

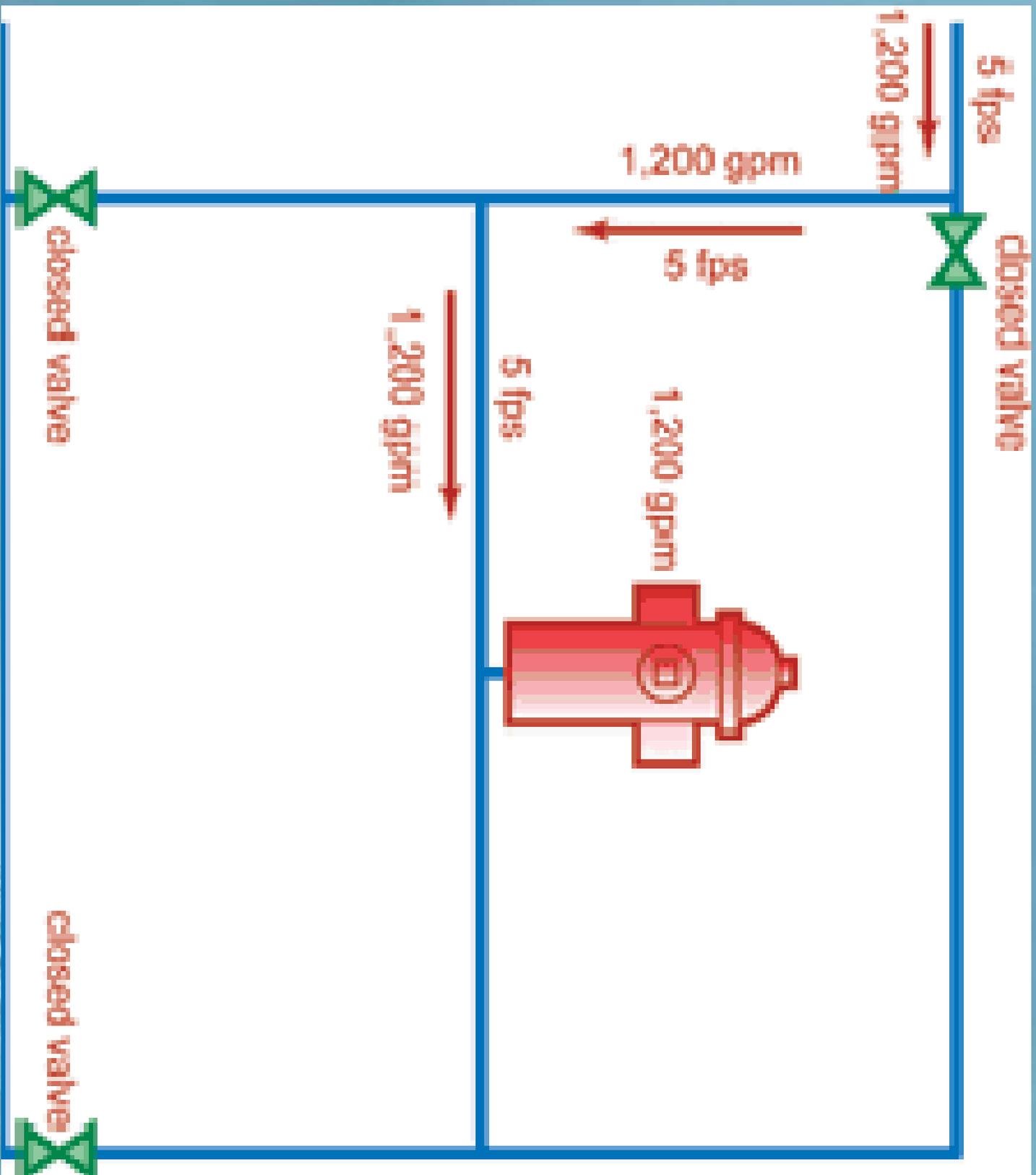


Unidirectional Flushing

The goal of UDF is to:

- Isolate a section of water main.
- Flow water @ 5 feet per second.
- Remove and flush sediment and buildup from water main pipes.

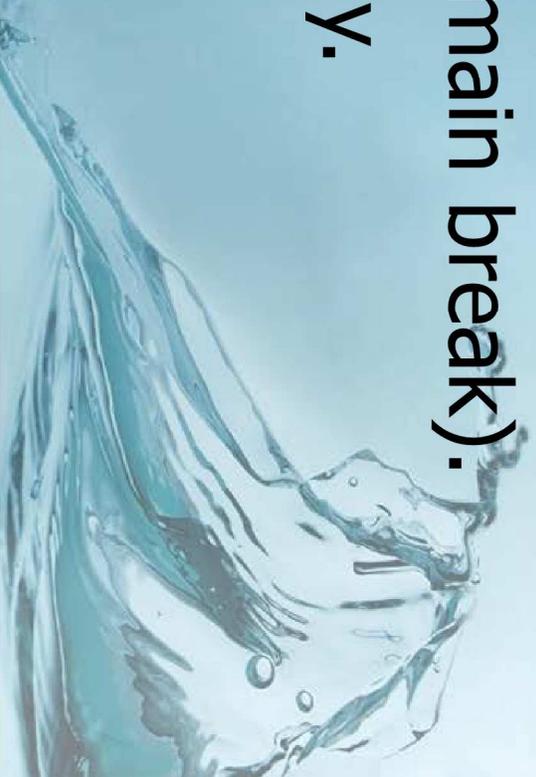




Unidirectional Flushing

UDF does a good job, but also has challenges:

- Wastes a lot of potable water.
- Creates reportable storm water discharge event.
- Results in customer complaints.
- Risk of property damage (flooding).
- Risk of water hammer (water main break).
- Engineer's study to do correctly.



NO-DES

What is NO-DES?

Neutral Output Discharge Elimination System



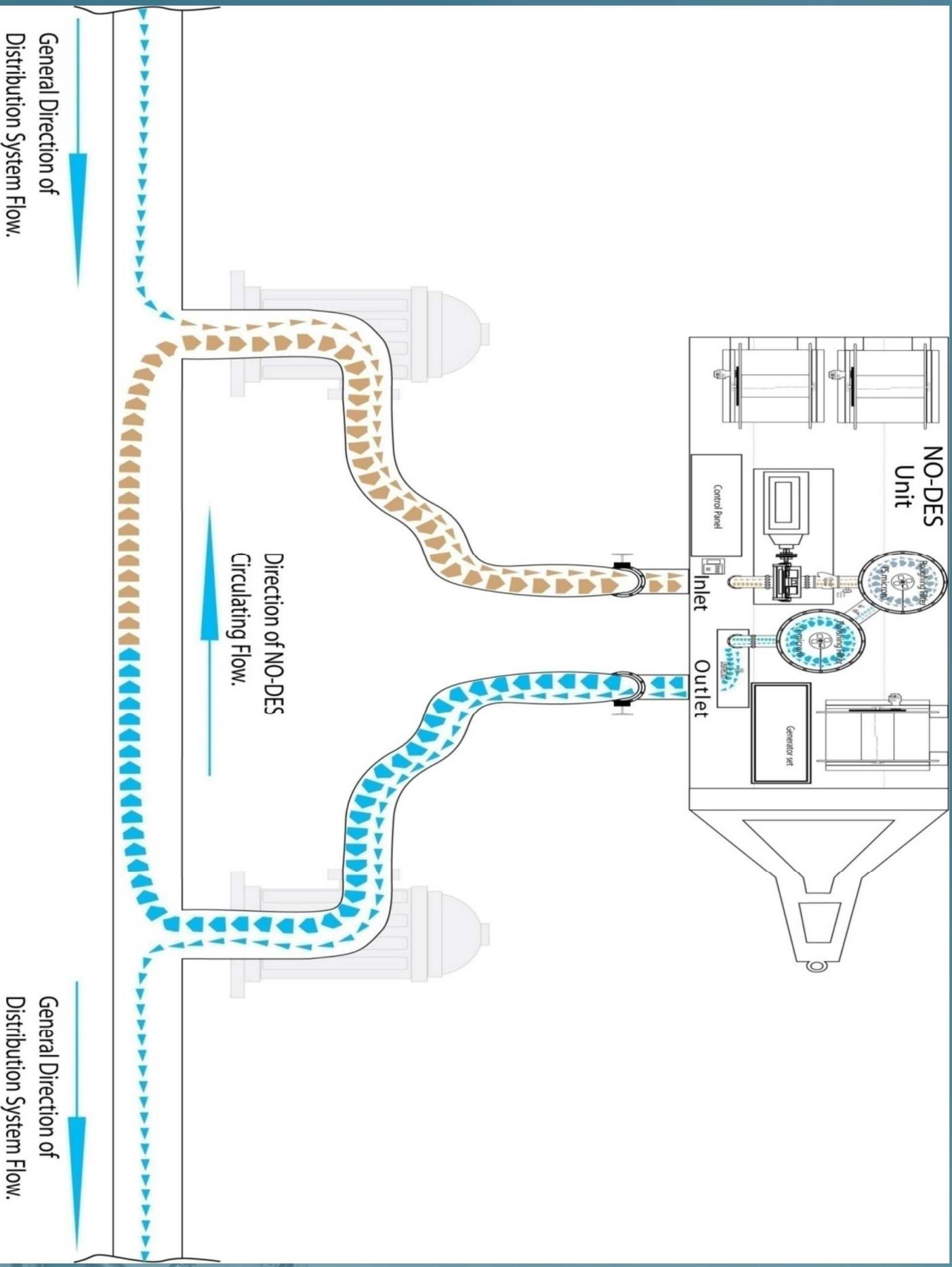
NO-DES

A new water flushing technology that:

- Connects to two water hydrants.
- Creates a reverse hydraulic loop between two water hydrants using on-board pump.
- Filters water to 1 micron absolute.
- Measures water flow and turbidity with on-board instruments.



NO-DES

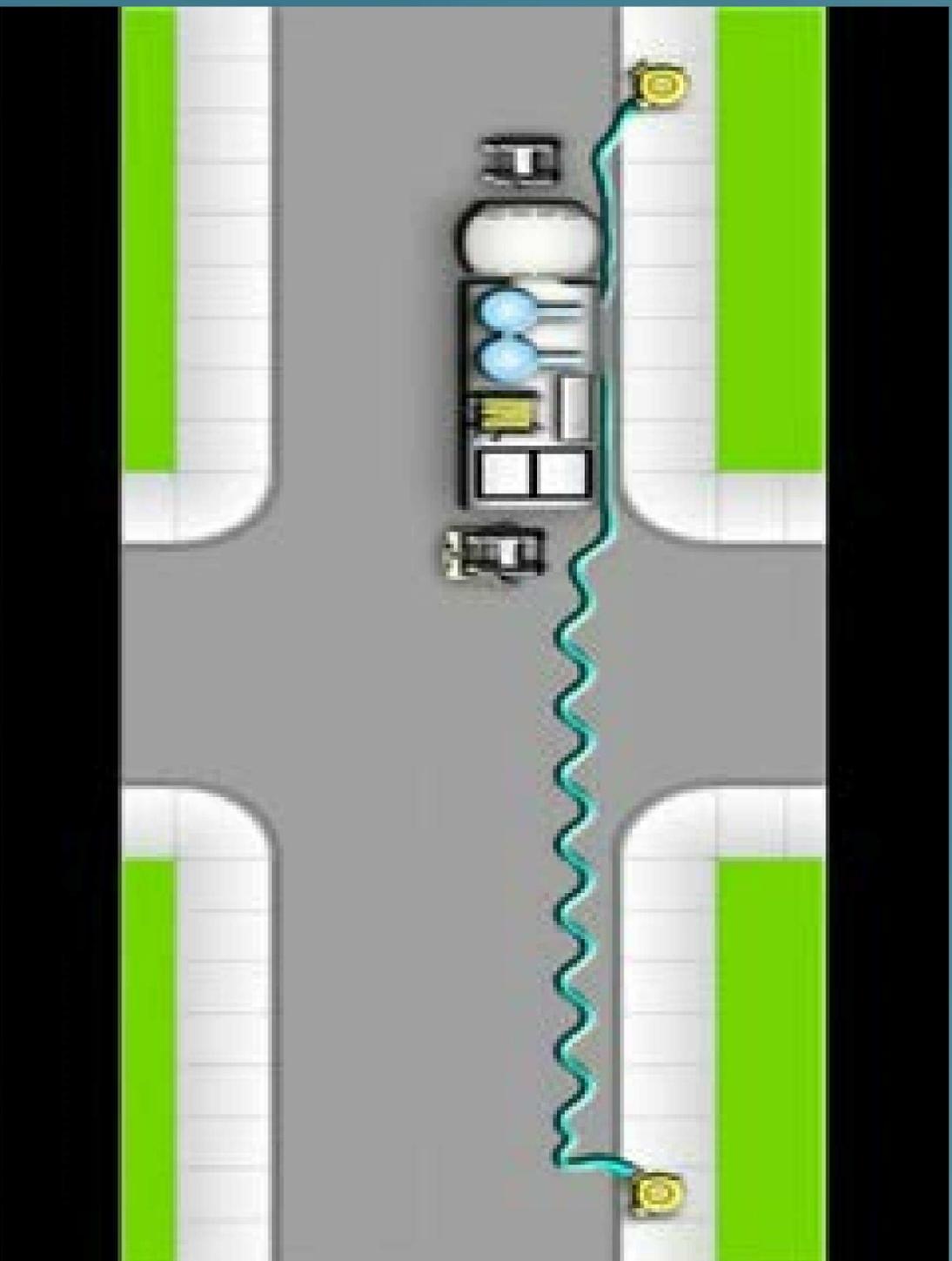


General Direction of Distribution System Flow.

Direction of NO-DES Circulating Flow.

General Direction of Distribution System Flow.

NO-DES



NO-DES System



Hose, Hose Reel and Hose Burro



Hose Burro Unloading Hose Reel

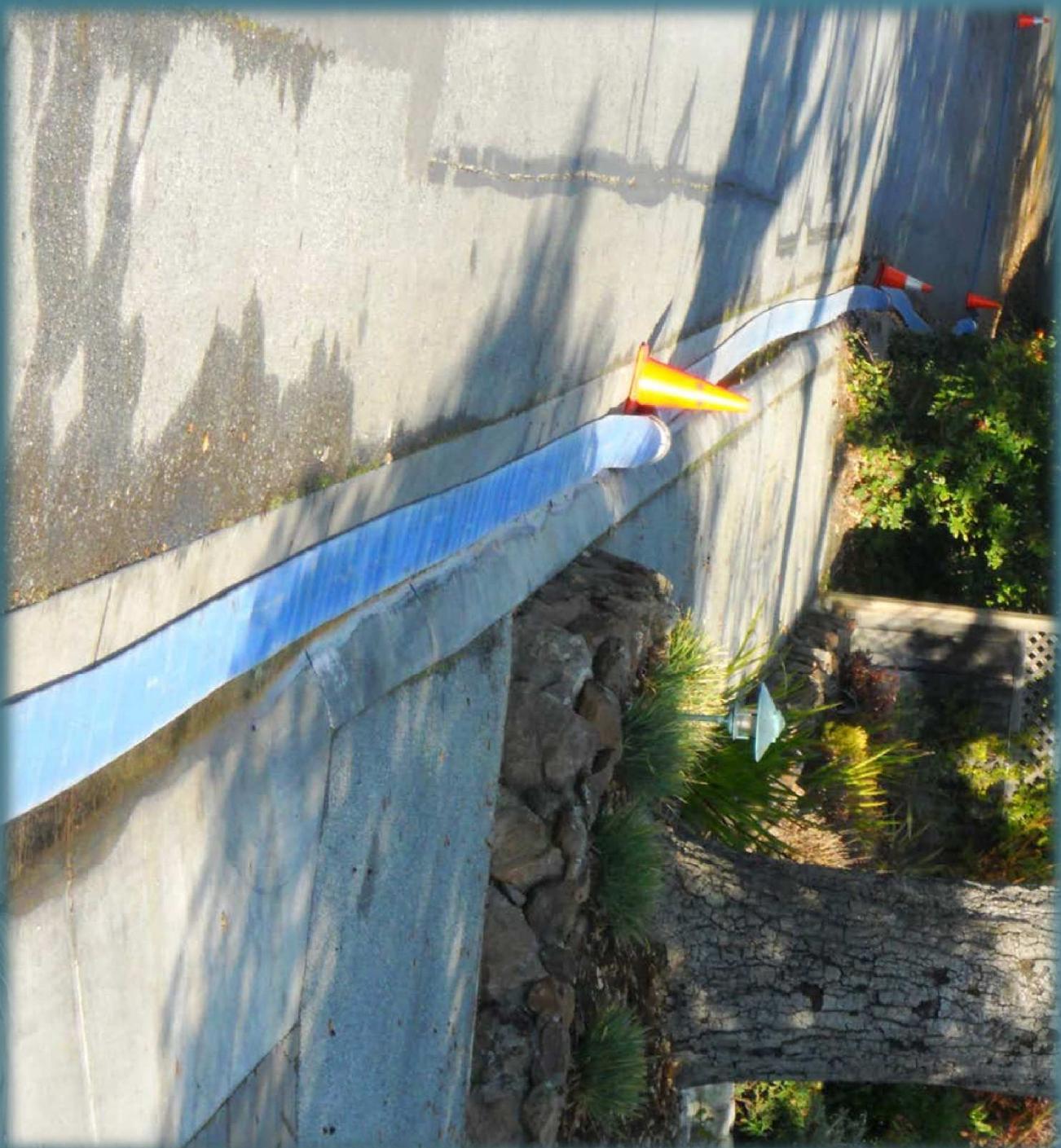


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Hose Burro Deploying Hose



Hose Deployed



Hose Ramps



Hose Connected to Hydrant



Filtration Chambers



Filter Chamber and Filter Bags



Bag Filters Before and After



Bag Filters Fully Loaded



Instrument Box



MODES FROM VELOCITY CHART
For 315sec Velocity

2	29 gpm
4	117 gpm
6	264 gpm
8	470 gpm
10	734 gpm
12	1057 gpm
14	1439 gpm
16	1880 gpm

For 515sec Velocity

2	49 gpm
4	196 gpm
6	441 gpm
8	783 gpm
10	1224 gpm
12	1762 gpm
14	2399 gpm

| Flow Rate (gpm) |
|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| 29 | 117 | 264 | 470 | 734 | 1057 | 1439 | 1880 | 2399 | 2918 |
| 49 | 196 | 441 | 783 | 1224 | 1762 | 2399 | 3036 | 3673 | 4310 |
| 69 | 275 | 616 | 1116 | 1714 | 2351 | 3088 | 3725 | 4362 | 5000 |
| 89 | 354 | 795 | 1439 | 2143 | 2879 | 3716 | 4553 | 5380 | 6207 |
| 109 | 433 | 974 | 1762 | 2572 | 3408 | 4345 | 5280 | 6207 | 7134 |
| 129 | 512 | 1153 | 2085 | 3001 | 3937 | 4972 | 5999 | 7021 | 8048 |
| 149 | 591 | 1332 | 2408 | 3430 | 4466 | 5600 | 6727 | 7849 | 8971 |
| 169 | 670 | 1511 | 2731 | 3859 | 4995 | 6227 | 7454 | 8571 | 9694 |
| 189 | 749 | 1690 | 3054 | 4288 | 5524 | 6854 | 8181 | 9298 | 10417 |
| 209 | 828 | 1869 | 3377 | 4717 | 6053 | 7481 | 8908 | 10025 | 11140 |
| 229 | 907 | 2048 | 3700 | 5146 | 6582 | 8108 | 9535 | 10752 | 11863 |
| 249 | 986 | 2227 | 4023 | 5575 | 7111 | 8735 | 10162 | 11479 | 12586 |
| 269 | 1065 | 2406 | 4346 | 5994 | 7640 | 9362 | 10789 | 12206 | 13309 |
| 289 | 1144 | 2585 | 4669 | 6413 | 8169 | 9989 | 11416 | 12933 | 14032 |
| 309 | 1223 | 2764 | 4992 | 6832 | 8698 | 10616 | 12043 | 13660 | 14755 |
| 329 | 1302 | 2943 | 5315 | 7251 | 9227 | 11243 | 12670 | 14387 | 15478 |
| 349 | 1381 | 3122 | 5638 | 7670 | 9756 | 11870 | 13297 | 15114 | 16201 |
| 369 | 1460 | 3301 | 5961 | 8089 | 10285 | 12497 | 13924 | 15841 | 16924 |
| 389 | 1539 | 3480 | 6284 | 8508 | 10814 | 13124 | 14551 | 16568 | 17647 |
| 409 | 1618 | 3659 | 6607 | 8927 | 11343 | 13751 | 15178 | 17295 | 18370 |
| 429 | 1697 | 3838 | 6930 | 9346 | 11872 | 14378 | 15805 | 18022 | 19093 |
| 449 | 1776 | 4017 | 7253 | 9765 | 12401 | 15005 | 16432 | 18749 | 19816 |
| 469 | 1855 | 4196 | 7576 | 10184 | 12930 | 15632 | 17059 | 19476 | 20539 |
| 489 | 1934 | 4375 | 7899 | 10603 | 13459 | 16259 | 17686 | 20203 | 21262 |
| 509 | 2013 | 4554 | 8222 | 11022 | 13988 | 16886 | 18313 | 20930 | 21985 |
| 529 | 2092 | 4733 | 8545 | 11441 | 14517 | 17513 | 18940 | 21657 | 22708 |
| 549 | 2171 | 4912 | 8868 | 11860 | 15046 | 18140 | 19567 | 22384 | 23431 |
| 569 | 2250 | 5091 | 9191 | 12279 | 15575 | 18767 | 20194 | 23111 | 24154 |
| 589 | 2329 | 5270 | 9514 | 12698 | 16104 | 19394 | 20821 | 23838 | 24877 |
| 609 | 2408 | 5449 | 9837 | 13117 | 16633 | 20021 | 21448 | 24565 | 25600 |
| 629 | 2487 | 5628 | 10160 | 13536 | 17162 | 20648 | 22075 | 25292 | 26323 |
| 649 | 2566 | 5807 | 10483 | 13955 | 17691 | 21275 | 22702 | 26019 | 27046 |
| 669 | 2645 | 5986 | 10806 | 14374 | 18220 | 21902 | 23329 | 26746 | 27769 |
| 689 | 2724 | 6165 | 11129 | 14793 | 18749 | 22529 | 23956 | 27473 | 28492 |
| 709 | 2803 | 6344 | 11452 | 15212 | 19278 | 23156 | 24583 | 28200 | 29215 |
| 729 | 2882 | 6523 | 11775 | 15631 | 19807 | 23783 | 25210 | 28927 | 29938 |
| 749 | 2961 | 6702 | 12098 | 16050 | 20336 | 24410 | 25837 | 29654 | 30661 |
| 769 | 3040 | 6881 | 12421 | 16469 | 20865 | 25037 | 26464 | 30381 | 31384 |
| 789 | 3119 | 7060 | 12744 | 16888 | 21394 | 25664 | 27091 | 31108 | 32107 |
| 809 | 3198 | 7239 | 13067 | 17307 | 21923 | 26291 | 27718 | 31835 | 32830 |
| 829 | 3277 | 7418 | 13390 | 17726 | 22452 | 26918 | 28345 | 32562 | 33553 |
| 849 | 3356 | 7597 | 13713 | 18145 | 22981 | 27545 | 28972 | 33289 | 34276 |
| 869 | 3435 | 7776 | 14036 | 18564 | 23510 | 28172 | 29599 | 34016 | 35000 |
| 889 | 3514 | 7955 | 14359 | 18983 | 24039 | 28799 | 30226 | 34743 | 35723 |
| 909 | 3593 | 8134 | 14682 | 19402 | 24568 | 29426 | 30853 | 35470 | 36446 |
| 929 | 3672 | 8313 | 15005 | 19821 | 25097 | 30053 | 31480 | 36197 | 37169 |
| 949 | 3751 | 8492 | 15328 | 20240 | 25626 | 30680 | 32107 | 36924 | 37892 |
| 969 | 3830 | 8671 | 15651 | 20659 | 26155 | 31307 | 32734 | 37651 | 38615 |
| 989 | 3909 | 8850 | 15974 | 21078 | 26684 | 31934 | 33361 | 38382 | 39338 |
| 1009 | 3988 | 9029 | 16297 | 21497 | 27213 | 32561 | 33988 | 39109 | 40061 |
| 1029 | 4067 | 9208 | 16620 | 21916 | 27742 | 33188 | 34615 | 39836 | 40784 |
| 1049 | 4146 | 9387 | 16943 | 22335 | 28271 | 33815 | 35242 | 40563 | 41507 |
| 1069 | 4225 | 9566 | 17266 | 22754 | 28800 | 34442 | 35869 | 41290 | 42230 |
| 1089 | 4304 | 9745 | 17589 | 23173 | 29329 | 35069 | 36496 | 42017 | 42953 |
| 1109 | 4383 | 9924 | 17912 | 23592 | 29858 | 35696 | 37123 | 42744 | 43676 |
| 1129 | 4462 | 10103 | 18235 | 24011 | 30387 | 36323 | 37750 | 43471 | 44399 |
| 1149 | 4541 | 10282 | 18558 | 24430 | 30916 | 36950 | 38377 | 44198 | 45122 |
| 1169 | 4620 | 10461 | 18881 | 24849 | 31445 | 37577 | 39004 | 44925 | 45845 |
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| 1209 | 4778 | 10819 | 19527 | 25687 | 32503 | 38831 | 40258 | 46379 | 47291 |
| 1229 | 4857 | 11000 | 19850 | 26106 | 33032 | 39458 | 40885 | 47106 | 48014 |
| 1249 | 4936 | 11179 | 20173 | 26525 | 33561 | 40085 | 41512 | 47833 | 48737 |
| 1269 | 5015 | 11358 | 20496 | 26944 | 34090 | 40712 | 42139 | 48560 | 49460 |
| 1289 | 5094 | 11537 | 20819 | 27363 | 34619 | 41339 | 42766 | 49287 | 50183 |
| 1309 | 5173 | 11716 | 21142 | 27782 | 35148 | 41966 | 43393 | 50014 | 50906 |
| 1329 | 5252 | 11895 | 21465 | 28201 | 35677 | 42593 | 44020 | 50741 | 51629 |
| 1349 | 5331 | 12074 | 21788 | 28620 | 36206 | 43220 | 44647 | 51468 | 52352 |
| 1369 | 5410 | 12253 | 22111 | 29039 | 36735 | 43847 | 45274 | 52195 | 53075 |
| 1389 | 5489 | 12432 | 22434 | 29458 | 37264 | 44474 | 45901 | 52922 | 53798 |
| 1409 | 5568 | 12611 | 22757 | 29877 | 37793 | 45101 | 46528 | 53649 | 54521 |
| 1429 | 5647 | 12790 | 23080 | 30296 | 38322 | 45728 | 47155 | 54376 | 55244 |
| 1449 | 5726 | 12969 | 23403 | 30715 | 38851 | 46355 | 47782 | 55103 | 55967 |
| 1469 | 5805 | 13148 | 23726 | 31134 | 39380 | 46982 | 48409 | 55830 | 56690 |
| 1489 | 5884 | 13327 | 24049 | 31553 | 39909 | 47609 | 49036 | 56557 | 57413 |
| 1509 | 5963 | 13506 | 24372 | 31972 | 40438 | 48236 | 49663 | 57284 | 58136 |
| 1529 | 6042 | 13685 | 24695 | 32391 | 40967 | 48863 | 50290 | 58011 | 58859 |
| 1549 | 6121 | 13864 | 25018 | 32810 | 41496 | 49490 | 50917 | 58738 | 59582 |
| 1569 | 6200 | 14043 | 25341 | 33229 | 42025 | 50117 | 51544 | 59465 | 60305 |
| 1589 | 6279 | 14222 | 25664 | 33648 | 42554 | 50744 | 52171 | 60192 | 61028 |
| 1609 | 6358 | 14401 | 25987 | 34067 | 43083 | 51371 | 52798 | 60919 | 61751 |
| 1629 | 6437 | 14580 | 26310 | 34486 | 43612 | 52000 | 53425 | 61646 | 62474 |
| 1649 | 6516 | 14759 | 26633 | 34905 | 44141 | 52627 | 54052 | 62373 | 63197 |
| 1669 | 6595 | 14938 | 26956 | 35324 | 44670 | 53254 | 54679 | 63100 | 63920 |
| 1689 | 6674 | 15117 | 27279 | 35743 | 45199 | 53881 | 55306 | 63827 | 64643 |
| 1709 | 6753 | 15296 | 27602 | 36162 | 45728 | 54508 | 55933 | 64554 | 65366 |
| 1729 | 6832 | 15475 | 27925 | 36581 | 46257 | 55135 | 56560 | 65281 | 66089 |
| 1749 | 6911 | 15654 | 28248 | 37000 | 46786 | 55762 | 57187 | 66008 | 66812 |
| 1769 | 6990 | 15833 | 28571 | 37419 | 47315 | 56389 | 57814 | 66735 | 67535 |
| 1789 | 7069 | 16012 | 28894 | 37838 | 47844 | 57016 | 58441 | 67462 | 68258 |
| 1809 | 7148 | 16191 | 29217 | 38257 | 48373 | 57643 | 59068 | 68189 | 68981 |
| 1829 | 7227 | 16370 | 29540 | 38676 | 48902 | 58270 | 59695 | 68916 | 69704 |
| 1849 | 7306 | 16549 | 29863 | 39095 | 49431 | 58897 | 60322 | 69643 | 70427 |
| 1869 | 7385 | 16728 | 30186 | 39514 | 49960 | 59524 | 60949 | 70370 | 71150 |
| 1889 | 7464 | 16907 | 30509 | 39933 | 50489 | 60151 | 61576 | 71097 | 71873 |
| 1909 | 7543 | 17086 | 30832 | 40352 | 51018 | 60778 | 62203 | 71824 | 72596 |
| 1929 | 7622 | 17265 | 31155 | 40771 | 51547 | 61405 | 62830 | 72551 | 73319 |
| 1949 | 7701 | 17444 | 31478 | 41190 | 52076 | 62032 | 63457 | 73278 | 74042 |
| 1969 | 7780 | 17623 | 31801 | 41609 | 52605 | 62659 | 64084 | 74005 | 74765 |
| 1989 | 7859 | 17802 | 32124 | 42028 | 53134 | 63286 | 64711 | 74732 | 75488 |
| 2009 | 7938 | 17981 | 32447 | 42447 | 53663 | 63913 | 65338 | 75459 | 76211 |
| 2029 | 8017 | 18160 | 32770 | 42866 | 54192 | 64540 | 65965 | 76186 | 76934 |
| 2049 | 8096 | 18339 | 33093 | 43285 | 54721 | 65167 | 66592 | 76913 | 77657 |
| 2069 | 8175 | 18518 | 33416 | 43704 | 55250 | 65794 | 67219 | 77640 | 78380 |
| 2089 | 8254 | 18697 | 33739 | 44123 | 55779 | 66421 | 67846 | 78367 | 79103 |
| 2109 | 8333 | 18876 | 34062 | 44542 | 56308 | 67048 | 68473 | 79094 | 79826 |
| 2129 | 8412 | 19055 | 34385 | 44961 | 56837 | 67675 | 69100 | 79821 | 80549 |
| 2149 | 8491 | 19234 | 34708 | 45380 | 57366 | 68302 | 69727 | 80548 | 81272 |
| 2169 | 8570 | 19413 | 35031 | 45799 | 57895 | 68929 | 70354 | 81275 | 81995 |
| 2189 | 8649 | 19592 | 35354 | 46218 | 58424 | 69556 | 70981 | 82002 | 82718 |
| 2209 | 8728 | 19771 | 35677 | 46637 | 58953 | 70183 | 71608 | 82729 | 83441 |
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| 2249 | 8886 | 20129 | 36323 | 47475 | 60011 | 71437 | 72862 | 84183 | 84887 |
| 2269 | 8965 | 20308 | 36646 | 47894 | 60540 | 72064 | 73489 | 84910 | 85610 |
| 2289 | 9044 | 20487 | 36969 | 48313 | 61069 | 72691 | 74116 | 85637 | 8 |

Turbidity Meters

