# APPENDIX F

# REVISED DRAINAGE CONCEPT SUSMP TTM 47449

PAAS
PLANNING
ASSOCIATES
AND
SUBDIVISIONS
ENGINEERING CORPORATION

# REVISED DRAINAGE CONCEPT/ SUSMP

## TENTATIVE TRACT NO. 47449

VISTA VERDE PROJECT
SAN DIMAS AREA,
COUNTY OF LOS ANGELES

RECEIVED
DEC 15 2005
PROCESSING CENTER
LAND DEVELOPMENT DIVISION

REVISED DRAINAGE CONCEPT/SUSMP
APPROVED FOR DRAINAGE
APPROVED BY: RCE NO. 45354 DATE: 12/18/05
CHECKED BY: DATE: 12/18/05
LAND DEVELOPMENT DIVISION
LOS ANGELES COUNTY DEPARTMENT OF PUBLIC WORKS

**Includes Bridge Span & Clearance Calculations and 9 Catch Basin Volume & Flow Rate Calculations**

REGISTERED PROFESSIONAL ENGINEER
GARY MILES GANTNEY
No. 28495
CIVIL
STATE OF CALIFORNIA

Gary M. Gantney 12-15-05

**Gary M. Gantney, PE**
**RCE 28495, Expires 3-31-06**

**Date**

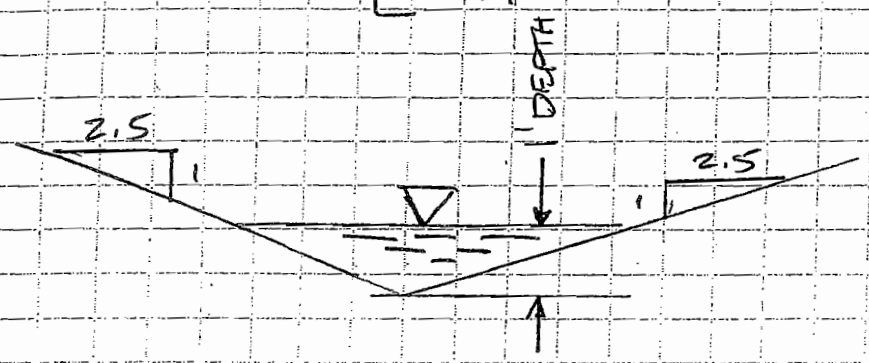
10365 W. Jefferson Blvd ◆ Culver City, CA 90232
Phone: (310) 945-3034 ◆ Fax: (310) 945-3036 ◆ Paas@Landeveloper.net

# DEPTH OF FLOW IN NATURAL CHANNA

## USING MANNING'S

$$Q = A \times \left[ \frac{1.486}{n} \times R^{2/3} S^{1/2} \right]$$

$Q = 40.7c$
$n = 0.035$
$S = 0.133$
$R = P/A$ (




$P_1' = 2.5 + 2.5$
$A = 2.5\#$ (1 FT

$R = \frac{5}{2.5} = 2$

$R^{2/3} = 1.587$

$S^{1/2} = 0.365$

## ASSUMING 1' DEPTH

$$A = \frac{Q}{V}$$

$$A = \frac{40.7}{\frac{1.486}{0.035} \times 1.587 \times 0.365}$$

$A = 1.65$ SF = DEPTH LESS THAN 1 F

REGISTERED PROFESSIONAL ENGINEER
GARY MILES GANTNER
No. 28495
Exp. 3-31-06
CIVIL
STATE OF CALIFORNIA

12-14-05

## A.1 METHOD FOR CALCULATING STANDARD URBAN STORMWATER MITIGATION PLAN FLOW RATES AND VOLUMES BASED ON 0.75-INCHES OF RAINFALL: WORKSHEET

PROJECT NAME

TRACT NO 47449
CATCH BASINS @ DRAINAGE AREA ①

## NOMENCLATURE

| | | |
|---|---|---|
| $A_I$ | = | Impervious Area (acres) |
| $A_P$ | = | Pervious Area (acres) |
| $A_U$ | = | Contributing Undeveloped Upstream Area (acres) |
| $A_{Total}$ | = | Total Area of Development and Contributing Undeveloped Upstream Area |
| $C_D$ | = | Developed Runoff Coefficient |
| $C_U$ | = | Undeveloped Runoff Coefficient |
| $I_X$ | = | Rainfall Intensity (inches / hour) |
| $Q_{PM}$ | = | Peak Mitigation Flow Rate (cfs) |
| $T_C$ | = | Time of Concentration (minutes, must be between 5-30 min.) |
| $V_M$ | = | Mitigation Volume ($ft^3$) |

## EQUATIONS

$A_{Total} = A_I + A_P + A_U$

$A_I = (A_{Total} * \%$ of Development which is Impervious)

$A_P = (A_{Total} * \%$ of Development which is Pervious)

$A_U = (A_{Total} * \%$ of Contributing Undeveloped Upstream Area***)

$C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$ If $C_D < C_U$, use $C_D = C_U$

$Q_{PM} = C_D * I_X * A_{Total} * (1 \text{ hour} / 3{,}600 \text{ seconds}) * (1 \text{ ft} / 12 \text{ inches}) * (43{,}560 \text{ ft}^2 / 1 \text{ a}$

$= C_D * I_X * A_{Total} * (1.008333 \text{ ft}^3\text{-hour / acre-inches-seconds})$

$T_C = 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.135}$

$V_M = (0.75 \text{ inches}) * [(A_I)(0.9) + (A_P + A_U)(C_U)] * (1 \text{ ft} / 12 \text{ inches}) * (43{,}560 \text{ ft}^2 / 1 \text{ a}$

$= (2{,}722.5 \text{ ft}^3 / \text{acre}) * [(A_I)(0.9) + (A_P + A_U)(C_U)]$

***** Contributing Undeveloped Upstream Area is an area where stormwater runoff from undeveloped upstream area will flow directly or indirectly to the Post-Construction I Management Practices (BMPs) proposed for the development. This additional flow must b included in the flow rate and volume calculations to appropriately size the BMPs.**

## PROVIDE PROPOSED PROJECT CHARACTERISTICS

| | | |
|---|---|---|
| $A_{Total}$ | 1.00 | Acres |
| Type of Development | Street | |
| Predominate Soil Type # | 89 | |
| % of Project Impervious | 92 | |
| % of Project Pervious | 8 | |
| % of Project Contributing Undeveloped Area | 0 | |
| $A_I$ | 0.92 | Acres |
| $A_P$ | 0.08 | Acres |
| $A_U$ | 0 | Acres |

## DETERMINING THE PEAK MITIGATED FLOW RATE ($Q_{PM}$):

In order to determine the peak mitigated flow rate ($Q_{PM}$) from the new development, use the Los An County Department of Public Works *Hydrology Manual*. Use the Modified Rational Metho calculating the peak mitigation $Q_{PM}$ for compliance with the Standard Urban Stormwater Mitigatior (SUSMP). Use attached **Table 1** for all maximum intensity ($I_X$) values used.

By trial and error, determine the time of concentration ($T_C$), as shown below:

**CALCULATION STEPS:**

1. Assume an initial $T_C$ value between 5 and 30 minutes.

$T_C$ 30 minutes

2. Using Table 1, look up the assumed $T_C$ value and select the corresponding $I_X$ intensity in inches/ho

$I_X$ 0.193 inches/hour

3. Determine the value for the Undeveloped Runoff Coefficient, $C_U$, using the runoff coefficient co corresponding to the predominant soil type.

$C_U$ 0.100

4. Calculate the Developed Runoff Coefficient, $C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$

$C_D$ 0.836

5. Calculate the value for $C_D * I_X$

$C_D * I_X$ 0.161

6. Calculate the time of concentration, $T_C = 10^{-0.507} * \underbrace{(C_D * I_X)}_{0.161}{}^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.13}$ 870 0.08

Calculated $T_C$ 30 minutes

7. Calculate the difference between the initially assumed $T_C$ and the calculated $T_C$, if the difference is greater than 0.5 minutes. Use the calculated $T_C$ as the assumed initial $T_C$ in the second iteration. If th $T_C$ value is within 0.5 minutes, round the acceptable $T_C$ value to the nearest minute.

## A.1 METHOD FOR CALCULATING STANDARD URBAN STORMWATE MITIGATION PLAN FLOW RATES AND VOLUMES BASED ON 0.75-INCHES C RAINFALL: WORKSHEET

**PROJECT NAME**

TRACT NO 47440

CATCH BASINS @ DRAINAGE AREA (2)

## NOMENCLATURE

| | | |
|---|---|---|
| $A_I$ | = | Impervious Area (acres) |
| $A_P$ | = | Pervious Area (acres) |
| $A_U$ | = | Contributing Undeveloped Upstream Area (acres) |
| $A_{Total}$ | = | Total Area of Development and Contributing Undeveloped Upstream Are |
| $C_D$ | = | Developed Runoff Coefficient |
| $C_U$ | = | Undeveloped Runoff Coefficient |
| $I_X$ | = | Rainfall Intensity (inches / hour) |
| $Q_{PM}$ | = | Peak Mitigation Flow Rate (cfs) |
| $T_C$ | = | Time of Concentration (minutes, must be between 5-30 min.) |
| $V_M$ | = | Mitigation Volume ($ft^3$) |

## EQUATIONS

$A_{Total} = A_I + A_P + A_U$

$A_I = (A_{Total} * \%$ of Development which is Impervious)

$A_P = (A_{Total} * \%$ of Development which is Pervious)

$A_U = (A_{Total} * \%$ of Contributing Undeveloped Upstream Area***)

$C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$ If $C_D < C_U$, use $C_D = C_U$

$Q_{PM} = C_D * I_X * A_{Total} * (1 \text{ hour} / 3{,}600 \text{ seconds}) * (1 \text{ ft} / 12 \text{ inches}) * (43{,}560 \text{ ft}^2 / 1 \text{ ac}$

$= C_D * I_X * A_{Total} * (1.008333 \text{ ft}^3\text{-hour / acre-inches-seconds})$

$T_C = 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.135}$

$V_M = (0.75 \text{ inches}) * [(A_I)(0.9) + (A_P + A_U)(C_U)] * (1 \text{ ft} / 12 \text{ inches}) * (43{,}560 \text{ ft}^2 / 1 \text{ ac}$

$= (2{,}722.5 \text{ ft}^3 / \text{acre}) * [(A_I)(0.9) + (A_P + A_U)(C_U)]$

***** Contributing Undeveloped Upstream Area is an area where stormwater runoff from undeveloped upstream area will flow directly or indirectly to the Post-Construction B Management Practices (BMPs) proposed for the development. This additional flow must b included in the flow rate and volume calculations to appropriately size the BMPs.**

## PROVIDE PROPOSED PROJECT CHARACTERISTICS

| | | |
|---|---|---|
| $A_{Total}$ | 7.01 | Acres |
| Type of Development | RESIDENTIAL | |
| Predominate Soil Type # | 89 | |
| % of Project Impervious | 42 | |
| % of Project Pervious | 58 | |
| % of Project Contributing Undeveloped Area | 0 | |
| $A_I$ | 2.94 | Acres |
| $A_P$ | 4.07 | Acres |
| $A_U$ | 0 | Acres |

## DETERMINING THE PEAK MITIGATED FLOW RATE ($Q_{PM}$):

In order to determine the peak mitigated flow rate ($Q_{PM}$) from the new development, use the Los An County Department of Public Works *Hydrology Manual*. Use the Modified Rational Metho calculating the peak mitigation $Q_{PM}$ for compliance with the Standard Urban Stormwater Mitigation (SUSMP). Use attached Table 1 for all maximum intensity ($I_X$) values used.

By trial and error, determine the time of concentration ($T_C$), as shown below:

CALCULATION STEPS:

1. Assume an initial $T_C$ value between 5 and 30 minutes.

$T_C$ 30 minutes

2. Using Table 1, look up the assumed $T_C$ value and select the corresponding $I_X$ intensity in inches/ho

$I_X$ 0.193 inches/hour

3. Determine the value for the Undeveloped Runoff Coefficient, $C_U$, using the runoff coefficient cur corresponding to the predominant soil type.

$C_U$ 0.100

4. Calculate the Developed Runoff Coefficient, $C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$
0.42 0.58 0.100

$C_D$ 0.436

5. Calculate the value for $C_D * I_X$

$C_D * I_X$ 0.084

6. Calculate the time of concentration, $T_C = 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.135}$
0.084 800 0.05

Calculated $T_C$ 43 minutes

7. Calculate the difference between the initially assumed $T_C$ and the calculated $T_C$, if the difference is greater than 0.5 minutes. Use the calculated $T_C$ as the assumed initial $T_C$ in the second iteration. If the $T_C$ value is within 0.5 minutes, round the acceptable $T_C$ value to the nearest minute.

## TABLE 1

### INTENSITY - DURATION DATA FOR 0.75-INCHES OF RAINFALL FOR ALL RAINFALL ZONES

| Duration, $T_C$ (min) | Rainfall Intensity, $I_X$ (in/hr) |
|---|---|
| 5 | 0.447 |
| 6 | 0.411 |
| 7 | 0.382 |
| 8 | 0.359 |
| 9 | 0.339 |
| 10 | 0.323 |
| 11 | 0.309 |
| 12 | 0.297 |
| 13 | 0.286 |
| 14 | 0.276 |
| 15 | 0.267 |
| 16 | 0.259 |
| 17 | 0.252 |
| 18 | 0.245 |
| 19 | 0.239 |
| 20 | 0.233 |
| 21 | 0.228 |
| 22 | 0.223 |
| 23 | 0.218 |
| 24 | 0.214 |
| 25 | 0.210 |
| 26 | 0.206 |
| 27 | 0.203 |
| 28 | 0.199 |
| 29 | 0.196 |
| 30 | 0.193 |

## DETERMINING THE VOLUME ($V_{SI}$)

In order to determine the volume ($V_{SI}$) of stormwater runoff to be mitigated from the new use the following equation:

$$V_{SI} = (2{,}722.5\ ft^3 / acre) * [(A_I)(0.9) + (A_P + A_U)(C_U)] = 83{,}112\ ft^3 = 308\ c$$

2.94 4.07 0.100

## A.1 METHOD FOR CALCULATING STANDARD URBAN STORMWATER MITIGATION PLAN FLOW RATES AND VOLUMES BASED ON 0.75-INCHES OF RAINFALL: WORKSHEET

**PROJECT NAME**

TRACT NO 47440

CATCH BASINS @ DRAINAGE AREAS (3)

## NOMENCLATURE

| | | |
|---|---|---|
| $A_I$ | = | Impervious Area (acres) |
| $A_P$ | = | Pervious Area (acres) |
| $A_U$ | = | Contributing Undeveloped Upstream Area (acres) |
| $A_{Total}$ | = | Total Area of Development and Contributing Undeveloped Upstream Area (a |
| $C_D$ | = | Developed Runoff Coefficient |
| $C_U$ | = | Undeveloped Runoff Coefficient |
| $I_X$ | = | Rainfall Intensity (inches / hour) |
| $Q_{PM}$ | = | Peak Mitigation Flow Rate (cfs) |
| $T_C$ | = | Time of Concentration (minutes, must be between 5-30 min.) |
| $V_M$ | = | Mitigation Volume ($ft^3$) |

## EQUATIONS

$A_{Total} = A_I + A_P + A_U$

$A_I = (A_{Total} * \%$ of Development which is Impervious)

$A_P = (A_{Total} * \%$ of Development which is Pervious)

$A_U = (A_{Total} * \%$ of Contributing Undeveloped Upstream Area***)

$C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$ If $C_D < C_U$, use $C_D = C_U$

$Q_{PM} = C_D * I_X * A_{Total} * (1 \text{ hour} / 3{,}600 \text{ seconds}) * (1 \text{ ft} / 12 \text{ inches}) * (43{,}560 \text{ ft}^2 / 1 \text{ ac}$

$= C_D * I_X * A_{Total} * (1.008333 \text{ ft}^3\text{-hour / acre-inches-seconds})$

$T_C = 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.135}$

$V_M = (0.75 \text{ inches}) * [(A_I)(0.9) + (A_P + A_U)(C_U)] * (1 \text{ ft} / 12 \text{ inches}) * (43{,}560 \text{ ft}^2 / 1$

$= (2{,}722.5 \text{ ft}^3 / \text{acre}) * [(A_I)(0.9) + (A_P + A_U)(C_U)]$

***** Contributing Undeveloped Upstream Area is an area where stormwater runoff fror undeveloped upstream area will flow directly or indirectly to the Post-Construction B Management Practices (BMPs) proposed for the development. This additional flow mus included in the flow rate and volume calculations to appropriately size the BMPs.**

## PROVIDE PROPOSED PROJECT CHARACTERISTICS

| | | |
|---|---|---|
| $A_{Total}$ | 6.19 | Acres |
| Type of Development | SINGLE FAMILY | |
| Predominate Soil Type # | 89 | |
| % of Project Impervious | 42 | |
| % of Project Pervious | 58 | |
| % of Project Contributing Undeveloped Area | 0 | |
| $A_I$ | 2.60 | Acres |
| $A_P$ | 3.59 | Acres |
| $A_U$ | 0 | Acres |

## DETERMINING THE PEAK MITIGATED FLOW RATE ($Q_{PM}$):

In order to determine the peak mitigated flow rate ($Q_{PM}$) from the new development, use the Los An County Department of Public Works *Hydrology Manual*. Use the Modified Rational Method calculating the peak mitigation $Q_{PM}$ for compliance with the Standard Urban Stormwater Mitigation (SUSMP). Use attached **Table 1** for all maximum intensity ($I_X$) values used.

By trial and error, determine the time of concentration ($T_C$), as shown below:

CALCULATION STEPS:

1. Assume an initial $T_C$ value between 5 and 30 minutes.

$T_C$ 30 minutes

2. Using Table 1, look up the assumed $T_C$ value and select the corresponding $I_X$ intensity in inches/h

$I_X$ 0.193 inches/hour

3. Determine the value for the Undeveloped Runoff Coefficient, $C_U$, using the runoff coefficient c corresponding to the predominant soil type.

$C_U$ 0.100

4. Calculate the Developed Runoff Coefficient, $C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$

$C_D$ 0.436

5. Calculate the value for $C_D * I_X$

$C_D * I_X$ 0.084

6. Calculate the time of concentration, $T_C = 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.1}$

$(C_D * I_X)$: 0.084; Length: 900; Slope: 0.02

Calculated $T_C$ 51 minutes

7. Calculate the difference between the initially assumed $T_C$ and the calculated $T_C$, if the difference greater than 0.5 minutes. Use the calculated $T_C$ as the assumed initial $T_C$ in the second iteration. If $T_C$ value is within 0.5 minutes, round the acceptable $T_C$ value to the nearest minute.

TABLE FOR ITERATIONS:

| Iteration No. | Initial $T_C$ (min) | $I_X$ (in/hr) | $C_E$ | $C_D$ | $C_D$*$I_X$ (in/hr) | Calculated $T_C$ (min) | Differ (mi |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

Acceptable $T_C$ value 30 minutes

8. Calculate the Peak Mitigation Flow Rate,

$Q_{PM} = C_D * I_X * A_{Total} * (1.008333\ ft^3\text{-hour / acre-inches-seconds})$

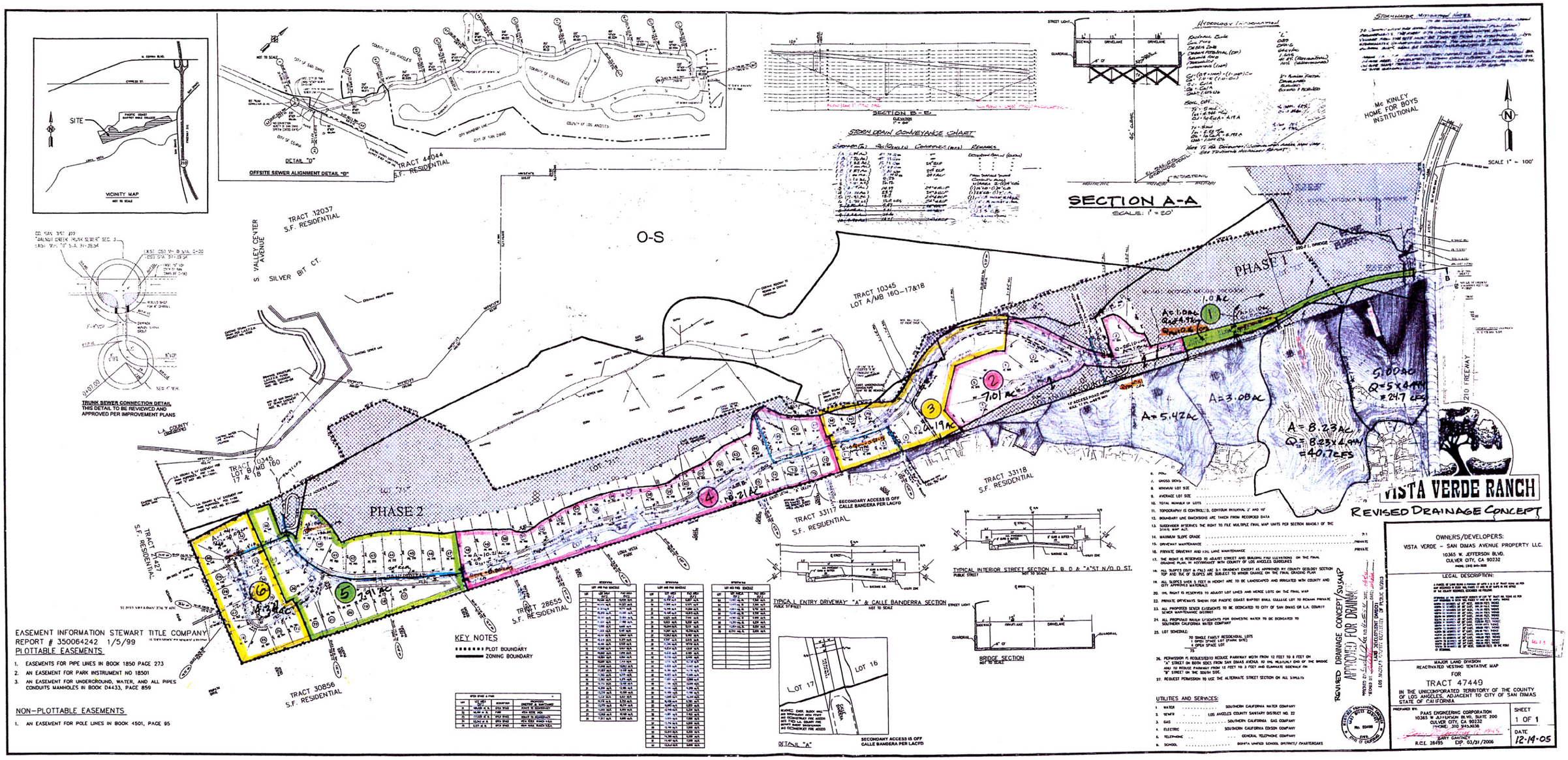
0.084 6.19

$Q_{PM}$ 0.52 cfs

## TABLE 1

### INTENSITY - DURATION DATA FOR 0.75-INCHES OF RAINFALL FOR ALL RAINFALL ZONES

| Duration, $T_C$ (min) | Rainfall Intensity, $I_X$ (in/hr) |
|---|---|
| 5 | 0.447 |
| 6 | 0.411 |
| 7 | 0.382 |
| 8 | 0.359 |
| 9 | 0.339 |
| 10 | 0.323 |
| 11 | 0.309 |
| 12 | 0.297 |
| 13 | 0.286 |
| 14 | 0.276 |
| 15 | 0.267 |
| 16 | 0.259 |
| 17 | 0.252 |
| 18 | 0.245 |
| 19 | 0.239 |
| 20 | 0.233 |
| 21 | 0.228 |
| 22 | 0.223 |
| 23 | 0.218 |
| 24 | 0.214 |
| 25 | 0.210 |
| 26 | 0.206 |
| 27 | 0.203 |
| 28 | 0.199 |
| 29 | 0.196 |
| 30 | 0.193 |




EASEMENT INFORMATION STEWART TITLE COMPANY
REPORT # 350064242 1/5/99

PLOTTABLE EASEMENTS

1. EASEMENTS FOR PIPE LINES IN BOOK 1850 PAGE 273
2. AN EASEMENT FOR PARK INSTRUMENT NO 18501
3. AN EASEMENT FOR UNDERGROUND, WATER, AND ALL PIPES CONDUITS MANHOLES IN BOOK D4433, PAGE 859

NON-PLOTTABLE EASEMENTS

1. AN EASEMENT FOR POLE LINES IN BOOK 4501, PAGE 95

## DETERMINING THE VOLUME ($V_{51}$)

In order to determine the volume ($V_{51}$) of stormwater runoff to be mitigated from the new use the following equation:

$$V_{51} = (2{,}722.5\ ft^3 / acre) * [(\underbrace{A_I}_{4.29})(0.9) + (\underbrace{A_P + A_U}_{5.92})(\underbrace{C_U}_{0.100})] = 12123\ ft^3 = 4$$

## A.1 METHOD FOR CALCULATING STANDARD URBAN STORMWATE MITIGATION PLAN FLOW RATES AND VOLUMES BASED ON 0.75-INCHES O RAINFALL: WORKSHEET

PROJECT NAME

TRACT NO 47449
CATCH BASIN @ DRAINAGE AREA (5)

# APPENDIX A VOLUME & FLOW RATE CALCULATIO

## NOMENCLATURE

| | | |
|---|---|---|
| $A_I$ | = | Impervious Area (acres) |
| $A_P$ | = | Pervious Area (acres) |
| $A_U$ | = | Contributing Undeveloped Upstream Area (acres) |
| $A_{Total}$ | = | Total Area of Development and Contributing Undeveloped Upstream Area (acr |
| $C_D$ | = | Developed Runoff Coefficient |
| $C_U$ | = | Undeveloped Runoff Coefficient |
| $I_X$ | = | Rainfall Intensity (inches / hour) |
| $Q_{PM}$ | = | Peak Mitigation Flow Rate (cfs) |
| $T_C$ | = | Time of Concentration (minutes, must be between 5-30 min.) |
| $V_M$ | = | Mitigation Volume ($ft^3$) |

## EQUATIONS

$A_{Total} = A_I + A_P + A_U$

$A_I = (A_{Total} * \%\text{ of Development which is Impervious})$

$A_P = (A_{Total} * \%\text{ of Development which is Pervious})$

$A_U = (A_{Total} * \%\text{ of Contributing Undeveloped Upstream Area***})$

$C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$ If $C_D < C_U$, use $C_D = C_U$

$Q_{PM} = C_D * I_X * A_{Total} * (1\text{ hour} / 3{,}600\text{ seconds}) * (1\text{ ft} / 12\text{ inches}) * (43{,}560\text{ ft}^2 / 1\text{ acre})$

$= C_D * I_X * A_{Total} * (1.008333\text{ ft}^3\text{-hour / acre-inches-seconds})$

$T_C = 10^{-0.507} * (C_D * I_X)^{-0.519} * \text{Length}^{0.483} * \text{Slope}^{-0.135}$

$V_M = (0.75\text{ inches}) * [(A_I)(0.9) + (A_P + A_U)(C_U)] * (1\text{ ft} / 12\text{ inches}) * (43{,}560\text{ ft}^2 / 1\text{ acre})$

$= (2{,}722.5\text{ ft}^3 / \text{acre}) * [(A_I)(0.9) + (A_P + A_U)(C_U)]$

***** Contributing Undeveloped Upstream Area is an area where stormwater runoff from an undeveloped upstream area will flow directly or indirectly to the Post-Construction Best Management Practices (BMPs) proposed for the development. This additional flow must be included in the flow rate and volume calculations to appropriately size the BMPs.**

## PROVIDE PROPOSED PROJECT CHARACTERISTICS

| | | |
|---|---|---|
| $A_{Total}$ | 7.91 | Acres |
| Type of Development | RESIDETIAL | |
| Predominate Soil Type # | 89 | |
| % of Project Impervious | 42 | |
| % of Project Pervious | 58 | |
| % of Project Contributing Undeveloped Area | 0 | |
| $A_I$ | 3.32 | Acres |
| $A_P$ | 4.59 | Acres |
| $A_U$ | 0 | Acres |

## DETERMINING THE PEAK MITIGATED FLOW RATE ($Q_{PM}$):

In order to determine the peak mitigated flow rate ($Q_{PM}$) from the new development, use the Los A County Department of Public Works *Hydrology Manual*. Use the Modified Rational Meth calculating the peak mitigation $Q_{PM}$ for compliance with the Standard Urban Stormwater Mitigatio (SUSMP). Use attached **Table 1** for all maximum intensity ($I_X$) values used.

By trial and error, determine the time of concentration ($T_C$), as shown below:

CALCULATION STEPS:

1. Assume an initial $T_C$ value between 5 and 30 minutes.

$T_C$ 30 minutes

2. Using Table 1, look up the assumed $T_C$ value and select the corresponding $I_X$ intensity in inches/h

$I_X$ 0.193 inches/hour

3. Determine the value for the Undeveloped Runoff Coefficient, $C_U$, using the runoff coefficient cu corresponding to the predominant soil type.

$C_U$ 0.100

4. Calculate the Developed Runoff Coefficient, $C_D = (0.9 * \text{Imp.}) + [(1.0 - \text{Imp.}) * C_U]$

$C_D$ 0.436

5. Calculate the value for $C_D * I_X$

$C_D * I_X$ 0.084

6. Calculate the time of concentration, $T_C = 10^{-0.507} * \underbrace{(C_D * I_X)}_{0.084}{}^{-0.519} * \underset{1000}{\text{Length}}{}^{0.483} * \underset{0.03}{\text{Slope}}{}^{-0.135}$

Calculated $T_C$ 51 minutes

7. Calculate the difference between the initially assumed $T_C$ and the calculated $T_C$, if the difference is greater than 0.5 minutes. Use the calculated $T_C$ as the assumed initial $T_C$ in the second iteration. If the $T_C$ value is within 0.5 minutes, round the acceptable $T_C$ value to the nearest minute.

TABLE FOR ITERATIONS:

| Iteration No. | Initial $T_C$ (min) | $I_X$ (in/hr) | $C_U$ | $C_D$ | $C_D$*$I_X$ (in/hr) | Calculated $T_C$ (min) | Dif ( |
|---|---|---|---|---|---|---|---|
| 1 | | | | | | | |
| 2 | | | | | | | |
| 3 | | | | | | | |
| 4 | | | | | | | |
| 5 | | | | | | | |
| 6 | | | | | | | |
| 7 | | | | | | | |
| 8 | | | | | | | |
| 9 | | | | | | | |
| 10 | | | | | | | |

Acceptable $T_C$ value 30 minutes

8. Calculate the Peak Mitigation Flow Rate,

$Q_{PM} = C_D * I_X * A_{Total} * (1.008333\ ft^3\text{-hour / acre-inches-seconds})$

0.084 7.91

$Q_{PM}$ 0.67 cfs

## TABLE 1

### INTENSITY - DURATION DATA FOR 0.75-INCHES OF RAINFALL FOR ALL RAINFALL ZONES

| Duration, $T_C$ (min) | Rainfall Intensity, $I_X$ (in/hr) |
|---|---|
| 5 | 0.447 |
| 6 | 0.411 |
| 7 | 0.382 |
| 8 | 0.359 |
| 9 | 0.339 |
| 10 | 0.323 |
| 11 | 0.309 |
| 12 | 0.297 |
| 13 | 0.286 |
| 14 | 0.276 |
| 15 | 0.267 |
| 16 | 0.259 |
| 17 | 0.252 |
| 18 | 0.245 |
| 19 | 0.239 |
| 20 | 0.233 |
| 21 | 0.228 |
| 22 | 0.223 |
| 23 | 0.218 |
| 24 | 0.214 |
| 25 | 0.210 |
| 26 | 0.206 |
| 27 | 0.203 |
| 28 | 0.199 |
| 29 | 0.196 |
| 30 | 0.193 |

## DETERMINING THE VOLUME ($V_{SI}$)

In order to determine the volume ($V_{SI}$) of stormwater runoff to be mitigated from the new
use the following equation:

$$V_{SI} = (2{,}722.5\ ft^3 / acre) * [(A_I)(0.9) + (A_P + A_U)(C_U)] = 7348\ ft^3 = 27$$

2.6 3.59 0.100