LID Implementation
Concept – Design - Execution

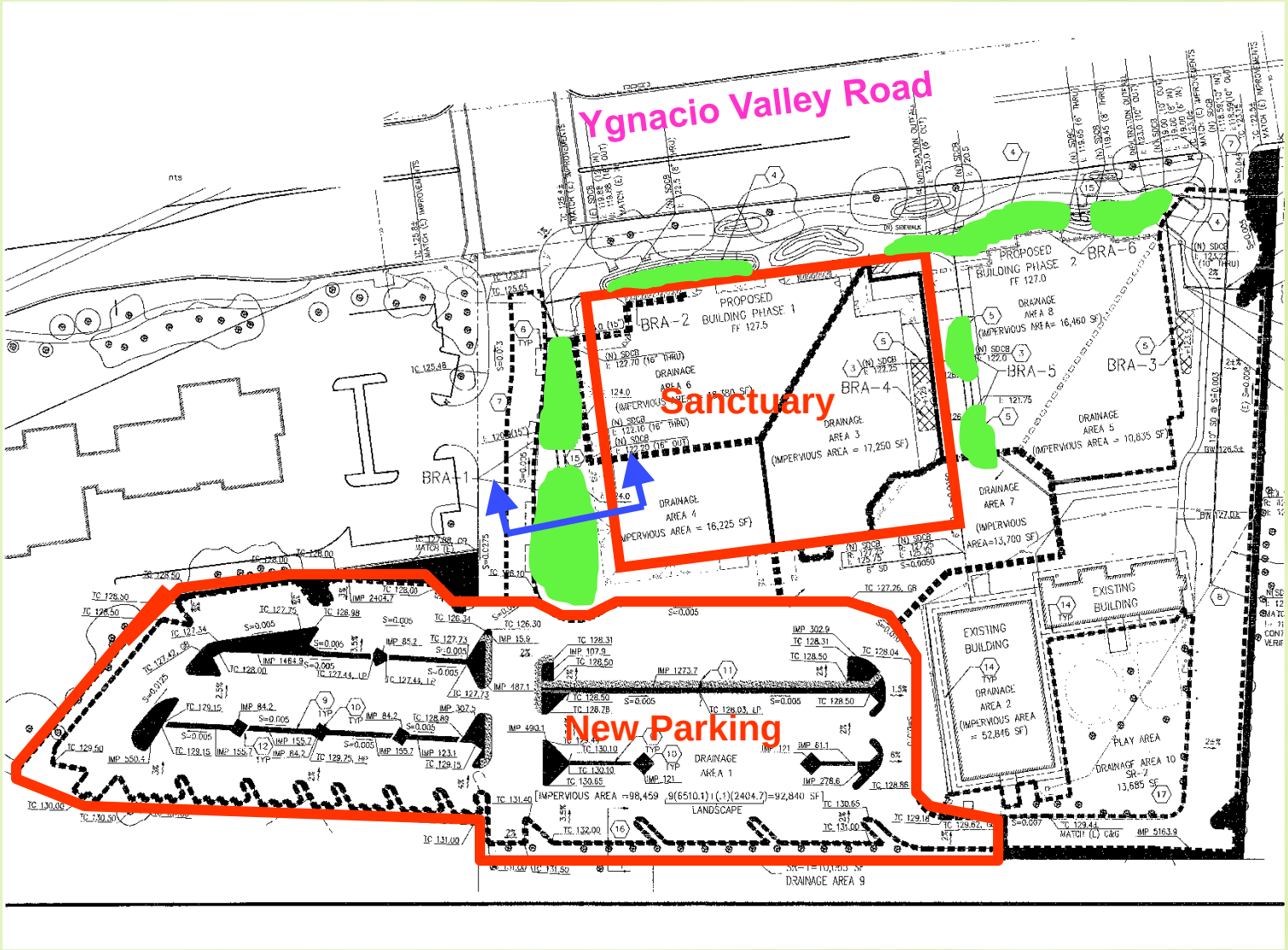
Scott Wikstrom
Senior Civil Engineer
City of Walnut Creek


Vallejo
Antioch
Richmond
North Creek Church
Walnut Creek
Berkeley
Oakland
San Francisco
Alameda
Daly City
San Leandro
Livermore
Pleasanton
Hayward
San Mateo
Fremont
Redwood City
Palo Alto
Mountain View
Sunnyvale
Santa Clara
San Jose
21.7 mi

North Creek Church

- 62,000 SF Sanctuary and Parking on 7 acre site
- Project “Deemed Complete” in April 2005
- Subject to the Treatment component of Provision C.3

Site Plan


Ygnacio Valley Road
Sanctuary
New Parking
BRA-1
BRA-2
BRA-3
BRA-4
BRA-5
BRA-6
PROPOSED BUILDING PHASE 1 FF 127.5
PROPOSED BUILDING PHASE 2 FF 127.0
EXISTING BUILDING
EXISTING BUILDING
PLAY AREA
LANDSCAPE
DRAINAGE AREA 1
DRAINAGE AREA 2 (IMPERVIOUS AREA = 52,846 SF)
DRAINAGE AREA 3 (IMPERVIOUS AREA = 17,250 SF)
DRAINAGE AREA 4 (IMPERVIOUS AREA = 16,225 SF)
DRAINAGE AREA 5 (IMPERVIOUS AREA = 10,835 SF)
DRAINAGE AREA 7 (IMPERVIOUS AREA=13,700 SF)
DRAINAGE AREA 8 (IMPERVIOUS AREA= 16,460 SF)
DRAINAGE AREA 10 SR-2 13,685 SF
DRAINAGE AREA 9
IMPERVIOUS AREA =98,459 ,9(6510.1)+(.1)(2404.7)=92,840 SF

Treatment Details

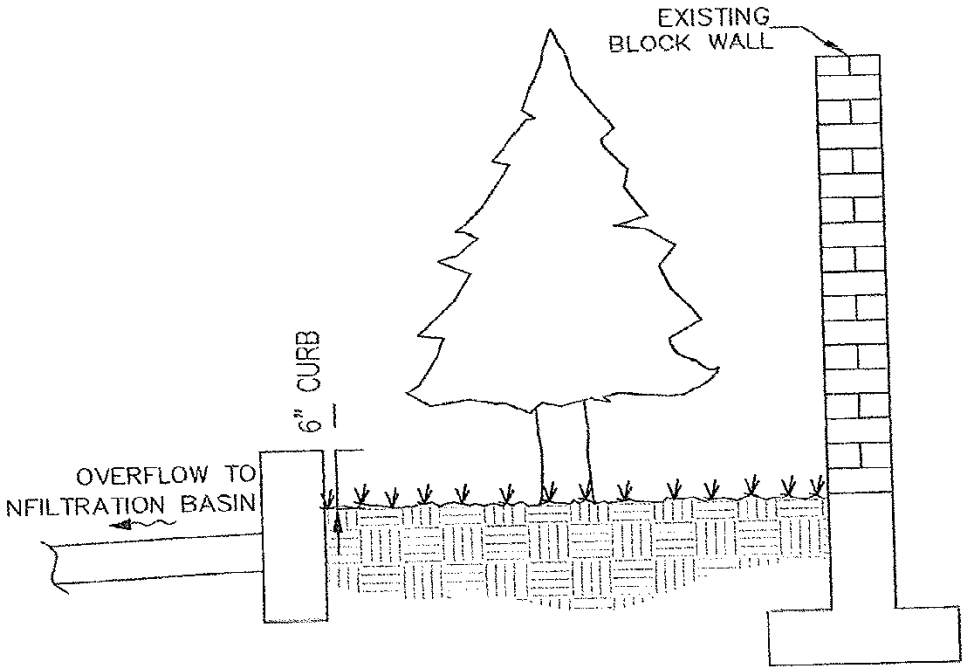
Impervious Areas

Drainage Area(s)	Area
1 & 4	BR
6	BR
5	BF
3	BF
8	BF
2 & 7	BF
9	SF
10	SF
	Total

[1] ACTUAL SURFACE AR

[2] AREA INCLUDES 10%

13,700+52,846+(0.1



DETAIL 4: SELF RETAINING LANDSCAPE AREA

LO
AC
SI

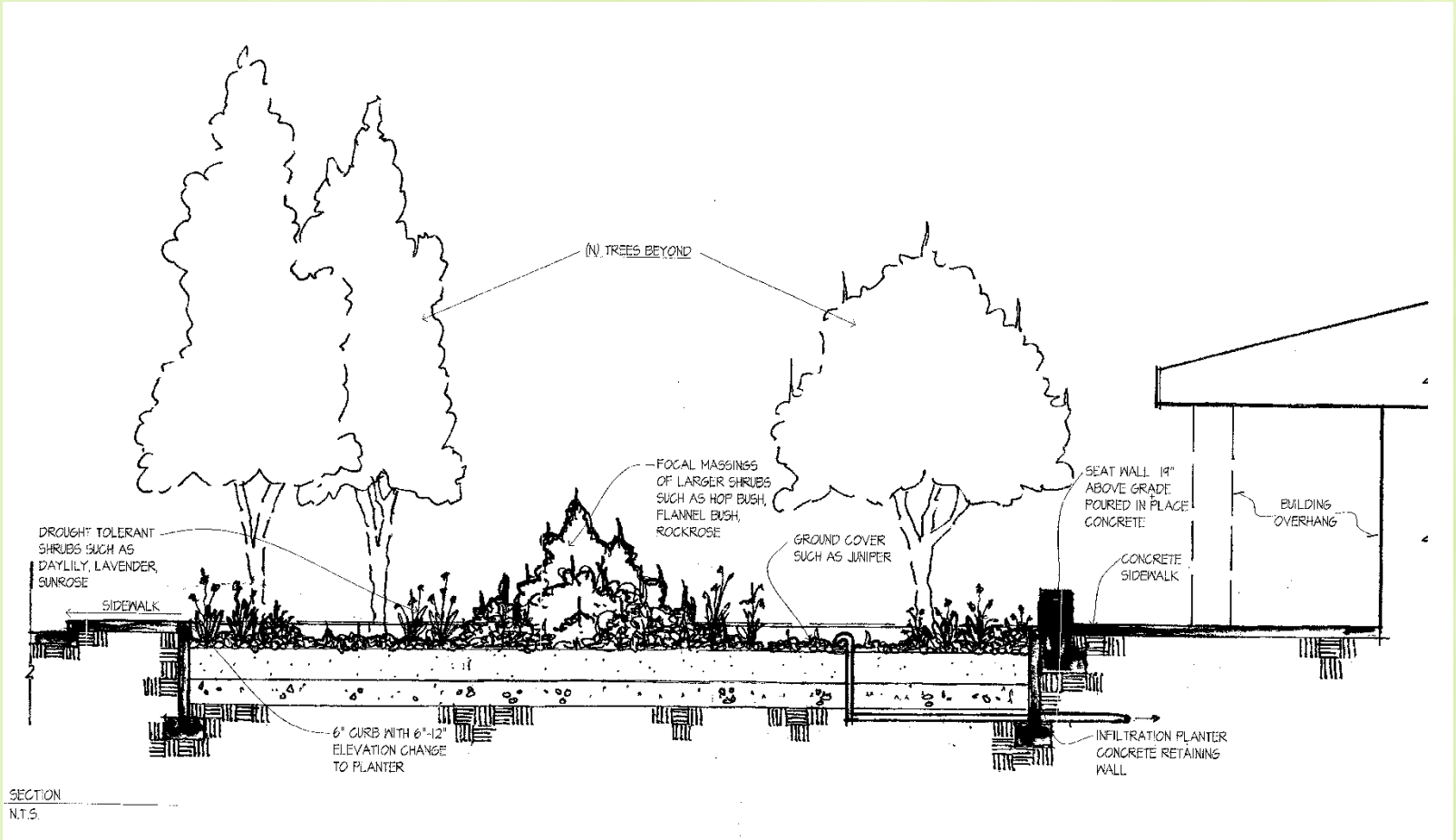
Surface Area as designed
4,605 [1]
990
440
730
900
2705
10370

R

Main Driveway

Infiltration Planter Cross Section

(Landscape Architect's Vision)



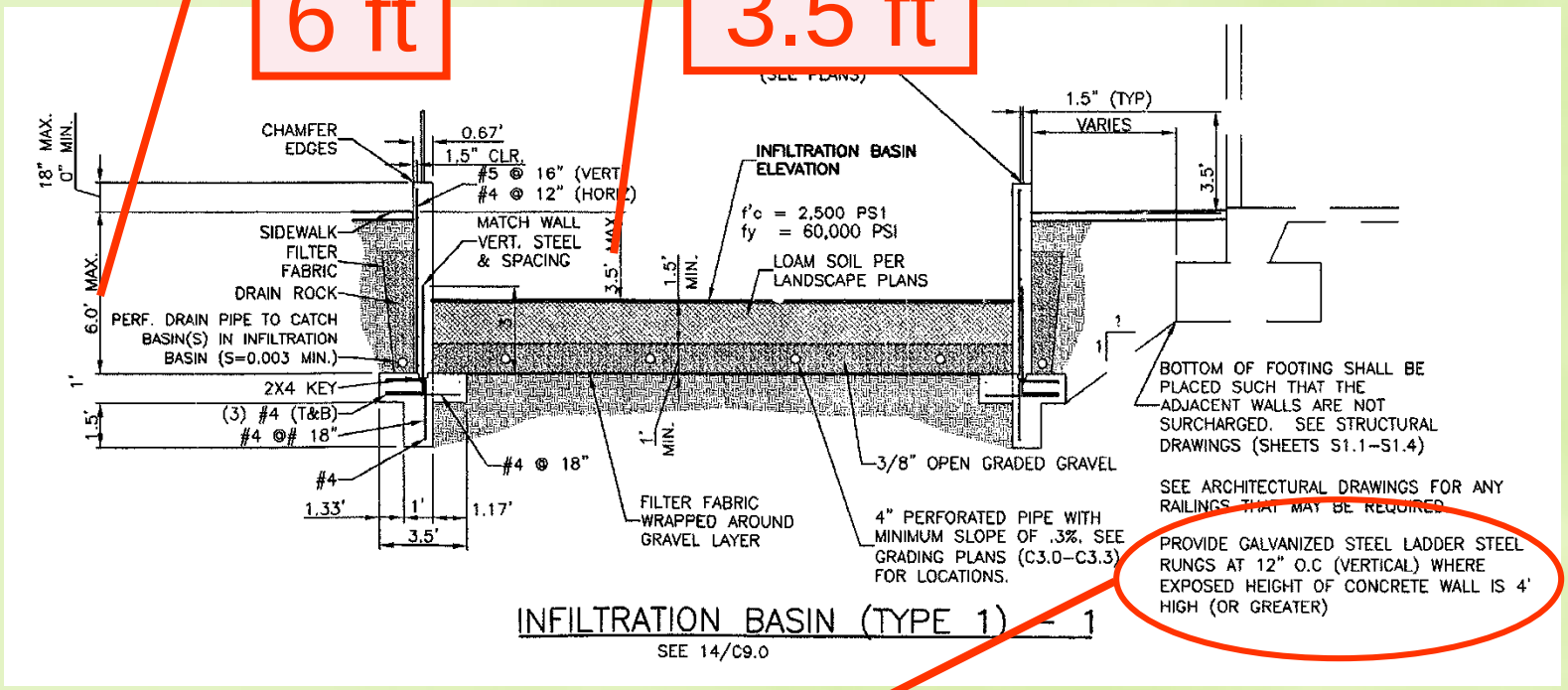
Main Driveway

Infiltration Planter Cross Section

(Engineer's Version)

6 ft

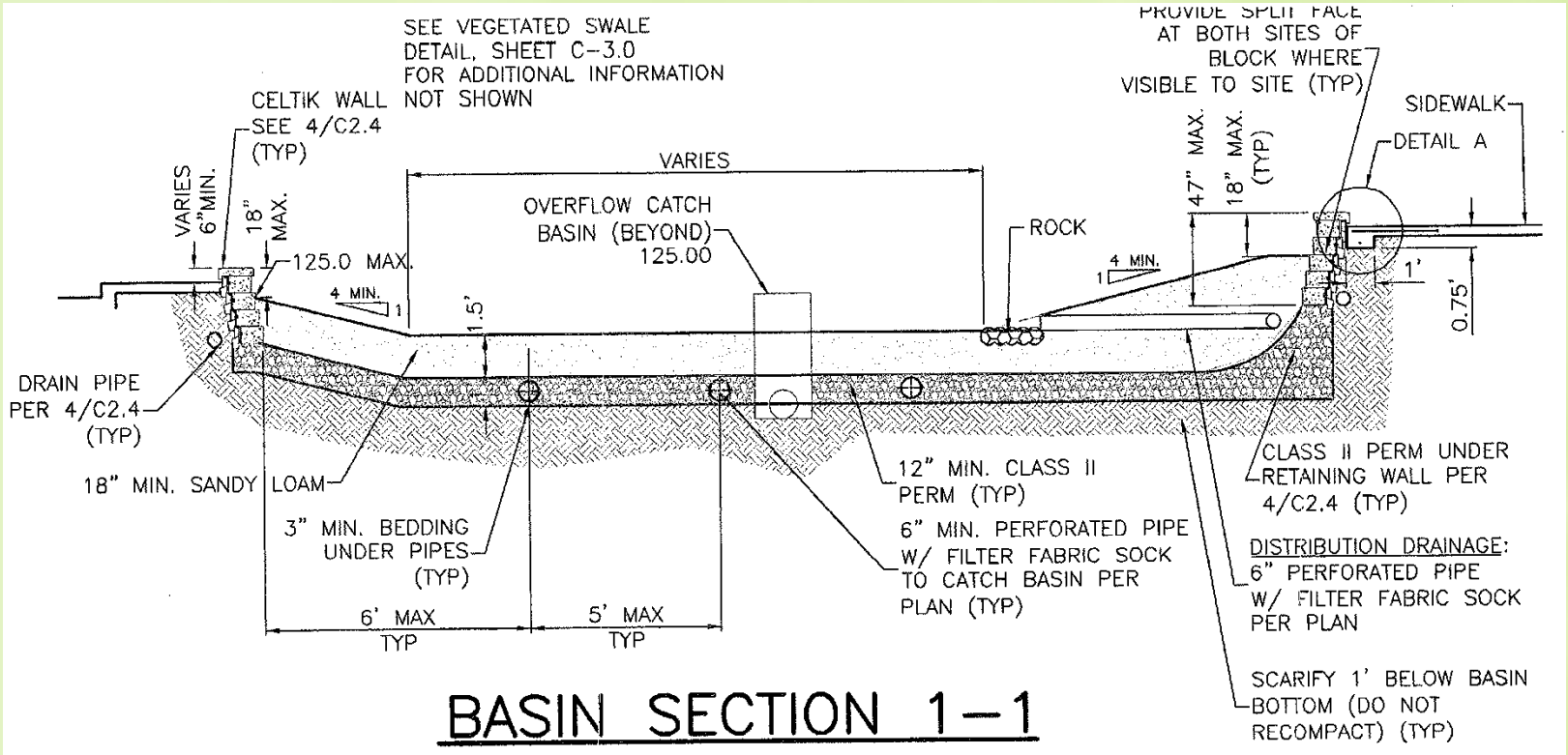
3.5 ft



Provide Ladder Rungs!

Resolution

- Input from all stakeholders
- Understanding the operation of a bio-retention basin



Construction

Final Product

In Operation

Lessons Learned

- Coordination of the various disciplines
- *Appropriate* level of detail at each stage of approval
- Understand the nuts and bolts
- Be wary of typical sections
- The C.3 Guidebook is a GUIDE
  BE CREATIVE


North Creek Church
247 ft

Rossmoor

- Privately run senior living community
- Population of about 9,200 residents
- Covers approximately 2,200 acres
- Maintain their own corporation yard
- Clean Water BMPs a long standing issue
- Yard redevelopment provided an opportunity for creative stormwater treatment solutions

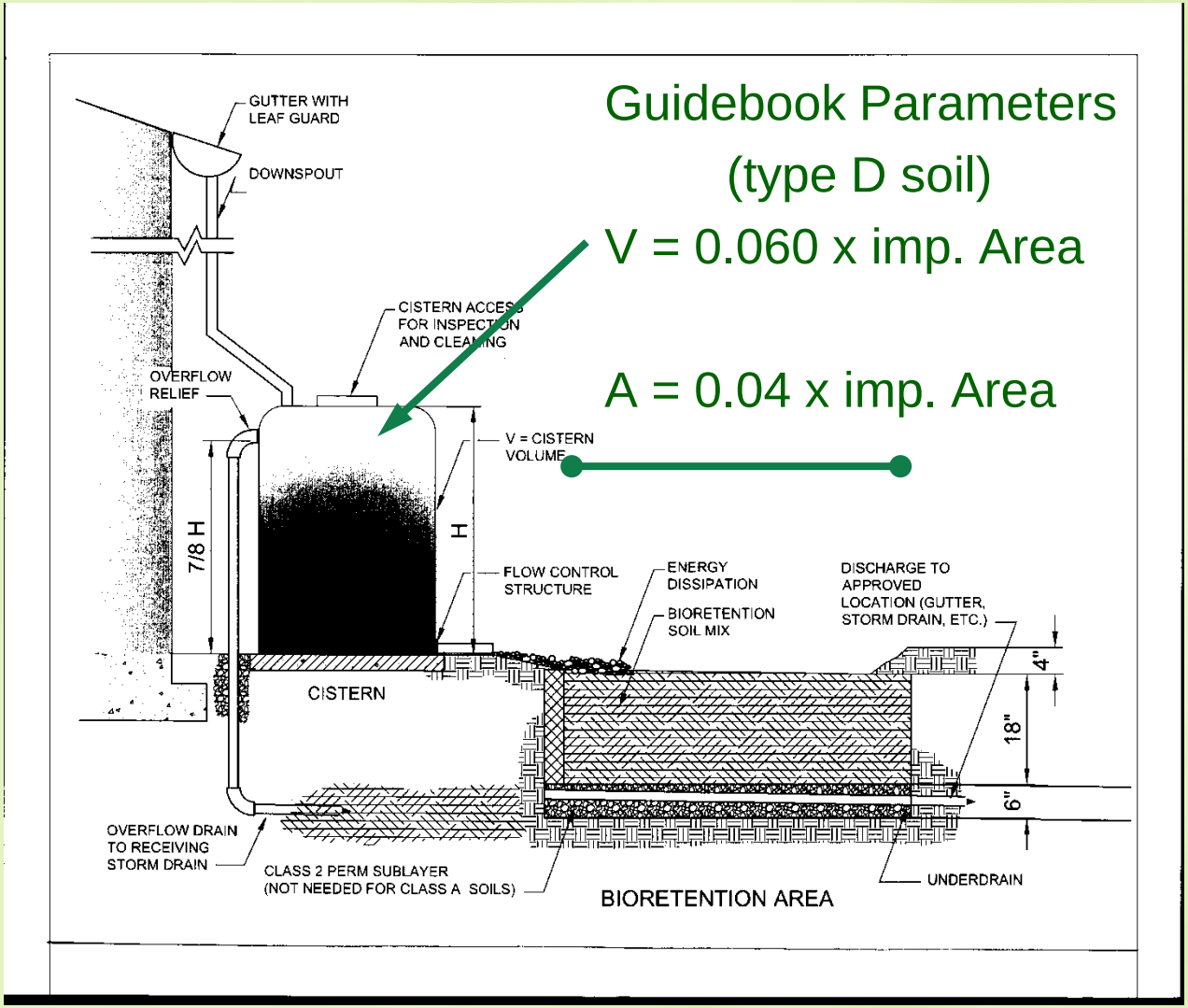
Rossmoor Corporation Yard Transfer Station

Stormwater Requirements

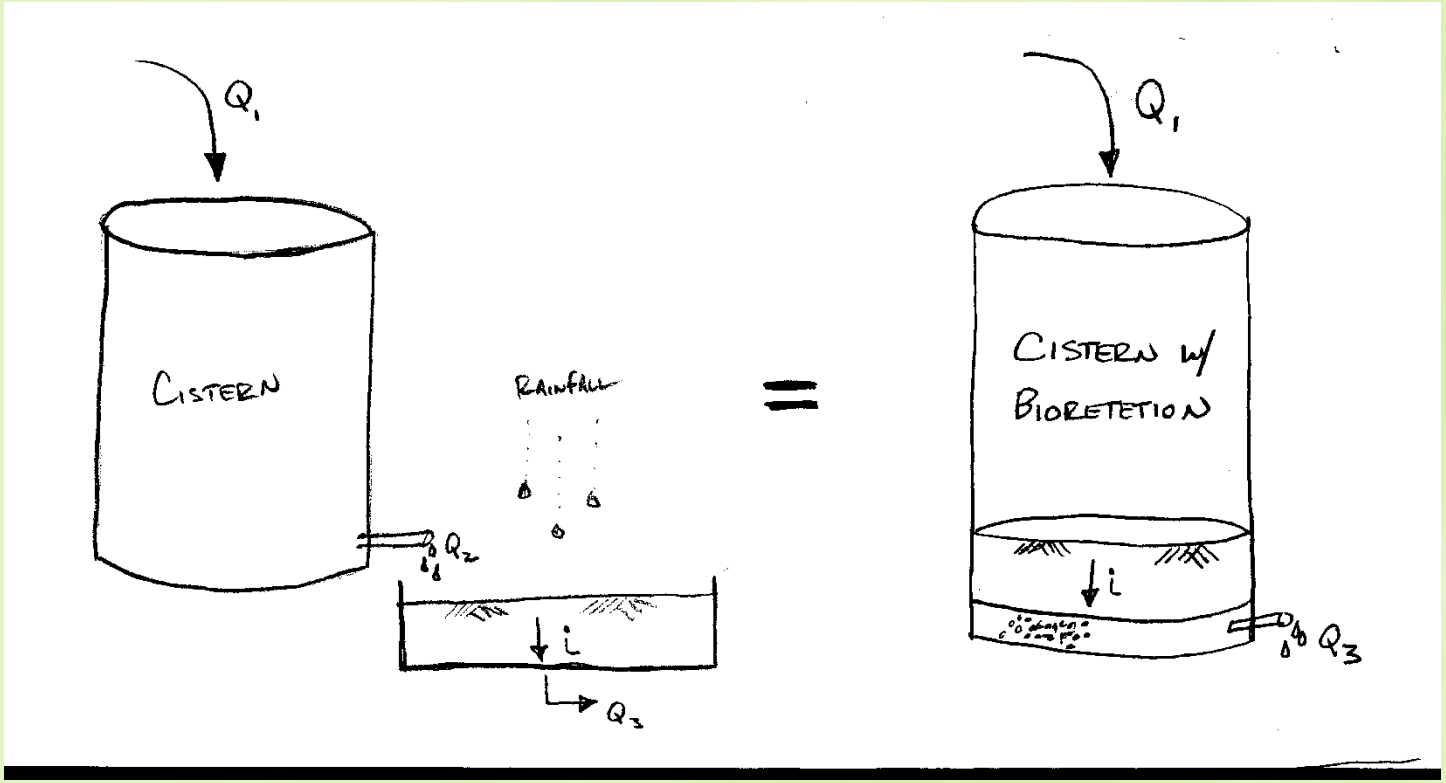
- Project subject to C.3 requirements
- Located in hillside area
- Significant debris loading anticipated
- Contra Costa C.3 Guidebook, 4th edition first included sizing criteria for a Cistern
- Rossmoor's engineer working with City staff developed a Cistern for stormwater treatment

Cisterns

Cisterns with Bioretention



Some Logic



Some Math

Assume: $A_{IMPERVIOUS} = 10{,}000\ ft^2$ — Group D Soils

$V_{CISTERN} = 600\ ft^3$ — Avg Rainfall = 20.2 in/yr (MAP)

Calc: A_{IMP} (min.)

Q_1 = Variable

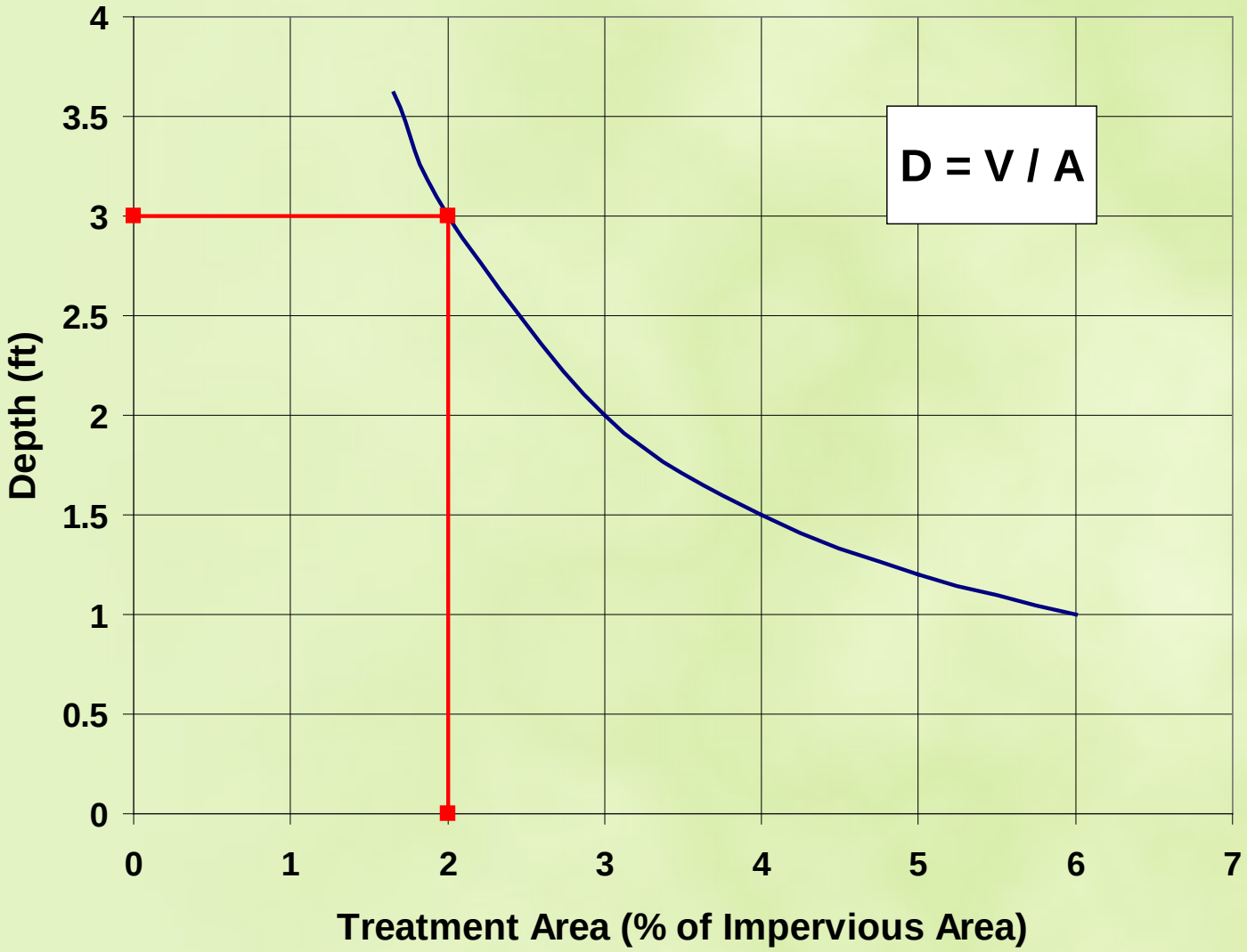
$$Q_{2MAX} = A_{IMPERVIOUS} \times \frac{0.122\,(MAP - 20.2) + 1.85}{1 \times 10^6} = 0.0185\ cfs$$

$$Q_3 = Q_2 + Rainfall\ (@\ 0.2''/hr) = 0.0185\ cfs + (4.6 \times 10^{-6} \times A_{IMP})\ cfs$$

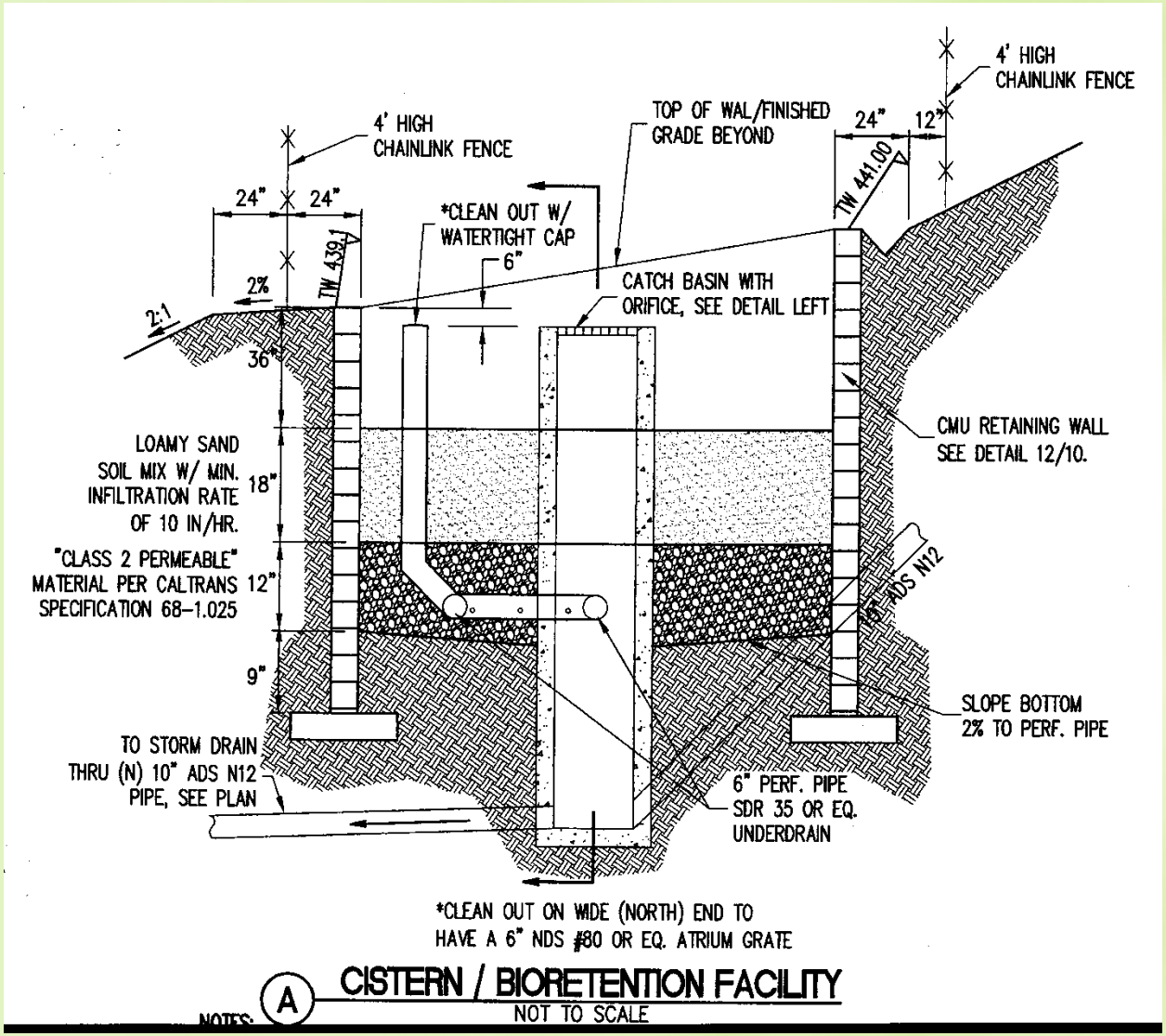
$$A_{IMP} = \frac{Q_3}{i} = \frac{Q_2}{i} + \frac{Rainfall}{i} = \frac{0.0185\ cfs}{1.16 \times 10^{-4}\ ft/sec} + 0.04\,A_{IMP}$$ where $i = \frac{5\ in}{hr} = 1.16 \times 10^{-4}\ \frac{ft}{sec}$

Solving for $A_{IMP} = 166\ ft^2$ or **1.66% sizing factor**

A Relationship



The Design


4' HIGH CHAINLINK FENCE
TOP OF WAL/FINISHED GRADE BEYOND
24"
12"
TW 441.00
4' HIGH CHAINLINK FENCE
24"
24"
*CLEAN OUT W/ WATERTIGHT CAP
6"
TW 439.1
2%
2:1
CATCH BASIN WITH ORIFICE, SEE DETAIL LEFT
36"
CMU RETAINING WALL SEE DETAIL 12/10.
LOAMY SAND SOIL MIX W/ MIN. INFILTRATION RATE OF 10 IN/HR.
18"
"CLASS 2 PERMEABLE" MATERIAL PER CALTRANS SPECIFICATION 68-1.025
12"
10" ADS N12
9"
SLOPE BOTTOM 2% TO PERF. PIPE
TO STORM DRAIN THRU (N) 10" ADS N12 PIPE, SEE PLAN
6" PERF. PIPE SDR 35 OR EQ. UNDERDRAIN
*CLEAN OUT ON WIDE (NORTH) END TO HAVE A 6" NDS #80 OR EQ. ATRIUM GRATE
A
CISTERN / BIORETENTION FACILITY
NOT TO SCALE
NOTES:

Under Construction

The “Cistern”

Rossmoor "Cistern"

- Uses parameters from C.3 Guidebook
- Designer thinking outside of the box
- Satisfies Treatment and Flow Control with addition of orifice plate
- Reduced treatment area - 2% of impervious surface
- Further refinement possible