# ADDENDUM
# TO
# HYDROLOGY REPORT

County of San Bernardino

## KISS Logistics Center

Hwy 395 and Phelan Road
APN: 3064-401-03, -04, -05

*Prepared For:*
City of Hesperia

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December 2023
Job No. 2178

# ADDENDUM TO KISS LGC HYDROLOGY

**To:**
City of Hesperia

**Subject:**
Clarification or Hydromodification, Offsite Runoff, and Regional Drainage with Oro Grande Wash

**Date:**
12/10/2023

## PURPOSE

The purpose of this addendum is to clarify and expand upon the detailed onsite hydrology study for the KISS LGC project. The developed condition map of the detailed study does not explicitly show how the developed Q100 flowrate would be mitigated back down to the level of the existing Q100 discharge for required hydromodification purposes. Furthermore, there is offsite flow which is conveyed through the KISS project site that must be accounted for at the discharge point of the KISS project of which this addendum also addresses. Lastly, a regional study is provided to show KISS project flows in relation to the Oro Grande Wash.

## Hydromodification for Q100 Flowrate and Volume

The developed condition hydrology map for the onsite detailed study provides a Q100 existing condition discharge of 59.10 cfs and an 'unmitigated' Q100 developed condition discharge of 92.66 cfs. However, it should be clarified that a mitigated Q100 discharge rate of 59.10 cfs will occur for the developed condition KISS LGC project as reported on the 'Offsite Hydrology Map' provided within Appendix C.

The proposed detention basin outlet will consist of a system of two separate 36" diameter riser pipes designed to restrict flow to no more than the existing Q100 flowrate of 59.10 cfs. The top of the riser pipe will be open and will be set at 8.75" below the maximum ponding depth in the basin. A series of perforations will be drilled into the walls of each riser pipe to alleviate the maximum ponding depth as well.

Since the storage volume provided within the basin exceeds that of the required hydromodification volume, at no time will the outflow discharge rate ever exceed that of the existing condition.

Mitigation for both flowrate and volumetric criteria are summarized in the tables below:

RATIONAL METHOD PEAK FLOWRATE - 100-YR EVENT

| | Existing | Developed | Mitigated |
|---|---|---|---|
| Basin | cfs | cfs | cfs |
| A | 40.17 | 91.66 | |
| B | 18.93 | N/A | |
| TOTAL | 59.10 | 91.66 | 59.10 |

UNIT HYDROGRAPH RUNOFF VOLUME - 100-YR EVENT

| Existing | Developed | Volume Required | Volume Provided | Surplus |
|---|---|---|---|---|
| ac-ft | ac-ft | ac-ft | ac-ft | ac-ft |
| 12.67 | 13.89 | 1.22 | 2.37 | 1.15 |

Hydraulic calculations for the outlet structure and for the basin volume are provided in Appendix B of this addendum.

## OFFSITE DRAINAGE

There are three offsite parcels that total 14.63 ac in size that lie immediately to the south of the KISS project site. Flows from these offsite parcels run in a northeast direction and are collected and routed separately though the KISS site to be discharged to the north. The historical flow patterns from the offsite parcels and across the KISS project site remain unchanged.

The offsite flows will be collected via a 5’ wide by 2.5’ deep concrete channel that runs along the southern boundary of the KISS project. The concrete channel then flows east into a 30” HDPE pipe located at the southeast corner of the KISS site. Once collected within the 30” HDPE pipe, offsite flows are then conveyed north along the east boundary of the KISS site until they are discharged at the northeast corner of the site along with the onsite flows from the KISS project itself. The offsite flows will be kept separate from the onsite flows until after water quality treatment has occurred for the onsite KISS runoff. The offsite flows are not treated for water quality as they originate from natural sources. Both onsite and offsite flows are discharged into an existing natural drainage channel that is immediately north of the KISS project and is discussed in further detail below.

A rational method hydrology study that quantifies the Q100 flowrates for the offsite areas has been provided in Appendix A of this addendum. The offsite flows have been confluenced with onsite flows within the hydrology model. An offsite hydrology exhibit is provided in Appendix C.

## REGIONAL DRAINAGE STUDY

A 200-scale Regional Drainage Exhibit is provided in Appendix C that illustrates flow patterns around the KISS project site in relation to the more easterly located Oro Grande Wash. The KISS project does not directly discharge into the Oro Grande Wash as Oro Grande Wash is located on the east side of Hwy 396 while KISS is on the west side of the 395 and two highway embankments separate the two. KISS project flows discharge into an existing natural drainage channel that continues to run north and stays on the west side of Hwy 395.

## EXISTING NATURAL DRAINAGE CHANNEL

The existing natural drainage that receives KISS project discharge, and the offsite parcel discharge, is an earthen channel that runs in a northerly direction. The drainage channel is separated from Hwy 395 flows due to an existing berm and asphalt curb that run along the western edge of the highway. Runoff from Hwy 395 does not enter into the natural channel because elevations along the western edge of Highway 395 average 1'-2' higher than elevations along the east half of the highway and this can be seen on the regional drainage exhibit.

A hydraulic analysis for the existing channel shows that combined KISS project and offsite parcel flows will not exceed the capacity of the natural channel for the Q100 event and are summarized in the table below.

NATURAL DRAINAGE CHANNEL CAPACITY

| Q100 Discharge | Channel Capacity | Delta |
|---|---|---|
| cfs | cfs | cfs |
| 92.58 | 98.07 | 5.49 |

## CONCLUSION

This addendum clarifies the Q100 mitigated flows for hydromodification, quantifies the offsite runoff that needs to be conveyed, and expands on the regional drainage for the project. By not exceeding the existing Q100 flowrate or volume discharge, through providing adequate conveyance of offsite flows, and by not directly discharging into the Oro Grande Wash, the KISS LGC project is considered to remain acceptable in terms of hydrology and hydraulic impacts.

# APPENDIX A

## RATIONAL METHOD OUTPUT
## FOR Q100
## OFFSITE HYDROLOGY

San Bernardino County Rational Hydrology Program

(Hydrology Manual Date - August 1986)

CIVILCADD/CIVILDESIGN Engineering Software, (c) 1989-2012 Version 7.2
Rational Hydrology Study Date: 12/10/23

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HESPERIA 29
OFFSITE PLUS DEVELOPED CONDITION HYDROLOGY
100-YR EVENT
ALPE

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Program License Serial Number 6301

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********* Hydrology Study Control Information **********

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Rational hydrology study storm event year is 100.0
Computed rainfall intensity:
Storm year = 100.00 1 hour rainfall = 1.290 (In.)
Slope used for rainfall intensity curve b = 0.7000
Soil antecedent moisture condition (AMC) = 3

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Process from Point/Station 1.000 to Point/Station 2.000
**** INITIAL AREA EVALUATION ****

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COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2) = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000 Max loss rate(Fm)= 0.079(In/Hr)
Initial subarea data:
Initial area flow distance = 965.000(Ft.)
Top (of initial area) elevation = 61.000(Ft.)
Bottom (of initial area) elevation = 48.800(Ft.)
Difference in elevation = 12.200(Ft.)
Slope = 0.01264 s(%)= 1.26
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration = 11.385 min.
Rainfall intensity = 4.129(In/Hr) for a 100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff = 27.343(CFS)
Total initial stream area = 7.500(Ac.)
Pervious area fraction = 0.100
Initial area Fm value = 0.079(In/Hr)

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Process from Point/Station 2.000 to Point/Station 3.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****

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Upstream point/station elevation = 48.800(Ft.)
Downstream point/station elevation = 41.500(Ft.)
Pipe length = 940.00(Ft.) Manning's N = 0.013
No. of pipes = 1 Required pipe flow = 27.343(CFS)
Nearest computed pipe diameter = 30.00(In.)
Calculated individual pipe flow = 27.343(CFS)
Normal flow depth in pipe = 19.50(In.)
Flow top width inside pipe = 28.62(In.)
Critical Depth = 21.40(In.)
Pipe flow velocity = 8.09(Ft/s)
Travel time through pipe = 1.94 min.
Time of concentration (TC) = 13.32 min.

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Process from Point/Station 2.000 to Point/Station 3.000
**** SUBAREA FLOW ADDITION ****

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COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    13.32 min.
Rainfall intensity =      3.699(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.881
Subarea runoff =     21.541(CFS) for    7.500(Ac.)
Total runoff =     48.883(CFS)
Effective area this stream =       15.00(Ac.)
Total Study Area (Main Stream No. 1) =       15.00(Ac.)
Area averaged Fm value =    0.079(In/Hr)


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Process from Point/Station        3.000 to Point/Station        4.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =    41.500(Ft.)
Downstream point elevation =    40.500(Ft.)
Channel length thru subarea  =   510.000(Ft.)
Channel base width      =    5.000(Ft.)
Slope or 'Z' of left channel bank =   2.000
Slope or 'Z' of right channel bank =   2.000
Manning's 'N'    = 0.025
Maximum depth of channel  =    6.000(Ft.)
Flow(q) thru subarea =     48.883(CFS)
Depth of flow =   1.864(Ft.), Average velocity =   3.005(Ft/s)
Channel flow top width =   12.456(Ft.)
Flow Velocity =    3.00(Ft/s)
Travel time  =    2.83 min.
Time of concentration =   16.15 min.
Critical depth =      1.219(Ft.)


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Process from Point/Station        3.000 to Point/Station        4.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =     15.000(Ac.)
Runoff from this stream =     48.883(CFS)
Time of concentration =   16.15 min.
Rainfall intensity =     3.233(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Program is now starting with Main Stream No. 2


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Process from Point/Station        5.000 to Point/Station        6.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Initial subarea data:
Initial area flow distance =   945.000(Ft.)
Top (of initial area) elevation =    61.000(Ft.)
Bottom (of initial area) elevation =    48.800(Ft.)
Difference in elevation =    12.200(Ft.)
Slope =    0.01291  s(%)=       1.29
TC = k(0.304)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   11.242 min.
Rainfall intensity =      4.166(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.883
Subarea runoff =     24.278(CFS)
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Total initial stream area =        6.600(Ac.)
Pervious area fraction = 0.100
Initial area Fm value =    0.079(In/Hr)


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Process from Point/Station        6.000 to Point/Station        4.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
______________________________________________________________________________
Upstream point/station elevation =    48.800(Ft.)
Downstream point/station elevation =    40.500(Ft.)
Pipe length  =   560.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    24.278(CFS)
Nearest computed pipe diameter  =     24.00(In.)
Calculated individual pipe flow  =    24.278(CFS)
Normal flow depth in pipe =   17.48(In.)
Flow top width inside pipe =   21.35(In.)
Critical Depth =   20.91(In.)
Pipe flow velocity =      9.89(Ft/s)
Travel time through pipe =    0.94 min.
Time of concentration (TC) =    12.19 min.


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Process from Point/Station        6.000 to Point/Station        4.000
**** SUBAREA FLOW ADDITION ****
______________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Time of concentration =    12.19 min.
Rainfall intensity =      3.937(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.882
Subarea runoff =     22.258(CFS) for    6.800(Ac.)
Total runoff =     46.537(CFS)
Effective area this stream =       13.40(Ac.)
Total Study Area (Main Stream No. 2) =       28.40(Ac.)
Area averaged Fm value =    0.079(In/Hr)


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Process from Point/Station        6.000 to Point/Station        4.000
**** CONFLUENCE OF MAIN STREAMS ****
______________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     13.400(Ac.)
Runoff from this stream =     46.537(CFS)
Time of concentration =   12.19 min.
Rainfall intensity =     3.937(In/Hr)
Area averaged loss rate (Fm) =    0.0785(In/Hr)
Area averaged Pervious ratio (Ap) = 0.1000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     48.88    15.000     16.15    0.079      3.233
2     46.54    13.400     12.19    0.079      3.937
Qmax(1) =
          1.000 *    1.000 *    48.883) +
          0.817 *    1.000 *    46.537) + =      86.926
Qmax(2) =
          1.223 *    0.755 *    48.883) +
          1.000 *    1.000 *    46.537) + =      91.660

Total of 2 main streams to confluence:
Flow rates before confluence point:
      49.883      47.537
Maximum flow rates at confluence using above data:
       86.926       91.660
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Area of streams before confluence:
       15.000       13.400
Effective area values after confluence:
       28.400       24.719


Results of confluence:
Total flow rate =     91.660(CFS)
Time of concentration =    12.186 min.
Effective stream area after confluence  =     24.719(Ac.)
Study area average Pervious fraction(Ap) =  0.100
Study area average soil loss rate(Fm) =    0.079(In/Hr)
Study area total =      28.40(Ac.)


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Process from Point/Station        4.000 to Point/Station        7.000
**** PIPEFLOW TRAVEL TIME (Program estimated size) ****
________________________________________________________________________
Upstream point/station elevation =    40.500(Ft.)
Downstream point/station elevation =    37.500(Ft.)
Pipe length  =    86.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    91.660(CFS)
Nearest computed pipe diameter  =     33.00(In.)
Calculated individual pipe flow  =    91.660(CFS)
Normal flow depth in pipe =   25.13(In.)
Flow top width inside pipe =   28.13(In.)
Critical depth could not be calculated.
Pipe flow velocity =     18.89(Ft/s)
Travel time through pipe =    0.08 min.
Time of concentration (TC) =    12.26 min.


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Process from Point/Station        4.000 to Point/Station        7.000
**** USER DEFINED FLOW INFORMATION AT A POINT ****
________________________________________________________________________
COMMERCIAL subarea type
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 32.00
Adjusted SCS curve number for AMC 3 = 52.00
Pervious ratio(Ap) = 0.1000     Max loss rate(Fm)=     0.079(In/Hr)
Rainfall intensity =     22.662(In/Hr) for a   100.0 year storm
User specified values are as follows:
TC =   1.00 min.  Rain intensity =      22.66(In/Hr)
Total area this stream =         0.00(Ac.)
Total Study Area (Main Stream No. 1) =       28.40(Ac.)
Total runoff =     59.10(CFS)


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Process from Point/Station        4.000 to Point/Station        7.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 1
Stream flow area =      0.000(Ac.)
Runoff from this stream =     59.100(CFS)
Time of concentration =    1.00 min.
Rainfall intensity =    22.662(In/Hr)
Area averaged loss rate (Fm) =   -1.#IND(In/Hr)
Area averaged Pervious ratio (Ap) = -1.#IND
Program is now starting with Main Stream No. 2


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Process from Point/Station        8.000 to Point/Station        9.000
**** INITIAL AREA EVALUATION ****
________________________________________________________________________
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 67.00
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Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.290(In/Hr)
Initial subarea data:
Initial area flow distance =   900.000(Ft.)
Top (of initial area) elevation =    73.500(Ft.)
Bottom (of initial area) elevation =    59.500(Ft.)
Difference in elevation =    14.000(Ft.)
Slope =    0.01556  s(%)=       1.56
TC = k(0.525)*[(length^3)/(elevation change)]^0.2
Initial area time of concentration =   18.343 min.
Rainfall intensity =      2.957(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area (Q=KCIA) is C = 0.812
Subarea runoff =     16.971(CFS)
Total initial stream area =        7.070(Ac.)
Pervious area fraction = 1.000
Initial area Fm value =    0.290(In/Hr)


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Process from Point/Station        9.000 to Point/Station       10.000
**** IMPROVED CHANNEL TRAVEL TIME ****
________________________________________________________________________
Upstream point elevation =    59.500(Ft.)
Downstream point elevation =    56.000(Ft.)
Channel length thru subarea  =   465.000(Ft.)
Channel base width      =    3.000(Ft.)
Slope or 'Z' of left channel bank =   0.000
Slope or 'Z' of right channel bank =   0.000
Estimated mean flow rate at midpoint of channel =     25.252(CFS)
Manning's 'N'    = 0.015
Maximum depth of channel  =    1.500(Ft.)
Flow(q) thru subarea =     25.252(CFS)
Depth of flow =   1.260(Ft.), Average velocity =   6.678(Ft/s)
Channel flow top width =    3.000(Ft.)
Flow Velocity =    6.68(Ft/s)
Travel time  =    1.16 min.
Time of concentration =   19.50 min.
Critical depth =      1.297(Ft.)
 Adding area flow to channel
UNDEVELOPED (poor cover) subarea
Decimal fraction soil group A = 1.000
Decimal fraction soil group B = 0.000
Decimal fraction soil group C = 0.000
Decimal fraction soil group D = 0.000
SCS curve number for soil(AMC 2)  = 67.00
Adjusted SCS curve number for AMC 3 = 84.60
Pervious ratio(Ap) = 1.0000     Max loss rate(Fm)=     0.290(In/Hr)
Rainfall intensity =      2.833(In/Hr) for a   100.0 year storm
Effective runoff coefficient used for area,(total area with modified
rational method)(Q=KCIA) is C = 0.808
Subarea runoff =     16.510(CFS) for    7.560(Ac.)
Total runoff =     33.481(CFS)
Effective area this stream =       14.63(Ac.)
Total Study Area (Main Stream No. 2) =       43.03(Ac.)
Area averaged Fm value =    0.290(In/Hr)
Depth of flow =   1.543(Ft.), Average velocity =   7.231(Ft/s)
!!Warning: Water is above left or right bank elevations
ERROR - Channel depth exceeds maximum allowable depth
Critical depth =      1.563(Ft.)


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Process from Point/Station       10.000 to Point/Station       11.000
**** PIPEFLOW TRAVEL TIME (User specified size) ****
________________________________________________________________________
Upstream point/station elevation =    56.000(Ft.)
Downstream point/station elevation =    37.500(Ft.)
Pipe length  =  1100.00(Ft.)   Manning's N = 0.013
No. of pipes = 1  Required pipe flow  =    33.481(CFS)
Given pipe size =     24.00(In.)
NOTE: Normal flow is pressure flow in user selected pipe size.
The approximate hydraulic grade line above the pipe invert is
     8.231(Ft.)  at the headworks or inlet of the pipe(s)
 Pipe friction loss =     24.086(Ft.)
 Minor friction loss =      2.645(Ft.)  K-factor =   1.50
Critical depth could not be calculated.
Pipe flow velocity =     10.66(Ft/s)
Travel time through pipe =    1.72 min.
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Time of concentration (TC) =    21.22 min.


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Process from Point/Station       10.000 to Point/Station       11.000
**** CONFLUENCE OF MAIN STREAMS ****
________________________________________________________________________
The following data inside Main Stream is listed:
In Main Stream number: 2
Stream flow area =     14.630(Ac.)
Runoff from this stream =     33.481(CFS)
Time of concentration =   21.22 min.
Rainfall intensity =     2.670(In/Hr)
Area averaged loss rate (Fm) =    0.2900(In/Hr)
Area averaged Pervious ratio (Ap) = 1.0000
Summary of stream data:

Stream Flow rate    Area    TC     Fm       Rainfall Intensity
 No.    (CFS)   (Ac.)       (min) (In/Hr)     (In/Hr)


1     59.10     0.000      1.00   -1.#IO     22.662
2     33.48    14.630     21.22    0.290      2.670
Qmax(1) =
Fm Value exceeds Rainfall Intensity in one of the streams
Summing flow rates for conflunce solution
           1.000 *    1.000 *    59.100) +
           9.400 *    0.047 *    33.481) + =      73.928
Qmax(2) =
Fm Value exceeds Rainfall Intensity in one of the streams
Summing flow rates for conflunce solution
           1.000 *    1.000 *    59.100) +
           1.000 *    1.000 *    33.481) + =      92.581

Total of 2 main streams to confluence:
Flow rates before confluence point:
      60.100      34.481
Maximum flow rates at confluence using above data:
       73.928       92.581
Area of streams before confluence:
        0.000       14.630
Effective area values after confluence:
        0.689       14.630


Results of confluence:
Total flow rate =     92.581(CFS)
Time of concentration =    21.224 min.
Effective stream area after confluence  =     14.630(Ac.)
Study area average Pervious fraction(Ap) = -1.#IO
Study area average soil loss rate(Fm) =   -1.#IO(In/Hr)
Study area total =      14.63(Ac.)
End of computations, Total Study Area =           43.03 (Ac.)
The following figures may
be used for a unit hydrograph study of the same area.
Note: These figures do not consider reduced effective area
effects caused by confluences in the rational equation.

Area averaged pervious area fraction(Ap) = 0.406
Area averaged SCS curve number =  43.9
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# APPENDIX B

## HYDRAULIC CALCULATIONS

1. PROPOSED DETENTION BASIN VOLUME
2. PROPOSED 30” RISER OUTLET
3. PROPOSED 30” HDPE CONVEYANCE PIPE
4. PROPOSED 5’WX1.5D CONCRETE CHANNEL
5. EXISTING DRAINAGE CHANNEL CAPACITY

DETENTION BASIN SIZE WORKSHEET

| BASIN STORAGE VOLUME | | | |
|---|---|---|---|
| PONDED VOLUME | | | |
| Top | 27,746 | sf | |
| Bttm | 7,886 | sf | |
| Avg Area | 17,816 | sf | |
| min depth | 1.3 | ft | |
| max depth | 6.0 | ft | |
| Avg depth | 3.2 | ft | |
| Ponded Vol | 56,120 | cf | |
| | | | |
| UNDEGROUND VOLUME | | | |
| Bttm | 7,886 | sf | |
| Depth to media | 2.0 | ft | |
| void ratio | 0.3 | | |
| Volume Media | 4,732 | cf | |
| | | | |
| Depth to gravel | 1.0 | ft | |
| void ratio | 0.4 | | |
| Volume Gravel | 3,154 | cf | |
| | | | |
| TOTAL STORED VOLUME | 64,006 | cf | 1.47 ac/ft |
| | | | |
| FLOW THROUGH VOLUME | | | |
| Bttm | 7,886 | sf | |
| Infil rate | 5.0 | in/hr | |
| time | 12.0 | hr | |
| FLOW THROUGH VOLUME | 39,430 | cf | 0.91 ac/ft |
| | | | |
| GRAND TOTAL VOLUME PROVIDED | 103,436 | cf | 2.37 ac/ft |

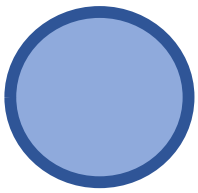
# MAX OUTFLOW at 30" RISER PIPE

Orifice Calc

Q orifice = $C_d$A x (2gh)^0.5

| | | |
|---|---|---|
| Cd = | 0.61 | |
| A = | 7.069 | $ft^2$ |
| g = | 32.2 | $ft/s^2$ |
| h = | 8.75 | in |
| Q orifice = | 29.55 | cfs |

diam= 36 in



Riser Inlet Capacity (Q orifice) = 29.55 cfs

TOTAL OUTLET SYSTEM CAPACITY

| RISER # | MAX $Q_{100}$ OUTFLOW cfs |
|---|---|
| 1 | 29.5 |
| 2 | 29.5 |
| TOTAL | 59.1 |

# 30" HDPE @ 1.0% = 41.01 CFS

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.013 | |
| Channel Slope | 0.01000 | ft/ft |
| Normal Depth | 2.50 | ft |
| Diameter | 2.50 | ft |

## Results

| | | |
|---|---|---|
| Discharge | 41.01 | $ft^3/s$ |
| Flow Area | 4.91 | $ft^2$ |
| Wetted Perimeter | 7.85 | ft |
| Hydraulic Radius | 0.63 | ft |
| Top Width | 0.00 | ft |
| Critical Depth | 2.15 | ft |
| Percent Full | 100.0 | % |
| Critical Slope | 0.00926 | ft/ft |
| Velocity | 8.36 | ft/s |
| Velocity Head | 1.08 | ft |
| Specific Energy | 3.58 | ft |
| Froude Number | 0.00 | |
| Maximum Discharge | 44.12 | $ft^3/s$ |
| Discharge Full | 41.01 | $ft^3/s$ |
| Slope Full | 0.01000 | ft/ft |
| Flow Type | SubCritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Average End Depth Over Rise | 0.00 | % |
| Normal Depth Over Rise | 100.00 | % |
| Downstream Velocity | Infinity | ft/s |

# 30" HDPE @ 1.0% = 41.01 CFS

## GVF Output Data

| | | |
|---|---|---|
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 2.50 | ft |
| Critical Depth | 2.15 | ft |
| Channel Slope | 0.01000 | ft/ft |
| Critical Slope | 0.00926 | ft/ft |

# 5' WIDE, 1.5' DEPTH, CONCRETE DITCH @ 0.5% = 37.74 CFS

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.020 | |
| Channel Slope | 0.00500 | ft/ft |
| Normal Depth | 1.50 | ft |
| Bottom Width | 5.00 | ft |

## Results

| | | |
|---|---|---|
| Discharge | 37.74 | $ft^3/s$ |
| Flow Area | 7.50 | $ft^2$ |
| Wetted Perimeter | 8.00 | ft |
| Hydraulic Radius | 0.94 | ft |
| Top Width | 5.00 | ft |
| Critical Depth | 1.21 | ft |
| Critical Slope | 0.00926 | ft/ft |
| Velocity | 5.03 | ft/s |
| Velocity Head | 0.39 | ft |
| Specific Energy | 1.89 | ft |
| Froude Number | 0.72 | |
| Flow Type | Subcritical | |

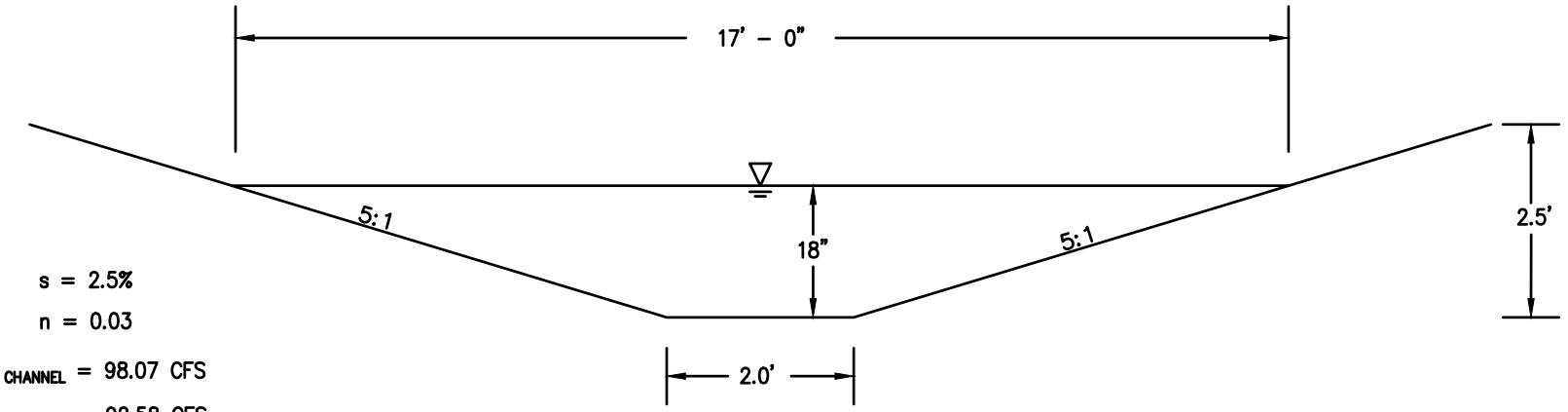
## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.50 | ft |
| Critical Depth | 1.21 | ft |
| Channel Slope | 0.00500 | ft/ft |
| Critical Slope | 0.00926 | ft/ft |

# KISS LOGISTICS CENTER
# CHANNEL EXHIBIT




s = 2.5%

n = 0.03

$Q_{EX\ CHANNEL}$ = 98.07 CFS

$Q_{DEV+OFFSITE}$ = 92.58 CFS

TYPICAL SECTION
NOT TO SCALE

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# EX CHANNEL = 98.07 CFS

## Project Description

| | |
|---|---|
| Friction Method | Manning Formula |
| Solve For | Discharge |

## Input Data

| | | |
|---|---|---|
| Roughness Coefficient | 0.030 | |
| Channel Slope | 0.02500 | ft/ft |
| Normal Depth | 1.50 | ft |
| Left Side Slope | 5.00 | ft/ft (H:V) |
| Right Side Slope | 5.00 | ft/ft (H:V) |
| Bottom Width | 2.00 | ft |

## Results

| | | |
|---|---|---|
| Discharge | 98.07 | $ft^3/s$ |
| Flow Area | 14.25 | $ft^2$ |
| Wetted Perimeter | 17.30 | ft |
| Hydraulic Radius | 0.82 | ft |
| Top Width | 17.00 | ft |
| Critical Depth | 1.70 | ft |
| Critical Slope | 0.01371 | ft/ft |
| Velocity | 6.88 | ft/s |
| Velocity Head | 0.74 | ft |
| Specific Energy | 2.24 | ft |
| Froude Number | 1.33 | |
| Flow Type | Supercritical | |

## GVF Input Data

| | | |
|---|---|---|
| Downstream Depth | 0.00 | ft |
| Length | 0.00 | ft |
| Number Of Steps | 0 | |

## GVF Output Data

| | | |
|---|---|---|
| Upstream Depth | 0.00 | ft |
| Profile Description | | |
| Profile Headloss | 0.00 | ft |
| Downstream Velocity | Infinity | ft/s |
| Upstream Velocity | Infinity | ft/s |
| Normal Depth | 1.50 | ft |
| Critical Depth | 1.70 | ft |
| Channel Slope | 0.02500 | ft/ft |

## EX CHANNEL = 98.07 CFS

### GVF Output Data

| | | |
|---|---|---|
| Critical Slope | 0.01371 | ft/ft |

# APPENDIX C

## EXHIBITS

1. OFFSITE HYDROLOGY EXHIBIT - 100 SCALE
2. REGIONAL HYDROLOGY EXHIBIT - 200 SCALE

# KISS LGC

# OFFSITE HYDROLOGY

12/10/22

BASIN VOLUME SUMMARY
$V_{PROV}$ = 2.37 AC-FT *
$V_{REQ}$ = 1.22 AC-FT
$V_{SURPLUS}$ = 1.15 AC-FT

* SEE ADDENDUM REPORT FOR BACK-UP CALCULATIONS

DEV $V_{100}$ = 13.89 AC-FT
EX $V_{100}$ = 12.67 AC-FT
$V_{REQ}$ = 1.22 AC-FT

DEV $Q_{100}$=92.58 CFS
EX $Q_{100}$=92.58 CFS

DEV $Q_{100}$=59.10 CFS
DEV Unmitigated $Q_{100}$=91.66 CFS
EX $Q_{100}$=59.10 CFS

EX $Q_{100}$=33.48 CFS

EX $Q_{100}$=16.97 CFS

SEE DETAILED ONSITE DEVELOPED CONDITION HYDROLOGY

KISS LOGISTICS

PROPOSED 30" SD FOR OFFSITE FLOW CONVEYANCE

PROPOSED CONCRETE DRAINAGE DITCH

OFFSITE PARCELS

APN 3064-401-08

APN 3064-401-09

APN 3064-401-10

LOT LINE

11 / 37.5

7 / 37.5

1 / 61.0

9 / 59.5

10 / 56.0

8 / 73.5

7.07 / 900

7.56 / 465

1335.5

1340

1338

1344

1342

CALIENTE RD.

PHELAN RD

MAIN ST

HWY 395

WASH

GRANDE

ORO

NOTE: ADD 3500 TO ALL PROPOSED ELEVATIONS SHOWN.


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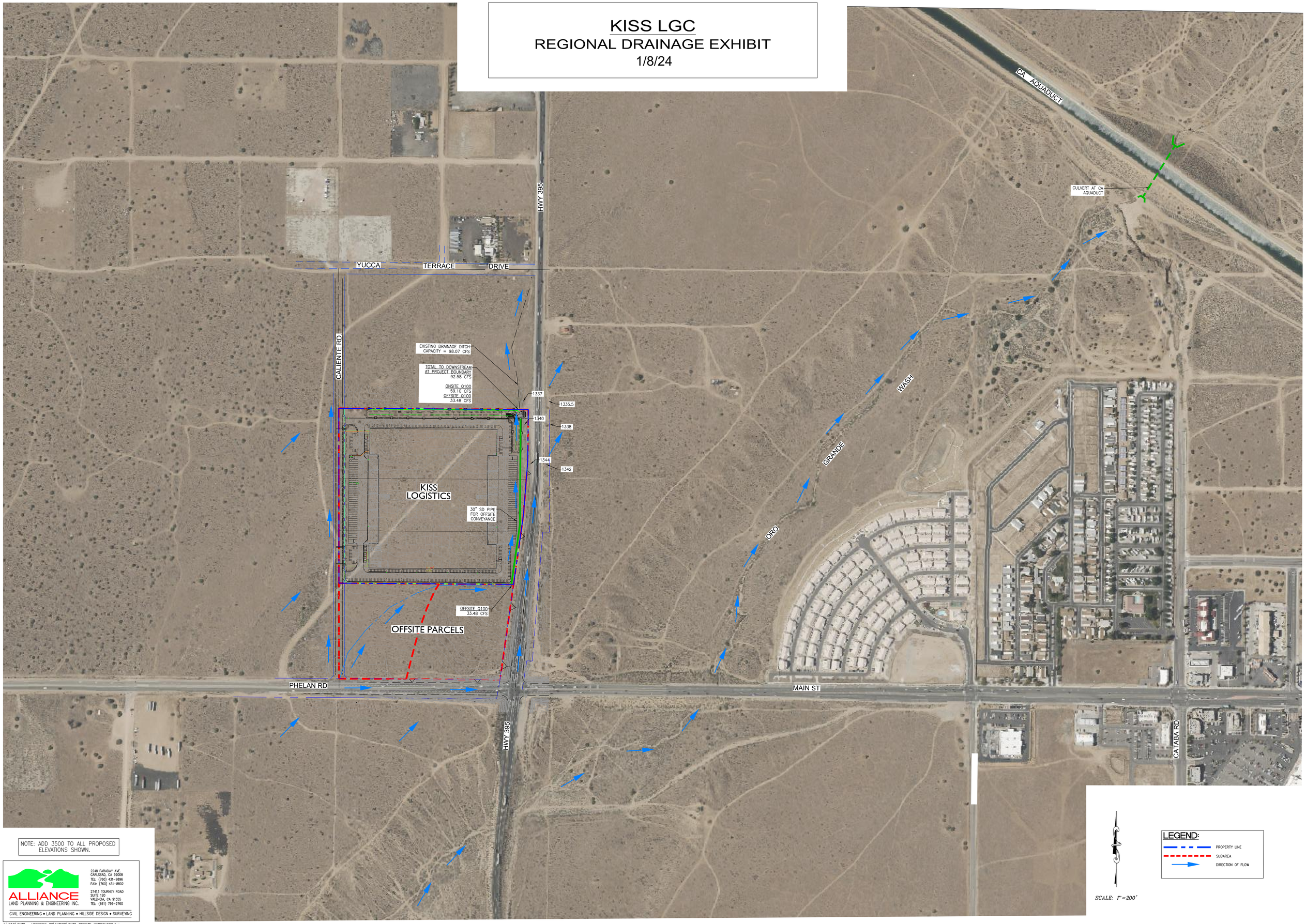
SCALE: 1"=200'

LEGEND:

- PROPERTY LINE
- SUBAREA
- FLOWPATH
- D — PROPOSED STORM DRAIN
- LF — PROPOSED LOWFLOW DRAIN
- PROPOSED HIGH FLOW CATCH BASIN
- # / XX.X — NODE / ELEVATION
- X.XX / XXX' — ACREAGE / LENGTH

# KISS LGC
## REGIONAL DRAINAGE EXHIBIT
1/8/24




NOTE: ADD 3500 TO ALL PROPOSED ELEVATIONS SHOWN.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LEGEND:
- PROPERTY LINE
- SUBAREA
- DIRECTION OF FLOW

SCALE: 1"=200'

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