwater maps of the Upper Santa Ana River Basin (Carson and Matti, 1982) reveals a groundwater depth in excess of 30 feet.

Foundations shall be setback a minimum distance of 10 feet from the drainage disposal system and the bottom of footing shall be a minimum of 10 feet from the expected zone of saturation. The boundary of the zone of saturation may be assumed to project downward from the top of the permeable portion of the disposal system at an inclination of 1 to 1 or flatter, as determined by the soils engineer.

8.0 Conclusions and Recommendations

Based upon our evaluations, the proposed development is acceptable from a geotechnical engineering standpoint. By following the recommendations and guidelines set forth in our report, the structures will be safe from excessive settlements under the anticipated design loadings and conditions. The proposed development shall meet all requirements of the City Building Ordinance and will not impose any adverse effect on existing adjacent structures.

The following recommendations are based upon soil conditions encountered in our field investigation; these near-surface soil conditions could vary across the site. Variations in the soil conditions may not become evident until the commencement of grading operations for the proposed development and revised recommendations from the soils engineer may be necessary based upon the conditions encountered.

It is recommended that site inspections be performed by a representative of this firm during all grading and construction of the development to verify the findings and recommendations documented in this report. Any unusual conditions which may be encountered in the course of the project development may require the need for additional study and revised recommendations.

8.1 Site Grading Recommendations

Any vegetation and/or demolition debris shall be removed and hauled from proposed grading areas prior to the start of grading operations. Existing vegetation shall not be mixed or disced into the soils. Any removed soils may be reutilized as compacted fill once any deleterious material or oversized materials (in excess of eight inches) is removed. Grading operations shall be performed in accordance with the attached *Specifications for Placement of Compacted Fill.*

8.1.1 Removal and Recompaction Recommednations

All disturbed soils and/or fill (about 1 to 7 feet below ground surface) shall be removed to competent native material, the exposed surface scarified to a depth of 12 inches, brought to within 2% of optimum moisture content and compacted to a minimum of 90% of the laboratory standard (ASTM: D-1557) prior to placement of any additional compacted fill soils, foundations, slabs-on-grade and pavement. Grading shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

It is possible that isolated areas of undiscovered fill not described in this report are present on site; if found, these areas should be treated as discussed earlier. A diligent search shall also be conducted during grading operations in an effort to uncover any underground structures, irrigation or utility lines. If encountered, these structures and lines shall be either removed or properly abandoned prior to the proposed construction.

Any imported fill material should be preferably soil similar to the upper soils encountered at the subject site. All soils shall be approved by this firm prior to importing at the site and will be subjected to additional laboratory testing to assure concurrence with the recommendations stated in this report.

If placement of slabs-on-grade and pavement is not completed immediately upon completion of grading operations, additional testing and grading of the areas may be necessary prior to continuation of construction operations. Likewise, if adverse weather conditions occur which may damage the subgrade soils, additional assessment by the soils engineer as to the suitability of the supporting soils may be needed.

Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase. Adequate drainage away from the structures, pavement and slopes should be provided at all times.

8.1.2 Fill Blanket Recommendations

Due to the potential for differential settlement of foundations placed on compacted fill and native materials, it is recommended that all foundations including floor slab areas be underlain by a uniform compacted fill blanket at least two feet in thickness. This fill blanket shall extend a minimum of five horizontal feet outside the edges of foundations or equidistant to the depth of fill placed, whichever is greater.

8.2 Shrinkage and Subsidence

Results of our in-place density tests reveal that the soil shrinkage will be on the order of 5 to 10% due to excavation and recompaction, based upon the assumption that the fill is compacted to 92% of the maximum dry density per ASTM standards. Subsidence should be 0.2 feet die to earthwork operations.

The volume change does not include any allowance for vegetation or organic stripping, removal of subsurface improvements, or topographic approximations. Although these values are only approximate, they represent our best estimate of lost yardage, which will likely occur during grading. If more accurate shrinkage and subsidence factors are needed, it is recommended that field testing the actual equipment and grading techniques should be conducted.

8.3 Temporary Excavations

Temporary unsurcharged excavations in the existing site materials may be made at vertical inclinations up to 4 feet in height unless cohesionless soils are encountered. In areas where soils with little or no binder are encountered, where adverse geological conditions are exposed, or where excavations are adjacent to existing structures, shoring or flatter excavations may be required. The temporary cut slope gradients given above do not preclude local raveling and sloughing. All excavations shall be made in accordance with the requirements of the soils engineer, CAL-OSHA and other public agencies having jurisdiction. Care should be taken to provide or maintain adequate lateral support for all adjacent improvements and structures at all times during the grading operations and construction phase.

8.4 Foundation Design

All foundations may be designed utilizing the following allowable bearing capacities for an embedded depth of 24 inches into approved engineered fill with the corresponding widths:

Allowable Bearing Capacity (psf)		
Width (feet)	Continuous Foundation	Isolated Foundation
1.5	2000	2500
2.0	2075	2575
4.0	2375	2875
6.0	2500	3000

The bearing value may be increased by 500 psf for each additional foot of depth in excess of the 24-inch minimum depth, up to a maximum of 4,000 psf. A one-third increase may be used when considering short-term loading and seismic forces.

Any foundations located along property line or where lateral overexcavation is not possible may utilize an allowable bearing capacity of 1,500 psf. All foundations will require to reinforced with a minimum of one No. 4 bar, top and bottom. A representative of this firm shall inspect all foundation excavations prior to pouring concrete.

8.5 Settlement Analysis

Resultant pressure curves for the consolidation tests are shown on Plates C to F. Computations utilizing these curves and the recommended allowable soil bearing capacities reveal that the foundations will experience settlements on the order of ¾ inch and differential settlements of less than ¼ inch.

8.6 Lateral Resistance

The following values may be utilized in resisting lateral loads imposed on the structure. Requirements of the California Building Code should be adhered to when the coefficient of friction and passive pressures are combined.

Coefficient of Friction - 0.35

Equivalent Passive Fluid Pressure = 200 lbs./cu.ft.

Maximum Passive Pressure = 2,000 lbs./cu.ft.

The passive pressure recommendations are valid only for approved compacted fill soils or competent native materials.

8.7 Retaining Wall Design Parameters

Active earth pressures against retaining walls will be equal to the pressures developed by the following fluid densities. These values are for **granular backfill material** placed behind the walls at various ground slopes above the walls.

Surface Slope of Retained Materials (Horizontal to Vertical)	Equivalent Fluid Density (lb./cu.ft.)
Level	30
5 to 1	35
4 to 1	38
3 to 1	40
2 to 1	45

Any applicable short-term construction surcharges and seismic forces should be added to the above lateral pressure values. An equivalent fluid pressure of 45 pcf may be utilized for the restrained wall condition with a level grade behind the wall.

The seismic-induced lateral soil pressure for walls greater than 6 feet may be computed using a triangular pressure distribution with the maximum value at the top of the wall. The maximum lateral pressure of (20 pcf) H where H is the height of the retained soils above the wall footing should be used in final design of retaining walls. Sliding resistance values and passive fluid pressure values may be increased by 1/3 during short-term wind and seismic loading conditions.

All walls shall be waterproofed as needed and protected from hydrostatic pressure by a reliable permanent subdrain system. The granular backfill to be utilized immediately adjacent to retaining walls shall consist of an approved select granular soil with a sand equivalency greater than 30. This backfill zone of free draining material shall consist of a wedge beginning a minimum of one horizontal foot from the base of the wall extending upward at an inclination of no less than ¾ to 1 (horizontal to vertical).

8.8 Slab Design

All concrete slabs shall be a minimum of six inches in thickness in the proposed warehouse areas and four inches in office and hardscape, all reinforced using No. 3 bars at sixteen-inch spacing in each direction and positioned in the center of the slab. Additional reinforcement requirements and an increase in thickness of the slabs-on-grade may be necessary based upon soils expansion potential and proposed loading conditions in the structures and should be evaluated further by the project engineers and/or architect.

A vapor retarder (10-mil minimum thickness) should be utilized in areas which would be sensitive to the infiltration of moisture. This retarder shall meet requirements of ASTM E 96, *Water Vapor Transmission of Materials* and ASTM E 1745, *Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.* The vapor retarder shall be installed in accordance with procedures stated in ASTM E 1643, *Standard practice for Installation of Water Vapor Retarders used in Contact with Earth or Granular Fill Under Concrete Slabs.*

The moisture retarder may be placed directly upon compacted subgrade soils conditioned to near optimum moisture levels, although one to two inches of sand beneath the membrane is desirable. The subgrade upon which the retarder is placed shall be smooth and free of rocks, gravel or other protrusions which may damage the retarder. Use of sand above the retarder is under the purview of the structural engineer; if sand is used over the retarder, it should be placed in a dry condition.

8.9 Pavement Section Design

The table below provides a preliminary pavement design based upon an R-Value of 27 for the subgrade soils for the proposed pavement areas. Final pavement design may need to be based on R-Value testing of the subgrade soils near the conclusion of site grading to assure that these soils are consistent with those assumed in this preliminary design.

Type of Traffic	Traffic Index	Asphalt (in.)	Base Material (in.)
Automobile Parking Stalls	4.0	3.0	4.0
Light Vehicle Circulation Areas	5.5	3.5	7.5
Heavy Truck Access Areas	7.0	4.0	8.0

Any concrete slab-on-grade in pavement areas shall be a minimum of seven inches in thickness and may be placed on approved subgrade soils. The recommendations are based upon estimated traffic loads. Client should submit any other anticipated traffic loadings for the building areas and roadways to the soils engineer, if necessary, so that pavement sections may be reviewed to determine adequacy to support the proposed loadings.

All pavement areas shall have positive drainage toward an approved outlet from the site. Drain lines behind curbs and/or adjacent to landscape areas should be considered by client and the appropriate design engineers to prevent water from infiltrating beneath pavement. If such infiltration occurs, damage to pavement, curbs and flow lines, especially on sites with expansive soils, may occur during the life of the project.

Any approved base material shall consist of a Class II aggregate or equivalent and should be compacted to a minimum of 95% relative compaction. All pavement materials shall conform to the requirements set forth by the City of Colton. The base material; and asphaltic concrete should be tested prior to delivery to the site and during placement to determine conformance with the project specifications. A pavement engineer shall designate the specific asphalt mix design to meet the required project specifications.

8.10 Utility Trench and Excavation Backfill

Trenches from installation of utility lines and other excavations may be backfilled with on-site soils or approved imported soils compacted to a minimum of 90% relative compaction. All utility lines shall be properly bedded with clean sand having a sand equivalency rating of 30 or more. This bedding material shall be thoroughly water jetted around the pipe structure prior to placement of compacted backfill soils.

8.11 Corrosion Design Criteria

Representative samples of the surficial soils, typical of the subgrade soils expected to be encountered within foundation excavations and underground utilities were tested for corrosion potential. The minimum resistivity value obtained for the samples tested is representative of an environment that may be severely corrosive to metals. The soil pH value was considered mildly alkaline and may not have a significant effect on soil corrosivity. Consideration should be given to corrosion protection systems for buried metal such as protective coatings, wrappings or the use of PVC where permitted by local building codes.

According to Table 4.3.1 of ACI 318 Building Code and Commentary, these contents revealed negligible sulfate concentrations. Therefore, a Type II cement according to latest CBC specifications may be utilized for building foundations at this time. It is recommended that additional sulfate tests be performed at the completion of site grading to assure that the as graded conditions are consistent with the recommendations stated in this design. Corrosion test results may be found on the attached Table IV.

8.12 Expansive Soil

The upper on-site soils are non-expansive (EI < 20). When soils have an expansion index (EI) of 20 or more, special attention should be given to the project design and maintenance. The attached *Expansive Soil Guidelines* should be reviewed by the engineers, architects, owner, maintenance personnel and other interested parties and considered during the design of the project and future property maintenance.

9.0 Closure

The recommendations and conclusions contained in this report are based upon the soil conditions uncovered in our test excavations. No warranty of the soil condition between our excavations is implied. NorCal Engineering should be notified for possible further recommendations if unexpected to unfavorable conditions are encountered during construction phase. It is the responsibility of the owner to ensure that all information within this report is submitted to the Architect and appropriate Engineers for the project.

A preconstruction conference should be held between the developer, general contractor, grading contractor, city inspector, architect, and soil engineer to clarify any questions relating to the grading operations and subsequent construction. Our representative should be present during the grading operations and construction phase to certify that such recommendations are complied within the field.

This geotechnical investigation has been conducted in a manner consistent with the level of care and skill exercised by members of our profession currently practicing under similar conditions in the Southern California area. No other warranty, expressed or implied is made.

We appreciate this opportunity to be of service to you. If you have any further questions, please do not hesitate to contact the undersigned.

Respectfully submitted,
NORCAL ENGINEERING

Keith D. Tucker
Project Engineer
R.G.E. 841

Scott D. Spensiero
Project Manager

SPECIFICATIONS FOR PLACEMENT OF COMPACTED FILL

Excavation

Any existing low-density soils and/or saturated soils shall be removed to competent natural soil under the inspection of the Geotechnical Engineering Firm. After the exposed surface has been cleansed of debris and/or vegetation, it shall be scarified until it is uniform in consistency, brought to the proper moisture content and compacted to a minimum of 90% relative compaction (in accordance with ASTM: D 1557).

In any area where a transition between fill and native soil or between bedrock and soil are encountered, additional excavation beneath foundations and slabs will be necessary in order to provide uniform support and avoid differential settlement of the structure.

Material for Fill

The on-site soils or approved import soils may be utilized for the compacted fill provided they are free of any deleterious materials and shall not contain any rocks, brick, asphaltic concrete, concrete or other hard materials greater than eight inches in maximum dimensions. Any import soil must be approved by the Geotechnical Engineering firm a minimum of 72 hours prior to importation of site.

Placement of Compacted Fill Soils

The approved fill soils shall be placed in layers not excess of six inches in thickness. Each lift shall be uniform in thickness and thoroughly blended. The fill soils shall be brought to within 2% of the optimum moisture content, unless otherwise specified by the Soils Engineering firm. Each lift shall be compacted to a minimum of 90% relative compaction (in accordance with ASTM: D 1557) and approved prior to the placement of the next layer of soil. Compaction tests shall be obtained at the discretion of the Geotechnical Engineering firm but to a minimum of one test for every 500 cubic yards placed and/or for every 2 feet of compacted fill placed.

The minimum relative compaction shall be obtained in accordance with accepted methods in the construction industry. The final grade of the structural areas shall be in a dense and smooth condition prior to placement of slabs-on-grade or pavement areas. No fill soils shall be placed, spread or compacted during unfavorable weather conditions. When the grading is interrupted by heavy rains, compaction operations shall not be resumed until approved by the Geotechncial Engineering firm.

Grading Observations

The controlling governmental agencies should be notified prior to commencement of any grading operations. This firm recommends that the grading operations be conducted under the observation of a Soils Engineering firm as deemed necessary. A 24-hour notice must be provided to this firm prior to the time of our initial inspection.

Observation shall include the clearing and grubbing operations to assure that all unsuitable materials have been properly removed; approve the exposed subgrade in areas to receive fill and in areas where excavation has resulted in the desired finished grade and designate areas of overexcavation; and perform field compaction tests to determine relative compaction achieved during fill placement. In addition, all foundation excavations shall be observed by the Soils Engineering firm to confirm that appropriate bearing materials are present at the design grades and recommend any modifications to construct footings.

EXPANSIVE SOIL GUIDELINES

The following expansive soil guidelines are provided for your project. The intent of these guidelines is to inform you, the client, of the importance of proper design and maintenance of projects supported on expansive soils. ***You, as the owner or other interested party, should be warned that you have a duty to provide the information contained in the soil report including these guidelines to your design engineers, architects, landscapers and other design parties in order to enable them to provide a design that takes into consideration expansive soils.***

In addition, you should provide the soil report with these guidelines to any property manager, lessee, property purchaser or other interested party that will have or assume the responsibility of maintaining the development in the future.

Expansive soils are fine-grained silts and clays which are subject to swelling and contracting. The amount of this swelling and contracting is subject to the amount of fine-grained clay materials present in the soils and the amount of moisture either introduced or extracted from the soils. Expansive soils are divided into five categories ranging from "very low" to "very high". Expansion indices are assigned to each classification and are included in the laboratory testing section of this report. *If the expansion index of the soils on your site, as stated in this report, is 21 or higher, you have expansive soils.* The classifications of expansive soils are as follows:

Classification of Expansive Soil*

Expansion Index	Potential Expansion
0-20	Very Low
21-50	Low
51-90	Medium
91-130	High
Above 130	Very High

*From Table 18A-I-B of California Building Code (1988)

When expansive soils are compacted during site grading operations, care is taken to place the materials at or slightly above optimum moisture levels and perform proper compaction operations. Any subsequent excessive wetting and/or drying of expansive soils will cause the soil materials to expand and/or contract. These actions are likely to cause distress of foundations, structures, slabs-on-grade, sidewalks and pavement over the life of the structure. ***It is therefore imperative that even after construction of improvements, the moisture contents are maintained at relatively constant levels, allowing neither excessive wetting or drying of soils.***

Evidence of excessive wetting of expansive soils may be seen in concrete slabs, both interior and exterior. Slabs may lift at construction joints producing a trip hazard or may crack from the pressure of soil expansion. Wet clays in foundation areas may result in lifting of the structure causing difficulty in the opening and closing of doors and windows, as well as cracking in exterior and interior wall surfaces. In extreme wetting of soils to depth, settlement of the structure may eventually result. Excessive wetting of soils in landscape areas adjacent to concrete or asphaltic pavement areas may also result in expansion of soils beneath pavement and resultant distress to the pavement surface.

Excessive drying of expansive soils is initially evidenced by cracking in the surface of the soils due to contraction. Settlement of structures and on-grade slabs may also eventually result along with problems in the operation of doors and windows.

Projects located in areas of expansive clay soils will be subject to more movement and "hairline" cracking of walls and slabs than similar projects situated on non-expansive sandy soils. There are, however, measures that developers and property owners may take to reduce the amount of movement over the life the development. The following guidelines are provided to assist you in both design and maintenance of projects on expansive soils:

- Drainage away from structures and pavement is essential to prevent excessive wetting of expansive soils. Grades should be designed to the latest building code and maintained to allow flow of irrigation and rain water to approved drainage devices or to the street. Any "ponding" of water adjacent to buildings, slabs and pavement after rains is evidence of poor drainage; the installation of drainage devices or regrading of the area may be required to assure proper drainage. Installation of rain gutters is also recommended to control the introduction of moisture next to buildings. Gutters should discharge into a drainage device or onto pavement which drains to roadways.

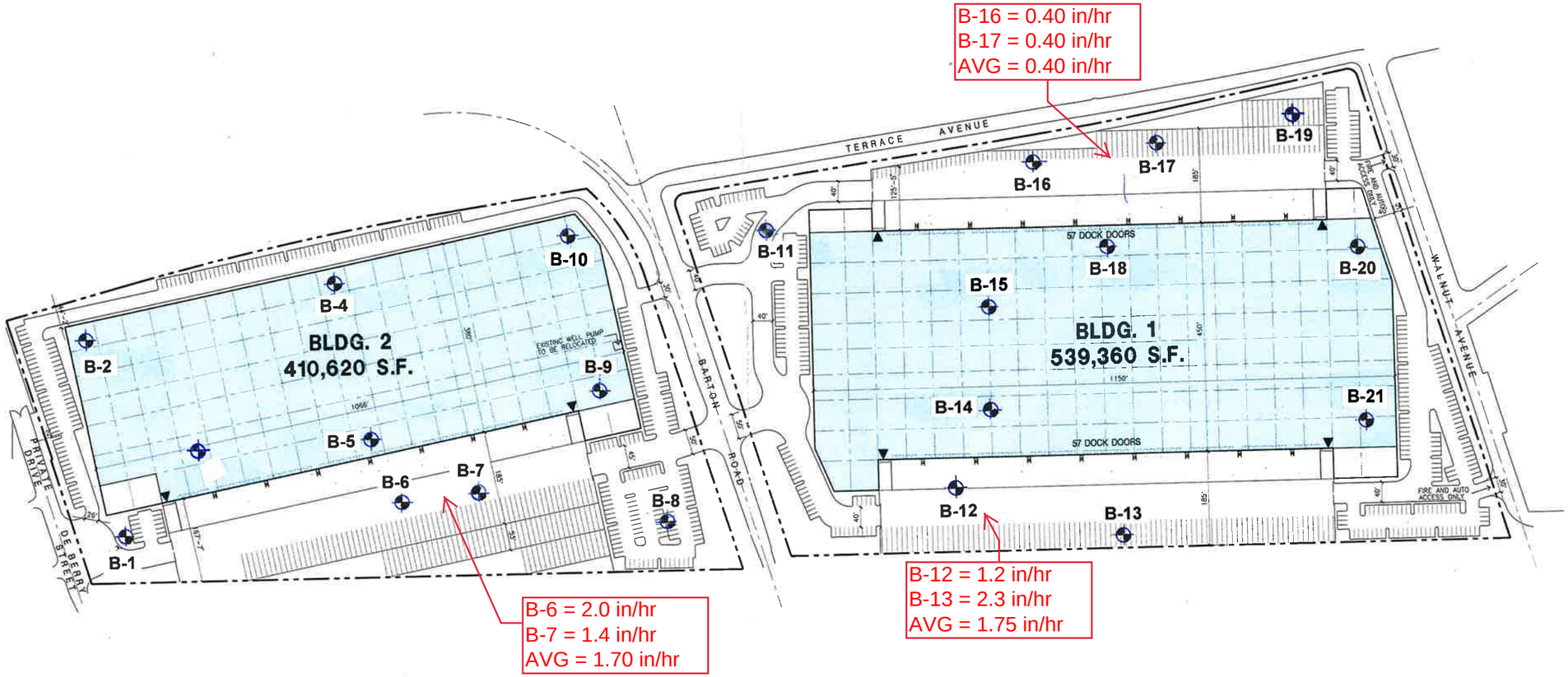
- Irrigation should be strictly controlled around building foundations, slabs and pavement and may need to be adjusted depending upon season. This control is essential to maintain a relatively uniform moisture content in the expansive soils and to prevent swelling and contracting. Over-watering adjacent to improvements may result in damage to those improvements. NorCal Engineering makes no specific recommendations regarding landscape irrigation schedules.

- Planting schemes for landscaping around structures and pavement should be analyzed carefully. Plants (including sod) requiring high amounts of water may result in excessive wetting of soils. Trees and large shrubs may actually extract moisture from the expansive soils, thus causing contraction of the fine-grained soils.

- Thickened edges on exterior slabs will assist in keeping excessive moisture from entering directly beneath the concrete. A six-inch thick or greater deepened edge on slabs may be considered. Underlying interior and exterior slabs with 6 to 12 inches or more of non-expansive soils and providing presaturation of the underlying clayey soils as recommended in the soil report will improve the overall performance of on-grade slabs.

- Increase the amount of steel reinforcing in concrete slabs, foundations and other structures to resist the forces of expansive soils. The precise amount of reinforcing should be determined by the appropriate design engineers and/or architects.

- Recommendations of the soil report should always be followed in the development of the project. Any recommendations regarding presaturation of the upper subgrade soils in slab areas should be performed in the field and verified by the Soil Engineer.



north

1" = 80'
0 80 160 240

NorCal Engineering
SOILS AND GEOTECHNICAL CONSULTANTS

PROJECT 20852-18 | DATE JANUARY 2019

SITE PLAN

List of Appendices
(in order of appearance)

Appendix A – Log of Excavations

Log of Borings B-1 to B-21

Appendix B – Laboratory Tests

Table I – Maximum Dry Density

Table II – Expansion

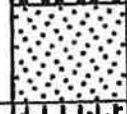
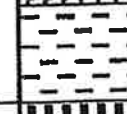
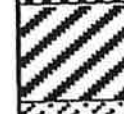
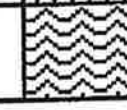
Table III – Atterberg Limits

Table IV – Corrosion

Appendix C – ASCE Seismic Hazards Report

Appendix D – Soil Infiltration Data

Appendix A

MAJOR DIVISION			GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL, SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES
MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	SAND AND SANDY SOILS	CLEAN SAND (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
	MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	SANDS WITH FINE (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND-CLAY MIXTURES
FINE GRAINED SOILS	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

NOTE: DUAL SYMBOLS ARE USED TO INDICATE BORDERLINE SOIL CLASSIFICATIONS

UNIFIED SOIL CLASSIFICATION SYSTEM

KEY:

- ■ Indicates 2.5-inch Inside Diameter. Ring Sample.
- ⊠ Indicates 2-inch OD Split Spoon Sample (SPT).
- ⧅ Indicates Shelby Tube Sample.
- ◫ Indicates No Recovery.
- ◧ Indicates SPT with 140# Hammer 30 in. Drop.
- ⊠ Indicates Bulk Sample.
- ◩ Indicates Small Bag Sample.
- ◨ Indicates Non-Standard
- ⊠ Indicates Core Run.

COMPONENT PROPORTIONS

DESCRIPTIVE TERMS	RANGE OF PROPORTION
Trace	1 - 5%
Few	5 - 10%
Little	10 - 20%
Some	20 - 35%
And	35 - 50%

COMPONENT DEFINITIONS

COMPONENT	SIZE RANGE
Boulders	Larger than 12 in
Cobbles	3 in to 12 in
Gravel	3 in to No 4 (4.5mm)
Coarse gravel	3 in to 3/4 in
Fine gravel	3/4 in to No 4 (4.5mm)
Sand	No. 4 (4.5mm) to No. 200 (0.074mm)
Coarse sand	No. 4 (4.5 mm) to No. 10 (2.0 mm)
Medium sand	No. 10 (2.0 mm) to No. 40 (0.42 mm)
Fine sand	No. 40 (0.42 mm) to No. 200 (0.074 mm)
Silt and Clay	Smaller than No. 200 (0.074 mm)

MOISTURE CONTENT

DRY	Absence of moisture, dusty, dry to the touch.
DAMP	Some perceptible moisture; below optimum
MOIST	No visible water; near optimum moisture content
WET	Visible free water, usually soil is below water table.

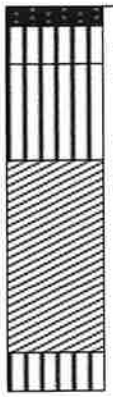
RELATIVE DENSITY OR CONSISTENCY VERSUS SPT N -VALUE

COHESIONLESS SOILS		COHESIVE SOILS		
Density	N (blows/ft)	Consistency	N (blows/ft)	Approximate Undrained Shear Strength (psf)
Very Loose	0 to 4	Very Soft	0 to 2	< 250
Loose	4 to 10	Soft	2 to 4	250 - 500
Medium Dense	10 to 30	Medium Stiff	4 to 8	500 - 1000
Dense	30 to 50	Stiff	8 to 15	1000 - 2000
Very Dense	over 50	Very Stiff	15 to 30	2000 - 4000
		Hard	over 30	> 4000

Hager Pacific Properties, LLC
20852-18

Log of Boring B-1

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	



Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement with Petromat					
		FILL					
		Sandy SILT					
		Grey, firm, moist					
		NATURAL					
5		Sandy SILT	■	8/12	8.9	114.0	
		Brown, stiff, moist					
		Clayey SILT					
		Brown, stiff, moist					
			■	10/15	12.7	108.9	
10		Sandy SILT					
		Brown, stiff, moist					
		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

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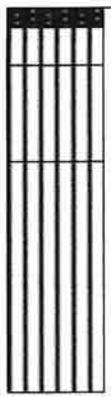
Log of Boring B-2

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	



Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement with Petromat					
		FILL					
		Sandy to clayey SILT					
		Grey, firm, moist					
		NATURAL					
5		Clayey SILT					
		Brown, stiff, moist					
		Sandy SILT					
		Brown, stiff, moist					
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

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Log of Boring B-3

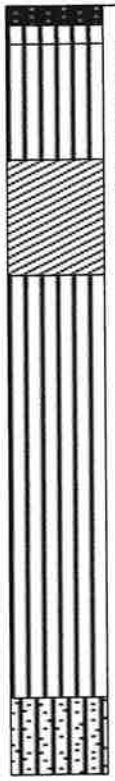
Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0	Asphalt Pavement with Petromat					
	FILL Sandy SILT Grey, firm, moist	■	5/14	13.4	112.8	
	NATURAL Sandy SILT Brown, stiff, moist	■	11/13	14.7	111.4	
5	Clayey SILT Brown, stiff, moist					
	Sandy SILT Brown, stiff, moist	■	17/30	9.7	106.6	
10						
		■	35/45	11.3	110.7	
15						
	BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, hard, moist	■	50-4"	8.0	115.3	
20	Boring completed at depth of 20'					
25						
30						
35						

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Log of Boring B-4

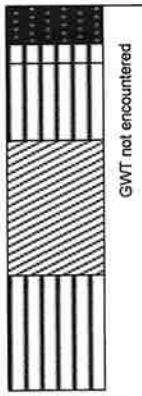
Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured



Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement with Petromat					
		FILL Sandy SILT Grey, firm, moist					
		NATURAL Sandy SILT Brown, firm, moist	■	3/5	12.9	103.9	
5		Clayey SILT Brown, stiff, moist					
		Sandy SILT Brown, stiff, moist	■	8/12	10.5	111.2	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

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Log of Boring B-5

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Grey, firm, moist					
		NATURAL Sandy SILT Brown, firm, moist		7/7	5.3	105.1	
5		Clayey SILT Brown, stiff to very stiff, moist		18/37	8.8	117.5	
10				16/23	7.7	112.5	
15		BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, very hard, moist		50-3"	6.0	120.1	
		Boring completed at depth of 15'					
20							
25							
30							
35							

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Log of Boring B-6

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Grey, firm, moist					
		NATURAL Sandy SILT Brown, stiff, moist					
5		GWT not encountered					
		Clayey SILT Brown, stiff, moist					
10		BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, hard to very hard, moist					
15		Boring completed at depth of 15.5'					
20							
25							
30							
35							

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Log of Boring B-7

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Grey, firm, moist					
		NATURAL Sandy SILT Brown, stiff, moist					
5		GWT not encountered					
		Clayey SILT Brown, stiff, moist					
10		BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, hard to very hard, moist					
15		Boring completed at depth of 15.5'					
20							
25							
30							
35							

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Log of Boring B-8

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Grey, firm, moist					
		NATURAL Sandy SILT Brown, stiff, moist					
5		Clayey SILT Brown, stiff, moist					
		Boring completed at depth of 5'					
10							
15							
20							
25							
30							
35							

GWT not encountered

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Log of Boring B-9

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		FILL Sandy SILT Grey, firm, moist					
		NATURAL Sandy SILT Brown, stiff, moist					
5		Clayey SILT Brown, stiff, moist	■	8/15	10.7	114.9	
10		Boring completed at depth of 10'	■	12/18	13.8	116.0	
15							
20							
25							
30							
35							

GWT not encountered

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Log of Boring B-10

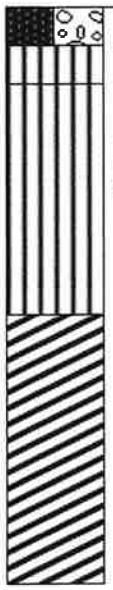
Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured



Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0	Asphalt Pavement / Base Material					
	FILL Sandy SILT Brown, firm, moist	■	3/4	12.7	110.9	
	NATURAL Sandy SILT Brown, firm, moist	■	3/5	14.4	107.6	
5						
	Silty CLAY Brown, stiff, moist	■	11/21	12.1	118.6	
10						
	Boring completed at depth of 15'	■	12/18	14.2	115.0	
15						
20						
25						
30						
35						

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Log of Boring B-11

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement with Petromat					
		FILL Sandy SILT Grey, firm, moist					
		GWT not encountered					
5		NATURAL Sandy SILT Brown, stiff, moist					
		Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

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Log of Boring B-12

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Material					
		FILL Sandy SILT Brown, firm, moist					
5		NATURAL Sandy SILT Brown, stiff, moist					
		Clayey SILT Brown, stiff, moist					
10		Silty CLAY Brown, stiff, moist					
		Boring completed at depth of 11.5'					
15							
20							
25							
30							
35							

GWT not encountered

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Log of Boring B-13

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Gravel					
		FILL Sandy SILT Grey, firm, moist					
		NATURAL Clayey SILT Brown, stiff, moist					
5		GWT not encountered					
10		BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, hard, moist					
15		Boring completed at depth of 13'					
20							
25							
30							
35							

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Log of Boring B-14

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Material					
		FILL Clayey SILT Grey, firm, moist					
		GWT not encountered					
		NATURAL Clayey SILT Brown, firm to stiff, moist		4/7	20.6	100.3	
5				10/22	24.7	105.8	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

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Log of Boring B-15

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured

Depth (feet)	Lithology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Material					
		FILL Sandy SILT Brown, firm, moist	■	7/7	9.5	108.7	
5		NATURAL Sandy SILT Brown, stiff, moist	■	4/10	15.0	115.6	
		Clayey SILT BRown, stiff, moist					
10			■	9/11	13.6	117.3	
		BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, hard to very hard, moist	■	50-5"	12.3	110.9	
20			■	40/50	8.1	112.4	
		Boring completed at depth of 21'					
25							
30							
35							

GWT not encountered

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20852-18

Log of Boring B-16

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Material					
		FILL Sandy SILT Brown, firm, moist					
		NATURAL Sandy SILT Brown, firm to stiff, moist					
5		Clayey SILT Brown, stiff, moist					
		Sandy SILT Brown, stiff, moist					
10		Boring completed at depth of 10.5'					
15							
20							
25							
30							
35							

GWT not encountered

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Hager Pacific Properties, LLC
20852-18

Log of Boring B-17

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Material					
		FILL Sandy SILT Grey-brown, firm, moist					
5		GWT not encountered					
		NATURAL Clayey SILT Brown, stiff, moist					
10		Sandy SILT Brown, stiff, moist					
		Boring completed at depth of 11'					
15							
20							
25							
30							
35							

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Hager Pacific Properties, LLC
20852-18

Log of Boring B-18

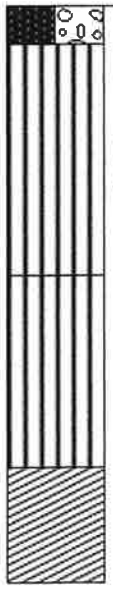
Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18 | **Groundwater Depth:** None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs | **Drop:** 30"

Surface Elevation: Not Measured



Depth (feet)	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0	Asphalt Pavement / Base Material					
	FILL Sandy SILT Grey-brown to brown, firm to stiff, moist	■	9/14	13.1	117.4	
5		■	3/4	11.6	104.7	
	NATURAL Sandy SILT Brown, firm, moist					
10						
	Clayey SILT Brown, stiff, moist	■	13/21	13.4	117.1	
15	Boring completed at depth of 15'					
20						
25						
30						
35						

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\20852-18.log Date: 1/31/2019

NorCal Engineering

Hager Pacific Properties, LLC
20852-18

Log of Boring B-19

Boring Location: Barton and Terrace, Colton

Date of Drilling: 12/19/18

Groundwater Depth: None Encountered

Drilling Method: Simco 2800HS

Hammer Weight: 140 lbs

Drop: 30"

Surface Elevation: Not Measured

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement					
		FILL					
		Sandy to clayey SILT					
		Grey, firm to stiff, moist	■	7/12	13.4	110.9	
		NATURAL					
5		Sandy SILT					
		Brown, stiff, moist					
		Clayey SILT					
		Brown, stiff, moist					
		Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\20852-18.log Date: 1/31/2019

NorCal Engineering

Hager Pacific Properties, LLC
20852-18

Log of Boring B-20

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Materials					
		FILL Sandy SILT Brown, firm, moist	■	8/10	13.8	113.8	
5		NATURAL Sandy SILT Brown, stiff, moist	■	10/14	12.1	115.7	
		BEDROCK Decomposed Granite Silty (fine to coarse grained) SAND Brown, hard, moist	■	50-5"	8.5	119.7	
10		Boring completed at depth of 10'					
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\20852-18.log Date: 1/31/2019

Hager Pacific Properties, LLC
20852-18

Log of Boring B-21

Boring Location: Barton and Terrace, Colton	
Date of Drilling: 12/19/18	Groundwater Depth: None Encountered
Drilling Method: Simco 2800HS	
Hammer Weight: 140 lbs	Drop: 30"
Surface Elevation: Not Measured	

Depth (feet)	Lith-ology	Material Description	Samples: Type	Samples: Blow Counts	Laboratory: Moisture	Laboratory: Dry Density	Laboratory: Fines Content %
0		Asphalt Pavement / Base Material					
		FILL					
		Sandy SILT					
		Brown, firm, moist	■	7/24	12.6	111.2	
		BEDROCK					
5		Decomposed Granite					
		Silty (fine to coarse grained) SAND	■	27/35	9.2	114.0	
		Brown, hard to very hard, moist					
		Boring completed at depth of 6'					
10							
15							
20							
25							
30							
35							

GWT not encountered

SuperLog CivilTech Software, USA www.civiltech.com File: C:\Superlog4\PROJECT\20852-18.log Date: 1/31/2019

Appendix B

TABLE I
MAXIMUM DENSITY TESTS

Sample	Classification	Optimum Moisture	Maximum Dry Density (lbs./cu.ft.)
B-5 @ 2'	Sandy SILT	13.0	124.0
B-14 @ 2'	Clayey SILT	15.0	115.0

TABLE II
EXPANSION TESTS

Sample	Classification	Expansion Index
B-5 @ 2'	Sandy SILT	18
B-14 @ 2'	Clayey SILT	60

TABLE III
ATTERBERG LIMITS

Sample	Liquid Limit	Plastic Limit	Plasticity Index
B-1 @ 5''	32	22	10
B-1 @ 10'	38	24	14
B-14 @ 5'	35	22	13
B-14 @ 10'	30	21	9

TABLE IV
CORROSION TESTS

Sample	pH	Electrical Resistivity	Sulfate (%)	Chloride (ppm)
B-5 @ 2'	7.1	2,111	0.003	233
B-14 @ 2'	7.2	2,854	0.005	221

% by weight
ppm – mg/kg

GMU GEOTECHNICAL, INC.

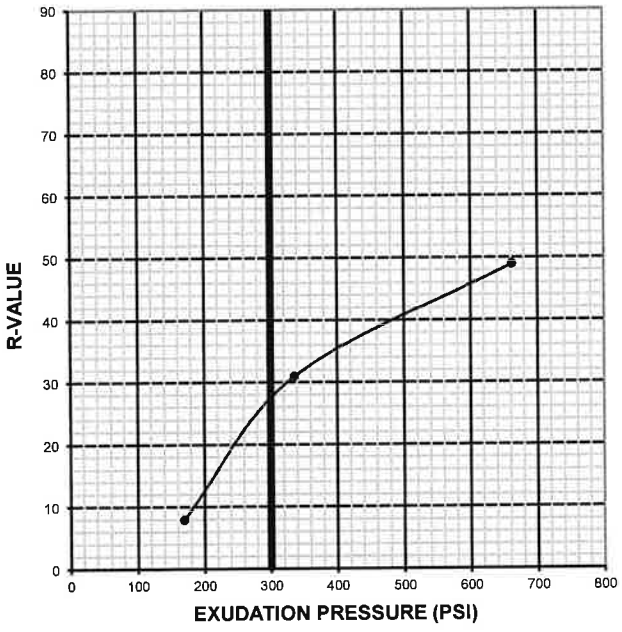
R-VALUE TEST REPORT

☑ CT-301 ☐ ASTM-D2844

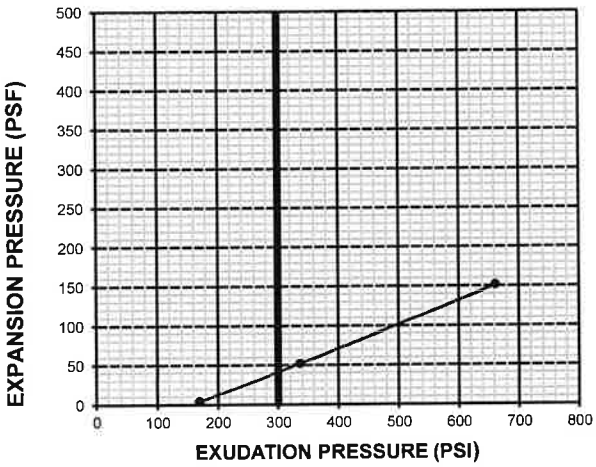
PROJECT NAME:	Norcal (Hager Pacific Properties, LLC)	PROJECT NUMBER:	L-190101
SAMPLE LOCATION:	Corner of Barton & Lacadena Dr. S, Colton CA	SAMPLE NUMBER:	B1
SAMPLE DESCRIPTION:	Sandy Clay (CL), reddish brown	SAMPLE DEPTH:	1.5'
SAMPLED BY:	J.S 12/19/18	TESTED BY:	RC
		DATE TESTED:	1/16/2019

TEST SPECIMEN	A	B	C
MOISTURE AT COMPACTION %	14.9	12.5	11.3
WEIGHT OF SAMPLE, grams	1173	1127	1095
HEIGHT OF SAMPLE, Inches	2.68	2.47	2.42
DRY DENSITY, pcf	115.5	123.0	123.2
COMPACTOR AIR PRESSURE, psi	100	154	175
EXUDATION PRESSURE, psi	170	336	662
EXPANSION, Inches x 10exp-4	1	12	35
STABILITY Ph 2,000 lbs (160 psi)	134	84	51
TURNS DISPLACEMENT	5.66	5.08	5.58
R-VALUE UNCORRECTED	8	31	49
R-VALUE CORRECTED	8	31	49
EXPANSION PRESSURE (psf)	4.3	51.8	151.2

R-VALUE VS. EXUDATION PRESSURE



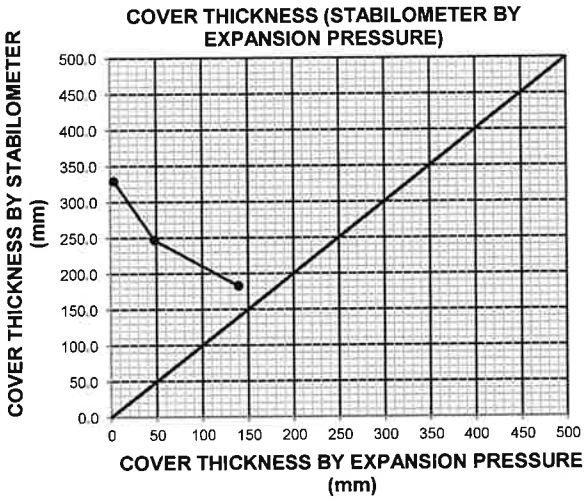
EXPANSION PRESSURE VS. EXUDATION PRESSURE



R-VALUE AT EQUILIBRIUM:	27

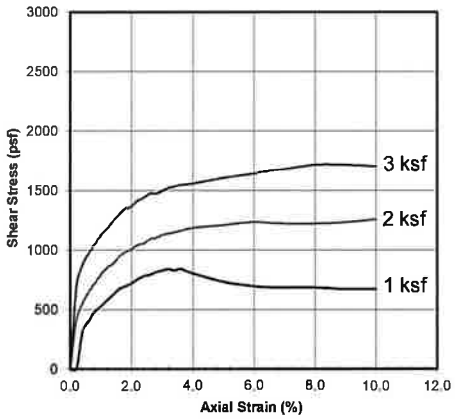
R-VALUE BY EXUDATION PRESSURE:	27
R-VALUE BY EXPANSION PRESSURE:	N.A
EXPANSION PRESSURE AT 300 PSI EXUDATION:	40
TRAFFIC INDEX (Assumed):	5.5
GRAVEL FACTOR (Assumed):	1.5
UNIT MASS OF COVER MATERIAL, kg/m^3 (Assumed):	2100.0

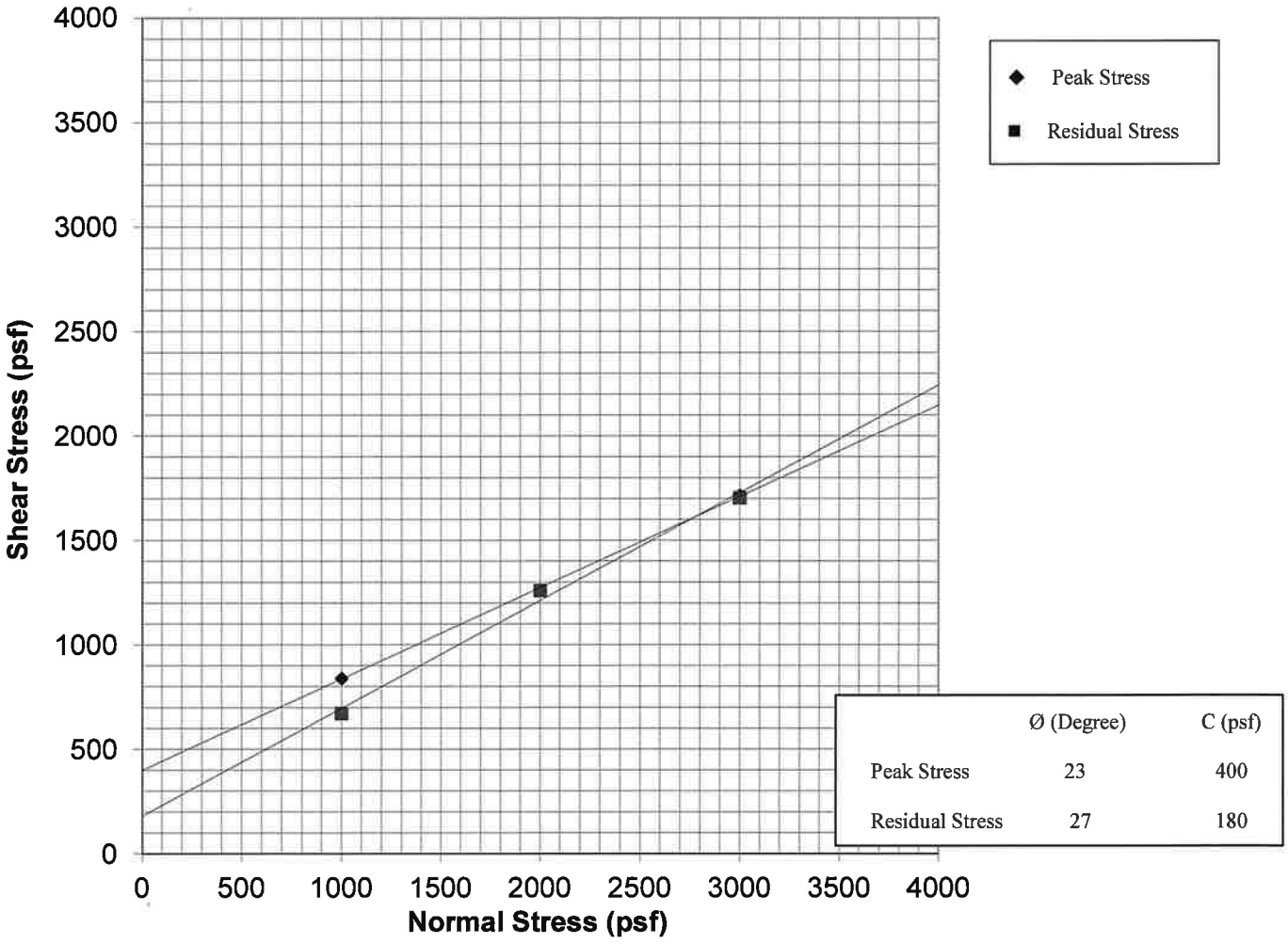
COVER THICKNESS (STABILOMETER BY EXPANSION PRESSURE)



Sample No.	B3@2'	
Sample Type:	Undisturbed/Saturated	
Soil Description:	Silty Clay w/ Some Fine Grained Sand	

		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	840	1260	1716
Displacement	(in)	0.080	0.250	0.200
Residual Stress	(psf)	672	1260	1704
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	112.8	112.8	112.8
In Situ Water Content	(%)	13.4	13.4	13.4
Saturated Water Content	(%)	18.2	18.2	18.2
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	23	400
Residual Stress	27	180

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SOILS AND GEOTECHNICAL CONSULTANTS

Hager Pacific Properties, LLC

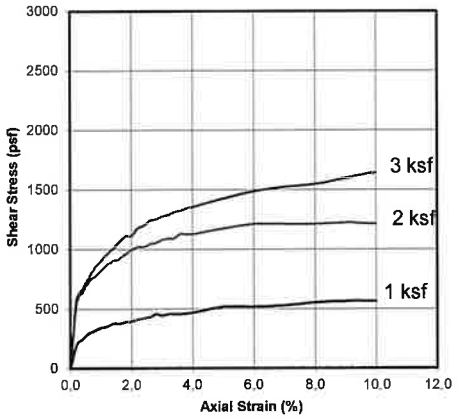
PROJECT NUMBER: 20852-18 DATE: 1/7/2019

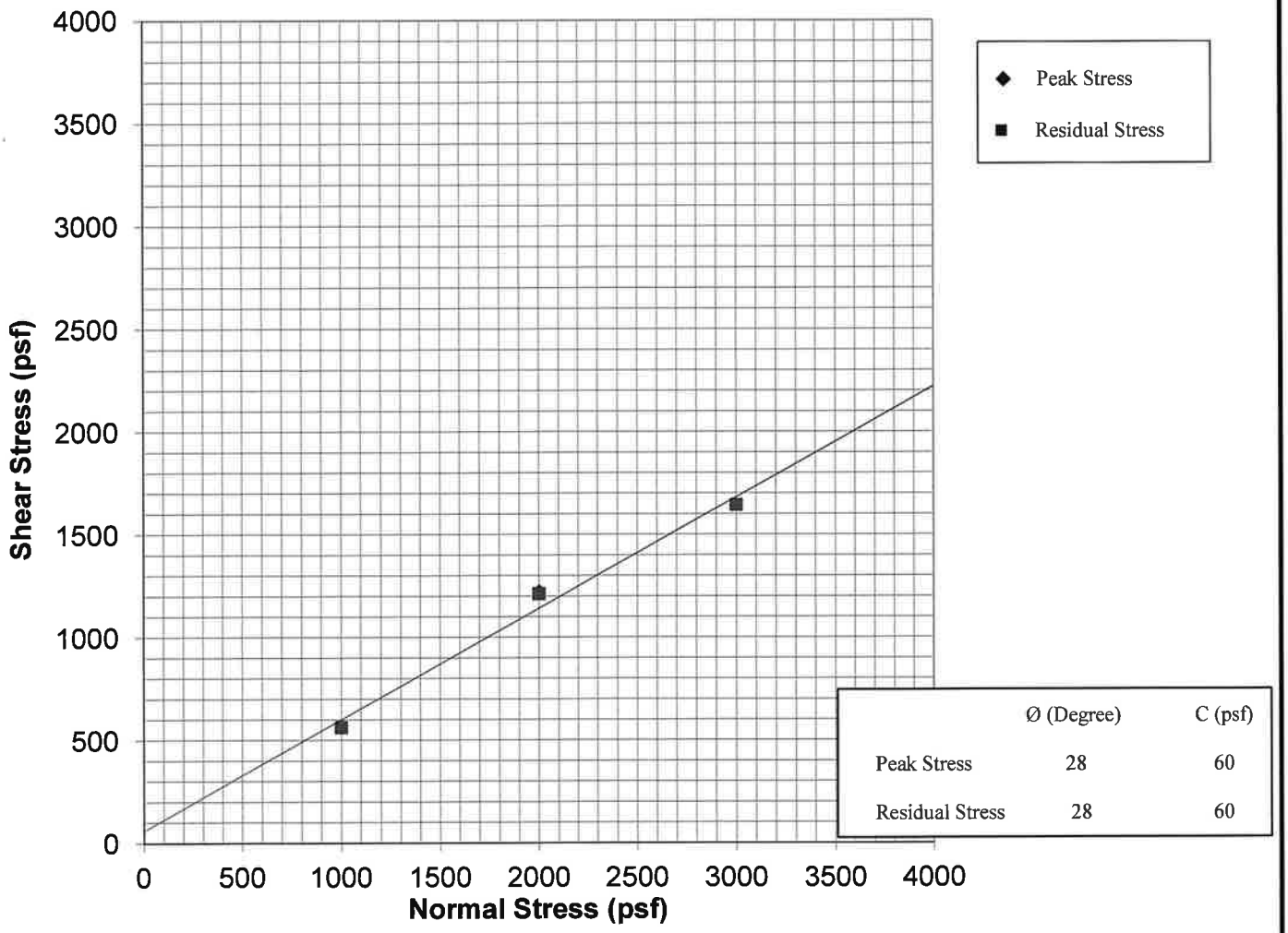
DIRECT SHEAR TEST

ASTM D3080

Plate A

Sample No.		B14@3'		
Sample Type:		Undisturbed/Saturated		
Soil Description:		Silty Clay		
		1	2	3
Normal Stress	(psf)	1000	2000	3000
Peak Stress	(psf)	564	1224	1644
Displacement	(in.)	0.225	0.225	0.250
Residual Stress	(psf)	564	1212	1644
Displacement	(in.)	0.250	0.250	0.250
In Situ Dry Density	(pcf)	90.3	90.3	90.3
In Situ Water Content	(%)	20.6	20.6	20.6
Saturated Water Content	(%)	32.0	32.0	32.0
Strain Rate	(in/min)	0.020	0.020	0.020





	Ø (Degree)	C (psf)
Peak Stress	28	60
Residual Stress	28	60

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SOILS AND GEOTECHNICAL CONSULTANTS

Hager Pacific Properties, LLC

PROJECT NUMBER: 20852-18 DATE: 1/7/2019

DIRECT SHEAR TEST

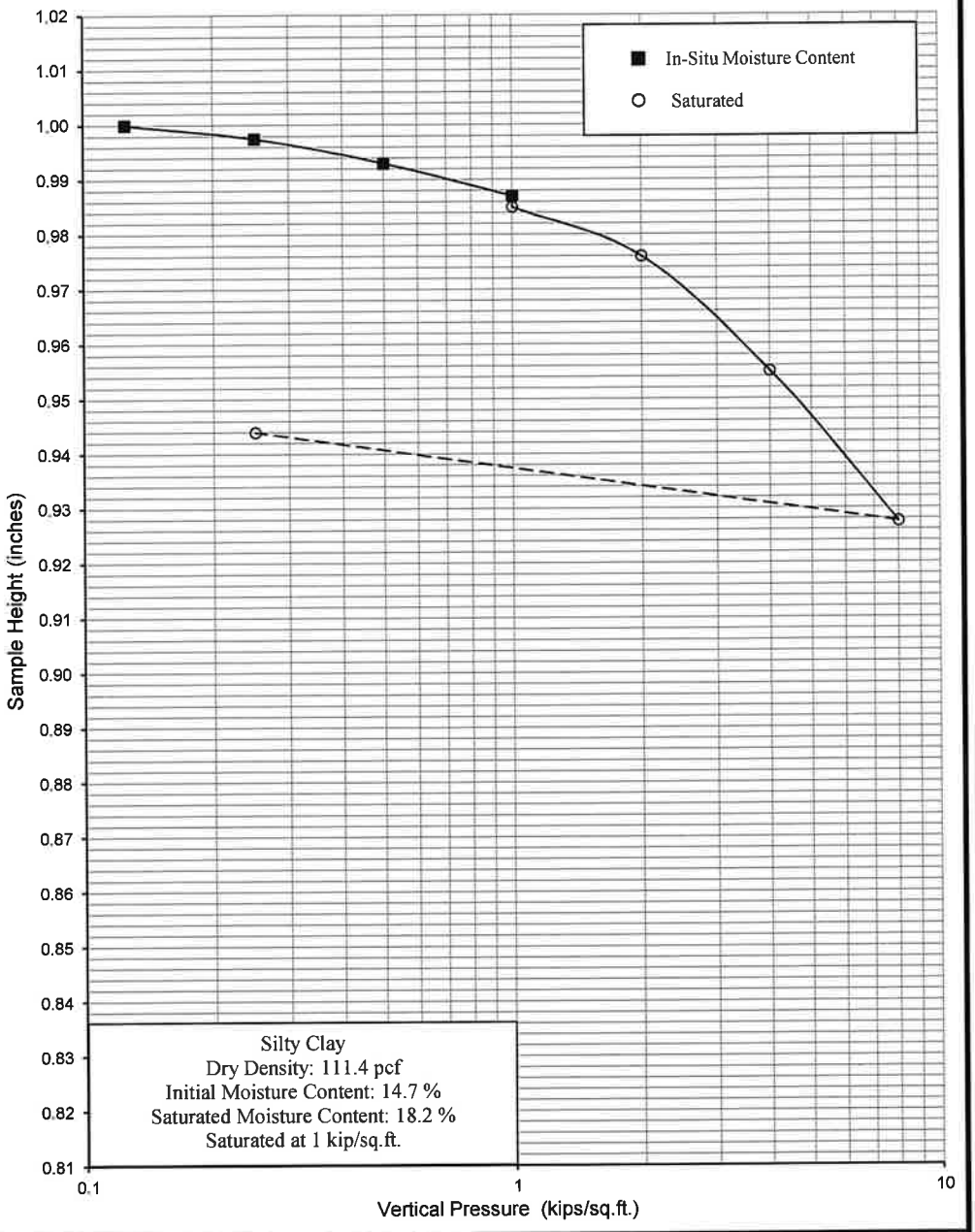
ASTM D3080

Plate B

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9975	0.2	
0.5	0.9930	0.7	
1	0.9870	1.3	
1	0.9850	1.5	Saturated
2	0.9760	2.4	
4	0.9550	4.5	
8	0.9275	7.3	
0.25	0.9440	5.6	

Sample No.	B3
Depth	5'
Date	1/7/2019

Date Tested: 1/2/2019
Sample: B3
Depth: 5'



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SOILS AND GEOTECHNICAL CONSULTANTS

Hager Pacific Properties, LLC

PROJECT NUMBER: 20852-18 DATE: 1/7/2019

CONSOLIDATION TEST

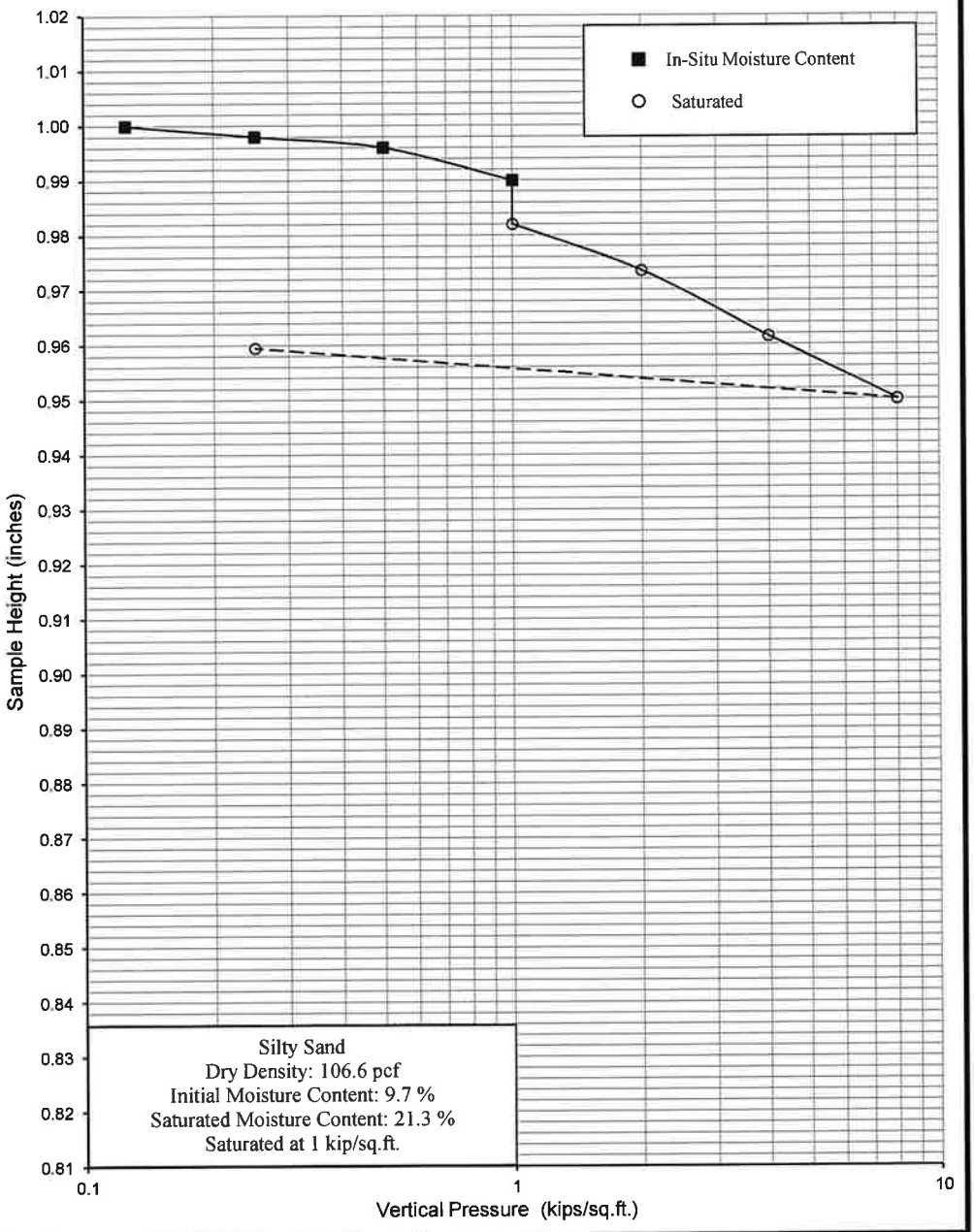
ASTM D2435

Plate C

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9980	0.2	
0.5	0.9960	0.4	
1	0.9900	1.0	
1	0.9820	1.8	Saturated
2	0.9735	2.7	
4	0.9615	3.9	
8	0.9500	5.0	
0.25	0.9595	4.1	

Sample No.	B3	Depth	10'	Date	1/7/2019

Date Tested: 1/2/2019
Sample: B3
Depth: 10'



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SOILS AND GEOTECHNICAL CONSULTANTS

Hager Pacific Properties, LLC

PROJECT NUMBER: 20852-18 DATE: 1/7/2019

CONSOLIDATION TEST

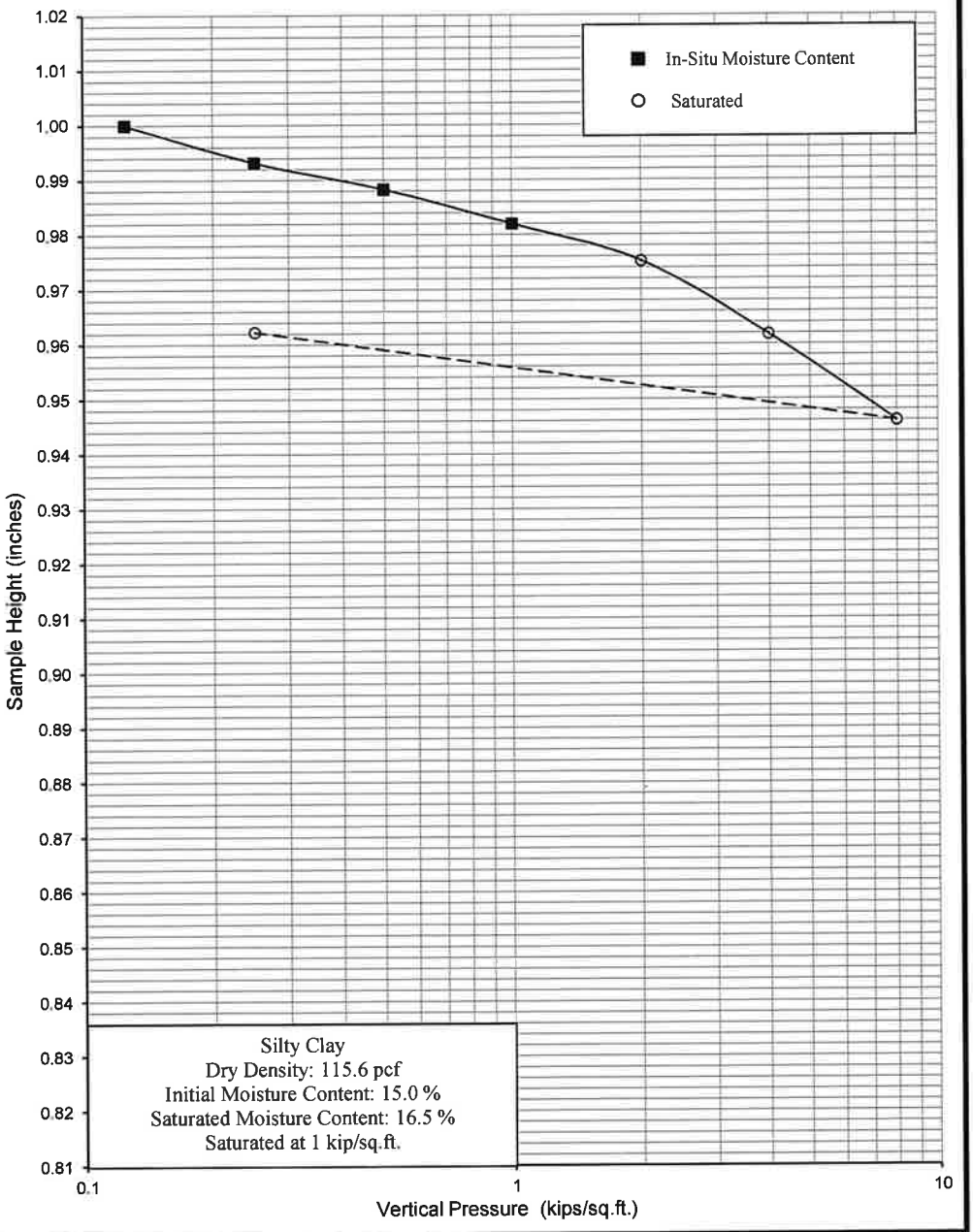
ASTM D2435

Plate D

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9932	0.7	
0.5	0.9883	1.2	
1	0.9820	1.8	
1	0.9820	1.8	Saturated
2	0.9752	2.5	
4	0.9618	3.8	
8	0.9460	5.4	
0.25	0.9623	3.8	

Sample No.	B15	Depth	5'	Date	1/7/2019

Date Tested: 1/2/2019
Sample: B15
Depth: 5'



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SOILS AND GEOTECHNICAL CONSULTANTS

Hager Pacific Properties, LLC

PROJECT NUMBER: 20852-18 DATE: 1/7/2019

CONSOLIDATION TEST

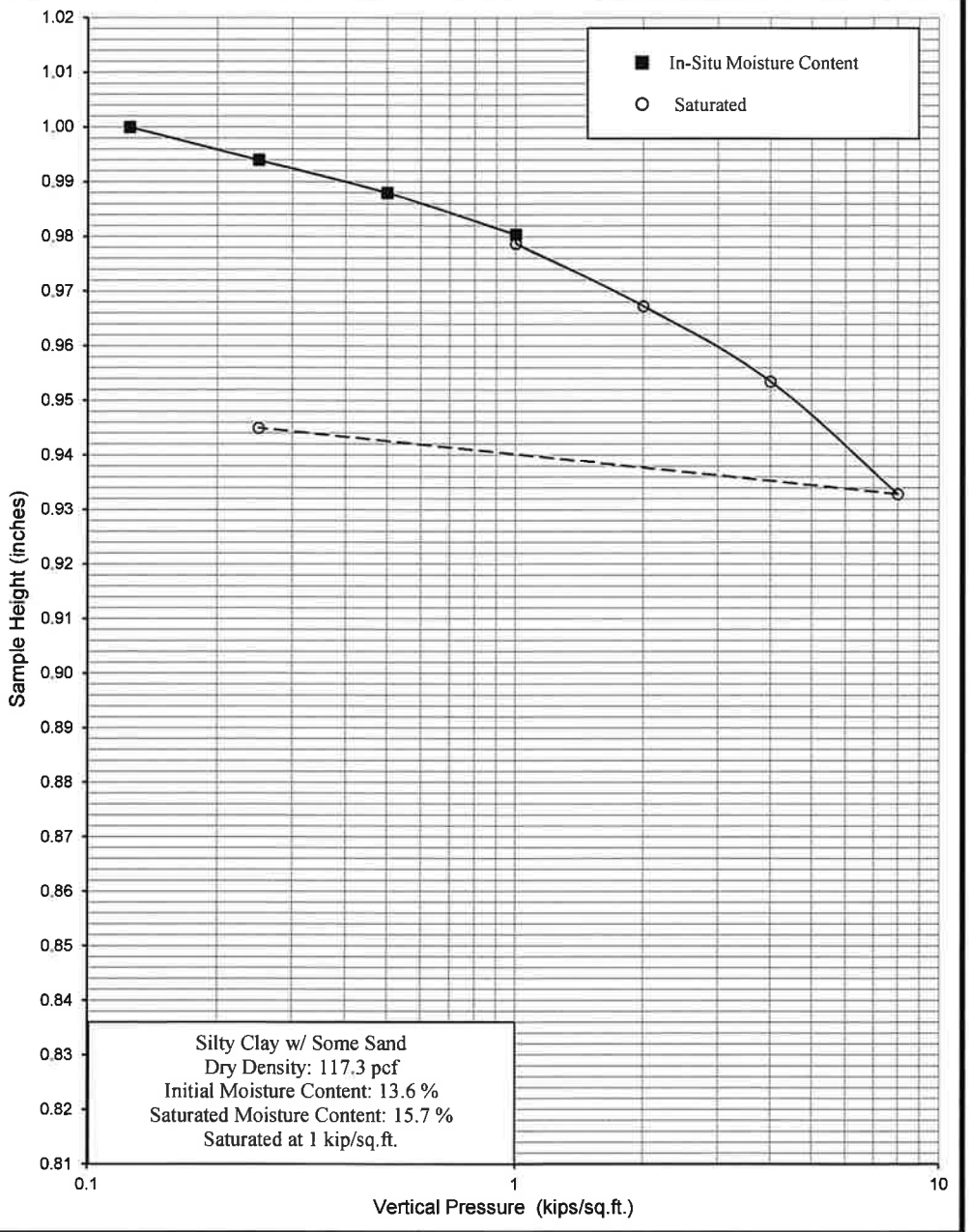
ASTM D2435

Plate E

Vertical Pressure (kips/sq.ft.)	Sample Height (inches)	Consolidation (percent)	
0.125	1.0000	0.0	
0.25	0.9940	0.6	
0.5	0.9880	1.2	
1	0.9804	2.0	
1	0.9787	2.1	Saturated
2	0.9673	3.3	
4	0.9535	4.7	
8	0.9329	6.7	
0.25	0.9450	5.5	

Sample No.	B15	Depth	10'	Date	1/7/2019

Date Tested: 1/3/2019
Sample: B15
Depth: 10'



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SOILS AND GEOTECHNICAL CONSULTANTS

Hager Pacific Properties, LLC

PROJECT NUMBER: 20852-18 DATE: 1/7/2019

CONSOLIDATION TEST

ASTM D2435

Plate F

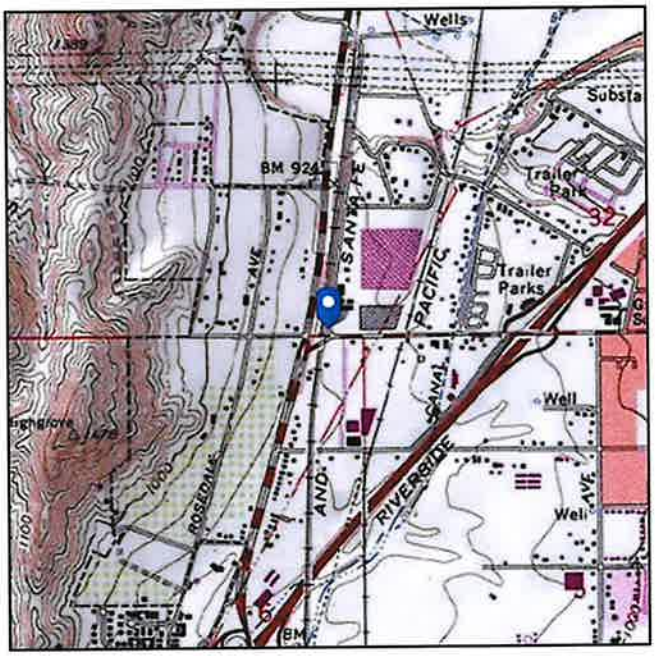
Appendix C

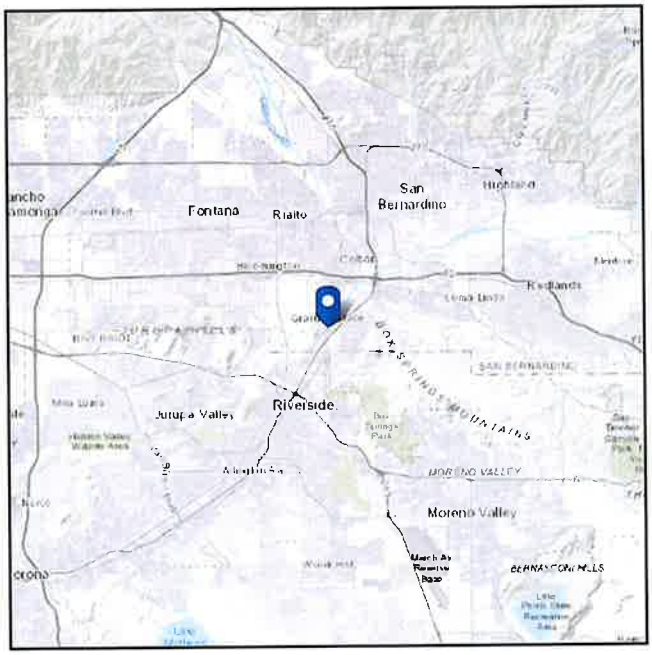
ASCE 7 Hazards Report

Address:
No Address at This Location

Standard: ASCE/SEI 7-10
Risk Category: III
Soil Class: D - Stiff Soil

Elevation: 943.5 ft (NAVD 88)
Latitude: 34.033912
Longitude: -117.332349





ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

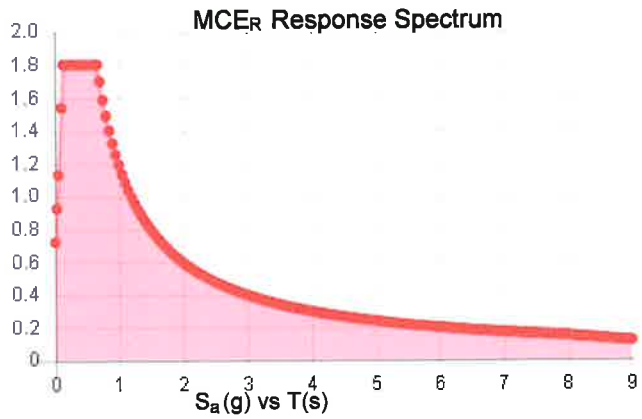
Seismic

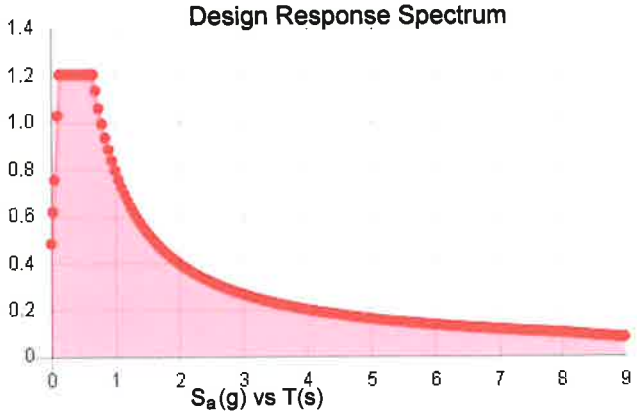
Site Soil Class: D - Stiff Soil

Results:

S_S :	1.806	S_{DS} :	1.204
S_1 :	0.795	S_{D1} :	0.795
F_a :	1	T_L :	8
F_v :	1.5	PGA :	0.706
S_{MS} :	1.806	PGA_M :	0.706
S_{M1} :	1.193	F_{PGA} :	1
		I_e :	1.25

Seismic Design Category E





Data Accessed: Tue Jan 22 2019

Date Source: USGS Seismic Design Maps based on ASCE/SEI 7-10, incorporating Supplement 1 and errata of March 31, 2013, and ASCE/SEI 7-10 Table 1.5-2. Additional data for site-specific ground motion procedures in accordance with ASCE/SEI 7-10 Ch. 21 are available from USGS.

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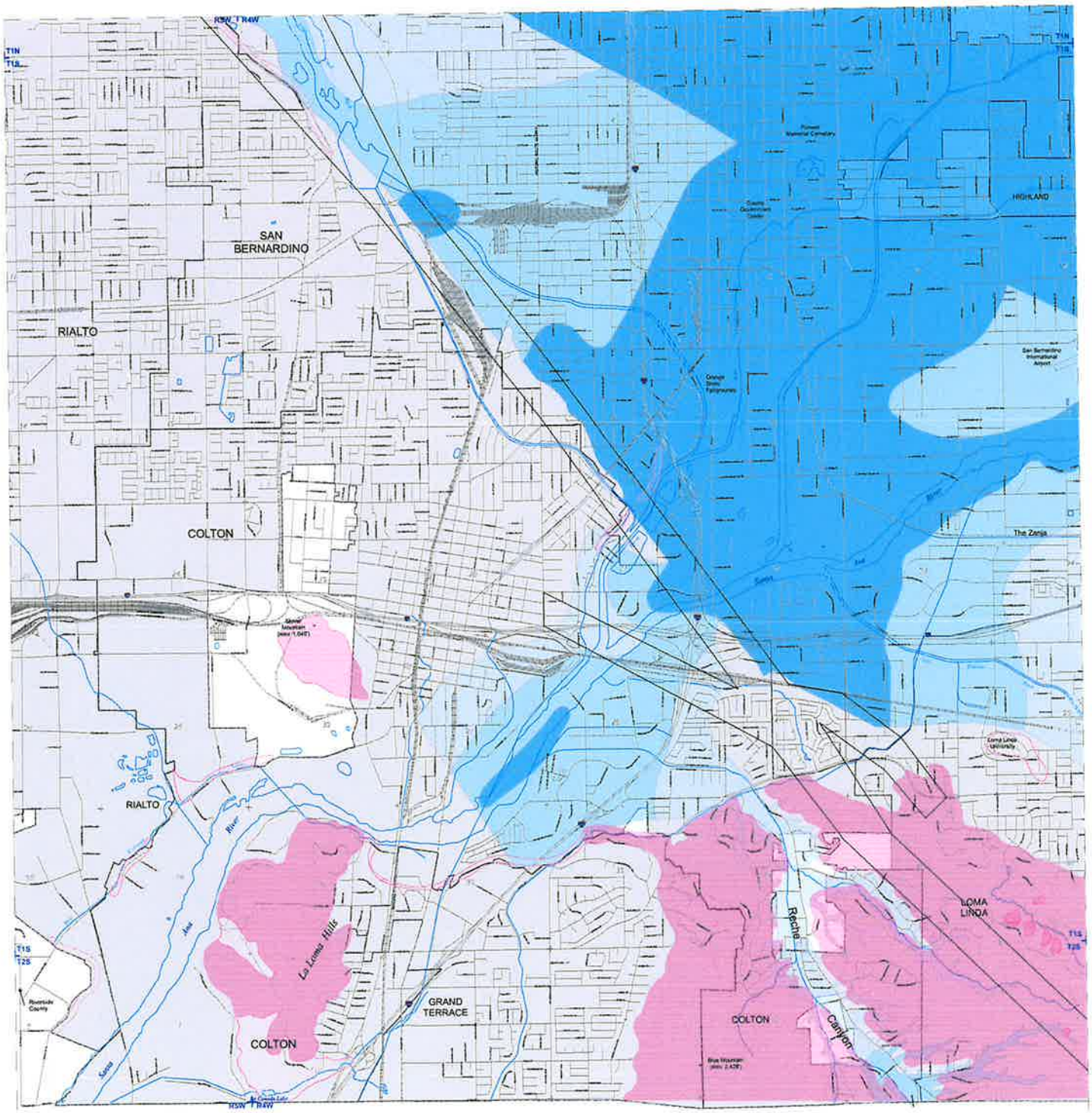

Generalized Landslide Susceptibility

Zone of Suspected Liquefaction Susceptibility

Zone of Susceptibility

San Bernardino County Land Use Plan
GENERAL PLAN
Geologic Hazard Overlays

Generalized Liquefaction Susceptibility

Earthquake Fault Zones

Earthquake Fault Zone Boundary

County Designated Fault Zones

Cities

FH30 C
San Bernardino S

Appendix D

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Hager Pacific Properties, LLC
Project Number: 20852-18
Test Hole No. 1

Name of Tester Javier Sanchez

Depth of Test Hole 15.5'

Date Tested 12/19/18

Diameter of Test Hole 8"

Caving_____

Date Excavated 12/18/18

Strata Peculiarities____

Sandy Soil Criteria Test

TIME	TRIAL NO	T1	H1	H2	D
1:55	1	30	0.0	30.0	30.0
2:25					
2:25	2	30	0.0	28.5	28.5
2:55					

_____ Soil Criteria

TIME	T1	TE	H1	H2	D
7:10	30	30	0.0	55.0	55.0
7:40					
7:40	30	60	0.0	43.0	43.0
8:10					
8:10	30	90	0.0	43.0	43.0
8:40					
8:40	30	120	0.0	46.0	46.0
9:10					
9:10	30	150	0.0	45.5	45.5
9:40					
9:40	30	180	0.0	46.0	46.0
10:10					
10:10	30	210	0.0	45.5	45.5
10:40					
10:40	30	240	0.0	46.0	46.0
11:10					
11:10	30	270	46.0	75.0	29.0
11:40					
11:40	30	300	75.0	104.5	29.5
12:10					

T1 – Time Interval (min.) **TE – Total Elapsed Time (min.)** **H1 – Initial Water Level**
H2 – Final Water Level (in.) **d – Change in H_2O Level (in.)**

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Hager Pacific Properties, LLC
Project Number: 20852-18
Test Hole No. 2

Name of Tester Javier Sanchez

Depth of Test Hole 15.7'

Date Tested 12/19/18

Diameter of Test Hole 8"

Caving_____

Date Excavated 12/18/18

Strata Peculiarities____

Sandy Soil Criteria Test

TIME	TRIAL NO	T1	H1	H2	D
2:20	1	30	0.0	48.5	48.5
2:50					
2:50	2	30	0.0	39.0	39.0
3:20					

_____ Soil Criteria

TIME	T1	TE	H1	H2	D
7:15	30	30	0.0	44.0	44.0
7:45					
7:45	30	60	0.0	40.5	40.5
8:15					
8:15	30	90	0.0	37.5	37.5
8:45					
8:45	30	120	0.0	39.0	39.0
9:15					
9:15	30	150	0.0	37.5	37.5
9:45					
9:45	30	180	0.0	37.0	37.0
10:15					
10:15	30	210	0.0	36.0	36.0
10:45					
10:45	30	240	0.0	35.5	35.5
11:15					
11:15	30	270	35.5	60.5	25.0
11:45					
11:45	30	300	60.5	84.5	24.0
12:15					

T1 – Time Interval (min.)
TE – Total Elapsed Time (min.)
H1 – Initial Water Level
H2 – Final Water Level (in.)
d – Change in H_2O Level (in.)

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Hager Pacific Properties, LLC
Project Number: 20852-18
Test Hole No. 3

Name of Tester Javier Sanchez

Depth of Test Hole 13.1'

Date Tested 12/19/18

Diameter of Test Hole 8"

Caving _____

Date Excavated 12/18/18

Strata Peculiarities ____

Sandy Soil Criteria Test

TIME	TRIAL NO	T1	H1	H2	D
10:40	1	30	0.0	104.0	104.0
11:10					
11:10	2	30	0.0	94.5	94.5
11:40					

_____ Soil Criteria

TIME	T1	TE	H1	H2	D
11:42	10	10	0.0	72.0	72.0
11:52					
11:52	10	20	0.0	70.5	70.5
12:02					
12:02	10	30	0.0	71.0	71.0
12:12					
12:12	10	40	0.0	69.0	69.0
12:22					
12:22	10	50	0.0	70.5	70.5
12:32					
12:32	10	60	0.0	71.5	71.5
12:42					
12:42	10	70	0.0	69.0	69.0
12:52					
12:52	10	80	0.0	70.0	70.0
1:02					
1:02	10	90	70.0	77.5	7.5
1:12					
1:12	10	100	77.5	86.0	8.5
1:22					

T1 – Time Interval (min.)
TE – Total Elapsed Time (min.)
H1 – Initial Water Level
H2 – Final Water Level (in.)
d – Change in H_2O Level (in.)

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Hager Pacific Properties, LLC
Project Number: 20852-18
Test Hole No. 4

Name of Tester Javier Sanchez

Depth of Test Hole 11.6'

Date Tested 12/19/18

Diameter of Test Hole 8"

Caving _____

Date Excavated 12/18/18

Strata Peculiarities ____

Sandy Soil Criteria Test

TIME	TRIAL NO	T1	H1	H2	D
8:13	1	30	0.0	18.1	18.0
8:43					
8:43	2	30	0.0	17.5	17.5
9:13					

_____ Soil Criteria

TIME	T1	TE	H1	H2	D
7:20	30	30	0.0	19.0	19.0
7:50					
7:50	30	60	0.0	21.0	21.0
8:20					
8:20	30	90	0.0	14.5	14.5
8:50					
8:50	30	120	0.0	16.0	16.0
9:20					
9:20	30	150	0.0	15.0	15.0
9:50					
9:50	30	180	0.0	15.5	15.5
10:20					
10:20	30	210	0.0	16.5	16.5
10:50					
10:50	30	240	0.0	15.5	15.5
11:20					
11:20	30	270	15.5	34.0	18.5
11:50					
11:50	30	300	34.0	48.0	14.0
12:20					

T1 – Time Interval (min.) **TE – Total Elapsed Time (min.)** **H1 – Initial Water Level**
H2 – Final Water Level (in.) **d – Change in H_2O Level (in.)**

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Hager Pacific Properties, LLC
Project Number: 20852-18
Test Hole No. 5

Name of Tester Javier Sanchez

Depth of Test Hole 10.9'

Date Tested 12/19/18

Diameter of Test Hole 8"

Caving_____

Date Excavated 12/18/18

Strata Peculiarities____

Sandy Soil Criteria Test

TIME	TRIAL NO	T1	H1	H2	D
9:32	1	30	0.0	11.0	11.0
10:02					
10:02	2	30	0.0	10.0	10.0
10:32					

_____ Soil Criteria

TIME	T1	TE	H1	H2	D
7:27	30	30	0.0	7.5	7.5
7:57					
7:57	30	60	0.0	6.0	6.0
8:27					
8:27	30	90	0.0	6.0	6.0
8:57					
8:57	30	120	0.0	5.5	5.5
9:27					
9:27	30	150	0.0	6.0	6.0
9:57					
9:57	30	180	0.0	5.5	5.5
10:27					
10:27	30	210	0.0	6.5	6.5
10:57					
10:57	30	240	0.0	6.0	6.0
11:27					
11:27	30	270	6.0	12.0	6.0
11:57					
11:57	30	300	12.0	17.0	5.0
12:27					

T1 – Time Interval (min.)
TE – Total Elapsed Time (min.)
H1 – Initial Water Level
H2 – Final Water Level (in.)
d – Change in H_2O Level (in.)

NORCAL ENGINEERING

SOILS AND GEOTECHNICAL CONSULTANTS

PERCOLATION TEST DATA

Client: Hager Pacific Properties, LLC
Project Number: 20852-18
Test Hole No. 6

Name of Tester Javier Sanchez

Depth of Test Hole 10.7'

Date Tested 12/19/18

Diameter of Test Hole 8"

Caving_____

Date Excavated 12/18/18

Strata Peculiarities____

Sandy Soil Criteria Test

TIME	TRIAL NO	T1	H1	H2	D
8:57 9:27	1	30	0.0	10.0	10.0
9:27 9:57	2	30	0.0	9.0	9.0

_____ Soil Criteria

TIME	T1	TE	H1	H2	D
7:24 7:54	30	30	0.0	10.5	10.5
7:54 8:24	30	60	0.0	7.0	7.0
8:24 8:54	30	90	0.0	7.0	7.0
8:54 9:24	30	120	0.0	7.5	7.5
9:24 9:54	30	150	0.0	7.0	7.0
9:54 10:24	30	180	0.0	7.0	7.0
10:24 10:54	30	210	0.0	7.5	7.5
10:54 11:24	30	240	0.0	7.0	7.0
11:24 11:54	30	270	7.0	12.5	5.5
11:54 12:24	30	300	12.5	18.0	5.5

T1 – Time Interval (min.) **TE – Total Elapsed Time (min.)** **H1 – Initial Water Level**
H2 – Final Water Level (in.) **d – Change in H_2O Level (in.)**

SOIL INFILTRATION RATE CALCS ⇒ Auger Boring

Location:	TH-1	TH-2	TH-3	TH-4	TH-5	TH-6
• Depth =	15.5'	15.7'	13.1'	11.6'	10.9'	10.7'
• Hole Dia. =	8"	8"	8"	8"	8"	8"
• Drop = Δd	58.5"	48"	16"	32.5"	11"	11"
• Time = Δt Interval	1.0 hr	1.0 hr	0.33 hr	1.0 hr	1.0 hr	1.0 hr
• Preadjusted Perc. Rate	58.5 in/hr	48 in/hr	48 in/hr	32.5 in/hr	11 in/hr	11 in/hr
• Initial Water Depth = d_1	140"	153"	87"	124"	125"	121"
• Reduction Factor = R_f	28.7	33.3	20.8	27.9	30.9	29.9
• INFILTRATION RATE	2.0 in/hr	1.4 in/hr	2.3 in/hr	1.2 in/hr	0.4 in/hr	0.4 in/hr

$$\text{Infiltration Rate} = \frac{\text{Preadjusted Perc. Rate}}{\text{Reduction Factor}}$$

$$\text{Reduction Factor} = R_f = \left[\frac{2 \cdot d_1 - \Delta d}{\text{Dia.}}\right] + 1$$

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DATE

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